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German Environmental Economic Accounting (GEEA)

- Summary information -

Objectives

Nature has much to offer for economic use. It supplies energy and raw materials, provides the location for businesses, and serves as a medium receiving pollutants, waste, etc. However, its potential is not unlimited. Being used it is reduced, at worst even destroyed. Nature is a factor of production whose scarcity must be considered in national economic accounting. This has been noted only in recent years as environmental problems are becoming more serious and pressing.

German Environmental Economic Accounting (GEEA) approaches the statistical coverage of changes in "natural capital" due to economic activities. The idea is to calculate depreciation for nature as it is done for produced assets. In this context, sustainable development serves as a guiding principle. This means - as a first approximation - making the use of material, energy, and land for economic activities more efficient. In the final analysis, sustainability requires the long-term preservation of nature's functions (potentials). Environmental Economic Accounting is to show in statistical terms which natural resources are used, consumed, depleted, or destroyed by the economic activities (production/consumption) of a period, and what expenditure is done or necessary for countermeasures. All this is based on the process of creating value added as reflected in economic statistics. Generally, only trends, mean values, distributions and similar macro-economic indicators are of interest. Individual cases such as materials, spaces, enterprises or incidents are aggregated.

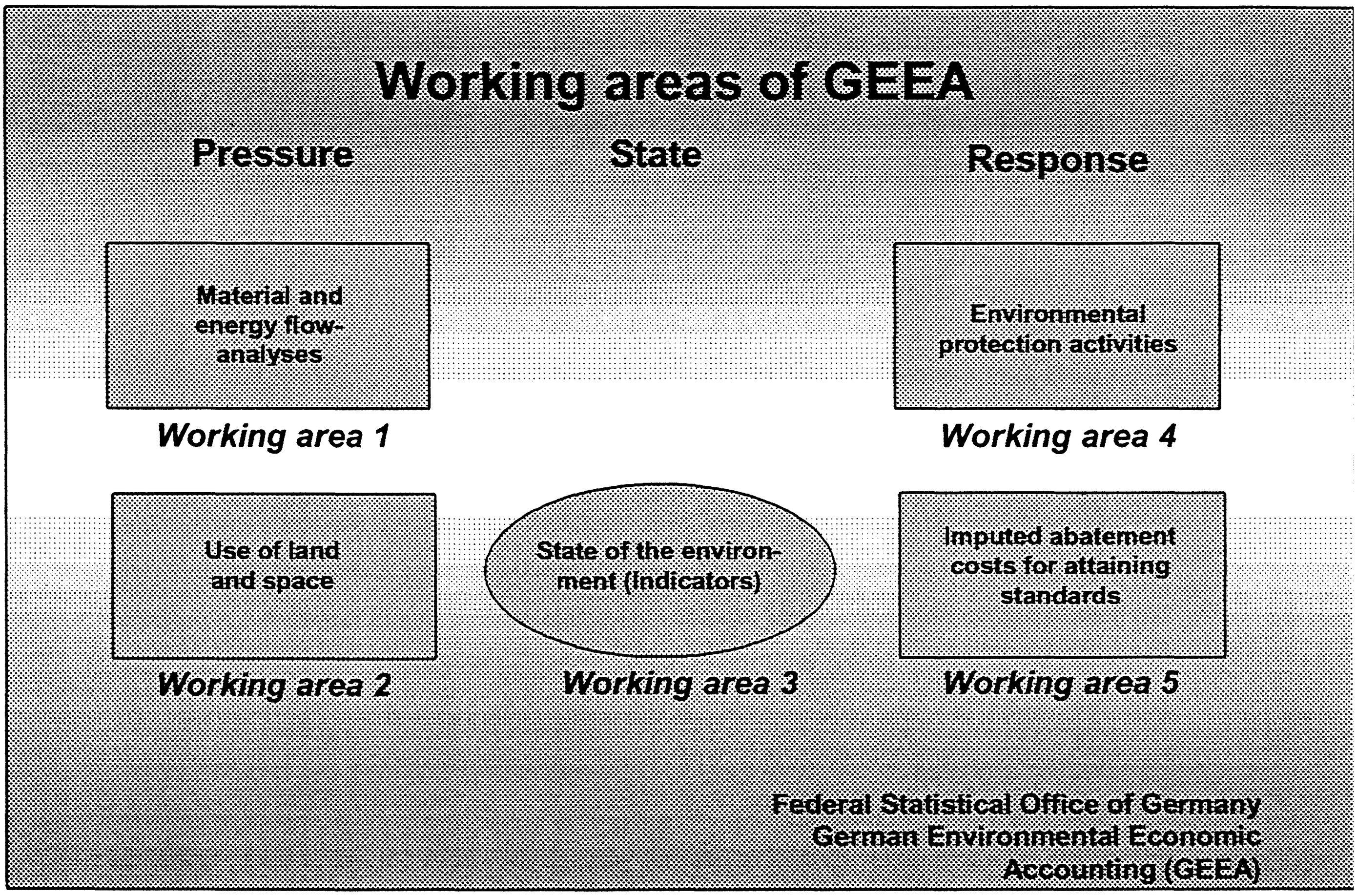
Subject Structure

Statistical data have to be provided for the main categories sources of pressures on the environment, state of the environment and environmental protection measures. For the category pressures, a distinction can be made between material flows and area uses. In the field of environmental protection there are aftercare and preventive measures. This subject structure is following the "pressure-state-response framework" developed and used by international institutions (e.g.UN, OECD) for structuring statistical data on the environment

Methodological concept

The calculation of depreciation for natural capital involves numerous methodological problems (problems of valuation/aggregation, limited knowledge of cause-effect relations, significant regional differences). For this reason, one must not expect too much of such a calculation. It would certainly be wishful thinking to believe that such a calculation could provide one single objective and indisputable depreciation value in monetary terms from which a sound, sustainable growth of the national income could in turn be derived. The „Eco-Domestic Product" or „Green National Product" as one single figure will not be calculated by the Federal Statistical Office. Moreover it seems to be more realistic to calculate pathways for a sustainable economy with the help of dynamic multi-sectoral models. By statistical law modelling in general is not a task of the Statistical Office. Such modelling calculations will be conducted in Germany by independent research institutes. For developing these multi-sectoral models GEEA will offer in close co-operation with the research institutes basic data.

The German Environmental Economic Accounting has been set up to provide answers to questions in economic and environmental policy at every stage on the way to the final and filled GEEA-system. For evaluating the efficiency of natural resource handling within the framework of structural and environmental policy, it is of fundamental importance to know the use of raw materials, energy and land changes within the sectors of the economy over time, and what, in contrast, the emissions into the natural environment are. Highly aggregated indices of the state of the environment indicate qualitative changes in a standardized form and reflect the effects and benefits side of environmental protection measures. The cost side and the current burden on the economy are recorded for environmental protection activities which are actually being carried out. Imputed abatement costs of additional preventive measures complete the picture, helping to weigh different "standards" (target values) for important physical pressures. The following figure presents the complete concept of the German Environmental Economic Accounting:



Five subjects are covered by the German Environmental Economic Accounting:

1. Material and energy flow analyses, raw material consumption, emission structure
2. Use of land and space, land cover
3. State of the environment
4. Environmental protection activities, capital formation, expenditures
5. Imputed abatement costs for attaining standards

The various subject areas are each characterized by their own specific methods: In subject areas 1, 4, and 5, methods of economic statistics and accounting are used to balance the material flows caused by the economic sectors and the environmental protection activities taken. Subject area 2 deals with immaterial pressures arising from a modified distribution of land uses and physical interventions. Remote sensing and geo information systems are used here as methodological instruments. In subject area 3, the objective basically is to condense measuring and monitoring data, which are available in an isolated form so as to provide suitable indicators. On the basis of subject area 2, an area sample is developed which aims at

the production of ecoindicators/ecoindices. The sample should reflect the change of diversity of landscapes, fauna and flora in an efficient and cost saving way.
The entire working area of Environmental Economic Accounting does not include the setting of standards. For establishing such standards, however, information from Environmental Economic Accounting explicitly aims at providing factual data on costs and benefits of alternative standard values for the process of political decision-making.

Relation to national accounting

The result of the discussion on an environment-related extension of national accounting is that it would seem best to continue as before with the traditional national product computations, which are an important means of short and medium-term monitoring of business development. For presenting economic-ecological relations a satellite system should be created separately, which has to be closely linked with the traditional national accounts as its core system. This approach would be preferable in view of the methodological and statistical deficits still existing with regard to the valuation of economic pressures created by the business sector. Limiting the approach to supplementary satellite systems means that there will be the chance to test new concepts, methods and to use new data. This would not affect the data quality required for national product computations in the narrower sense. International concepts for a satellite system for the environment were developed in particular by the United Nations. In a handbook on national accounting, the System for Integrated Environmental and Economic Accounting (SEEA) was presented. In Germany, the satellite system for the environment is implemented on the basis of the conceptual proposals of the SEEA as part of the German Environmental Economic Accounting. Presently the SEEA handbook is in a process of revision based on the experiences made by international institutions and statistical offices working in this field. The Federal Statistical Office of Germany is participating in this work and so the further development of GEEA will rely on the outcomings of these discussions.

Multi-sectoral modelling approaches

As mentioned above the calculation of total cost figures for the entire economy reflecting the depreciation on the natural assets of a nation is not carried out within the framework of the GEEA. Nevertheless the data of the GEEA-subject areas „Material- and energy flow analyses“, „Environmental protection activities“ and „Imputed abatement costs“ offer an important part of the basic information required for multi-sectoral modelling approaches.

These models, in Germany conducted by scientific institutions, try to estimate the total abatement costs for the entire economy expressing the periodical valuation of the pressures on the environment. The results of such type of modelling calculation are depending to a great extent on the underlying model specific assumptions and restrictions.

Scientific advice

In 1990 the Federal Minister for the Environment, Nature Conservation and Nuclear Safety established an Advisory Council for Environmental Economic Accounting that has been entrusted with providing scientific advice in any matters related to Environmental Economic Accounting. In its 1991 and 1995 statements, the council expressed the opinion that Environmental Economic Accounting are indispensable for an environmental policy aimed at achieving sustainability. At regular intervals the council discusses the methodological bases of the concept of Environmental Economic Accounting and the details of its implementation. These aspects are discussed in detail in the third statement of the Advisory Council as well, given to the Ministry of Environment in 1998. In 1994, an Advisory Circle representing various social groups (above all industrial and environmental associations and trade unions) was assigned to the Council with the aim to put Environmental Economic Accounting on a broad social basis.

Work progress and results

The subject areas provide the framework for supporting further development and empirical work. Research projects and field studies partly assisted by external experts have been and will be carried out in each field of work. Empirical data have become available on economic activities creating pressures, material and energy flow analyses, emissions of individual sectors of economic activity and environmental protection expenditure. They are published periodically in the series 19 „Environment“ by the Federal Statistical Office. Core results about the main environmental economic tendencies of Germany are presented to the public every year by a GEEA press conference. Most of these data are also available on the homepage of the Federal Statistical Office of Germany (see: http://www.statistik-bund).

The data base of GEEA will be further developed step by step in order to present data to support political decision making aiming at sustainable development of society and economy.

Residuals in SEEA, rev. 1 (chapter 3)

The principle idea of physical accounting is the description of physical flows to have a look at important pressures that occur along with economic activities. An important application is the combination of physical and monetary accounting in order to associate economic driving forces with environmental pressures. Therefore, the description and presentation of material flows within an accounting system should primarily follow the SNA production boundaries and conventions.

In the case of material products for physical flows there is always a corresponding monetary flow in the traditional SNA, but the application of SNA rules to the „expanded material list“ creates additional methodological questions to be answered. In this context, the definition and distinguishing of the various material flows (products, raw materials, residuals) is underlying the further considerations:
Products are output of a production process and are an economic good.
Residuals are output of a production process but are not an economic good (unwished by-product of economic activities).
Raw materials are input of a production process, they can be economic good or not.

The assignment of a produced material flow (product or residual) can exclusively be done in dependency of the price situation. In any case, these flows aim to different economic activities as well as to nature. Actually, only a part of the residuals is crossing the boundary to nature and a part remains within the economic system. The assignment to residuals does not automatically mean a transition into nature and therefore should not be generally accounted in this way. This consideration takes into account, that the further transformation of residuals within the economic system does not affect the border to nature in the physical reality. They are inputs directly for production processes (recycling, treatment, landfills) that produce services. Although those physical flows do not affect the border to nature, they are nevertheless useful for the creation of related pressure indicators.

For practical purposes, the price criterium to decide between products or residuals may cause some disadvantages that should be taken into consideration:
The strictly use of the price criterium as the only base for the delimination of material flows leads to changing assignments within the material list. Depending on the price situation, an identical material flow can be a product as well as a residual. But changing assignments for the list of materials make the handling of the system unnecessarily difficult and disturb hardly the possibilities for its analysing and interpretation.

The price recording data base for residuals may be insufficient. This means, existing prices may be (statistically) missing or cannot be separated from other sources.
For this reasons, a practicable and stable realization of the price criterium in order to improve the handling and interpretation of the system may be necessary.

The delimination between product and residual in the former SEEA does indirectly use the price criterium and refers to the definition "unwished by-products of economic activities"[1]. This convention assumes, that "unwished by-products" may have no price. It starts up with the production process, that produces main-products and automatically unwished by-products (residuals). As a consequence, the identification of residuals refers to the results of the overall relevant political discussion in this field (e. g. waste catalogues).

Thus, the assignment of a material to the category residuals also means the delimination between different kinds of residuals in dependency of their input into the respective economic activities or nature:
Residuals, that directly pass the border to **nature** (Input in not produced assets)
Residuals for **recycling** (Input into the economic activity recycling)
Residuals for **treatment** (Input in external environmental protection services)
Residuals (waste) for **landfill** (Input in produced assets/controlled landfills)
The flows of these materials and their interrelations with economic activities and nature can best been shown within the methodological framework of a PIOT.

Assuming the above mentioned considerations, the following guidelines are proposed for the practical realization of the methodology regarding residuals:
No cross border accounting to nature for residuals that remain within the economic sphere.
Creating a stable realization of the price criterium (no change between product and residual within the material list).
Distinguishing between residuals according to their destination (nature or economic activities).

The following tables show the results based on this guidelines and with focus on residuals as an aggregated example of the German PIOT 1990 for production branches and private households as well as for changes in tangible assets and the rest of the world.

[1] Residuals are normally the unwanted by-products of economic activities. In some cases, they can be sold ... . In other cases, they are used without a price for recycling or they are transformed by environmental protection activities incurring additional costs. ... In many cases, the borderline between the main output and the residuals of production processes cannot be sharply drawn. ... The question of existing markets is, of course, important but should not be considered as decisive in the definition of residuals.

Physical Input (Uses) and Output (Supply) Table (Germany, west, 1990)
Total materials in million t

	Production activities of branches				Consumption activities of households	Produced assets		Non produced natural assets	Rest of the world	Total
	Recycling	External environmental protection services	Other branches	Totals		Consumer durables, inventories, fixed assets, produced natural assets	Controlled landfills			
					Inputs (uses)					
Raw materials	13.1	3,509.8	45,707.1	49,230.0	280.4	0.0	0.0	0.0	0.0	49,510.4
R. mat., used (incl. air, minerals)	12.0	9.8	1,857.8	1,879.6	221.4	0.0	0.0	0.0	0.0	2,101.0
Raw mat., not used	0.0	0.0	981.8	981.8	0.0	0.0	0.0	0.0	0.0	981.8
Water raised	1.1	3,500.0	42,867.5	46,368.6	59.0	0.0	0.0	0.0	0.0	46,427.6
Products	8.9	17.4	5,683.7	5,710.0	3,075.0	854.2	0.0	0.0	205.9	9,845.1
Residuals	104.4	4,426.7	3.4	4,534.5	0.0	0.0	117.3	49,045.8	2.1	53,699.7
Waste for recycling	104.4	0.0	0.0	104.4	0.0	0.0	0.0	0.0	0.0	104.4
Waste for treatment	0.0	30.5	3.4	33.9	0.0	0.0	0.0	0.0	2.1	36.0
Waste for landfill	0.0	0.0	0.0	0.0	0.0	0.0	117.3	0.0	0.0	117.3
Raw mat., not used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	981.8	0.0	981.8
Other mat. discharged	0.0	0.0	0.0	0.0	0.0	0.0	0.0	613.8	0.0	613.8
Waste water f. treatment	0.0	4,396.2	0.0	4,396.2	0.0	0.0	0.0	0.0	0.0	4,396.2
Waste water discharged	0.0	0.0	0.0	0.0	0.0	0.0	0.0	44,846.6	0.0	44,846.6
Water vaporised	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1,565.9	0.0	1,565.9
Oxygen	0.0	0.0	0.0	0.0	0.0	0.0	0.0	226.1	0.0	226.1
Carbon dioxide	0.0	0.0	0.0	0.0	0.0	0.0	0.0	777.8	0.0	777.8
Other air emissions	0.0	0.0	0.0	0.0	0.0	0.0	0.0	33.8	0.0	33.8
Total inputs	126.4	7,953.9	51,394.2	59,474.5	3,355.4	847.4	117.3	49,052.6	208.1	113,055.3
					Outputs (supply)					
Raw materials	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49,510.4	0.0	49,510.4
R. mat., used (incl. air, minerals)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2,101.0	0.0	2,101.0
Raw mat., not used	0.0	0.0	0.0	0.0	0.0	0.0	0.0	981.8	0.0	981.8
Water raised	0.0	0.0	0.0	0.0	0.0	0.0	0.0	46,427.6	0.0	46,427.6
Products	90.9	0.4	9,139.3	9,230.6	0.0	222.1	0.0	0.0	392.6	9,845.3
Residuals	35.4	7,953.5	42,255.0	50,243.9	3,355.4	100.4	0.0	0.0	0.0	53,699.7
Waste for recycling	0.3	6.0	77.0	83.3	4.4	16.7	0.0	0.0	0.0	104.4
Waste for treatment	1.1	4.4	17.7	23.2	4.4	8.4	0.0	0.0	0.0	36.0
Waste for landfill	0.8	1.9	84.0	86.7	10.9	19.8	0.0	0.0	0.0	117.4
Raw mat., not used	0.0	0.0	981.8	981.8	0.0	0.0	0.0	0.0	0.0	981.8
Other mat. discharged	12.9	10.6	515.2	538.7	19.5	55.6	0.0	0.0	0.0	613.8
Waste water f. treatment	4.1	0.3	1,755.6	1,760.0	2,636.2	0.0	0.0	0.0	0.0	4,396.2
Waste water discharged	0.0	7,894.7	36,951.9	44,846.6	0.0	0.0	0.0	0.0	0.0	44,846.6
Water vaporised	5.3	22.0	1,066.4	1,093.7	472.3	0.0	0.0	0.0	0.0	1,566.0
Oxygen	0.0	0.0	226.1	226.1	0.0	0.0	0.0	0.0	0.0	226.1
Carbon dioxide	10.7	12.3	559.9	582.9	194.9	0.0	0.0	0.0	0.0	777.8
Other air emissions	0.3	1.4	19.3	21.0	12.8	0.0	0.0	0.0	0.0	33.8
Total Outputs	126.4	7,953.9	51,394.2	59,474.5	3,355.4	322.6	0.0	49,510.4	392.6	113,055.5

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WORKING PAPER No. 22

INTEGRATING BASIC STATISTICAL DATA INTO ENVIRONMENTAL ECONOMIC ACCOUNTING - THE EXAMPLE OF WASTE -

Paper submitted by the Federal Statistical Office of Germany[1]

1 Prepared by Bambang Tjahjadi.

Contribution to Session 1:

Material Flow and Waste Statistics (Data Collection and Methods used)

Contents

Abstract

In the context of German Environmental Economic Accounting (GEEA), it has become possible for the first time to estimate the amount of waste despite the lack of basic statistics. To fill the data gaps in time series, the available statistical basic data of waste (from 1993) were processed and used in the context of Material Flow Accounting (MFA) as a methodological part of GEEA. Waste amount of 1994 was then estimated for example with the help of waste coefficients. The estimates of overall waste will be represented and discussed in relation to the economic indicator by means of gross value added. In addition to that, waste to be disposed of is shown as a potential pressure for the nature as well. Due to the different conceptions, the estimated results of MFA are not directly comparable to the results which were collected by waste statistics.

1 Material Flow Accounting (MFA) as a methodological part of German Environmental Economic Accounting (GEEA)

Before we are talking about the specific topic in integrating waste statistics into Material Flow Accounting (MFA), it seems to be useful to have a good look briefly at the general framework of German Environmental Economic Accounting (GEEA) which was developed by the German Federal Statistical Office in Wiesbaden. The division which is responsible for the GEEA has been working since 1985 in the department of economic and environmental statistics. One of the aspects of developing the GEEA is to anticipate the challange of the society towards sustainable development. Besides Environmental Economic Accounting (EEA), sustainability indicators have played an important role in this context, especially since the "Earth Summit" in Rio de Janeiro in 1992. In this context, RADERMACHER (1997) described the specific role of statistics and accounting as follows:

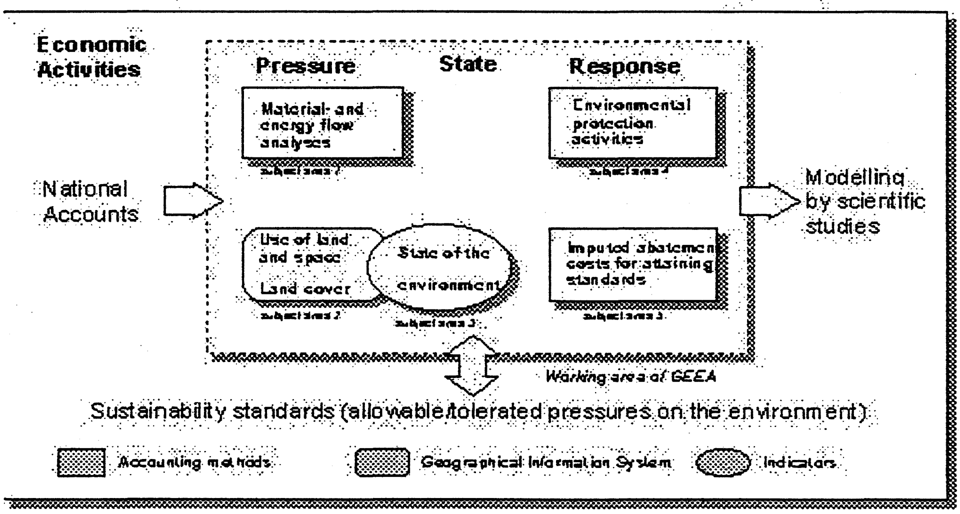
> "...Statistics and accounting provide quantitative (ex post) models of the actual situation, their task is neither to simulate future / hypothetical situations. ..., there are two working areas in the close neighbourhood of accounting which must be well co-ordinated with accounting activities and frameworks: basic statistics and indicators. ... Basic statistics, indicators and accounting provide information for different utilisations. Their quality profiles (accuracy, actuality and level of detail) have to be different, accordingly. Separated user groups and user needs require a menu of statistical data which observe one specific item from selected angles. Nevertheless, accounting can and should be used as a tool to improve consistency and performance of the production and analysis of statistical figures in general. ..." (p. 4).

1.1 Objectives and Structure of GEEA

One of the objectives of German Environmental Economic Accounting (GEEA) is to integrate nature as one of the factors of production in the economy. The idea is to calculate depreciation for nature as it is done for produced assets. The factor of nature has therefore to be added to the conventional factors of production by means of capital and human resources; it supplies energy and raw materials, provides the location for businesses, and serves as a medium receiving polutants, waste etc.. Environmental Economic Accounting is to show in statistical terms what kinds of natural resources are used, consumed, depleted, or destroyed by the economic activities (production/consumption) of a period, what expenditure is done or necessary for countermeasures. All this is based on the process of creating value added as reflected in economic statistics. Generally, only trends, mean values, distributions and similar macro-economic indicators are of interest. Individual cases such as materials, spaces, enterprises or incidents are aggregated. Statistical data have to be provided for the following main categories: sources of pressures on the environment, state of the environment and environmental protection measures (FSO 1997, p. 1).

Following the approaches of pressure-state-response, the GEEA method was developed; it consists of five different modules (Figure 1: GEEA): 1. Material and energy flow analyses, 2. Use of land and space, land cover, 3. State of the environment, 4. Environmental protection activities, capital formation and expenditures and 5. Imputed abatement costs for attaining standards (see RADERMACHER, STAHMER 1994 and 1995).

Fig. 1: German Environmental Economic Accounting (GEEA)



As indicated by the different symbols, the various subject areas are characterized by their own specific methods: In subject areas 1, 4 and 5, methods of economic statistics and accounting are used to balance the material flows caused by the economic sectors and the environmental protection activities taken. Subject area 2 deals with the immaterial pressures arising from a modified distribution of land uses and physical interventions. Remote sensing and geo information systems are used here as methodological instruments. In subject area 3, the objective basically is to condense measuring and monitoring data, which are available in an isolated form so as to provide suitable indicators. On the basis of the results of subject area 2, an area sample is developed which aims at the production of indicators on the quality of natural assets. The sample should reflect the change of diversity of landscapes, fauna and flora in an efficient and cost saving way (FSO 1997, p. 3).

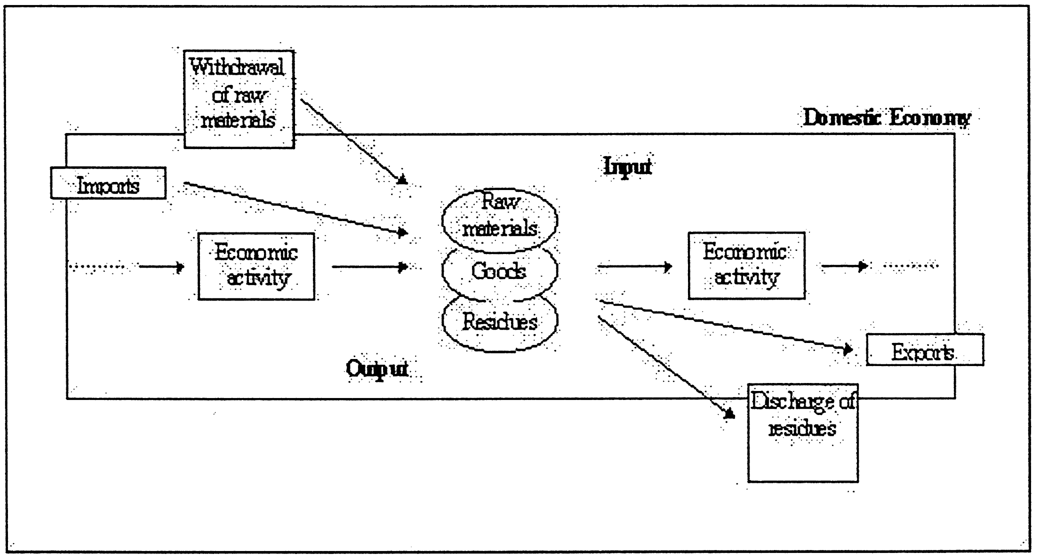
In Germany, the collection and evaluation of environment related data has already a long tradition. Basic environment statistics (waste, water and environmental expenditures) have been carried out since the early seventies (BALTES, NOWAK 1974). Geographical information systems and remote sensing have been applied for land cover/use statistics for about ten years (RADERMACHER 1993). The concepts of satellite systems in the field of environment accounting have been developed by accountants of the Federal Statistical Office in the eighties (STAHMER 1987; SCHÄFER, STAHMER 1989).

1.2 Waste within MFA

As a methodological part of GEEA, the concept of the Material Flow Accounting (MFA) uses the natural sciences as a background to enlarge the material flow concept of the economy into the "industrial metabolism" (see e.g. BACCINI, BRUNNER 1991; AYRES, SIMONIS 1994; STRASSERT 1991 and 1996). The priority of the MFA is to show the relationship between economic activities and environment pressures by means of the output side of environmental burdens, e.g. air emissions, waste and waste water. The main characteristics of the MFA concept can be summarized as follows (RADERMACHER, STAHMER 1996 and 1998; HÖH 1997; TJAHJADI, SCHÄFER, RADERMACHER, HÖH 1998):

- Nature is taken into account by putting an additional asset/stock account both on the input and the output side of the system of national accounts;
- The border between the economy and nature is defined explicitly: raw materials are extracted from the nature and residues are discharged into the nature;
- The vector of goods and services in the system of national accounts is supplemented by raw materials and residues;

Fig. 2: Material flow through the domestic economy

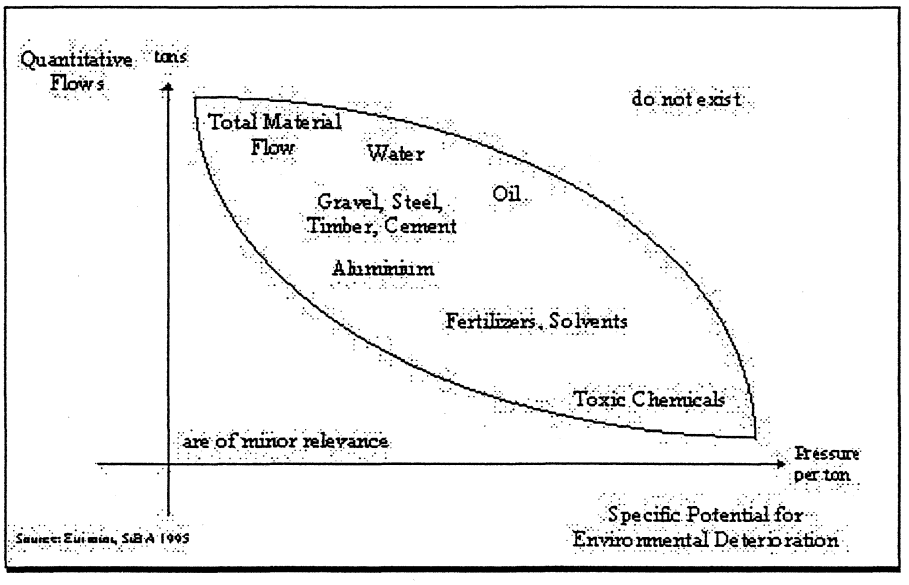


- The material and energy flows within the system borders (e.g. domestic economy, activities of production and consumption, technical processes) are calculated by taking the law of conservation of material and energy into account.

Depending on the system borderlines, economic activities can also be interpreted as a technical network aiming at the production of goods and services. Within the system borderlines, raw materials (material and energy) will be transformed into products or groups of products and environmental burdens, e.g. air emissions, waste and waste water. Waste is therefore a type of residues produced by the economic activities, and - as a first approximation - a distinction can be made between overall waste, waste to be disposed of (into the nature) and waste to be utilized /recycled (in the economy). In relation to GEEA, the first step to do is to cover the material flows caused by activities of the domestic economy.

Material flows through an economy is a complex matter, as it implies multiple hierarchical scales which can be taken as reference points for an observation (scales of economic units, scales of regions, scales of substances, etc.). Even if we decided to account only for flows through the total economy and the entire national territory we would still have to determine which materials or substances had to be integrated. This depends on the selection criteria which are a function of a widespread understanding of environmental relevance. In Germany it has been decided to follow a top-down approach, starting from the totals of material and energy flows and then trying to distinguish those flows as far as possible with respect to their economic, environmental and regional relevance (fig. 3).

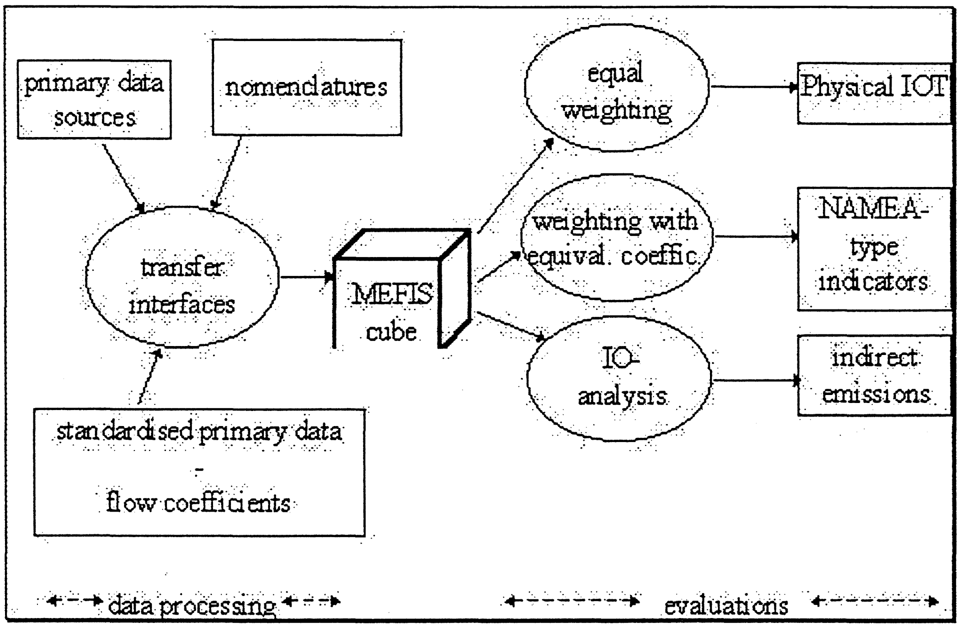
Fig. 3: Scales of Material and Substance Flows



The data processing for material and energy flow accounting as well as their primary results will be organized in the Material and Energy Flow Information System (MEFIS) and can then be evaluated for different purposes (see RADERMACHER, STAHMER 1996 and 1998, HEINZE 1998), e.g. investigation of the indirect emissions using the input-output analysis (e.g. THOMAS 1996, STBA 1997 and 1998), making out the physical input-output table through equal weighting of the data (STAHMER, KUHN, BRAUN 1998), calculation of NAMEA-type indicators e.g. greenhouse effect and acidification through weighting with equivalent coefficients (STBA 1997 and 1998; TJAHJADI, SCHÄFER, RADERMACHER, HÖH 1998). Figure 4 shows the MEFIS flow chart which describes both the processing of data into MEFIS and the evaluations of processed data for different users. Our topic concentrates on the first point and focuses on the processing of waste data.

Fig. 4: MEFIS flow chart

(German Federal Statistical Office 1998)



One of the requirements of the MEFIS information system is to provide the data in time series for the different users. On the environmental burdens of the output side, the primary data of air emissions in Germany are already standardised and are available in time series from 1978 until 1994 for eight types of air emissions (CO2, CO, SO2, NOx, CH4, N2O, NMVOC and particulate matter) (see STBA 1998a). In comparison with air emissions, the time series for waste data are still in the development stage, as the primary data sources, especially the waste statistics, were compiled every three years.

2 Methodology : Functional Structure of MFA

Due to the different conceptions of Material Flow Accounting (MFA) and basic waste statistics, the presented data consequently have different results, too. The information system of the material flows integrates data - as far as possible - in the form of time series, which are provided for the production branches (homogenous production units) according to the concepts of Input-Output-Tables in National Accounts. In comparison with MFA, the waste statistics are a part of environmental statistics which aims at the collection of environmental data according to the German law on environmental statistics in the context of environmental policy (see e.g. SPIES 1984, USTATG 1980 and 1994). Waste statistics provides periodical data (every three years) and the data were collected within the units of establishments. The last waste statistics from 1993 were published in 1996 (STBA 1996) and 1997 (STBA 1997b).

This chapter describes firstly the methodology, how to integrate waste statistics data into Material Flow Accounting (MFA), and secondly how to estimate the waste amount to fill the data gaps in time series for the MFA. With the example of 1994, the estimated results of overall waste amount and waste to be disposed of will then be presented in the chapter 3.

2.1 Integrating Basic Statistical Data into MFA

Two points will be presented here: First, the purposes of delimitation of production branches and the principle on transferring the data from the units of establishments into production branches, and second, the steps needed for integrating basic waste statistical data into MFA.

2.1.1 Delimitation of Production Branches of MFA

The economic activities in the material and energy flow accounts are classified according to the functional delimitation of production branches as applied in the German System of Input-Output-Tables. A production branch is defined as the totality of all homogeneous production units producing a commodity within a commodity group (STBA 1995, p. 22). From the aspect of Environmental Economic Accounting, the classification of the economic activities by production branches thus provides the connection between data on residues or environmental burdens and economic data (e.g. value added, employed persons). At the same time, this functional classification is the prerequisite for investigating the economic linkages by means of the input-output analysis, e.g. investigation of the cumulative environmental burdens caused by consumption. Due to the concept of the German Input-Output-Tables there are 58 production branches which can be divided into branches of good producing industries (40), branches of agriculture and forestry (2) and branches of services (16).

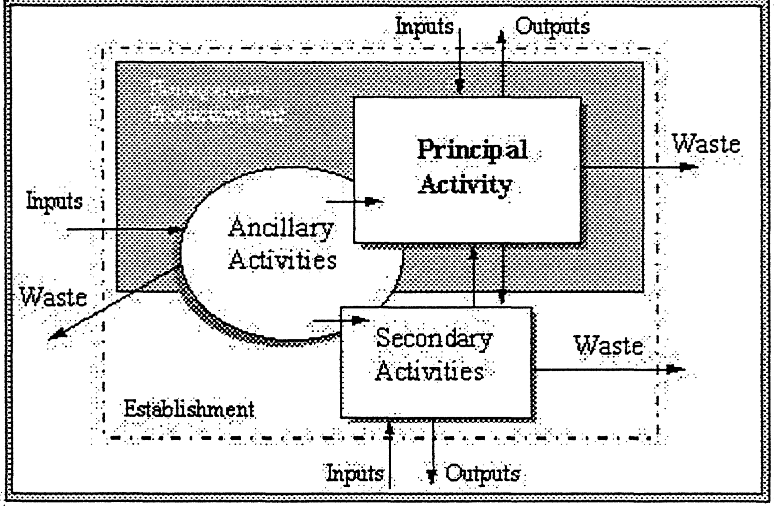
To transfer basic waste statistics from the units of establishments into the production branches, we have to distinguish three types of activities within the establishments: principal, secondary and ancillary activities (see Figure 5). According to the System of National Accounts (see UNITED NATION 1993, pp. 113) the main criterion for distinguishing the principal and secondary activities is value added:

> "The principal activity of a producer unit is the activity whose value added exceeds that of any other activities carried out within the same unit.... The value added of secondary activity must be less than that of the principal activity" (p. 114).

The output of the activity is the criterion to distinguish the ancillary activities from the principal and secondary activities:

> "The output of the principal activity...must consist of goods or services that are capable of being delivered to other units even though they may be used for own consumption or own capital formation. ... A secondary activity ... whose output, like that of the principal activity, must be suitable for delivery outside the producer unit. ... The output of an ancillary activity is not intended for use outside the enterprise. An ancillary activity is a supporting activity undertaken within an enterprise in order to create the conditions within which the principal or secondary activities can be carried out" (p. 114), e.g. administration, purchase, sales etc..

Fig. 5: The scheme of principal, secondary and ancillary activity



A production branch is characterized by the homogeneous production units which correspond to the principal activity including its ancillary activities. Therefore, the production branches are formed by selecting the principal activity and separating it from the secondary activities including their ancillary activities; the secondary activities are transferred to the corresponding branches. Consequently, the waste materials produced by these activities have to be selected and transferred using the same procedure.

The problem which has yet to be solved is how to distinguish the waste of principal activity from the waste of secondary and ancillary activities, as waste statistics do not give any explicit information about these various activities. Besides, there is no production matrix which allows the transition from the units of establishments to the production branches. Therefore, it is inevitable to proceed as follow:

1. Following the availability of waste statistical basic data and the material flows within an establishment, two types of secondary activities have to be taken into account separately for each principal activity: the production of electricity and the activities of building and construction;
2. Developing of a transition matrix for other secondary activities seems to be less meaningful due to the higher degree of homogenity of units of establishments (comparing with units of enterprises used as a starting point in German National Accounts);
3. According to the conventions of the German Input Output Table, the activities of waste water treatment, thermical waste treatment and production of process water within the establishment are assigned to ancillary activites.

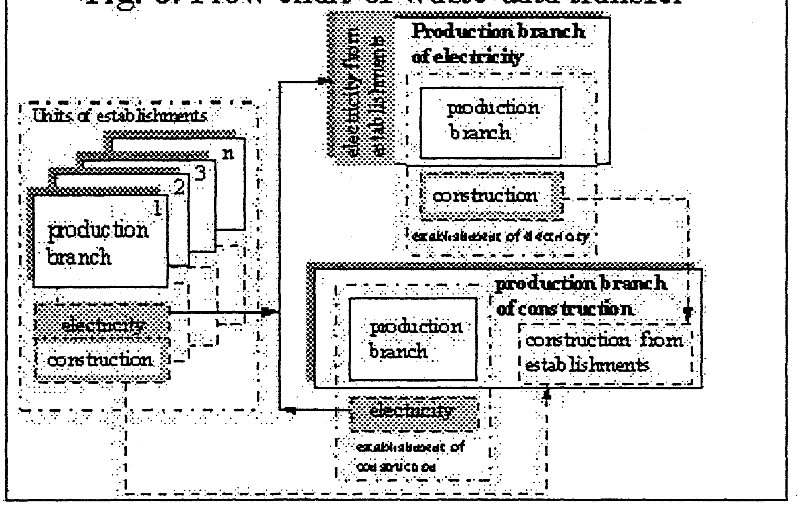
2.1.2 Steps from Basic Waste Data to MFA

What is particularly advantageous for MFA purposes, are the basic statistical waste data for the good producing industry, as these include the information on the origin of waste. Therefore, the transfer of data to MFA focuses here first on the production branches of good producing industries. For the remaining branches of services and of agriculture and forestry, the data transfer has to be pursued by an estimation method; this will be described in the next chapter.

Following the ideas of delimitation of production branches mentioned in the last chapter, the transfer of basic waste data from units of establishments into production branches is carried out in following steps:

- Using the basic waste statistics, the significant types of waste (according to German waste catalogue/LAGA) produced by the relevant secondary activities (the production of electricity and the activities of construction) including their ancillary activities (e.g. gas purification within production of electricity) have firstly to be separated from all types of waste produced for each establishment;
- These selected waste data have then to be transferred to the corresponding production branches (homogeneous production units) electricity and/or construction;
- The remaining types of waste produced by the principal activity and its ancillary activities are assigned to the homogeneous production units (production branches). Depending on the classification degree of the available basic statistics, some good producing industries have to be aggregated into the corresponding production branch, e.g. sugar production into the manufacturing of food products.

Fig. 6: Flow chart of waste data transfer



- The contribution of small firms is added to the summarized data according to the production branches; this is done by the help of the relation of production values between small firms and establishments with more than 20 employees. For this purpose, some assumptions are made for small firms, e.g. they have no internal electricity production and waste water treatment.

2.2 Filling Data Gaps in Times Series for MFA

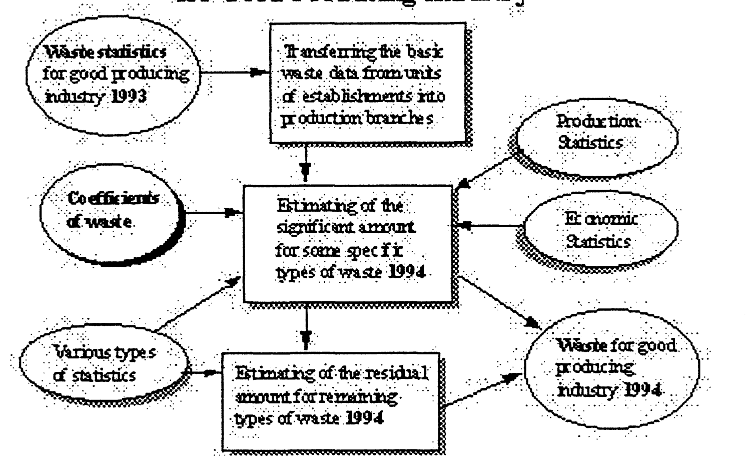
2.2.1 Problems and Needs

The information system of material and energy flows (MEFIS) strives to provide data in the form of time series. The first reason is to enable long term comparisons and the second to achieve a complete description of all kinds of material flows in a given year. For this purpose, it is favorable to update the data yearly. Waste statistics as a data base are collected in general every three years. The last waste statistics from 1993 were published in 1996 and 1997 (STBA 1996 and 1997b). Besides, the amendment of the law on environment statistics (USTATG 1994) in Germany entered into force on 1 January 1997. According to this, there will be no collection of waste data showing the origin of waste any longer. In the context of MFA, such data are important for transferring the basic data to the production branches. Due to these backgrounds, an estimation method to calculate the amount of waste by branches was developed by the Federal Statistical Office of Germany to fill the data gaps in time series for MFA.

2.2.2 Estimation Method for Branches of Good Producing Industries

40 out of 58 production branches are assigned to the good producing industry. Estimating the amount of waste is carried out for each of these branches. To estimate the waste of good producing industry in 1994, the primary data based on the waste statistics of good producing industry (1993) have to be transferred first from the establishment concept into the production branches following the procedure as mentioned in the previous chapter.

Fig. 7: Estimation Method of the Amount of Waste for Good Producing Industry



The amount of waste 1994 is calculated by estimating the significant amount of some specific types of waste and the residual amount of the remaining types of waste. Most of the specific types of waste are typical for the corresponding branches as they have a strong relation with the material flows (inputs or outputs) of the principal unit of production, e.g. whey with the production of cheese, sludge or dust of top gas with the production of raw iron. In contrary to that, the remaining types of waste has usually no specific relation with the principal unit of production.

2.2.2.1 Significant Amount for Some Specific Types of Waste

Estimating the significant amount of waste (about 82%) was carried out by using the coefficients for some specific types of waste which show the relation between the amount of waste and a (physical or monetary) unit of measurement[2]. These specific types of waste (about 57) were selected from the 435 types of waste shown according to the German waste cataloque (LAGA). They are assigned to the various production branches. A coefficient of waste is therefore specific of both the type of waste and the branch of production. Using these coefficients, the amount of waste in a certain year can be estimated to fill the data gaps in time series caused by the lack of waste statistics. The amount of waste is obtained by multiplying the coefficient of waste by the yearly change in the corresponding (physical or monetary) unit of measurement, e.g. the amount of production based on the production statistics or the production value based on the economic statistics.

2.2.2.2 Residual Amount for Remaining Types of Waste

Within a production branch, part of the waste amount can be estimated by using these coefficients. The rest of waste has normally to be calculated by using the most important coefficient which has already contributed a significant amount of waste within a production branch. For production branches which have no coefficient at all, the estimation is carried out according to the specific conditions of that production branch. In some cases, it is necessary to determine additionally a significant unit of measurement, e.g. the overall amount of water production for the branch of water supply.

From the overall amount of waste, about 90 % can be estimated by using the physical unit of measurement. With regard to waste the physical unit is more relevant than the monetary unit of measurement, as waste is part of the material flow within a production process.

The contribution of small firms is then added to the estimated amount of waste from the good producing industries with more than 20 employees using the corresponding relation of production values.

2.2.3 Estimation Method for the Branches of Agriculture & Forestry and Services

Due to the lack of a statistical data base connected to the origin of waste, an estimation method was developed by the German Federal Statistical Office (see STAHMER, KUHN, BRAUN 1998) to determine the waste amount of these branches. For the branches of services, the main problem is how to allocate the aggregated waste amount estimated from the waste statistics to the branches. The developed method uses various statistics and data sources (see Figure 8).

Estimating the waste for several branches follows by using the waste statistics and the data of commodity inputs which give any relevant information on the waste produced. For this purpose, the waste-relevant commodity inputs of all the branches of services are firstly selected. The allocation factors to the different branches of services have then to be determined on the basis of the relation between the waste-relevant commodity inputs for any individual branch and for the total of service branches. Using these allocation factors, the aggregated amount of waste determined from the waste statistics can be allocated to the corresponding branches of services. Then, the hospital waste on the basis of waste statistics can be

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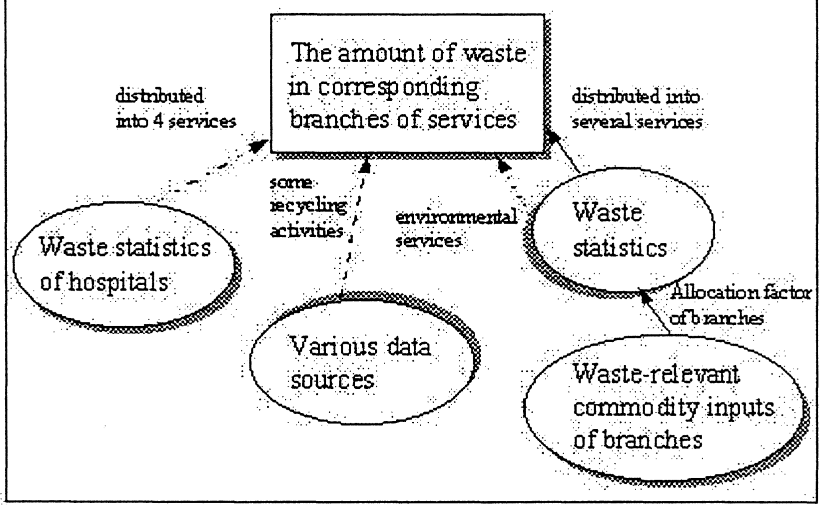
[2] The determination of waste coefficients was carried out by the Fraunhofer insitute (ISI) in Karlsruhe on behalf of the German Federal Statistical Office in Wiesbaden (ISI 1998).

allocated into the corresponding branches of services which are related to the hospital e.g. health and veterinary market services, central and local government etc.. Besides, the waste amount of environmental services (here: waste water treatment plant and waste incinerator) can be calculated on the basis of waste statistics. To determine the waste of some recycling activities, e.g. the recycling of wrecked cars and wagons, various data sources have to be used.

Fig.8: Estimating Waste by Branches of Services



For the branches of agriculture and forestry, estimating waste is carried out by using waste statistics of good producing industry and the data of waste-relevant commodity inputs. Firstly, the waste-relevant commodity inputs of the branches agriculture and forestry are selected. These selected commodity inputs are then used to determine the overall amount of the corresponding commodity inputs from all of the industry branches. Using the waste statistics of industry, the selected commodity inputs are connected to the relevant types of waste to determine the waste amount. The relations between waste amount and the corresponding commodity input within the industry result in allocation factors which are used for estimating the waste of agriculture and forestry.

Using this general method, the waste of services was then estimated for 1993 (TJAHJADI, SCHÄFER, RADERMACHER, HÖH 1998a). In 1994, the waste of services and of agriculture & forestry was determined by using the factors which show the relation of the production values at constant prices between two corresponding years.

3 Results

3.1 References for Interpretation (see STBA 1998)

Before we present the results, it is useful to summarize the important points which have been taken into account as the framework for interpreting the data:

- The concept of production branch of material flow accounting and environmental economic accounting has to be distinguished from the concept of establishment in the waste statistics for the good producing industry. The results for the waste amount from the two approaches are therefore not directly comparable (see chapter 2), e.g. for electricity production, the waste produced by the production branch differs from the waste produced by the establishment or enterprise, as electricity can be produced in all enterprises or establishments as well.

- The requirements of data quality for the two approaches are different, too: while the collected data in the waste statistics demand high standards (in detail), the estimated data in the context of material flow accounting have a summarizing character.

Besides, the results of material flow accounting do not intend to establish a hierarchy of responsibilities of environmental burdens between the production branches, because

a) the purpose of material flow accounting is to show the interrelation between production and consumption in the economy and not only to represent a part of economic activities, e.g. production. In this context, there is no sense in looking for the responsibility of environmental burdens only from one side,

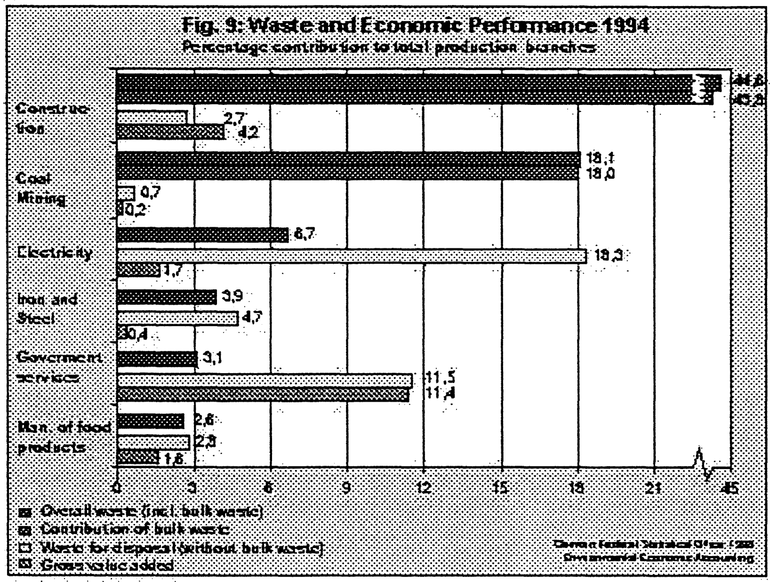
b) the profile of production branches (see Figure 9), which can be used as a tool for decision makers to create environmental policies, shows the structure of the environmental economic relations through connecting the data on environmental burdens - e.g. air emissions, waste etc. - to the economic data, e.g. value added, employed persons.

Corresponding to the concept of value added, the overall amount of waste which is generated directly from the individual production branches will be taken into account. From environmental aspects, the overall waste amount plays an important role, as the scale of the actual pressure of waste disposed of into the nature depends on the success of the activities intended to avoid and utilize waste, e.g. through recycling. In relation to the profile of production branches, the waste data will be shown by combining them with economic indicators, i.e. gross value added. In addition to that, waste to be disposed of will be represented as well, as a potential pressure on nature.

3.2 Waste Amount and Economic Performance by Production Branches, 1994

In the context of German Environmental Economic Accounting, it has become possible for the first time to estimate the amount of waste despite the lack of basic statistics which were collected periodically (every three years). The available statistical basic data (from 1993) were processed and used in the context of material flow accounting, and then estimated for 1994 e.g. with the help of waste coefficients (see chapter 2).

In 1994, nearly 350 million tons of overall waste were generated in all of the production branches; most of them (about 89%) were contributed by the industry, which produced almost 35% of gross value added. Ten of 58 production branches generated nearly 86% of the waste amount and contributed almost 30% of the gross value added. Each of these ten production branches produced more than five million tons. The following figure shows the percentage of overall waste and gross value added of the first six important branches: building and construction, coal mining, production of electricity, production of iron and steel, services of central and local government, and production of food (see STBA 1998).



Nearly 50% of waste were produced in the production branch of building and construction, while almost one fifth of the overall waste was generated in coal mining. Most of that waste was bulk waste in the sense of excavated material, demolition waste, and mining waste. However, the contribution of both branches to economic performance is much smaller; for construction and building, it is about 4%, while for coal mining it is less than 1%. Besides, almost 7% of the overall amount of waste is generated in the field of electricity production, which accounts for a share of less than 2% of economic performance. These three production branches, which are most important for the overall amount of waste, account for more than two thirds of the total amount of waste. In the context of production, waste produced can be interpreted as undesired material in production, too.

These examples illustrate two other important aspects: First, large amounts of undesired material are inevitably generated as part of the production of indispensable intermediate commodities (such as coal and electricity) for subsequent production branches. Second, large amounts of waste (e.g. demolition waste) result from the dismantling of accumulated materials, in the economy also from removing existing infrastructure (e.g. demolition of buildings).

The production of iron and steel accounts for nearly 4% of the total amount of waste, while that branch contributes by far less than 1% to economic performance. The services of central and local government, including for instance environmental protection services (public waste disposal), produce over 3% of all undesired material. As the public sector generally has a service character, its contribution to value added is much greater. The production of food accounts for just under 3% of the overall amount of waste; this branch contributes 1.6% of the economic performance.

3.3 Waste to Be Disposed of, 1994

The overall amount of waste which is generated as a direct result of production is subsequently either utilized or disposed of. Waste to be utilized are residual substances, which are transferred to third parties for utilization outside the establishment. It covers both waste intended for recycling enterprises and waste intended for trade in waste materials. Residual substances which are recycled within the establishment are not covered by the survey (see STBA 1997b, p. 8). Waste to be utilized remain therefore in the economy. In contrary, waste to be disposed of gives any informations about potential pressure on nature/environment due to its discharge into nature (e.g.landfills). From environmental-economic aspects, it is therefore meaningful to consider the waste to be disposed of, too. In the waste statistics, the amount of waste to be disposed of includes both waste which is transported to external disposal plants (including waste collected as part of public collection of household refuse) and also waste which is disposed of in internal plants of establishment (landfills and incineration plants, i.e. waste incineration plants and furnace where waste is regularly burnt, too). External disposal facilities are public disposal plants for domestic waste (landfills and incineration plants), landfills for demolition waste and excavated material as well as other facilities (e.g. composting facilities) (see STBA1997b, p. 8-9).

Figure 9 shows the percentage contribution of waste for disposal of some individual production branches to total production branches, too. Excluding the bulk waste, over 70 million tons are produced as waste for disposal by all production branches. Comparing to the overall amount of waste, the production branches mentioned before have different shares in that waste: construction nearly 3%, coal mining less than 1%, electricity production nearly 20%, iron and steel production almost 5%, services of central and local government more than 10%, and food production less than 3%.

4 Outlook

In the context of GEEA, some topics in the field of waste are important for future work:

First: Filling data gaps for waste referring to the period after 1994
For this purpose, the changing aspects of the framework of the estimation method have to be taken into account, for example:

- the introduction of new nomenclatures for the types of waste, for products and for economic branches from the european framework;
- the changes in waste-related laws, such as the new law on waste management and waste of October 1994 (that entered into force on 7 October 1996), including its subordinate provisions; also, new ordinances in the field of waste recycling and the ordinances applicable to landfilling, and the amendment of the environmental statistics law of September 1994, which entered into force on 1 January 1997;
- the changes in terminology and in the delimitation between waste and non-waste;
- the technical progress made in fields with a considerable amount of waste produced, such as reutilization of construction waste, car wrecks, electronic waste, etc., and the capacities of the establishments concerned.

Second: Harmonizing the data according to requirements of the MEFIS information system
This regards first of all the checking of whether available data meet the requirements of the Material and Energy Flow Information System (MEFIS) and what data have to be harmonized and calculated in the future.

Third: Cumulated amount of waste
The general method of calculating indirect emission will have to be adopted to permit calculation waste amount which indirectly produced through intermediate consumption.

Fourth: Environmental relevance of waste

This regards the development of a weighting system to describe the specific environmental risk of the amount of waste concerned. Such a weighting system exists, for example, in the sphere of air emissions; it allows to aggregate the emissions by their specific effect regarding an environmental problem examined (e.g. greenhouse effect). A pre condition towards developing such a weighting system for waste is the proposal made by the Federal Statistical Office to break down the overall amount of waste by four waste categories; forming those categories takes account of the quantitative and qualitative (ecotoxic) criteria.

Fifth: Filling data gaps for the time before 1993
The question here is, how far the available data make it necessary to adjust or modify the developed estimation method, in order to permit a calculation of the data for former years in the context of material and energy flow accounting.

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Trends of production factors,
residual and contaminate substances and productivities

Specification	Units	1991	1993	1995	1999 ?/strong>
Production factors					
Primary energy consumption	Petajoule	14.467	14.179	14.269	14.20
Raw material withdrawal and Imports ?/td>	Mill. t	1.460	1.413	1.485	1.41
Water extraction from nature	Mill. m?/small>	51.344	48.150	48.909	..
Greenhouse gases	Mill. t	1.148	1.073	1.051	1 007 ?/td
Acidification gases	Mill. t	5.7	4.5	3.5	2.5 ?/td
Waste	Mill. t	354	363	365	..
Water disposal into nature	Mill. m?/small>	51.148	47.966	48.724	..
Built–up land and land used for traffic purposes	km?/small>	...	40.305	...	..
Hours worked	Mill. Std.	59	58	57	5
Consumption of fixed capital (at 1995prices)	DM bn	447	492	521	57
final consumption:					
Gross domestic product	DM bn	3.346	3.384	3.523	3.73

(at 1995 prices)					
Gross domestic product in relation to production factors (Germany 1991 respectively 1993 = 100)					
Primary energy consumption	–	100	103,2	106,7	113,
Raw material withdrawal and					
Imports ?/td>	–	100	104,5	103,5	115,
Water extraction from nature	–	100	107,8	110,5	..
Greenhouse gases	–	100	108,2	115,0	125,2 ?/td
Acidification gases	–	100	129,7	173,6	248,8 ?/td
Waste	–	100	98,7	102,1	..
Water disposal into nature	–	100	107,8	110,5	..
Built–up land and land used for					
traffic purposes	–	...	100,0	...	..
Hours worked	–	100	103,0	109,4	116,
Consumption of fixed capital (at 1995prices)	–	100	91,9	90,3	86,

?Partly estmate.
?nbsp;Extraction used of abiotic raw material and imported abiotic goods.
?nbsp;1998

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Revenues from taxes and fees related to the environment

Tax/Fee	1992	1994	1996	1999
	million DM			
Mineral oil tax	55.166	63.847	68.251	71.278
Motor vehicle tax	13.317	14.169	13.743	13.767
Fees related to waste water discharges	11.784	13.731	12.599	.
Fees related to waste disposal and treatment	10.462	11.357	11.388	.
Total	90.729	103.103	105.981	.

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Material and energy flows
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Materials	1991	1993	1995	1998
	Solids and Gases			
Withdrawal	5.121	4.779	4.503	4.150
aRaw material withdrawal (inland)	3.968	3.681	3.376	2.996
aaUnused raw material, extraction	2.686	2.422	2.089	1.791
aaRaw material, extraction used	1.282	1.260	1.287	1.205
aaaBiotic raw material	188	205	198	216
aaaAbiotic raw material	1.094	1.054	1.090	989
aaaaFuel	364	296	265	226
aaaaOre	0	0	0	1
aaaaMinerals, stones and clays	730	758	825	763
aaImport	433	423	464	505
aaaBiotic goods	68	64	69	73
aaaAbiotic goods	365	359	395	431
aaaaFuel	203	208	214	246
aaaaOre and other products	74	63	78	85
aaaaMinerals, stones and clays and aaaatheir products	51	56	64	54
aaaaProducts of chemical industry	23	21	24	29
aaaaMetal products and machinery	8	6	8	10
aaaaOther	6	5	7	8
aaOxygen input processes	719	675	663	649
Discharge	4.390	4.044	3.728	...
aaMaterial application	295	283	283	277
aaaFertilizer	294	282	282	276
aaaPesticides (active substances)	0	0	0	0
aaaSewage sludge	1	1	1	1

aaUnused raw material, extraction	2.527	2.258	1.934	1.657
aaExport	211	202	225	260
aaaaBiotic goods	52	51	60	67
aaaaAbiotic goods	159	151	165	193
aaaaaFuel	21	22	25	34
aaaaaOre and other products	37	36	38	41
aaaaaMinerals, stones and clays and aaaaatheir products	50	41	45	50
aaaaaProducts of chemical industry	30	32	34	39
aaaaaMetal products and machinery	12	10	12	16
aaaaaOther	9	9	11	13
aaWaste, total	354	363	365	...
aaAir emissions	1.002	938	921	901
Balance Solids and Gases	731	735	775	...
	Water			
aaWater extraction from nature	51.344	48.150	48.909	...
aaWater disposal into nature	51.148	47.966	48.724	...
aaExported minus imported water	8	8	8	...
Balance Water	189	176	177	...
	Total			
Material retained	920	911	952	...

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Energy consumption				
Branches	1991	1994	1996	1998
Petajoule				
Agriculture, forestry and fishing	207.1	147.0	159.0	152.6
Production industries	8387.3	8007.9	8104.3	7756.9
Coal-mining, Peat cutting	650.7	500.1	398.0	283.6
Manufacturing of food products	264.4	265.4	282.1	272.6
Manufacturing of pulp. paper and paper products	208.3	234.0	218.9	212.8
Coking plant, Petroleum processing, manufacturing of fertile material	477.7	508.5	499.7	438.7
Manufacture of chemicals. Chemical products	1654.2	1612.5	1489.1	1493.9
Manufacture of other non-metallic mineral products	316.0	331.9	374.2	373.2
Manufacture of basic metals and fabricated metal products	817.5	737.7	751.8	766.7
Electricity and gas supply	2654.0	2690.3	2853.6	2734.4
Rest of Production				

industries	1344.4	1127.4	1236.9	1181.0
Service activities	2026.4	2049.9	2269.7	2199.5
Total including statistical balance	10715.4	10284.6	10571.0	10349.1
final consumption: Private households	3751.4	3793.7	4174.9	4104.9
1991 = 100				
Agriculture, forestry and fishing	100	71.0	76.8	73.7
Production industries	100	95.5	96.6	92.5
Coal–mining, Peat cutting	100	76.9	61.2	43.6
Manufacturing of food products	100	100.4	106.7	103.1
Manufacturing of pulp. paper and paper products	100	112.3	105.1	102.2
Coking plant, Petroleum processing, manufacturing of fertile material	100	106.5	104.6	91.8
Manufacture of chemicals. Chemical products	100	97.5	90.0	90.3
Manufacture of other non–metallic mineral products	100	105.0	118.4	118.1
Manufacture of basic metals and fabricated metal products	100	90.2	92.0	93.8
Electricity and gas supply	100	101.4	107.5	103.0
Rest of Production industries	100	83.9	92.0	87.8
Service activities	100	101.2	112.0	108.5
Total including statistical balance	100	96.0	98.7	96.6
final consumption: Private households	100	101.1	111.3	109.4

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Energy consumption relevant for emissions				
Branches	1991	1994	1996	1998
in Petajoule				
Agriculture, forestry and fishing	150.8	130.8	139.2	133.4
Production industries	7276.5	6642.7	6619.5	6328.4
Coal-mining, Peat cutting	675.9	526.6	411.7	285.6
Manufacturing of food products	209.1	210.0	222.8	216.6
Manufacturing of pulp. paper and paper products	164.8	189.9	177.7	174.2
Coking plant, Petroleum processing, manufacturing of fertile material	596.7	453.0	427.3	427.5
Manufacture of chemicals. Chemical products	750.1	652.9	523.8	524.5
Manufacture of other non-metallic mineral products	257.8	269.9	311.1	313.0
Manufacture of basic metals and fabricated metal products	825.9	774.8	785.8	825.6
Electricity and gas supply	2993.0	2886.5	3005.8	2848.7
Rest of Production industries	803.3	679.2	753.5	712.6

Service activities	1597.8	1632.7	1803.2	1721.7
Total	9025.1	8406.2	8561.8	8183.4
final consumption: Private households	3253.9	3171.2	3517.1	3455.5
1991 = 100				
Agriculture, forestry and fishing	100	86.7	92.3	88.4
Production industries	100	91.3	91.0	87.0
Coal-mining, Peat cutting	100	77.9	60.9	42.3
Manufacturing of food products	100	100.4	106.5	103.6
Manufacturing of pulp. paper and paper products	100	115.3	107.9	105.7
Coking plant, Petroleum processing, manufacturing of fertile material	100	75.9	71.6	71.6
Manufacture of chemicals. Chemical products	100	87.0	69.8	69.9
Manufacture of other non-metallic mineral products	100	104.7	120.7	121.4
Manufacture of basic metals and fabricated metal products	100	93.8	95.1	100.0
Electricity and gas supply	100	96.4	100.4	95.2
Rest of Production industries	100	84.6	93.8	88.7
Service activities	100	102.2	112.9	107.8
Total	100	93.1	94.9	90.7
final consumption: Private households	100	97.5	108.1	106.2

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Emissions of carbon dioxide (CO_2)				
Branches	1991	1994	1996	1998
mn t				
Agriculture, forestry and fishing	11.4	9.6	10.1	9.5
Production industries	632.5	573.3	563.2	541.1
Coal-mining, Peat cutting	67.3	52.2	39.6	27.7
Manufacturing of food products	14.3	14.0	14.7	14.4
Manufacturing of pulp. paper and paper products	11.1	12.3	11.4	11.2
Coking plant, Petroleum processing, manufacturing of fertile material	38.1	28.4	27.5	27.6
Manufacture of chemicals. Chemical products	53.2	44.8	36.4	37.0
Manufacture of other non-metallic mineral products	33.1	38.4	38.4	38.8
Manufacture of basic metals and fabricated metal products	67.3	58.4	63.2	66.8
Electricity and gas supply	289.3	276.5	279.1	267.7
Rest of Production industries	58.8	48.2	52.9	49.9
Service activities	110.1	109.8	118.9	112.1
Total	753.9	692.6	692.2	662.8
final consumption: Private				

households	222.5	211.7	232.1	223.3
1991 = 100				
Agriculture, forestry and fishing	100	84.2	89.1	84.1
Production industries	100	90.6	89.0	85.6
Coal–mining, Peat cutting	100	77.6	58.8	41.2
Manufacturing of food products	100	98.2	102.9	100.7
Manufacturing of pulp. paper and paper products	100	110.7	102.7	100.8
Coking plant, Petroleum processing, manufacturing of fertile material	100	74.6	72.2	72.5
Manufacture of chemicals. Chemical products	100	84.2	68.3	69.5
Manufacture of other non–metallic mineral products	100	116.2	116.2	117.4
Manufacture of basic metals and fabricated metal products	100	86.7	93.9	99.3
Electricity and gas supply	100	95.6	96.5	92.5
Rest of Production industries	100	81.9	90.0	84.9
Service activities	100	99.7	108.1	101.8
Total	100	91.9	91.8	87.9
final consumption: Private households	100	95.1	104.3	100.4

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Land cover data 1990

Nomen-clature	Land cover categories	Germany		city states	
		1000 ha	%	1000 ha	%
1	Artificial surfaces	2.671,6	7,5	122,3	59,7
11	Urban fabric	2.103,2	5,9	87,9	42,9
12	Industrial, commercial and transport units	309,0	0,9	20,2	9,9
13	Mine, dump and construction sites	151,4	0,4	1,2	0,6
14	Artificial non-agricultural vegetated areas	108,0	0,3	12,9	6,3
2	Agricultural areas	21.661,0	60,7	46,3	22,6
21	Arable land	14.270,3	40,0	17,0	8,3
22	Permanent crops	258,0	0,7	2,6	1,3
23	Pastures	4.326,9	12,1	19,0	9,3
24	Heterogeneous agricultural areas	2.805,8	7,9	7,7	3,8
3	Forests and semi-natural areas	10.821,0	30,3	24,5	12,0
31	Forests	10.424,1	29,2	22,2	10,8
32	Shrub and/or herbaceous vegetation associations	331,2	0,9	2,1	1,0
33	Open spaces with little or no vegetation	65,7	0,2	0,3	0,1
4	Wetlands	168,9	0,5	1,3	0,6
41	Inland wetlands	155,0	0,4	0,7	0,3
42	Coastal wetlands	13,9	0,0	0,6	0,3
5	Water bodies	379,8	1,1	10,6	5,2
51	Inland waters	342,7	1,0	5,3	2,6

	52	Marine waters	37,1	0,1	5,3	2,6
	aa	Total area	35.702,2	100,0	205,0	100,0

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Environmental protection expenditure

Sector ---------- ---------- ------- Environmental domain	1994	1995	1996 ?/strong>	1997 ?/strong
aaa	million DM (Current prices)			
Manufacturing industry	17.430	17.510	17.600	15.4
aaaaWaste management	3.220	3.290	3.520	3.2
aaaaWaste water management	5.440	5.770	5.680	5.3
aaaaNoise abatement	310	370	360	3
aaaaProtection of ambient air	8.460	8.080	8.050	6.5
				a
General goverment	28.630	27.440	24.830	22.0
aaaaWaste management	10.230	10.770	10.630	9.2
aaaaWaste water management	17.940	16.280	13.820	12.4
aaaaNoise abatement	380	300	300	3
aaaaProtection of ambient air	80	90	80	
				a
Manufacturing industry and General goverment	20.010	24.370	27.650	29.0
aaaaWaste				

management	9.890	12.550	14.500	14.2
aaaaWaste water management	10.120	11.820	13.150	14.7
?nbsp;1996 and 1997 preliminary results.				

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Joint ECE/Eurostat Work Session on
Methodological Issues of Environment
Statistics
(Ma'ale Hachamisha (15 km from Jerusalem),
Israel, 11-14 October 1999)

Working paper No.16

ENERGY USE OF PRIVATE HOUSEHOLDS BY PURPOSES OF FINAL CONSUMPTION

Submitted by the Federal Statistical Office of Germany[1]

Introductory note

The consumption of energy is of critical importance in the context of utilising our natural environment. **a specific** environmental problem. It is rather a cross-section indicator which may provide information on a variety of environmental problems, such as pressures on landscape, ecosystems, soils, waters, and ground water, which are caused by the extraction of energetic raw materials, the creation of air emissions and of wastes, and the consumption of cooling water in the context of transforming and consuming energy sources. Last but not least, the consumption of non-renewable raw materials is important with regard to preserving the bases of life for future generations. At the same time, the use of energy is of crucial importance for the economic process because nearly every economic activity (production, consumption) is connected either directly or indirectly with the consumption of energy.

This means that the use of energy and the economic reasons for such use have to play an important part in Environmental-Economic Accounting, as this system deals especially with the interaction between economic activity and the environment. This is why it is our goal to provide comprehensive data on energy flows as part of the German system of Environmental-Economic Accounting. This will enable us to offer different kinds of data which may serve as starting points for analyses and which refer to the different phases of the economic process.

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1 Prepared by Karl Schoer, Environmental Economic Accounting, Geographical Information Systems in Statistics.

Our data supply may provide answers to the following questions:

- What is the level of **direct** energy consumption of the indusries (homogeneous branches) regarding their production and of private households regarding their consumption (**economic activity**)?

- What is the level of energy consumption, taking account of all stages of production, (**cumulated** energy consumption) for the production of **products**?

- What is the level of energy input, referring to the relevant **final uses**?

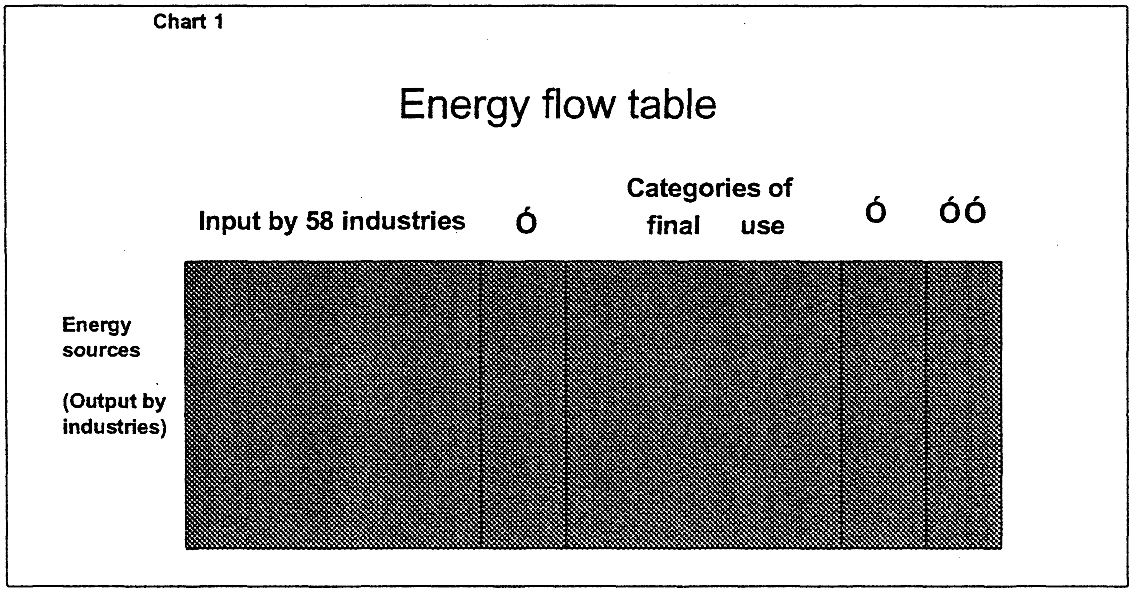
As is indicated by its very name, Environmental-Economic Accounting is an accounting approach; that is an approach of secondary statistics integrating the available information into a comprehensive and consistent methodological framework.

The first of the aspects mentioned before, that is presenting direct energy consumption, may be obtained directly from the accounting database as explained before. The other two aspects deal not only with the energy consumption connected directly with a specific production or consumption activity. They rather refer to examining the total energy content of individual goods, that is, the total energy used in all previous stages of production together has to be calculated (cumulated energy consumption). At the level of the overall economy, the data needed for this purpose can be obtained only by applying an input-output model approach.

In the following, I will first explain the concept of calculating direct energy consumption within the accounting framework as far as is necessary for understanding the presentation in general. In the second section, I will describe how the cumulated energy consumption is calculated by means of the input-output approach. In the last section, some important results will be shown.

Direct energy consumption

The Federal Statistical Office regularly compiles an input-output table of energy flows or, to be more precise, an **energy flow table** showing the use of energy in physical units (Joule), broken down by types of energy sources.



The energy flow table is fully compatible with the monetary input-output table (IOT) which shows the entire economic interactions in monetary units. Compatibility refers in particular to the definition of homogeneous branches, although it also means that all other issues of the presentation concept are compatible, too and, in addition, data sources and calculation methods are closely coordinated.

Chart 1 shows the general structure of the energy flow table. The energy flow table shows the uses of the total supply of primary and secondary energy in a breakdown by types of energy source.

Primary energy sources are raw materials (coal, mineral oil, natural gas) and natural energy sources such as water power and solar energy. Nuclear fuels are included here, too. Primary energy sources are in part used directly for energetic purposes (for example, part of coal and natural gas), while another part is transformed into other energy sources. Secondary energy sources are energy sources that have been created through processes of transforming primary or secondary energy sources. They include, for instance, coal briquettes, mineral oil products, electricity, steam, and remote heating.

The total energy supply shown in the energy flow table comprises the domestic production and the imports for the individual energy sources. What is desired now is to combine the data on the total supply and the use of energy sources presented in physical units with the data of the input-output table (IOT) shown in monetary units. For this purpose, the same breakdowns must be used for the use side of the physical flows and for the representation of the use of goods in the IOT. The energy flow table shows for the individual energy sources (rows) their use (columns) as intermediate goods (58 homogeneous branches of the IOT) and as goods of final use (final consumption of households, final consumption of general government, capital formation, exports). In the context of final uses, energy is consumed in the categories "final consumption of households" (for example the use of heating oil, gas, electricity, or fuel), "exports" (exports of energy sources), and "capital formation" (only change in stocks of energy sources); no energy is consumed in final consumption of general government.

So, the energy flow table shows which energy sources are directly used for what purpose and to what extent. Every type of energy source may clearly be allocated to a homogeneous branch or a homogeneous product group of the IOT. Thus it is possible to allocate the energy sources in physical units to the output of the homogeneous branches as shown in the input-output table. For example, for the product group "mineral oil production", those energy sources are represented which belong to the mineral oil products, such as motor fuel or heating oil.

The direct results of the energy flow table already offer interesting opportunities of analysis, especially if combined with the data of the monetary IOT. The data allow in particular to illustrate the main issue of Environmental-Economic Accounting, that is the connection between economic activity and environmental pressures, which in this context are examined from the aspect of energy use. By means of the energy flow table, the energy used can directly be allocated to the goods produced or to the consumption activities. It is very important to know how much energy is used for what production or consumption activities because that information is a good basis for policy measures aimed at reducing energy consumption (how much energy is used for what economic activity). Also, those data can serve as a basis for assessing the impact of such measures, both with regard to the target variable energy consumption and also concerning the indirect economic effects (what production or consumption activities are affected to what extent by the measure?).

Direct energy consumption can directly be influenced by the acting persons. For instance, private households may reduce their energy consumption by using low-energy equipment, applying heat insulation, reducing the room temperature, and driving their cars more economically or less often. In production, companies can directly reduce their direct energy consumption by modifying their production processes.

In addition to absolute data on direct energy consumption, ratios may be calculated, such as direct specific energy consumption in the individual homogeneous branches (energy use in physical units in relation to value added in monetary units).

Indirect energy consumption

In this section, I will explain the calculation of indirect energy consumption, which allows to examine also the second and third problem mentioned above. Here the focus is on cumulated energy consumption, that is the total energy consumption caused by the production of a good or the goods of final use.

This way of examining things is based on the knowledge that energy quantities used for intermediate purposes will indirectly serve the purposes of final use, too. Energy used in this way is either needed for the production of goods of final use or for the production of intermediate goods, which – after undergoing one or more stages of production – will also be integrated in the goods of final use.

Indirect energy consumption can be calculated with the help of the input-output table. In the following, I will outline the basic elements of how to calculate indirect energy consumption for final use by means of the input-output model and what opportunities of analysis are provided by those data.

With regard to final consumption of households, calculating indirect energy consumption means calculating not only the amount of energy directly consumed in the consumption process (example: the quantity of fuel consumed in car driving). What is also calculated is the total amount of energy consumed for producing goods for consumption of households at the various stages of production (e.g., the total energy consumed in producing a car and its components). This opens up additional opportunities of analysis permitting both to apply energy reduction measures more efficiently and to estimate more precisely the effects of such measures.
Such computations may be performed in a similar way for other types of materials. The Federal Statistical Office has already published such data for the emission of greenhouse gases and acidification gases, which are created in the course of certain production processes (especially the consumption or transformation of energy sources).

The main starting point for the calculation is the energy flow table in physical units presented earlier. It is linked with the monetary input-output table. What is used here is especially the interconnection of industries shown in the monetary input-output table. Input-output tables show the direct economic interactions between the producing sectors and the final use of goods for a specific period. So, they are suited for model calculations which – under certain assumptions – can also illustrate the indirect economic interactions in the spheres of production and use of goods.

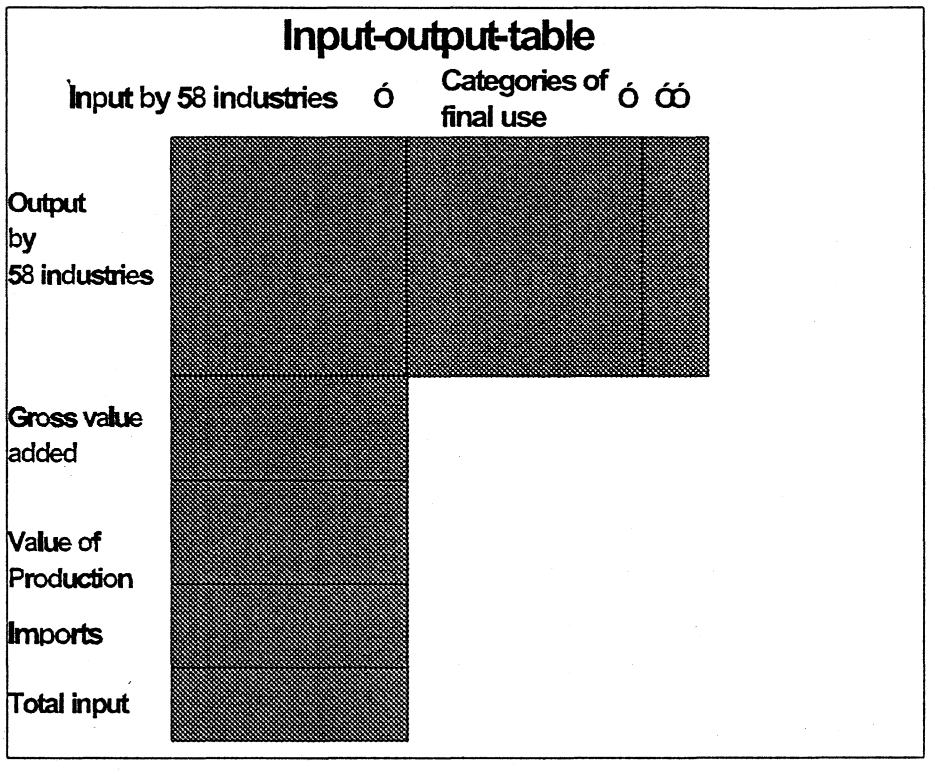
The monetary input-output table is structured according to the following pattern shown in chart 2.

Allocating the energy quantities of intermediate use to the goods of final use is performed by means of the matrix of the Leontiev inverses. Basically, that matrix can be derived from the monetary IOT through an algorithm.[2] In a model, using the interactions shown in the table, the entire production is allocated to the goods of final use. In combining the Leontiev coefficients on the one hand and the information on

direct input of primary energy to the homogeneous branches from the energy-flow table as well as the information on the proportion of the final uses in relation to the total output of the homogeneous branches

[2] For details of the calculation method see: Stahmer, Carsten: "Direkter und indirekter Energiegehalt der Güter der letzten Verwendung" in: Reich, Utz-Peter/ Stahmer, Carsten (ed.): Input-Output-Rechnung: Energiemodelle und Methoden der Preisbereinigung, Frankfurt/Main 1981, pp. 71-113.

Chart 2



from the monetary input-output table on the other hand the total intermediary (indirect) input of primary energy for final uses is obtained by product groups.

Calculating the energy content of goods of final use is an ex-post analysis of the economic processes. Using input-output tables for the additional calculation of the amount of energy used in the preceding stages of production to produce a product (to put it more precisely: a homogeneous product group) is a step towards a model calculation; that step involves making a number of assumptions.

These assumptions include in particular the following:

- The goods are produced with linear technology, that means the relation between inputs and the amounts of goods produced is assumed to be constant.
- For any individual good of a homogeneous branch (homogeneous product group), the average input structure of that homogeneous branch is assumed.

As far as domestic primary energy is transformed into secondary energy (for example, crude oil into motor fuel) or a secondary energy source is transformed into another secondary source (for example, crude petrol into domestic fuel), double counts will occur if the indirect effects are included. This can be avoided only by excluding secondary energy of domestic production. In this context, imported secondary energy can be treated as quasi primary energy because primary or secondary energy is not included if it had been used in other countries to produce secondary energy which was later exported to Germany.

What has not been included yet is energy input in foreign countries which was directly or indirectly necessary to produce German imports (energy sources and other goods). For a comprehensive representation of the energy consumption caused by final use, however, it is necessary to cover that part, too.

Energy input abroad can be determined only if information on the production relations in those countries is available. To get such information, imports would have to be subdivided by countries of origin. Then, to those imports direct and indirect energy inputs would have to be assigned, following the method described earlier, and using as a basis the country-specific input-output tables and country-specific energy flow tables.

At the best, such data are available in some few cases only. Therefore, the assumption is made that input structures and the relations between energy input and produced goods are identical in Germany and abroad. This means that the energy contents of imported goods are estimated on the basis of the German input-output table and the German energy flow table. Primary energy input abroad for the production of German imports, that has been estimated in that way, has now to be added to the total direct energy supply (primary energy from domestic production and imported primary and secondary energy). This will result in the total primary energy supply for final use, or the energy content of goods of final use.

Allocating the indirect energy consumption to the individual categories of final use is done by product groups, according to the use structure of the monetary IOT. Cumulated energy consumption by product groups is determined as the sum of direct and indirect energy consumption.

Another way of presenting energy consumption by final consumption of households is using the breakdown by purposes of final consumption of households. Here, direct and indirect energy input for final consumption of households by product groups is allocated to the purposes of final consumption of households. This is done with the help of a monetary matrix of "product groups (homogeneous branches) by purposes of final consumption of households". The result is direct and indirect energy consumption by purposes of final consumption of households. Cumulated energy consumption is obtained by adding up direct and indirect energy consumption.

Results

Table 1 shows the energy flows at the level of the overall economy from production through to the final use categories. As regards direct energy consumption, the total supply of primary energy amounts to 15,147 petajoules, 29% of which were produced

Table 1:

Primary energy
Germany 1995

Specification	Direct	Indirect	Cumulated	
	Petajoule			Total supply =100
Domestic Production	4 328	0	4 328	23,0
+ Imports	10 819	3 677	14 496	77,0
Total supply	15 147	3 677	18 824	100,0
- Intermediate Consumption	10 128	- 10 128	0	0,0
Final uses	5 018	13 805	18 824	100,0
- Exports	1 044	4 248	5 292	28,1
Domestic final uses	3 974	9 558	13 532	71,9
Private consumption	4 141	6 005	10 145	53,9
Public consumtion	0	1 451	1 451	7,7
Gross capital formation	- 166	2 102	1 936	10,3

within the country (domestic production) and 71% imported. A total amount of 10,128 petajoules was used for production (intermediate consumption), while the remaining part was used immediately for final use purposes (5018 petajoules). A total of 1,044 petajoules were allocated to exports (exports of energy sources), 4,141 petajoules to the final consumption of households and -166 petajoules to capital formation (changes in stocks of energy sources). If, however, indirect energy consumption is also taken into consideration, the total supply of energy increases by the energy contents of the goods imported (excl. energy sources) of 3,677 petajoules to a total of 18,824 petajoules, 23% of which were produced within the country and 77% imported. Here, intermediate consumption is fully allocated to the final use

Table 2:

Primary energy use for private consumption
Germany, 1995

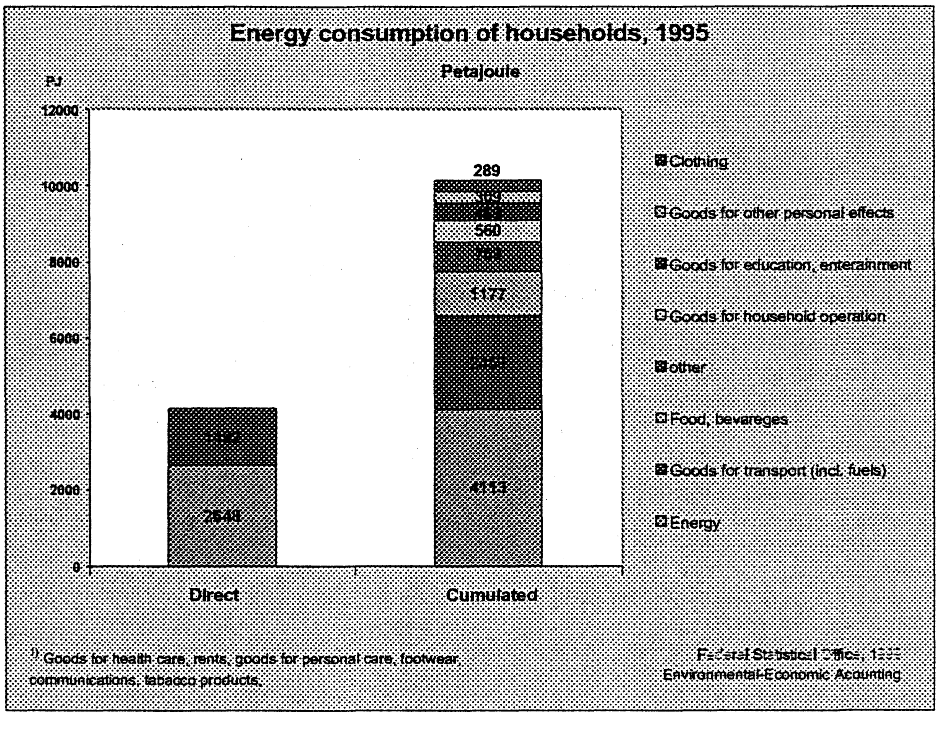
Serial number	Industries	Direct	Indirect	Cumulated	
		Petajoule			per private consumption of households (Kilojoule/DM)
1	Agricultural products		137,8	137,8	5 201
2	Forestry and fishery products, etc.	91,6	16,0	107,6	39 609
3	Electric power, steam, hot water	629,1	1321,3	1950,4	52 491
4	Gas	879,5	50,3	929,8	71 384
5	Water		0,0	0,0	.
6	Coal, products of coal mining	106,8	20,1	126,9	86 359
7	Products of mining (excl. coal, crude petroleum, natural gas)		2,8	2,8	12 194
8	Crude petroleum		0,0	0,0	.
9	Chemical products (incl. nuclear fuel)		378,7	378,7	13 390
10	Refined petroleum products	2433,6	356,1	2789,7	50 046
11	Plastic products		45,0	45,0	5 653
12	Rubber products		21,7	21,7	4 475
13	Stones and clays, building and constr. materials, etc.		28,1	28,1	7 679
14	Ceramic products		18,4	18,4	7 175
15	Glass and glass products		15,8	15,8	10 039
16	Iron and steel		0,0	0,0	.
17	Non-ferrous metals, semi-finished products thereof		0,0	0,0	.
18	Foundry products		0,0	0,0	.
19	Products of drawing plants, cold rolling mills, etc.		0,8	0,8	5 250
20	Structural metal products, rolling stock		0,0	0,0	.
21	Machinery and equipment (excl. electrical)		4,1	4,1	2 796
22	Office machinery, automatic data processing equipment		2,3	2,3	1 993
23	Road vehicles		338,1	338,1	3 223
24	Ships, boats and floating structures		3,0	3,0	3 843
25	Aircraft and spacecraft		0,3	0,3	2 293
26	Electrical machinery, equipment and appliances		74,4	74,4	2 641
27	Precision and optical instruments, clocks and watches		19,1	19,1	2 377
28	Tools and finished metal products		52,1	52,1	5 379
29	Musical instruments, games and toys, sports goods etc.		40,3	40,3	3 036
30	Wood		2,6	2,6	5 391
31	Wood products		106,2	106,2	3 075
32	Pulp, paper and paper board		4,7	4,7	15 684
33	Products of paper and paper board		36,5	36,5	6 347
34	Products of printing and duplicating		0,9	0,9	3 632
35	Leather and leather products, footwear		33,2	33,2	3 019
36	Textiles		89,3	89,3	4 561
37	Wearing apparel		109,1	109,1	2 623
38	Food products (excl. beverages)		627,5	627,5	4 500
39	Beverages		117,0	117,0	3 701
40	Tobacco products		20,8	20,8	800
41	Building and civil engineering works, etc.		0,0	0,0	.
42	Installation and building completion works		12,3	12,3	2 228
43	Services of wholesale trade, etc., recovery		105,2	105,2	1 381
44	Services of retail trade		500,8	500,8	2 566
45	Railway services		101,3	101,3	12 397
46	Water transport services, services of ports, etc.		3,7	3,7	4 252
47	Communication services		47,8	47,8	1 015
48	Other transport services, n.e.c.		209,5	209,5	4 392
49	Banking services		74,8	74,8	4 035
50	Insurance services (excl. social security funds)		61,0	61,0	963
51	Real estate renting services		241,8	241,8	650
52	Market services of hotels and restaurants,homes,hostels		202,6	202,6	3 105
53	Market services of education, research, culture und publishing services		90,0	90,0	1 865
54	Health and veterinary market services		26,0	26,0	1 107
55	Other market services, n.e.c.		63,9	63,9	1 090
56	Services of central and local government		71,0	71,0	2 292
57	Services of social security funds		0,0	0,0	.
58	Services of private non-profit inst., domestic services		98,4	98,4	1 448
59	Total	4140,6	6004,6	10145,2	5 658

categories so that the total supply now corresponds to final uses. All in all, 54% of primary energy consumption for final use purposes were caused by the consumption of households, 28% by exports and the proportion of public consumption and capital formation comes to 18% all together.

Table 2 illustrates the use of primary energy for the final consumption of households in a breakdown by product groups. Some of these product groups are of particular importance to the total consumption of energy. These groups include electric power, steam, hot water (1,950 petajoules), gas (930 petajoules), refined petroleum products (2,790 petajoules), food products (628 petajoules), and services of retail trade (501 petajoules). The relation between energy consumption and the final consumption expenditure of households, which is shown in the last column of the table, should be of interest, too. The average energy consumption per DM of the final consumption expenditure of households amounts to 5,700 kilojoules. As for some product groups, however, this relation by far exceeds the average value. This first of all applies to energy sources as coal (86000 kilojoules per DM), gas (71,000 kilojoules per DM), electricity (52,000 kilojoules per DM), refined petroleum products (50,000 kilojoules, per DM) and forestry and fishery products (40,000 kilojoules per DM). For other products, too, values are indicated which are clearly above average. These products include chemical products, glass products, paper, and railway services. The values indicated for most of the services, however, are by far below the average for all product groups.

Chart 3 illustrates the primary energy input for consumption of households in a breakdown by purposes. As regards direct energy consumption, almost two thirds of the consumption can be allocated to using energy (in particular heating oil, gas, electricity) and one third to goods for transport (especially petrol). Cumulated consumption is more than twice as large as direct consumption. Here, too, the above-mentioned uses play a dominating role, with their share amounting to nearly two thirds. As far as energy sources and goods for transport are concerned, however,

Chart 3



transformation losses (e.g. in power generation) and, for instance, the energy used in automobile manufacturing are as well covered in this context. Due to their indirect energy contents, however, other uses, whose overall proportion amounted to 35%, contributed also considerably to the total energy consumption of households. Food products hence accounted for 12% of total consumption, while the share of goods for household operation was just under 6%, and goods for education and entertainment made up almost 5% of total energy consumption.

Environment

Environmental-Economic Accounting in Germany 2000

Results of the statistical office presented on the press conference in Frankfurt am Main in October 2000

Federal Statistical Office
Environmental-Economic Accounting 2000

October 2000

Report

of the Federal Statistical Office about the Environmental-Economic Accounting 2000

Contents

authors: Regierungsdirektor Dr. Karl Schoer and colleagues

Environmental Economic Accounting in Germany – Results 2000

1 The productivity of using nature

Any economic activity, be it the production of goods and services, be it consumption, involves using our natural environment. There are many ways of using nature. Materials are withdrawn from nature as raw materials, areas are used as a location for economic activities and for the discharge of residuals and pollutants, nature is used as a sink, i.e. substances are taken up by nature[1].

Doing business in line with the principle of sustainability requires dealing with nature as carefully as possible, so that future generations, too, may enjoy an intact environment. The use of the environment may be measured through the quantities of natural **input factors** such as the consumption of raw materials and energy as well as the kind and intensity of land use. The use of nature as a sink for residuals and pollutants can be measured only indirectly, that is through the quantities of residuals and pollutants discharged. If we establish a relation between the various quantities measured in physical units and the economic performance, we may calculate productivities - similar to studying the economic input factors of labour and capital - as an indicator of the efficiency of using natural input factors. The quantity and productivity trends for the individual environmental input factors however show only whether, and to what extent, the relevant factor is used more carefully than in the past. The indicator does not provide information on the extent to which the goal of sustainability has been reached.

Input factors

Productivities can be presented for the use of the following input factors from the economy and nature:

The use of economic factors
Labour - Volume of labour as the total of hours worked (mn hours)
Capital - Capital use as consumption of fixed capital (DM mn at 1995 prices)

Nature as a source of resources
Area - Area use as built-up land and land used for traffic purposes (mn km^2)
Energy - Energy consumption as the consumption of primary energy (petajoules)
Raw materials - Raw material consumption measured as the quantities of abiotic raw materials withdrawn from domestic nature and used plus imported abiotic goods (mn t)
Water - Water consumption as the quantity of water withdrawn from nature (mn m^3)

Nature as a sink for residuals and pollutants
Greenhouse gases - Pressure on the environment through the emission of greenhouse gases
Acidification gases - Pressure on the environment through the emission of acidification gases
Waste - Pressure on the environment through the discharge of waste into nature
Waste water - Pressure on the environment through the discharge of used water into nature

In Germany the development of the quantitative use of the individual natural factors was heterogeneous in the 1990s. **Nature as a source of resources**, in its function as a raw material and energy provider, was somewhat less heavily used in 1999 than in 1991 (figures 1 and 2). Raw material consumption was down 3.2%, energy consumption 1.8%. The decrease of energy consumption was partly due to a more efficient use of energy, supported by energy saving measures. Not considering weather-related fluctuations, another factor influencing the trend of energy consumption was the marked decrease of energy use in the new Länder in the early 1990s.

The trend of raw material consumption was mainly influenced by fluctuations in demand for construction raw materials.

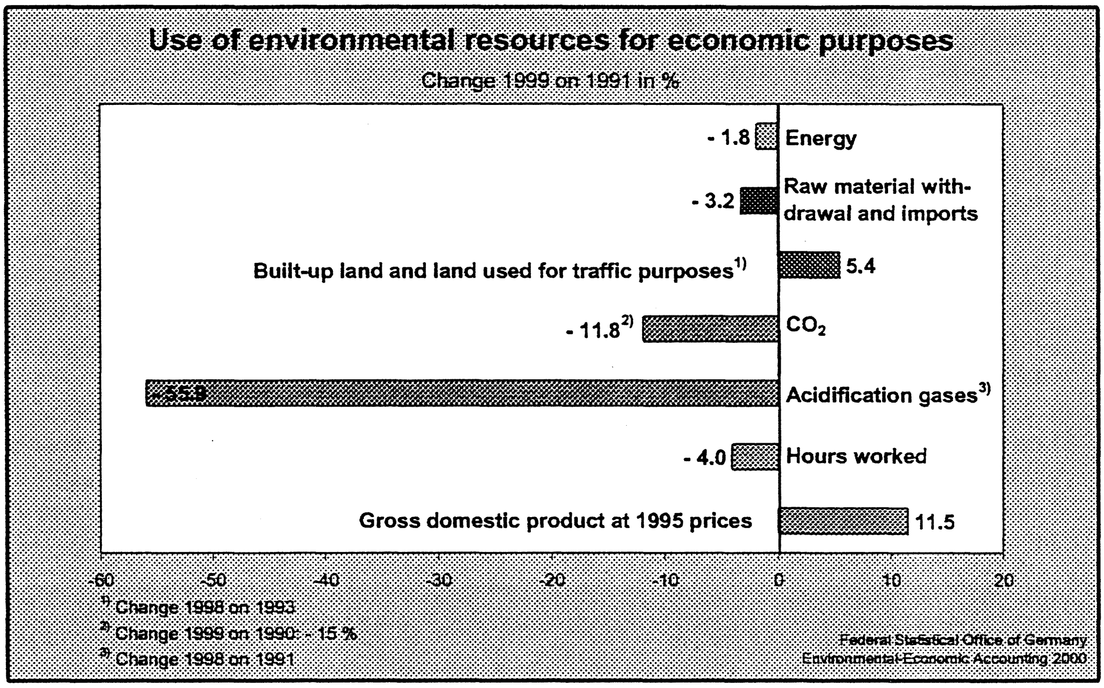


Figure 1

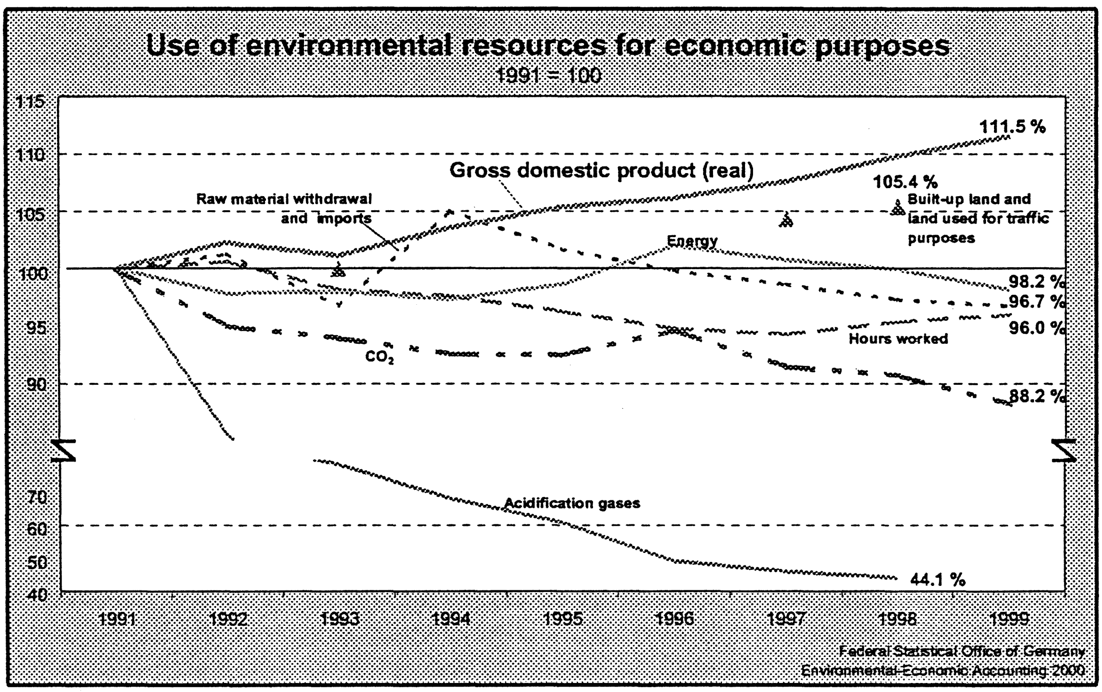


Figure 2

According to provisional estimates of the Federal Office of Building and Regional Planning for 1998, built-up land and land used for traffic purposes increased from 40 305 km^2 in 1993 to 42 495 km^2 in 1998 (+ 5.4%). That was an increase by 120 ha per day.[2]

The use of **nature as a sink** for residuals and pollutants regarding air emissions has clearly decreased since 1991. Compared with 1990 (the reference year for the Federal Government's goal of reducing the emission of carbon dioxide) the discharge of carbon dioxide (CO_2) was down

15%. On the basis of 1991 - which for reasons of data availability is generally used as the reference year in this report -, this is a decrease of CO_2 emissions by nearly 12%. The discharge of acidification gases was down 56 % between 1991 and 1998. The development of carbon dioxide emissions, which is much better than the trend of energy consumption, is mainly due to an increased use of energy sources containing less carbon. In addition to using more natural gas, older brown coal power stations were closed down especially in the new Länder. The strong decrease in acidification gas emissions is mainly due to flue gas desulphurisation.

When adjusted for price changes, the gross domestic product rose 11.5% between 1991 and 1999. This means that the pressure to use nature, which is caused by economic growth, developed rather moderately in the period observed. From 1991 to 1999 the number of hours worked fell 4.0%. Using the environment through carbon dioxide and acidification gas emissions was reduced even more strongly than using the factor of labour; however, savings achieved with regard to the energy and raw materials factors were clearly smaller than for the number of hours worked.

Long-term examination of the absolute development of the input of natural factors shows that, although the use of such factors increased between 1960 and 1980, it decreased again in the 1980s and 1990s – with the exception of built-up land and land used for traffic purposes (figure 3).

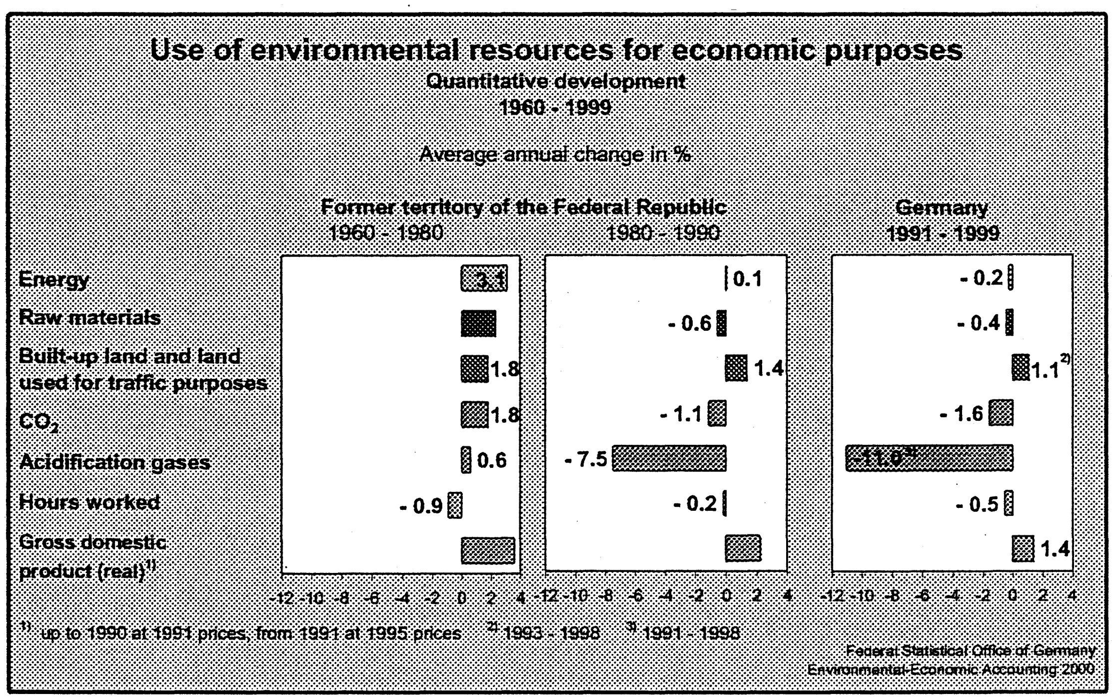


Figure 3

In the period from 1960 to 1980 and for the former territory of the Federal Republic - as all-German data are available only from 1991 -, all environmental input factors show a clear rise in quantities used. Energy consumption rose an average 3.1% per year within that period, consumption of raw materials grew an average 2.3% per year, the use of land for settlement and traffic purposes expanded an annual 1.8% and carbon dioxide emissions also increased an average 1.8%. For acidification gases, a comparatively small rise of 0.6% per year was observed.

The trends recorded for the 1980s were similar to those in the first decade after German unification, i.e. nearly unchanged energy consumption, slightly decreasing raw material consumption, an average annual growth of built-up land and land used for traffic purposes by 1.4% in the 1980s and by 1.1% in the 1990s, emissions of carbon dioxide falling an annual 1.1% and 1.6%, respectively. The decreasing trend in the quantity of acidification gases discharged accelerated clearly in the 1990s (an average of - 11.0% per year) when compared with the 1980s (- 7.5%).

Productivity – An indicator of the efficiency of factor use

The productivity of an input factor indicates how much economic output is produced by using one unit of the factor concerned.

$$\text{Productivity} = \frac{\text{Gross domestic product (real)}}{\text{Input factor}}$$

Productivity indicates how efficiently a national economy deals with the use of labour, capital and nature. Due to their different qualities and functions, those factors cannot directly be compared with each other. However, by observing their development over long periods one may obtain information on how the relations between the factors have changed.
It must also be noted that for the calculation of productivities the entire real yield of the economic activity is referred only to the production factor concerned, although the product is created through the joint action of all production factors. Therefore the productivity as calculated can serve only for rough orientation.
The methodological changeover of gross domestic product calculation to the European System of Accounts (ESA 95) and the simultaneous changeover to base year 1995 have an impact on the development of productivities over time. Consequently, the figures are not comparable with those of previous publications.

However, economic activity and the consequent pressure to use natural input factors slowed down when observed over the long term. In the period from 1960 to 1980 the average annual growth of the price-adjusted gross domestic product in the former territory of the Federal Republic (+ 3.6%) was considerably larger, and in the 1980s (+ 2.2%) still markedly larger than in the 1990s (+ 1.4%).

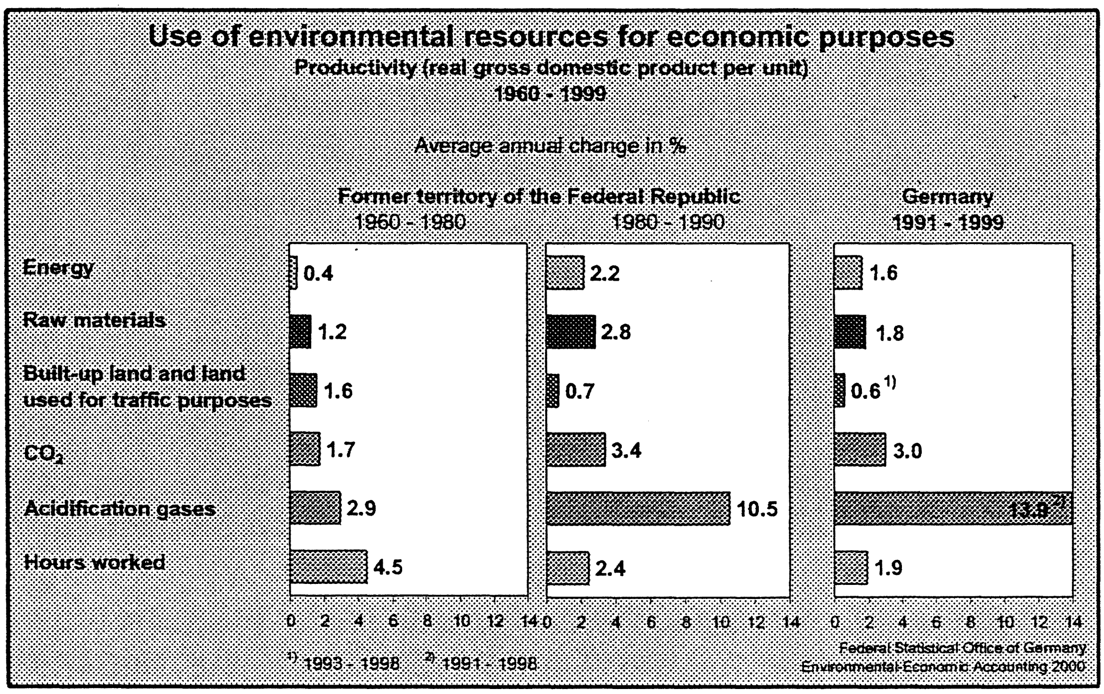


Figure 4

From the aspect of the efficiency of using natural input factors, the result thus differs from what was obtained when examining absolute quantities. The **efficiency** in using natural input factors - measured as the productivity, i.e. real gross domestic product per unit - increased for all factors examined, except for built-up land and land used for traffic purposes, as early as in the period from 1960 to 1980; however, that increase was clearly smaller than in the last two decades (figure 4). Comparing the last two decades with one another shows that the average development of productivity for the input factors examined was usually slower in the 1990s than in the 1980s. The average annual growth of energy productivity fell from 2.2% to 1.6%, the increase in raw material productivity slowed down from 2.8% to 1.8% and the average annual rise in area productivity decreased from 0.7% to 0.6%. Productivity growth regarding the use of nature as a sink for carbon dioxide fell from an average 3.4% in the 1980s to 3.0% in the 1990s. An exception is the corresponding growth in productivity for acidification gases, which in the 1990s (+ 13.9% per year) was larger than in the 1980s (+ 10.5%). If we take into account that for most of the indicators the increased efficiency in the 1990s was to a considerable extent due to unification-related special effects - such as large-scale close-downs in particularly environment-intensive branches or the conversion of plants in eastern Germany -, the data show a clear slowdown in productivity growth for the natural input factors.

Targets were defined for some of the indicators mentioned here, i.e. CO_2 emissions, energy productivity, raw material productivity and area use. The target for the reduction of CO_2 emissions was defined by the Federal Government. The other targets were set up by the Federal Ministry for the Environment as part of developing the Environmental Barometer. These are the targets referred to also by the annual economic report 2000 of the Federal Government.[3] The first three targets will be dealt with more closely here.

According to the targets, CO_2 emissions should be reduced by 25% between 1990 and 2005. Energy productivity should double between 1990 and 2020 and for raw material productivity a 2.5-fold increase on the level of 1993 is envisaged for 2020.

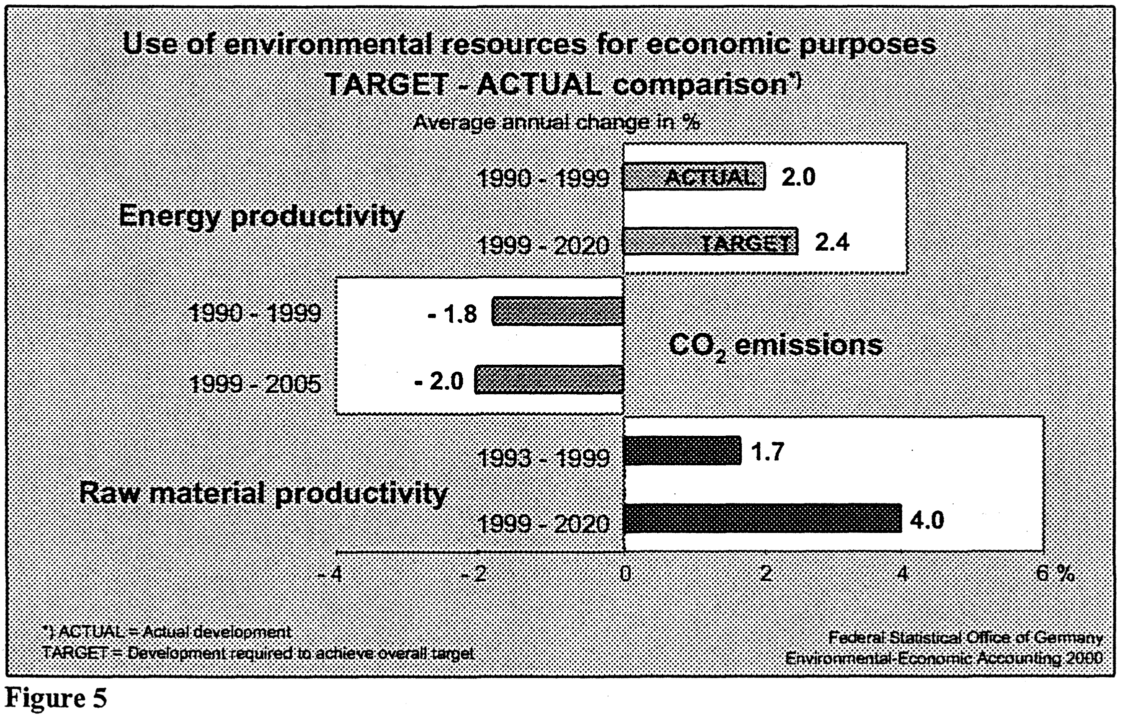


Figure 5

If we compare for the examined indicators the actual pace of development in the 1990s (ACTUAL) with the target to be achieved over the next few years, which is required to arrive at the overall target, there is a considerable gap between the two. So the targets can be met only if we succeed in accelerating the development:

- **Energy productivity** rose about 20% between 1990 and 1999. This is an average annual increase of 2.0%. To meet the target set by the Federal Government, an average annual increase of 2.4% would be required until 2020 (figure 5).

- Actual **CO_2 emissions** fell by 153 mn t to 861 mn t between 1990 and 1999[4]. This is an average annual decrease by 17 mn t or 1.8%. More than half (86 mn t) of the total decrease of CO_2 emissions between 1990 and 1999 referred to the period 1990 to 1992. So for the period starting 1992 the average annual decrease was clearly smaller (9.6 mn t or 1.1%) than for the entire period. To meet the Federal Government's target (reduction to 760 mn t by 2005), CO_2 emissions into the environment in Germany would have to fall an annual 16.5 mn t or 2.0% in the years remaining until 2005 - that would be about the average of the past decade, but considerably more than the average of the years since 1992.

- **Raw material productivity** rose 10.3% from 1993 to 1999. This is an average annual increase of 1.7%. To meet the Federal Government's target for the increase of raw material productivity by 2020, an average annual growth of raw material productivity of 4.0% would be required for the years after 1999.

Selected indicators of the Environmental Barometer

Gegenstand der Nachweisung	Maßeinheit	1990	1992	1993	1998	1999
Energieproduktivität	Mill. DM/ PJ	219	239	237	255	263
	1990 = 100	100	109,1	108,2	116,4	120,0
CO_2-Emissionen	Mill. t	1 014	928	918	886	861
	1990 = 100	100	91,5	90,5	87,4	84,9
Rohstoffproduktivität	1993 = 100	-	-	100	108,1	110,3

2 Energy consumption

The use of energy is of crucial importance for almost any production process. The production and use of energy put pressures on the environment through the withdrawal of non-renewable raw materials from nature, through the impairment of landscapes and ecosystems in the process of energy production, through the emission of air pollutants and solid residuals as well as through the withdrawal and discharge of cooling water in the process of energetic transformation or combustion.

Energy consumption

Calculating energy consumption by economic sectors and households as part of Environmental-Economic Accounting is based on the input-output table of energy flows that has been adjusted to the energy balance.

Energy use comprises the entire use of energy in a specific economic sector, irrespective of whether the energy is consumed there or transformed (e.g. coal into electricity) and passed on in another form to downstream sectors.

Energy consumption is the difference between the quantity of energy used in an economic sector and the quantity passed on by that sector to downstream sectors. Generally, the quantity of energy used is entirely consumed in the process of production and consumption activities of the sector (e.g. to run machines, equipment and vehicles or for room heating) and finally discharged into the environment in the form of heat. In sectors producing energetic products for further use in subsequent production stages, only part of the energy used is consumed.

For the analysis of energy use, Environmental-Economic Accounting data at the medium aggregation level provide important information referring to the various stages of the economic process. Such information may be used to evaluate environmental policy measures and their direct and indirect effects. Environmental Economic Accounting may be used to answer questions such as:

- What is the amount of **direct** energy consumption of the economic sectors regarding the production of their products and of households regarding their consumption (**economic activities**)?
- What is the amount of energy used with regard to the relevant **Final Uses**?

The direct volume of primary energy in Germany amounted to 15 489 petajoules in **1997,** 4 035 petajoules of which were produced within the country (26.1%) and 11 454 petajoules (73.9%) were imported (figure 6). Of the total volume, 10 443 petajoules (67.4%) were used for the production of goods and services (intermediate consumption) while 4 131 petajoules (26.7%) were directly consumed through consumption activities of households. 948 petajoules (6.1%) were exported as energy sources.

Another way of examining the volume of energy is looking at it as the cumulative energy volume from the aspect of Final Uses (final consumption expenditure of households and non-profit institutions serving households, government final consumption expenditure, exports, gross fixed capital formation and changes in inventories). When looking at things this way, what is allocated to the relevant Final Use is not only direct energy consumption but also indirect energy consumption, i.e. the total quantity of energy used at all stages of production (as intermediate consumption) for the production of the goods of Final Use.

Data directly collected are not available on the amount of indirect energy use for the goods of Final Use. They may however be estimated using a model approach on the basis of input-output tables.[5] What is included here in analysing indirect energy consumption is the indirect energy consumption that was used abroad for the production of imported intermediate consumption goods. Thus it is possible to cover the entire volume of energy used for the production of goods of Final Use. The indirect energy content of the imported goods (excl. energy sources) amounted to 6 597 petajoules in 1997. So the cumulative volume of primary energy is 22 086 petajoules, which is over two fifth more than the direct volume. The share of the imported quantity of energy increases accordingly when indirect imports are included, so that with such an overall approach more than four fifth (81.7%) of the cumulative primary energy were imported from abroad.

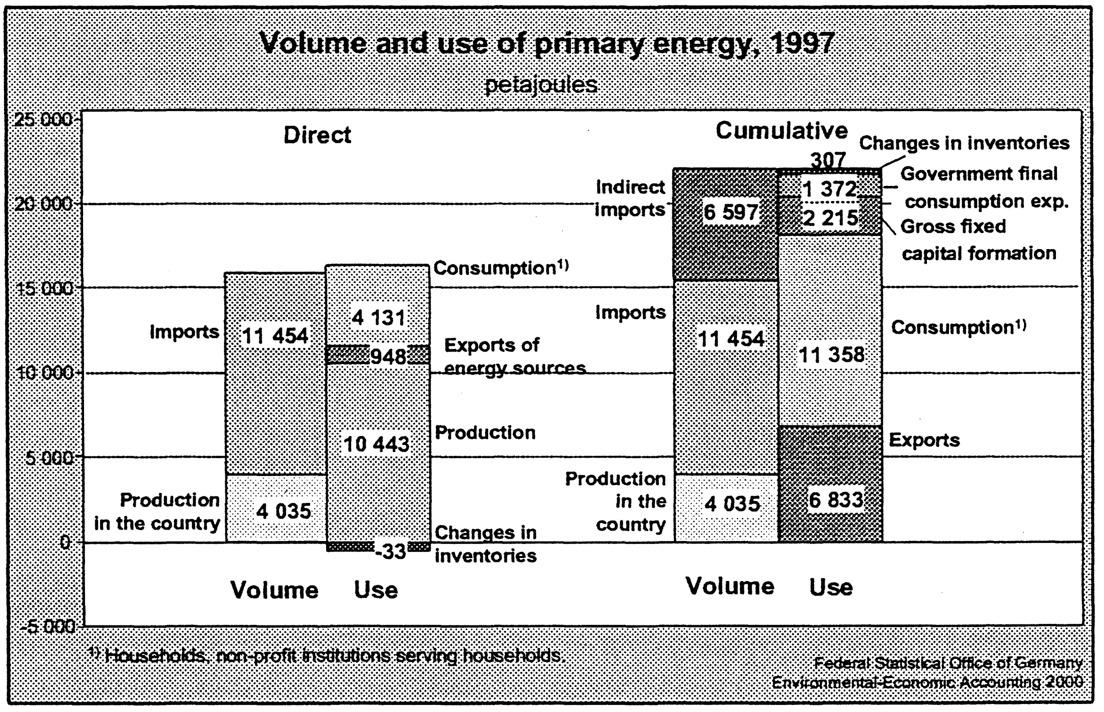


Figure 6

Of the total volume of primary energy, 11 358 petajoules (51.4%) were used for the production of goods for household consumption. For the production of exported goods, 6 833 petajoules (30.9%) were used. The remaining primary energy was spread over the other categories of Final Use.

Examining things from the aspect of environmental pressures caused by domestic economic activities shows that just a small part of environmental pressures related to the withdrawal of energy sources from nature were created within the country, whereas the large majority was produced abroad. Where environmental pressures are created by using energy sources in the production process, e.g. air emissions, a considerable part of them were created abroad, too. Indirect energy imports amounted to 6 597 petajoules in 1997, while indirect energy exports totalled 5 885 petajoules. The pressures within the country caused by the production of exported goods were somewhat smaller than the pressures abroad created by the production of goods imported by Germany.

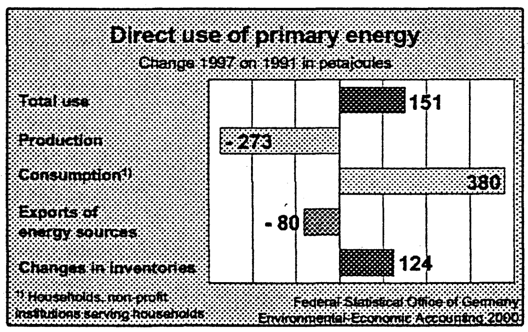
Cumulative energy consumption

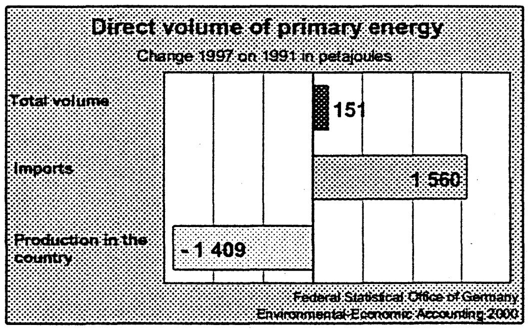
The consumption of energy required for the use of goods results directly from a specific activity of economic sectors and households. It is therefore referred to as **direct energy consumption**.

The consumption of energy required at the stages preceding the production of goods is referred to as **indirect consumption**. The quantity of energy indirectly required abroad can be taken into account by assuming a production structure and technology corresponding to that within the country.

The sum total of direct and indirect consumption is the **cumulative energy consumption**.

The **development** of the afore-mentioned items was quite varied between **1991 and 1997** (figures 7 and 8). Direct primary energy consumption in 1997 was nearly unchanged when compared with 1991. That development resulted from reduced energy consumption in production and increased direct energy consumption of households for their consumption activities. In the production area, consumption fell 2.5% (- 273 petajoules) over the period under examination, while at the same time the production volume rose 7.6% (measured as the price-adjusted development of gross domestic product). This clearly shows that production and direct energy consumption have clearly been decoupled. Direct energy consumption of households rose 10.1% (+ 380 petajoules). The production of energy sources in the country fell by 1 409 petajoules between 1991 and 1997 (- 25.9%). That decrease was largely offset by an increase of imports of energy sources by 1 560 petajoules (+ 15.8%). The growing substitution of energy production in the country by imports was presumably accompanied by a corresponding shift of environmental problems into other countries.





Figures 7 and 8

The following explanations will focus on **direct energy consumption** of the individual economic sectors in Germany. The development of energy productivity with regard to the overall economy may serve as an indicator to describe the development of our economy's energy efficiency (see section 1 of this report). Between 1991 and 1998 energy productivity increased 9.9%. A major factor influencing the development of energy consumption is the use of energy in the production area. Production accounts for more than two thirds of direct domestic energy use (production and consumption) underlying the indicator (figure 9). Data on energy consumption by economic sectors, which are obtained as part of Environmental-Economic Accounting, allow a detailed examination of trends. By representing energy use and other pressure factors relevant from environmental aspects in a breakdown by economic sectors, it is possible to establish in particular relations between them and economic items represented in the framework of national accounts. Linking such data then allows indicating in which economic sector environmental pressures were produced.

Also, those data are the basis for simulation calculations whose purpose is to estimate the effects (benefits and costs) of environmental policy measures. With the help of simulation models set up by research institutes it can be estimated, for example, to what extent a given environmental target can be met using different tools (e.g. charge rates). At the same time, such calculations provide information on the impact to be expected in the various cases for economic key figures such as production, employment or prices.

The development of energy consumption in the overall economy is the result of general economic growth, structural changes (shifts between the shares of economic branches with different energy intensity in the total production) and the trend of energy productivity or the specific energy consumption of the various sectors. The decreasing trend of direct energy consumption in production between 1991 and 1998 (- 3.4%) was mainly due to the trend in production industries (- 7.5%). For the service sector, however, a marked rise in energy use (+ 8.5%) was observed.

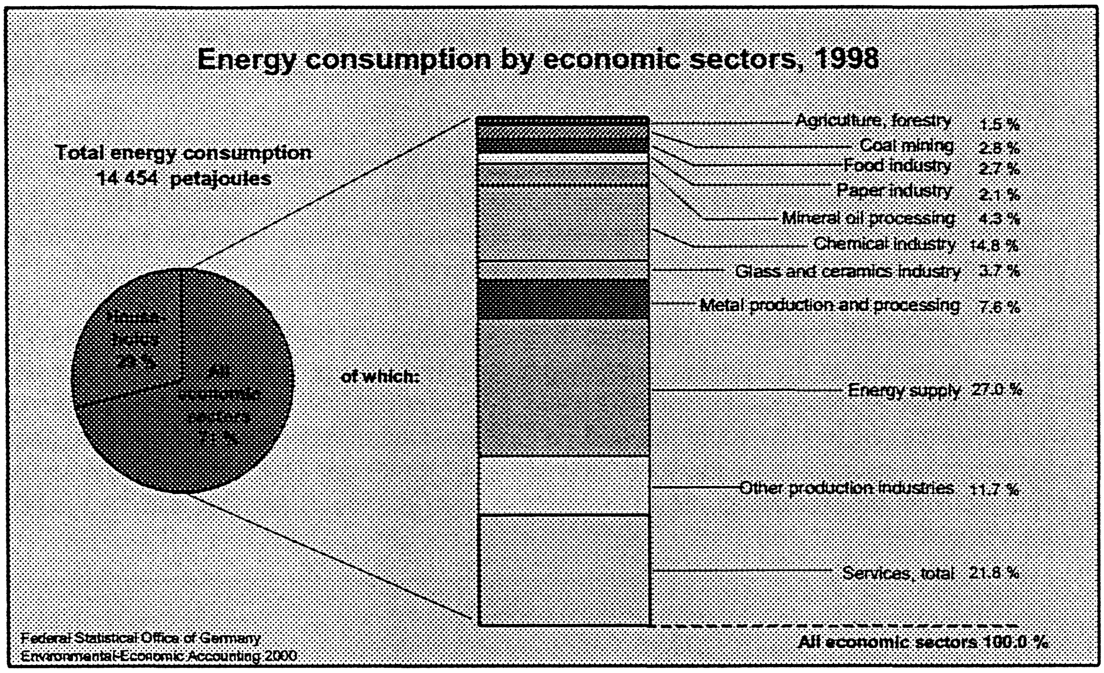


Figure 9

Within production industries, the sectors with high energy consumption reduced their consumption, in part even substantially, over the period examined (figure 10). They include coal mining with a reduction by 367 petajoules (- 56.4%), the chemical industry (- 160 petajoules or - 9.7%), metal production (- 51 petajoules or – 6.2%) as well as coking and mineral oil processing (- 39 petajoules or – 8.2%). Increases in energy consumption compared with 1991 were recorded for energy supply (+ 80 petajoules or + 3.0%) and the sector of glass and ceramics industry and quarrying (+ 57 petajoules or + 18.1%).

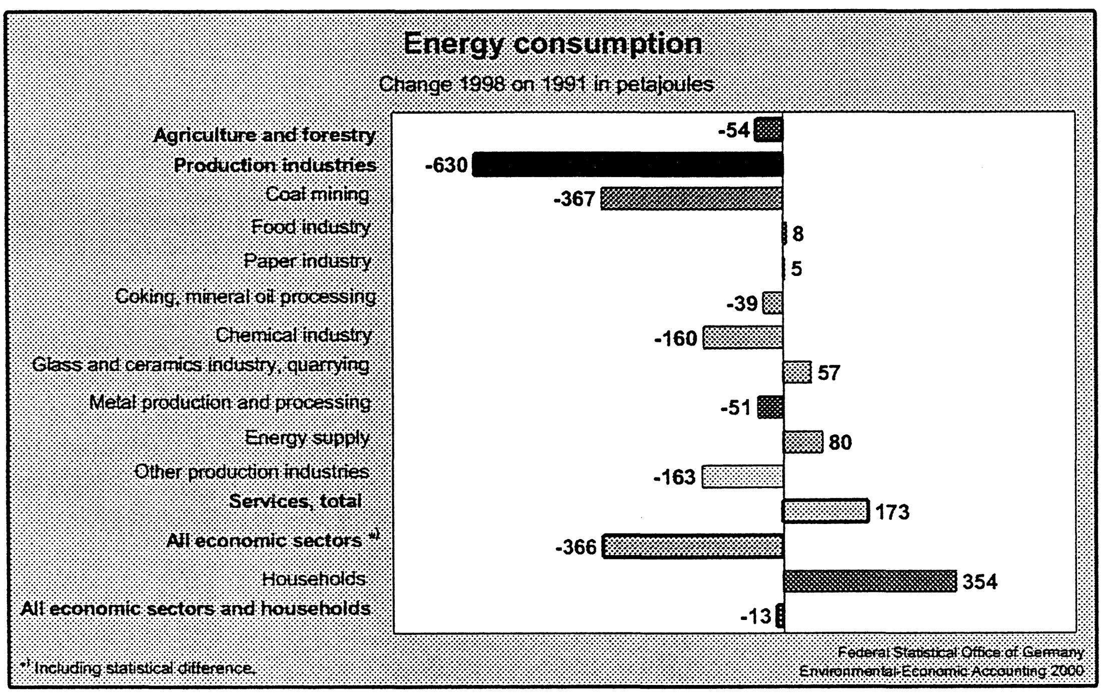


Figure 10

A major factor influencing the development of productivity in the overall economy is the trend of energy efficiency in the individual sectors. The energy efficiency may be represented approximately by the development of energy productivity (gross value added per energy consumption) or of the specific energy consumption (energy consumption per gross value added). In the following, the term "specific energy consumption" will be used which is common for the representation by sectors.

The decrease in energy consumption was due not only to the reduction of the specific energy consumption in individual sectors but also the changing economic structure, i.e. the relative expansion of low-energy sectors and the relative shrinking of energy-intensive sectors (see also the quantification of the individual effects in the section on carbon dioxide emissions).

The level of specific energy consumption differs considerably for the various production processes – depending on the relevant technological situation (figure 11). The average specific energy consumption in production industries was 7.3 joules per DM in 1998, while for services it was an average of just 0.9 joule per DM. Within production industries, for example, the specific energy consumption of the food industry is 4.3 joules per DM, while for the sectors of coking/mineral oil processing and coal mining it was 78.8 joules per DM and 51.3 joules per DM, respectively.

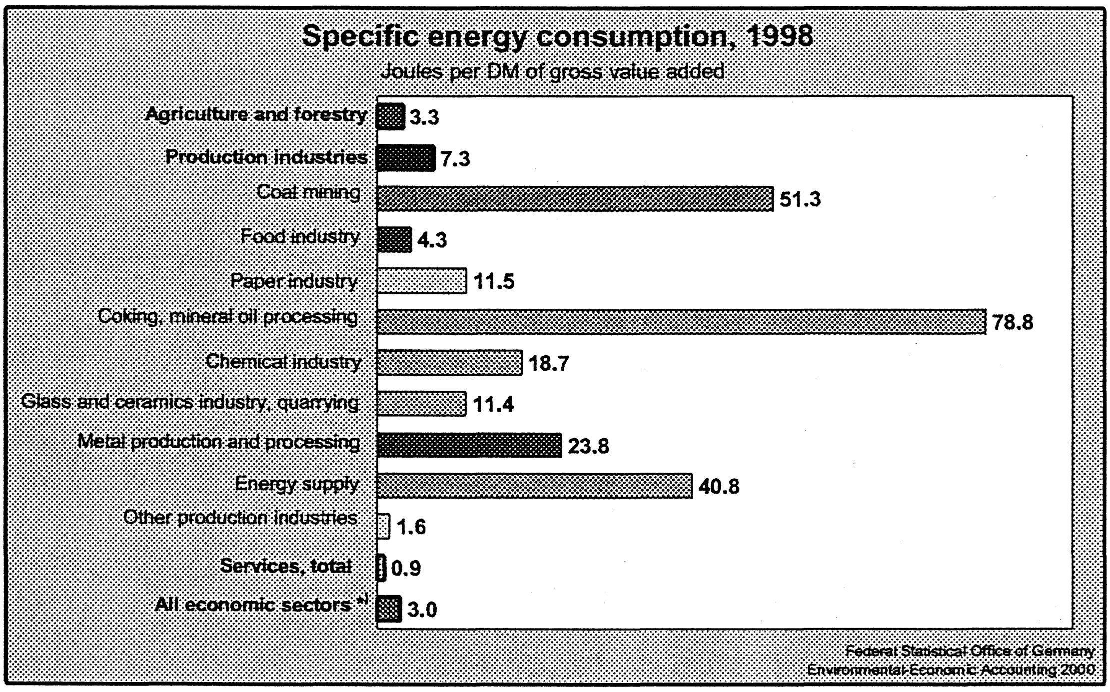


Figure 11

The decrease in specific energy consumption between 1991 and 1998 in production industries (- 4.2%) was less marked than in the service sector (- 9.4%) (figure 12).

Within production industries, specific energy consumption trends varied. A particularly marked decline was observed for the chemical industry (- 18.8%) and energy supply (- 9.2%); specific energy consumption increased in coking/mineral oil processing and in coal mining.

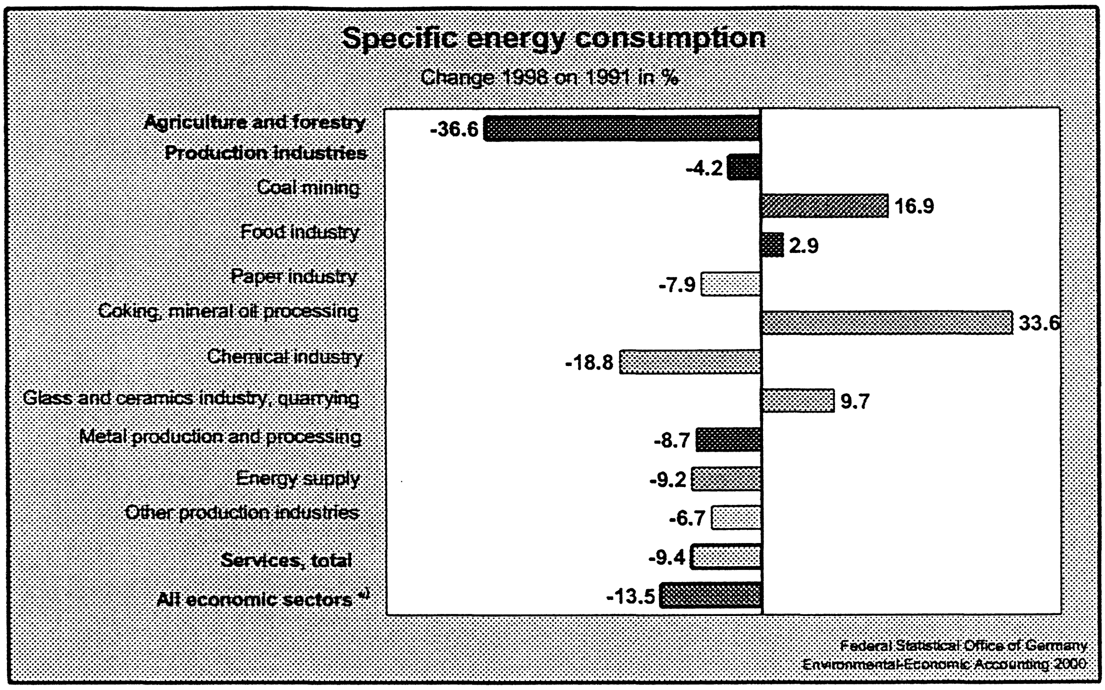


Figure 12

3 Emissions of carbon dioxide

Emissions of carbon dioxide (CO_2) are mainly created by the burning of energy sources. Such emissions are a major cause of the "greenhouse effect".

Calculating direct emissions into the air

Direct emissions of the various air pollutants are calculated for the economic sectors and households by means of specific emission coefficients (database of the Federal Environmental Agency), energy consumption (database of the German Institute for Economic Research / energy balance) and by taking account of the processes running in the production sectors.

The calculations are based on the **energy consumption relevant for emissions**, which covers only those energy sources whose consumption directly causes emissions into the air. **Total energy consumption**, however, covers also those energy sources whose consumption does not directly cause emissions (especially electricity and remote heating).

Direct emissions of carbon dioxide in Germany caused by economic activities amounted to 886.1 mn t in **1998** (figure 13). 662.8 mn t of that amount (74.8%) were discharged during the production of goods and services, while 223.3 mn t (25.2%) were created directly through the consumption activities of households. When broken down by purposes of final consumption of households, about two thirds (69 %) of the consumption-related emissions were caused through the use of emission-relevant energy sources for the purpose of "energy" (heating of buildings, hot water preparation, cooking), while one third (31%) was due to the utilisation of motor fuels for transport purposes. As regards production-related emissions, production industries accounted for four fifth, and the sector of "energy supply" for about half of them. The CO_2 emissions in the latter area are caused in particular by power generation. The sector of "glass and ceramics industry, quarrying" accounted for 5.9% of all production related emissions, the "chemical industry" for 5.6%. The share of "coking, mineral oil processing" was 4.2%, while all service branches together had a share of 16.9%.

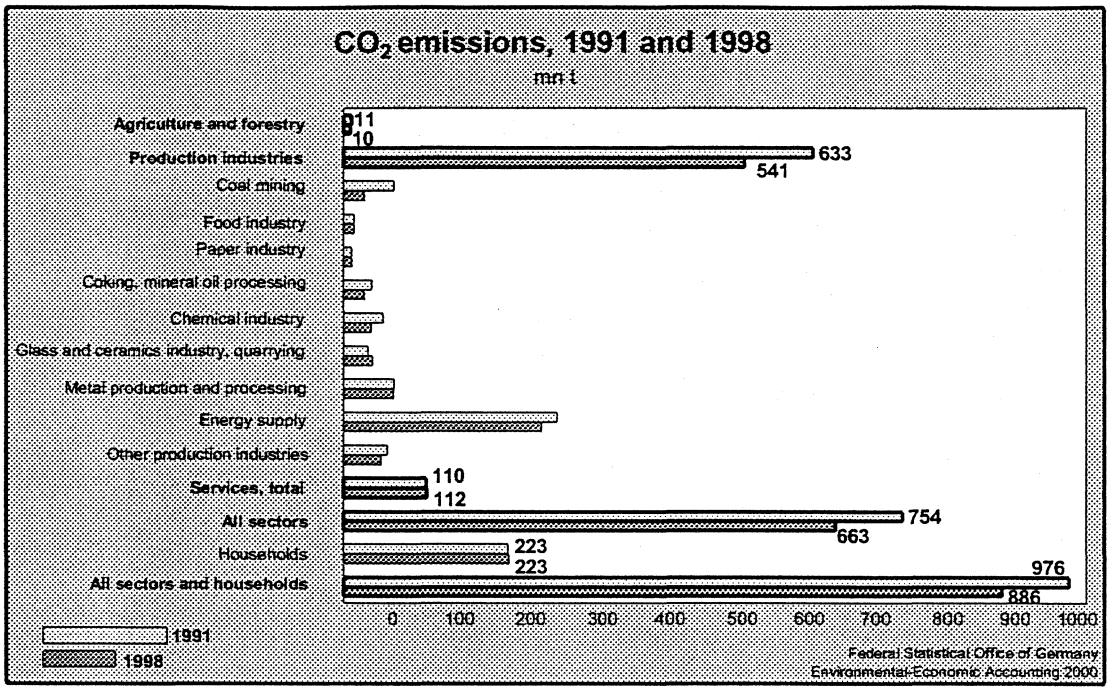


Figure 13

Between **1991 and 1998,** direct CO_2 emissions decreased by 90.4 mn t (- 9.3%) to 886.1 mn t. The direct carbon dioxide emissions of households (consumption) rose slightly over the period examined (+ 0.8 mn t or + 0.4%), while the economic sectors (production) accounted for a decline by 91.2 mn t (- 12.1%).

The slight increase of **emissions of households** by 0.4% was contrasted by an 8.5% rise in price-adjusted final consumption expenditure of households. This shows that the trend of consumption expenditure of households and that of their direct CO_2 emissions has been decoupled. There are two effects explaining that development. About one third of it is due to the fact that the emission-relevant energy consumption per DM of final consumption of households decreased (- 2.1%) and about two thirds result from a decline in CO_2 emissions per energy quantity used (- 4.3%), i.e. the utilisation of energy sources containing less carbon (substitution of solid fuels by mineral oil and especially natural gas).

Specific energy consumption and energy productivity

The **specific energy consumption** of an economic sector indicates how much energy was consumed to obtain one unit of the economic output produced there (value added):

$$\text{specific energy consumption} = \frac{\text{energy consumption}}{\text{gross value added (real)}}$$

The **energy productivity** of an economic sector indicates how much economic output (value added) was produced by using one unit of the energy consumed there:

$$\text{Energy productivity} = \frac{\text{gross value added}}{\text{energy consumption (real)}}$$

The direct emissions of carbon dioxide through **production** may be decomposed mathematically into various components, that is a growth effect, a structural effect, an energy intensity effect and a CO_2 intensity effect. Those effects represent in model terms the mathematical influence of the individual components on the level of CO_2 emissions with the assumption that the other influencing factors remained unchanged. The growth effect represents the effect caused by the general increase in production. The structural effect covers the influence exerted by the changing economic structure (based on the breakdown of the economy by 60 sectors) on the CO_2 emissions. For example, the emission of carbon dioxide by the overall economy, with gross domestic product remaining constant, would be reduced if the share of relatively low-emission service sectors increased at the expense of emission-intensive sectors of production industries. The energy intensity effect (relation between the trend of emission-relevant energy consumption and real value added) may - with some reservations - be interpreted as a measure of the efficiency of energy use. The CO_2 intensity effect (relation between the trend of CO_2 emissions and the emission-relevant energy quantity used) measures to what extent the emission of carbon dioxide was influenced by the change in the average carbon content of energy sources, e.g. by the use of lower-carbon and thus lower-CO_2 emission energy sources.

The mathematical decomposition of the entire decrease of carbon dioxide emissions in production by 91.2 mn t between 1991 and 1998 into the afore-mentioned components leads to the following result (figure 14): Due to the real growth of production (growth effect), CO_2 emissions would have to have increased by about 69 mn t compared with 1991. However, that influence was more than offset by the other factors. The largest contribution was made by structural change, which contributed an estimated 74 mn t decline in emissions. More efficient energy use had an effect of - 66 mn t in mathematical terms. The growing use of low-carbon energy sources (e.g. natural gas) contributed 21 mn t to the decline in the overall production-related CO_2 emissions.

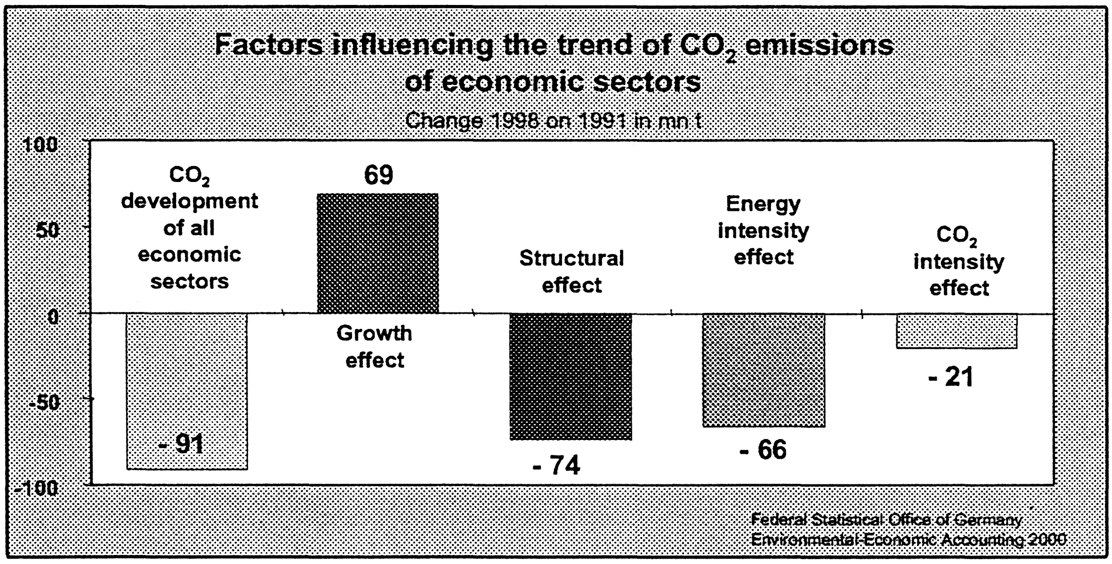


Figure 14

Examining the change of **carbon dioxide emission by economic sectors** shows the following picture: The decreasing trend of emissions of the economic sectors between 1991 and 1998 was mainly effectuated by production industries with a decline by 91.4 mn t (- 14.4%). The CO_2 emissions of the service branches, however, were up 2.0 mn t (+ 1.8%) over the same period.

The sectors within production industries that reduced their emissions between 1991 and 1998 were "coal mining, peat extraction" (- 39.6 mn t), "energy supply" (- 21.6 mn t), "chemical industry" (- 16.2 mn t) and "coking, mineral oil processing" (- 10.5 mn t).

As has been shown in the context of the overall economy, a large part of the reduction of CO_2 emissions is due to structural change, i.e. the expansion of low-CO_2 sectors and the shrinking of CO_2-intensive sectors. Another important factor causing that development is the reduction of specific CO_2 emission (CO_2 emission per DM of gross value added) in the individual sectors. In turn, the specific CO_2 emission is influenced both by the efficiency of energy use (specific energy consumption) and the carbon content of the energy sources used.

Decomposition analysis

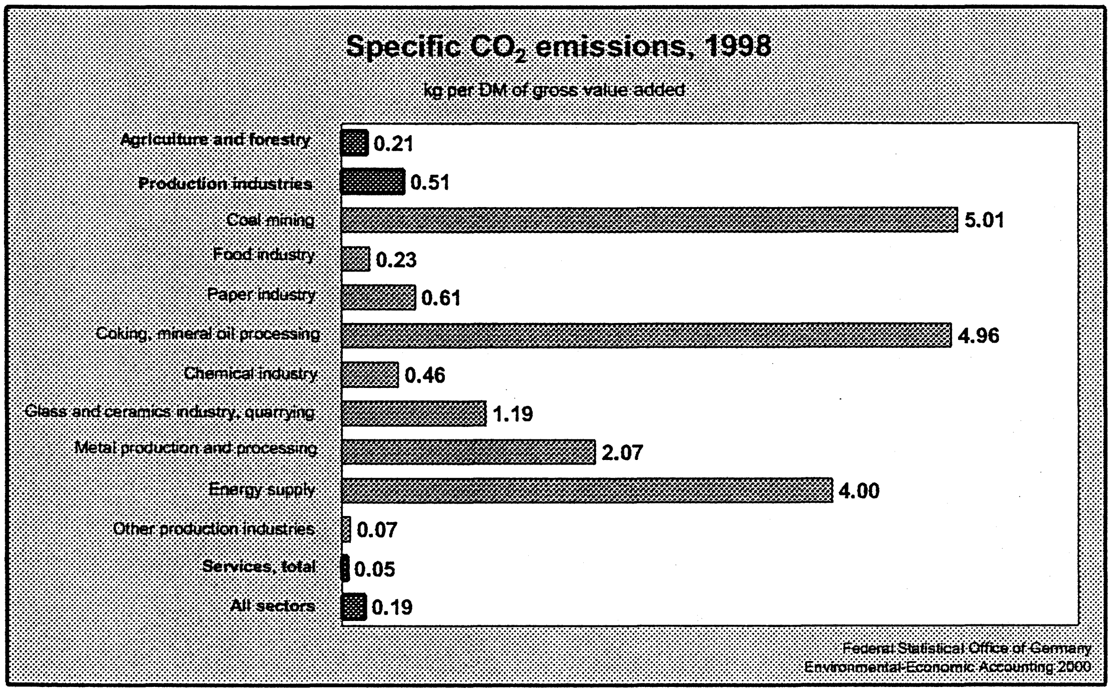
Decomposition analysis is a tool that may be used to describe the impact that various factors have on a specific trend. The results for the development of CO_2 emissions show the influence exerted by any factor with the assumption that the other factors remain unchanged (ceteris paribus rule).

The following factors influencing the trend of CO_2 emissions during **production** (all sectors) between 1991 and 1998 were taken into account:

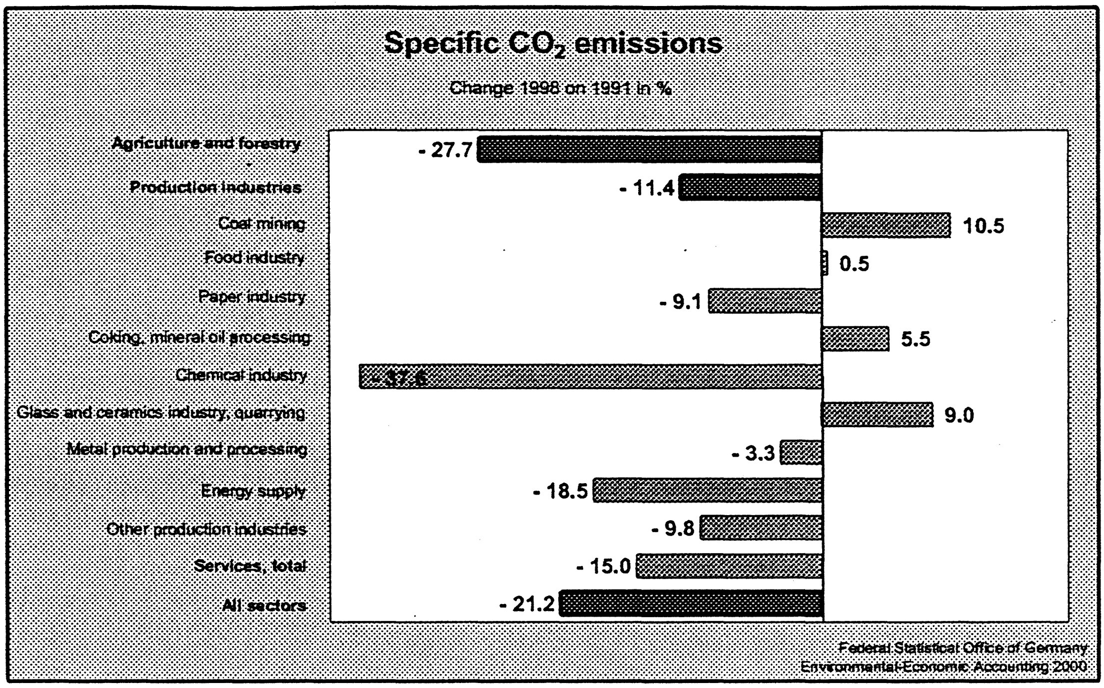
- economic output (gross value added at prices of 1995)
- economic structure (shares of economic sectors in the gross value added of production)
- energy intensity of the production (emission-relevant energy consumption / gross value added) and
- CO_2 intensity of energy consumption (CO_2 emissions / emission-relevant energy consumption)

As regards the methodological requirements (exogenous and independent character of the factors), the capacity of decomposition is limited, especially in the sphere of economic analysis; this has to be taken into account when interpreting the results. So, applying that method allows obtaining provisional information on the effects of various influences - e.g. on the trend of CO_2 emissions - by using relatively simple tools.

Due to the different technical conditions of the various production processes, the levels of specific CO_2 emission differ considerably (figure 15). The average specific CO_2 emission for production industries in 1998 was 0.51 kg per DM, while for services it was just an average 0.05 kg per DM. There is an even wider range within production industries, with the highest values observed for coal mining (5.01 kg per DM) and the food industry (0.23 kg per DM). The decline in specific CO_2 emission between 1991 and 1998 was less marked for production industries (- 11.4%) than for the service sector (- 15.0%) (figure 16). For nearly all sectors within production industries, a decrease in specific CO_2 emission was recorded. It was particularly marked for the chemical industry (- 37.6%), energy supply (- 18.5%) and the paper industry (- 9.1%).



Figures 15



Figures 16

4 Withdrawal of materials / raw materials

Economic activities (production of goods and their consumption) involve material flows. This means that materials are withdrawn from nature and, after transformation in the economic process and in consumption, are discharged again into nature in the form of residuals and pollutants.

One of the goals of Environmental-Economic Accounting of the Federal Statistical Office is to represent such material flows at an aggregated level in physical units (e.g. tonnes). The systematic coverage and representation of material throughput of the economy by means of a "material balance" shows the extent and trend of the physical utilisation of the environment and forms the statistical basis for further analyses (figure 17).

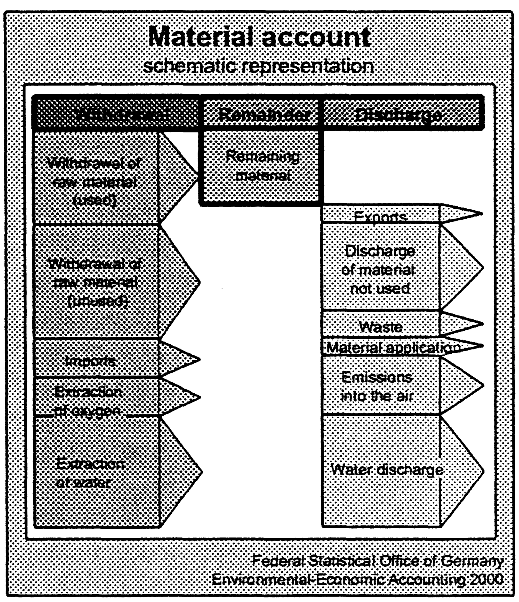


Figure 17

Comparing the material flows for 1991 and 1998 shows that the total material throughput of the German economy fell during the 1990s. The volume of material (withdrawal of raw materials from domestic nature, excluding water and including the materials imported from the rest of the world) fell by 971 mn t (- 19%) to 4,150 mn t. This means that 51 t of materials per inhabitant were withdrawn for economic purposes in 1989.

The decrease in **withdrawal of materials** is due to several causes.

The decline in total use of materials in Germany between 1991 and 1998 is mainly the result of a marked reduction of excavated waste material in brown coal mining (reduced to about two thirds), which, in turn, was the consequence of a decrease in brown coal extraction in the new Länder. Extracting one tonne of brown coal produces almost ten tonnes of excavated waste material. As a result of the strong decline in excavated brown coal waste material, the total volume of the **withdrawal of unused materials** fell by nearly one third (- 895 mn t) (figure 18). Such materials include excavated waste material in mining, excavated earth and the like.

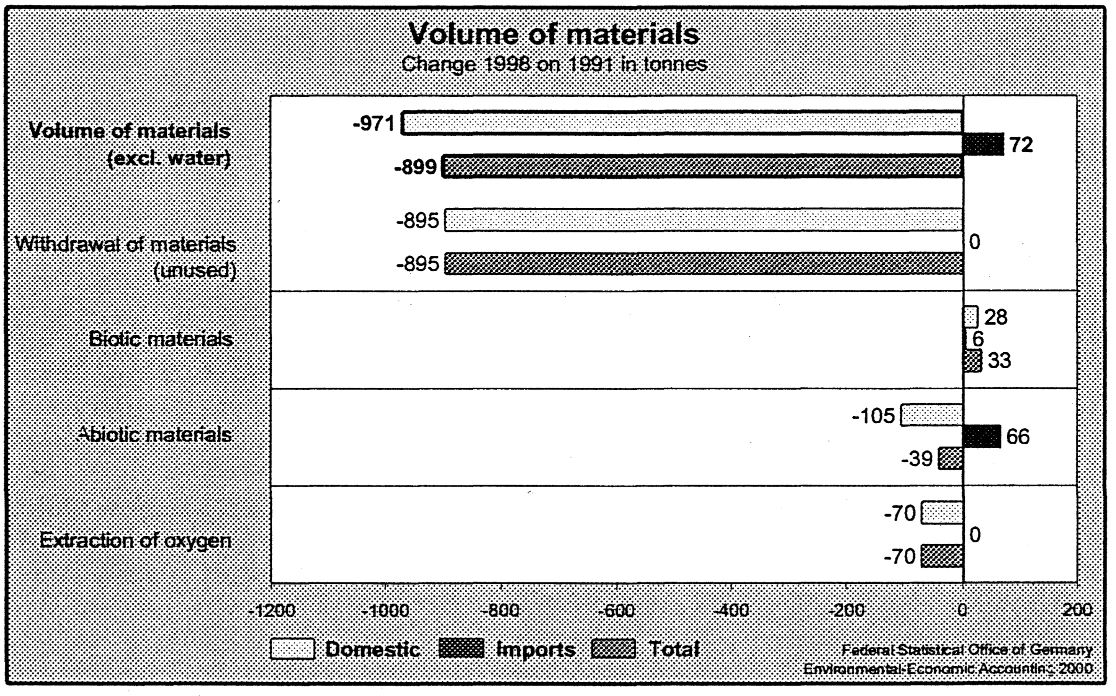


Figure 18

The withdrawal of materials subsequently used did not change very much over the period examined. However, the share of renewable (biotic) raw materials (including the products made of them) increased, while the share of non-renewable (abiotic) raw materials and the products made of them declined. The use of biotic materials (plants, animals) rose by 33 mn t between 1991 and 1998. The quantity of abiotic materials used was down altogether by 39 mn t, with the withdrawal from domestic nature (especially energy sources as well as stones and earths) decreasing by 105 mn t and imports of abiotic materials increasing by 66 mn t. The extraction of oxygen, caused especially by the burning of energy sources, was down by 70 mn t. Overall withdrawal of abiotic materials (withdrawal of raw materials within the country plus imports of materials) is used by the Federal Ministry for the Environment as a reference value to calculate the leading indicator "raw material productivity" as part of the Environmental Barometer (see section 1).

For the withdrawal of non-renewable raw materials from nature, the question of sustainability arises with regard to the bases of life of future generations, because materials used up today will not be available in the future. The quantity of substances withdrawn at the same time is a general indicator of the pressure on the natural environment, such as interventions in nature through the withdrawal of raw materials, and of the pressure caused by residuals and pollutants necessarily involved in the processing and consumption of such materials. So, material consumption is not only an indicator of the consumption of non-renewable resources but can also provide information on other environmental problems.

Representation and definition of the withdrawal of material

For the representation of material flows, the Federal Statistical Office has chosen a pragmatic approach – in particular because of data availability – which has included direct material flows but excluded indirect material flows for the time being. **Direct use of material** covers the withdrawal of raw materials, whether or not utilised, from domestic nature and the imported materials (raw materials as well as finished and semi-finished products). **Indirect use of material** covers the withdrawal of materials from nature in the rest of the world in the context of producing the goods later imported to Germany.

Representing indirect withdrawal of material appears necessary because the principle of sustainability in using nature applies not only at the national but also at the global level. Especially where domestic raw materials are substituted by foreign raw materials or by less material-intensive finished or semi-finished products (example: electricity imports instead of domestic coal extraction), the withdrawal of raw material in the rest of the world increases despite the decreasing use of material within the country.

Indirect use of material, however, is very difficult to determine with a satisfactory degree of accuracy. This is because it requires both data on the quantity of material not utilised in the context of extracting the imported raw materials abroad and information on the quantity of material used in producing the imported finished and semi-finished products. The Federal Statistical Office intends to improve the database for such calculations to the extent that it will be possible to perform such estimations with sufficient accuracy.

In the following, the various abiotic materials will be allocated to the environmental pressure categories of "**consumption of resources**", impairment of "**landscapes and ecosystems**" (including ground water in the context of withdrawal) as well as "**discharge of residuals and pollutants**" during production and consumption. By adding up the quantities, indicators may be derived which for the two latter categories, however, allow just a rough overall estimation of the relevant pressure potential.

The importance of the consumption of resources and the threat of a depletion of specific natural resources may be approximated through the category of the possible **range** of the **raw material**[6]. Considering that aspect will differ, depending on whether we look at the national or the international context. For many resources in the country, the danger of depletion may be counteracted by importing larger quantities of the relevant raw material from the rest of the world. The alternative: A specific raw material may in Germany be replaced in the economic process by other raw materials with similar functions. This means that the danger of raw materials becoming depleted or the limited range of raw materials mainly depend on the possibilities of substitution in terms of geography and material and on the time span examined.

In many cases, withdrawing non-renewable raw materials involves the utilisation of area or an impairment of the quality of **landscapes and ecosystems**. Altogether, the quality of landscapes and ecosystems in Germany is presumably much more impaired by other forms of intensive use requiring more area, such as the utilisation of areas for settlement and traffic purposes or for intensive farming and, above all, by the discharge of residuals and pollutants. The changes in landscape and ecosystem quality through the withdrawal of raw materials mainly consist in changes of habitats of animals and plants, in the influencing of the shape of landscapes by relief changes (e.g. hill slopes or holes remaining from surface mining), in impacts on the structure of groundwater landscapes and in the impairment of the marine environment regarding offshore extraction of raw materials.

The withdrawal of raw materials from nature is the starting point for the processing of raw materials up to the use and consumption of the goods made thereof. During that overall-economic process of production and consumption, **residuals and pollutants** are produced. These include especially emissions into the air, the discharge of waste and waste water and emissions into water bodies. For the domestic territory, that indicator is not examined because Environmental-Economic Accounting provides direct information on emissions of residuals and pollutants such as air emissions, waste and waste water.

To represent the influence of raw material withdrawal (including imported materials) on the above-mentioned environmental pressure factors, the relevant materials are allocated to those factors and aggregated on the basis of the relevant quantities (in tonnes). For this purpose, the material flows "withdrawal of raw materials within the country" (relevant from the national aspect) and "imports" are broken down by the extent to which they have been processed (relevant from the international aspect). Individual materials or categories of materials can be included several times for aggregation if they are relevant for more than one of the pressure categories used.

The allocation of the withdrawal and imports of raw materials to the represented environmental aspects as well as their description are based on work accomplished by the Federal Institute for Geosciences and Natural Resources (BGR) and were coordinated with it. The BGR has detailed information on the material flows as well as area and energy consumption involved in the extraction and processing of specific raw materials[7].

From the **national point of view,** the aspect of the depletion of raw material resources is relevant only for the energy sources of mineral oil and natural gas; however, with an overall level of 19 mn t in 1998 (about 2%) – compared with a total withdrawal of 989 mn t – they are not really relevant. Areas where raw material extraction in Germany has an impact on landscapes and **ecosystems** and where it is in competition with other types of area use are the extraction of brown coal and stones/earths as well as salts. Between 1991 and 1999 the withdrawal of those raw materials – they account for over 90% of the entire withdrawal of abiotic raw materials (utilised) in Germany – decreased by 5.5% from about 1 bn t to 950 mn t (figure 19).

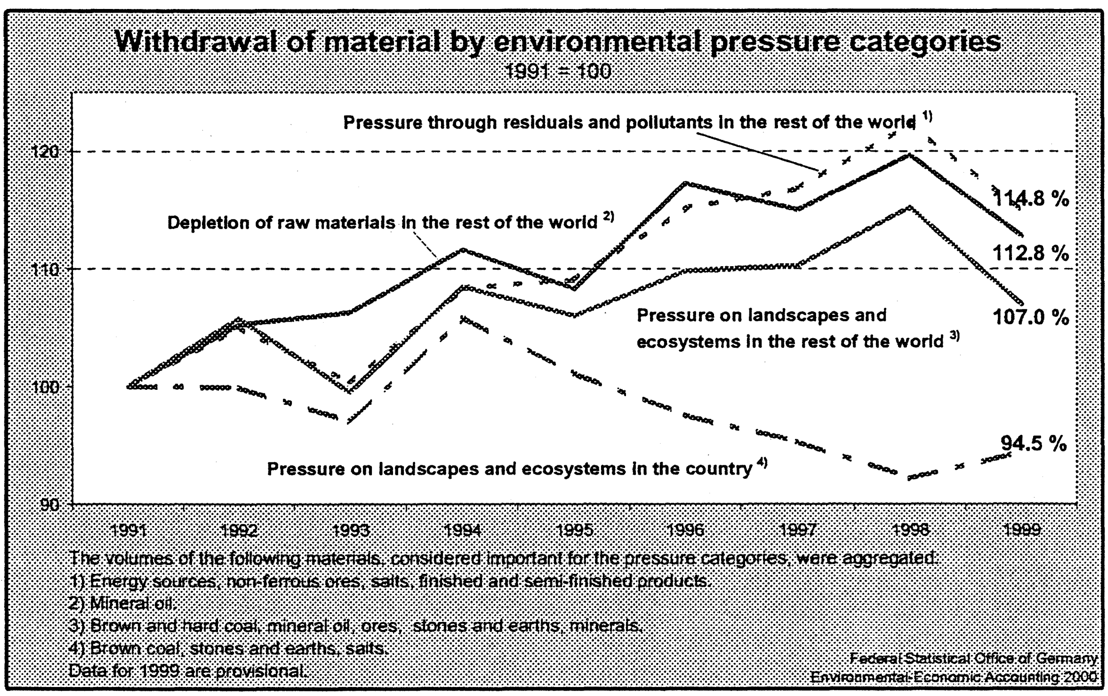


Figure 19

From the **international** point of view, the aspect of the – time – **range of raw materials,** in particular of mineral oil, is of crucial importance because its resources are estimated to have a range of 44 years with the current level of consumption. According to current knowledge, a much longer range is assumed for other raw materials. For natural gas, the global range is estimated at 64 years, for coal at 185 years[8]. For the indicator, only imports of mineral oil (incl. its products, e.g. heating oil) to Germany were taken into account[9]. The imported quantity of mineral oil and mineral oil products increased by 12.8% between 1991 and 1999, reaching 155 mn t.

Impairments of landscapes and **ecosystems** in the rest of the world are observed mainly for those raw materials that are extracted largely through surface mining in the countries of origin. This applies not only to brown coal but also to hard coal, ores, stones/earths and minerals. In addition, mineral oil extraction, too, has an impact on ecosystems. Imports of such raw materials – including finished and semi-finished products made of energy sources – increased 7.0% between 1991 and 1999, reaching 257 mn t.

The volume of **residuals and pollutants** produced in the rest of the world is important in ecological terms in the following areas: the extraction of energy sources, salts and non-ferrous ores, such as copper, and the production of finished and semi-finished goods. The volume of such materials imported to Germany rose by 14.8% between 1991 and 1999 to 329 mn t. However, the imports of finished and semi-finished goods was contrasted by exports of 146 mn t (in 1998). The emission of residuals and pollutants caused by the production of those goods were produced in the country, while those materials were used for Final Use in the rest of the world.

Altogether, material consumption allocated to pressure categories shows the following trend: The withdrawal of materials causing environmental pressures in the country decreased, while imports of such materials involving environmental pressures in the rest of the world increased.

5 Environmental protection measures

Environmental protection measures aimed at avoiding, reducing or removing impairments of nature can exert a major influence on the above-mentioned productivity indicators for residuals and pollutants. As part of its Environmental-Economic Accounting system, the Federal Statistical Office reports about the trend of **environmental protection expenditure** of enterprises in production industries and of the general government sector as well as their **fixed assets for environmental protection**. An item covered for the first time here is environmental protection expenditure of the **privatised public waste and wastewater disposal enterprises**, whose importance is growing; Environmental-Economic Accounting coverage thus has considerably been extended. Environment-related fixed assets in this field will be determined next.

Covering environmental protection measures

Major data sources for the monetary environmental protection data as represented here are the statistics on the investments and current expenditures for environmental protection in production industries, the annual balance sheet statistics of public enterprises and the annual expenditure and revenue data of public budgets.

Environmental-Economic Accounting results do not include expenditures on integrated environmental protection investments in production industries (for the years 1975 to 1995, the primary statistics showed for those investments an average share of about 17% in total environment-related investments in production industries) and for the construction industry generally. These values have no longer been covered since reference year 1996 following an amendment of the environmental statistics law.

The indicator "current expenditures" does not include the charges and remuneration paid by enterprises of production industries to third parties for disposal services.

Also, due to a database still inadequate, the tables do not include environmental protection expenditure in agriculture and in part of the service sector. For the latter, only the privatised public waste and wastewater disposal enterprises have been included. What is lacking for a complete representation of the waste and waste water disposal sector, which is relevant here in terms of quantity, is mainly data of the purely private-sector waste and waste water disposal enterprises. No official data are available on expenditures for specific household activities relevant for the environment such as insulation or solar energy facilities. Other areas of expenditure relevant for the environment, such as nature conservation and ground rehabilitation, cannot adequately be covered either for the time being.

The figures below describe above all the production of environmental protection services and their costs. What is not represented, however, is the way such environmental protection services are funded, e.g. through charges and contributions. As government establishments and privatised public enterprises generally charge cost covering fees for their environmental protection services, most of their expenditures are presumably borne by their customers, i.e. households and enterprises.

In 1997, environmental protection expenditure in production industries, general government and privatised public waste and wastewater disposal enterprises totalled DM 66.5 bn. This was a 1.8% share of the gross domestic product. However, that total figure is just a lower limit. What is lacking is mainly the so-called integrated environmental protection investments in production industries and parts of the service sector with the purely private-sector waste disposal enterprises, such as expenditure for the activities of *DSD – Duales System Deutschland (Grüner Punkt)* (dual waste management system Germany – Green Dot System).

The comparison between 1997 and 1994 in figure 20 shows that price-adjusted expenditure remained nearly unchanged, with the individual economic sectors showing opposite trends. Expenditure in production industries was down by DM 2.9 bn (- 16%), for general government even by DM 7 bn (- 24%). The latter decrease, however, was contrasted by an increase in expenditure by DM 8.6 bn (+ 43%) for the privatised public waste and wastewater disposal enterprises. That rise is mainly the result of the increasing shift from previously government disposal establishments – whose expenditure for environmental protection in the past was included in the statistics of public budgets – to private-sector business forms. Expenditure by general government and public disposal enterprises together rose by DM 1.6 bn (+ 3.2%) over the examined period.

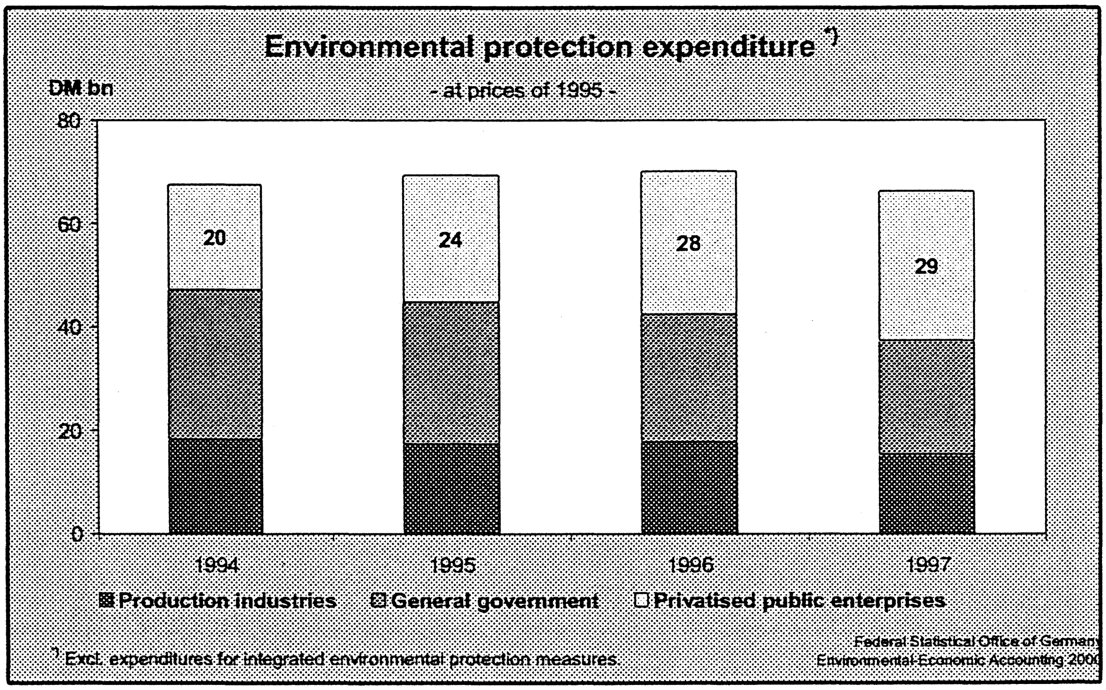


Figure 20

Environmental protection expenditure is composed of **investments** and **current expenditure**. When examined over time, current expenditure is becoming more important than environmental protection investments. The decrease in environment-specific investments by DM 7.4 bn (- 25%) between 1994 and 1997 was contrasted by an increase in current expenditure by DM 6.1 bn (+ 16.3%). The main reason is the considerable stock of environmentally protective facilities, which has been developed especially during the past two decades.

In **production industries,** investments decreased sharply between 1994 and 1997 (- 43%). Two reasons are believed to be important here. First, the data available presumably underrepresent the development because the integrated environmental protection measures – which are not included – are gaining in importance, while a large part of cost-intensive environmentally protective facilities – which generally follow the production process (end-of-pipe facilities) – already exist. As regards air quality control, the denitrification and desulfurisation plants, whose gradual implementation has been required by law since the mid-1980s, have been in general use for a long time already. So, conversions have become quite rare and, consequently, the relevant investments are decreasing, while operating costs are increasing.

In the **general government sector**, investments decreased considerably as a result of the above-mentioned shifts (- 37%), while for the public disposal enterprises they slightly increased accordingly. Current expenditure show a much more positive trend. One of the reasons for the decline in investments, for example regarding water protection, is the high percentage of households connected to the public sewage system, which reached 93% in 1997. Therefore, environmental protection expenditure regards more and more maintenance and reclamation.

Analysing the current expenditure flows by areas of environmental protection (figure 21) clearly shows that **water protection** and **waste disposal** are prevailing; both of them are taken care of mainly by general government or public enterprises. These two environmental protection areas together accounted for about 90% of the total environmental protection expenditure in 1997. Air pollution control measures are observed almost only in production industries and had a share of 10% in expenditure, while expenditure on noise abatement accounted for 1% of overall expenditure.

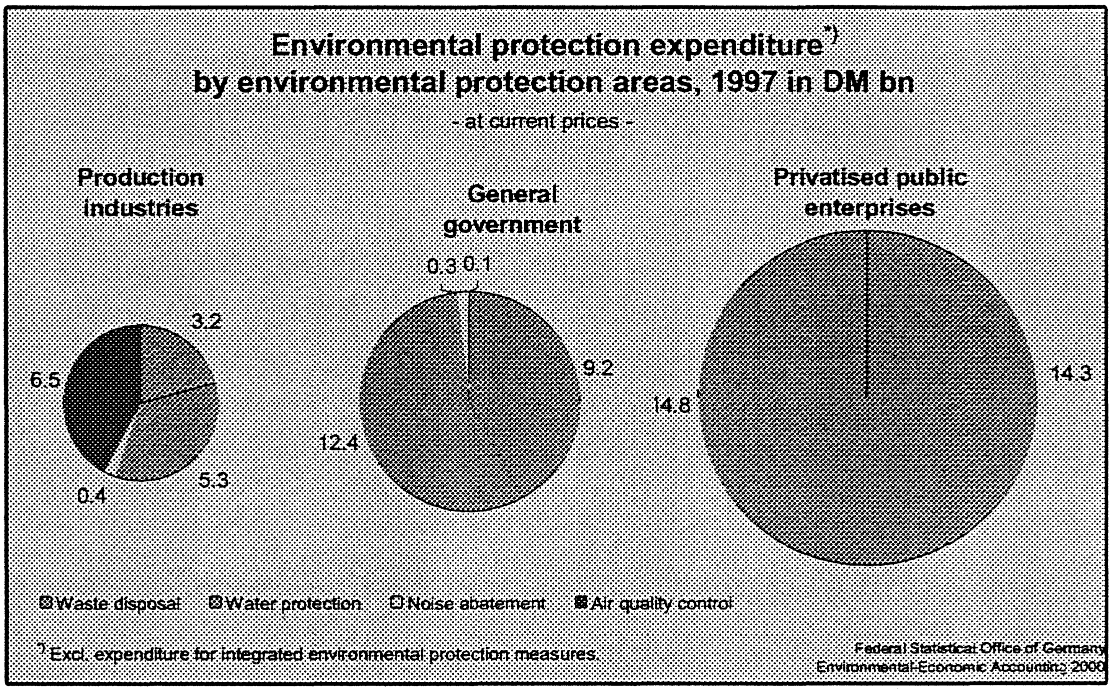


Figure 21

A detailed examination by investments and current expenditure shows considerable differences. In 1997, water protection investments had the largest share (71%) in total investments. Waste disposal had a share of 19%. The opposite ranking was observed for current expenditure, where waste disposal accounted for about half of the total amount, followed by water protection (38%) and expenditure on air quality control (11%) in production industries.

The structure of expenditure by areas of environmental protection basically exists also for **gross fixed assets related to environmental protection**. Gross fixed assets comprise the stock of durable reproducible means of production which are used only for environmental protection purposes. As was done in determining environmental protection expenditure, environmental protection-related parts of facilities (integrated facilities) in production industries are not taken into account here. As data availability is still insufficient for private-sector waste disposal enterprises, it is not possible at present to represent that area statistically in the calculation of fixed assets as part of Environmental-Economic Accounting.

Gross fixed assets related to environmental protection at replacement costs (as a counterpart to current prices) amounted to just under DM 472 bn at the beginning of 1998 for production industries and general government together. Figure 22 illustrates the dominant role of the general government sector, whose fixed assets are 3.5 times that of production industries. The reason is capital-intensive water protection, whose facilities alone account for nearly three fourths of total environment-related fixed assets. For general government, waste facilities are the only other area that has some importance (just under DM 26 bn). Plants for air quality control have the largest share with enterprises of production industries (DM 58 bn), followed by water protection and waste disposal plants.

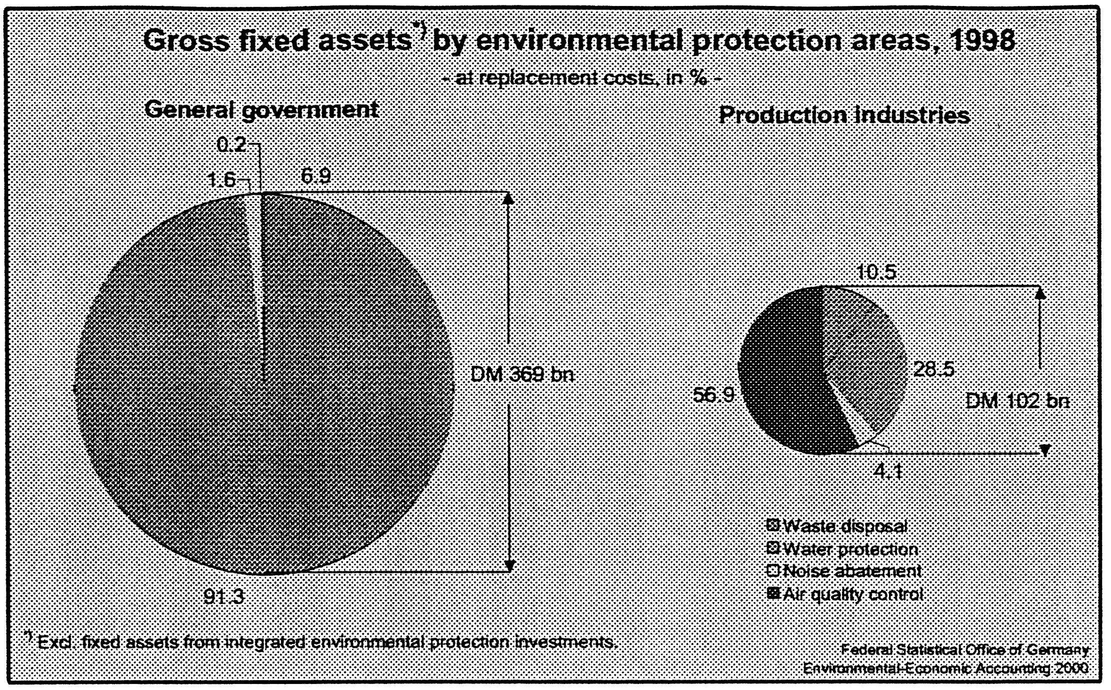


Figure 22

6 Environment-related taxes

In the context of the discussion about employing economic tools for environmental policies, environmental taxes are of particular interest. On 1 April 1999, the "ecological tax" was introduced in Germany. Even before that, the mineral oil tax had been raised several times in the 1990s. What is the trend of environment-related tax revenues? Have the tax increases exerted an influence on consumption? Are we more efficient now in using the "raw material" of mineral oil?

Environment-related taxes

Following the concept for the statistical coverage of environment-related taxes, which has been developed at an international level, the definition of environmental taxes is based on the concept of the **tax base** – irrespective of the motives for introducing the tax and of the purpose the revenue is used for. The decisive criterion is that the tax base refers "to a physical unit (or a proxy of it) of something that has a proven, specific negative impact on the environment". **In concrete terms**, this includes emissions in the broadest sense (air emissions, waste water, waste, noise), energy products, fertilizers, pesticides and transport. This means that in Germany the environment-related taxes that are most relevant in terms of quantities are the mineral oil tax and the electricity tax (basis of taxation is an energy product) as well as the motor vehicle tax (emission-related or, until 1 July 1997, traffic-related tax base).
The results presented here refer to those taxes only. Value-added tax on motor vehicles, mineral oil and electricity are not included.

Figure 23 shows the trend of **environment-related taxes** in Germany for the period from 1991 to 1999. Last year, the revenue from motor vehicle tax, mineral oil tax and electricity tax, which was introduced only in 1999, totalled some DM 88.6 bn. So, revenue from environment-related taxes was by 52% larger than in 1991. Total tax revenue of public budgets rose about 44% in that period. The share of environment-related taxes in the total tax revenue in Germany was 9.3% in 1999, which was slightly larger than in 1991 (8.8%), but smaller than in the years 1994 to 1996 (9.9% and 9.7%, respectively).

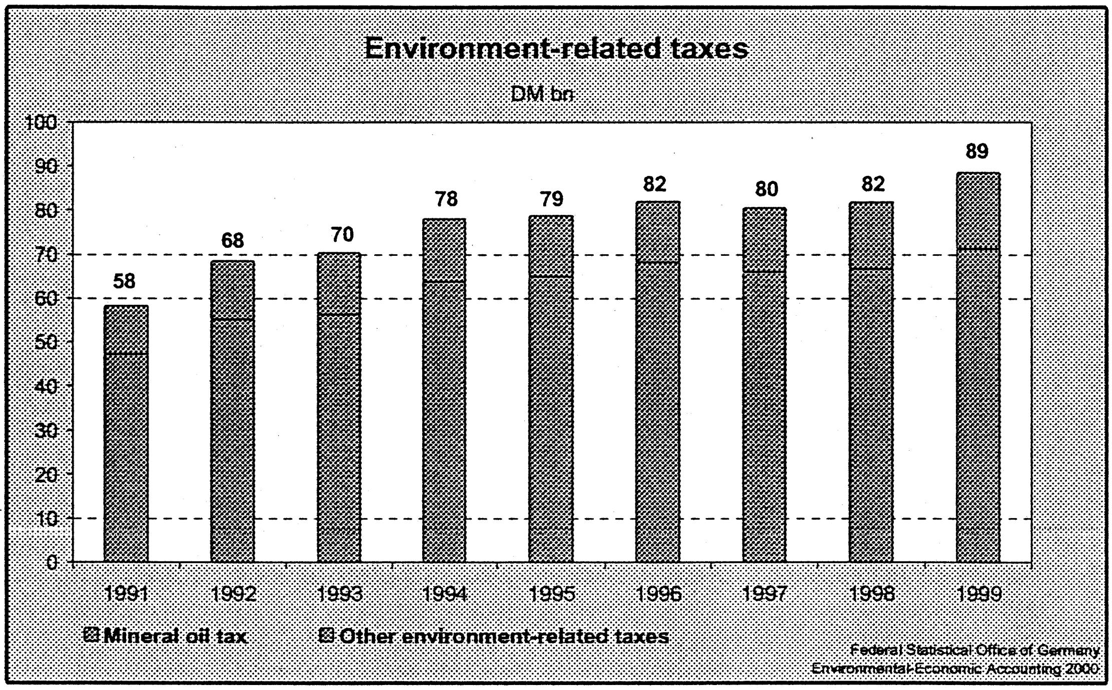


Figure 23

Compared with 1998, i.e. the year before the ecological tax was introduced, environment-related taxes increased by 8.2% or DM 6.7 bn: Electricity tax revenue amounted to DM 3.6 bn, the additional revenue from mineral oil tax was DM 4.6 bn, while the revenue from motor vehicle tax was down by DM 1.4 bn, which was due to tax law effects (e.g. temporary tax exemption for vehicles meeting the Euro 3 or Euro 4 standard).

Ecological tax

The **ecological tax**, which was introduced in Germany on 1 April 1999 through the law on entering the ecological tax reform, extended the taxation of energy by raising the mineral oil tax rates and introducing an electricity tax. On 1 April 1999, the mineral oil tax was increased by 6 Pfennig per litre of motor fuel, by 4 Pfennig per litre of domestic fuel, and by 0.32 Pfennig per kilowatt hour of gas, and an electricity tax of 2 Pfennig per kilowatt hour was introduced (see also the table below on the mineral oil tax burden). Some areas were granted reduced tax rates or tax exemptions, such as reduced tax rates for agriculture, production industries, rail transport and public short-distance passenger transport; tax exemption was granted for power-heat combination and electricity tax exemption for electricity obtained from renewable energy sources. The law of 16 December 1999 on continuing the ecological tax reform involved further increases of taxes on motor fuels and electricity for the years 2000 to 2003, which are not relevant yet for the results presented here.

Accounting for about four fifth, **mineral oil tax** has the largest share in the total of environment-related tax revenue (1999: DM 71 bn), and within that item it is the taxes on carburettor and diesel fuels (about DM 63 bn in 1999) accounting for the largest share.

Major factors influencing the development of mineral oil tax revenue over the last few years have been the following: The rates of taxes on such motor fuels were raised several times during the 1990s, i.e. the tax on unleaded patrol was increased in several steps e.g. from 60 Pfennig per litre in early 1991 to 104 Pfennig per litre in 1999, and the tax on diesel from 44 to 68 Pfennig per litre. At the same time, the annual quantities of patrol (leaded and unleaded together) on which tax was paid remained largely unchanged since the early 1990s, while those of diesel rose continuously, with a growth rate of 31.4% between 1991 and 1999 and an increase of 4.7% in 1999 compared with a year earlier.

Development of the mineral oil tax burden for major motor fuel types
DM per litre

Month / Year	Unleaded carburettor fuel	Diesel fuel
1/1991 to 6/1991	0,60	0,44
7/1991 to 12/1992	0,82	0,54
1/1993 to 12/1993	0,82	0,55
1/1994 to 3/1999	0,98	0,62
4/1999 to 12/1999	1,04	0,68
from 1/2000	1,10	0,74

Revenue from **motor vehicle tax** amounted to just under DM 14 bn in 1999, compared with DM 11 bn in 1991. Over that period, motor vehicle tax rates, too, were modified several times; the latest change was in mid-1997, when the basis of taxation on passenger cars was switched from cubic capacity to emissions. In the same period, the stock of cars – which is the second factor determining the volume of tax revenue – increased considerably for both passenger cars and lorries. In 1999, the number of registered (or temporarily deregistered) passenger cars and station wagons in Germany was 42.3 mn, which was an increase by 5.6 mn (15%) on 1991. The number of lorries and road tractors rose from 1.8 mn in 1991 to 2.6 mn in 1999, i.e. it almost doubled.

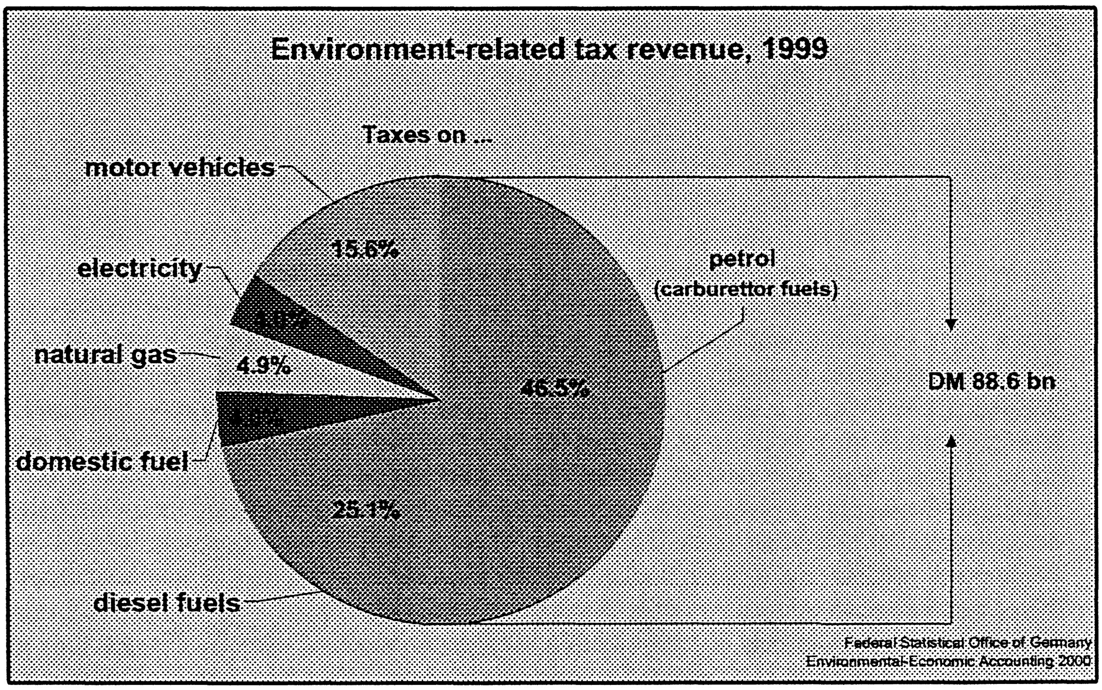


Figure 24

Environment-related taxes and transport

The large majority of environment-related tax receipts in 1999, i.e. 87% (figure 24), is connected with transport, especially road transport. Due to energy consumption and air emissions, road transport at the same time is a special focus of environmental policy. The share of road transport in total final energy consumption in the Federal Republic of Germany amounted to 25% in 1998. Just under one fifth of carbon dioxide emissions in 1998 came from road transport, while 55% of carbon monoxide, almost half of nitrogen oxides (48%) and about one quarter of the emissions of volatile organic compounds (excl. methane) came from road transport.

When examining the connection between environment-related taxes and **energy consumption in road transport**, it should be considered that the adequate comparative figure is price rather than the tax rate. Although, generally, taxes on motor fuels are fully passed on to consumers, such taxes are just one of several factors determining motor fuel prices, as is shown by the current development.

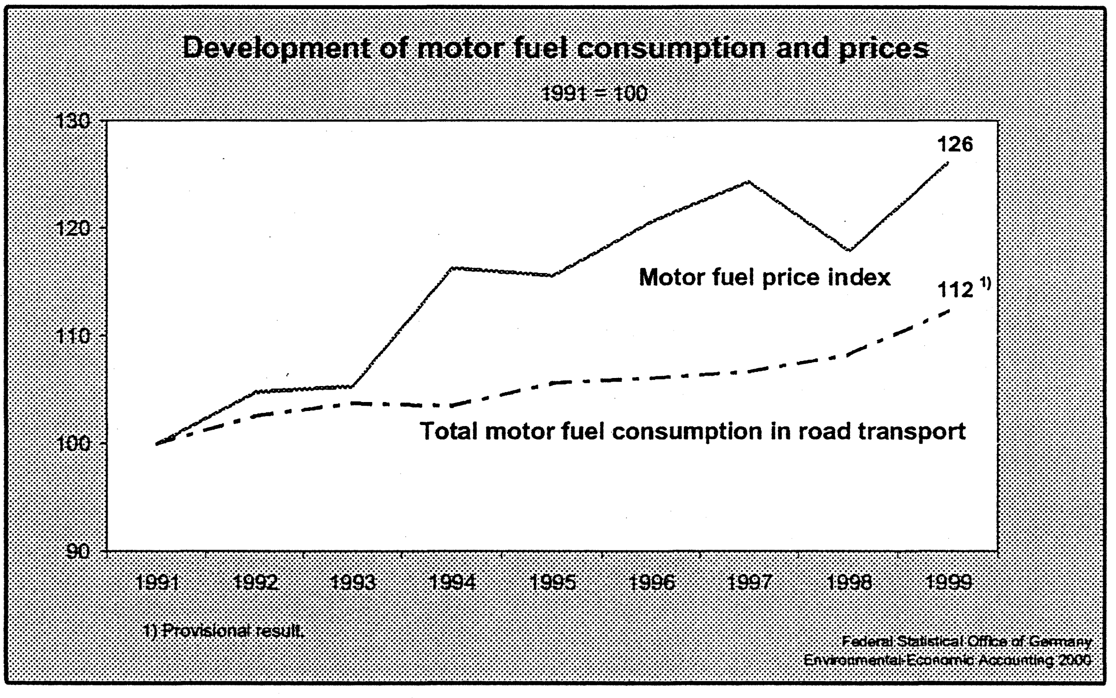
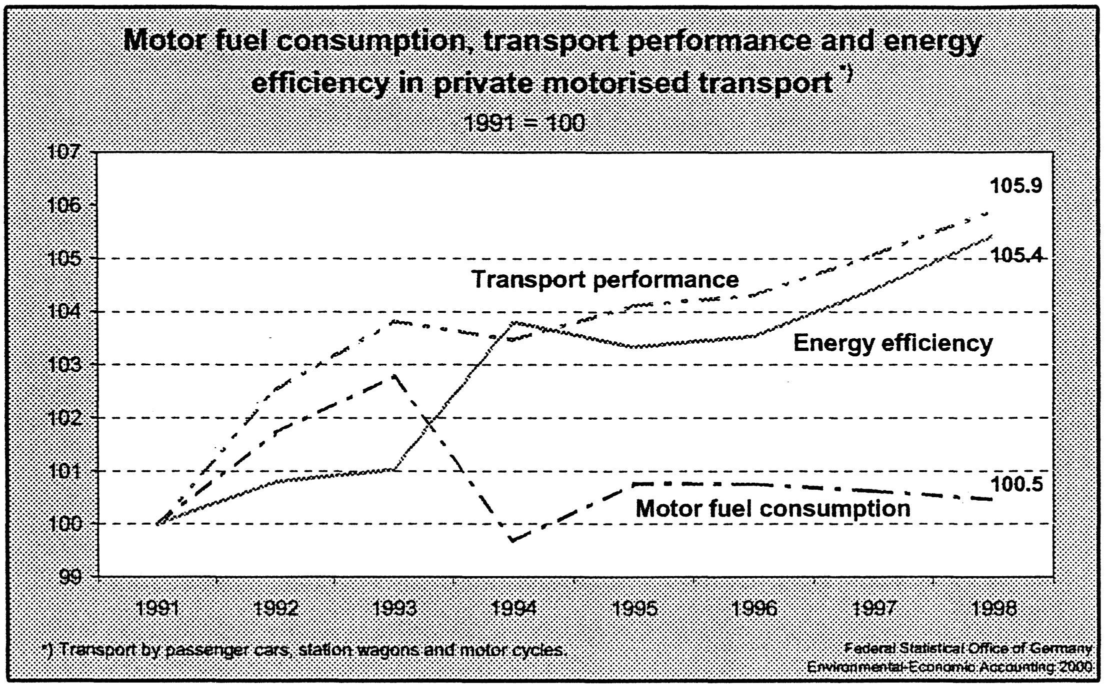


Figure 25

Figure 25 represents the developments of the **motor fuel price index** and of **motor fuel consumption** (always petrol and diesel together). As we can see there, the entire consumption of motor fuels showed a continuous slight increase during the 1990, with the exception of 1994. However, price rises generally led to a smaller increase in consumption. An exception here is the year 1999. Despite a sharp rise in the price level, motor fuel consumption increased more strongly than in the preceding years. The fact that reactions to the motor fuel price increases - some of which were considerable – were rather moderate in recent years is believed to be due mainly to the fact that citizens have only limited opportunities of changing their petrol and diesel consumption behaviour in the short term. There are hardly any short-term alternatives for commuters, professional drivers, booked holiday trips, the entire sphere of goods transport, etc. Also, technological adjustments (e.g. development and purchase of low-consumption vehicles) have only long-term effects on consumption because the stock of vehicles changes only gradually. Between 1991 and 1998 motor fuel prices rose about 18% altogether. One might have expected that, as a reaction, people would reduce their demand for transport services, i.e. drive less frequently or use motor fuels more efficiently. For private motorised transport by passenger cars, station wagons and motor cycles, the transport performance determined for Germany in 1998 was 756 bn passenger-kilometres, with an increase by just under 6% compared with 1991. Motor fuel consumption in that area, however, remained nearly unchanged. Putting transport performance in relation to energy consumption shows that the **efficiency of motor fuel use in private transport** improved in the 1990s (figure 26). In private motorised transport by passenger cars, station wagons and motor cycles, the number of passenger-kilometres achieved per litre of motor fuel consumed in 1998 was 5.5% larger than in 1991.



Figures 26

For freight transport by road, it is not possible to give equivalent information on the efficiency of motor fuel use. The reason here is that, while transport performance is covered for articulated vehicles and lorries with a gross vehicle weight of more than 6 t or a load capacity of over 3.5 t (i.e. excluding the "small" commercial vehicles), motor fuel consumption is available only for overall freight transport by road (including that of "small" commercial vehicles).

What is particularly relevant from environmental aspects - in addition to energy use in road transport and, consequently, the issue of using resources economically - is the **emissions caused by road transport** (cf. above). For the major air emissions from road transport, all pollutants decreased clearly during the 1990s. Only CO_2 emissions increased in that period. Due to their close link with energy consumption, they developed nearly parallel to energy consumption; in 1998 they were about 9% above the level of CO_2 emissions in road transport in 1991. This may be compared with motor fuel consumption in road transport, which rose 8.3% over the same period. The other air emissions from road transport, however, decreased clearly in the 1990s (figure 27), that is for instance emissions of nitrogen oxides by 30%, those of carbon monoxide by 49% and of volatile organic compounds (excl. methane) by 64%. These are results of the manifold technological and administrative measures taken in Germany in the past decade, such as the growing share of low-emission motor vehicles in the overall stock, exhaust-specific modifications in engines, the introduction of low-sulphur motor fuels and the disappearance of leaded petrol from the market.

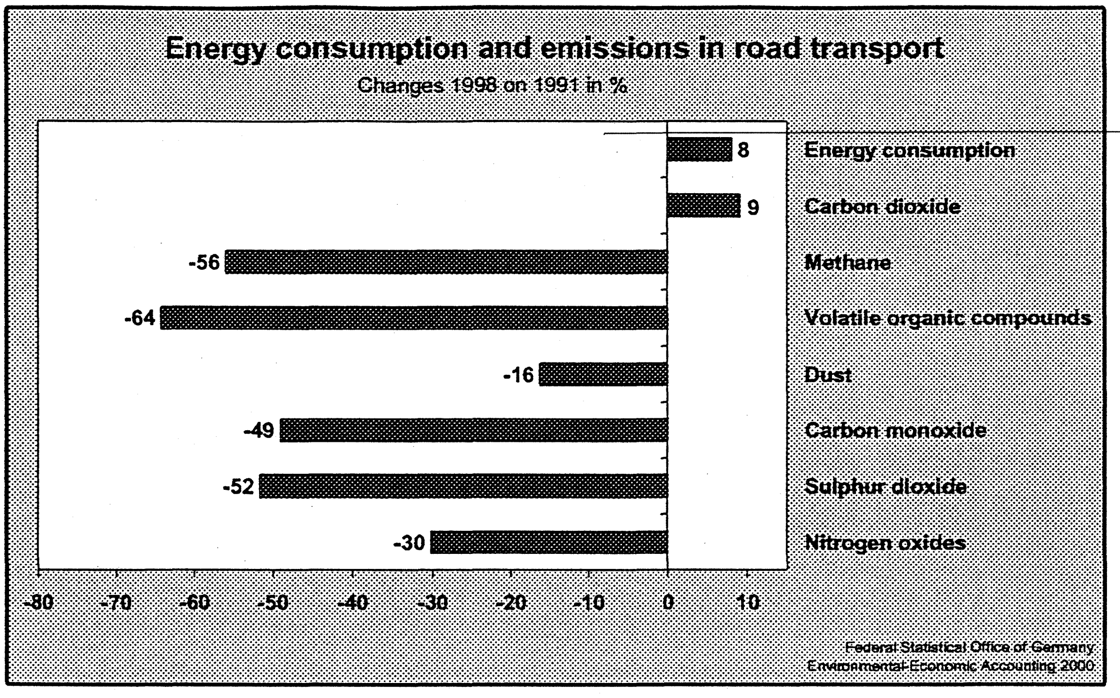


Figure 27

[1] In addition to its function as a sink, other services provided by nature should be mentioned such as the buffer, recreation and production functions.

[2] The impairments of nature and landscape caused by the use of area for built-up land and land used for traffic purposes can in part be compensated for by compensation or replacement measures (Articles 8, 8a Federal Law on Nature Conservation); it is not possible yet to provide quantitative information on that issue.

[3] *Bundestags-Drucksache* 14/2611 of 28 January 2000. See also: Environmental Barometer (*Umweltbarometer*) of the Federal Ministry for the Environment and the German Environment Index (*Deutscher Umweltindex - DUX*) derived from it. http://www.umweltbundesamt.de/dux/umweltbarometer.htm

[4] Data source: Federal Environmental Agency.

[5] The model approach is based on the assumption that the production structure abroad corresponds to that within the country. See in particular: Schoer, K.: Energy use of private households by purposes, Paper delivered at the ECE / Eurostat "Work Session on methodological issues of environment statistics", Jerusalem, October 1999. http://www.unece.org/stats/documents/1999.10.env.htm

[6] The range of raw materials is determined by the ratio of resources that may be extracted and actual current extraction of raw materials. That calculatory range provides a temporary picture within a highly dynamic system. Important factors here are the market situation at any point in time and the intensity of exploration.

[7] See i.a.: *Stoffmengenflüsse und Energiebedarf bei der Gewinnung ausgewählter mineralischer Rohstoffe*, in: *Geologisches Jahrbuch, Sonderhefte*, Series *H* (*Wirtschaftsgeologie, Berichte zur Rohstoffwirtschaft*), Issues SH 1 – 11, Hanover 1999.

[8] cf.: Stahl, W. (*BGR*) , *Die weltweiten Reserven der Energierohstoffe: Mangel oder Überfluss?* http://www.bgr.de

[9] Over the long term other raw materials, in addition to mineral oil, will be relevant from the aspect of the danger of scarcity because a range of raw materials extending only little beyond the coming generation cannot be considered satisfactory in terms of sustainability.

Statistisches Bundesamt
Umweltökonomische Gesamtrechnungen 2000

Anhang

Zum Bericht des Statistischen Bundesamtes zu den Umweltökonomischen Gesamtrechnungen 2000

Inhalt

Abkürzungen - Maßeinheiten

J	=	Joule	(1J = 1 Ws)	Mill.	=	Millionen	
kJ	=	Kilojoule	(1 kJ = 10^3 J)	Mrd.	=	Milliarden	
MJ	=	Megajoule	(1 MJ = 10^6 J)	Std.	=	Stunde	
GJ	=	Gigajoule	(1 GJ = 10^9 J)	m^3	=	Kubikmeter	
TJ	=	Terajoule	(1 TJ = 10^{12} J)	%	=	Prozent	
PJ	=	Petajoule	(1 PJ = 10^{15} J)	m^2	=	Quadratmeter	
SKE	=	Steinkohleeinheit	(1 t SKE = 0,0294 TJ)	Km^2	=	Quadratkilometer	
W	=	Watt		ha	=	Hektar	(= 10.000 m^2)
Ws	=	Wattsekunde		l	=	Liter	
MWh	=	Megawattstunde	(= 3,6 GJ)	Pkm	=	Personenkilometer	
kg	=	Kilogramm					
t	=	Tonne					
Dz	=	Doppelzentner	(= 100 kg)				

Zeichenerklärung

0	=	weniger als die Hälfte von 1 in der letzten besetzten Stelle, jedoch mehr als nichts
...	=	Angabe fällt später an
X	=	Tabellenfach gesperrt, weil Aussage nicht sinnvoll
.	=	Zahlenwert unbekannt oder geheimzuhalten
-	=	nichts vorhanden

Abweichungen in den Summen durch Runden der Zahlen möglich.

Tabelle 1: Bevölkerung und Wirtschaft

Gegenstand der Nachweisung	Maßeinheit	1991	1992	1993	1994	1995	1996	1997	1998	1999
Einwohner	Mill.	80,0	80,6	81,2	81,4	81,7	81,9	82,1	82,0	82,
Erwerbspersonen	Mill.	40,7	40,4	40,4	40,6	40,5	40,7	41,0	41,2	41,
Erwerbstätige Inländer	Mill.	38,5	37,9	37,4	37,3	37,3	37,2	37,1	37,5	37,
Arbeitslose										
Insgesamt	Mill.	2,2	2,6	3,1	3,3	3,2	3,5	3,9	3,7	3,
In % der Erwerbspersonen	%	5,4	6,3	7,6	8,2	7,9	8,6	9,5	9,0	8,
Privater Verbrauch in Preisen von 1995	Mrd. DM	1843	1891	1892	1910	1948	1965	1976	2015	206
Arbeitsstunden										
Insgesamt	Mrd. Std.	59,4	59,8	58,3	58,0	57,2	56,3	56,0	56,7	57,
Je Erwerbstätigen im Inland	Std.	1544,9	1578,7	1560,9	1555,1	1530,2	1511,0	1506,4	1509,4	1503,
Kapitalstock in Preisen von 1995										
Insgesamt [1]	Mrd. DM	15642	16156	16647	17110	17566	18000	18428	18859	1930
Je Erwerbstätigen im Inland	1 000 DM	406	426	446	459	471	484	496	503	51
Je Arbeitsstunde	DM	263	272	280	288	296	303	310	317	32
Abschreibungen in Preisen von 1995	Mrd. DM	447	472	492	507	521	535	547	562	57
Bruttoinlandsprodukt in Preisen von 1995										
Insgesamt	Mrd. DM	3346	3421	3384	3463	3523	3550	3600	3674	373
Je Erwerbstätigen im Inland	DM	87000	90300	90600	92800	94200	95300	96800	97900	9830
Je Arbeitsstunde	DM	56	57	58	60	62	63	64	65	6
Je 1000 DM Abschreibungen	DM	7486	7253	6882	6828	6760	6637	6576	6542	645
Nachrichtlich:										
Erwerbstätige im Inland	Mill.	38,5	37,9	37,4	37,3	37,4	37,3	37,2	37,5	37,

[1] Ohne Nutztiere und Nutzpflanzungen

Tabelle 2: Einsatz von Umweltressourcen für wirtschaftliche Zwecke

Gegenstand der Nachweisung	Maßeinheit	1991	1992	1993	1994	1995	1996	1997[1]	1998[1]	1999[1]
		Produktionsfaktoren								
Primärenergieverbrauch	Petajoule	14 467	14 150	14 179	14 078	14 269	14 746	14 574	14 454	14 200
Rohstoffentnahme und Import [2]	Mill. t	1 460	1 479	1 413	1 533	1 485	1 458	1 440	1 421	1 413
Wasserentnahme aus der Natur [3]	Mill. m^3	51 344	49 852	48 150	48 972	48 909	...	...	...	...
Treibhausgase	Mill. t	1 148	1 094	1 073	1 054	1 051	1 067	1 031	1 007	...
darunter: Kohlendioxid	Mill. t	976	928	918	904	903	924	893	886	861
Versauerungsgase	Mill. t	5,7	4,9	4,5	3,9	3,5	2,8	2,6	2,5	...
Abfall	Mill. t	354	371	363	379	365	...	...	...	...
Wasserabgabe an die Natur [4]	Mill. m^3	51 148	49 665	47 966	48 787	48 724	...	...	...	...
Siedlungs- und Verkehrsfläche [5]	km^2	...	...	40 305	...	...	...	42 052	42 495	...
Arbeitsstunden	Mrd. Std.	59	60	58	58	57	56	56	57	57
Abschreibungen (Preise von 1995)	Mrd. DM	447	472	492	507	521	535	547	562	578
nachrichtlich:										
Bruttoinlandsprodukt in Preisen von 1995	Mrd. DM	3 346	3 421	3 384	3 463	3 523	3 550	3 600	3 674	3 731
		Produktionsfaktoren (Deutschland 1991 bzw. 1993 = 100)								
Primärenergieverbrauch	-	100	97,8	98,0	97,3	98,6	101,9	100,7	99,9	98,2
Rohstoffentnahme und Import [2]	-	100	101,3	96,8	105,0	101,7	99,8	98,6	97,3	96,8
Wasserentnahme aus der Natur [3]	-	100	97,1	93,8	95,4	95,3	...	...	...	...
Treibhausgase	-	100	95,3	93,4	91,8	91,5	92,9	89,8	87,7	...
darunter: Kohlendioxid	-	100	95,0	94,0	92,6	92,5	94,6	91,4	90,7	88,2
Versauerungsgase	-	100	85,7	78,0	67,9	60,6	49,0	46,1	44,1	...
Abfall	-	100	104,9	102,5	107,1	103,2	...	...	...	...
Wasserabgabe an die Natur [4]	-	100	97,1	93,8	95,4	95,3	...	...	...	...
Siedlungs- und Verkehrsfläche [5]	-	...	...	100	...	...	...	104,3	105,4	...
Arbeitsstunden	-	100	100,7	98,2	97,6	96,3	94,8	94,3	95,4	96,0
Abschreibungen (Preise von 1995)	-	100	105,5	110,0	113,5	116,6	119,7	122,5	125,6	129,3
		Bruttoinlandsprodukt im Verhältnis zu Produktionsfaktoren (Deutschland 1991 bzw. 1993 = 100)								
Primärenergieverbrauch	-	100	104,5	103,2	106,4	106,7	104,1	106,8	109,9	113,6
Rohstoffentnahme und Import [2]	-	100	100,9	104,5	98,5	103,5	106,3	109,1	112,8	115,2
Wasserentnahme aus der Natur [3]	-	100	105,3	107,8	108,5	110,5	...	...	...	...
Treibhausgase	-	100	107,3	108,2	112,7	115,0	114,2	119,8	125,2	...
darunter: Kohlendioxid	-	100	107,6	107,6	111,8	113,8	112,1	117,7	121,0	126,4
Versauerungsgase	-	100	119,3	129,7	152,5	173,6	216,5	233,4	248,8	...
Abfall	-	100	97,5	98,7	96,6	102,1	...	...	...	...
Wasserabgabe an die Natur [4]	-	100	105,3	107,8	108,5	110,5	...	...	...	...
Siedlungs- und Verkehrsfläche [5]	-	...	...	100	...	...	...	102,0	103,0	...
Arbeitsstunden	-	100	101,6	103,0	106,0	109,4	111,9	114,1	115,1	116,1
Abschreibungen (Preise von 1995)	-	100	96,9	91,9	91,2	90,3	88,7	87,8	87,4	86,2

1) Zum Teil geschätzt
2) Verwertete Entnahme abiotischer Rohstoffe und importierte abiotische Güter.
3) Einschl. Fremd- und Regenwasser.
4) Einschl. Fremd- und Regenwasser, Verluste bei der Wasserverteilung und Verdunstung.
5) Gemäß Flächenenerhebung; (Stichtag ist der 31.12. d. Vorjahres, also Berichtsjahre 1992 und 1996) sowie vorläufiger Schätzung des Bundesamtes für Bauwesen und Raumordnung (Stichtag ist der 31.12. Des Vorjahres, also Berichtsjahr 1997).

Tabelle 3: Material- und Energieflüsse
in Mill. Tonnen

Gegenstand der Nachweisung	1991	1992	1993	1994	1995	1996	1997	1998
	Feststoffe und Gase [1]							
Entnahmen	5 121	4 697	4 779	4 717	4 503	4 438	4 276	4 150
Rohstoffentnahme (Inland)	3 968	3 559	3 681	3 589	3 376	3 285	3 139	2 996
Nicht verwertete Entnahme [2]	2 686	2 336	2 422	2 259	2 089	2 021	1 897	1 791
Verwertete Entnahme	1 282	1 223	1 260	1 330	1 287	1 263	1 242	1 205
Biotische Stoffe	188	130	205	191	198	212	215	216
Abiotische Stoffe	1 094	1 093	1 054	1 140	1 090	1 051	1 027	989
Energieträger	364	325	296	277	265	256	244	226
Erze	0	0	0	0	0	0	0	1
Mineralien, Steine und Erden	730	768	758	862	825	795	783	763
Einfuhr	433	456	423	463	464	475	482	505
Biotische Güter	68	70	64	69	69	69	70	73
Abiotische Güter	365	386	359	394	395	406	413	431
Energieträger	203	210	208	217	214	238	238	246
Erze und deren Erzeugnisse	74	74	63	75	78	70	76	85
Mineralien, Steine und Erden sowie deren Erzeugnisse	51	64	56	64	64	59	57	54
Erzeugnisse der chemischen Industrie	23	23	21	24	24	25	27	29
Maschinen und Geräte	8	8	6	7	8	8	9	10
Sonstige Waren	6	6	5	6	7	6	7	8
Sauerstoffentnahme	719	683	675	664	663	678	655	649
Abgaben	4 390	3 988	4 044	3 901	3 728	...	...	...
Stoffausbringung	295	284	283	284	283	283	278	277
Düngemittel	294	283	282	283	282	282	277	276
Pflanzenschutzmittel	0	0	0	0	0	0	0	0
Klärschlamm	1	1	1	1	1	1	1	1
Nicht verwertete Abgabe [3]	2 527	2 167	2 258	2 091	1 934	1 875	1 757	1 657
Ausfuhr	211	216	202	223	225	238	249	260
Biotische Güter	52	54	51	57	60	60	61	67
Abiotische Güter	159	162	151	166	165	178	188	193
Energieträger	21	23	22	25	25	35	32	34
Erze und deren Erzeugnisse	37	37	36	38	38	37	43	41
Mineralien, Steine und Erden sowie deren Erzeugnisse	50	50	41	48	45	46	48	50
Erzeugnisse der chemischen Industrie	30	30	32	34	34	36	38	39
Maschinen und Geräte	12	12	10	11	12	13	15	16
Sonstige Waren	9	10	9	10	11	12	12	13
Abfall insgesamt [4]	354	371	363	379	365	...	...	...
Luftemissionen	1 002	950	938	923	921	940	908	901
Saldo Feststoffe und Gase	731	709	735	816	775	...	...	...
	Wasser							
Wasserentnahme aus der Natur [5]	51 344	49 852	48 150	48 972	48 909	...	...	...
Wasserabgabe an die Natur [6]	51 148	49 665	47 966	48 787	48 724	...	...	...
Saldo Ex- und Import von Wasser	8	8	8	8	8	...	...	...
Saldo Wasser	189	179	176	177	177	...	...	...
	Insgesamt							
Materialverbleib	920	888	911	993	952	...	...	...

1) Einschl. nicht fester Energieträger, Schlämme, Säuren und Laugen.
2) Einschl. Bodenaushub, Bergematerial der Steinkohle, Abraum der Braunkohle.
3) Einschl. Abraum der Braunkohle und Bergematerial der Steinkohle, das nicht unterirdisch verfüllt wird.
4) Einschl. Bodenaushub, Bauschutt, Straßenaufbruch, Bergematerial der Steinkohle, das unterirdisch verfüllt wird.
5) Einschl. Fremd- und Regenwasser.
6) Einschl. Fremd- und Regenwasser, Verluste bei der Wasserverteilung und Verdunstung.

Tabelle 4: Material- und Energieflüsse 1995
in Mill. Tonnen

Entnahmen		Abgaben	
Feststoffe [1]			
Rohstoffentnahme (Inland)	3 376,3	Stoffausbringung	282,8
Nicht verwertete Entnahme	2 088,9	Düngemittel	281,6
Braunkohle (Abraum)	1 906,7	Wirtschaftsdünger	276,9
Steinkohle	51,1	Handelsdünger (Nährstoff)	4,7
sonstige Energieträger	1,9	Pflanzenschutzmittel	0,0
Erze	0,0	Klärschlamm	1,2
Mineralien, Steine, Erden	30,6	Nicht verwertete Abgabe [2]	1 934,0
Bodenaushub	98,6	Ausfuhr	224,7
Verwertete Entnahme	1 287,3	Biotische Güter	59,5
Biotische Stoffe	197,7	Tiere und tierische Erzeugnisse	6,8
Tiere	0,2	Pflanzen u. pflanzl. Erzeugnisse [3]	35,5
Pflanzen	172,4	Holz und Holzwaren	17,2
Holz	25,0	Abiotische Güter	165,2
Abiotische Stoffe	1 089,6	Energieträger	25,3
Energieträger	264,6	Erze und deren Erzeugnisse	37,7
Steinkohle	53,6	Mineralien, Steine und Erden [4]	44,7
Braunkohle	192,8	Erzeugnisse der chem. Industrie	34,2
Erdöl	2,9	Maschinen und Geräte	12,4
Erdgas	14,7	Sonstige Waren	10,9
Erdölgas	0,1		
Energetischer Torf	0,2		
Andere Produkte der Erdöl-, Erdgasgewinnung	0,3	Abfall	365,4
Erze	0,1	Bodenaushub	98,6
Eisen- und Manganerze	0,1	Bauschutt, Straßenaufbruch	41,0
NE-Erze	0,0	Bergematerial	56,3
Schwefel und Magnetkies	0,0	Abfall ohne Massenabfälle	169,5
Sonstige Erze	0,0		
Mineralien, Steine und Erden	824,9	**Zusammen**	2 806,9
Steine und Erden	803,6		
Rohe und ungebrochene Natursteine, unbearbeitete Erden	250,0		
Sand und Kies	428,8		
Schiefer	0,1		
Kalk- und Dolomitgestein	62,2		
Rohgips und Kreide, Anhydrit	9,3		
Tonerdehaltige Rohstoffe	47,7		
Quarzit, Feldspat, Pegmatit	2,2		
Andere rohe und gebrochene Natursteine	0,5		
Torf für gärtnerische Zwecke	3,0		
Mineralien und deren Erzeugnisse	21,3		
Salze	20,2		
Kalirohsalze	7,2		
Stein- und Hütten-, Saline-, Streu- und Auftausalze, Quellsalze	13,0		
Flußspat, Schwerspat und Graphit	0,2		
Schwefel aus der Erdgasgewinnung	1,0		
Sonstige bergbauliche Erzeugnisse	0,0		
Einfuhr	463,6		
Biotische Güter	68,6		
Tiere und tierische Erzeugnisse	5,8		
Pflanzen und pflanzliche Erzeugnisse [3]	40,1		
Holz und Holzwaren	22,7		
Abiotische Güter	395,0		

Energieträger	214,4		
Erze und deren Erzeugnisse	78,0		
Mineralien, Steine und Erden [4]	64,0		
Erzeugnisse der chemischen Industrie	24,5		
Maschinen und Geräte	7,5		
Sonstige Waren	6,5		
Zusammen	3 839,9	**Saldo Feststoffe**	1 032,9
	Gase		
Sauerstoffentnahme		Luftemissionen an Massenschadstoffen	
zur Kohlendioxid (CO_2) - Bildung	656,7	Kohlendioxid (CO_2)	903,0
zur Kohlenmonoxid (CO) - Bildung	3,8	Kohlenmonoxid (CO)	6,7
zur Stickstoffdioxid (NO_2) - Bildung	1,4	Stickstoffdioxid (NO_2)	2,0
zur Schwefeldioxid (SO_2) - Bildung	1,0	Schwefeldioxid (SO_2)	2,1
zur Distickstoffoxid (N_2O) - Bildung	0,1	Distickstoffoxid (N_2O)	0,2
		Ammoniak (NH_3)	0,6
		Methan (CH_4)	3,9
Zusammen	663,1	Staub	0,3
		Flüchtige organische Verbindungen, außer Methan (NMVOC)	2,0
		Zusammen	920,8
		Saldo Gase	- 257,8
		Saldo Feststoffe und Gase	775,1
	Wasser		
Wasserentnahme aus der Natur	48 908,8	Wasserabgabe an die Natur	48 724,0
Fremd- und Regenwasser [5]	5 272,9	Fremd- und Regenwasser [5]	5 272,9
Oberflächenwasser, Uferfiltrat	43 635,9	Abwasser	40 740,1
		Verdunstung	1 999,9
		Verluste	711,1
		Saldo Ex- und Import von Wasser	8,0
Zusammen	48 908,8	**Zusammen**	48 732,0
		Saldo Wasser [6]	176,7
		Materialverbleib	951,9

1) Einschl. nicht fester Energieträger, Schlämme, Säuren und Laugen.
2) Einschl. Abraum der Braunkohle und Bergematerial der Steinkohle, das nicht unterirdisch verfüllt wird.
3) ohne Holz. - 4) sowie deren Erzeugnisse.
5) Entnahme über die Kanalisation (z. B. Entwässerung versiegelter Flächen).
6) Ubergang in andere Materialarten.

Tabelle 5: Einsatz von Umweltressourcen für wirtschaftliche Zwecke
Früheres Bundesgebiet

Gegenstand der Nachweisung	Maßeinheit	1960	1970	1980	1990
Primärenergieverbrauch	Petajoule	6 198	9 870	11 436	11 495
Rohstoffentnahme und Import [1]	Mill. t	757	1 079	1 195	1 130
Wasserentnahme aus der Natur [2]	Mill. m^3	20 260			46 440
Treibhausgase	Mill. t	555	907	950	857
darunter: Kohlendioxid	Mill. t	555	744	792	700
Versauerungsgase	Mill. t	4	5	5	2
Abfall	Mill. t	219			320
Wasserabgabe an die Natur [3]	Mill. m^3	20 121			46 271
Siedlungs- und Verkehrsfläche [4]	km^2	18 780		27 310	30 452
Arbeitsstunden	Mrd. Std.	56	52	47	46
Abschreibungen (Preise von 1991)	Mrd. DM	78	158	242	318
nachrichtlich:					
Bruttoinlandsprodukt unrevidiert in Preisen von 1991	Mrd. DM	1 000	1 543	2 018	2 520

1) Verwertete Entnahme abiotischer Rohstoffe und importierte abiotische Güter.
2) Einschl. Fremd- und Regenwasser.
3) Einschl. Fremd- und Regenwasser, Verluste bei der Wasserverteilung und Verdunstung.
4) Gemäß Flächenenerhebung; (Stichtag ist der 31.12. d. Vorjahres, also Berichtsjahre 1992 und 1996) sowie vorläufiger Schätzung des Bundesamtes für Bauwesen und Raumordnung (Stichtag ist der 31.12. Des Vorjahres, also Berichtsjahr 1997).

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Tabelle 6: Aufkommen und Verwendung von Primärenergie mit Vorleistungen aus dem In- und Ausland

Gegenstand der Nachweisung	Direkt	Indirekt	Kumuliert	
	PJ			Letzte Verwendung = 100
1991				
Gewinnung im Inland	5 444	0	5 444	26,3
+ Import	9 894	5 325	15 219	73,7
= Aufkommen	15 338	5 325	20 663	100,0
- Intermediärer Verbrauch	10 716	- 10 716	0	0,0
= Letzte Verwendung	4 622	16 040	20 663	100,0
- Export u. Hochseebunkerungen	1 028	4 681	5 709	27,6
= Letzte inländische Verwendung	3 594	11 360	14 954	72,4
Konsumausgaben[1]	3 751	7 353	11 104	53,7
Konsumausgaben des Staates	-	1 592	1 592	7,7
Anlageinvestitionen	-	2 392	2 392	11,6
Vorratsveränderungen	- 157	23	- 134	- 0,6
1997				
Gewinnung im Inland	4 035	-	4 035	18,3
+ Import	11 454	6 597	18 051	81,7
= Aufkommen	15 489	6 597	22 086	100,0
- Intermediärer Verbrauch	10 443	- 10 443	0	0,0
= Letzte Verwendung	5 046	17 039	22 085	100,0
- Export u. Hochseebunkerungen	948	5 885	6 833	30,9
= Letzte inländische Verwendung	4 098	11 154	15 252	69,1
Konsumausgaben[1]	4 131	7 227	11 358	51,4
Konsumausgaben des Staates	-	1 372	1 372	6,2
Anlageinvestitionen	-	2 215	2 215	10,0
Vorratsveränderungen	- 33	341	307	1,4
1997 gegenüber 1991 in Prozent				
Gewinnung im Inland	- 25,9	0,0	- 25,9	
+ Import	15,8	23,9	18,6	
= Aufkommen	1,0	23,9	6,9	
- Intermediärer Verbrauch	- 2,5	- 2,5	0,0	
= Letzte Verwendung	9,2	6,2	6,9	
- Export u. Hochseebunkerungen	- 7,8	25,7	19,7	
= Letzte inländische Verwendung	14,0	- 1,8	2,0	
Konsumausgaben[1]	10,1	- 1,7	2,3	
Konsumausgaben des Staates	0,0	- 13,8	- 13,8	
Anlageinvestitionen	0,0	- 7,4	- 7,4	
Vorratsveränderungen	- 78,8	1 362,0	- 329,5	
1997 gegenüber 1991 absolut				
Gewinnung im Inland	- 1 409	0	- 1 409	
+ Import	1 560	1 272	2 832	
= Aufkommen	151	1 272	1 423	
- Intermediärer Verbrauch	- 273	273	0	
= Letzte Verwendung	423	999	1 423	
- Export u. Hochseebunkerungen	- 80	1 205	1 124	
= Letzte inländische Verwendung	504	- 206	298	
Konsumausgaben[1]	380	- 126	254	
Konsumausgaben des Staates	0	- 220	- 220	
Anlageinvestitionen	0	- 177	- 177	
Vorratsveränderungen	124	317	441	

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1) Private Haushalte, private Organisationen ohne Erwerbszweck

Tabelle 7: Energieverbrauch nach Wirtschaftsbereichen

WZ 93	Wirtschaftsbereiche	1991	1992	1993	1994	1995	1996	1997	1998
	in Petajoule								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	207,1	150,0	151,7	147,0	159,8	159,0	151,0	152,6
C-F	**Produzierendes Gewerbe insgesamt**	8387,3	8108,4	7893,7	8007,9	8036,7	8104,3	7950,9	7756,9
10	Kohlenbergbau, Torfgewinnung	650,7	595,4	567,2	500,1	473,4	398,0	292,4	283,6
15	Ernährungsgewerbe	264,4	264,2	262,4	265,4	277,6	282,1	271,4	272,6
21	Papiergewerbe	208,3	213,2	229,0	234,0	225,9	218,9	208,7	212,8
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	477,7	441,5	489,7	508,5	491,9	499,7	427,2	438,7
24	Chemische Industrie	1654,2	1622,4	1550,4	1612,5	1511,1	1489,1	1590,1	1493,9
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	316,0	301,1	320,9	331,9	379,1	374,2	365,6	373,2
27	Metallerzeugung und -bearbeitung	817,5	756,0	703,3	737,7	770,9	751,8	724,7	766,7
40	Energieversorgung	2654,0	2684,5	2598,6	2690,3	2687,0	2853,6	2897,1	2734,4
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	1344,4	1230,2	1172,2	1127,4	1219,8	1236,9	1173,7	1181,0
G-Q	**Dienstleistungen insgesamt**	2026,4	2018,5	2077,5	2049,9	2118,0	2269,7	2177,3	2199,5
A-Q	**Alle Wirtschaftsbereiche, einschl. stat. Diff.**	10715,4	10363,2	10250,3	10284,6	10333,0	10571,0	10442,7	10349,1
	Nachrichtlich: Private Haushalte	3751,4	3786,8	3928,7	3793,7	3936,0	4174,9	4131,3	4104,9
	1991 = 100								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	100	72,5	73,3	71,0	77,2	76,8	72,9	73,7
C-F	**Produzierendes Gewerbe insgesamt**	100	96,7	94,1	95,5	95,8	96,6	94,8	92,5
10	Kohlenbergbau, Torfgewinnung	100	91,5	87,2	76,9	72,7	61,2	44,9	43,6
15	Ernährungsgewerbe	100	99,9	99,3	100,4	105,0	106,7	102,7	103,1
21	Papiergewerbe	100	102,4	109,9	112,3	108,4	105,1	100,2	102,2
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	100	92,4	102,5	106,5	103,0	104,6	89,4	91,8
24	Chemische Industrie	100	98,1	93,7	97,5	91,4	90,0	96,1	90,3
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	100	95,3	101,5	105,0	119,9	118,4	115,7	118,1
27	Metallerzeugung und -bearbeitung	100	92,5	86,0	90,2	94,3	92,0	88,6	93,8
40	Energieversorgung	100	101,1	97,9	101,4	101,2	107,5	109,2	103,0
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	100	91,5	87,2	83,9	90,7	92,0	87,3	87,8
G-Q	**Dienstleistungen insgesamt**	100	99,6	102,5	101,2	104,5	112,0	107,4	108,5
A-Q	**Alle Wirtschaftsbereiche, einschl. stat. Diff.**	100	96,7	95,7	96,0	96,4	98,7	97,5	96,6
	Nachrichtlich: Private Haushalte	100	100,9	104,7	101,1	104,9	111,3	110,1	109,4

Tabelle 8: Bruttowertschöpfung nach Wirtschaftsbereichen
Preise von 1995

WZ 93	Wirtschaftsbereiche	1991	1992	1993	1994	1995	1996	1997	1998
	in Mrd. DM								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	39,3	41,6	42,5	40,3	42,2	45,1	44,9	45,7
C-F	**Produzierendes Gewerbe insgesamt**	1093,6	1088,4	1028,3	1061,7	1060,8	1033,4	1048,6	1056,2
10	Kohlenbergbau, Torfgewinnung	14,8	12,7	13,3	10,8	10,8	8,7	5,9	5,5
15	Ernährungsgewerbe	63,2	59,3	62,9	68,1	67,3	64,7	66,3	63,3
21	Papiergewerbe	16,6	17,3	16,3	17,3	15,1	16,5	18,4	18,5
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	8,1	7,7	7,6	6,1	4,5	3,8	4,8	5,6
24	Chemische Industrie	71,7	71,3	71,0	75,5	78,9	77,9	79,2	79,8
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	30,4	31,3	32,2	34,8	35,2	32,6	32,3	32,8
27	Metallerzeugung und -bearbeitung	31,4	31,7	28,4	29,1	31,2	30,7	31,9	32,2
40	Energieversorgung[1)]	59,0	58,6	58,4	59,2	63,0	69,1	66,2	75,7
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	798,4	798,6	738,1	760,7	754,8	729,4	743,7	742,9
G-Q	**Dienstleistungen insgesamt**	1984,0	2058,5	2086,6	2124,8	2192,4	2253,6	2301,2	2376,6
A-Q	**Alle Wirtschaftsbereiche**	3116,8	3188,5	3157,3	3226,7	3295,4	3332,1	3394,7	3478,5
	1991 = 100								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	100	106,0	108,1	102,6	107,5	114,7	114,3	116,3
C-F	**Produzierendes Gewerbe insgesamt**	100	99,5	94,0	97,1	97,0	94,5	95,9	96,6
10	Kohlenbergbau, Torfgewinnung	100	85,6	89,5	72,9	73,1	58,7	40,0	37,3
15	Ernährungsgewerbe	100	93,8	99,6	107,8	106,5	102,5	104,9	100,2
21	Papiergewerbe	100	103,7	98,0	104,0	90,7	98,9	110,8	110,9
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	100	94,7	94,0	75,6	55,4	47,3	59,3	68,8
24	Chemische Industrie	100	99,4	99,0	105,3	109,9	108,6	110,4	111,3
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	100	103,1	105,8	114,6	115,8	107,2	106,1	107,7
27	Metallerzeugung und -bearbeitung	100	100,9	90,6	92,8	99,5	98,0	101,6	102,7
40	Energieversorgung[1)]	100	99,4	99,1	100,4	106,8	117,1	112,2	113,5
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	100	100,0	92,5	95,3	94,5	91,4	93,2	93,1
G-Q	**Dienstleistungen insgesamt**	100	103,8	105,2	107,1	110,5	113,6	116,0	119,8
A-Q	**Alle Wirtschaftsbereiche**	100	102,3	101,3	103,5	105,7	106,9	108,9	111,6

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1) 1998 Einschl. Wasserversorgung

Tabelle 9: Spezifischer Energieverbrauch nach Wirtschaftsbereichen
Energieverbrauch je DM Bruttowertschöpfung

WZ 93	Wirtschaftsbereiche	1991	1992	1993	1994	1995	1996	1997	1998
	Joule / DM								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	5,3	3,6	3,6	3,7	3,8	3,5	3,4	3,3
C-F	**Produzierendes Gewerbe insgesamt**	7,7	7,4	7,7	7,5	7,6	7,8	7,6	7,3
10	Kohlenbergbau, Torfgewinnung	43,9	46,9	42,7	46,3	43,7	45,7	49,3	51,3
15	Ernährungsgewerbe	4,2	4,5	4,2	3,9	4,1	4,4	4,1	4,3
21	Papiergewerbe	12,5	12,4	14,0	13,5	15,0	13,3	11,3	11,5
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	59,0	57,6	64,4	83,1	109,6	130,5	89,0	78,8
24	Chemische Industrie	23,1	22,8	21,8	21,4	19,2	19,1	20,1	18,7
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	10,4	9,6	10,0	9,5	10,8	11,5	11,3	11,4
27	Metallerzeugung und -bearbeitung	26,1	23,9	24,7	25,3	24,7	24,5	22,7	23,8
40	Energieversorgung	45,0	45,8	44,5	45,4	42,6	41,3	43,8	40,8
11-14, 16-20, 22, 25, 28-37,41,45	Übriges Produzierendes Gewerbe	1,7	1,5	1,6	1,5	1,6	1,7	1,6	1,6
G-Q	**Dienstleistungen insgesamt**	1,0	1,0	1,0	1,0	1,0	1,0	0,9	0,9
A-Q	**Alle Wirtschaftsbereiche**	3,4	3,3	3,2	3,2	3,1	3,2	3,1	3,0
	1991 = 100								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	100	68,4	67,8	69,2	71,8	66,9	63,8	63,4
C-F	**Produzierendes Gewerbe insgesamt**	100	97,1	100,1	98,3	98,8	102,3	98,9	95,8
10	Kohlenbergbau, Torfgewinnung	100	106,9	97,4	105,4	99,5	104,3	112,4	116,9
15	Ernährungsgewerbe	100	106,5	99,7	93,1	98,6	104,1	97,9	102,9
21	Papiergewerbe	100	98,7	112,1	108,0	119,5	106,3	90,5	92,1
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	100	97,6	109,1	140,9	185,8	221,3	150,9	133,6
24	Chemische Industrie	100	98,7	94,7	92,6	83,1	82,9	87,1	81,2
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	100	92,4	96,0	91,7	103,6	110,4	109,1	109,7
27	Metallerzeugung und -bearbeitung	100	91,6	94,9	97,3	94,8	93,9	87,3	91,3
40	Energieversorgung	100	101,8	98,9	101,0	94,8	91,8	97,3	90,8
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	100	91,5	94,3	88,0	96,0	100,7	93,7	93,3
G-Q	**Dienstleistungen insgesamt**	100	96,0	97,5	94,5	94,6	98,6	92,6	90,6
A-Q	**Alle Wirtschaftsbereiche**	100	94,5	94,4	92,7	91,2	92,3	89,5	86,5

Tabelle 10: Emissionsrelevanter Energieverbrauch nach Wirtschaftsbereichen

WZ 93	Wirtschaftsbereiche	1991	1992	1993	1994	1995	1996	1997	1998
	in Petajoule								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	150,8	133,8	135,3	130,8	140,4	139,2	131,8	133,4
C-F	**Produzierendes Gewerbe insgesamt**	7276,5	6865,0	6639,1	6642,7	6574,3	6619,5	6313,6	6328,4
10	Kohlenbergbau, Torfgewinnung	675,9	606,0	585,8	526,6	513,9	411,7	311,3	285,6
15	Ernährungsgewerbe	209,1	208,9	207,0	210,0	218,0	222,8	215,4	216,6
21	Papiergewerbe	164,8	169,7	185,7	189,9	184,4	177,7	170,5	174,2
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	596,7	520,7	490,6	453,0	418,8	427,3	425,1	427,5
24	Chemische Industrie	750,1	710,6	653,9	652,9	550,0	523,8	522,2	524,5
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	257,8	242,3	260,9	269,9	316,2	311,1	305,5	313,0
27	Metallerzeugung und -bearbeitung	825,9	785,4	727,3	774,8	823,2	785,8	766,3	825,6
40	Energieversorgung	2993,0	2881,3	2820,0	2886,5	2826,3	3005,8	2893,9	2848,7
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	803,3	740,2	708,0	679,2	723,5	753,5	703,5	712,6
G-Q	**Dienstleistungen insgesamt**	1597,8	1604,9	1657,9	1632,7	1660,7	1803,2	1718,1	1721,7
A-Q	**Alle Wirtschaftsbereiche**	9025,1	8603,6	8432,2	8406,2	8375,3	8561,8	8163,6	8183,4
	Nachrichtlich: Private Haushalte	3253,9	3161,0	3297,3	3171,2	3300,1	3517,1	3481,9	3455,5
	1991 = 100								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	100	88,8	89,7	86,7	93,1	92,3	87,4	88,4
C-F	**Produzierendes Gewerbe insgesamt**	100	94,3	91,2	91,3	90,3	91,0	86,8	87,0
10	Kohlenbergbau, Torfgewinnung	100	89,7	86,7	77,9	76,0	60,9	46,1	42,3
15	Ernährungsgewerbe	100	99,9	99,0	100,4	104,2	106,5	103,0	103,6
21	Papiergewerbe	100	103,0	112,7	115,3	111,9	107,9	103,5	105,7
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	100	87,3	82,2	75,9	70,2	71,6	71,2	71,6
24	Chemische Industrie	100	94,7	87,2	87,0	73,3	69,8	69,6	69,9
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	100	94,0	101,2	104,7	122,7	120,7	118,5	121,4
27	Metallerzeugung und -bearbeitung	100	95,1	88,1	93,8	99,7	95,1	92,8	100,0
40	Energieversorgung	100	96,3	94,2	96,4	94,4	100,4	96,7	95,2
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	100	92,1	88,1	84,6	90,1	93,8	87,6	88,7
G-Q	**Dienstleistungen insgesamt**	100	100,4	103,8	102,2	103,9	112,9	107,5	107,8
A-Q	**Alle Wirtschaftsbereiche**	100	95,3	93,4	93,1	92,8	94,9	90,5	90,7
	Nachrichtlich: Private Haushalte	100	97,1	101,3	97,5	101,4	108,1	107,0	106,2

Tabelle 11: CO_2-Emissionen nach Wirtschaftsbereichen

WZ 93	Wirtschaftsbereiche	1991	1992	1993	1994	1995	1996	1997	1998
	in Mill. Tonnen								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	11,4	9,9	10,0	9,6	10,4	10,1	9,5	9,5
C-F	**Produzierendes Gewerbe insgesamt**	632,5	596,1	573,0	573,3	567,0	563,2	544,8	541,1
10	Kohlenbergbau, Torfgewinnung	67,3	59,6	57,9	52,2	49,6	39,6	30,3	27,7
15	Ernährungsgewerbe	14,3	14,1	13,8	14,0	14,7	14,7	14,4	14,4
21	Papiergewerbe	11,1	11,5	12,1	12,3	12,0	11,4	11,0	11,2
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	38,1	32,2	29,6	28,4	27,6	27,5	27,5	27,6
24	Chemische Industrie	53,2	50,2	45,3	44,8	38,5	36,4	37,4	37,0
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	33,1	35,2	35,8	38,4	40,0	38,4	38,4	38,8
27	Metallerzeugung und -bearbeitung	67,3	60,7	55,8	58,4	67,1	63,2	65,0	66,8
40	Energieversorgung	289,3	279,2	272,4	276,5	265,0	279,1	270,9	267,7
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	58,8	53,3	50,3	48,2	52,7	52,9	49,9	49,9
G-Q	**Dienstleistungen insgesamt**	110,1	108,9	112,0	109,8	111,5	118,9	112,0	112,1
A-Q	**Alle Wirtschaftsbereiche**	753,9	714,9	694,9	692,6	688,9	692,2	666,2	662,8
	Nachrichtlich: Private Haushalte	222,5	212,7	223,0	211,7	214,6	232,1	226,2	223,3
	1991 = 100								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	100	87,3	87,6	84,2	91,4	89,1	83,4	84,1
C-F	**Produzierendes Gewerbe insgesamt**	100	94,2	90,6	90,6	89,6	89,0	86,1	85,6
10	Kohlenbergbau, Torfgewinnung	100	88,6	86,0	77,6	73,6	58,8	45,1	41,2
15	Ernährungsgewerbe	100	98,5	96,5	98,2	102,7	102,9	101,0	100,7
21	Papiergewerbe	100	103,7	108,8	110,7	108,4	102,7	99,5	100,8
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	100	84,6	77,8	74,6	72,3	72,2	72,1	72,5
24	Chemische Industrie	100	94,3	85,1	84,2	72,2	68,3	70,2	69,5
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	100	106,6	108,3	116,2	121,0	116,2	116,2	117,4
27	Metallerzeugung und -bearbeitung	100	90,2	82,9	86,7	99,7	93,9	96,6	99,3
40	Energieversorgung	100	96,5	94,2	95,6	91,6	96,5	93,6	92,5
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	100	90,6	85,4	81,9	89,5	90,0	84,9	84,9
G-Q	**Dienstleistungen insgesamt**	100	98,9	101,8	99,7	101,3	108,1	101,7	101,8
A-Q	**Alle Wirtschaftsbereiche**	100	94,8	92,2	91,9	91,4	91,8	88,4	87,9
	Nachrichtlich: Private Haushalte	100	95,6	100,2	95,1	96,4	104,3	101,7	100,4

Tabelle 12: Spezifische CO_2-Emissionen nach Wirtschaftsbereichen

CO_2-Emission je DM Bruttowertschöpfung

WZ 93	Wirtschaftsbereiche	1991	1992	1993	1994	1995	1996	1997	1998
	Kg / DM								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	0,29	0,24	0,23	0,24	0,25	0,22	0,21	0,21
C-F	**Produzierendes Gewerbe insgesamt**	0,58	0,55	0,56	0,54	0,53	0,54	0,52	0,51
10	Kohlenbergbau, Torfgewinnung	4,54	4,70	4,36	4,83	4,57	4,55	5,12	5,01
15	Ernährungsgewerbe	0,23	0,24	0,22	0,21	0,22	0,23	0,22	0,23
21	Papiergewerbe	0,67	0,67	0,74	0,71	0,80	0,69	0,60	0,61
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	4,71	4,20	3,89	4,65	6,14	7,18	5,72	4,96
24	Chemische Industrie	0,74	0,70	0,64	0,59	0,49	0,47	0,47	0,46
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	1,09	1,12	1,11	1,10	1,14	1,18	1,19	1,19
27	Metallerzeugung und -bearbeitung	2,14	1,92	1,96	2,00	2,15	2,05	2,04	2,07
40	Energieversorgung	4,90	4,76	4,66	4,67	4,21	4,04	4,09	4,00
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	0,07	0,07	0,07	0,06	0,07	0,07	0,07	0,07
G-Q	**Dienstleistungen insgesamt**	0,06	0,05	0,05	0,05	0,05	0,05	0,05	0,05
A-Q	**Alle Wirtschaftsbereiche**	0,24	0,22	0,22	0,21	0,21	0,21	0,20	0,19
	1991 = 100								
A-B	**Land- und Forstwirtschaft, Fischerei und Fischzucht**	100	82,4	81,0	82,1	85,0	77,6	72,9	72,3
C-F	**Produzierendes Gewerbe insgesamt**	100	94,7	96,3	93,4	92,4	94,2	89,8	88,6
10	Kohlenbergbau, Torfgewinnung	100	103,5	96,1	106,4	100,7	100,2	112,7	110,5
15	Ernährungsgewerbe	100	105,0	97,0	91,1	96,4	100,4	96,3	100,5
21	Papiergewerbe	100	100,0	111,0	106,4	119,5	103,8	89,9	90,9
23	Kokerei, Mineralölverarbeitung, Herstellung von Brutstoffen	100	89,3	82,8	98,8	130,4	152,7	121,6	105,5
24	Chemische Industrie	100	94,9	85,9	80,0	65,7	62,9	63,5	62,4
26	Glasgewerbe, Keramik, Verarbeitung von Steinen und Erden	100	103,5	102,4	101,4	104,5	108,4	109,6	109,0
27	Metallerzeugung und -bearbeitung	100	89,4	91,5	93,5	100,1	95,8	95,0	96,7
40	Energieversorgung	100	97,1	95,1	95,2	85,8	82,4	83,4	81,5
11-14, 16-20, 22, 25, 28-37, 41,45	Übriges Produzierendes Gewerbe	100	90,6	92,4	86,0	94,7	98,5	91,1	90,2
G-Q	**Dienstleistungen insgesamt**	100	95,3	96,8	93,1	91,7	95,1	87,7	85,0
A-Q	**Alle Wirtschaftsbereiche**	100	92,7	91,0	88,7	86,4	85,9	81,1	78,8

Tabelle 13: Materialentnahme nach Umweltbelastungskategorien

Umweltaspekt	1991	1992	1993	1994	1995	1996	1997	1998	1999
	Entnahme im Inland								
	in Mill. Tonnen								
Belastung von Landschaften und Ökosystemen[1)]	1005,8	1005,4	975,9	1064,8	1016,5	981,4	958,9	927,4	950,4
	1991 = 100								
Belastung von Landschaften und Ökosystemen[1)]	100	100,0	97,0	105,9	101,1	97,6	95,3	92,2	94,5
	Einfuhr								
	in Mill. Tonnen								
Erschöpfung von Rohstoffen[2)]	137,2	144,4	145,7	153,1	148,6	160,8	157,7	164,2	154,7
Belastung von Landschaften und Ökosystemen[3)]	240,4	254,3	239,2	260,8	254,7	263,9	265,0	276,9	257,1
Belastung durch Rest- und Schadstoffe[4)]	286,1	300,6	286,9	310,0	312,1	329,5	334,3	350,1	328,5
darunter: Halb- und Fertigwaren	173,3	179,2	167,0	180,2	189,4	201,5	207,0	212,8	196,4
	1991 = 100								
Erschöpfung von Rohstoffen	100	105,2	106,2	111,6	108,3	117,2	115,0	119,6	112,8
Belastung von Landschaften und Ökosystemen	100	105,8	99,5	108,5	106,0	109,8	110,2	115,2	107,0
Belastung durch Rest- und Schadstoffe	100	105,1	100,3	108,4	109,1	115,2	116,8	122,4	114,8
darunter: Halb- und Fertigwaren	100	103,4	96,4	104,0	109,3	116,2	119,5	122,8	113,3

Die Mengen folgender für die Belastungskategorien als bedeutend erachteter Materialien wurden aggregiert:
1) Braunkohle, Steine und Erden, Salze.
2) Erdöl.
3) Braun- und Steinkohle, Erdöl, Erze, Steine und Erden, Mineralien.
4) Energieträgern, NE-Erze, Salze, Halb- und Fertigwaren.
Daten für 1999 vorläufig

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Tabelle 14 : Umweltschutzausgaben
in Preisen von 1995

Gegenstand der Nachweisung	Maßeinheit	1991	1992	1993	1994	1995	1996	1997
Ausgaben für Umweltschutz insg. 1)	Mill. DM	.	.	.	67 546	69 308	70 141	66 232
Anteil am Bruttoinlandsprodukt	%	X	X	X	2,0	2,0	2,0	1,8
davon: Prod. Gewerbe 2)	Mill. DM	17 442	18 233	18 427	18 287	17 496	17 826	15 422
Staat	Mill. DM	28 393	31 777	29 663	28 997	27 443	24 758	21 926
privatisierte öffentl. Unternehmen 3)	Mill. DM	.	.	.	20 262	24 369	27 557	28 884
Investitionen für Umweltschutz	Mill. DM	.	.	.	30 069	27 462	25 220	22 652
Anteil an den Gesamtinvestitionen	%	X	X	X	3,8	3,5	3,2	2,9
davon: Prod. Gewerbe 2)	Mill. DM	6 350	6 710	6 500	6 049	5 050	4 900	3 454
Staat	Mill. DM	14 843	16 897	14 653	13 517	11 982	9 818	8 516
privatisierte öffentl. Unternehmen 3)	Mill. DM	.	.	.	10 503	10 430	10 502	10 682
Laufende Ausgaben für Umweltschutz	Mill. DM	.	.	.	37 477	41 846	44 921	43 580
davon: Prod. Gewerbe 2) 4)	Mill. DM	11 092	11 523	11 927	12 238	12 446	12 926	11 968
Staat	Mill. DM	13 550	14 880	15 010	15 480	15 461	14 940	13 410
privatisierte öffentl. Unternehmen 3)	Mill. DM	.	.	.	9 759	13 939	17 055	18 202

1) Ausgaben für Umweltschutz = Summe aus Investitionen und laufende Ausgaben für Umweltschutzzwecke.
2) Ohne Baugewerbe und Ausgaben für integrierte Umweltschutzmaßnahmen.
3) Hierunter sind die Ausgaben der außerhalb der öffentlichen Haushalte geführten Unternehmen, insbesondere Eigenbetriebe der Abfallbeseitigung und des Gewässerschutzes, erfasst.
Sie werden in den UGR wie in den Volkswirtschaftlichen Gesamtrechnungen als Teil der Unternehmen und nicht des Staatssektors betrachtet.
Konsistente Daten liegen erst ab Berichtsjahr 1994 vor, 1997 vorläufige Ergebnisse.
4) Ohne Gebühren und Entgelte für Entsorgungsleistungen durch Dritte.

Statistisches Bundesamt
Umweltökonomische Gesamtrechnungen 2000

Tabelle 15 : Umweltschutzausgaben nach Umweltschutzbereichen 1997
jeweilige Preise
Mill. DM

Gegenstand der Nachweisung	Insgesamt	Abfall-beseitigung	Gewässerschutz	Lärm-bekämpfung	Luftreinhaltung
Ausgaben für Umweltschutz insg. [1]	66 533	26 712	32 507	691	6 623
davon: Prod. Gewerbe [2]	15 443	3 199	5 344	364	6 536
Staat	22 036	9 225	12 398	327	87
privatisierte öffentl. Unternehmen [3]	29 053	14 288	14 765	-	-
Investitionen für Umweltschutz	22 367	4 337	15 847	516	1 667
davon: Prod. Gewerbe [2]	3 550	510	1 233	189	1 618
Staat	8 346	835	7 135	327	49
privatisierte öffentl. Unternehmen [3]	10 471	2 992	7 479	-	-
Laufende Ausgaben für Umweltschutz	44 166	22 375	16 660	175	4 956
davon: Prod. Gewerbe [2][4]	11 893	2 689	4 111	175	4 918
Staat	13 690	8 390	5 263	-	38
privatisierte öffentl. Unternehmen [3]	18 582	11 296	7 286	-	-

1) Ausgaben für Umweltschutz = Summe aus Investitionen und laufende Ausgaben für Umweltschutzzwecke.
2) Ohne Baugewerbe und Ausgaben für integrierte Umweltschutzmaßnahmen.
3) Hierunter sind die Ausgaben der außerhalb der öffentlichen Haushalte geführten Unternehmen, insbesondere Eigenbetriebe der Abfallbeseitigung und des Gewässerschutzes, erfasst.
Sie werden in den UGR wie in den Volkswirtschaftlichen Gesamtrechnungen als Teil der Unternehmen und nicht des Staatssektors betrachtet.
Konsistente Daten liegen erst ab Berichtsjahr 1994 vor, 1997 vorläufige Ergebnisse.
4) Ohne Gebühren und Entgelte für Entsorgungsleistungen durch Dritte.

Tabelle 16 : Bruttoanlagevermögen für Umweltschutz nach Umweltschutzbereichen
Bestand am Jahresanfang 1998 zu Wiederbeschaffungspreisen
in Mill. DM

Gegenstand der Nachweisung	Insgesamt	Abfall-beseitigung	Gewässerschutz	Lärm-bekämpfung	Luftreinhaltu
Bruttoanlagevermögen für Umweltschutz	471 840	36 416	366 475	10 115	58 834
davon: Prod. Gewerbe [1]	102 399	10 771	29 137	4 220	58 271
Staat	369 441	25 645	337 338	5 895	563

1) Ohne Baugewerbe und Anlagevermögen aus integrierten Umweltschutzinvestitionen.

Tabelle 17 : Einnahmen umweltbezogener Steuern und Steuereinnahmen insgesamt
Mill. DM

Jahr	Kassenmäßige Steuereinnahmen öffentlicher Haushalte				
	insgesamt [1]	darunter: umweltbezogene Steuern			
		zusammen	Mineralölsteuer	Kraftfahrzeugsteuer	Stromsteuer
	Früheres Bundesgebiet				
1980	364 916	27 936	21 351	6 585	-
1985	437 199	31 871	24 521	7 350	-
1990	549 667	42 935	34 621	8 314	-
	Deutschland				
1991	661 919	58 277	47 266	11 011	-
1992	731 730	68 483	55 166	13 317	-
1993	749 119	70 358	56 300	14 058	-
1994	786 159	78 016	63 847	14 169	-
1995	814 284	78 693	64 888	13 805	-
1996	848 705	81 994	68 251	13 743	-
1997	853 055	80 426	66 008	14 418	-
1998	893 343	81 848	66 677	15 171	-
1999	952 178	88 596	71 278	13 767	3 551

[1] Vor Abzug von Kindergeld (Familienkassen und steuerliches Kindergeld).

Tabelle 18: Versteuertes Mineralöl

Jahr	Benzin, verbleit und unverbleit	Dieselkraftstoffe	Leichtes Heizöl	Erdgas
	1 000 m³			Mill. MWh
1991	40 643	25 890	41 752	692
1992	41 103	27 387	41 671	676
1993	41 606	28 782	41 758	720
1994	40 094	29 324	39 543	731
1995	40 067	30 425	39 208	807
1996	40 329	30 733	43 749	889
1997	40 645	31 423	41 702	845
1998	40 793	32 487	39 351	803
1999	40 898	34 018	33 412	762

Tabelle 19: Kennzahlen des Straßenverkehrs

Jahr	Motorisierter Individualverkehr [1]				Straßengüterverkehr	
	Kraftstoff-verbrauch	Verkehrs-leistungen	Verkehrs-aufkommen [2]	Bestand an Pkw und Kombi [3]	Kraftstoff-verbrauch	Bestand an Lkw und Sattelzug-maschinen [3]
	Mill. l	Mrd. Pkm	Mill. Pers.	Mill.	Mill. l	Mill.
1991	46 220	713,5	46 774	36,8	15 460	1,8
1992	47 016	731,5	47 572	38,0	16 344	2,0
1993	47 507	740,8	48 338	38,9	16 634	2,1
1994	46 075	738,3	49 182	39,8	17 918	2,2
1995	46 573	742,9	49 640	40,4	18 730	2,3
1996	46 569	744,3	49 756	41,0	19 067	2,4
1997	46 509	749,7	50 108	41,4	19 474	2,5
1998	46 436	755,7	50 876	41,7	20 571	2,5
1999	...	...	...	42,3	...	2,6

[1] Mit Pkw, Kombi und motorisierten Zweirädern.
[2] Nur Pkw und Kombi.
[3] Einschl. vorübergehend abgemeldeter Fahrzeuge.

Quelle: Bundesministerium für Verkehr, Bau- und Wohnungswesen (Hrsg.): Verkehr in Zahlen 1999.

Tabelle 20: Emissionen des Straßenverkehrs

Jahr	Kohlendioxid	Stickstoff-oxide	Schwefeldioxid	Kohlenmonoxid	Staub	Flüchtige organ. Verbindungen	Methan
	Mill. t	1 000 t					
1991	154	1 226	62	5 811	43	1 144	5
1992	160	1 186	66	5 168	45	978	4
1993	164	1 140	69	4 702	47	830	3
1994	161	1 063	70	4 093	46	687	3
1995	165	1 029	70	3 865	45	617	3
1996	165	961	38	3 559	41	545	2
1997	166	909	29	3 230	38	468	2
1998	168	856	30	2 963	36	409	2

Quelle: Umweltbundesamt, Berlin

Glossar

Einsatzfaktoren

Für die Nutzung folgender Einsatzfaktoren aus der Ökonomie und aus der Natur können Produktivitäten dargestellt werden (Tabelle 2):

Nutzung ökonomischer Faktoren

Arbeit - Arbeitsvolumen als geleistete Arbeitsstunden (Mill. Std.)
Kapital - Kapitalnutzung als Abschreibungen (Mill. DM in Preisen von 1995)

Natur als Ressourcenquelle

Fläche - Flächeninanspruchnahme als Siedlungs- und Verkehrsfläche (Mill. km^2)
Energie - Energieverbrauch als Verbrauch von Primärenergie (Petajoule)
Rohstoffe - Rohstoffverbrauch als Entnahme von abiotischen Rohstoffen (verwertete abiotische Rohstoffe und importierte abiotische Güter; Mill. t)
Wasser - Wasserverbrauch als Entnahme von Wasser aus der Natur (Mill. m^3)

Natur als Senke für Rest- und Schadstoffe

Treibhausgase - Belastung der Umwelt durch die Emission von Treibhausgasen
Versauerungsgase - Belastung der Umwelt durch die Emission von Versauerungsgasen
Abfall - Belastung der Umwelt durch die Abgabe von Abfall an die Natur
Abwasser - Belastung der Umwelt durch die Abgabe von genutztem Wasser an die Natur

Produktivität – Indikator für die Effizienz der Faktornutzung

Die Produktivität eines Einsatzfaktors gibt an, wie viel wirtschaftliche Leistung mit der Nutzung einer Einheit dieses Faktors produziert wird.

$$\textbf{Produktivität} = \frac{\textbf{Bruttoinlandsprodukt (real)}}{\textbf{Einsatzfaktor}}$$

Die Produktivität drückt aus, wie effizient eine Volkswirtschaft mit dem Einsatz von Arbeit, Kapital und Natur umgeht. Direkt untereinander vergleichbar sind diese Faktoren wegen ihrer unterschiedlichen Beschaffenheit und Funktionen nicht. Die Beobachtung ihrer Entwicklung über längere Zeiträume kann aber darüber Auskunft geben, wie sich das Verhältnis dieser Faktoren verändert.
Weiterhin ist zu beachten, dass bei der Berechnung von Produktivitäten der gesamte reale Ertrag der wirtschaftlichen Tätigkeit ausschließlich auf den jeweiligen Produktionsfaktor bezogen wird, obwohl das Produkt aus dem Zusammenwirken sämtlicher Produktionsfaktoren entsteht. Die ermittelte Produktivität kann deshalb nur als grobes Orientierungsmittel dienen.
Die methodische Umstellung der Berechnung des Bruttoinlandsproduktes auf das Europäische System der Volkswirtschaftlichen Gesamtrechnungen (ESVG 95) mit gleichzeitigem Wechsel des Basisjahres auf 1995 hat Auswirkungen auf die Entwicklung der Produktivitäten im Zeitverlauf, so dass die Zahlen nicht mit vorherigen Veröffentlichungen vergleichbar sind.

Energieverbrauch

Die Berechnungen zum Energieverbrauch nach Wirtschaftsbereichen werden in den Umweltökonomischen Gesamtrechnungen auf Grundlage der auf die Energiebilanz abgestimmten Input-Output-Tabelle der Energieströme durchgeführt.

Die **Energieverwendung** umfasst den gesamten Einsatz von Energie in einem Wirtschaftsbereich, und zwar unabhängig davon ob die Energie dort selbst verbraucht oder umgewandelt und in anderer Form (z. B. Kohle in Strom) an nachgelagerte Bereiche weitergegeben wird.

Der **Energieverbrauch** ergibt sich aus der Differenz zwischen der in einem Wirtschaftsbereich eingesetzten und der von diesem Wirtschaftsbereich an nachfolgende Bereiche weitergegebenen Energiemenge. In der Regel wird die eingesetzte Energiemenge im Verlauf der Produktions- und Konsumaktivität eines Bereiches vollständig verbraucht (z. B. zum Antrieb von Maschinen, Geräten und Fahrzeugen oder zur Raumheizung) und letztlich als Wärme an die Umwelt abgegeben. In Bereichen, die energetische Produkte zur Weiterverwendung in nachfolgenden Produktionsstufen herstellen, wird die eingesetzte Energiemenge nur zu einem Teil verbraucht.

Der **emissionsrelevante Energieverbrauch** ist die Grundlage zur Ermittlung energiebedingter Emissionen in die Luft. Er stellt diejenige Energiemenge dar, deren Verbrauch in einem Wirtschaftsbereich ursächlich für die Entstehung der Luftemissionen ist.

Kumulierter Energieverbrauch

Der zur Verwendung von Gütern notwendige Verbrauch von Energie ist unmittelbares Resultat einer bestimmten Aktivität der Wirtschaftsbereiche und der privaten Haushalte und wird deshalb als **direkter Energieverbrauch** bezeichnet.

Der Energieverbrauch, der bei der Produktion in den Vorstufen der Güterherstellung notwendig ist, wird als **indirekter Verbrauch** bezeichnet. Dabei kann die indirekt im Ausland benötigte Energiemenge nach Maßgabe einer dem Inland entsprechenden Produktionsstruktur und -technik berücksichtigt werden.

Die Summe von direktem und indirektem Verbrauch bildet der **kumulierte Energieverbrauch.**

Berechnung direkter Emissionen in die Luft

Die **direkten Emissionen** der einzelnen Luftschadstoffe werden für die Wirtschaftsbereiche und die privaten Haushalte mit Hilfe spezifischer Emissionskoeffizienten (Datenbasis Umweltbundesamt), dem Energieverbrauch (Datenbasis DIW/Energiebilanz) und unter Berücksichtigung der in den Produktionsbereichen ablaufenden Prozesse ermittelt.

Grundlage dieser Berechnungen ist jeweils der **emissionsrelevante Energieverbrauch**, der nur diejenigen Energieträger umfasst, bei deren Verbrauch unmittelbar Emissionen in die Luft entstehen. Ergänzend umfasst der **gesamte Energieverbrauch** auch solche Energieträger, deren Verbrauch unmittelbar keine Emissionen hervorruft (insbesondere Strom und Fernwärme).

Spezifischer Energieverbrauch und Energieproduktivität

Der **spezifische Energieverbrauch** eines Wirtschaftsbereichs gibt an, wie viel Energie zur Erwirtschaftung einer Einheit der dort erzielten wirtschaftlichen Leistung (Wertschöpfung) verbraucht wurde:

$$\textbf{spezifischer Energieverbrauch} = \frac{\textbf{Energieverbrauch}}{\textbf{Bruttowertschöpfung}}$$

Die **Energieproduktivität** eines Wirtschaftsbereichs gibt an, wie viel wirtschaftliche Leistung (Wertschöpfung) mit einer Einheit der dort verbrauchten Energie erzielt wurde:

$$\textbf{Energieproduktivität} = \frac{\textbf{Bruttowertschöpfung}}{\textbf{Energieverbrauch}}$$

Dekompositionsanalyse

Die Dekompositionsanalyse ist ein Instrument, mit dessen Hilfe die Wirkung von Einflussfaktoren auf eine interessierende Entwicklung beschrieben werden kann. Die Ergebnisse für die Entwicklung der CO_2-Emissionen zeigen den jeweiligen Einfluss eines Faktors unter der Annahme, dass die übrigen Faktoren jeweils unverändert bleiben (ceteris-paribus-Regel).

Folgende Einflussfaktoren der Entwicklung der CO_2-Emissionen bei der **Produktion** (alle Wirtschaftsbereiche) zwischen 1991 und 1998 wurden berücksichtigt:

- der wirtschaftlichen Leistung (Bruttowertschöpfung in Preisen von 1995)
- der Wirtschaftsstruktur (Anteile der Wirtschaftsbereiche an der Bruttowertschöpfung der Produktion)
- der Energieintensität der Produktion (emissionsrelevanter Energieverbrauch / Bruttowertschöpfung)
  und
- der CO_2-Intensität des Energieverbrauchs (CO_2-Emissionen / emissionsrelevanter Energieverbrauch)

Von den methodischen Voraussetzungen (Exogenität und Unabhängigkeit der Faktoren) sind der Dekomposition vor allem im Bereich der ökonomischen Analyse Grenzen gesetzt, die bei der Interpretation der Ergebnisse zu berücksichtigen sind. Somit bietet die Anwendung des Verfahrens die Möglichkeit, mit vergleichsweise einfachen Mitteln erste Aussagen über die Wirkung verschiedener Einflüsse – z. B. auf die Entwicklung der CO_2-Emissionen – zu treffen.

Darstellung und Abgrenzung der Materialentnahme

Bei der Darstellung der Materialströme durch das Statistische Bundesamt wurde – insbesondere wegen der verfügbaren Daten – ein pragmatischer Ansatz gewählt, der bislang nur die unmittelbaren, nicht aber die mittelbaren Materialströme einbezieht. Der **unmittelbare Materialeinsatz** erfasst die verwertete und die nicht verwertete Rohstoffentnahme aus der inländischen Natur sowie die importierten Materialien (Rohstoffe sowie Halb- und Fertigwaren). Zum **mittelbaren Materialeinsatz** zählen die im Zusammenhang mit der Erzeugung der importierten Güter entstandenen Materialentnahmen aus der Natur in der übrigen Welt.

Eine Darstellung der mittelbaren Materialentnahme erscheint erforderlich, weil der Grundsatz der Nachhaltigkeit bei der Nutzung der Natur nicht nur national, sondern global gilt. Insbesondere, wenn inländische Rohstoffe durch ausländische Rohstoffe oder durch weniger materialintensive Halb- und Fertigwaren substituiert werden (Beispiel: statt inländischer Kohleförderung Import von Strom), verringert sich zwar der Materialaufwand im Inland, gleichzeitig steigt aber die Rohstoffentnahme in der übrigen Welt.

Der mittelbare Materialeinsatz lässt sich allerdings nur sehr schwer mit einem befriedigenden Genauigkeitsgrad ermitteln, da dazu sowohl Angaben über die Menge der nicht verwerteten Materialien beim Abbau der importierten Rohstoffe im Ausland als auch Informationen über die bei der Erzeugung der importierten Halb- und Fertigwaren eingesetzten Materialmenge benötigt werden. Das Statistische Bundesamt will die Datenbasis für solche Berechnungen soweit verbessern, dass künftig Schätzungen mit hinreichender Genauigkeit möglich werden.

Umweltschutzausgaben

Zentrale Datenquellen für die hier ausgewiesenen monetären Umweltschutzangaben sind die Statistiken zu den Investitionen und laufenden Aufwendungen für Umweltschutz im Produzierenden Gewerbe, die Jahresabschlussstatistik öffentlicher Unternehmen sowie die Jahresrechnungsergebnisse der öffentlichen Haushalte.

Aufgrund des novellierten Umweltstatistikgesetzes von 1994 werden bei den Unternehmen des Produzierenden Gewerbes ab dem Berichtsjahr 1996 u.a. die Ausgaben für integrierte Umweltschutzinvestitionen nicht mehr abgefragt. Gleichzeitig werden nun die laufenden Ausgaben für Umweltschutz erstmals direkt bei diesen Unternehmen ermittelt, entsprechend ohne Berücksichtigung der zusätzlichen Aufwendungen für integrierte Maßnahmen. Die abgebildeten Daten zu den laufenden Ausgaben im Produzierenden Gewerbe für den Zeitraum vor 1996 entstammen der bisherigen Ermittlung im Rahmen der Anlagevermögensrechnung für Umweltschutz. Sie umfassen nicht die Gebühren und Entgelte der Unternehmen des Produzierenden Gewerbes, die für Entsorgungsleistungen an Dritte gezahlt wurden. Beim Abgleich der laufenden Ausgaben aus der Basiserhebung für 1996 und 1997 für das Produzierende Gewerbe insgesamt mit den entsprechend errechneten Werten aus der Anlagevermögensrechnung ergab sich eine Differenz von rund –10%. In einem Korrekturverfahren wurden die Ergebnisse der Wirtschaftzweige für den Zeitraum vor 1996 an das geänderte Niveau angepasst.

Um nun zu konsistenten und mit der Primärstatistik weitgehend abgestimmten Zeitreihen zu gelangen, wurden sowohl bei der Ausgaben- als auch der Anlagevermögensrechnung für Umweltschutz die Investitionen für integrierte Umweltschutzleistungen vor 1996 nicht mehr berücksichtigt (die Primärstatistik wies diesen für die Jahre 1975 bis 1995 einen Anteil an den umweltbezogenen Gesamtinvestitionen des Produzierenden Gewerbes von durchschnittlich rund 17% zu). Da ab 1996 zudem die Umweltschutzinvestitionen für das Baugewerbe nicht mehr abgefragt werden, wird das Produzierende Gewerbe für die weiter zurückliegenden Jahre hier gleichsam ohne das Baugewerbe nachgewiesen.

Nicht enthalten sind in den Tabellen aufgrund einer noch unzureichenden Datenbasis die Umweltschutzausgaben der Landwirtschaft und von Teilen des Dienstleistungsbereichs. Bei letzterem sind lediglich die privatisierten öffentlichen Entsorgungsunternehmen berücksichtigt. Zur vollständigen Abbildung des hier quantitativ bedeutsamen Entsorgungsbereiches fehlen vor allem noch die rein privaten Abfall- und Abwasserentsorgungsunternehmen. Amtliche Daten über Ausgaben für spezifische umweltrelevante Aktivitäten der privaten Haushalte, wie z.B. Dämmschutzmaßnahmen, Solaranlagen liegen nicht vor. Auch können weitere umweltrelevante Ausgabenfelder wie Naturschutz und Bodensanierung noch nicht adäquat berücksichtigt werden.

Umweltbezogene Steuern

Basierend auf einem auf internationaler Ebene erarbeiteten Konzept einer Statistik über umweltbezogene Steuern orientiert sich die Definition von Umweltsteuern an der **Besteuerungsgrundlage** - unabhängig von der Motivation zur Einführung der Steuer oder von der Verwendung der Einnahmen. Maßgeblich ist danach, dass die Steuer sich auf eine physische Einheit (oder einen Ersatz dafür) bezieht, die nachweislich spezifische negative Auswirkungen auf die Umwelt hat. **Konkret** sind darunter Emissionen im weitesten Sinne (Luftemissionen, Abwasser, Abfall, Lärm), Energieerzeugnisse, der Verkehr oder Dünge- und Pflanzenschutzmittel zu verstehen. Für Deutschland sind somit bei den Steuern die Mineralölsteuer und die Stromsteuer (Besteuerungsgrundlage Energieerzeugnis) sowie die Kraftfahrzeugsteuer (emissionsbezogene bzw. bis 1.7.1997 verkehrsbezogene Besteuerungsgrundlage) quantitativ am bedeutsamsten.
Die hier präsentierten Ergebnisse beziehen sich ausschließlich auf diese Steuern. Die Mehrwertsteuer auf Kraftfahrzeuge, Mineralöl oder Strom ist nicht einbezogen.

Ökosteuer

Die sog. **Ökosteuer,** die zum 1. April 1999 mit dem Gesetz zum Einstieg in die ökologische Steuerreform in Kraft trat, erweiterte die Energiebesteuerung indem die Mineralölsteuersätze erhöht und eine Stromsteuer eingeführt wurde. Im einzelnen wurde zum 1.4. 99 die Mineralölsteuer auf Kraftstoffe um 6 Pfennig je Liter, auf leichtes Heizöl um 4 Pfennig je Liter und auf Gas um 0,32 Pfennig je Kilowattstunde erhöht sowie eine Stromsteuer von 2 Pfennig je Kilowattstunde eingeführt. Für einige Bereiche wurden dabei ermäßigte Steuersätze bzw. Steuerbefreiungen festgelegt. Als Beispiele seien stichwortartig genannt: ermäßigte Steuersätze für Landwirtschaft, Produzierendes Gewerbe sowie für Schienenbahnverkehr und öffentlichen Personennahverkehr; Steuerbefreiung für Kraft-Wärme-Kopplung, Freistellung von Strom aus erneuerbaren Energiequellen von der Stromsteuer. Mit dem Gesetz zur Fortführung der ökologischen Steuerreform wurden weitere Steuererhöhungen für Kraftstoffe und Strom für die Jahre 2000 bis 2003 festgelegt, die aber in den hier vorgestellten Ergebnissen noch nicht zum tragen kommen.

Personenkilometer

Personenkilometer ergeben sich durch die Multiplikation der Zahl der beförderten Personen mit der Zahl der zurückgelegten Kilometer.

Statistisches Bundesamt
Umweltökonomische Gesamtrechnungen 2000

Weitere Informationen

zu den Umweltökonomischen Gesamtrechnungen 2000

Umweltökonomische Gesamtrechnungen (UGR)

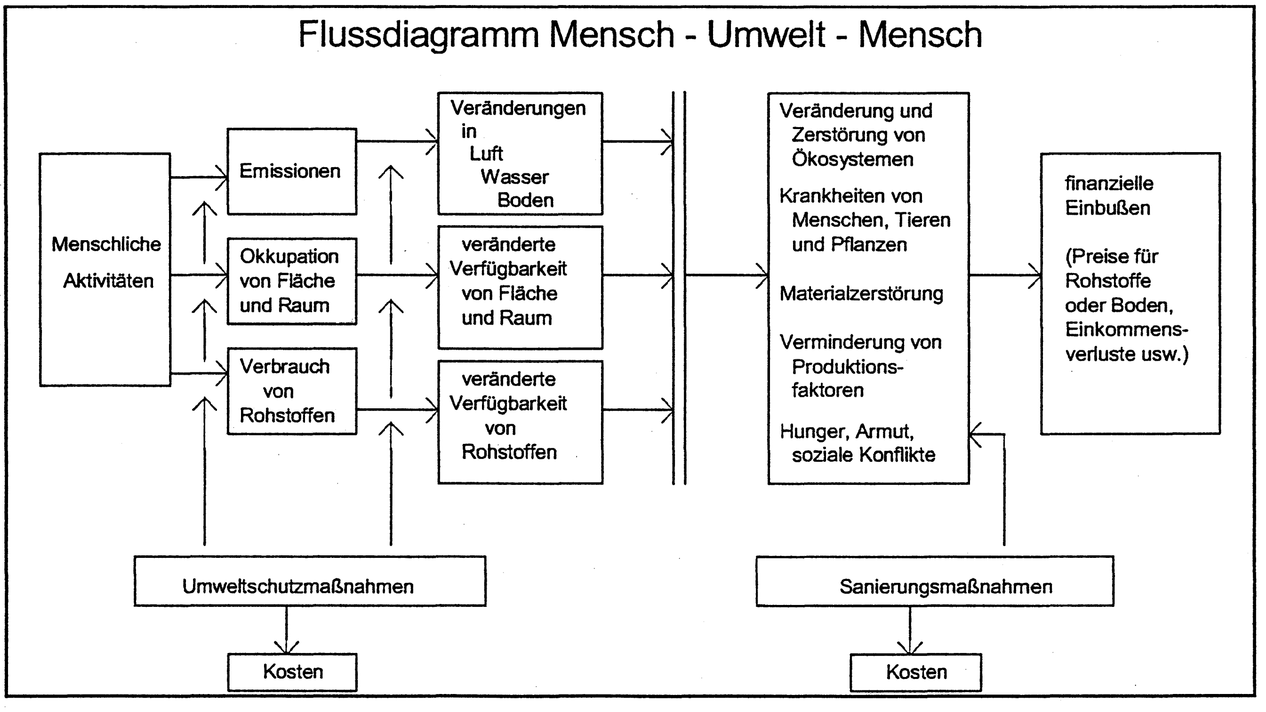
Kurzinformation über Methode, aktuellen Arbeitsstand und erzielte Ergebnisse

Zielsetzung der UGR

Die Natur stellt für wirtschaftliche Nutzungen vielfältige Leistungen zur Verfügung. Sie liefert Energie und Rohstoffe, stellt den Wirtschaftsstandort bereit und dient als Aufnahmebecken für Schadstoffe, Abfälle usw. Ihr Leistungspotential ist jedoch nicht unendlich, sondern wird durch Inanspruchnahme vermindert, schlimmstenfalls sogar zerstört. Dass Natur ein Produktionsfaktor ist, dessen Knappheit in einer wirtschaftlichen Bilanz zu berücksichtigen ist, wird allerdings seit einigen Jahren mit dringender werdenden globalen Umweltproblemen deutlich.

Die statistische Erfassung von Veränderungen im "Naturvermögen", ausgelöst durch wirtschaftliche Tätigkeiten, ist Ziel der UGR. Analog zu den Volkswirtschaftlichen Gesamtrechnungen, wo für produzierte Vermögensgegenstände Abschreibungen kalkuliert werden, um Wertminderungen zu erfassen, sollen in den UGR die Basisdaten für die Berechnung der Abschreibungen auf das Naturvermögen ermittelt werden. Nachhaltige Entwicklung (sustainable development) dient dabei als generelles Leitbild. Im einzelnen bedeutet dies - in erster Näherung - eine Verbesserung der Material-, Energie- und Flächeneffizienz ökonomischer Aktivitäten, letztlich fordert Nachhaltigkeit aber den langfristigen Erhalt von Funktionen (Potentialen) der Natur. Die UGR soll statistisch zeigen, welche natürlichen Ressourcen durch die wirtschaftlichen Aktivitäten (Produktion/Konsum) einer Periode beansprucht, verbraucht, entwertet oder zerstört werden; Ausgangspunkt ist der in der Wirtschaftsstatistik abgebildete Prozess ökonomischer Wertschöpfung. Dabei sind grundsätzlich nur Trends, Mittelwerte, Verteilungen u.ä. Makroindikatoren von Interesse; Einzelfälle - seien es Stoffe, Standorte und Regionen, Unternehmen oder Störfälle - werden zu statistischen Massen aggregiert.

Inhaltliche Struktur



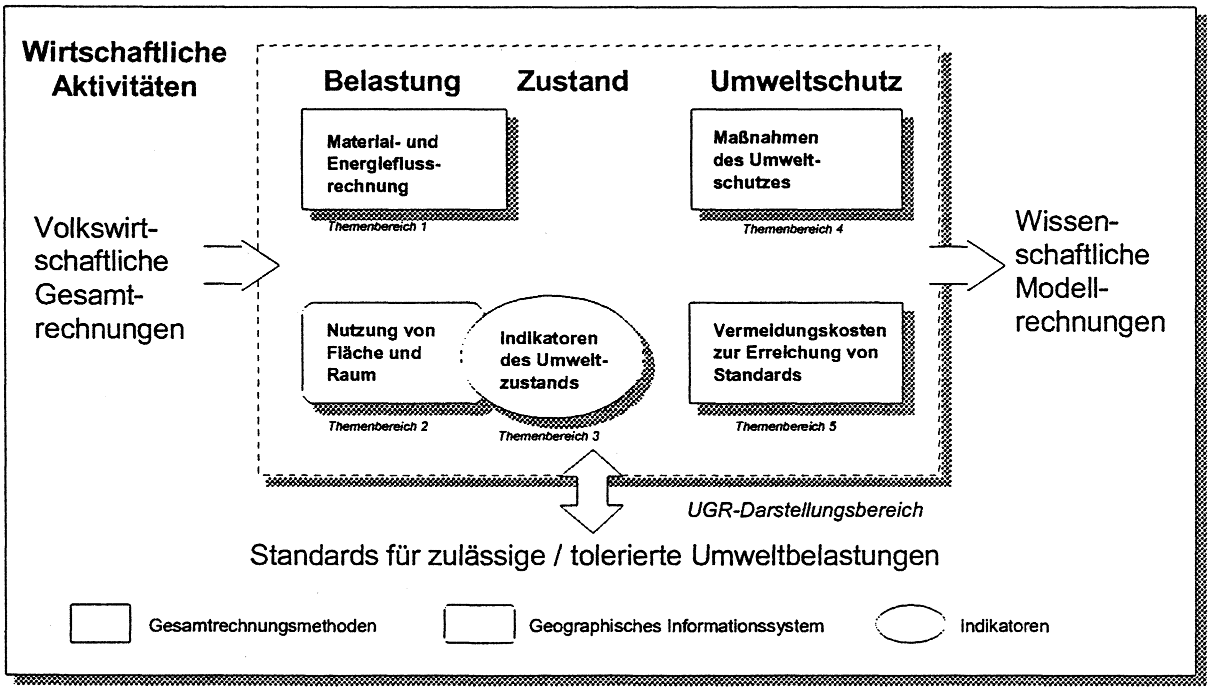
Entstehung der Umweltbelastung, Umweltzustand und Umweltschutzmaßnahmen sind die Kategorien, für die statistische Daten bereitzustellen sind. Bei den Belastungen sind weiter Stoffströme und Flächennutzungen, beim Umweltschutz präventive und nachsorgende Maßnahmen zu unterscheiden. Im obigen „Flussdiagramm Mensch-Umwelt-Mensch" wird diese inhaltliche Struktur skizziert.

Methodisches Konzept

Die Kalkulationsschritte hin zu Abschreibungen auf das Naturvermögen sind mit vielfältigen methodischen Problemen (Bewertungs-/Aggregationsprobleme, beschränktes Wissen über Ursache-Wirkungs-Zusammenhänge und große regionale Unterschiede) verbunden. Es ist deshalb deutlich davor zu warnen, die Erwartungen in eine solche Kalkulation zu überziehen. Dass sich daraus zweifelsfrei und objektiv eine einzige Abschreibungsgröße in DM ergibt, aus der sich ein gesundes, nachhaltiges Wachsen des volkswirtschaftlichen Einkommens ableiten ließe, gehört sicher zu den trügerischen Hoffnungen. Das „Ökosozialprodukt", als eine Zahl der amtlichen Statistik, wird es nicht geben. Vielmehr zeichnet sich ein Weg ab, wie mit Hilfe gesamtwirtschaftlicher Modellrechnungen von Forschungsinstitutionen Entwicklungspfade in Richtung „Nachhaltige Wirtschaft" skizziert werden können. Das Statistische Bundesamt wird hier in Kooperation mit den Forschungsinstituten Basisdaten für derartige multi-sektorale Modellrechnungen bereitstellen.

Das Konzept der UGR ist so aufgebaut, dass bereits Zwischenschritte Antworten auf wirtschafts- und umweltpolitische Fragen geben. Wie sich der Einsatz von Rohstoffen, Energie und Bodenflächen in den Sektoren der Wirtschaft zeitlich verändert und welche Stoffe an die Umwelt abgegeben werden, ist für die Beurteilung der Effizienz im Umgang mit natürlichen Ressourcen im Rahmen von Struktur- und Umweltpolitik von Wichtigkeit. Hochaggregierte Indikatoren über den Umweltzustand sollen die qualitativen Veränderungen in einer standardisierten Form zeigen. Die Kostenseite und die aktuelle Belastung der Wirtschaft wird für die tatsächlich durchgeführten Umweltschutzmaßnahmen festgehalten. Die Schätzung von Vermeidungskosten für zusätzliche präventive Maßnahmen runden das Bild ab und unterstützen die Abwägung und Entscheidung zwischen unterschiedlichen "Standards" (Zielgrößen im Sinne von physischen Reduktionszielen) für die einzelnen gravierenden Belastungsfaktoren. Zusammengefasst ergibt sich folgendes Bild für das UGR-Konzept:

Umweltökonomische Gesamtrechnungen UGR



Die UGR sind dabei in die abgebildeten 5 Themenbereiche gegliedert:

1. Material- und Energieflussrechnungen, Rohstoffverbrauch, Emittentenstruktur,
2. Nutzung von Fläche und Raum,
3. Umweltzustand,
4. Maßnahmen des Umweltschutzes, Investitionen, Ausgaben,
5. Vermeidungskosten zur Erreichung von Standards.

Die verschiedenen Themenbereiche sind jeweils durch eine ihnen eigene charakteristische Methode gekennzeichnet; der Plural im Namen UGR ist also kein Zufall, sondern Programm.
In den Themenbereichen 1 „Material- und Energieflussrechnungen", 4 „Maßnahmen des Umweltschutzes" und 5 „Vermeidungskosten" werden Wirtschaftsstatistiken und Gesamtrechnungsmethoden angewandt, um die von den Wirtschaftssektoren verursachten Stoffströme sowie die getroffenen bzw. denkbaren Umweltschutzmaßnahmen zu bilanzieren. Themenbereich 2 „Nutzung von Fläche und Raum" befasst sich mit den Belastungen, die nicht stofflicher Art sind, sondern auf einer geänderten Nutzungsverteilung des Raumes beruhen; methodische Instrumente sind Fernerkundung und Geoinformationssysteme. Im Themenbereich 3 „Indikatoren des Umweltzustandes" besteht die Aufgabe im wesentlichen darin, die räumlich und inhaltlich isolierten Mess- und Beobachtungsdaten zu geeigneten Indikatoren zu verdichten. Eine „ökologische Flächenstichprobe" dient in diesem Zusammenhang dazu, Veränderungen in der Diversität von Landschaften, Pflanzen und Tieren auf wirtschaftliche Weise zu sammeln.
Der UGR-Gesamtdarstellungsbereich umfasst nicht das Setzen von umweltpolitischen Zielgrößen. Die UGR stellen jedoch für den politischen Entscheidungsprozeß Sachdaten über Kosten und Nutzen alternativer Standardwerte im Sinne von physischen Reduktionszielen zur Verfügung.

Beziehung zu den Volkswirtschaftlichen Gesamtrechnungen

Die Diskussion über eine umweltbezogene Erweiterung der Volkswirtschaftlichen Gesamtrechnungen hat ergeben, dass es am sinnvollsten erscheint, die traditionellen Sozialproduktsberechnungen als wichtiges Hilfsmittel für die kurz- und mittelfristige Wirtschaftsbeobachtung wie bisher fortzusetzen und dazu ergänzend ein Rechenwerk für die Darstellung der ökonomisch-ökologischen Zusammenhänge in einem eigenständigen Datenwerk, einem sogenannten Satellitensystem, aufzubauen. Letzteres sollte allerdings eng mit den Volkswirtschaftlichen Gesamtrechnungen verknüpft werden. Für diesen Weg sprechen die noch vorhandenen methodischen und statistischen Defizite bei der Bewertung der Umweltbelastungen durch die Wirtschaft. Die Beschränkung auf ergänzende Satellitensysteme bedeutet, dass die Möglichkeit geschaffen wird, neue Konzepte auszuprobieren und auch Daten zu verwenden, die statistisch noch nicht völlig abgesichert sind. Die für die Sozialproduktsberechnung im engeren Sinne nötige Datenqualität würde dadurch nicht beeinträchtigt werden. Internationale Konzepte für ein Umwelt-Satellitensystem wurden insbesondere von den Vereinten Nationen entwickelt. In einem Handbuch der Volkswirtschaftlichen Gesamtrechnungen wurde das "System for Integrated Environmental and Economic Accounting (SEEA)" vorgestellt. In Deutschland wird das Umwelt-Satellitensystem auf der Basis der konzeptionellen Vorschläge des SEEA im Rahmen der Umweltökonomischen Gesamtrechnungen realisiert.

Sektorale Modellrechnungen

Die Aufgabe, gesamtwirtschaftliche Kostengrößen zur Bewertung der Abschreibungen auf das Naturvermögen zu ermitteln, liegt - wie dargelegt - außerhalb des Darstellungsbereiches der UGR. Die Ergebnisse der Themenbereiche „Umweltschutzmaßnahmen" und „Vermeidungskosten" liefern aber wichtige Komponenten des Grunddatengerüstes für dynamische, sektorale Modellrechnungen. Diese zielen in Richtung gesamtwirtschaftlicher Vermeidungskosten als Näherungsgröße für die periodengerechte, monetäre Bewertung der Umweltbelastung. Naturgemäß hängen die Ergebnisse sowohl von statischen als auch von dynamischen Modellrechnungen in starkem Maße von den zuvor getroffenen Annahmen ab. Derartige Modellrechnungen liegen außerhalb des Aufgabengebietes der amtlichen Statistik und sollten aus diesem Grund von externen wissenschaftlichen Institutionen durchgeführt werden.

Wissenschaftliche Begleitung

Der Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit hat einen Beirat zur Umweltökonomischen Gesamtrechnung eingerichtet, der die Aufgabe hat, ihn in allen Fragen wissenschaftlich zu beraten, die mit den UGR in Zusammenhang stehen. Der Beirat hat in seinen Stellungnahmen 1991 und 1995 die Auffassung vertreten, dass die UGR unerlässlich sind für eine am Ziel der Nachhaltigkeit ausgerichtete Umweltpolitik. Darüber hinaus werden regelmäßig Fragen der näheren Ausgestaltung und methodischen Grundlagen des UGR-Konzepts erörtert. Diese stehen auch im Mittelpunkt der Dritten Stellungnahme des Beirats, die im Juli 1998 dem Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit übergeben wurde. Seit 1994 ist dem Beirat ein Begleitkreis zugeordnet, in dem gesellschaftliche Gruppen (vor allem Wirtschafts- und Umweltverbände sowie Gewerkschaften) vertreten sind. Damit sollen die Arbeiten zu den UGR auf eine breite gesellschaftliche Basis gestellt werden.

Aktueller Arbeitsstand und Ergebnisse

Die UGR-Themenbereiche bieten den Rahmen für den weiteren empirischen Aufbau und die konzeptionelle Vertiefung. In jedem Gebiet wurden bzw. werden Forschungsprojekte und Feldstudien durchgeführt, die z.T. von externen Sachverständigen unterstützt werden. Empirische Daten über die belastungserzeugenden Wirtschaftsaktivitäten, über detaillierte Material- und Energieflussrechnungen sowie über Emissionen der Wirtschaftsbereiche, über Umweltschutzausgaben und die Bodenbedeckung liegen vor und werden im Rahmen der Fachserie 19 „Umwelt" des Statistischen Bundesamtes kontinuierlich veröffentlicht. Die Eckdaten der UGR und wesentlichen umweltökonomischen Trends der Bundesrepublik Deutschland werden jährlich im Rahmen einer UGR-Pressekonferenz der Öffentlichkeit vorgestellt. Die Datenbasis wird laufend erweitert, um somit Schritt für Schritt Antworten auf wirtschafts- und umweltpolitische Fragen zur Umsetzung des Leitbildes „Nachhaltige Entwicklung" geben zu können.

Ausgewählte Veröffentlichungen zu den Umweltökonomischen Gesamtrechnungen des Statistischen Bundesamtes

Grundlegende Beiträge

Beirat „Umweltökonomische Gesamtrechnung“ beim Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit: Umweltökonomische Gesamtrechnung - Zweite Stellungnahme zu den Umsetzungskonzepten des Statistischen Bundesamtes, in: Zeitschrift für angewandte Umweltforschung, H. 4/1995, S. 455 ff.

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4.5 Land and Ecosystems Accounts (LEA)

1 Role of land and ecosystems accounting

In **national accounts** land is treated as a non-produced economic asset that provides economic benefits to its owner and as an important part of balance sheets. The existence of balance sheets encourages analysts to look more broadly in monitoring and assessing economic and financial conditions and behaviour (SNA 13.4).

In **environmental accounting** this economic view of land is only part of the picture. Economic use of land is often connected with short- or long-term processes of deterioration (or improvement), e.g. the opening of uncultivated land (such as virgin forests or wetlands) for recreational or agricultural purposes may upset ecological balances, the use of areas for traffic or human settlement has radically changed the characteristics of land and ecosystems or agricultural use could cause soil erosion. On the other hand, the introduction of less intensive management practices (e.g. organic farming) or restoration activities may lead to improvements. The objective of a better understanding of the relationship between economic activities and the environment requires to take into account (1.) the use of land by different economic activities and (2.) the potentials of land from an ecological view. The latter relates e.g. to the extent and quality of habitats and ecosystems or the characteristics of the soil. In this context land is treated as environmental asset.

Land and ecosystems as environmental assets are the most suited categories of assets for the **integration of ecological and**, in particular, **regional aspects** in environmental accounting. The ecological debate on natural assets also hinges on this point. The science of ecology is inclined to see natural assets as the stock of functioning ecosystems and not merely as a list of single elements of the environment. Nature can only be protected if complete ecosystems are maintained intact. Thus from an economic and ecological point of view the value of assets that deliver services to human systems (indirect use benefits) in the long term depends heavily on intact ecosystems and not on individual species or elements (1993 SEEA 35). However, it is often difficult even to find suitable indicators in physical terms to describe some of these aspects. The disposal services of the environment are an important example in this regard. On the one hand, it is relatively easy to record the quantities of residuals that are emitted into the natural environment; on the other hand, it is much more difficult to describe the effects of ambient concentrations that result in a contamination of biota and soil and the final effect on health of biota, ecosystems and human beings (1993 SEEA 41 and 42).

A comprehensive set of land and ecosystems accounting tables allows the **linking** of **the economic and** the **environmental dimension** and permits to derive aggregated sustainability indicators. These indicators provide the background framework for area-related policies (e.g. nature protection, agricultural and transport policy). However, there are different opinions as to which extent the environmental dimension should be covered either by environmental accounting or in separate natural science information systems. Often a decision has to be taken on a national level in the light of national priorities and the importance given to an integrated view of economic and ecological aspects in the context of sustainable development policies or in physical planning.

In general the integration of a more comprehensive land and ecosystems accounting module in the SEEA can be **useful for several reasons**:

- It provides a complete picture of land cover and land use for a nation and allows to derive trends and indicators of change.
- It aids the integration of diverse data sources on land cover and land use as well as other data e.g.on population, economic activity, water balances, species or fertilizer use.
- It promotes standardisation and classifications of land cover, land use and causes of changes in land cover and land use.
- It allows to link changes in land use, land cover, habitats and biodiversity as far as possible to the driving forces.
- It can be applied at national, regional watershed or landscape type level (Eurostat 1999).

In the following section general features of accounting for all land and ecosystem categories are described. More details on integrated descriptions of selected land and ecosystem types can be found e.g. in the sections on forest, fishery and water accounts (see sections 4.2, 4.3 and 4.4).

2 State of development of land and ecosystems accounting

The concepts for the economic description of **land as an economic asset** are well developed in the SNA and practical experience exists on the implementation of these concepts on the basis of land statistics. Land statistics in general have a long tradition in the statistical system. Nevertheless they are caracterised by compromises to satisfy the needs of many diverse users and corresponding differences in definitions, classifications and methods between countries.

The economic treatment of **land in the SNA** is rather simple from a conceptual point of view: Land as a non-produced asset is defined as the ground itself, including the soil covering and the associated surface water, over which ownership rights can be exercised and which can, therefore, be the subject of transactions between institutional units (see SNA 10.121 and chapter 2.1 Environmental assets in the 1993 SNA). In the SNA only economic land that is owned and has the potential to provide economic benefits to its owner is considered. An aggregated classification with four types of land is included in the asset classification: land underlying buildings and structures; land under cultivation; recreational land and associated surface water; other land and associated surface water (see chapter 2.1 Environmental assets in the 1993 SNA).

The treatment of land and ecosystems as environmental assets in environmental accounting leads to a high variety of rather different **user needs** (e.g. subject of interest in terms of functions of land or different political levels) with the consequence that standardisation can only succeed within rather narrow limits.

The extensive use of accounting methods in this field and the **development of land and ecosystems accounts** that adequately deal with the complexity of land and ecosystems as environmental assets is a rather new development and closely linked to the appearance of geo-referenced land use or land cover data.[1] The current situation is characterised by various aspects: On the one hand, a general consensus on the need and the basic structure of a comprehensive approach of land and ecosystems accounting emerges in and between many countries. On the other hand, conflicts concerning the use of land and ecosystems are often characterised by specific regional or national interests or circumstances. This results in a high heterogenity of observation methods and reporting formats because current land accounting activities are not only dominated by global but by national or regional objectives and by the data available at these different levels.

[1] A major input has been the work done by the Conference of European Statisticians of the United Nations from 1992 to 1994 and the following discussions in meetings of the International Association in Income and Wealth and of the London Group.

In addition it proved to be very important to take the **natural conditions** into account in order to derive policy relevant trends. Environmental impacts resulting from the depositions or emissions of more or less harmful substances (such as nutrients, toxics and other pollutants) may be different according to local environmental conditions. This is true, as well, for other pressures resulting from natural ressource use, either through withdrawel and operation or by in situ use including land use (Parker et al. 1996). Policy interest in land and ecosystems accounting is therefore not restricted to general tables with a high level of aggregation, but often focuses on issue-oriented accounts (e.g. biodiversity, quality of land and habitats) or regionalised accounts (e.g. catchment areas, coastel zones), which require more detail.

The consequence of this situation is a **lack of internationally agreed classifications** and a **high diversity** of data collection methods with different observation units and scales. First attempts to develop internationally comparable reporting systems can be noted in Europe and at world level. However, a common set of accounting tables has still to be developed and then to be tested in different countries. As a consequence a land and ecosystems accounting module must be characterised by a compromise between standardisation and flexibility. It seems to be extremely difficult (or impossible) to develop a single standard land classification that serves all the different purposes in a meaningful way.

The implementation of land accounting modules is only promising if political interest and a rather well-developed system of basic statistics on land are available. In many countries basic statistics on land are less developed and sometimes even nationwide data on the main types of land are only partially available (e.g only for agricultural types of land). Therefore, **further progress** in the field of land and ecosystems accounting depends on the right mix of development of concepts, improvement of the data situation and a strong orientation towards practical implementation. The design of a framework and of a statistical programme for obtaining the primary data must go hand in hand. Finally, a co-operation between statisticians, economists, geographers and biologists seems to be essential in the development and implementation of land and ecosystems accounting.

3 Observation units and classifications

In the field of land and ecosystems accounting a special feature seems to be the extremely close **link** between the **objectives** of the studies, the determination of the observation or **accounting units** and the **scale** and the **classifications** used.

3.1 Land cover and land use

A **basic distinction** in land and ecosystems accounting is that between **land cover** and **land use**. Land cover reflects the (bio)physical dimension of the earth‘s surface and corresponds in some regard to the notion of ecosystems (see 3.2). Land use is based on the functional dimension of land for different human purposes or economic activities. Typical examples for land cover categories are built-up areas, grassland, forests or rivers and lakes. In the case of land use types like dwellings, industrial use, transport, recreational use or nature protection areas are characteristic examples. A given surface can be a „forest“ from the land cover point of view, from the land use perspective it may belong to timber production, recreational areas, nature protection areas or to areas of no use. Land use in terms of human activities may result in changes in biophysical land cover (e.g. deforestation, building a road, urbanisation) or in changes of the conditions of the natural or modified biotopes (e.g. due to use of fertilizers or pesticides or to leaving land fallow, due to intensity of traffic on a road, due to the density of population in a town). In principle land use can be better linked to economic activities. The land cover results from both the use of land by activities and the natural processes, whether modified by human activities or not (see Conference of European Statisticans 1995).

Land cover is normally observed by satellite observation, aerial photographs and ground surveys. **Information** on land use is gathered by cadastral surveys, surveys of economic units, aerial photography or ground surveys.

Sometimes the land **cover** at a large scale is considered **as a proxy for the use**. Actually, land use is an issue much more complex than land cover because of the different functions a single land cover unit can fulfil. Often there are parallel or multiple land uses, in particular with regard to recreation /tourism and to use restrictions due to protection status of land. A forest, for example, has functions as a producer of timber, a regulator of climate and water regimes, an absorbing medium for carbon dioxide, a retainer of soil, a habitat for wildlife and a provider of recreational functions. The use of one function of the natural environment can impair its capacity to serve others. These trade-offs among functions of natural assets are one of the focuses of the ecological-economic interrelationhips that are studied in environmental accounting (1993 SEEA 39). When a primary or dominant use is hard to determine, multiple allocation or a separate recording of multi use could be considered (Eurostat Task Force 1999).

The distinction of land use and land cover is basic from an analytical point of view. Statistical work is, however, often caracterised by more or less **mixed classifications** of land use and land cover (see 3.3). Often built-up areas are more land use oriented parts of the classification whereas the disaggregation of more natural categories - like forest and woodland, wetland or semi-arid and arid land – reflects more land cover aspects. Sometimes the whole mixed classification is more use or more cover oriented.

3.2 Observation units

Land use and land cover data are produced for different observation units. In the **SNA** the delimitation of basic units of land is not explicitly discussed. The concepts demand to take the type of land use and the ownership as important elements of the delimitation into account. Both aspects are in general documented in land registers based on **legal units** or can be surveyed by questionnaires to economic units.

In **environmental accounting, additional types of land units** are used. On the one hand the use of land can be studied independently from the ownership (legal) aspect. This can be done as well on the basis of land registers as by aerial photographs or field surveys. On the other hand more land cover or ecosystems oriented presentations sometimes use similar sources of data, but are in the case of land cover often based on georeferenced satellite data, too. In all basic information systems the scale of the study determines the delimitation and the homogeneity of the basic land units, defined as surface areas with certain cover characteristics. At a small or medium scale, the land cover units are largely composite and must be classified according to their main characteristics. They could be regarded as ecosystems on a higher hierarchical level. In large scale studies including fieldwork, rather homogenous land units – such as biotopes – are common. In principle there seems to be no difference to the discussions about different types of units in the economic sphere (from multinational firms to homogenous production units). In land accounting, however, no consensus is available on the „ideal“ type of unit and the fact that different objectives of analysis require different basic units is more or less recognised. From a theoretical and conceptional point of view, in land cover and ecosystems accounting some basic land unit types like biotopes, ecosystems or more heterogenous land cover units are emerging and shortly described in the following. In some cases land cover or land use aspects are combined with geometrical units (e.g. grids of 1 km^2) which are described by the dominant type of land use or cover.

Biotopes in the strict sense of the word are abiotic areas that can be geographically clearly defined and that feature a combination of specific abiotic, non-living factors (regarding climate, soil, light, temperature, water, nutrients, etc.) They therefore offer specific habitat conditions for organisms. Biotopes in the pragmatic sense in vegetation science incorporate both the spatial components and the vegetation within an area, i.e. parts of the biocoenosis. They are typically land cover units. Where there are no plants, the existing abiotic land cover (e.g. buildings, roads, landfills) is used for descriptive purposes. The notion of biotope is in this context not restricted to protected areas or areas of high ecological value. It covers the total land of a country.

In land accounting, more heterogenous **land cover units** are often used. They can be understood as aggregates of connected biotopes, where the dominating type of biotope determines the land cover class. In Europe, e.g. the project CORINE Land Cover is based on satellite data and on basic units with a mininmum size of 25 ha and a classification of 44 different land cover categories. Large areas with the same land cover class are in this context often described as ecozones or landscapes (e.g. agricultural ecozones or landscapes).

Ecosystems are inhabited spaces and cover both the abiotic biotopes and the biocoenoses for communities – in other words its organisms. Ecosystems are best seen as the systems of interactions between the abiotic habitat and the organisms (flora and fauna) in a spatial unit. They form a superior whole: the holistic system does not react in the same way as its individual components would. Ecosystems can be defined for different hierarchical levels. Examples of higher-ranking ecosystems are the sea, the forest, the meadow, etc. with all the organisms which live there and their interactions. Such systems consist of subsystems (e.g. pond, river, marshland, etc.). The notion of ecosystem is, however, not restricted to more natural parts of the land. In principle it covers all types of land including urban ecosystems. There is no classification that allows for the clearcut geographical separation of the theoretical notion of „ecosystems“ in the landscape. Depending on the species of fauna, different requirements and geographical demarcations must be applied. For a pragmatic differenciation of units of ecosystems on a low hierarchical level the biotopes in the sense of vegetation units are often used. On a higher hierarchical level the more heterogenous land cover units or ecozones (or even the biographic regions in the world) can be interpreted as ecosystems (Hoffmann-Kroll et. al. 1999). (Note: In the asset classification we have to decide on which hierarchical level we want to integrate an ecosystem classification. From my point of view, the level of land cover would be the adequate one in the SEEA. CORINE Land Cover or a FAO cover classification could be used as an orientation. However I would not go too much into detail.) As species are part of the ecosystems, they are included twice in the asset classification of the SEEA: as individual plants or animals in the biotic natural ressources and as parts of ecosystems.

3.3 Classifications

(Note: the chapter is still based on the Canberra-version of the asset classification)

In the SEEA classification of assets, land and ecosystems are included twice: as natural resource stock asset and as environmental system asset. Furtheron, soil is included as an additional natural resource stock asset.

Land as **natural resource stock asset** characterises the space used in human activities. It includes only land which provides a direct input into human activities. Five different types of land resources are distinguished: urban and built-upon land (2.3.2), land for transportation and other networks (2.3.3), agricultural land (2.3.4), land for intensive forestry (2.3.5) and recreational land (2.3.6). Other benefits of land than space are included in the environmental system asset part of the classification. Therefore, only part of the total area of a country is shown as natural resource stock asset.

In the asset classification of the SEEA (see chapter 2.3), ecological aspects of land, the aspect of land cover or the provision of services to humans are taken into consideration by the integration of environmental system assets. **Terrestrial and aquatic ecosystems** are seperate environmental asset categories. For illustrative purposes the terrestrial ecosystems are further subdivided into a few major types of biographic regions to be found on the planet. (Note: see note at the end of chapter 3.2 concerning the adequate hierarchical level.) More detailed classifications that could be used in environmental accounting on a national or a regional level have to be based on the definition of the corresponding observation units and the scale of observation (see chapter 3.2). At the moment, internationally agreed land cover classifications are available from FAO and for selected regions, e.g. the CORINE land cover classification for Europe. A complete and internationally agreed biotope or ecosystem classification is not available.

(Note: Still to be added is a comparison to SNA and SEEA 93 asset classification in the case of land, based on Robs general comparison of the asset classifications, and to the ECE land use classification.)

When land cover and biotopes aspects are included in a land and ecosystems accounting module, in the current situation this has to be done on the basis of these regional or national classifications. For classifications of the **regional dimension** of land use or cover, e.g. for ecozones as connected areas of the same land cover unit, or landscape type units the situation is more or less the same.[2] Landscape type units are land classes as spatial units which are characterised by rather homogenous natural conditions, e.g. regarding soil, climate, geology, hydrology or relief (see Haines-Young et.al. 1996 and Seibel et. al 1999). However, even if internationally standardised classifications existed, the parallel use of different classifications for land use (natural resource stock aspect) and land cover/biotope aspects would be necessary in land and ecosystems accounting.

For **land use** in general the more detailed ECE land use classification is the standard option for the time being and sometimes used in the context of environmental accounting (United Nations 1989). This classification is better suited to analyse types of land use with different environmental impacts than e.g. the land classification in the SNA. However, the ECE is rather old and not entirely satisfactory (e.g. need of further disaggregation for agriculture). Several international bodies are currently working towards an improved land use classification (see e.g. FAO 1999, Eurostat 1999).

4 Structure of the land and ecosystems accounts

4.1 Land in the SNA 93

Land as **natural resource stock asset** is inluded in the SNA 1993 as part of the balance sheets of institutional sectors and the total economy (Note: check with relation to SNA classification in chapter 3.3). It is part of the non-financial and non-produced assets. The economic benefits that are taken into account are restricted to income-related benefits and can be expressed in monetary units by multiplying physical stocks and the corresponding market values. However, physical data are not explicitly treated in the balance sheets.

In the SNA the presentation of the value of stocks of land at different points in time is fully integrated with the changes of these stocks in a given period by transactions or other flows (see table 1 in chapter 3 structure of the asset accounts, subchapter 3.2 SNA assets accounts). In the **capital account** aquisitions less disposals of land are included as purchases or sales of non-produced assets and not as gross fixed capital formation. However, major improvements in the quantity, quality or productivity of land or the prevention of land deterioration are recorded as gross

[2] These approaches are normally based on regular grids (e.g. 1x1km cells) or geographically homogenous zones (see Weber 1997).

fixed capital formation and consumption of fixed capital. Examples are e.g. the reclamation of land from the sea by the construction of dykes, sea walls or dams or the clearance of forests to enable land to be used in production for the first time (for more details, see SNA 1993 10.51-10.54 and 10.121-10.125).

Changes in value of land that result from **other flows** are recorded in the other changes in the volumes of asset accounts (in the case of volume changes of land) or in the revaluation account (in the case of changes in level or structure of prices). Concerning land the following flows are relevant:

- Transfers to economic assets, e.g. if land is transferred from a wild or waste state to one in which ownership may be established and entering the system boundary (SNA 12.18);
- Changes in quality due to (changes in) economic use are regarded as the appearance or disappearance of additional amounts of assets, e.g. change from cultivated land to land underlying buildings or change from cultivated land to communal grazing land result in an increase or decrease in the value of land (SNA 12.20 and 12.32);
- Changes in quality as a result of environmental degradation, e.g. erosion, nutrient loss (SNA 12.33);
- Changes in status, changes due to political and catastrophic events, e.g. due to abnormal flooding or earthquakes (SNA 12.37);
- Changes in classification, e.g. changes in land use for a particular parcel of land. Not included is change in value resulting from the change in classification (SNA 12.62);
- Holding gains between the beginning and the end of a period that are the result of price changes of land over time and that are recorded in the revaluation accounts (SNA 12.63ff.).

In the SNA land is valued at its current price paid by a new owner including written-down costs of ownership transfer. The value of land includes major improvements that can not be physically separated from the land itself. The **valuation** at market prices is particularly difficult in the case of land, because often real transactions and market prices include buildings, structures, plantations or biological resources (e.g. vineyards) linked to a parcel of land. The separation of the value of land from the value of these other assets is often difficult and can – in the case of a single transaction – even be evaluated in a different way by the purchaser and the seller. Because land prices can vary enormously according to locations and the uses for which a piece of land is suitable or sanctioned calculations should be done on a rather detailed level. Often a clear restriction in this regard is the low number of transactions with land compared to the total of the stock especially if the structure of the transactions and the stocks is quite different, e.g. in the case of transactions at the borders of agglomerations and considerable parts of the stocks in the centers with high price differences (for more detail see SNA 12.53 – 12.58). If the use of asset prices from transactions for the valuation of land is impossible or restricted, an attempt can be made to determine the value of land via other indicators such as rents or revenue (see chapter 3 structure of the asset accounts, subchapter 3.3 valuation of natural resource stock assets).

4.2 Physical accounts

4.2.1 Overview

Market price valuations are entirely useful and relevant when it comes to an economic assessment of nature as a fixed asset. However, they are not suitable for representing ecological aspects as market prices are based on human use and exploitation potential and do not reflect the ecological significance of an area. Areas of high ecological value that are, for example, protected or use-restricted have considerably lower market prices than unprotected agricultural land or city centers heavily used for economic purposes. Additionally from the point of view of balance sheets different types of land use have to be distinguished if their prices are significantly different. In the context of environmental accounting the classification of types of use or of cover is more determined by the environmental relevance or impacts of the types of land than by price aspects.[3] This normally requires a more detailed classification and level of calculation. As a consequence of these demands **priority is often given to physical accounts,** measuring land in units of surface area (hectare or km^2) or in some cases in length units or number of units (zones, biotopes etc).

In the following are presented as **core accounts** of the land use and ecosystems accounting module important types of accounts that all nations could compile in a similar and as far as possible standardised way (see 4.2.1). From an environmental policy point of view informations from core accounts are necessary but often resp. normally not satisfactory in formulating and monitoring environmental policy. To be politically useful these informations have to be supplemented by further, more issue-oriented results that take into account national and regional situations as well as the different availability of basic data. Due to their issue-oriented character, **supplementary accounts** (see 4.2.2) cannot be standardised as much as the core accounts but are consistently linked to them. In the case of ecosystems accounting e.g., the land cover aspect is included in the core accounts, biotope accounting in the supplementary accounts. Because supplementary accounts are often indispensable for the users they form an important part of the land and ecosystems accounting module. The distinction of core and supplementary accounts characterises a compromise of standardisation and flexibility that does not need to be stable in the future.

4.2.2 Core accounts

A **precondition** for a politically useful and scientifically sound land and ecosystems accounting module is a good **data base** with georeferenced land use and land cover data. If only non-georeferenced data, e.g. data from one source with a mixed classification of land cover and land use categories or even only part of it, is available only the land cover resp. land use stocks at different points of time and the net changes for each category of the classification between the opening and the closing stock can be deducted. In this situation the following accounts can be implemented only to a very limited extent. Especially the identification of types of changes – in the physical accounts similar to the identification of different types of other volume changes in the SNA (see table in the annex 1 to chapter 3 structure of the asset accounts) – is not feasible in a satisfying way (see below). For this reason a full integration of land in the structure of the asset accounts can only be reached by using georeferenced data.

In the land and ecosystems accounting module core accounts establish the interface between the treatment of land as an economic asset in the SNA, the description of land use and land cover from an environmental perspective and more issue-oriented aspects like the quality of ecosystems. They provide a basic reference in terms of structure of land use and land cover. The different **aspects** treated in this context are shown by figure 1:

FIGURE 1: Structure of the core set of land cover/land use accounts
(see Conference of European Statisticans 1995, p. 6)
(Note: Figure 1 is not yet available as file but promised)

- On the stock side the relation between land use and land cover as well as land use by economic activities are selected.

[3] Another aspect is that in balance sheets for some types of analysis land can be valued together with other assets like buildings if a separation of the values is not possible. The composite asset should be classified in the category with the greater part of its value. In environmental accounting separate figures are needed (see SNA 13.57 – 13.58).

- The accounting of changes concentrate on the change of land cover resp. land use in terms of gross flows between two points in time and on an analysis of different types of changes that is similar to the analysis of the other volume changes in the SNA.

The tables used for these aspects are presented in the following in a simple form. The classifications used correspond to the relevant parts of the asset classification of the SEEA in chapter 2.3. (Note: The text is based on the Canberra version. I have additionally subdivided other terrestrial ecosystems into agricultural ecosystems and urban ecosystems. Without these differentiation land accounting looses much of its potential.) To be politically meaningful and scientifically sound they have to be adapted to the situation in a country or to the concrete objectives of the analysis. The realisation of this structure demands a big effort. Often significant changes in land cover and land use are occuring only in longer time scales. For these reasons the different tables of land accounting are normally characterised by a **periodicity** of 4 or more years whereas separated land use data for the description of land as an economic asset can be available and analysed on a yearly basis. As a consequence in land accounting the notions of initial and final year are sometimes more suited than opening and closing stocks. The land accounting tables allow a much better understanding of the basic developments over time.

The presentation of a **land use/land cover-matrix** for one year is from an asset accounting point of view restricted to the opening resp. closing stocks. Table 1 shows the land use/land cover-matrix on the basis of the classification of land as an economic asset (land use) and the ecosystem part (cover) of the SEEA asset classification. This table is an ideal starting point for more in depth considerations and analysis. Both apects of land, land use and the relation to economy as well as land cover and the relation to nature, are integrated. The illustrative example for France on the basis of national classifications (see table 1 in the annex) (Note: illustrative table for France is not yet available as file but promised.) shows, that for some categories of land cover, e.g. arable land and permant crops, the link of the cover to one use category (primary production) is quite evident. For others, e.g. slightly artificialised areas, the table indicates the importance of different types of use or the part of the area that is not used at all. The compilation of this table assumes georeferenced basic data on land use and land cover either on the total area of a country or on the same area sample. As only few countries can fulfil this demand and because the production of separate land use and land cover data from only one source is only feasible to a limited extent most countries will only be able to fill in the total column and the total row sometimes supplemented by some cases inside the matrix. If data are only available for one mixed classification of land use and land cover, the land use/land cover-matrix will be in practice a diagonal matrix and of no additional information value compared to the results of basic statistics.

The second important element on the stock side of the core accounts deepens the presentation of the relation to the economy **by linking land use to economic activities** (see table 2). In this context land is regarded as a production factor and not as much as part of balance sheets. As a consequence the SNA treatment of land as part of balance sheets of institutional sectors is supplemented and enlarged in several points: the land use by economic activities matrix is targeted to industries and private households (not only to institutional sectors) and the presentation is normally based on the actual use of land (not on ownership) in the production and consumption processes.[4] It is, however, restricted to physical data (surface area). The illustrative table 2 in the annex gives an example for such a type of analysis for Germany. In this case the table is produced for selected land use

[4] In principle different options exist for the allocation of land to industries and households: One could make a close reference to national accounts classifications and categories (e.g. based on ownership for transport infrastructures or recreational areas) or proceed more use-oriented by allocating areas for selected public goods (e.g. roads, parks) to the units that actually use these areas. Furtheron, indirect land use linked to land used by industries producing intermediate goods can be included in the analysis.

Table 1: Land use/land cover-matrix

3.1 Land cover[2]		2.3 Land use[1] 2.3.2 Urban and built-upon land	2.3.3 Transportation and other network	2.3.4 Agricultural land	2.3.5 Land for intensive forestry	2.3.6 Recreational land	2.3.7 Other land
3.1 Terrestrial ecosystems	3.1.1 Forests						
	3.1.2 Wetlands						
	3.1.3 Montane regions						
	3.1.4 Prairies						
	3.1.5 Tundra						
	3.1.6 Other terrestrial ecosystems						
	3.1.6.1 Agricultural ecosystems						
	3.1.6.2 Urban ecosystems						
3.2 Aquatic ecosystems	3.2.1 Marine						
	3.2.2 Coastal						
	3.2.3 Riverrine						
	3.2.4 Lacustrine						
	3.2.5 Other aquatic ecosystems						

[1] Land as natural stock in the SEEA asset classification
[2] Ecosystems: terrestrial and aquatic environmental system assets, 3.1.6.1 and 3.1.6.2 added

categories only.[5] A table on land use by industries (or products) and households allows deriving, for example, indicators for land productivity (value added per unit of land used). However, the allocation rules of land to producers (industries) on the basis of actual use are in some cases difficult to fix and standards are not yet fully developed (see Krack-Roberg/Schäfer 1998 and Leurs/van Dalen 1998). Often there are parallel uses, in particular with regard to recreation (e.g. agricultural land, forests or waters may be used for several purposes) or protected areas. It is sometimes hard to determine a ‚primary‘ or 'dominant‘ use so that multiple allocation or a separate recording of multiple use could be considered. A land use by economic activities matrix can be estimated on the basis of non-georeferenced data, too. A precondition is that the use-oriented categories of the classification are highly disaggregated and that other basic data - e.g. on land for housing, kitchen gardens, use of land by industries from housing and industry surveys - are available or can be estimated in a reliable way.

[5] In the case of Germany political discussion concentrates a lot on traffic and built-up areas. For the other categories of land use the quality of the use is judged much more important than the quantity of land (surface area in km²) used. As a consequence the land use by industries table is restricted to the traffic and built-up land.

Table 2: Land use by industries and private households

Industries[2] and private households	2.3 Land use[1]					
	2.3.2 Urban and built-upon land	2.3.3 Transportation and other network	2.3.4 Agricultural land	2.3.5 Land for intensiv forestry	2.3.6 Recreational land	2.3.7 Other land
Agriculture, hunting, forestry, fishing A+B						
Mining quarrying C						
Manufacturing, electricity D+E						
Construction F						
Wholesale, retail trade, repair motor vehicles, hotels and restaurants G+H						
Transport, storage, communication I						
Financial intermediation, real. est., other business services J+K						
Educ., health, social, personel services M+N+O+P						
Public admin., defence, social security, other public services L						
Private households						

[1] Land as natural stock in the SEEA assets classification
[2] ISIC classification (System of national Accounts 1993)

From the stock accounts time series on opening or closing stocks can be established that show the net flows in the periods included. However, for the interpretation of **changes** in the field of land accounting gross flows (areas increasing the stock of a category during a period and areas decreasing it) are especially important from an ecological point of view because the replacement of old stocks of parts of nature (old part of a forest) by new stocks (afforestation) in a country is normally linked to a considerable loss in ecological quality. In general two levels of changes can be distinguished: changes between categories of land use or land cover (**external changes**, changes in classification) and changes within categories (**internal changes**). External changes are desribed in the core accounts. They can be described to some extent by more detailed classifications of land use and cover. Internal changes will typically be described in supplementary accounts (see chapter 4.2.3.4). To some extent a bigger part of the total changes can be covered by the external changes in the core accounts if more detailed classifications are used (Eurostat 1999).

The **land cover change matrix,** cross-tabulating land cover at two different points in time gives a detailed insight into the external changes (see table 3). The same analysis can be done for land use changes, too. It shows how much of the opening stock of a land cover category is still the same in the closing stock and between which categories of land cover gross flows can be noticed. The total increase, the total decrease, the total change (increase + decrease) and the net change (increase –

decrease) can be deducted from this table. The production of such a table has normally to be based on georeferenced data sources because single data for the same unit cover in the opening stock (initial year) and in the closing stock (final year) must be known and analysed. The analysis can in principle be done on the basis of the total area or of a sample. In the latter case the size of the sample determines however to which extent the gross flows can be analysed with reliable statistical quality. (Note: An illustrative table for the annex with results from the UK is not yet available as file but promised. A short comment will be added to the text.)

The land cover change matrix forms the ideal starting point for developing an analysis of the types of changes of land cover (resp. land use) in line with the general structure of the asset accounts (see chapter structure of the asset accounts, 3.4 SEEA asset accounts). In the case of land changes in quantity, e.g. an increase of the stock of land by reclaiming land from the sea, are marginal. A **classification of causes of changes** has to focus on changes in quality that correspond to changes in classification in the case of external changes. Standard classifications on the types of changes are not readily available at international level, only selected national approaches exist. For this reason the proposal of a classification included in table 4 is based on some first discussions on important types of changes (see Eurostat 1999) and has a more illustrative character. (Note: An illustrative table for the annex with results from the UK is not yet available as file but promised. A short comment will be added to the text.)

Table 3: Land cover[1] changes matrix

3.1 Land cover (initial year)	3.1 Land cover (Final year)													Total (initial year)	Decrease
	3.1 Terrestrial ecosystems	3.1.1 Forests	3.1.2 Wetlands	3.1.3 Montane regions	3.1.4 Prairies	3.1.5 Tundra	3.1.6 Other terrestrial ecosystems	**3.2 Aquatic ecosystems**	3.2.1 Marine	3.2.2 Coastal	3.2.3 Riverrine	3.2.4 Lacustrine	3.2.5 Other aquatic ecosystems		
3.1 Terrestrial ecosystems															
3.1.1 Forests															
3.1.2 Wetlands															
3.1.3 Montane regions															
3.1.4 Prairies															
3.1.5 Tundra															
3.1.6 Other terrestrial ecosystems															
3.1.6.1 Agricultural ecosystems															
3.1.6.2 Urban ecosystems															
3.2 Aquatic ecosystems															
3.2.1 Marine															
3.2.2 Coastal															
3.2.3 Riverrine															
3.2.4 Lacustrine															
3.2.5 Other aquatic ecosystems															
Total (final year)															
Increase															

Total changes (Increase + Decrease)															
Net changes (Increase - Decrease)															

[1] Ecosystems: terrestrial and aquatic environmental system assets, 3.1.6.1 and 3.1.6.2 added

Table 4: Changes in land cover[1] by categories of changes

Land cover	Initial stock	Increase								Total	Decrease								Total	Final stock
		Changes due to economic decisions	Artificialisation/ urbanisation	Changes in agricultural practices	Restoration and rehabilitation	**Changes due to other causes**	Multiple causes	Natural causes	Catastrophic causes		**Changes due to economic decisions**	Artificialisation/ urbanisation	Changes in agricultural practices	Restoration an rehabilitation	**Changes due to other causes**	Multiple causes	Natural causes	Catastrophic causes		
3.1 Terrestrial ecosystems																				
3.1.1 Forests																				
3.1.2 Wetlands																				
3.1.3 Mountain regions																				
3.1.4 Prairies																				
3.1.5 Tundra																				
3.1.6 Other terrestrial ecosystems																				
3.1.6.1 Agricultural ecosystems																				
3.1.6.2 Urban ecosystems																				
3.2 Aquatic ecosystems																				
3.2.1 Marine																				
3.2.2 Coastal																				
3.2.3 Riverine																				
3.2.4 Lacustrine																				
3.2.5 Other aquatic ecosystems																				
Total																				

[1] Ecosystems: terrestrial and aquatic environmental system assets, 3.1.6.1 and 3.1.6.2 added

The analysis of the causes of changes in table 4 is restricted to external changes. It assumes georeferenced land data for all units of the total area or for a permanent sample of units and data on gross changes. This type of data is actually better available for land cover than for land use. For every unit the cover category of the intial stock (opening stock) and the final stock (closing stock) is identified. If they are different, the change is allocated to a type of change according to fixed allocation rules. To carry out this procedure individual data on gross flows are required. In traditional, non-georeferenced land statistics only the net flows are available and in the physical accounts the types of changes can not be deduced.[6]

In some cases **additional aspects** can be added to the core accounts. Linear landscape features (e.g. hedgerows and walls) are a typical example. Linear features are othen rather poorly represented in land cover classifications. Nevertheless reporting on their quantity in form of length units in some countries adds important informations on significant elements in the landscape (see e.g. the contribution of the United Kingdom in Conference of European Statisticans 1995). Another aspect are regional accounts that enlarges the possibilities of analysis in some regards considerably (see 4.2.3.1).

4.2.3 Supplementary accounts

4.2.3.1 General aspects

The supplementary accounts are strongly driven by policy interests (see chapter 4.2.1) . They can be divided into **two groups**: The first group concerns problems of naturalness and intensity of **land use** respectively. Phenomena such as sealing or fragmentation are incorporated and closer links to the economic activities are established than in table 2 of the core accounts on land use by industries and private households. The focus of the second group is more on **land cover** aspects, the state of the natural environment or biotopes accounting. Aspects such as biodiversity are integrated.

In environmental accounting in the context of the SEEA, national tables of the core accounts have a high priority. The precondition of georeferenced data additionally opens the possibility of deducting **regional accounts** on a subnational level. This is particularly relevant for the supplementary accounts. Regional accounts often are of high political interest in the field of land accounting. In the land cover part nature-oriented regional classifications like ecozones, landscape type units (land classes) or watersheds are widely used (see chapter 3.3), in the land use oriented parts of the accounts administrative regions can be relevant as well.

In general supplementary accounts are characterised by the fact that they integrate land use or land cover data with data from a great variety of other economic and ecological **data sources**. In this regard one of the problems in establishing ideal supplementary accounts often is the availability of well-suited data and statistical instruments or monitoring programmes. Especially for characterising the quality of the environment the data situation often is fragmentary compared to economic and social statistics or to data on the pressures exerted by economic activities.

4.2.3.2 Land use-oriented accounts

In land use-oriented supplementary accounts the land use parts of the core accounts are differenciated in a consistent way by more detailed descriptions of issue-oriented aspects. The

[6] In physical accounting the situation is different from monetary accounting. For monetary accounting of land in the SNA (see 4.1), it is possible to identify the type of changes in the revaluation and other changes of volumes accounts on the basis of net changes in physical units, because normally the physical net flows are valued by the corresponding prices.

description of changes in artificiality of land and their link to human driving forces or pressures and the intensity of use of land are in general the main theme in the land use-oriented accounts. **Typical issues** are in this context e.g. the sealing of soil, the partitioning (fragmentation) of land by transport networks and the impacts on land by industries, agriculture, tourism, transport and human settlements (see Conference of European Statisticians 1995). Often both production patterns including technological aspects and consumption patterns have to be considered.

Soil sealing seems to be a good and simple example to explain the relation to the core accounts. In some countries the sealing of soil is a major environmental problem as the functions of the soil are totally desturbed. Consequences are e.g. the destruction of biotopes and the impacts on the microclimate and the water balances. The units used to produce results for land use in the core accounts are normally sealed up to very different degrees. In the case of dwellings e.g. the ground area of the house often is completely sealed up whereas the garden around is not or only to a very extent. To detect general trends of soil sealing in a country or in a region the degrees of sealing of the different land use (or even land cover) categories have to be derived from other data sources (e.g. interpretation of arial photographs, housing statistics or field surveys) and linked to the volume of the different land use categories. Depending on the objective this can be done on the basis of the land use classification in table 1 of the core accounts, a classification where single categories (e.g. land underlying building and structures) are further disaggregated, or even in the context of table 2 by economic activities.

Other data that can be integrated in the supplementary accounts are e.g. data on the intensity of use of agricultural, urban or infrastructure land like use of chemicals in agriculture, emissions, disposal of waste, extraction of water or other resources, transport related information like traffic density etc.[7] An important feature of the supplementary accounts is that in many cases the issues demand data that are regionalised or even geocoded. The detail of geographical referencing determines the detail of possible accounting (see Parker et. al. 1996).

4.2.3.3 Land cover-oriented accounts

In the land cover-oriented supplementary accounts the land cover information in the core accounts is extended by describing in a more detailed way the potentials of land and aspects of biodiversity. The **potentials of land** relate e.g. to the richness of the natural habitats in terms of extent and biodiversity, to their vulnerability, to the characteristics of the soil, to the social and economic activities of which it is the support. The potentials can be assessed from several points of view, one of them being the capacity of the landscape to sustain natural life under the pressure of human activities (Parker et. al. 1996). In the case of the cover-oriented accounts the link to economic activities and pressures is more difficult to establish than for use-oriented accounts. In principle data on biotopes, flora, fauna and informations on the natural conditions in a country or region (climate, soil, water etc.) are important premises for the land cover-oriented accounts.

For analysing land cover or ecosystems on a more sophisticated level often more homogenous land units are used. Especially **biotope accounting** is a very important example in this regard. Biotope accounts are normally better targeted to nature conservation policy or to (ecosystems) theory than land cover descriptions. The link to the core accounts can in principle be established by a table crossclassifying land cover and biotopes in the same way as table 1 of the core accounts does for land use and land cover. As in the core accounts a biotope change matrix (corresponding to table 3) and a table indicating the causes of changes (corresponding to table 4), distinguishing human influences from natural developments, can be produced (see e.g. Stott/Haines-Young 1996).[8]

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[7] For examples see e.g. Conference of European Statisticians 1995 or European Environement Agency (1997).
[8] Basic data in biotope accounting are often georeferenced. See e.g. Stott/Haines-Young 1996 and Seibel et. al. 1997.

An important aspect of biotope accounting is the integration of quality indicators, e.g. on **biodiversity aspects** (see chapter 4.2.3.4). Changes in **biodiversity** in most cases are a consequence of human activities. However, in biotope accounting only the dimension of diversity of species in biotopes can be integrated. In the biodiversity debate habitat diversity, that can be understood as diversity of biotopes in a landscape, is another important aspect. To include habitat diversity in the land and ecosystems accounting module more heterogenous landscape units like ecozones or landscape type units have to be described by the corresponding quality indicators. In the case of biodiversity the parallel use of different accounting units is therefore indispensable (Hoffmann-Kroll et.al. 1999).

In general the surface area accounts for landscapes and ecosystems or biotopes that are reqired to reflect biodiversity can be linked not only to diversity indicators but also to the relevant **material** (e.g. degradation by residuals) **or functional indicators** for describing the state of the environment. It leads to a systematic, theory-based description of the state of environment which would extend (from a conceptional point of view) the current data reporting conducted on a medial or sectoral basis.

4.2.3.4 Integration of quality aspects

The integration of quality aspects of land is a common feature of both types of supplementary accounts, land use- and land cover- oriented accounts. Quality aspects can only be integrated directly in an accounting structure based on surface areas (see 4.2.1) as long as they can be desribed as **external changes by more detailed classifications**. In the more detailed version of SEEA as discussed in Rio it is therefore clearly stipulated that land and ecosystems types should be further subdivided in a classification system based on quality. The description of the stocks and changes of land and ecosystems would accordingly be extended to such quality classes. However, there are two clear **limitations** to such an approach of general, aggregated quality classes from a methodological and practical point of view:

- There are no concise breakdowns by complex quality classes of land or ecosystems types which are scientifically sound. For the forest ecosystems, for instance, the health of the trees, the soil, the abundance of wild plants and animals or the state of the soil would all have to be considered. At the current state of the art, a quality classification in view of these aspects would be feasible only if normative standards as well as statistical descriptions were applied for the aggregation of the individual factors to quality classes.
- Because of the combination of the various quality characteristics, any attempt to avoid normative elements in the assessment by cross-classifications results in a very large number of quality classes. This would be unrealistic and/or extremely costly to be quantified in a reliable way at present.

The only practical solution is a pragmatic approach. The surface area of ecosystems or land cover units can be depicted by integrated **accounting methods**, whereas the **indicator method** is used for any further qualitative differentiation of these units. If suitable non-additive quality indicators are defined for the classes used for describing land use, land cover or biotopes in the corresponding accounts, the quality indicators can be added to the surface values as separate columns in stock matrices. From a methodological point of view this approach is similar to monetary valuation in the treatment of land as an economic asset. In the latter case the additive measure is the price as an expression of the productivity of land; from an ecological point of view, internal quality is expressed by different quality indicators instead.

This approach opens the field to a lot of **politically important analyses** by combining the advantages of accounting and indicator methods. **For example**, aspects of **biodiversity** (especially habitat and species diversity) can be reflected by accounting methods only to a very limited extent. The consistent methdological link between accounting methods such as surface area balances and the respective biodiversity indicators are imperative for a satisfying result. To give a concrete idea from the kind of links between area balances and quality aspects in the following some examples of appropriate indicators will be named which are suitable to describe biodiversity in the rural landscape. The biodiversity of habitats in a landscape or ecozone (heterogenous land cover units , see chapter 3.2) on the one hand can be recorded by indicators like naturalness of landscape (percentage of area covered by natural and rather natural biotope types), biotope diversity of landscape (number of non-technical biotope types), length of linear features/verges, number of small biotopes or occurence of endangered biotopes (in percentage of area). On the biotope level biodiversity of species can be characterised by indicators like the mean number of species (in biotopes or sample units in biotopes), the share of endangered species (as mean number or percentage of all species) or the share of specific strategy types that describe the stress to which e.g. plants are subjected (see Hoffmann-Kroll et al. 1999 or for some other indicators Haines-Young et.al 1996).

Another politically relevant example is **soil degradation**. Soil degradation is defined as a process that lowers the capacity of the soil to produce goods and services. The two categories of soil degradation are displacement of material by water or wind erosion and soil deterioration by chemical or physical processes. Examples for indicators used in the supplementary accounts to cover the aspect of **chemical deterioration of soils** are loss of nutrients and/or organic matter, salinization, acidification, pollution, acid sulphate soils or eutrophication. (United Nations 1999; see especially paragraph 299 to the link of soil, land, socio-economic data and data on natural conditions).

In general the degree to which quality indicators are combined with the accounts depends on the objectives of the analysis; in environmental accounting a **more limited** use of quality indicators than in natural science reporting systems on the state of environment is normally adequate.

5 Integration of soil

In the **SNA** (see 4.1) soil is not treated as a separate economic asset. It has no distinct monetary value. If the quality of soil is important for the use of land – as it is e.g. the case for agricultural or forest land – the quality of soil is a factor influencing the price of land.

In the asset classification and in physical accounting of the **SEEA** soil is integrated explicitly as distinct natural ressource stock asset. (Note: This is valid for the Canberra-version of the asset classification.) This reflects the quantitative dimension of soil that is soil erosion reducing the availability of soil as a consequence of direct human use at a site (see table in the annex 1 to chapter 3 structure of the asset accounts). Physical flows connected with soil erosion are treated as involving a decrease in soil and an increase in the soil of the area to which the soil has been transported by wind and water (1993 SEEA 289). This underlines the character of soil as an in principle depletable asset. On the other hand, the use of soil is different from that, for example, of sand and stone extracted by the mining industry. The basic character of soil as a natural resource stock asset is in a way more similar to the character of land. As shown in chapter 4.2.3.4 the negative impacts of soil degradation are integrated in the land and ecosystems accounting module, too. The qualitative dimension of soil (type of soil, nutrients etc.) is an important aspect of all terrestrial ecosystems. If soil erosion is included in this type of analysis, it is done more under the aspect of surface area (in ha) that is affected by erosion problems or has a high risk to be eroded.

As a consequence the way in which soil is included in environmental accounting – as natural resource stock asset or as part of land and ecosystems accounting – depends on the **importance of the quantitative resp. the qualitative dimension** of soil in a country or region (For a more detailed presentation see United Nations 1999, p.123ff.).

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WORKING PAPER No. 14

LAND USE AND BIODIVERSITY INDICATORS FROM ECOLOGICAL AREA SAMPLING - RESULTS OF A PILOT STUDY IN GERMANY

Paper submitted by S. Seibel, Federal Statistical Office of Germany

GE.97-

Abstract

Ecological Area Sampling (EAS) is a new statistical approach to provide data on the state and development of ecosystem and landscape structures. EAS is a systematically designed and standardized tool of data sampling and analysis to get representative results of physical structures for the whole of Germany. Data are collected periodically in monitoring sites selected at random. The concepts were tested to a limited extent in a pilot study in summer 1995 and summer 1996. In the article the general concepts of EAS will briefly be outlined. The survey contents and the indicators that can be derived will be described, and some first results of the pilot study will be given.

1. Objectives of EAS and pilot study

1. Ecological Area Sampling (EAS) is a new tool with which integrated data on the **nature and landscape structures** and their development are to be collected for the first time in a systematic, representative and periodical manner which will be uniform for the whole of Germany.

2. EAS is part of a more comprehensive research project on the state of environment which is integrated into the **Environmental Economic Accounting (EEA)**. In EEA much work has already be done to provide information from a national point of view both for the pressures of economy on the environment and for responses to improve the environmental conditions. A description of the state of the environment on a national scale however is still missing. In order to fill this gap, land cover information for the whole of Germany has been derived from satellite data (project CORINE Land Cover), and a research project on the development of a system of indicators of the quality of environment in Germany has been carried out. The EAS ist part of this latter project, as the physical structure of landscapes and ecosystems is an important aspect of this indicator system. The other aspects are impacts of pollution and the functionality of ecosystems (cf. Schäfer 1995).

3. Information on the state of the environment in Germany that is currently collected on a regular basis focuses mainly on the impact on media and organisms caused by harmful substances ("impacts" aspect). For this there exists a number of monitoring systems covering the area of Germany. Data on the state and quality of landscapes and nature from "physical structure" aspects, which provide just as important information on the state of the environment, are however available only for specific cases, limited spatial sections or do not meet the requirements of an indicator system on the state of environment in a satisfying way. For this reason EAS is the precondition for systematic, periodic, and nation-wide data collection in this field (cf. Heidrich-Riske/Hoffmann-Kroll 1994 and Barr/Bunce 1993). Thus it will be a reliable **basis for information and a useful tool for decision-making in the field of nature conservation**, which so far has not been available at the level of the Federal Republic:

- The EAS results permit supplying information on the state and changes of nature and the landscape in current land use areas.
- The EAS will provide for the first time data on the frequency and quality of ecosystem types which will be reliable in terms of statistics for the whole of Germany. This means considerable support for political action in the field of nature conservation because

"large-area nature conservation", i.e. sustainable use also outside protected areas, requires information on the entire territory too.

- By means of EAS, area-related changes of the biological diversity in Germany may be represented and evaluated for all-German nature conservation policies.
- EAS results will permit to measure the success or failure of nature protection policies at the federal level because the extent of changes can be observed.
- EAS results will provide a basis for comparison with regard to purposeful area protection measures as part of nature conservation; e.g. the efficiency of large-scale nature conser vation projects of the federal government can be represented in comparison with the state of the overall landscape.

4. For EAS, data on the landscape quality, the biotope quality, and the occurrence of species in biotopes are collected in **periodically monitored sites** that were selected at random. Some aspects of the survey design of EAS were already presented at the Joint ECE/Eurostat Work Session in Helsinki 1994 and in Mèze 1995 (cf. Heidrich-Riske/Hoffmann-Kroll 1994 and Schäfer 1995). First of all, a concept was developed in cooperation between the Federal Statistical Office and the Federal Office for Nature Conservation with the support of private companies (cf. Back/Rohner/Willecke 1995, Foeckler/Herrmann/Schmidt et al. 1996). The survey design and programme are shown in chart 1 (see chapter 2).

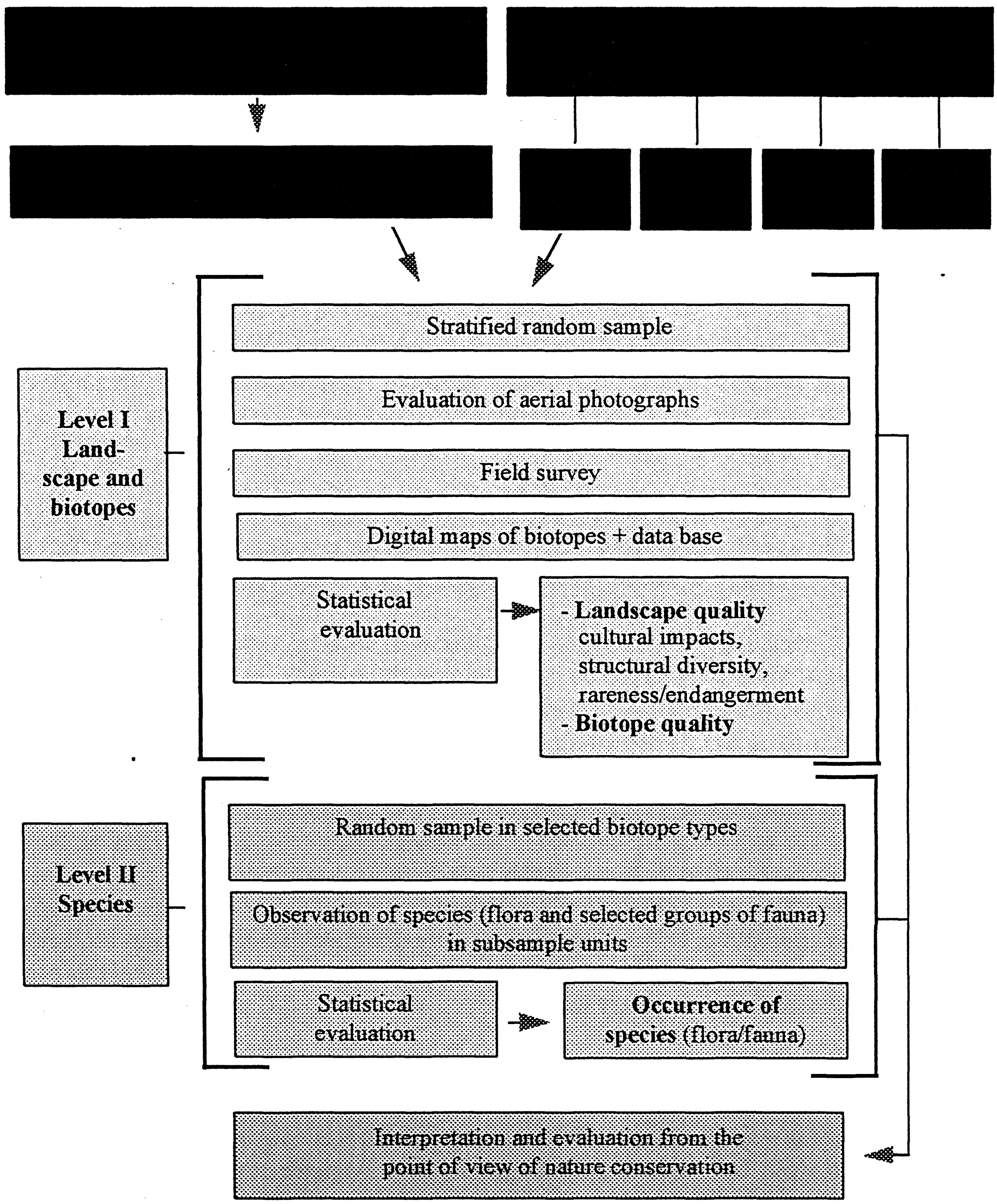
5. The concepts were testet to a limited extent in a pilot study in summer 1995 and summer 1996. This pilot study - from which results are now available - focused in particular on finding solutions to issues of methodology (e.g. sampling concept, operationalisation of indicators, sampling errors) and survey organisation. Especially for an entirely new survey tool such as EAS, a **methodological pilot study** is indispensable. For analysing the contents, the results of the pilot study are suitable only to a limited degree, which is due to two factors: First, the mainly methodological character of the pilot study and, second, the small sample size which, in turn, is due to limited funds. The consequences of these restrictions are the delimitation of the pilot study test area (see chapter 2) and the sampling random errors that occurred in the pilot study; because of the small sample size, these errors are considerably more serious than would be expected for the main survey. However, since the pilot study is a rather large survey if compared with other data available for the ecological field, the standards applied to the representation of results should be less exacting than usual in official statistics - all the more so, since there is a great national demand for data which at least give an impression of magnitudes.

6. In the following, the general concept of EAS and the role of CORINE Land Cover (CLC) and of the land classes will briefly be outlined. The survey contents and the indicators that can be derived will be described, and some results of the pilot study will be given.

2. General features

7. Ecological Area Sampling may be divided into **two levels** (see chart 1):

Chart 1: Ecological Area Sampling (EAS)



- At the first level, indicators of **landscape quality** and of **biotope quality** are covered for the sample units (size $1 km^2$). For this purpose, aerial photographs are evaluated to cover the biotopes existing in a given sample area. The scale of biotopes is quite appropriate to describe the state of the environment because it permits an analysis in terms of ecological theory, too. Subsequently, the landscape is examined (through a field survey) and the biotopes checked for their coverage or, where necessary, further specified by means of a biotope classification comprising some 500 items. Moreover, the field survey allows the coverage of small biotopes that are not visible on the aerial photograph. For important biotope types, the field survey also serves to cover additional variables on the biotope quality. The results of aerial photograph interpretation and field survey then are digitalized and stored in a geographical information system (ARC/INFO). Subsequently the data are raised to higher levels such as land classes (see below) or biotope types in Germany. Results are evaluated both for the overall areas of the sample units concerned (landscape quality) and for individual biotope types (biotope quality). Theoretical work on the concepts of this level is described in detail in Back/Rohner/Willecke (1995).

- At the second level, these results are supplemented by an analysis of the **species** (plants and some groups of species of animals) existing in randomly selected subsample units within the sample areas of the first level. The concept for this second level is described in detail in Schmidt/Foeckler/Herrmann (1996).

8. Only when landscape quality and biotope quality (level I) are linked with the stock of species in biotopes (level II) it will be possible to arrive at a satisfactory assessment of the ecosystem quality with regard to the physical structure, as is planned for the indicator system.

9. Generally, any landscape - agricultural landscapes, urban areas, woodland and land cover types close to nature - has to be included in such a sample for the Federal Republic of Germany. For reasons of pragmatism, however, the pilot project currently focuses on **agricultural areas** (type of land cover) **in Brandenburg, Berlin and Thuringia**. Land cover in Germany was entirely covered as part of the European **CLC**[1] project for areas with a minimum size of 25 ha and for linear structures (e.g. watercourses) with a minimum width of 100 m. The indicators mentioned in the following are tailored to the prevailing type of agricultural area. Nevertheless the indicators partly seem to be applicable for the other non-urban areas, too. The landscape and nature quality based on structural variables is assessed mainly from the aspect of biodiversity and nature conservation. Other, and possibly competing, environmental aims such as groundwater protection, climate protection, recreation and the like, are not included in this project. This would in part require supplementary indicators.

10. Since the appearance of landscapes and the occurrence of species heavily depend on the local land conditions, a classification of Germany into 28 **land classes** was developed; each of these land classes is characterised by a largely homogeneous natural composition (regarding geology, climate, soil, hydrology and morphology). Because of methodological and financial reasons seven of the total of 28 land classes were selected in the test area of the pilot study for the coverage of landscape and biotope quality, while for the coverage of species four of those seven classes were selected.

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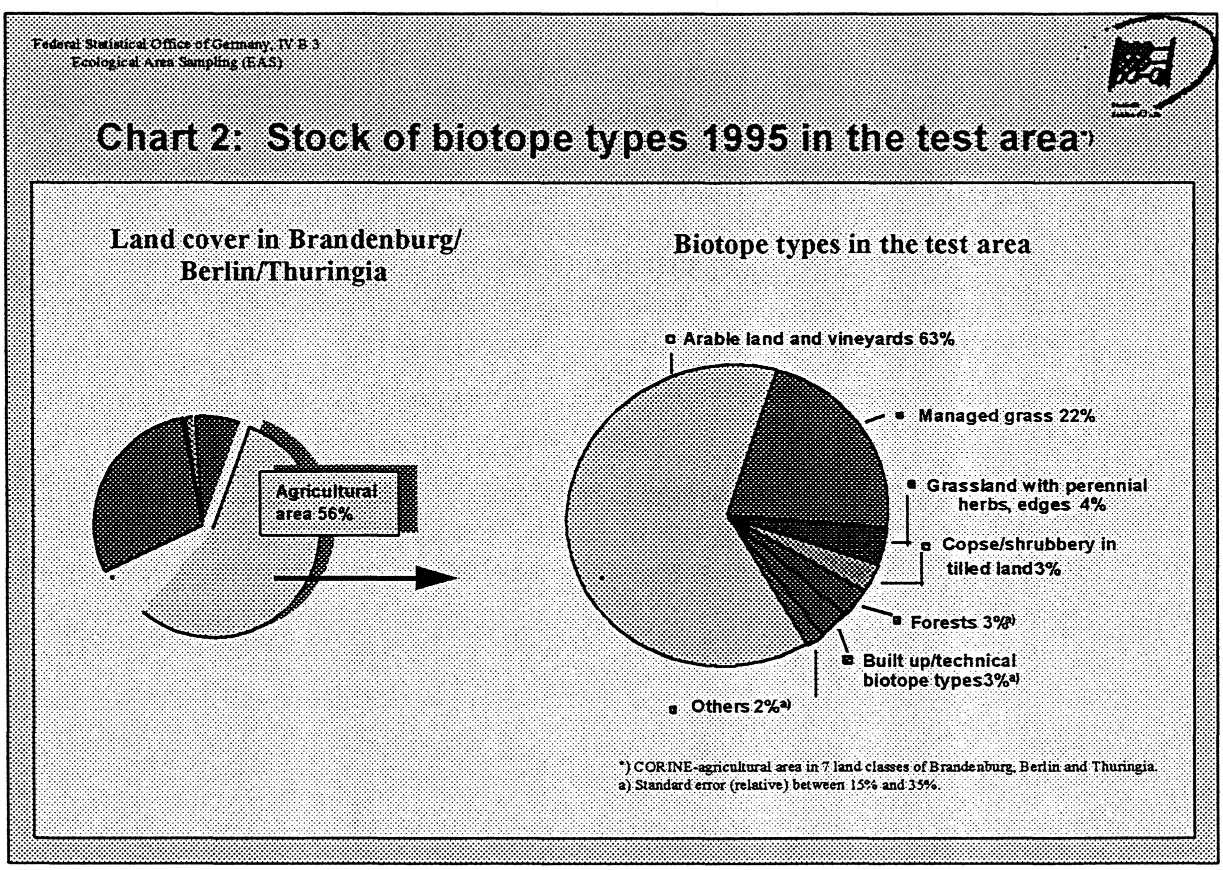
[1] On the basis of satellite data, aerial photographs and topographical maps.

11. While the information on land cover and land classes are available for the entire test area (which was limited as explained above), 70 **sample units** of 1 square kilometre each were selected as part of the pilot study to cover the landscape and biotope quality. The occurrence of species was generally covered in even smaller **subsample units**.

12. The much higher degree of differentiation of the **EAS compared with** the coverage of **land cover** (the lower limit of coverage for biotopes is 400 m², which is just 0.16% of the lower limit of coverage for the evaluation of land cover as part of CLC) becomes obvious simply by comparing the biotope types covered by the EAS with the land cover units. Chart 2 shows how a landscape unit that looks homogeneous on a small scale (the CORINE agricultural area in Brandenburg, Berlin and Thuringia) becomes more differentiated when changing from land cover types to biotope types. Of course, arable land and managed grass - accounting for 85% of the area - are highly dominant in the agricultural land cover types. However, it becomes also obvious that there do occur smaller non-agricultural biotope types to a significant extent, e.g. forest (3%) as well as settlement and technical biotope types (also 3%). This quantitative information about the shares of different biotope types is quite essentiel for the interpretation of qualitative changes over time (cf. Krack-Roberg/Riege-Wcislo/Wirthmann 1995, Conference of European Statisticians 1995).



3. The first level of the sample survey

3.1 Indicators of landscape quality

13. The landscape quality of the sample units will be covered by indicators with regard to **three items**:

- cultural impact/intensity of use,
- structural diversity and
- rareness / endangerment

Chart 3: Indicators of landscape quality in agricultural pattern

item	indicator
intensity of use	artificiality soil sealing risk of erosion of arable land fragmentation
structural diversity	biotope diversity plot size of agricultural areas elements with linear features small biotopes spatial distribution of structural elements spatial distribution of endangered biotopes
rareness/endangerment	occurrence of endangered biotopes

14. The indicators to be covered in the sphere of **cultural impact/intensity of use** are artificiality/naturalness, soil sealing, risk of erosion, and fragmentation. The degree of artificiality / naturalness of the sample area is shown by the shares of the area of biotope types with low artificiality levels.

Chart 4: Artificiality of biotope types by land classes 1995 in the test area*)

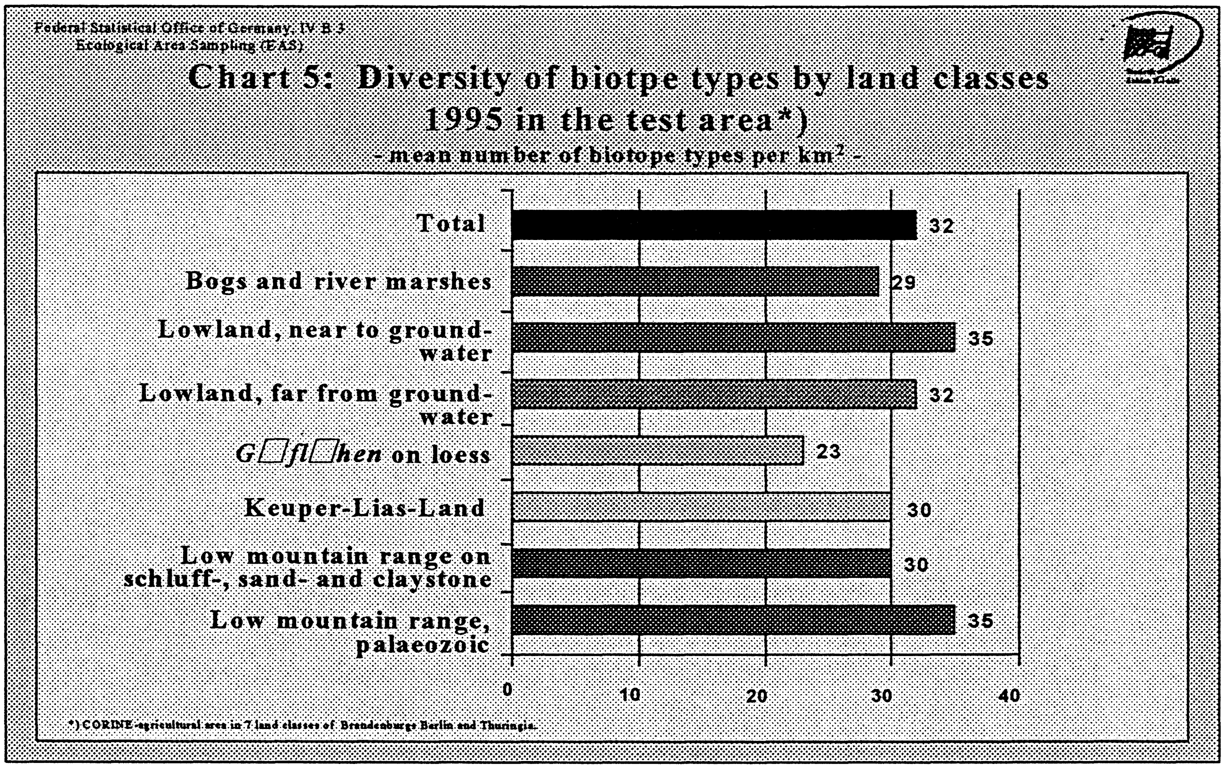
Land class	Degree of artificiality[1]			
	1 natural biotope types and biotope types close to nature	2 semi-natural biotope types	3/3-4/4 biotope types determined by culture	without allocation
	% area			
Total	4[a)]	25[a)]	68	3[a)]
Bogs and river marshes	4[b)]	31[b)]	61[a)]	5[b)]
Lowland, near to groundwater	5[a)]	35[a)]	57[a)]	3[a)]
Lowland, far from groundwater	3[a)]	14[b)]	82	2[b)]
G□fl□hen on loess	2[a)]	10[b)]	86	2[b)]
Keuper-Lias-Land	4[b)]	8[a)]	83	4[b)]
Low mountain range on schluff-, sand- and claystone	4[b)]	14[a)]	79	3[b)]
Low mountain range, palaeozoic	4[a)]	34[a)]	52	10[b)]

*) CORINE-agricultural area in 7 land classes of Brandenburg, Berlin and Thuringia.
1) Allocation by Naturnah/BfN 1995.
a) Standard error (relative) between 15% and 35%.
b) Standard error (relative) 35% or more.

15. Generally, the biotope types may be allocated to different levels of naturalness on the type level. This work was carried out by prior technical discussion. The three groups distinguished here are natural biotope types (and biotope types close to nature); semi-natural biotope types; biotope types characterised by cultural impact and artificial biotope types (to simplify matters, the latter are referred to as "biotope types determined by culture" in the following). Chart 4 shows the corresponding area shares, broken down by land classes. The extent to which the natural environment is already characterised by human impact in the agricultural landscape is shown by the large share of biotope types determined by culture (68%) and the small share of natural biotope types (and biotope types close to nature) (4%) in the test area. An examination of the individual land classes reveals considerable variations depending on the natural situation: Marshland and river plains, plain land near to groundwater and palaeozoic low mountain ranges are covered by semi-natural biotope types up to a degree of about a third. For the remaining four land classes the shares of biotope types determined by culture rise to about 80% or even more. Among the agricultural areas, plain land near to groundwater has the largest share (5%) of natural biotope types (and biotope types close to nature). These are essentially reeds. The fertile, and thus intensively used plain land distant from groundwater and the *Gäuflächen* on loess show the lowest figures (3% and 2%) for natural biotope types (and biotope types close to nature).

16. To assess the overall degree of soil sealing of the sample area, the degree of soil sealing of built-upon biotope types is roughly estimated as part of the field survey. As regards the risk of erosion, it will only be possible to develop a rough indicator which will mainly be derived from the slope inclination, possibly including precipitation. The presentation of fragmentation is to focus on the length of the paved road network per ha in the areas outside the settlement area.

17. In the field of **structural diversity**, attempts are currently made to cover the following indicators: biotope diversity, biotope size of arable land, the occurrence of elements with linear features and of small biotopes, the spatial distribution of such elements and of biotopes of the red data book. To show biotope diversity, the number of biotopes and of biotope types within the sample area is to be determined.



18. Biotope types of the settlement sphere and technical biotope types such as dumping grounds are not taken into account here. Chart 5 shows the average number of different biotope types by land classes. On average, there are 32 biotope types per square kilometre. The fertile *Gäuflächen* (23 biotope types per square kilometre) are the most monotonous ones, while the greatest number of different biotope types per area unit are found in the palaeozoic low mountain ranges and in plain land near to groundwater (35). This result corresponds quite clearly to the distribution of biotope types with different levels of naturalness (Chart 4). The results thus show quite clearly how aspects of cultural characterisation of the landscape are interlinked with aspects of structural impoverishment.

19. For arable and viticultural land, the biotope size as an important indicator is estimated. The occurrence of elements with linear features is determined by calculating the overall length of such elements within the sample area. For small biotopes such as ponds, isolated trees, rocks and the like, the frequency of occurrence in the sample area is determined on the basis of the results of the field survey.

20. As regards the sphere of **rareness/endangerment**, it will be attempted to cover the biotopes of the red data book and to determine the shares of their areas.

21. As a result of the pilot survey, there will be **refinements or slight changes in indicator construction**, especially in computing the indicators of spatial distribution of structural elements. In general however **the indicators proved a success**.

3.2 Indicators of biotope quality

22. From the aspect of nature conservation, it is possible to allocate different values to different biotope types at the type level (e.g. according to intensity of use/artificiality levels of the types; see above). Additional characteristics regarding the determination of **biotope quality** of selected important biotope types are covered at the object level as part of the field survey. As such characteristics - 4 to 7 per biotope type -differ according to the biotope types, their complete presentation would be too far-reaching here.

23. In the following, some quality aspects are presented with regard to the group of biotope types with the greatest area shares in the test area, i.e. **arable land** (see chapter 2), among which grainfields and fallow land have the biggest shares. The quality is - among other things - described by the occurence of edges and wild plants.

24. As far as the occurrence of edges in arable land is concerned, the situation is heterogeneous: A total of 86% of the arable land in the test area had edges, while 12% had none. A more differentiated examination of land classes shows however that in every land class most fields (73% of field area at least) had edges, but this predominance differs according to the land class. In marshlands and river plains, in the *Gäuflächen* on loess and in the Keuper-Lias-land the share of fields without edges is still considerable (more than 15 up to 25%). In plain land and in low mountain ranges on poor clay, clay and sandstone, however, arable land with edges prevail quite clearly with more than 90%. For the palaeozoic low mountain ranges, it is not meaningful to compile the relevant figures because there is a large share of unavailable data. Altogether, there is a slightly decreasing percentage for edges in landscapes which are characterized by wide plains.

Chart 6: Occurence of edges in arable land by landscape types and land classes 1995 in the test area*)

Landscape type Land classes	Total	arable land with edges	arable land without edges	arable land without information
	% area			
Total	**100**	**86**	**12[a)]**	**2[b)]**
Bogs and lowland	100	89	9[a)]	2[b)]
of that:				
Bogs and river marshes	100	77[a)]	16[b)]	7[b)]
Lowland, near to groundwater	100	91	8[b)]	2[b)]
Lowland, far from groundwater	100	94	6[b)]	2[b)]
Cuestas and low montain range	100	79	19[b)]	1[b)]
of that:				
G□fl□hen on loess	100	73	25[b)]	2[b)]
Keuper-Lias-Land	100	77[a)]	22[b)]	1[b)]
Low mountain range on schluff-, sand- and claystone	100	98	2[b)]	1[b)]
Low mountain range, palaeozoic	100	78	-	22[a)]

*) CORINE-agricultural area in 7 land classes of Brandenburg, Berlin and Thuringia.

a) Standard error (relative) between 15% and 35%.

b) Standard error (relative) 35% and more.

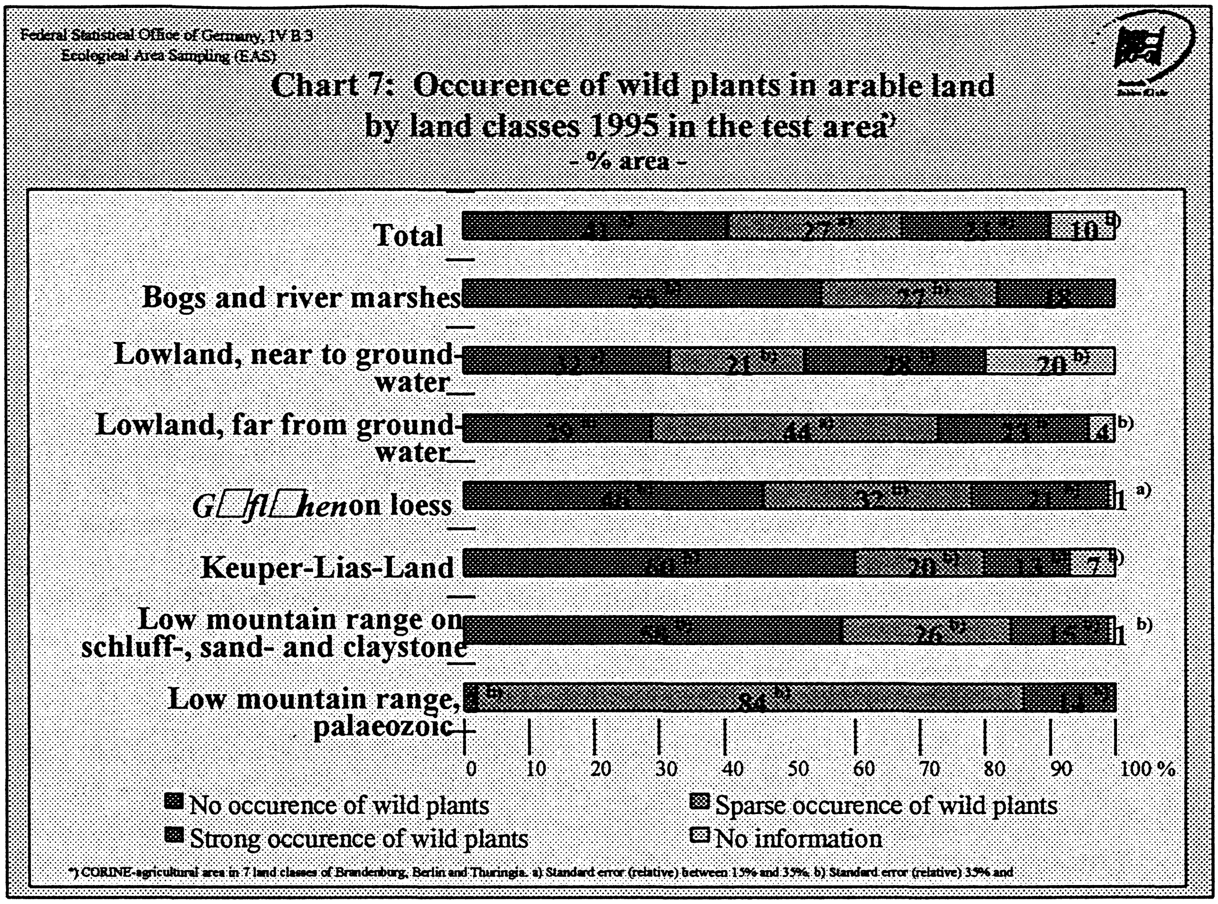


Chart 7: Occurence of wild plants in arable land by land classes 1995 in the test area*)
- % area -

25. In 1995, there were wild plants in half of the total area of the arable land within the test area. In 27% of the fields, wild plant occurrence was sparse, while in 23% it was strong. In 41% of the fields, there were no wild plants, and for 10% of the fields no data are available. In marshland and river plains, in the Keuper-Lias land as well as in low mountain ranges on poor clay, clay and sandstone, clearly over 50% of the area of the arable land has no wild plants and in less than 20% the occurrence of wild plants is strong. The most extreme situation is found in the Keuper-Lias land, where 60% of the fields have no wild plants, while in just 13% the occurrence of wild plants is strong. In plain land near to and distant from groundwater, arable land without and with strong occurrence of wild plants is roughly balanced, although here too there is a slight majority of fields without wild plants. In plain land distant from groundwater, fields with sparse occurrence of wild plants have the largest share (44%). Only in the palaeozoic low mountain ranges, the area of the arable land with strong occurrence of wild plants (14%) is larger than that without wild plants (just 2%). Here, the share of fields with sparse wild plant occurrence is 84%.

26. In general, the characteristics of biotope quality proved a success, too. Nevertheless there is a need for further standardisations in specific cases.

4. Level II of the Ecological Area Sample

4.1 Purpose of data collection and pilot study

27. The **purpose of further differentiation** of the area sample at level II is to derive information on the stock and changes of communities of plants and selected groups of animals. This is necessary for **two reasons**: First, the species and the preservation of their diversity are a value of their own and, second, the occurrence of species permits to draw conclusions on the state of the habitats (biotopes), which in turn makes it possible to derive further information on the biotope quality in addition to what was obtained from the first level. Comparable studies carried through in Great Britain (cf. Barr and Bunce, 1993 in the Countryside Survey) show that qualitative changes of biotopes (i.e. changes in the number and composition of species and in their ecological types of requirement patterns) occur long before land changes emerge through the transition to another biotope type. For instance, the total length and the outward appearance of hedges in specific land classes did not show any changes over time, while the number of species living in hedges dramatically decreased in the same period. This example clearly shows that there are several relevant measuring levels for describing the physical structure of the environment. Depending on the issue to be examined, it may not be sufficient to represent the physical structure of the environment only at the above-described level I (and by means of the indicators mentioned there).

28. For flora and fauna, differentiated collection concepts were developed as part of the project (cf. Foeckler, F., Herrmann, T., Schmidt, H. et al., 1996). Based on a catalogue of criteria (among which gradient of intensity of anthropogenic use, gradient of humidity and nutrients, meaning for flora and fauna, and others), a number of **biotope types and groups of biotope types were selected**. Considering the objective of "nature conservation over the entire area", it was deliberately avoided to focus on the areas that are particularly valuable for the protection of species and biotopes. Examples for selected biotope types are arable land, vineyards, different types of grassland, moors, shrub land / edges, ditches and lakes.

29. As for level I, areas for floristic and faunistic studies are selected at random. Such **random sampling** is performed in two steps: First, biotopes of previously defined types are selected at random within the sample square kilometres of level I. Then the subsample units ("plots") in the selected biotopes are drawn.

30. The **theoretical preparatory work** already showed that the requirements of such a statistical approach are more difficult to meet for animals than for plants, which is mainly due to animal mobility. The problems of practical coverage, too, are more numerous and more difficult for animals. This is why the focus of level II for the empirical work of the pilot project was on the floristic studies, even though the theoretical concept was developed both for plants and animals.

31. In summer 1996, a **pilot study** for level II was carried through. The coverage of species in the pilot study was limited to even more restricted groups of biotope types. With regard to the vegetation, where the examination clearly focused higher plant species, the selection consisted of three groupings of grassland biotope types: grassland biotopes on arid land; semi-humid, intensively used grassland with a small diversity of species; and a selection of shrub land as linear biotope types. The animals covered were birds in the sample square kilometres serving to cover the landscape structure in Thuringia and water molluscs in ditches.

4.2 Methodology and indicators for covering the flora

32. The sizes and shapes of the sample areas/plots are based on the "minimum area" and vary between 4 and 64 m^2 (squares or rectangles), depending on the biotope type. It proved better, however, to uniform the plot size in a main survey to be able to compare the results. For each group of biotope types selected, biotope survey forms were designed. **Primary data** to be collected are:

- number of species per plot,
- degree of soil coverage[2],
- height and number of stock strata,
- total degree of soil coverage of stock strata and
- species belonging to stock strata.

33. In addition, there are various auxiliary variables such as general data on the plots or the flowering aspect of important species to ensure the comparability of the phenological times of recording.

34. The list below shows the most important among a number of **indicators** suggested which refer to the sample plots of any biotope type and are derived either direct from the basic data or through linkage with additional information:

- **Mean number of species**: It indicates the diversity of species but has to be interpreted taking into account additional information such as the range of species that is typical of the biotope concerned.
- **Evenness of species** in combination with the degree of soil coverage: This indicator describes the dominance structure (that may change, for instance, with the stock of species remaining unchanged) on the basis of the ratios of the degrees of soil coverage and indicates the structural diversity of the flora.
- The **total degree of soil coverage and the height of the stock strata** indicate the stability and productivity of a location.
- The **share of specific strategy types** describes the "stress" (disturbance and availability of resources) to which the plants of a location are subjected. This is achieved by subdividing the stocks according to the share of highly competitive species (C strategists), stress-tolerant species (S strategists), and species tolerating unstable, disturbed conditions of ruderal locations (R strategists).
- The **ecological indicator values** for nutrients and humidity: the share of specific nutrient and humidity indicators provides information about the relevant conditions of the location.
- The share of indicator types for low levels of ***Hemerobie*** (artificiality of land cover): *Hemerobie* is "the total of all intended and unintended effects exerted by man on an

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[2] Percentage of the plot that is covered by specific species if the relevant total leaf surface as seen from above is projected onto the ground.

ecosystem" (BLUME and SUKOPP, 1976)[3]. By allocating *Hemerobie* values to individual species, the degree of naturalness of, or cultural impact on, vegetation stocks is shown.
- The number of species included in the **Red List** shows the importance of the biotope type concerned for the protection of endangered species.

35. Among three proposed programme variants of a floristic survey, the **"minimum programme"** is the solution meeting minimum requirements in terms of subject-matter. It is limited, among other things, to:

- data collection in all selected biotope types which, however, are combined to form groups of biotope types;
- one survey per year in the summer months;
- a follow-up period of 5 years;
- coverage of species only for vascular plants, while for cryptogams only the total degree of soil coverage is covered.

36. To give an example of the vegetation structure in the test area, chart 8 shows the structure of plant communities by land classes in arid grassland, in semi-humid, intensively used grassland with a small diversity of species and in selected shrub land.

37. The absolute values for the average number of species, the average number of Red-List species and the average number of two types of ecological indicator species (oligotrophy and nitrogen) per area examined ("plot") may be compared in a meaningful way for different groups of biotope types only if the figures refer to areas of the same size. Consequently, absolute values for arid grassland (examined area 36 m^2) cannot be compared with those of intensively used grassland (8 m^2) and shrub land (8 m^2), whereas shrub land can be compared with intensively used grassland. The shares of different groups of species on the total amount of species per plot, however, can be compared between all biotope types examined.

38. In arid grassland there are 40 species to be found per plot on the average, varying from 26 to 46 according to the land class. Intensively managed grassland has 19 species per plot (from 14 to 24 in the different land classes). For shrub land the situation is quite similar (21 species, varying from 18 to 27).

39. There are only few endangered species (species of the Red List); their mean numbers per plot are below one for all biotope types and all land classes. Arid grassland still has the highest share (1.7%) which is due to site conditions with rather high values in plain land distant from low mountain ranges shrub land has more endangered species than intensively used grassland.

Chart 8: Structure of arid grassland, intensively used grassland, and shrub land by land classes 1996 in the test area[*)]

[3] BLUME,젝.-P., SUKOPP,젝. (1976): ?ologische Bedeutung anthropogener Bodenver?derungen. Schr.Reihe Vegetationskunde. 10, p. 75-89, Bonn-Bad Godesberg.

Indicators	Land class: Total		Lowland, near to groundwater		Lowland, far from groundwater		Low mountain range on schluff-, sand- and claystone		Low mountain range, palaeozoic	
	Mean number of species per plot	Share on total number in %	Mean number of species per plot	Share on total number in %	Mean number of species per plot	Share on total number in %	Mean number of species per plot	Share on total number in %	Mean number of species per plot	Share on total number in %
Arid grassland										
Species	39,7	-	36,65	-	25,74	-	46,42	-	28,18[a]	-
Red List-species	0,69[a]	1,7	0,77[a]	2,1	0,09[b]	0,4	0,94[a]	2,0	0,08[b]	0,3
Ecological indicator species: oligotropy	16,72[a]	42	6,95	19	8,42[b]	33	23,17	50	9,09[a]	32
Ecological indicator species: nitrogen	3,28[a]	8	7,27[a]	20	3,65	14	1,78	4	4,57	16
Intensively used grassland										
Species	19,29	-	13,52	-	14,7	-	21,83	-	23,83	-
Red List-species	0,02[b]	0,1	0	0,0	0	0,0	0,01[b]	0,1	0,22[b]	0,9
Ecological indicator species: oligotropy	1,23[a]	6	0,16	1	0,2	1	1,66[a]	8	3,85[b]	16
Ecological indicator species: nitrogen	7,37	38	5,03	37	7,06	48	7,73	35	6,42a)	27
Shrub land										
Species	20,65	-	18,67[a]	-	18,41	-	27,16	-	22,4	-
Red List-species	0,14[b]	0,7	0,22[b]	1,2	0,05[b]	0,3	0,07[b]	0,3	0	0,0
Ecological indicator species: oligotropy	2,1	10	1,44[a]	8	1,44[b]	8	4,22[a]	16	2,62[a]	12
Ecological indicator species: nitrogen	6,71	33	5,28	28	7,22	39	9,46	35	8,15	36

*) CORINE-agricultural area in 4 land classes of Brandenburg, Berlin and Thuringia.
a) Standard error (relative) between 15% and 35%.
b) Standard error (relative) 35% and more.

40. As for the different biotope types examined arid grassland is characterized by the highest share of oligotrophy indicator species (42%) and the lowest share of nitrogen indicator species (8%). Most clearly this fact is to be seen in low mountain ranges on poor clay, clay and sandstone where oligotrophy indicator species have a share of 50% and nitrogen indicator species only of 4%. Oppositely intensively used grassland has the highest share of nitrogen indicator species (38%) and the lowest share of oligotrophy indicator species (6%). Only in Palaeozoic low mountain ranges the highest share of nitrogen indicator species (36%) and at the same time the lowest share of oligotrophy indicator species (12%) is not achieved in intensively used grassland but in shrub land. Comparing the different land classes it is obvious that the oligotrophy indicator species mainly concentrate on low mountain ranges, whereas the highest shares of nitrogen indicator species (except for arid grassland) are to be found in the *Gäuflächen* on loess.

41. First experiences of the pilot study show that there are indicators which seem to be not quite suitable, e.g. evenness (which does not differentiate in a sufficient way) or the hight and the coverage of the stock strata (which are not measurable exactly). Nevertheless further tests will give additional information.

4.3 Methodology and indicators for covering the fauna

42. For the faunistic study, **groups of species** were selected on the basis of a catalogue of criteria (indicator value, time required for investigation, feasibility, acceptance). Among the invertebrates, these groups are butterflies, dragonflies, locusts, ground beetles and water molluscs, while among vertebrates the birds and amphibia were chosen. For every group of species, the sample area is standardised (as a plot or transsect[4]). Observation is performed either for the entire sample area of level I (transsect for birds and butterflies) or only in specific biotope types. For every group of species, landscape survey forms were developed.

43. **Indicators** under consideration are, among others:

- total number of species in the plots/biotope type or in the sample unit;
- share of rare species or species included in the Red List in the sample units;
- share of species by ecological types of requirement patterns ("stenök"/"euryök" to induce ranges of variation of environmental factors, stenotopic/eurytopic to characterise the similarity of habitats, species preferring specific temperatures or humidities).

44. Due to financial aspects it seemed to be convenient to divide the fauna programme into several steps which could be carried out according to funds available. A first proposition was performed by experts of the Federal Office of Nature Conservation. The first step consists of the coverage of birds in the sample units of level I and of locusts in several grassland types. As with flora and landscape, the follow-up period here is five years, with different numbers of runs in the year of observation, depending on the group of species.

5. Outlook

45. The results shown as examples will certainly not provide enough differentiation for many interesting issues. Although it would be possible also as part of the pilot study to obtain results for other survey characteristics, providing tables with a more detailed breakdown, the random error caused by the small sample size would in some cases reach a dimension that would involve a considerable risk of overinterpreting the results. A routine EAS main survey for the representation of trends would have to include forest and land cover types close to nature rather than being limited to the CORINE agricultural area; due to a larger sample size and the inclusion of the other land cover types, a considerable reduction of errors would be expected[5]. Thus a main survey for Germany would provide a more comprehensive and more differentiated programme which nevertheless could be evaluated with a justifiable degree of errors. Also, it would be possible to include in that programme additional survey contents (e.g. with regard to the fauna) and more comprehensive evaluations (e.g. regarding the relation of different survey contents such as the

[4] Transsect: Precisely defined path through a sample area along which the species are recorded in a previously defined manner.

[5] First, there are still considerable random errors at present with regard to information on biotope types which occur mainly outside the CORINE agricultural area (e.g. forest). Second, in the case of areas continuously monitored, the errors of estimation occurring during trend estimation are clearly smaller than for stocktaking at a specific point in time.

fauna of birds in relation to the structural diversity of the landscape). Despite its focus on methodological aspects, the pilot study successfully demonstrated by means of examples the possible information value also in terms of contents and the potential of the EAS to provide highly important information on ecological structural situations which so far has not been available in Germany. In the following, the experiences of the pilot study will lead to a concept for a main survey. Although this concept is widely accepted financial aspects and the timing for the survey remain to be cleared.

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Material Flow Analysis in the framework of environmental economic accounting in Germany

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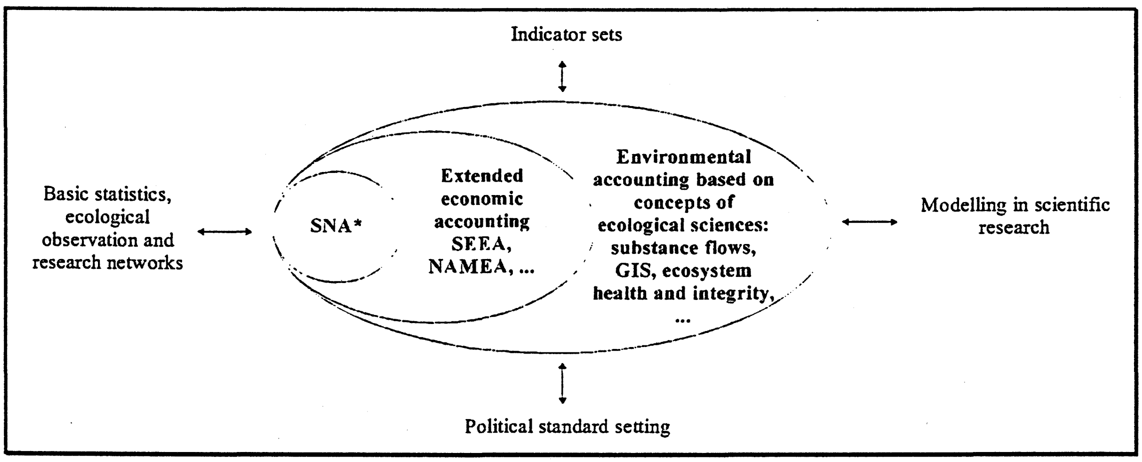
1 The German Environmental Economic Accounting

1.1 The menu of environment statistics

Before we will outline the concept of the German Environmental Economic Accounting it is useful to remember the specific role of statistics and accounting towards sustainable development. Statistics and accounting provide quantitative (ex post) models of the actual situation. Their task is neither to set standards or political targets nor to simulate future or hypothetical situations. Hence, there is a need for a close co-operation between statistics, scientific research and the political setting of standards. Furthermore, there are two working areas in the close neighbourhood of accounting which must be well co-ordinated with accounting activities and frameworks: basic statistics and indicators. In particular with respect to the very limited financial and personal capacities it seems to be unacceptable that double work would be done in the development of basic statistical systems and indicator sets. Basic statistics, indicators and accounting provide information for different uses. Their quality profiles (accuracy, up-to-dateness and level of detail) have to be different, accordingly. Different user groups and user needs require a menu of statistical data which observe one specific item from selected angles. Nevertheless, accounting can and should be used as a tool to improve consistency and performance of the production and analysis of statistical figures in general. Keeping these conditions in mind, it seems to be meaningful to distinguish between a narrow set of environmental accounts, being in line with the main concepts and formal rules of national accounting, and a set of tables, accounts or even maps which are more loosely linked (via identical classifications, accounting units, etc.) to the System of National Accounts (SNA). The SNA itself should integrate those environmental goods which are of short-term and national economic interest (in figure 1 this is indicated by an asterisk).

Figure 1: Scope and context of environmental accounting



It is obvious that this proposal is in so far different from the actual SEEA handbook (United Nations 1993) as it underlines the limitations in providing answers to environmental problems from the very beginning. A consequence of this is to deny the existence of an "Eco-Domestic Product" which is meaningful, descriptive and comprehensive. Being less ambitious concerning the endogenous monetarisation of environmental elements this approach emphasises the major role that accounting is able to play as part of decision processes. It opens the door for complementary modules where the SEEA - being closely linked to economic accounting - has limitations. Those shortcomings are, in particular, the dominance of the national scale (global or regional issues can rarely be integrated), qualitative changes (biodiversity, etc.) and changes in distributions (e.g. spatial restructuring).

1.2 The framework for Environmental Economic Accounting

Based on these theoretical fundaments the German Federal Statistical Office has developed the framework for a "Green" Accounting System (Radermacher/Schäfer/Seibel 1995; Radermacher 1996; Radermacher/Stahmer 1996). The objective is to add meaningful modules to the traditional System of National Accounts which are designed to quantify the external (environmental) effects of economic activities. Figure 2 describes the different modules and there relation to decision making and target setting.

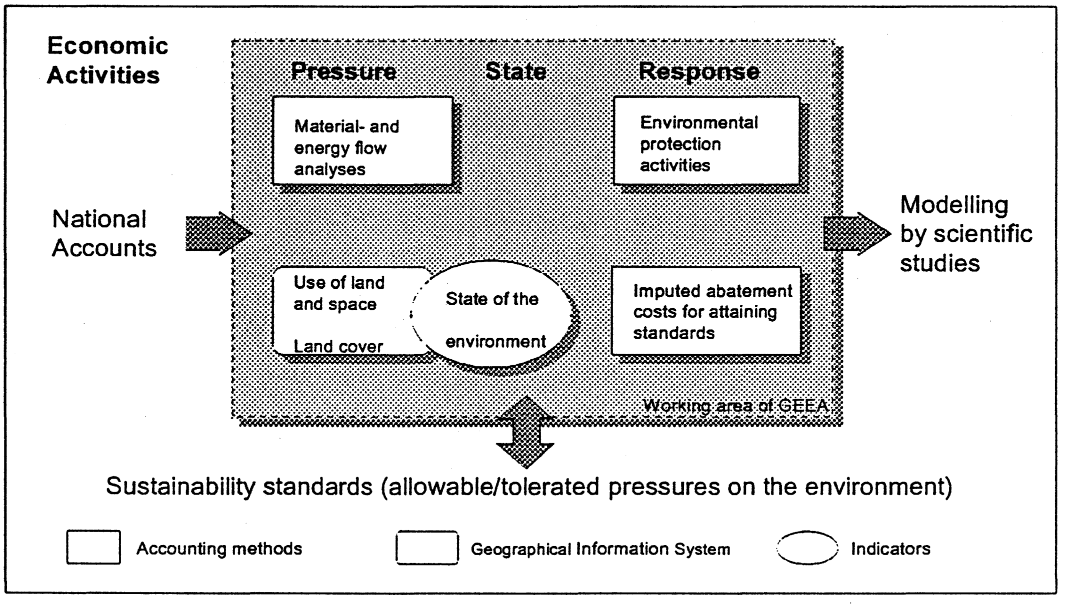
In Germany, the collection and evaluation of environment related data has already a long tradition. Basic environment statistics (waste, water and environmental expenditures) have been carried out since the early seventies (Baltes/Nowak 1974). Geographical information systems and remote sensing are applied for land cover/use statistics since about ten years (Radermacher 1993). The concepts of satellite systems in the field of environmental accounting have been developed by accountants of the Federal Statistical Office in the eighties. Since 1989, there has been a special division for "German Environmental Economic Accounting (GEEA)" in the department for economic and environmental statistics (Radermacher/Stahmer 1994). This new division is now responsible for the whole field of integrated economic and environmental accounting. Nevertheless, work on satellite systems has been continued in the department of national accounts. This work has now become an integral part of the GEEA. On the other hand, other types of information and adequate methods of evaluation and aggregation are considered in the GEEA, too. The framework could already be realised and published to an extend that is relevant for actual policy making in Germany. However, the questions of aggregation and evaluation are in a stage that is still characterised by research and development.

1.3 Methodological concept

The calculation of depreciation for nature capital involves numerous methodological problems (problems of valuation/aggregation, limited knowledge of cause-effect relations, and great regional differences). For this reason, we must not expect too much of such a calculation. It would certainly be wishful thinking to believe that such a calculation could provide one single objective and indisputable depreciation value in DM terms from which a sound, sustainable growth of the national income could in turn be derived. It would be realistic instead to expect that in a gradual process of setting up such a system, the data actually measured, collected or observed would first be processed in an adequate manner, and then condensed further by means of standardised valuation procedures. It still remains to be seen to what extent such a condensation will be useful, and whether a valuation in money terms will be completely successful.

For this reason, Environmental-Economic Accounting has been set up in such a way as to provide answers to questions of economic and environmental policy at every stage on the way to the final system. For evaluating the efficiency of natural resource handling within the framework of structural and environmental policy, it is of fundamental importance to know how the use of raw materials, energy and land changes within the sectors of the economy over time, and what, in contrast, the emissions into the natural environment are. Highly aggregated indices of the state of the environment indicate qualitative changes in a standardised form and reflect the effects and benefits side of environmental protection measures. The costs side and the current burden on the economy is recorded for environmental protection activities which are actually being carried out. Abatement costs of additional preventive measures complete the picture, helping to weigh different "standards" (target values) for individual serious pressure factors against each other and to decide in favour of one of them. The following figure 2 presents the complete concept of the German Environmental-Economic Accounting:

Figure 2: German Environmental Economic Accounting



The following five subjects are covered by the German Environmental-Economic Accounting:

1. Material and energy flow analyses, raw material consumption, emission structure
2. Use of land and space
3. State of the environment
4. Environmental protection activities, capital formation, expenditures
5. Imputed abatement costs for attaining sustainability standards

As indicated by the different symbols, the various subject fields are characterized by their own specific methods: In subject fields 1, 4, and 5, methods of economic statistics and accounting are used to balance the material flows caused by the economic sectors and the environmental protection activities taken. Subject field 2 deals with immaterial pressures arising from a modified distribution of land uses, physical intervention, etc; the methodological instruments used are remote sensing and geo information systems. In subject field 3, the objective basically is to condense measuring and monitoring data, which are available in an isolated form, both with regard to space and contents, so as to provide suitable indicators; on the basis of subject field 2, an area sample is prepared which aims at the production of ecoindicators/ecoindices. The entire working area of Environmental-Economic Accounting does not include the setting of standards. For establishing such standards, however, information from Environmental-Economic Accounting explicitly aims at providing factual data, where available, on costs and benefits of alternative standard values for the process of political decision-making.

2 Material and energy flow accounting in Germany

2.1 Conception and Progress

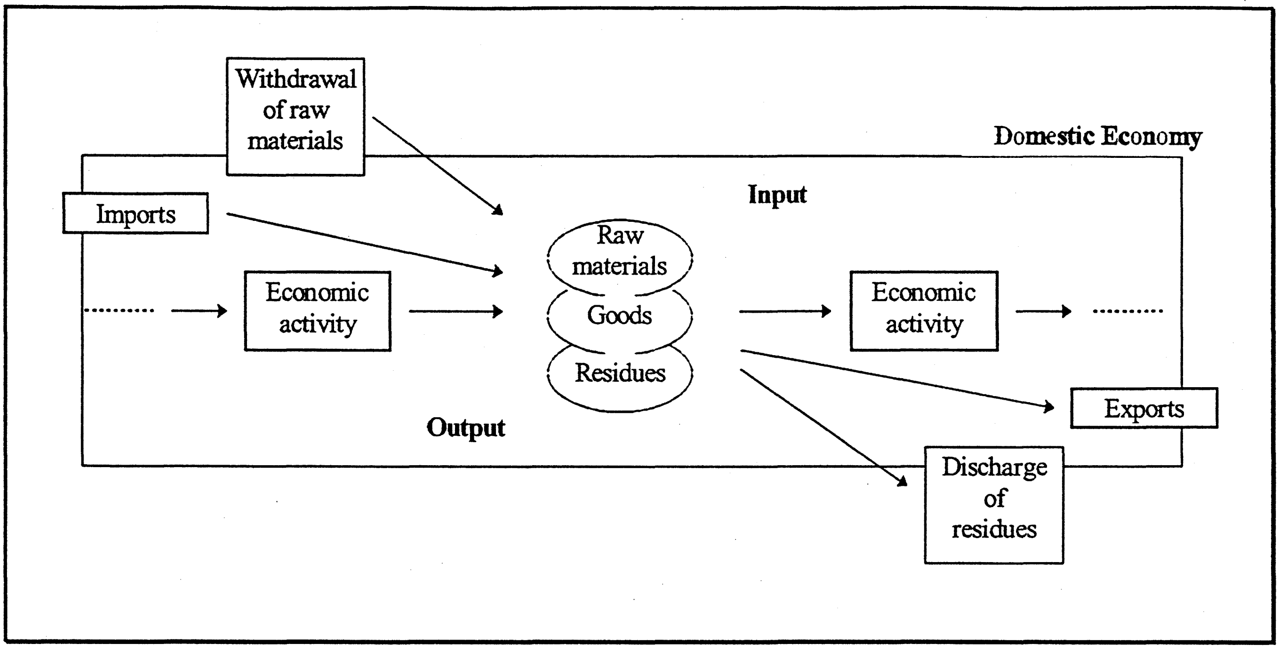
As a methodological part of GEEA, the material and energy flow analyses uses the natural sciences as a background to enlarge the material flow concept of the economy into the "industrial metabolism" (see BACCINI, P., BRUNNER, P. 1991; AYRES, R.U., SIMONIS, U.E. 1994; STRASSERT 1991 and 1996).

Characteristics of the concept are (see Figure 3):

- Nature is taken into account by putting an additional asset/stock account both on the input and the output side of the system of national accounts;
- The border between the economy and nature is defined explicitly: raw materials are extracted from the nature and residues are discharged into the nature;
- The vector of goods and services in the system of national accounts is supplemented by raw materials and residues;
- The material and energy flows within the system borders (e.g. domestic economy, activities of production and consumption, technical processes) are calculated by taking the law of conservation of material and energy into account.

Within the system borderlines raw materials (material and energy) will be transformed into products or groups of products and environmental burdens e.g. air emissions, waste and waste water. Depending on the system borderlines, economic activities can be interpreted as a technical network aiming at the production of goods and services. In relation to GEEA, it is relevant to cover the material and energy flows caused by activities of the domestic economy (RADERMACHER, W., STAHMER, C. 1996).

Figure 3: Material flow through the domestic economy



The results of material and energy flow accounts in Germany are based on previous work e.g. the investigation of the consumption of raw materials (RADERMACHER, W., HÖH, H. 1993) and the emission structure of air emissions for branches (THOMAS, J. 1996 u. 1993). They are preliminary comprised in the publications of material and energy flow accounts (e.g. StBA 1995a).

Table 1 shows the material flow accounts 1960, 1990 and 1995 for Germany, which represents the withdrawal and the discharge of materials in total. Detailed information of the environmental-economic trends for the former territory in both years can be gathered from the publication from KUHN, M., RADERMACHER, W., STAHMER, C. (1994). Such expression of material flow accounts is also published regularly in the Statistical Yearbook of the German Federal Statistical Office (e.g. StBA 1998). With a similar approach the resource flows for four important industrialised countries (Germany, Japan, the Netherlands and the United States of America) was recently published (see WRI et al. 1997), which opens the possibility to compare the material flows in those countries.

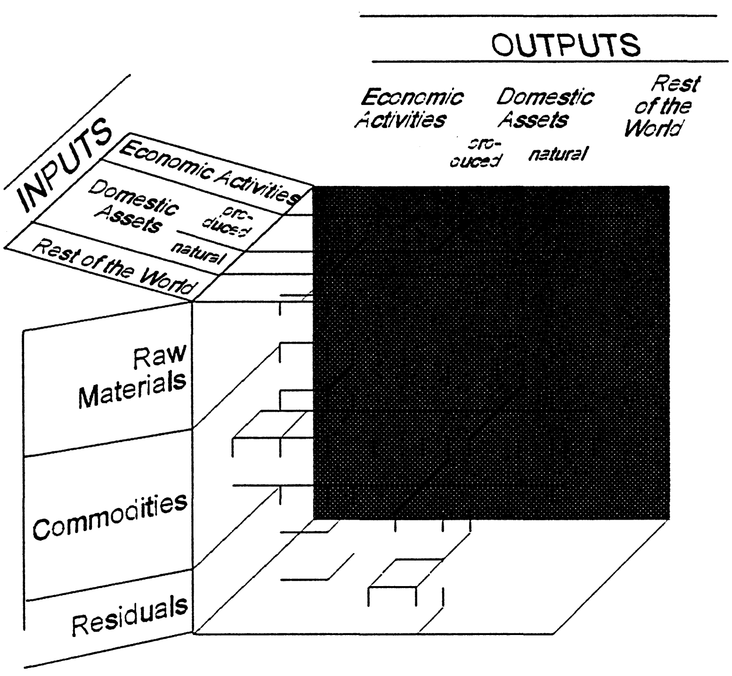
Furthermore the first Physical Input-Output-Table (PIOT) for 1990 has been set up which brings together the material accounts of the domestic economy e.g. raw materials extraction, flows of commodities in the production and consumption activities, and discharge of residuals (air emissions, waste and waste water) into the nature (STAHMER, C., KUHN, M., BRAUN, N. 1997). In this account the activities of the domestic economy (former territory of the Federal Republic) are divided into 58 branches of production, an additional branch of environmental protection activities (included recycling) and consumption activities of private households. The tables also show in physical units the inputs and outputs of gross fixed capital formation (equipment and construction), stocks and nature. The nature serves the domestic economy with raw materials and at the same time absorbs residues from the economic activities. The material flows are broken down by nine types of raw materials, 49 groups of commodities and eleven sorts of residues.

On the basis of the work mentioned above, two targets were developed for the next steps: first improving the data on waste and waste water and second bringing together all the results of material and energy flows into a Material and Energy Flow Information System (MEFIS).

2.2 Material and Energy Flow Information System

The basic structure of MEFIS is a virtual cube (Figure 4) which shows the material and energy flows on the basis of the scheme of the Physical Input-Output-Table (PIOT) (see AGME 1997). The horizontal face of the cube describes a matrix of economic activities of the domestic economy, change in capital and in nature and the rest of the world as well. The vertical axis of the cube shows the types of materials, which were divided into raw materials, commodities and residues. Every horizontal face of the cube gives a description of a specific material flow within the mentioned areas of the matrix.

Figure 4: The MEFIS Cube



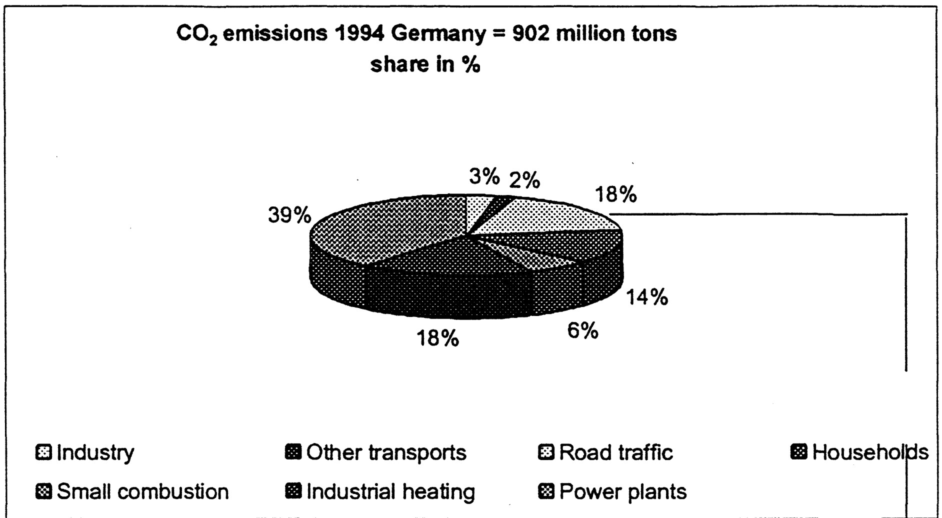
Federal Statistical Office, Germany 1997

One of the targets which have to be achieved in MEFIS is to improve the material flows which were captured by PIOT 1990. This can be obtained by improving the breakdown of material types and by linking raw materials, commodities and residues.

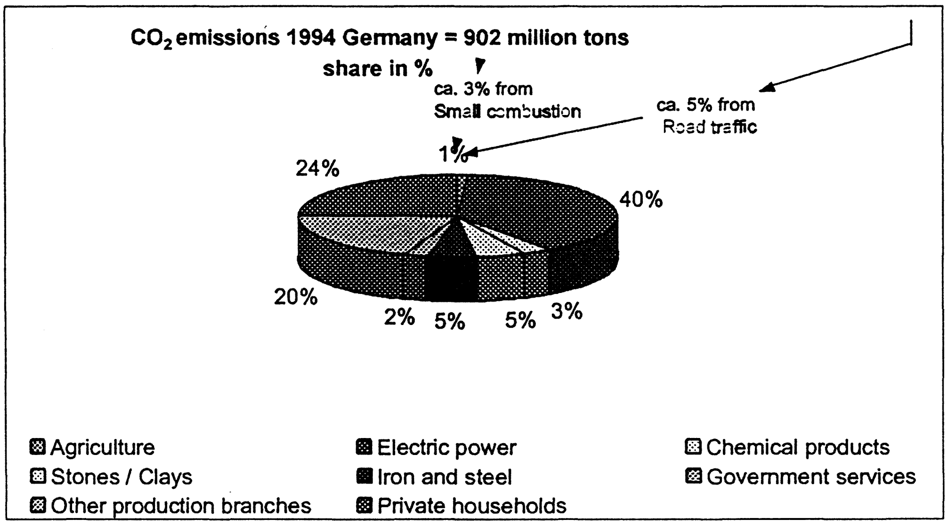
The economic activities in the material and energy flow accounts are classified according to the functional delimitation of branches as applied in the German System of National Accounts. A branch is defined as the totality of all homogeneous production units producing a commodity within a commodity group (StBA 1995). From the aspect of Environmental Economic Accounting, the classification of the economic activities by branches thus provides the connection between the economic data and the data on residues or environmental burdens. At the same time, this functional classification is the prerequisite for investigating the economic linkages by means of the input-output analysis, e.g. investigation of the cumulative environmental burdens for consumption. So, the environmental burdens (e.g. air emissions) determined with a breakdown by branches are completely different from those which are calculated on the basis of the emission sources. The first one are orientated towards activities, while the second one are orientated towards the emission sources, without taking account of direct linkage with economic activities, e.g. the production and consumption of commodities. The determination of environmental burdens on the basis of emission sources thus represents the principle that the party causing burdens is liable for the damages (cf. StBA 1997a). Figure 5 shows the differences of the results of this approach for CO_2 air emissions as an example.

From the aspect of environmental policies, this means that the analysis of environmental burdens and environmental protection activities are thus not limited to technical and regulatory bases, e.g. using the "end-of-pipe" technology and tightening the threshold limit values of emissions. Environmental economic accounting opens up the possibility to analyse the environmental burdens on the basis of economical activities, e.g. the production or consumption of commodities.

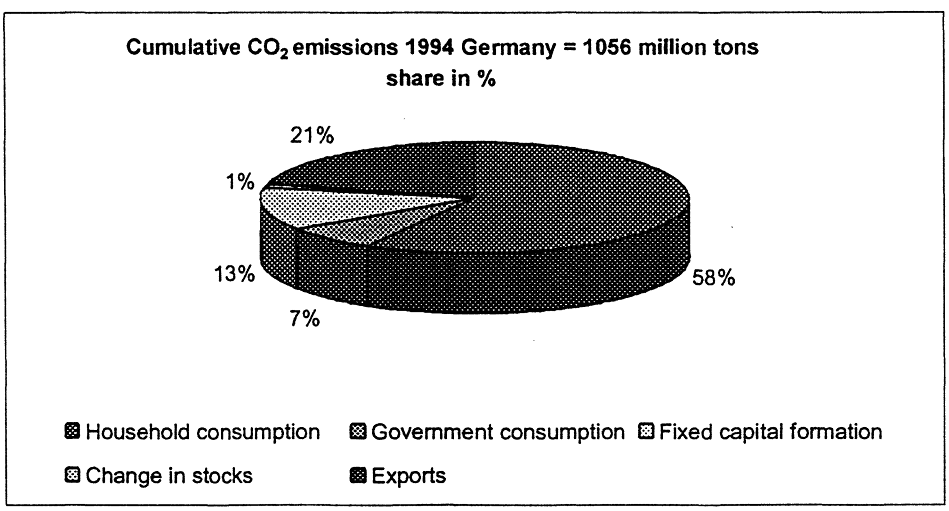
Figure 5: Origin of CO_2 emissions according to emitter groups



Allocation of CO_2 emissions according to production branches



Distribution of cumulative CO_2 emissions according to final consumptions



2.3 *Further Considerations*

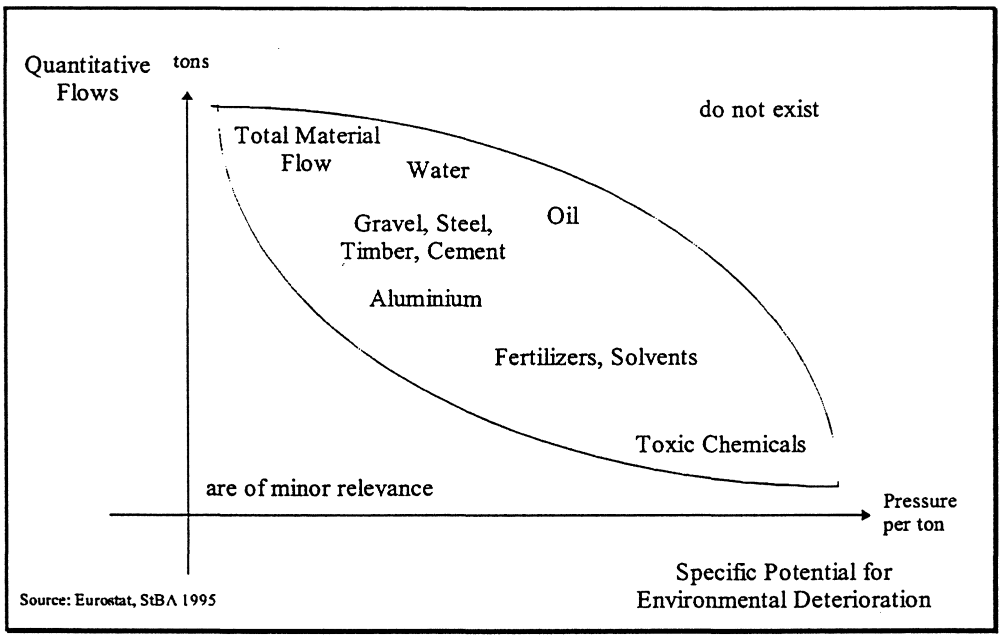
The German approach which has started with the "Emitter-Structure" (polluting substances in a breakdown of economic branches) meanwhile has integrated further demands from another group of users. Stimulated by the recent discussion in Germany (see e.g. SCHMIDT-BLEEK 1994) and Austria (see e.g. FISCHER KOWALSKI et al. 1997) it became clear that a set of pure 'reductionistic' indicators which measure specific impacts at the output side of the economy is not sufficient as decision support for a preventive environmental policy. A more 'holistic' view is needed enabling us to describe the 'physical reality' of economic activities as part of their natural environment in order to improve the understanding of material/energy flows in connection with the production of goods and services. These analytical goals require a higher degree of integration and consistency (in a physical sense). Hence, it was necessary to adjust the methods of material flow analysis which so far had been developed and used for single products / substances (a micro-economic perspective) for an application in a macro-economic context. An adjustment is needed, since it is by no means possible to quantify all material flows of an entire economy with the same degree of detail as in substance flow accounting. A specific quality mix of information has to be determined. In this context it is convenient to distinguish five broad sets of considerations which are interlocking:

- scientific adequacy: do the description and evaluation methods deal well with the important features of the natural world and its characteristic processes of change?
- social adequacy: do the methods furnish information in ways that respond to stake-holders' needs and that support social processes of decisionmaking?
- economic rationality: do the suggested courses of action that emerge from the valuation process respect economic efficiency, in the sense of appearing to be a reasonably cost-effective way of arriving at the envisaged outcome?
- statistical adequacy: are the empirical measurement and subsequent aggregation procedures consistent with the guiding theoretical precepts, and do they conform to norms of reliability, coverage or representativeness?
- budgetary realism: can the proposed approaches be expected to yield reliable and useful information (judged in terms of the four sets of considerations above) within the limits on resources that can be committed to the research?

The bringing together of scientific, social, and economic considerations in real time is a process in which a lot of decisions have to be taken with respect to the concrete specification of an accounting system.

Two examples may exemplify this: First, it has to be decided how to deal with a very complex reality. I.e., how to reduce and to simplify complexity in order to achieve measurability? Material flows through an economy is a complex matter as it implies multiple hierarchical scales which can be taken as reference points for an observation (scales of economic units, scales of regions, scales of substances, etc.). Even if we decide to account only for flows through the total economy and the entire national territory we would still have to determine which materials or substances have to be integrated. This is depending on the selection criteria which again are a function of a widespread understanding of environmental relevance. In Germany it has been decided to follow a top-down-approach, starting from the totals of material and energy flows and then trying to distinguish those flows as far as possible with respect to their economic, environmental and regional relevance (see figure 6).

Figure 6: Scales of Material and Substance Flows



Secondly, the borderlines of the accounting system have to be defined. We have decided to delimit the system 'economy' in correspondence to the physical flows. That means that a flow between two economic activities is part of the economy even if this flow has no economic value (e.g. the discharge of sewage water into the drainage system).

3 Availability of data on environmental burdens

As part of the material and energy flow accounts, three types of environmental burdens are examined on the output side: air emissions, waste and waste water. The calculation method for air emissions is based on the energy balance, which is compiled by the working group " energy balance", and on the technical emission factors determined by the German Federal Environment Agency (UBA). This method is largely standardised. Compared to that, the method to calculate the amount of waste and waste water is in the development stage, and it was used for setting up the first Physical Input-Output-Table in Germany. Basic data for this method are mainly the statistics of the German Federal Statistical Office; the statistical data on waste and waste water are collected as a rule every three and four years, respectively. Because of the different times of collection it is at the moment not possible to show the material flows in all the three areas of environmental burdens for the same year. In this context a method to assess the amount of waste and waste water for a specific year or in a time series has to be developed. A corresponding study on waste is carried out at the moment; the result of this study should make it possible to assess the amount of waste in various categories.

In table 2 the following types of direct and cumulative air emissions were calculated for the most important branches and the private households for 1994 (Germany): nitrogen oxide NO_x, sulphur dioxide SO_2, carbon dioxide CO_2 , methane CH_4, dinitrogen oxide N_2O, carbon monoxide CO, particulate matter and NMVOC (non methane volatile organic compounds). The cumulative emissions are calculated as the sum of direct and indirect emissions. The investigated emissions from the processes are the direct result of a specific economic activity of a branch, and therefore they are defined as direct emissions. The emissions resulting from the domestic or foreign production of intermediate goods (included is also the purchase of electricity from suppliers) are defined as indirect emissions (StBA 1997a).

4 Results of the material flow analysis for the GEEA press conference

The GEEA press conference 1998 of the Federal Statistical Office dealt with the questions of how productively we are using nature in Germany, how that productivity performs when compared with that of labour and capital, and what the development has been like over the last few years. Here are the key answers:

- Over the last 35 years, rationalization and technical progress in Germany have reduced the production factor "labour" much more than the factor "nature" (in some cases, labour was even entirely replaced).
- For the first time, the use of the production factor "nature", was measured in a rather differentiated manner through GEEA. A "Natur productivity" was calculated as the ratio of economic performance (measured by gross domestic product) to the volume of natural resources used. In 1995, the productivity of energy use was 31% higher than in 1960, while that of water use increased 36% and

that of raw materials 49%. However, labour productivity rose by 207% in the same period, that is it more than tripled. Due to the increasing use of fixed capital in production, capital productivity fell 44%.

- With regard to the use of nature as a sink for residuals and pollutants, nature productivity between 1960 and 1995 showed different trends: For greenhouse gases, productivity doubled, for acidification gases it almost quadrupled, while for waste it rose nearly 70%, and for waste water it increased almost 20%.
- Those responsible for environmental loads are not only production industries but also, and to a considerable extent, households. Household consumption (heating of buildings and private transport) caused direct discharges of some 227 million t of greenhouse gases into the environment in 1994. In addition, households were indirectly responsible for emissions of 2.5 times that amount, that is another 560 million t, which were generated by the production of all the goods demanded by households. The total greenhouse gas load on the environment that is attributed directly or indirectly to the consumption of households in 1994 amounted to nearly 790 million t, that is about 60% of the German overall load of greenhouse gases.
- Detailed industry profiles show in which economic branches production involves environmental burdens: During the production of goods and services in Germany, some 830 million t of greenhouse gases were released in 1994; more than 40% of them were caused by electricity production in power plants.
- Within the GEEA framework, the Federal Statistical Office used an estimation procedure to determine the total amount of waste produced in 1994 and its distribution among economic groups of generators. All production areas together produced nearly 350 million t of waste. The sectors with the largest shares were construction (over 40% - mainly excavated earth and demolition waste), coal mining (almost 20% - mainly slag), and electricity generation (just under 7%). When interpreting these figures, it should be noted that GEEA focuses on the quantitative aspect, i.e. no differentiation is made between waste categories with different environmental hazards.
- In the field of sewage pollution, GEEA focuses on the quantitative aspect; the development of water quality is not examined. In 1995, production activities generated more than 40 bn m^3 of waste water. Nearly 70% of the total amount were produced by energy supply (almost entirely cooling water), while only one tenth was generated by public waste-water disposal.

5 An example: Environmental indicators for greenhouse effect and acidification

5.1 Method

Environmental indicators are calculated by aggregation of physical pressures within the same category of effects or environmental subjects. Physical flows are aggregated by multiplying them by a equivalence factors of global warming potential. On the basis of the available data on air emissions the indicators of greenhouse gases and acidification are calculated, following the recommendations of the International Panel for Climatic Change IPCC (StBA, 1997a).

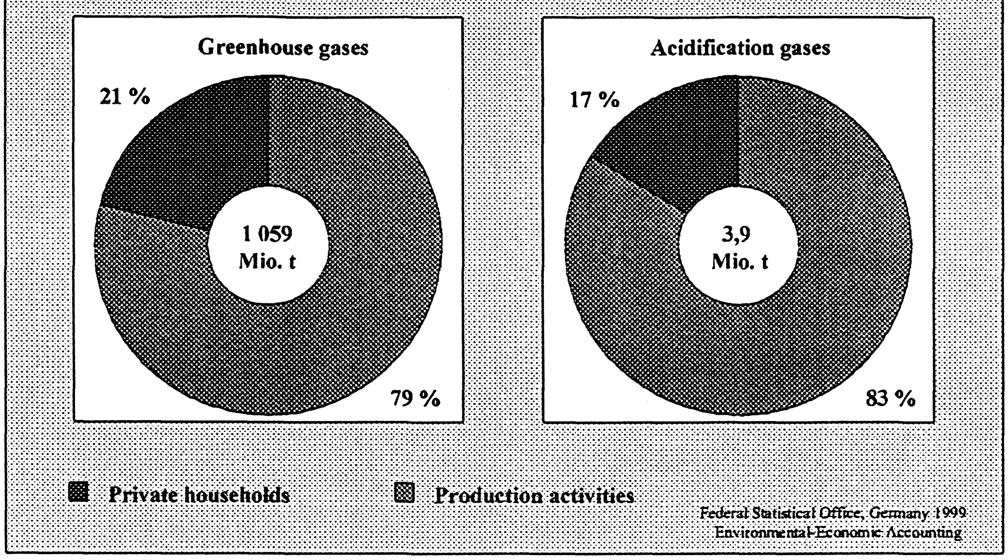
To calculate the indicator of the greenhouse effect, the air emissions of CO_2, N_2O and CH_4 are weighted and aggregated on the basis of $CO_2 = 1$. For example, N_2O emissions receive a weight of 310, and CH_4 emissions a weight of 21, compared to CO_2 emissions. The result is the greenhouse gas emission expressed in CO_2 equivalents. To calculate the indicator of the acidification effect, the air emissions of NO_x and SO_2 are aggregated on the basis of $SO_2 = 1$ by multiplying the quantity of NO_x by the factor 0.7.

5.2 Results for air emissions

The direct air emissions of greenhouse gases and acidification gases as well as their cumulative emissions are presented with the related economic figures of gross value added. The economic figures are taken from the monetary Input-Output Tables (StBA, 1997b).

Regarding the direct emissions, value added are presented (see table 3). Four fifth of the greenhouse gases - with a total amount of more than one billion tonnes - are emitted by production activities. This share is even higher in the case of acidification gases with a total amount of four million tonnes (see figure 7). As shown in the chart, three quarters of the direct emissions of greenhouse gases and acidification gases from all production sectors are caused by just six production sectors. Less than five percent (greenhouse gases) and less than three percent (acidification gases) of the respective air emissions from production activities are emitted from each of the other production sectors.

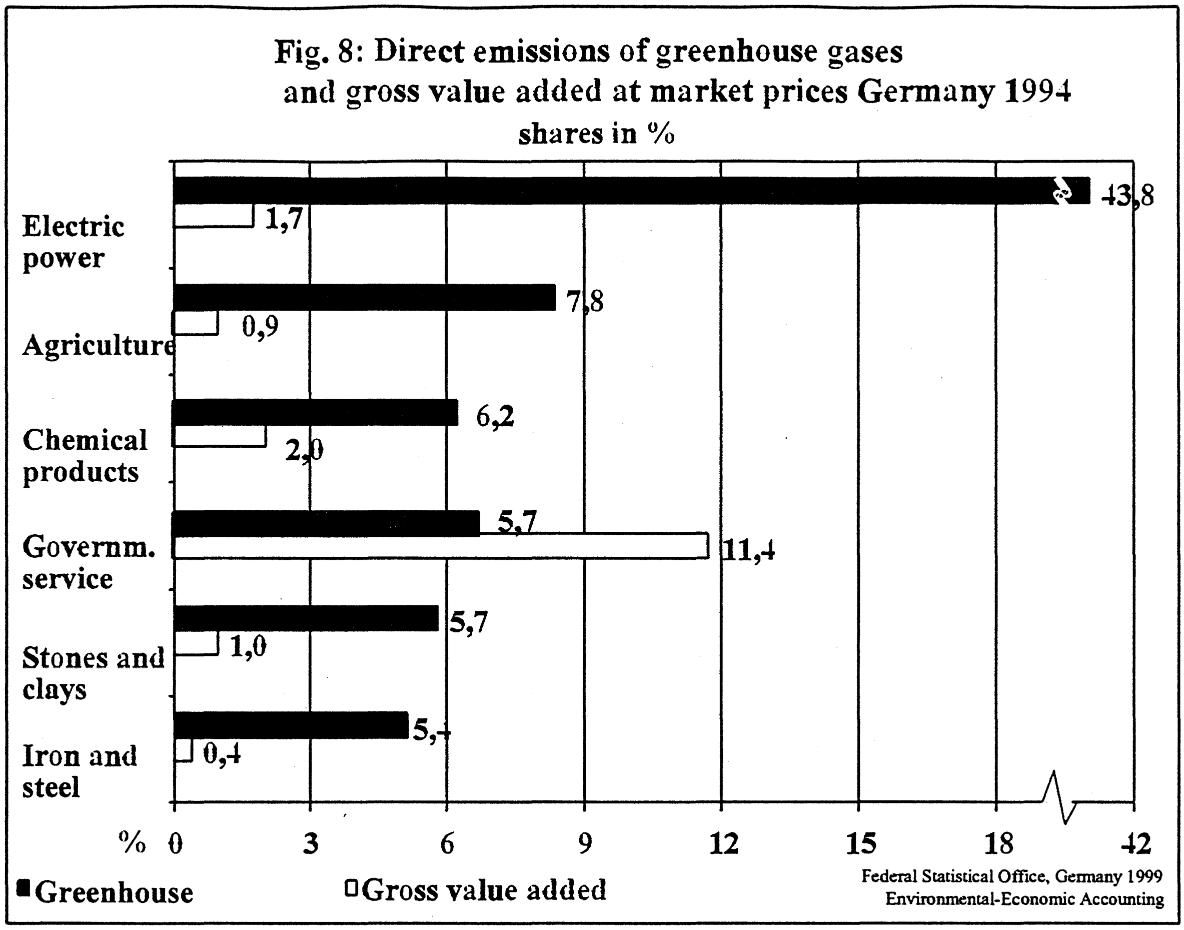
Figure 7: Direct emissions, Germany 1994



Generally, only a few production sectors are responsible for the largest quantities of the direct emissions and so contribute the largest shares to the respective environmental effects (see figures 8). At the same time, the effect of those production sectors on economic performance (value added) is in inverse proportion. The exception to this rule is constituted by the government services. Their share in the emissions is also comparatively high, one of the reasons being their activities in waste disposal and waste water treatment. Their contribution to value added and their share of employed persons exceeds their contribution to the direct greenhouse effect as a result of their main activity being services.

More than 40 % of the greenhouse gases and more than half of the acidification gases are emitted by the electric power sector (including the power plants of energy supply companies, of railroad companies and in the industry). On the other hand, less than 1 % of the persons are employed in the electric power sector and its contribution to value added is less than 2 %. Also remarkable is the contribution of the agricultural sector to the greenhouse effect with more than 8 % of the respective emissions, 2.6 % of the employed persons and only a 1%-share in value added. Those and the other examples mostly refer to sectors that produce important inputs (like electricity, agrarian raw materials) for the further processing in the other sectors.

Due to the economic interconnection, examining only the direct emissions is not sufficient to get a complete idea about the environmental pressure from a sector's air emissions. This is the reason why a second perspective is taken in calculating cumulative emissions that already arise with the production of the inputs of a sector (see table 4).



The order of the most important emitters of cumulative emissions differs clearly from that of the direct emissions. Due to its large share of direct emissions and in spite of its small share of indirect emissions, the electric power sector is still in the first place. The following positions are mostly occupied by sectors with high inputs of intermediate goods.

The relation between direct and indirect emissions differs widely, comparing the production sectors. As a rule, in the primary industries the direct emissions are dominant, in the processing industries and in the service sectors the indirect emissions are prevailing, which is due to the relatively high inputs of intermediate goods, for example electricity.

Examples are the electric power sector, where the cumulative emissions of greenhouse gases are only 10 % higher, or agriculture, where they are less than 20 % higher than the direct emissions. On the other hand, the cumulative emissions of the food products sector are nine times, and those of the building sector even ten times higher than the direct emissions.

The additional information about the cumulative emissions gives a good idea of the emissions caused totally by the production of a certain group of goods. It allows also to draw conclusions about the total emissions caused by the respective demand. Also, indications can be derived about the production sectors with the highest potentials to avoid emissions and the best chances for the application of avoiding techniques and strategies.

Table 1: Material flow account 1)

million tons

Materials	1960	1990	1995	Materials	1960	1990	1995
	Former territory of the Federal Republic		Germany		Former territory of the Federal Republic		Germany
Withdrawal				**Discharge**			
				Solids, fuels 2)			
Raw material withdrawal	1,253	2,072	3,501	Material application	227	252	283
Raw materials, extraction used	780	995	1,368	Fertilizer	226	251	282
Biotic raw material	133	188	198	Farm manure	224	246	277
Abiotic raw material	647	807	1,171	Commercial fertilizer (nutrient)	3	5	5
Fuel	248	193	266	Pesticides (active substances)	0.01	0.03	0.03
Other	399	614	905	Sewage sludge	0.7	0.9	1.2
Not used raw materials, extraction				Not used raw materials, extraction			
(incl. soil excavation,				(incl. flate)	415	982	1,989
excavated materials a. rubble)	474	1,077	2,133				
Imported goods	136	387	464	Exported goods	75	207	225
Biotic goods	25	65	69	Biotic goods	6	46	60
Abiotic goods	110	323	395	Abiotic goods	70	160	165
				Waste (incl. soil excavation, rubble)	113	164	194
Recycling	16	58	76	Recycling	16	58	76
Total	1,405	2,517	4,041	Total	846	1,661	2,768
Oxygen consumption and air pollutants							
Oxygen input				Air Emissions	568	717	914
processes (CO2; CO)	409	533	651	Carbon dioxide	555	707	895
				Carbon monoxide	9.8	7.4	6.9
				Nitrogen dioxide	1.6	2.0	1.9
				Sulphur dioxide	3.3	0.9	2.1
Total	1,814	3,050	4,900	Total	1,414	2,378	3,682
				Balance (material retained)	400	672	1,218

1) Discrepancies in totals by rounding of figures.

2) Including useful gases and certain liquid materials.

Table 2: Air emissions (direct and cumulative) of the most important branches in Germany 1994

No.	Branches	Carbondioxide CO_2			Carbonmonoxide CO			Sulphurdioxide SO_2			Nitrogenoxide NO_x			Particulate matter			Methane CH_4			Distickstoffoxide N_2O			NMVOC		
		direct	cumulative 1)		direct	cumulative 1)		direct	cumulative 1)		direct	cumulative 1)		direct	cumulative 1)		direct	cumulative 1)		direct	cumulative 1)		direct	cumulative 1)	
		1000 t	1000 t	direct =100	1000 t	1000 t	direct =100	1000 t	1000 t	direct =100	1000 t	1000 t	direct =100	1000 t	1000 t	direct =100	1000 t	1000 t	direct =100	1000 t	1000 t	direct =100	1000 t	1000 t	direct =100
1	Agriculture	8,967	19,223	214	113	144	128	12	52	424	75	97	130	119	128	108	1,693	1,789	106	61	65	107	41	58	142
2	Electric power, steam, hot water supply	353,553	376,200	106	126	166	133	1,720	1,803	105	344	382	111	43	53	121	7	361	5,537	13	43	340	8	44	580
3	Coal mining	8,974	18,529	206	26	43	166	64	106	167	17	29	173	102	106	104	812	835	103	0	1	360	2	7	285
4	Man. of chemical products, (incl. nuclear fuel)	25,237	67,824	269	19	102	544	87	275	317	43	109	256	8	31	368	1	206	18,720	81	86	105	69	99	144
5	Man. of refined petroleum products.....	17,844	33,473	188	66	91	137	59	176	297	26	48	189	1	6	484	5	302	5,588	1	2	371	142	150	105
6	Quarr. of stones and clays, man. of building and const. material..	46,139	58,017	126	209	244	117	45	95	210	100	121	121	24	34	141	3	77	2,792	1	3	294	17	28	165
7	Man. of iron and steel.......................	43,882	64,084	146	955	989	104	53	146	276	40	70	174	59	87	146	3	206	7,455	1	2	295	6	14	238
8	Man. of electr. machin., equip., applian...	3,362	30,734	914	20	159	816	4	102	2,828	9	60	676	1	18	2,600	0	84	21,555	0	5	5,039	6	31	520
9	Man. of food products (excl. beverages).............................	12,686	48,598	383	28	213	753	28	142	514	31	163	527	12	133	1,154	1	1,627	182,811	0	60	14,835	30	105	351
10	Construction (excl.install.&build.compl.)	6,167	69,292	1,124	78	414	529	8	140	1,691	44	181	408	5	46	844	2	138	9,102	0	6	2,115	26	76	289
11	Wholesale trade, etc., recovery..	12,165	22,098	182	99	126	127	10	50	501	95	115	121	7	12	165	2	50	3,121	0	2	379	44	59	136
12	Retail trade.......................................	11,538	39,990	347	127	174	137	7	134	1,929	48	87	184	3	14	482	2	87	3,802	0	3	678	39	61	157
13	Transport activities n.e.c.................	28,622	42,094	147	166	223	134	20	71	357	242	268	110	18	26	142	2	80	4,986	1	3	320	79	108	136
14	Other market service activities	8,011	35,196	439	172	272	158	4	98	2,427	35	96	272	2	21	1,284	3	180	6,137	0	11	3,293	49	97	199
15	Central and local goverment	22,370	66,484	297	93	218	235	22	196	874	51	128	254	4	29	724	1,044	1,250	120	7	15	219	23	84	370
16	Rest of branches..............................	71,523	X	X	433	X	X	129	X	X	210	X	X	31	X	X	363	X	X	2	X	X	535	X	X
17	All of branches................................	681,040	X	X	2,728	X	X	2,272	X	X	1,409	X	X	441	X	X	3,941	X	X	170	X	X	1,116	X	X
	final consumption:																								
18	Private households...........................	220,899	X	X	4,446	X	X	217	X	X	634	X	X	71	X	X	156	X	X	8	X	X	1,006	X	X
19	All of branches and private households..................	901,939	X	X	7,174	X	X	2,490	X	X	2,044	X	X	511	X	X	4,097	X	X	178	X	X	2,122	X	X

1) Cumulative emissions are calculated as the sum of direct and indirect emissions

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Table 3: Direct emissions of greenhouse gases and acidification gases and gross value added (at market prices) 1994

Row No.	Branches	Emissions of greenhouse gases [1]		Emissions of Acidification gases [1]		Gross value added
		1000 T	%	1000 T	%	%
1	Agriculture	69.925	8,41	65	1,98	0,91
2	Electic power, steam,					
	hot water supply..	357.793	43,01	1.961	60,17	1,73
3	Coal mining	28.943	3,48	75	2,31	0,24
4	Man. of chemical products,					
	(incl. nuclear fuel)..	51.282	6,16	117	3,59	2,01
5	Man.of refined petroleum products..................	18.169	2,18	77	2,37	1,64
6	Quarr. of stones and clays,					
	man. of building and constr. material............	46.486	5,59	115	3,54	0,99
7	Man of iron and steel..	44.175	5,31	81	2,48	0,38
8	Man. of electr. machin.,equip.&appliances.......	3.405	0,41	10	0,30	2,94
9	Man of food products					
	(excl. beverages)..	12.838	1,54	49	1,51	1,64
10	Construction (excl.install.&build.compl.).........	6.290	0,76	39	1,21	4,16
11	Wholesale trade, etc.,					
	recovery..	12.363	1,49	77	2,35	6,73
12	Retail trade..	11.724	1,41	40	1,23	4,59
13	Transport activities n.e.c..................................	28.997	3,49	190	5,82	2,45
14	Other market service activities.........................	8.187	0,98	29	0,88	14,10
15	Cental and local goverment	50.205	6,03	58	1,78	11,37
16	Rest of branches..	81.135	9,75	276	8,47	44,13
17	All of branches..	831.917	100	3.259	100	100
	final consumption:					
18	Private households..	227.299	X	661	X	
19	All of branches					
	and private households..................................	1.059.216	X	3.920	X	

1) To calculate the greenhouse effect, the air emissions of carbondioxide, dinitrogenoxide and methane are weighted and aggregated. For the calculation of acidification, the air emissions of sulphurdioxide and nitrogenoxide are taken into account.

Table 4: Cumulative emissions of greenhouse gases and acidification gases, 1994

Row No.	Branches	Cumulative[1)] emissions of greenhouse gases[2)]		Cumulative[1)] emissions of acidification gases[2)]	
		1000 t	direct E.=100	1000 t	direct E.=100
1	Agriculture	83.987	120	120	185
2	Electric power, steam, hot water supply..	398.932	111	2.071	106
3	Coal mining	39.257	136	127	168
4	Man. of chemical products, (incl. nuclear fuel)......................................	100.237	195	352	301
5	Man. of refined petroleum products..............	41.576	229	210	272
6	Quarr. of stones and clays, man. of building and constr. material...........	60.727	131	180	156
7	Man. of iron and steel..................................	69.792	158	195	241
8	Man. of electr. machin.,equip.&appliances.....	34.466	1.012	144	1.471
9	Man. of food products (excl. beverages)..	107.782	840	257	520
10	Construction (excl. install.&build.compl.).......	74.484	1.184	267	678
11	Wholesale trade, etc., recovery..	23.926	194	130	170
12	Retail trade..	42.998	367	195	484
13	Transport activities n.e.c...............................	45.133	156	259	136
14	Other market service activities......................	43.037	526	166	574
15	Central and local goverment	102.053	203	286	494
16	Rest of branches...	X	X	X	X
17	All of branches..	X	X	X	X

1) Cumulative emissions are calculated as the sum of direct and indirect emissions.
2) To calculate the greenhouse effect, the air emissions of carbondioxide, dinitrogenoxide and methane are weighted and aggi
For the calculation of acidification, the air emissions of sulphurdioxide and nitrogenoxide are taken into account.

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Physical Input-Output Tables for Germany, 1990

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eurostat

Working Paper No. 2/1998/B/1 19 January 1998

Physical Input-Output Tables for Germany, 1990

Report prepared for DG XI and Eurostat by:

Carsten Stahmer, Michael Kuhn and Norbert Braun
German Federal Statistical Office

Executive summary

The 1990 Physical Input-Output Tables (PIOT) are a **macro-economic activity-based material flow account**, predominantly in tonnes. This makes them a major component of Section 1 "Material and Energy Flow Accounts" of the Federal Statistical Office's **Environmental Economic Accounting (EEA) [Umweltökonomische Gesamtrechnungen (UGR)]**. The PIOT concept is based on the principles of the United Nations "System for Integrated Environmental and Economic Accounting" (**SEEA**) (United Nations 1993) for a physical accounting system (building block B).

In the PIOT, the activities of the **domestic economy** (Federal Republic of Germany prior to unification - the old Länder) are subdivided according to the 58 branches of the German Input-Output Account, an additional branch for external environmental protection services, and the consumption activities of households. Apart from these activities, additions to and reductions of domestic tangible assets and foreign trade are also described in tonnes. The stock of tangible assets itself is not shown. The most significant addition as compared with the monetary Input-Output Table is the inclusion of nature as a source of raw materials and a sink for residuals. **Non-produced natural assets** provide the economy with raw materials in the form of water, oxygen, mineral resources, etc. and have to absorb such residuals as waste water, air emissions and waste.

The PIOT show the inputs (uses) and outputs (supply) of materials for each branch of production, for the consumption activities of households, for the tangible assets (e.g. buildings, machinery and equipment, or natural assets) and for the rest of the world. They distinguish nine raw materials, 49 types of products and 11 residuals. **Output** includes all the goods produced in the domestic economy and all those imported, the residuals arising in the course of production and consumption, and the withdrawals or physical diminution from the various tangible assets. So in PIOT, output is not only the result of production processes but the whole amount of materials coming out of the different categories (branches of production, consumption activities of households, various tangible assets and rest of the world). The total output of materials by these categories then flows to the categories of PIOT as **inputs**. Thus, raw materials and products are used as intermediate inputs in the various branches of production, are consumed by households, are added to tangible assets or are exported. Residuals are either discharged into nature (input of natural assets), processed by external environmental protection services and then discharged into nature, stored in controlled landfills or exported.

According to the physical law of the conservation of matter, the combination of withdrawals of raw materials, product flows and residuals into an **integrated system**, the PIOT, must result in the input and output of materials being identical in each branch of production and in the consumption activities of households. For the categories of tangible assets and for the rest of the world, the balance between input and output is given by the change in material stocks (material accumulation) and the net physical export or import. By definition, the sum of domestic material accumulation and net export or import must come out as zero.

PIOT 1990 is a complex system of tables, divided into a physical input (uses) table, a physical output (supply) table, a material integration table and two additional tables. The **physical input table** shows which categories of PIOT (branches of production, consumption activities of households, tangible assets or rest of the world) use or receive which materials (raw materials, products, residuals). The **physical output table** describes which categories produce or deliver which materials. Thus, for example, raw materials appear as an output of non-produced natural assets in the output table and as an input of the withdrawing sector (e.g. mining) in the input table. The **material integration table** describes the deliveries of materials between the categories of PIOT. The classifications of rows and columns of this table are identical and correspond to the columns of the input or output tables. For the input, output and material integration tables there are also sub-tables for energy, water and other materials. The material flows are shown in units of weight (tonnes). In addition, two **supplementary tables** are shown. One shows energy inputs and outputs in calorific values (joules). The other shows air emissions with a specific weighting for their contribution to the greenhouse effect and acidification.

In PIOT, the weight of some materials, such as water, mining overburden, energy carriers or building materials, tends to eclipse other **material flows**, some of which are significantly **more dangerous** to the natural environment. To some extent, this difficulty can be overcome by dividing the PIOT into sub-tables, as we have done for water, energy and other materials. A further step to overcome this difficulty are the above mentioned supplementary tables. The detailed PIOT are found in the Tables section; chapter 4 gives an overview of the results.

Contents

Territory covered

Figures relate to the territory of the Federal Republic of Germany up to 3 October 1990; they include West Berlin (former Federal territory).

Abbreviations

PIOT	=	Physical Input-Output Tables
SEEA	=	System for Integrated Environmental and Economic Accounting
ADP	=	Automatic Data Processing
proc.	=	processing
TFMG	=	tools and finished metal goods
prod.	=	production
extr.	=	extraction
man.	=	manufacturing
serv.	=	services
mkt.	=	market
NF	=	non-ferrous
PNPI	=	private, non-profit institutions
oth.	=	other
distr.	=	distribution

Units of measurement

mill.	=	million
t	=	tonne(s)
TJ	=	Terajoules (10^{12} Joule)

Other symbols

0	=	Nothing present or less than half of 1 in the last occupied position

Discrepancies in totals caused by rounding.

1 Introduction

So far as we know, this paper presents the first complete macro-economic material flow account in the form of an input-output table. Such Physical Input-Output Tables (PIOT) comprise not only the product flows of the traditional input-output tables in physical units, but also material flows between the natural environment and the economy. Complete material balances can therefore be generated for the various economic activities.

The PIOT are part of the Federal Statistical Office's **Environmental Economic Accounting (EEA)** (Radermacher, Höh 1993; Federal Statistical Office 1995; Radermacher, Stahmer 1996). The EEA are a reporting system, the aim of which is to show in statistical form the interrelationships between human economic activities and the natural environment. They are also intended to serve as a basis for more extensive analyses to answer questions of environmental and economic policy.

The EEA are based on the concept of sustainable development and are divided into the following five sections:

1. material and energy flow accounts
2. use of land and space
3. environmental indicators
4. environmental protection measures
5. avoidance costs for achieving standards of sustainability.

The PIOT must be considered as part of Section 1: "Material and energy flow accounts". In a sense, they represent the macro level in the material flow accounts.

The PIOT concepts are described in the United Nations "System for Integrated Environmental and Economic Accounting" (**SEEA**) (United Nations 1993). An initial attempt to produce PIOT was made in Austria using input-output data for 1983 (Katterl, Kratena 1990). This pioneering study discussed various conceptual problems of PIOT and presented the first, albeit incomplete, results for Austria. An important conceptual basis is provided in particular by the material/energy balances developed by Robert U. Ayres (Ayres 1978, 1993; Ayres, Simonis 1994). These concepts have been further developed and implemented over a number of years (see Baccini, Brunner 1991; Schmidt-Bleek 1994; Kuhn, Radermacher, Stahmer 1994; Bringezu 1995). Links with bioeconomics have been developed by Günter Strassert (Strassert 1991, 1994, 1996). So far as product flows are concerned, the concepts are largely the same as in the Federal Statistical Office's monetary input-output account (see Fachserie 18 "Volkswirtschaftliche Gesamtrechnungen", Reihe 2 "Input-Output-Tabellen 1990").

The work on the PIOT has been supported financially by Eurostat, the Statistical Office of the European Union, in the form of a research contract. The purpose of the research contract was to test the statistical implementation of the SEEA's proposed conceptual framework for material flow accounts respectively PIOT and to find ways of improving those concepts. It is also intended to show possible ways of interpreting and analysing PIOT.

Technical support in constructing the PIOT was given by the Wuppertal Institute for Climate, Environment and Energy (Stefan Bringezu and Helmut Schütz). In particular, results for certain aspects such as the biological metabolism of plants, animals and human beings were obtained under work contracts outside the Federal Statistical Office (Wuppertal Institute, Stephan Moll, Markus Imle and others).

The quality of the data in the 1990 PIOT presented here for the territory of the old Länder is not up to the Federal Statistical Office's usual high standards and there is no doubt room for considerable improvement. The first attempt at compiling PIOT is necessarily affected by many shortcomings that may be remedied in later versions. Comments on how the present version might be improved are therefore welcome. We hope that other countries will undertake similar work so that we can exchange experience.

2 Concepts

2.1 Overview

PIOT relate to building block B of the United Nations "System for Integrated Environmental and Economic Accounting" (SEEA) (United Nations 1993). The **SEEA** recommends a combined stock and flow account of materials and energy. Materials (including energy carriers) are extracted and transformed in the course of economic activities and sooner or later are returned to the environment. The PIOT divide these economic activities up, using the conventional input-output table classification, with the aim of showing complete material balances for each branch of production and for the consumption activities of households. The PIOT also show additions to and reductions of produced tangible assets, e.g. buildings, and non-produced natural assets, e.g. mineral resources. The PIOT do not show stocks, whereas the SEEA requires a complete stock accounts.

We shall now look at the SEEA general concept for a physical material flow and stock account (SEEA building block B). SEEA matrices that form the conceptual basis of PIOT are derived from a flow chart of the whole economy. The classifications stipulated in the SEEA are adopted by the PIOT, although in some instances they have to be adapted to German circumstances. We shall then describe how the PIOT concepts are derived from those of SEEA. Particular attention is paid to how the concepts are further developed and to any peculiarities.

2.2 Material flow accounting in the SEEA

Scheme 1 shows the material flows of the domestic economy. The complex relationships between the natural environment and the economy are reduced to a minimum in order to highlight the main features of what is really a very complicated system. The description covers three kinds of materials (raw materials, products, residuals), two types of economic activity (environmental protection activities and other activities) and two types of produced tangible assets (produced capital goods, etc. and controlled landfills of wastes). Non-produced domestic nature is shown as an area around the economy. Similarly, the rest of the world surrounds the country in question, which comprises domestic nature and the domestic economy.

It is not necessary to explain every material flow shown in Scheme 1. Raw materials and products, of domestic or foreign origin, are the domestic economy's material inputs. Transformations of those inputs within the economy give rise to new products, which are consumed or accumulated. As by-products of this transformation, residuals are treated in environmental protection installations and (or) stored in controlled landfills. Sooner or later, the materials leave the economy as residuals or as exported products. Those materials are received by domestic nature or by the rest of the world.

The material flows described in Scheme 1 (raw materials, products, residuals) may be classified as follows:

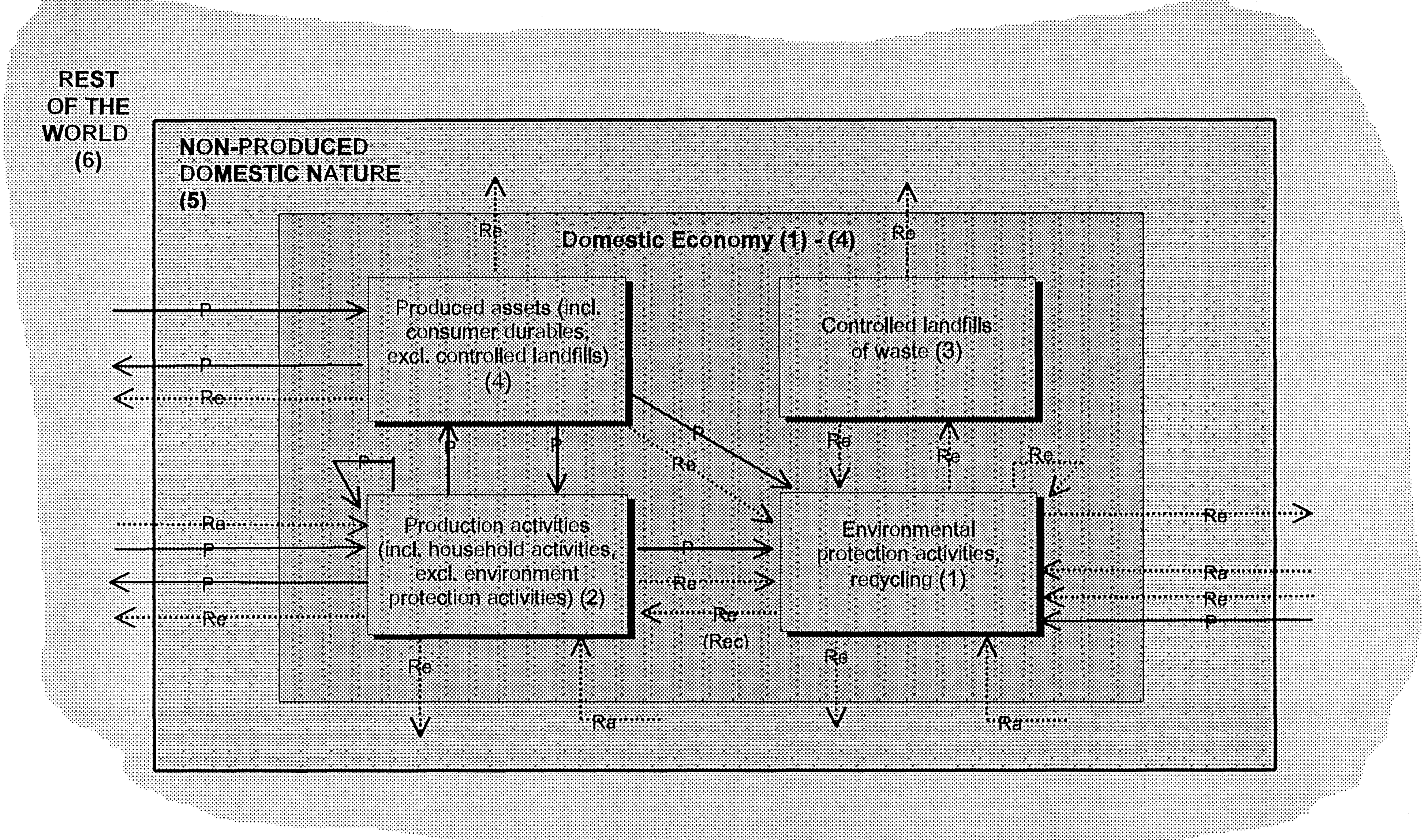
Material flows

1 **Raw materials**
- a Non-produced biomass (wild animals, plants and their products)
- b Subsoil assets
- c Water
- d Air, wind, etc.
- e Soil (erosion)

2 **Products**
- a Agriculture, forestry and fishery products
- b Ores and minerals
- c Electricity, gas and water
- d Manufacturing
- e Construction work
- f Material flows of services

3 **Residuals**
- a Waste (solid, liquid)
- b Waste water (cooling water, production waste water, etc.)
- c Air emissions (gases, dust, steam)

Scheme 1: Material flows of the domestic economy



P: Products, Re: Residuals, Ra: Raw Materials, Rec: Recycling.

Further information on the classification of raw materials and residuals is provided in the SEEA (paragraph 233 and Table 3.5). For products, the SEEA recommends the Central Product Classification (CPC).

The activity blocks (1) "Environmental protection activities, recycling" and (2) "production activities ", shown in Scheme 1, are identified and divided in the SEEA by an expanded version of the International Standard Industrial Classification (ISIC), paying particular attention to environmental protection activities; see below:

Economic Activities

1 Production activities of industries (ISIC)

37	Recycling
90	Waste water, waste and other disposal
A + B	Agriculture, forestry, fishing and fish farming
C	Mining and quarrying
D + E (except 37)	Manufacturing, power and water supply (except recycling)
F	Construction
G + H	Trade, hotels and restaurants
I	Transport and communication
J + K	Banking and insurance services, letting, business services
L	Public administration, defence, social security
M + N + O (except 90)	Education, health, social services and other services (except disposal)

2 Consumption activities of households

In the case of **households**, production activities can be described as well as consumption activities. The SEEA deals with this in Chapter V. Like the conventional system of national accounts, however, the PIOT show only consumption activities. The only "outputs" of the consumption process are residuals. Nevertheless, the description of consumption activities as transformation processes of materials and the special treatment given to consumer durables (section 2.3.6) blurs the borderline between production and consumption.

The SEEA shows stocks and changes in stocks of non-produced domestic nature in **asset accounts,** which are classified as follows:

Domestic assets (not including intangible assets)

1 Produced assets of industry

- a landfills of waste
- b machinery and equipment, buildings, inventories
- c produced natural assets

2 Consumer durables

3 Non-produced natural assets

- a non-produced biomass (wild animals, plants)
- b Subsoil assets
- c land and soil (incl. ecosystems)
- d water
- e air

The SEEA contains a detailed classification of assets (paragraph 145 and Annex D) with further disaggregations of the items described above. In the context of material flow accounts such as the PIOT, intangible non-produced assets, and land have no part to play. Apart from these, the PIOT do record additions to and reductions of the above assets.

Tables 1 to 3 show the material flows of Scheme 1 for the various kinds of materials in matrix form. The only distinctions made are between raw materials, products and residuals. Further disaggregation is of course necessary if meaningful analyses of material flows are to be made. These matrices are merely intended to illustrate the concept. The rows in the tables show activities or asset stocks delivering materials. The columns represent activities or asset stocks receiving materials. The rows and columns numbered 1 to 4 refer to the domestic economy (darker shaded area), row and column 5 to non-produced domestic natural assets, and row and column 6 to the rest of the world (lightly shaded area). Row 7 and column 7 show the total uses and total supply respectively. Each cross (x) represents a material flow.

The material flows of SEEA Tables 1 to 3 are combined in **Table 4**. The column totals (row 7) of Tables 1 to 3 are shown in rows 2 to 4 of Table 4. The row totals (column 7) of Tables 1 to 3 correspond to rows 5 to 7 of Table 4. All the material flows from Scheme 1 are therefore included, but particular information about the relationships between supplying and receiving activities (or stocks) is no longer evident. Such a condensed presentation of material flow data has the advantage of being easy to follow and could make it easier for many countries to carry out material flow analyses, since the amount of data required is very much reduced. According to the SEEA **asset data** (Table 4) should include opening stocks (row 1 of Table 4) and closing stocks (row 9). An additional item "Other volume changes" had to be introduced in order to arrive at a complete material stock balance. This item covers changes not brought about by the economic use of materials but, for example, by political or natural causes.

The PIOT do not describe physical stocks, but only material flows (**Table 5**). Table 4 has to be adjusted accordingly. Rows 1 to 6 of Table 5 represent the material flows of Scheme 1. Row 7 introduces balancing items reflecting changes in tangible assets or the accumulation of materials resulting from economic activities. Balancing items are also necessary for links between the domestic economy and the rest of the world. These balancing items represent net flows to the domestic economy from the rest of the world or vice versa. For economic activities, material inputs and outputs are balanced. The SEEA concepts and Table 5 in particular form the basis for the PIOT.

Table 1: Raw material flow matrix

Ser. No.	Uses / Supply	**Economic activities**		**Domestic assets**			**Rest of the world (exports)**	**Total supply**
		environmental protection, recycling	other (incl. household activities)	controlled landfills of waste	other produced assets (incl. cons.dur.)	non-produced natural assets		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Economic activities							
1	environmental protection, recycling							
2	other (incl. household activities)							
	Domestic assets							
3	controlled landfills of waste							
4	other produced assets (incl. cons.dur.)							
5	non-produced natural assets	X	X					X
6	**Rest of the world (imports)**	X	X					X
7	**Total uses**	X	X					X

Table 2: Product flow matrix

Ser. no.	Uses / Supply	**Economic activities**		**Domestic assets**			**Rest of the world (exports)**	**Total supply**
		environ-mental protection, recycling	other (incl. house-hold activi-ties)	controlled landfills of waste	other produced assets (incl. cons.dur.)	non-produced natural assets		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Economic activities							
1	environmental protection, recycling							
2	other (incl. household activities)	X	X		X		X	X
	Domestic assets							
3	controlled landfills of waste							
4	other produced assets (incl. cons.dur.)	X	X				X	X
5	non-produced natural assets							
6	**Rest of the world (imports)**	X	X		X			X
7	**Total uses**	X	X		X		X	X

Table 3: Residual flow matrix

Ser. no.	Supply / Uses	**Economic activities**		**Domestic assets**			**Rest of the world (exports)**	**Total supply**
		environ-mental protection, recycling	other (incl. house-hold activi-ties)	controlled landfills of waste	other produced assets (incl. cons.dur.)	non-produced natural assets		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Economic activities							
1	environmental protection, recycling	X	X	X		X	X	X
2	other (incl. household activities)	X				X	X	X
	Domestic assets							
3	controlled landfills of waste	X				X		X
4	other produced assets (incl. cons.dur.)	X				X	X	X
5	non-produced natural assets							
6	**Rest of the world (imports)**	X						X
7	**Total uses**	X	X	X		X	X	X

Table 4: Physical input-output table (PIOT) with stock data

Ser. no.	Uses ----- Supply	**Economic activities**		**Domestic assets**			**Rest of the world**	**Total**
		environ-mental protection, recycling	other (incl. house-hold activi-ties)	controlled landfills of waste	other produced assets (incl. cons.dur.)	non-produced natural assets		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
1	**Opening stocks**			X	X	X		
	+ **Uses**							
2	raw materials	X	X					X
3	products	X	X		X		X	X
4	residuals	X	X	X		X	X	X
	– **Supply**							
5	raw materials					X	X	X
6	products		X		X		X	X
7	residuals	X	X	X	X		X	X
8	± **Other volume changes**			X	X	X		
9	= **Closing stocks**			X	X	X		

Table 5: Physical input-output table (PIOT) without stock data

Ser. no.	Uses ----- Supply	Economic activities		Domestic assets			Rest of the world	Total
		environ-mental protection, recycling	other (incl. house-hold activi-ties)	controlled landfills of waste	other produced assets (incl. cons.dur.)	non-produced natural assets		
		(1)	(2)	(3)	(4)	(5)	(6)	(7)
	+ Uses							
1	raw materials	X	X					X
2	products	X	X		X		X	X
3	residuals	X	X	X		X	X	X
	– Supply							
4	raw materials					X	X	X
5	products		X		X		X	X
6	residuals	X	X	X	X		X	X
7	**= Balances**	O	O	X	X	X	X	0

2.3 Physical input-output tables

2.3.1 The basic concept

The 1990 PIOT are **a macro-economic, activity-based material flow account** in tonnes. The activities of the domestic economy (old Länder) are divided into the 58 branches of the German input-output account, with an additional branch for external environmental protection services, and the consumption activities of households. The PIOT also describe additions to and reductions of stocks - in other words, changes in tangible assets, for example buildings, machinery and equipment and natural assets - and foreign trade in tonnes.

So far as product flows are concerned, the PIOT are to a large extent comparable with the **monetary input-output tables**. The most important addition the PIOT make to the monetary input-output tables is the inclusion of natural assets as a source of raw materials and a sink for residuals. A distinction is made between produced and non-produced natural assets. Material flows to and from the **non-produced natural assets** are intended to give an indication of the economic use of the natural environment. In PIOT, **produced natural assets** comprise cultivated plants and animals. These expansions are discussed in section 2.3.6 "Special conceptual problems".

The PIOT show the outputs (supply) and inputs (uses) of materials for each branch of production, for the consumption activities of households each tangible assets and the rest of the world. Nine raw materials, 49 types of products and 11 residuals are distinguished. The **output** of materials includes all domestically produced and imported products, the residuals resulting from production and consumption, and the withdrawals or physical reductions of the various tangible assets. So in PIOT, output is not only the result of production processes but the whole amount of materials given up by the different categories (branches of production, consumption activities of households, various tangible assets and rest of the world) shown in PIOT. These materials flow to the various categories of PIOT as **inputs**. For example, raw materials and products may be used as intermediate inputs in the various branches of production, consumed by households, increase the tangible assets or be exported. Residuals are either discharged into nature (input of natural assets), treated by the branches "external environmental protection services" or „recycling" or are exported. The treated residuals are then discharged into nature or re-used as secondary raw materials.

The physical law of the conservation of matter (first principle of thermodynamics) means that the combination of all material flows (withdrawals of raw materials, product flows and residuals) in the PIOT makes the material inputs and outputs identical for every single branch of production and for the consumption activities of households. For the various kinds of tangible assets and the rest of the world, the balance of input and output is the change in material stocks (material accumulation) and the physical net export or import. The sum of domestic material accumulation and net export is by definition zero.

The 1990 PIOT are divided into the physical input (uses) table, the physical output (supply) table, the material integration table and two supplementary tables. The following sections of this Chapter look first at the individual table types, then at the system of tables and finally at a selected number of conceptual problems of the PIOT.

2.3.2 The Physical Input (Uses) Table and the Physical Output (Supply) Table

The **physical input table** shows which categories of PIOT - branches of production, consumption activities of households, tangible assets or rest of the world - use or receive which materials - raw materials, products or residuals. The **physical output table** describes which of these categories of PIOT produce or provide which materials. Thus, for example, raw materials appear as an output of non-produced natural assets in the output table and as an input of the branch „mining“ for the production of mining products in the input table.

The columns of the input table and the output table show 59 branches of production, the consumption activities of households, seven categories of tangible assets (private consumer goods, changes in stocks, landfills, buildings, machinery & equipment, and produced and non-produced natural assets) and the rest of the world. The rows show nine raw materials, 49 product categories and 11 types of emissions (for further subdivisions of air emissions see section 2.3.4).

As work on the PIOT progressed, it seemed appropriate to split both the input table and the output table into three **sub-tables**. This makes them easier to follow as regards the various problem fields and makes it easier to reconcile inputs and outputs. At the level of aggregation of the composite tables, the sources of the problems in balancing inputs and outputs would be difficult to see. Showing the supply and uses of water separately, for example, continues to be necessary, if only because of the quantities of water involved. The amount of water used in our economy is so great that all other material flows seem insignificant by comparison. The breakdown was made according to the kind of residuals and pragmatically from the basic statistics.

Sub-tables are distinguished for the following material inputs:

- energy,
- water,
- other materials.

On the input side, the sub-table for **energy** covers all energy carriers (fuels) and other materials (e.g. oxygen) necessary for their combustion and transformation. Opposite them on the **output** side are the **air emissions**, steam and combustion residues resulting from combustion, and products made from energy carriers. The **water** sub-table compares the entire water input of the various branches with the water output in the form of waste water, steam and water contained in products. Once the energy and water tables have been defined, we are left with a remainder consisting chiefly of non-energy raw materials and products on the input side, and chiefly products and **waste** (including reductions in stocks, such as builder's rubble or bulk waste) on the other. These very different materials are combined in the sub-table for **other materials**.

The row and column divisions of the sub-tables are fully compatible with those of the composite tables. In the sub-tables, **inputs and outputs** by column are identical for branches of production and consumption activities of households (but not for tangible assets and the rest of the world), as they are in the composite table. In the rows, on the other hand, the sub-tables may show differences between inputs and outputs. This is the case where part of a sub-table's output is posted as an input in another sub-table. Water is used in the manufacture of paints, for example. The total weight of paint produced also contains a quantity of water. The input corresponding to that water is part of the water withdrawn from nature. The output table for water therefore shows part of the output of the product "paint" corresponding to this input. For simplicity's sake, however, the use of the entire product "paint" is shown in the table of other materials.

2.3.3 The material integration table (input-output table)

The **material integration table** shows in its rows and columns the branches of production, consumption activities of households, tangible assets and the rest of the world (exports and imports). This breakdown is the same as the columns of the input table and the output table, but types of materials are not distinguished. The material integration table shows in its rows the use made of the entire supply of materials (raw materials, products and residuals) by the various categories of PIOT. The total material supply of a branch of production, for example, consists of the material output from domestic production and the imports of the same kinds of goods. The latter means that, for example, imports of agricultural products are assigned to the material supply of production branch 1 "production of agricultural products". The columns show what materials, and how much, are taken up by the branches of production or other categories and how high the overall material supply is. The total supply of material (column totals) is identical with the total use of material (row totals).

The material integration table is also divided into various **sub-tables**. The sub-tables show in detail the use made of products, raw materials and residuals and the use of imported products. The sub-table for residuals is further subdivided into the use of residuals from the utilisation of energy, of water and of other materials.

The material integration table differs conceptually from the input table and the output table in the posting of agricultural and forestry products. In the input and output tables, changes in **produced natural assets** are shown gross. This means that the total growth in biomass (output of agriculture and forestry) is posted first as an input of produced natural assets. The outputs of produced natural assets are the agricultural and forestry products used in the period. Although this is a departure from the SNA concept, showing them gross is of advantage for describing the biological metabolism. In the material integration table, however, we describe the produced natural assets net. This means that the agricultural and forestry products used in the period are ascribed directly to the users, and only genuine increases or decreases in stocks in the accounting period are shown as produced natural assets. The balancing item of produced natural assets is the changes in stocks of cultivated plants and animals. The material flows in the field of produced natural assets - as with the input tables and output tables as a whole - are therefore lower in the material integration table than in the input table and output table. In this respect, the procedure followed for the material integration table corresponds to the concept of the revised SNA. In other respects, the two table types are conceptually and quantitatively the same.

The concept of the **physical input table** and **output table** makes possible a much more highly detailed presentation of the allocation of materials to branches of production, consumption activities of households, tangible assets and rest of the world and thus of the relationships between the domestic economy and nature than the **material integration table**. However, the input table and output table do not say anything about the links between the categories of PIOT. The material integration table, on the other hand, is designed to show these **links** and thus forms the basis for input-output analyses. If material flows are to be investigated without input-output analyses, the input tables and output tables are probably the more suitable tool.

2.3.4 Supplementary tables

The previous explanatory notes to the PIOT concepts referred to a closed presentation of the material flow account in tonnes. Such a presentation in tonnes alone naturally abstracts from the **qualitative aspects** of material flows. The PIOT concepts can however also be applied to other units of measurement. As we see it, the purpose of any material flow account must be to offer, so far as is meaningful and possible, supplementary tables in units other than tonnes and to describe qualitative aspects.

It is at present possible to compile only two **supplementary tables**. These tables are of course conceptually fully compatible with the corresponding data in tonnes. The first supplementary table shows the sub-tables for **energy** of the Physical Input Table and Output Table in terajoules. The energy sub-table's breakdown into columns is exactly the same in tonnes as in **terajoules**. The choice of calorific values as the units does produce differences in the breakdown by rows, however. Thus, a new heading has been introduced under raw materials for hydroelectric power. On the output side, items such as useful energy (light, heating, etc.) and heat losses have to be shown. The generation and use of electric current can now also be shown here.

The second supplementary table shows the **air emissions** of the branches of production and households according to type of emission in greater detail than the Physical Input-Output Table. Air emissions are also weighted with **weighting factors** for the environmental problems of the greenhouse effect and acidification. The weighting factors show, for example, that the discharge of one tonne of nitrogen dioxide (N_2O) contributes 320 times more to global warming than the discharge of one tonne of carbon dioxide (CO_2). The weighting makes clear the contribution of individual branches of production to the total **pollution potential** of air emissions resulting from human activity, as regards the greenhouse effect or acidification. Such calculations have already been published by the Netherlands Central Bureau of Statistics (De Haan, Keuning, Bosch 1993).

2.3.5 The system of tables

Since the PIOT is a complex system of tables, an overview of the relationships between the composite table and sub-tables seems to be required. In this section, we shall not say anything more about the supplementary tables for energy in calorific values and for air emissions, as this seems unnecessary for understanding the context of the PIOT system of tables.

First, the quantitative connection of physical **Input Tables** and **Output Tables** is shown. This is done using the following single-column account for the corresponding total quantities of inputs and outputs from the various tables. The figures in brackets are the numbers of the tables in the table section.

		Total million t
(1) Physical Input (Uses) Table 1990		
(1.2)	Energy	4 543.3
+ (1.3)	Water	103 704.0
+ (1.4)	Other materials	4 808.1
= (1.1)	Total	113 055.4
(2) Physical Output (Supply) Table 1990		
(2.2)	Energy	4 564.9
+ (2.3)	Water	103 905.5
+ (2.4)	Other materials	4 585.0
= (2.1)	Total	113 055.4

This account shows that while the totals of inputs and outputs are the same, the totals of the sub-tables are nevertheless different. This is due to transformations from one kind of material to another, shown in the transitions between the sub-tables for energy, water or other materials (see section 2.3.2). The column totals of the branches of production and the consumption activities of households always match, however, as already explained.

The difference between the total quantity of materials given by the Input Table and Output Table and that shown in the Material Integration Table is explained by the conceptual difference already mentioned (see section 2.3.3). It involves the different posting of agricultural and forestry products in produced natural assets. The transition is quantified in the following account:

	million t
Input/Output as per Input Table or Output Table	113 055.4
- differences in produced natural assets	221.7
= total material supply / total material use as per material integration table	112 833.7

The **material integration table,** too, is divided into various sub-tables. The following account illustrates the quantitative relationship between the tables. The figures in brackets again refer to the table numbers in the table section.

			Total input or output million t
(3)	1990 Material integration table		
	(3.2)	Use of products and raw materials - domestic production	58 741.4
+	(3.3)	Use of residuals - domestic production 3.3.1 Total	53 699.8
+	(3.4)	Use of imported products	392.6
=	(3.1)	Total - domestic production and imports	112 833.7

The use of products and raw materials - not including residuals or imported products - is shown in Table 3.2. Table 3.4 shows the use of imports by product category and branches or households. Table 3.3 "Use of residuals - domestic production" is further divided into the following sub-tables:

		Total million t
(3.3) Use of residuals - domestic production		
(3.3.2)	Energy	2 069.4
+ (3.3.3)	Water	50 614.5
+ (3.3.4)	Other materials	1 015.9
= (3.3.1)	Total	53 699.8

The tables of uses of residuals (Tables 3.3.1 to 3.3.4) describe where the residuals originating in the various branches of production or other categories flow to. Among other things, this shows whether the residuals are discharged directly into nature or whether they are disposed of in the branch "external environmental protection services", for example.

2.3.6 Special conceptual problems

Changes in tangible assets

As already mentioned, the existing PIOT do not show any stocks of tangible assets, but only changes in such assets. They are therefore confined to material additions to or reductions of tangible assets. Apart from the types of tangible assets described below (private consumer goods and natural assets), the PIOT also show additions to and reductions of machinery&equipment and buildings, and only increases in stocks in waste in landfills. Transfers from controlled landfills to nature are not included for lack of adequate data. Additions to tangible assets are capital investments (in tonnes) and waste deposited in landfills. Reductions of physical assets are chiefly rubble and scrap. The balance of inputs and outputs describes the change in stocks of the corresponding types of tangible assets in tonnes. The changes in inventories (additions less reductions) are shown in the input table. Apart from stocks of live animals and plants, it is currently impossible to present additions and reductions separately. Attention should also be drawn to two special problems. **Military buildings** and **machinery and equipment** are presented in the PIOT as output of general government and input of the corresponding categories of tangible assets, since they normally remain in the stock of physical assets for several years. This is not fully in line with SNA concepts, which regard only assets that can also be used for civilian purposes as non-financial assets but not purely military installations. In the PIOT, material flows relating to **maintenance works** are shown as physical additions to assets. However, in accordance with the ESA (European System of Accounts), smaller maintenance works should be posted not as additions to assets but as intermediate consumption.

Natural assets

As already mentioned, the most important addition in the PIOT as compared to the monetary input-output table is the inclusion of **natural assets**. A distinction is made between produced and non-produced natural assets. In the PIOT, **produced natural assets** include cultivated plants and animals and are therefore closely linked to the production branches agriculture and forestry. We shall discuss this in the following section on agriculture and forestry. The **non-produced natural assets** are intended to provide an indication of the economic use of the natural environment. In a material flow account like the PIOT, this use is reflected in the material flows between nature and the economy. Without the additions to and reductions of natural assets, macroeconomic material balances like the PIOT cannot be closed. In simplified terms, a material flow of subsoil assets, water, oxygen, etc. flows from nature to the domestic economy. People use these materials, transform them and, sooner or later, return them to nature again in the form of residuals. The PIOT try to depict these flows, initially without qualitative evaluation. The essential criterion in the PIOT for a withdrawal from or discharge to nature is the direct transition from nature to the economy or vice versa and is ultimately based on the immediate availability of the materials. If, for example, a company were to allow effluent to seep away on its property, the PIOT would regard this as a discharge into nature, even though the company's property cannot be described as nature. The position with a withdrawal from nature is similar. The PIOT would interpret the withdrawal of water from an artificial lake as a withdrawal from nature, even though that water could also be considered a stock within the economy. In some cases, the system boundary is not clear and it has been drawn conventionally, with an eye also to the underlying statistical data.

The balance between input and output of non-produced natural assets is a quantity expressing the change in the distribution of materials between the domestic economy and nature. However, it is not sufficient to derive from this the pollution of the natural environment. To do that, additional qualitative indicators would have to be linked to the various material flows. In addition, the natural exchange of residuals between the national economy and the rest of the world would also have to be included.

Agriculture and forestry

In this field, the presentation in the PIOT differs greatly from the concept of the monetary input-output tables in their existing (unrevised) form, but does, however, largely take account of the concepts of the revised SNA. Agricultural and forestry production is virtually inseparable from nature, making the distinction particularly difficult. Consideration of the harvest quantity, for example, is not enough. In the PIOT, the output of agriculture and forestry corresponds to the total biomass increase of cultivated plants and animals (e.g. growth in woods cultivated as forestry operations, in cereals or potatoes, and the increase in livestock). This increase in biomass may increase the produced natural assets of agriculture and forestry or be consumed during the period in question.

Agriculture, forestry and produced and non-produced natural assets are closely interrelated. In the PIOT, non-produced natural assets provide agriculture and forestry with a large part of the materials necessary for the growth of biomass, such as rainwater, carbon dioxide and oxygen. Unfortunately, major influence factors like energy from the sun cannot be taken into account, as they cannot be measured in tonnes. Thee supplies of non-produced natural assets enable agriculture and forestry to produce cultivated plants and animals. Plants and animals form part of non-produced natural assets if they are not directly ascribable to agricultural or forestry production. These are e.g. trees in a wood not operated as a forestry enterprise or freely living wild animals.

Biological metabolism

As described above, the PIOT depict the natural growth of produced biomass as an output of agriculture and forestry. This concept allows a complete picture to be drawn of the material flows necessary for metabolism of cultivated plants and animals. The inputs of the metabolic processes are raw materials such as water or air (oxygen, carbon dioxide) and products such as animal feed or fertilisers. The metabolic outputs include the natural growth of trees and the like, products such as eggs or apples, and residuals (evaporated water, liquid manure, etc.). The need to include such metabolic processes arises from the need for a consistent application of the identity of material inputs and outputs. Thus, liquid manure and methane are major residual outputs of agriculture, the corresponding inputs of which, namely water, feed and breathing of farm animals, must therefore be included. Apart from the biological metabolism in agriculture and forestry, similar processes in households, namely the biological metabolism of humans and domestic animals, are included. In view of the quality of the data, the results for biological metabolism are included only in the review of findings (Chapter 4) and not explicitly shown in the tables section.

Households

The PIOT divide the households branch into consumption activities and the accumulation of consumer durables by households. The category "consumption activities of households" describes all material inputs and outputs used or disposed of again in a reporting period. In order to construct a complete material balance for this flow account, it is necessary to include not only purchases of consumer goods but also the entire metabolism of human beings and domestic animals. Only residuals are shown as outputs from the consumption activities of households. Apart from production for own consumption in agriculture, possible product outputs of households for own use are disregarded. In the accumulation of consumer durables, the purchases of furniture or cars, for example, increase that asset and disposals like bulk waste or scrapped motor vehicles reduce it. The resulting balance is the change in stocks of consumer durables in tonnes.

External environmental protection services

By comparison with the monetary input-output tables, the PIOT show an additional branch of production for external environmental protection services. In the monetary input-output tables this branch is part of "Other market services" and "Services of central and local government". An environmental protection service is described as external if it is provided for third parties, i.e. does not serve to dispose of residuals originating within the same enterprise. External environmental protection services include in particular sewage clarification and waste treatment. The landfilling of waste is a material accumulation and is shown under changes in tangible assets.

Services

On a conceptual level, the question arises whether the use of services should be included in a material flow account, and if so in what form. The PIOT should so far as possible record all materials received or discharged by the categories - production branches, consumption activities, tangible assets and rest of the world - described. In some cases, the use of services also involves material flows. For example, the service "catering in restaurants" involves a material flow to households equivalent to the weight of the food and drink consumed. Estimates of some of these material flows were included in the PIOT. A complete picture cannot however be given here for want of the necessary statistics. The most important of these material flows, such as the food and drink consumed in restaurants and canteens, are probably recorded in the PIOT.

3 Principles and methods of calculation

3.1 Overview

The compilation of the 1990 PIOT may be described briefly in five stages:

1. First, the **outputs** (supply) and **inputs** (uses) of products are calculated in tonnes, without material flows between nature and the economy. This gives the physical counterpart to the monetary input-output tables (Section 3.2).
2. Then the **material flows between the economy and nature** are ascertained. A link is made with the materials withdrawn from nature and the residuals produced. Natural assets are brought in as a contra entry to these material flows (Sections 3.3, 3.4).
3. The third stage is to **reconcile** the inputs and outputs of the various branches of production and the consumption activities of households and to check the balances in tangible assets and the rest of the world (section 3.5).
4. The input table and output table are then transferred into a symmetrical **material integration table** (Section 3.6).
5. Once the PIOT have been calculated in tonnes, the **supplementary tables** mentioned above are compiled (Section 3.7).

3.2 Product flows

In the **first stage**, vectors are determined for domestic production, imports and exports in tonnes. This involves principally products of the producing sector, agriculture and forestry. Data in physical units available from the production and foreign trade statistics form the basis for the vectors.

The statistics of **output in the manufacturing industry** describe around 60% of the categories of goods produced by **larger enterprises**[1] in mining and manufacturing in units of weight (tonnes). The other products recorded in these statistics have to be converted into tonnes from other physical units - e.g. piece, litre, square metre - using special average weights. Most of these conversion factors can be arrived at using ratios from the foreign trade statistics, e.g. ratios of tonnes to pieces or to square metres. Some of the conversion factors had to be obtained by special investigation or from supplementary information. In about 10% of cases, ratios of tonnes to DM are used. The conversion was made at the lowest possible level of aggregation so as to minimise the heterogeneity of products and thus the scope for error in making the conversion. Around 1,500 products are distinguished in the PIOT.

Since the statistics for the output of the manufacturing industries normally include larger enterprises (with more than 19 employees), supplementary estimates were made for **smaller enterprises** (with less than 20 employees). Further additions were required for **packing material** in a number of product categories (e.g. beverages, toys or musical instruments).

Data on the weight of new **buildings** were not found in the official statistics. Instead, the inputs of building materials for the branches "construction" and "installation and building completion works" were used to estimate the new buildings in tonnes. This output of the construction branches increases the accumulation of materials and must therefore be posted as an increase in tangible assets.

In **agriculture and forestry**, the PIOT presentation differs markedly from the concept of the monetary input-output tables. As explained in Chapter 2, the output of agriculture is represented by the increase in biomass of

[1] The statistics of output in the manufacturing industry normally cover only local units of enterprises with more than 19 employees.

cultivated plants and animals. The increase in biomass is calculated from data in physical units from the agriculture and forestry statistics on harvest quantities and stocks of plants and animals and from information from agronomics. This will be discussed further in Section 3.4.

The statistics of output in the manufacturing industries, agriculture and forestry and the supplementary estimates referred to provide us with a vector for the **domestic output of goods in tonnes**, divided into some 1,500 types of products according to the classification of the input-output tables (CIO). Production figures not directly measurable in tonnes, such as electricity, are not included. The foreign trade statistics provide highly detailed figures for **imports and exports of goods in tonnes**. This enables us to construct the following equation for every one of the 1,500 product types:

Domestic production + imports = domestically available goods[2] + exports = total supply.

These vectors establish the basic data for the product flows in the PIOT. The essential next step is to divide the products available within the country (domestic availability) among the **using categories** - branches of production, consumption activities of households and tangible assets. This is done partly with the help of physical data and partly following the use structures from the monetary input-output account which describe the branches of production and categories of final use in which each of the 1,500 product types is used. Since many of the use structures are derived from monetary data, corrections have to be made if significant price differences occur between various users or purchasers of the same product type. Data in physical units are available in the case of energy carriers, the distribution of water or purchase of fresh water, etc. (details in Section 3.3). The outcome of this step is a description of the deliveries in tonnes of the products to the various branches of production, to households, to the tangible assets (domestically available goods) and to the rest of the world (exports).

A number of **peculiarities** in the calculation of the PIOT product flows as compared to the monetary input-output tables are explained briefly below.

In the branch "wholesale trade, recycling", activities for the recovery of raw materials are combined to give an overall picture of the economy's recycling effort. The **recycling** activities of the manufacturing industries are included as well as those of trade. Recycling results in **secondary raw materials**. In the PIOT, this term is used to describe those treated or recycled wastes that flow back into the production process to substitute other raw materials. Not all the figures for the domestic production of secondary raw materials are contained in the production statistics. The most important other sources used to determine the extent of the production and use of secondary raw materials were the Federal Statistical Office's iron and steel statistics, waste statistics and various other statistics compiled by industry associations.

The branch "**External environmental protection services**", which is not explicitly shown in the monetary input-output tables, is formed on the basis of information from the statistics on waste, waste water and of the Federal Statistical Office's accounts of environmental protection expenditure.

In addition, a number of material flows connected with **services** are included in the PIOT. One important flow is the food consumed in restaurants and canteens. This is estimated on the basis of the National Nutrition Study and physiological factors and indicators.

Once the basic table for product flows in tonnes has been constructed, the material flows between the environment and the economy are added. This means raw materials withdrawn from non-produced natural assets for the purpose of production and consumption and residuals that pass from the national economy to the non-produced natural assets. The sub-tables for water and energy of the Physical Input Table and the Output Table are also compiled at this stage in the work, which is described below. The sub-table for other materials is produced later from residual amounts (Section 3.5).

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2 including changes in inventories.

3.3 Flows of raw materials and residuals

3.3.1 Raw materials

The **withdrawals of raw materials** from nature comprise not only subsoil assets, but also the overburden from mining, soil excavated for building purposes, water, oxygen - especially for combustion - and other materials which are incorporated into the goods during production and/or which arise as residuals.

The **subsoil assets** withdrawn from nature and often also the associated quantities of overburden are recorded in special mining statistics and certain association statistics. The overburden which occurs but is not used is posted at the same level on the input and the output side. **Oxygen inputs** are estimated on the basis of the energy carriers burned and the air emissions so produced. Oxygen inputs also occur in connection with the biological metabolism of human beings and animals.

3.3.2 Water and waste water

The **withdrawal** of **water** from non-produced natural assets, the **distribution of water** within the economy, and **waste water** are an inseparable unit, both as a material flow and from the point of view of the underlying data. The basic data are the Federal Statistical Office's Statistics of Water Supply and Waste Water Disposal (Federal Statistical Office 1991). These provide much valuable information for the construction of PIOT. Unfortunately, these statistics are not available for 1990, but for 1987 and 1991. They were converted to 1990 using association data, other auxiliary factors or by interpolation. Further calculations had to be made to arrive at the concepts and level of aggregation of the PIOT. The division of a composite item embracing households, the service sector, agriculture & forestry and smaller enterprises of the producing sector (normally with less than 20 employees) proved difficult. To break down this item, investigations were made of water withdrawal and distribution in particular. This is discussed below. These statistics also give results by industry, whereas the PIOT show them by branch of production. The difference is that industries are formed of institutions with the same principal economic activity, whereas branches produce solely the products of a particular category. In order to move from industries to branches, the quantities of water for secondary activities and the quantities of waste water they produce have to be transferred to the branches that produce mainly the goods in question. Since the survey unit for the water supply and waste water disposal statistics is the local unit, only a few quantitatively significant amounts of water and waste water need to be transferred.

For the purpose of compiling the **sub-table for water**, the **withdrawals of water** from nature are first determined for the input-output account's 58 branches of production, for external environmental protection services and for households. For larger enterprises of the manufacturing industries and water supply enterprises, this information can be obtained from the water statistics (Federal Statistical Office 1991) and association data. Additional estimates are required, chiefly for agriculture and households, but also for the unrecorded smaller enterprises and for services. The water input of agriculture is ascertained from the produced plants and animals using physiological indices[3]. The water withdrawn by households is estimated from the proportion of the population connected to the water supply. These calculations give the total water withdrawal from nature and thus an important total for the water table.

The next step is to determine the **water distributed** by water supply enterprises. For larger enterprises within manufacturing industry, information is again available from the water statistics. The composite item mentioned above for the supply of water to households, etc. must be broken down to arrive at the PIOT classification. The calculations for smaller producing sector enterprises, agriculture & forestry and services are based in part on production and workforce figures and in part on additional information. The distribution of water to households is obtained as the remainder. When added to the withdrawals of water from nature, this gives the total fresh water input of the branches and households. The **supply** (output) **of waste water** must also be determined for the 58 branches of production, external environmental protection services and households. For larger enterprises

3 This gives only that part of irrigation, rain, etc. that has actually gone into the agricultural products. The quantities of water received from the public water supply must be deducted in order to get the water withdrawn from nature by agriculture and forestry.

within manufacturing industry, the waste water statistics (Federal Statistical Office 1991) provide the basic data. The further divisions of the supply of waste water are estimated on the basis of the fresh water inputs of the various branches. The waste water statistics also show the amounts of waste water treated internally and externally. For larger enterprises, these data describe which branches send how much waste water to the branch "external environmental protection services" for external disposal and how much waste water is treated in the enterprises' internal clarification plants. It is assumed that households, the service sector and smaller enterprises have all their waste water disposed of externally, exceptionally a part which is evaporated or oozed away. For households at least, this is not entirely true, since in rural areas some households have their own treatment facilities. However, it is likely that only small amounts of waste water are involved.

3.3.3 Use of energy and air emissions

The Federal Statistical Office has for several years calculated the supply and use of energy in physical units (tonnes, joules) and, on the basis of that, the **air emissions** (Federal Statistical Office 1996). These results are adopted by the PIOT largely unchanged. In compiling the **energy sub-table**, a distinction is made, on the basis of use, between energy carriers that are burned in the production process and those that are not. Most man-made air emissions result from the burning of energy carriers. Air emissions are therefore calculated by multiplying the quantities used for combustion by specific emission coefficients.[4] In addition to energy and the air emissions resulting from their use, the PIOT energy sub-tables must also include other material flows to make the input and output columns identical. These include the oxygen required for combustion and certain chemical products necessary for the conversion of energy carriers. Apart from the energy carriers resulting from conversion and the air emissions (including steam), the output side must also show certain chemical products obtained from energy carriers and combustion residues.

3.3.4 Waste

The basis for the presentation of the **supply of waste** (waste output) and **waste disposal** in the PIOT is the waste disposal statistics and the waste balance sheet derived from them (Federal Statistical Office 1990), which compare the total amounts of waste produced and disposed of. The first step is to divide the amount of waste shown in the waste balance sheet among the 58 branches of production, households and the various tangible assets. The waste produced by **larger enterprises** in the producing sector is recorded in the waste statistics. Like the water supply and waste water disposal statistics, the waste balance sheet shows only a composite item for the waste produced by households, the service sector, smaller enterprises within the manufacturing industry, agriculture and forestry (when removed by refuse collection services). The waste from the **smaller enterprises** is included by making mark-ups in line with the supplementary estimates for smaller enterprises in the input of materials and products (see section 3.2). The amount of household and bulk waste produced by households is estimated from the results of the 1980 and 1985 national household refuse analysis and the key values from the waste balance sheet. The remainder of the composite item is divided among the service branches on the basis of selected product inputs.

The amounts of waste produced as shown in the waste statistics also contain waste from durable goods such as builders' rubble, scrap, etc. Depending on the type, this waste is shown as an output of the **various tangible assets** "buildings" or "machinery and equipment". Similarly, the waste produced by **households** is divided into waste from durables and non-durables. One major type of **agricultural** waste, namely liquid and solid manure, is not recorded in the waste statistics. These quantities are calculated on the basis of livestock numbers and average factors. Liquid and solid manure are shown in the PIOT as discharges of other materials into nature. In order to make the transition from waste production to disposal easier, the PIOT distinguish:

- waste for processing,
- waste for treatment and
- waste for landfill.

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4 Air emissions not resulting from the combustion of fuels are additionally estimated on the basis of physical quantities.

Waste for processing is an input of the branch "recycling". Waste for treatment is treated (e.g. incinerated) either internally, i.e. in the local unit where the waste is produced, or externally in the branch "external environmental protection services". In the PIOT, all waste for landfill flows to the tangible asset "controlled landfills".

Here, too, most of the data are taken from the waste statistics and the waste balance sheet. There are, however, major discrepancies between the supply and disposal of waste that have to be closed by means of plausible assumptions. For example, only about one half of the excavated soil for construction purposes that is recorded as waste in the waste statistics is also shown on the disposal side. It is assumed that the unrecorded portion is returned to nature.

3.4 Biological metabolism

There are only rough estimates available of the material inputs and outputs for the biological metabolism (animals and plants, humans). For these estimates, physiological information is combined with data on the consumption of products for food. This also provides us with the figures for the consumption of food in restaurants and canteens or the withdrawal of water by agriculture. The calculations were made in two research projects by Stephan Moll (Wittlich) and Helmut Schütz (Wuppertal Institute for Climate, Environment and Energy). The findings cannot be interpreted as "official" results. They should rather be regarded as rough estimates, which is nonetheless necessary in order to arrive at identical material inputs and outputs.

3.5 Reconciliation of inputs and outputs

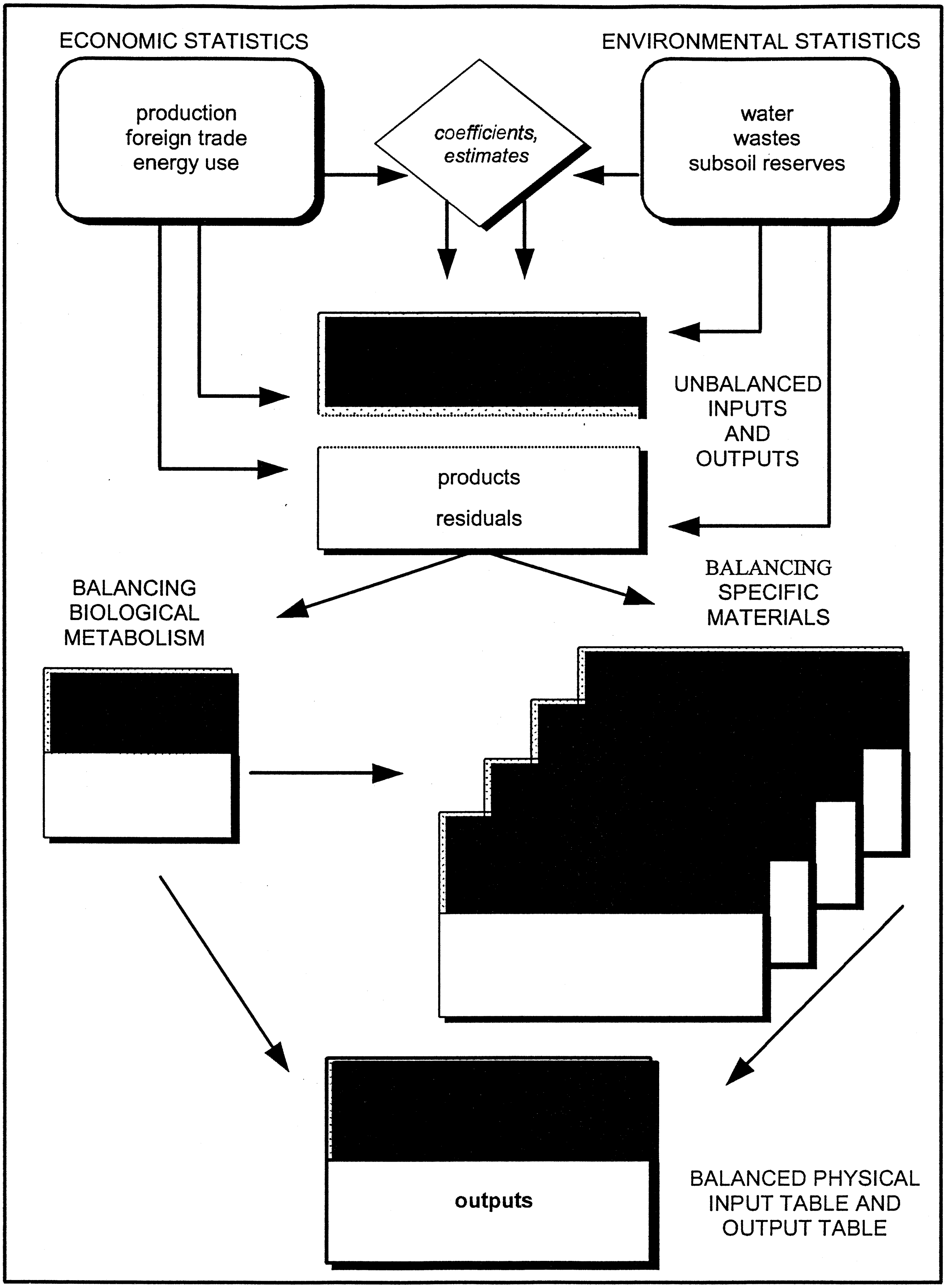
Material inputs and outputs of the branches of production and the consumption activities of households must be identical. The increase or decrease in the material stock of the domestic economy is reflected in the balance of the tangible assets columns and in the balance of imports and exports. For example, if the balance of produced tangible assets is positive overall, the stock of materials in the domestic economy has increased at the expense of the stocks of domestic non-produced natural assets and/or the rest of the world. This means that a corresponding negative amount must appear under the latter. Inputs and outputs are reconciled at the level of the sub-tables for water, energy and other materials.

The inputs and outputs of the sub-tables for **water and energy** are balanced first. Since inputs and outputs must be identical, this clearly shows up the weaknesses and gaps in the basic data. Changes have to be made to the allocation of material inputs and outputs to sub-tables and to branches, and additional estimates made to close the gaps. The balance is normally achieved by estimating suitable material outputs, a procedure which, incidentally, runs counter to the method in the monetary input-output account, where the outputs are normally given and the main task is to identify corresponding inputs. Inputs and outputs of these two sub-tables are subtracted from the unbalanced composite items (raw materials, products and residuals). The remaining physical material flows predominantly reflect both inputs of solid raw materials and products and outputs of solid products and waste. This third sub-table is called the **Table of Other Materials**. Other materials also include capital goods increasing the produced capital assets (buildings, machinery and equipment, consumer durables). Here, too, an independent reconciliation is made first of all. Ultimately, however, there must be a simultaneous reconciliation process between the three sub-tables in order to arrive at a plausible composite table.

The reconciliation of the inputs and outputs of the **biological metabolism** reflects a combination of the sub-tables for water, energy and other materials. These metabolic processes were therefore analysed and reconciled in a separate compilation stage, performed under the research contracts mentioned above. The results are integrated into the PIOT.

Scheme 2 gives an overview of the steps required for implementing the physical input table and output table. It is highly simplified, but shows the main elements in the calculation.

Scheme 2: Implementation of physical input tables and output tables



3.6 Material integration table

The material integration table is derived from the input table and the output table. The starting point for the calculation is the material outputs shown in the output table for the various branches of production, the consumption activities of households, the various tangible assets and the rest of the world. The entire output, i.e. the total raw materials, products and residuals of each of these categories, must be divided among the receiving categories of PIOT. Most of the information required can be taken from the input table. A branch's output of products is used by the domestic categories or exported. Residuals flow either direct to nature, to landfill sites, or to branches of production that treat or recycle the residuals (external environmental protection services, recycling). This presentation of the flows of materials between categories of PIOT must again guarantee that inputs and outputs are identical in the various branches of production and for households. The accumulations in the tangible assets and the physical net export or import must cancel each other out again in the total.

3.7 Supplementary tables

Like the sub-tables for energy in tonnes, the supplementary tables for **energy** in **calorific values** were compiled from existing figures (Federal Statistical Office 1996). In line with the presentation in tonnes, the additional branch of production for external environmental protection services had to be isolated from other branches. Most of the calculations were made in concert with the work on the sub-tables for energy in tonnes. Important energy flows like electricity and energy from water power were identified in addition to those in the presentation in tonnes. New output categories, namely useful energy (light, heating, etc.) and energy losses also had to be introduced here to make inputs and outputs identical for energy, too (second principle of thermodynamics). The main source for calculating useful energy and energy losses is the energy flow chart published annually by Rheinisch-Westfälische Elektrizitätswerke. Most of the energy losses were obtained as a residual amount.

The supplementary table for **air emissions** is based on the detailed figures for air emissions calculated in the Environmental Economic Accounting (Section 3.3.3). First, the air emissions of the branches of production and households are presented in the supplementary table in detail according to type in line with the composite air emissions of the energy sub-table of the Physical Output Table. Certain types of air emissions are then weighted with equivalence figures for green house effect and acidification (section 2.3.4). These figures are taken from a United Nations Environment Programme research report (United Nations Environment Programme 1992, 1994). It must be pointed out that in some cases there are very different equivalence figures for the same thing. The research report in question made a choice that is generally accepted in scientific circles.

It was not possible to include in the calculation all the influencing factors for the two environmental problems, but the important ones were. The pollution potential for the **greenhouse effect** is given by multiplying the equivalence figures for carbon dioxide (1), nitrogen dioxide (320) and methane (24.5) by the corresponding types of air emissions in 1,000 t. Other air emissions also contributing to the greenhouse effect are disregarded here. The calculation of the pollution potential for **acidification** (of the air and consequently of rain and soil) takes account of only two types of air emissions: sulphur dioxide, which is weighted with 1, and nitrogen oxides (NO_x), which are weighted with 0.7. Extensions for other environmental problems are both feasible and desirable.

3.8 Preconditions for implementation

The implementation of PIOT is a time-consuming and labour-intensive task. The work can be accomplished only if national accountants (especially "input-output experts") and experts in environmental statistics and accounting co-operate. The costs will probably be comparable with those of compiling an input-output table in monetary units.

What kind of data base is necessary to work successfully in this field? Four data sets seem to be especially important:

1. Production and foreign trade statistics disaggregated according to type of product in units of weight have to be available.

2. Information on the use of products in a deep breakdown by types of products and user categories. This information is available if the commodity flow method is used for compiling the input-output tables. Of course, this method is based on use structures in monetary terms, that is, any price differences have to be eliminated.

3. Environmental statistics on water use, waste water production and disposal, and waste production and disposal by branches of production or at least by important branches of industry.

4. Information on the annual depletion of natural resources are important.

Other necessary data can be estimated in relation to existing data (e.g. air emissions in relation to energy use). The lack of disaggregation in the basic statistics can also to some extent be compensated by the requirement that inputs and outputs be identical in each branch of production and for households. PIOT calculation and the construction of an emitter structure complement each other ideally. Thus, certain breakdowns by branch of production can hardly be estimated without the material inputs calculated in the PIOT. Also, because inputs and outputs are identical, the PIOT offer the possibility of identifying gaps and weaknesses in an emitter structure and closing them by estimation. On the other hand, the results of an emitter structure are central to the PIOT.

4 Review of findings

The detailed PIOT are given in the Tables section of this report. This chapter will describe only the aggregated PIOT in tonnes; the supplementary tables (Tables 4 and 5 in the tables section) are not discussed here. The aim is to give an overview of the various tables and to present the most important material flows.

Table 6 shows the highly aggregated overall physical input (uses) table and the output (supply) table for 1990 for the old Länder. The upper portion of the table shows the inputs (or uses) of materials. The raw materials are used by the branches of production and households. Additions of raw materials to tangible assets or to the rest of the world (exports) are, by definition, not shown. This may seem surprising, especially in the case of mineral resources. But the PIOT show exports of coal, for example, not as exports of raw materials but as exports of mining products, and they are therefore included in products. Products are used as intermediate inputs in the production of other goods, consumed by households, increase the tangible assets or are exported. Residuals are either disposed of or recycled in the branches "external environmental protection services" or "recycling", stored in controlled landfills (other assets) or discharged into nature. In the latter case, they are posted as inputs of non-produced natural assets.

Table 6: Physical Input (Uses) and Output (Supply) Table 1990

- Totals -

Old Länder

million t

Materials	Branches of production		Consump-tion activities of households	Changes in tangible assets			Rest of the world	Total
				Produced assets				
	external en-vironmental protection services, recycling	Other branches of production		Other assets	Produced natural assets	Non-produced natural assets		
				Inputs (Uses)				
Raw materials	3 522.9	45 707.1	280.4	0.0	0.0	0.0	0.0	49 510.4
Subsoil assets	0.0	1 961.1	0.0	0.0	0.0	0.0	0.0	1 961.1
Water from nature	3 501.1	42 867.5	59.0	0.0	0.0	0.0	0.0	46 427.6
Gases	21.8	878.5	221.4	0.0	0.0	0.0	0.0	1 121.7
Products	26.3	5 683.7	3 075.0	597.1	250.4	6.8	205.9	9 845.3
Residuals	4 531.1	3.4	0.0	117.3	0.0	49 045.8	2.1	53 699.8
Waste, other materials	134.9	3.4	0.0	117.3	0.0	1 595.6	2.1	1 853.4
Waste water, water vapour etc.	4 396.2	0.0	0.0	0.0	0.0	46 412.5	0.0	50 808.7
Air emissions	0.0	0.0	0.0	0.0	0.0	1 037.7	0.0	1 037.7
Total inputs	8 080.3	51 394.2	3 355.4	714.4	250.4	49 052.6	208.1	113 055.4
				Outputs (Supply)				
Raw materials	0.0	0.0	0.0	0.0	0.0	49 510.4	0.0	49 510.4
Subsoil assets	0.0	0.0	0.0	0.0	0.0	1 961.1	0.0	1 961.1
Water from nature	0.0	0.0	0.0	0.0	0.0	46 427.6	0.0	46 427.6
Gases	0.0	0.0	0.0	0.0	0.0	1 121.7	0.0	1 121.7
Products	91.4	9 139.2	0.0	0.4	221.7	0.0	392.6	9 845.3
Residuals	7 988.9	42 255.0	3 355.4	44.9	55.6	0.0	0.0	53 699.8
Waste, other materials	37.9	1 675.8	39.2	44.9	55.6	0.0	0.0	1 853.4
Waste water, water vapour etc.	7 926.3	39 773.9	3 108.5	0.0	0.0	0.0	0.0	50 808.7
Air emissions	24.7	805.3	207.8	0.0	0.0	0.0	0.0	1 037.7
Total outputs	8 080.3	51 394.2	3 355.4	45.3	277.3	49 510.4	392.6	113 055.4
				Balances (Changes in stocks)				
Inputs minus outputs	0.0	0.0	0.0	669.1	- 26.9	- 457.7	- 184.5	0.0

The categories from which these quantities of materials come are shown in the lower portion of **Table** 6, which presents the **outputs** (or the supply) of materials. In the branches of production there are both products and residuals, whereas the only outputs of households are residuals. Goods produced by households for their own use are disregarded. The output of produced tangible assets comprises firstly the sale of used products or, in the case of produced natural assets, of the agricultural and forestry products that are sold. Secondly, there are wastes like builder's rubble, scrap or harvest residues which reduce tangible assets. Withdrawals of raw materials appear as an output of non-produced natural assets. The output of the rest of the world in the next to the last column of Table 6 represents the imports into the domestic economy.

In the branches of production and the consumption activities of households, inputs and outputs are identical. In the columns „Changes in tangible assets" the balances (inputs less outputs) stand for the changes in stocks of tangible assets and the net import in tonnes. The balances of produced and non produced natural assets are negative. That means, output is larger than input and the stocks decrease. The category „Other assets" which includes building, equipment etc. increases as indicated by the positive balance. The balance with the rest of the world is negative. In Germany, imports measured in tonnes are nearly twice as high as exports. That is not surprising because traditionally Germany exports more high-tech goods and imports more raw materials or semi-fabricated goods. These latter products are on average cheaper per tonne than high-tech goods. That is the physical side of the traditionally positive foreign trade balance in monetary units.

The overall total of all materials is dominated by the quantities of water. This is true not only of raw materials and residuals, but also of products. These in fact also include the quantities of drinking water sold by water supply enterprises. Roughly two thirds of the total quantity of products in tonnes is therefore drinking water. Nearly half of the raw material inputs from „subsoil assets" are mining overburden, which is dealt with mainly as a throughput. That is, mining overburden is on the one side an input of raw materials and on the other side directly output of waste of mining industries. Oxygen is a quantitatively important substance shown as part of gases under raw material input, and is used mostly for combustion. On the output side, oxygen is incorporated in the emissions to air (CO_2, NO_x etc.). Further quantitatively important material flows are energy carriers and building materials.

The 1990 Physical Input-Output Table totals (Table 6) are divided into four sub-tables. Tables 7 to 9 below show the material flows in tonnes of energy, water and other materials for the branches of production and the consumption activities of households. Table 10 contains the inputs, outputs and changes in stocks of the various tangible assets and the rest of the world for all types of materials. This separation of tangible assets and the rest of the world from the energy, water and other materials sub-tables contrasts with the detailed tables in the tables section, but was necessary for technical and presentation reasons.

Table 7 shows inputs and outputs of energy flows measurable in tonnes for the branches of production and households. The presentation does not include forms of energy such as water power or electricity, since they cannot be directly measured in tonnes. To compensate for this weakness, the tables section contains supplementary tables for energy in calorific values (joules). The present Table 7 distinguishes between inputs and outputs of energy carriers, on the one hand for combustion - including combustion processes for the transformation of energy carriers (e.g. for electricity generation) - and, on the other hand, for transformation (without combustion processes, but including extraction and non-energy uses). Since all combustion processes are combined, the transformation of energy carriers consists mainly of the extraction and manufacture of coal mining products (branch 6). The inputs are predominantly raw materials from nature (overburden and unprocessed energy carriers). The outputs of branch 6 are chiefly products, more precisely saleable energy carriers, and overburden. Overburden is shown at the same level for inputs and outputs. The centre of interest in the presentation of the combustion of energy carriers is the relationship between energy inputs and air emissions. The greatest use of energy carriers and of the oxygen necessary for combustion is found in electricity generation and households. The high inputs and outputs of material in the category „Other branches of production" is explained by the large number of branches of production and the branches of transport they contain.

Table 7: Physical Input (Uses) and Output (Supply) Table 1990

- Energy -

-Branches of production, households -

Old Länder

million t

Product type number	Materials	Electricity generation and distribution, steam, hot water (3)	Gas production and distribution (4)	Extraction of coal, manufacture of coal mining products (6)	Extraction of crude oil and natural gas (8)	Manufacture of chemical products, fissile and fertile material (9)	Manufacture of refined petroleum products (10)	Other branches of production (1, 2, 5, 7, 11-59)	Consumption activities of households
		Composite branches of production							
	Transformation (except combustion)								
	Inputs (uses)								
	Raw materials	0,0	0,0	1 136,9	15,8	0,0	0,0	0,0	0,0
	Mining overburden	0,0	0,0	958,0	0,1	0,0	0,0	0,0	0,0
	Energy carriers	0,0	0,0	177,8	15,6	0,0	0,0	0,0	0,0
	Other gases	0,0	0,0	1,1	0,1	0,0	0,0	0,0	0,0
	Products	0,0	50,0	37,7	0,0	16,8	92,9	10,2	0,2
4,9,56	Gases and chemical products	0,0	0,9	0,1	0,0	1,3	1,1	0,1	0,0
6	Coal, coke and mine gas	0,0	0,7	36,6	0,0	2,4	0,0	6,2	0,0
8	Crude oil, natural gas	0,0	48,4	0,0	0,0	0,0	75,5	0,0	0,0
10	Refined petroleum products	0,0	0,0	1,0	0,0	13,0	16,3	3,9	0,2
	Total inputs	0,0	50,0	1 174,6	15,8	16,8	92,9	10,2	0,2
	Outputs (supply)								
	Products	0,0	49,7	206,2	15,6	16,5	92,7	6,7	0,0
	Energy carriers	0,0	49,7	206,2	15,6	0,0	92,7	6,4	0,0
	Other products	0,0	0,0	0,0	0,0	16,5	0,0	0,3	0,0
	Residuals	0,0	0,3	968,4	0,2	0,3	0,2	3,5	0,2
	Mining overburden	0,0	0,0	958,0	0,1	0,0	0,0	0,0	0,0
	Other materials	0,0	0,1	9,1	0,0	0,3	0,0	3,5	0,2
	Air emissions	0,0	0,2	1,3	0,1	0,0	0,2	0,0	0,0
	Total outputs	0,0	50,0	1 174,6	15,8	16,8	92,9	10,2	0,2
	Combustion								
	Inputs (uses)								
	Raw materials	249,2	0,6	5,7	1,6	26,8	16,4	266,3	205,0
	Oxygen	249,2	0,6	5,7	1,6	26,8	16,4	266,3	205,0
	Products	157,7	0,2	1,9	0,5	9,0	4,6	83,7	61,3
4	Distributed gases	9,1	0,2	0,0	0,0	3,9	0,7	19,0	13,7
6	Coal, coke and mine gas	142,8	0,0	1,1	0,0	3,3	0,0	16,7	2,5
10	Refined petroleum products	3,2	0,0	0,0	0,0	1,4	3,9	43,9	42,8
2,8,16	Other energy carriers	2,5	0,0	0,8	0,5	0,4	0,0	4,1	2,4
	Residuals	0,0	0,0	0,0	0,0	0,7	0,0	11,7	0,0
	Waste for incineration	0,0	0,0	0,0	0,0	0,7	0,0	11,7	0,0
	Total inputs	406,9	0,8	7,6	2,1	36,4	21,0	361,7	266,3
	Outputs (supply)								
	Residuals	406,9	0,8	7,6	2,1	36,4	21,0	361,7	266,3
	Ashes, slags, dusts, etc.	11,8	0,0	0,2	0,1	0,7	0,0	5,8	0,3
	Steam/water vapour	128,3	0,3	1,4	0,9	13,2	7,6	102,1	84,7
	Air emissions	266,8	0,5	6,0	1,1	22,6	13,4	253,8	181,3
	Total outputs	406,9	0,8	7,6	2,1	36,4	21,0	361,7	266,3

Table 8 describes the quantities of water and waste water. By far the majority of the water withdrawn is used for cooling in electricity generation (branch 3), with a corresponding amount of waste water on the output side. Other branches withdrawing large amounts of water from nature are water distribution (branch 5), the chemical industry (branch 9) and external environmental protection services (branch 56). In the case of external environmental protection services, the water from nature is rainwater, some of it polluted, that passes through the sewers to waste water treatment plants, where it is purified. The residuals received by this branch are all the waste water discharged by the branches of production and households for external disposal. The total of treated waste water and rainwater then determines the level of the treated waste water output of external environmental protection services discharged to nature.

Table 8: Physical Input (Uses) and Output (Supply) Table 1990

- Water -

- Branches of production, households -

Old Länder

million t

Product type number	Materials	Composite branches of production							Consumption activities of households
		Agriculture, forestry, fishing, etc.	Generation and distribution of electricity, steam, hot water	Extraction and distribution of water	Manufacture of chemical products, fissile, and fertile material	External environmental protection services	Services and general government	Other branches of production	
		1, 2	3	5	9	56	57	4, 6-8, 10-55, 58, 59	
					Inputs (uses)				
	Raw materials								
	Water from nature	262.2	30 308.6	5 513.7	3 146.8	3 500.0	82.4	3 554.8	59.0
	Products								
5	Water	61.9	143.7	1 659.6	372.9	16.6	333.0	1 140.5	2 926.0
	Residuals								
	Waste water	0.0	0.0	0.0	0.0	4 396.2	0.0	0.0	0.0
	Total inputs	324.1	30 452.3	7 173.3	3 519.7	7 912.8	415.4	4 695.3	2 985.0
					Outputs (supply)				
	Products								
5	Water	0.0	0.0	6 661.8	0.0	0.0	0.0	0.0	0.0
	Water included in other products	121.4	0.0	0.0	30.0	0.0	0.0	67.0	0.0
	Residuals								
	Wastes	0.0	0.4	0.5	0.0	0.0	0.0	0.0	0.0
	Waste water	27.2	30 085.1	429.9	3 462.3	7 895.0	318.8	4 386.8	2 619.9
	Water vapour, water oozed etc.	175.4	366.7	81.2	27.5	17.8	96.6	241.5	365.1
	Total outputs	324.1	30 452.3	7 173.3	3 519.7	7 912.8	415.4	4 695.3	2 985.0

The **other material flows** are described in **Table 9.** They involve a wide variety of mainly solid materials, such as plants, animals, minerals, sand and gravel, chemical products, motor vehicles, machinery and equipment, secondary raw materials or wastes. Most of the material flows are found among building materials and the related branches 13, 41 and 42.

Table 9: Physical Input (Uses) and Output (Supply) Table 1990

- Other materials -

- Branches of production, households -

Old Länder

million t

Product type number	Materials	Composite branches of production: Agriculture, forestry, fishing, etc.	Quarrying of stones and clays, manufacture of building materials, etc.	Construction	Other branches of the producing sector	Wholesale trade, etc., recycling	External environmental protection services	Other branches	Consumption activities of households
		1, 2	13	41, 42	3-12, 14-40	43	56	44-55, 57-59	
					Inputs (uses)				
	Raw materials	333,4	592,6	168,9	46,5	0,0	0,0	0,7	16,4
	Mining overburden	0,0	2,1	0,0	21,6	0,0	0,0	0,0	0,0
	Minerals	0,7	0,0	0,0	0,0	0,0	0,0	0,0	0,0
	Soil excavation	0,0	1,1	168,9	0,0	0,0	0,0	0,0	0,0
	Other solid materials (stones, etc.)	0,2	589,4	0,0	24,9	0,0	0,0	0,7	0,0
	Gases	332,5	0,0	0,0	0,0	0,0	0,0	0,0	16,4
	Products	133,3	200,8	595,8	544,9	1,6	0,1	40,4	87,5
43	Secondary raw materials	4,7	15,6	21,1	35,2	0,0	0,0	0,1	0,2
7	Mining products	2,6	1,3	0,0	64,9	0,0	0,0	0,8	1,3
13	Stones, clays, building mater., etc.	1,0	182,5	549,1	26,9	0,0	0,0	10,4	0,0
	Other products	125,0	1,4	25,5	417,8	1,6	0,1	29,2	86,1
	Residuals	0,0	0,0	0,0	0,0	104,4	21,5	0,0	0,0
	Wastes for recycling	0,0	0,0	0,0	0,0	104,4	0,0	0,0	0,0
	Wastes for treatment	0,0	0,0	0,0	0,0	0,0	21,5	0,0	0,0
	Total inputs	466,8	793,4	764,6	591,4	106,0	21,6	41,1	104,0
					Outputs (supply)				
	Products	129,9	756,4	540,3	419,9	90,9	0,4	25,2	0,0
1 - 43	Products (incl. biomass increase)	129,9	756,4	540,3	419,9	90,9	0,4	0,0	0,0
44	Plastic carrier bags	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0
52	Meals in restaurants, etc.	0,0	0,0	0,0	0,0	0,0	0,0	7,0	0,0
53	Books, magazines, etc.	0,0	0,0	0,0	0,0	0,0	0,0	1,3	0,0
57	Military goods	0,0	0,0	0,0	0,0	0,0	0,0	16,6	0,0
54,58,59	Social insurance benefits in kind	0,0	0,0	0,0	0,0	0,0	0,0	0,2	0,0
	Residuals	336,9	37,0	224,3	171,5	15,1	21,2	15,8	104,0
	Wastes for recycling	0,0	1,3	22,9	44,2	0,3	4,9	1,9	4,4
	Wastes for treatment	0,0	1,5	31,9	10,2	1,1	3,6	2,6	4,3
	Wastes for landfill	0,1	3,3	55,1	14,3	0,8	0,7	5,5	10,7
	Mining overburden	0,0	2,1	0,0	21,6	0,0	0,0	0,0	0,0
	Air emissions	259,2	0,0	0,7	8,8	0,0	1,4	1,9	48,9
	Other residuals	77,6	28,8	113,7	72,4	12,9	10,6	3,9	35,6
	Total outputs	466,8	793,4	764,6	591,4	106,0	21,6	41,1	104,0

Table 10 completes the sub-tables of the Physical Input-Output Table with **changes in tangible assets** and the **rest of the world**. Additions to tangible assets and the rest of the world (exports) appear under inputs, reductions and imports under outputs. Unlike Tables 6 to 9, the inputs and outputs of the various shown categories are not identical.

Table 10: Physical Input (Uses) and Output (Supply) Table 1990

- Changes in tangible assets, rest of the world -

Old Länder

million t

Materials	Changes in tangible assets							Rest of the world
	Produced assets						Non-produced natural assets	
				Fixed assets		Produced natural assets		
	Consumer durables	Inventories	Controlled landfills	Buildings	Machinery and equipment			
				Inputs (uses)				
Products	7,1	25,3	0,0	553,6	11,0	250,4	6,8	205,9
Residuals	0,0	0,0	117,3	0,0	0,0	0,0	49 045,8	2,1
Wastes	0,0	0,0	117,3	0,0	0,0	0,0	32,4	2,1
Mining overburden	0,0	0,0	0,0	0,0	0,0	0,0	981,8	0,0
Other materials discharged into nature	0,0	0,0	0,0	0,0	0,0	0,0	581,4	0,0
Waste water	0,0	0,0	0,0	0,0	0,0	0,0	44 846,6	0,0
Water vapour, oozed water etc.	0,0	0,0	0,0	0,0	0,0	0,0	1 565,9	0,0
Oxygen	0,0	0,0	0,0	0,0	0,0	0,0	226,1	0,0
Carbon dioxide etc.	0,0	0,0	0,0	0,0	0,0	0,0	811,7	0,0
Total inputs	7,1	25,3	117,3	553,6	11,0	250,4	49 052,6	208,1
				Outputs (supply)				
Raw materials	0,0	0,0	0,0	0,0	0,0	0,0	49 510,4	0,0
Mining overburden	0,0	0,0	0,0	0,0	0,0	0,0	981,8	0,0
Energy carriers	0,0	0,0	0,0	0,0	0,0	0,0	193,3	0,0
Minerals	0,0	0,0	0,0	0,0	0,0	0,0	0,7	0,0
Soil excavation	0,0	0,0	0,0	0,0	0,0	0,0	170,0	0,0
Other solid materials (stones, clay, etc.)	0,0	0,0	0,0	0,0	0,0	0,0	615,2	0,0
Water from nature	0,0	0,0	0,0	0,0	0,0	0,0	46 427,6	0,0
Oxygen	0,0	0,0	0,0	0,0	0,0	0,0	809,9	0,0
Carbon dioxide etc.	0,0	0,0	0,0	0,0	0,0	0,0	311,8	0,0
Products	0,1	0,0	0,0	0,0	0,3	221,7	0,0	392,6
Residuals	4,1	0,0	0,0	32,5	8,2	55,6	0,0	0,0
Wastes	4,1	0,0	0,0	32,5	8,2	0,0	0,0	0,0
Other materials discharged into nature	0,0	0,0	0,0	0,0	0,0	55,6	0,0	0,0
Total outputs	4,2	0,0	0,0	32,5	8,6	277,3	49 510,4	392,6
				Balances (changes in stocks)				
Inputs minus Outputs	2,9	25,3	117,3	521,1	2,4	- 26,9	- 457,7	- 184,5

By far the majority of the **inputs** are additions to **non-produced natural assets**. These are predominantly treated and untreated waste waters discharged into surface waters. Other significant quantities appear in the form of water vapour and carbon dioxide discharged into the air, and of overburden that is stored, some of it returned to nature. The **output** of non-produced natural assets in Table 10 includes all materials withdrawn from nature for human activities or originate during withdrawal without further use, such as mining overburden.

Looking at the **balances (changes in stocks)**, we find that most of the material accumulation takes place in buildings, inputs of which ultimately stem from non-produced natural assets. Most of the liquid and gaseous materials including energy carriers are throughputs with a comparatively small effect on the material accumulation, but which are central to air emissions and waste water. The rest of the world makes a **physical contribution** to the domestic economy, i.e. in tonnes more is imported than exported. More than 50% of imports are mining products (predominantly coal, crude oil and natural gas) and refined petroleum products. The composition of exports is much more heterogeneous.

Table 11: Physical Input (Uses) and Output (Supply) Table 1990

- Biological metabolism -

Old Länder

million t

Product type number	Materials	Biological activities of					Changes in stocks of		
		Cultivated plants (not incl. forests)	Cultivated animals (not incl. pets)	Forests	Pets	Human beings	Cultivated plants (not incl. forests)	Cultivated animals (not incl. pets)	Forests
					Inputs (uses)				
	Raw materials	385.3	137.4	47.5	0.3	16.1	0.0	0.0	0.0
	Minerals	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Water from nature	107.6	115.7	13.8	0.0	0.0	0.0	0.0	0.0
	Oxygen	0.0	21.8	0.0	0.3	16.1	0.0	0.0	0.0
	Carbon dioxide	277.0	0.0	33.7	0.0	0.0	0.0	0.0	0.0
	Products	11.2	169.2	0.1	1.1	56.8	195.1	32.3	23.0
1,2	Biomass increase	0.0	0.0	0.0	0.0	0.0	195.1	32.3	23.0
1	Agricultural products	1.3	98.3	0.0	0.0	12.2	0.0	0.0	0.0
5	Water	5.7	53.3	0.0	0.4	8.0	0.0	0.0	0.0
9	Fertilizers, pesticides	4.2	0.0	0.1	0.0	0.0	0.0	0.0	0.0
38	Food (not incl. beverages)	0.0	13.9	0.0	0.7	22.1	0.0	0.0	0.0
39	Beverages	0.0	0.0	0.0	0.0	14.6	0.0	0.0	0.0
43	Secondary raw materials	0.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0
	Total inputs	396.5	306.7	47.6	1.4	73.0	195.1	32.3	23.0
					Outputs (supply)				
	Products	195.1	32.3	23.0	0.0	0.0	139.5	32.2	49.9
1,2	Biomass increase	195.1	32.3	23.0	0.0	0.0	0.0	0.0	0.0
1	Agricultural products	0.0	0.0	0.0	0.0	0.0	139.5	32.2	0.0
2	Forest harvesting	0.0	0.0	0.0	0.0	0.0	0.0	0.0	49.9
	Residuals	201.4	274.4	24.6	1.4	73.0	55.6	0.0	0.0
	Excreta, plant wastes, etc.	0.0	241.3	0.0	0.8	31.6	55.6	0.0	0.0
	Water vapour, oozed water, etc.	0.0	7.8	0.0	0.3	22.2	0.0	0.0	0.0
	Oxygen	201.4	0.0	24.6	0.0	0.0	0.0	0.0	0.0
	Carbon dioxide	0.0	23.8	0.0	0.4	19.2	0.0	0.0	0.0
	Methane	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0
	Total outputs	396.5	306.7	47.6	1.4	73.0	195.1	32.2	49.9
					Balances (changes in stocks)				
	Inputs minus Outputs	0.0	0.0	0.0	0.0	0.0	0.0	0.0	- 26.9

Table 11 gives an overview of the **biological metabolism** of plants, animals and human beings. The data in Table 11 represent sub-items of Table 6 or Tables 7 to 10. Most of the data were calculated outside the Federal Statistical Office under work contracts. In order to arrive at a complete material balance, the entire inputs and outputs of living creatures must be included. Among other things, this gives a comprehensive picture of the oxygen and carbon dioxide inputs and outputs of plants, animals and human beings. The change in stocks of forests for 1990 is striking, showing a reduction of just under 27 million tonnes. This is due principally to that year's severe storms. There is no detailed table about the biological metabolism in the tables section.

The **material integration table (Table 12)** was compiled on the basis of the physical input table and the output table. It shows the categories of PIOT - branches of production, consumption activities of households, changes in tangible assets or rest of the world - to which the material output (raw materials, products and residuals) of any given categories flow. The material integration table is symmetrical, in other words, the row and column breakdowns are identical.

Table 12: Material Integration Table 1990

Old Länder

Million t

Supply \ Uses	Branches of production: Environmental protection, recycling	Branches of production: Other branches of production	Consumption activities of households	Changes in tangible assets: Produced assets: Other assets	Changes in tangible assets: Produced assets: Produced natural assets	Changes in tangible assets: Non-produced natural assets	Rest of the world	Total material uses
				Total materials				
Environmental protection, recycling	2,5	6,4	0,0	1,9	0,0	7 940,9	2,1	7 953,9
Other branches of production	1 795,2	5 772,9	3 075,0	681,9	28,7	40 354,0	205,5	51 913,1
Consumption activities of households	2 640,6	4,4	0,0	10,9	0,0	699,5	0,0	3 355,4
Other produced assets	5,7	16,7	0,0	19,8	0,0	2,7	0,4	45,3
Produced natural assets	0,0	0,0	0,0	0,0	0,0	55,6	0,0	55,6
Non-produced natural assets[1]	3 509,8	45 720,2	280,4	0,0	0,0	0,0	0,0	49 510,4
Total material input (= domestic material output)	7 953,9	51 520,6	3 355,4	714,4	28,7	49 052,6	208,1	112 833,7
+ Imports of similar commodities	0,0	392,6					-392,6	0,0
- Material accumulation	0,0	0,0	0,0	669,1	- 26,9	- 457,7	- 184,5	0,0
= Total material supply	7 953,9	51 913,2	3 355,4	45,3	55,6	49 510,4	0,0	112 833,7

1 The use of raw materials corresponds to the use of materials of non-produced natural assets.

For example, the material output of a branch of production normally consists of products and residuals. The domestic material output (or the material input) and the imports of similar goods give the **total material supply** of a branch of production. The **total material uses** of products - from domestic production and imports - **and** of residuals for this supply are shown in **one** row. Products flow, for example, to other branches of production or to households, residuals to external environmental protection services, controlled landfills or to non-produced natural assets. A breakdown for the different kinds of materials is not shown in this table. Such a breakdown (like in the input table and output table) is possible, but would require a third dimension.

5 Applications

5.1 Internal applications

The construction of PIOT requires data from a wide variety of economic and environmental statistics to be consistently combined in an overall system. For internal purposes, this has two particular advantages. Any gaps and inconsistencies in economic and environmental statistics in physical units become especially apparent when reconciling inputs and outputs. PIOT could play a similar role when combining statistics in physical units to that played by the National Accounts for monetary economic statistics.

Another internal use of PIOT is in estimating physical data on the interrelationships between economy and environment, if these are not evident from the basic statistics. The consistency of the overall PIOT system and the underlying principle of the conservation of matter, which requires inputs and outputs to be identical, makes it easier to estimate missing data. The preparation of **emitter structures** for air emissions, waste and waste water is an example of this. In Germany, the emitter structure for **air emissions** is calculated mainly from energy inputs and emission factors (as explained in Chapter 3). In the case of **waste** and **waste water**, a key sector of the emitter structures is covered by surveys. A complete emitter structure for waste and waste water can in turn be meaningfully built on the corresponding material inputs of the PIOT.

The budgets of statistical offices have been cut in many countries. It is therefore increasingly important to be able to supplement a reduced statistical programme with estimates so that users can continue their analytical work.

5.2 External uses

The PIOT data give an overall view of the materials used in the domestic economy. They show which branches of production are particularly material-intensive and the relationship between material use, goods produced and quantities of pollutants (waste, waste water, air emissions) in the various branches of production. Questions relating to the efficient use of raw materials and the importance of waste recycling and of secondary raw materials as a substitute for primary ones can be tackled using PIOT. The changes in the material intensity or the **material efficiency** of the branches of production over time could serve as interesting additional indicators for an environmentally-friendly development of the economy. Here, too, a distinction should be made at least between water, energy and other materials.

The extensive parallels between the monetary input-output tables and the PIOT mean that a connection can be made between the monetary and the physical levels at virtually any point. For example, residuals can be linked directly to the monetary input-output table. In this way, the effects of environmental policy measures affecting costs, such as the introduction of an ecological tax, can be investigated at both the monetary and the physical level. What would be the effect, for example, of an increase in the price of certain raw materials on the recycling of waste or the production of secondary raw materials? What impact do input- or output-oriented measures to reduce air emissions have on the use of energy carriers and on emissions overall?[5] Would any measures produce a shift between waste, waste water and air emissions? It may be possible to provide better answers to questions of the effectiveness of environmental policy measures in the light of a complete description of material flows as provided by the PIOT.

PIOT may be used to analyse material flows, showing not only the direct material inputs and outputs of economic activities but also the **indirect** material burdens of production and consumption. Goods are produced using materials from upstream stages of production. Upstream production in turn requires material inputs and creates residuals. Such indirect material flows can be traced using PIOT.

The **analysis** of direct and indirect material inputs can be applied to scenarios for reducing the consumption of materials in the economy. Even if the available technologies are unchanged, strategies for reducing the material intensity can be developed. In the absence of PIOT, such investigations can be undertaken by linking monetary

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[5] The energy table in calorific values (joules) already referred to is also required in order to answer this question.

input-output tables with physical data (e.g. on raw materials, energy use, residuals). However, such analyses do not achieve the standards of quality possible with physical data, since monetary data do not accurately reproduce physical structures. The reason for this is that prices within a given product category vary for different purchasers or categories of use. Monetary input-output analyses of material flows can therefore be interpreted only as an initial workable but preliminary step towards models based completely on physical information. The results from the model can of course be linked with monetary information (e.g. on costs or ecological taxes) at a second stage.

Further disaggregations of economic activities could be useful for special studies. Special attention should be paid to household activities, which are represented in only two columns (consumption activities, consumer durables) in the German PIOT. Such analyses might allow the satellite system of household production to be linked with environmental satellite systems (Stahmer 1996). Input-output analyses of certain fields of activity of households could also be of interest. For example, the question of the material flows and emissions associated with leisure activities could be discussed. Extended PIOT could also be a key analytical tool for bio-economic investigations (Strassert 1991, 1994, 1996).

The existing PIOT were simply an ex-post analysis of the physical relationships between inputs and outputs. Alternative input-output relationships of economic activities could be used to simulate **technological change**. Such studies bring us to dynamic PIOT incorporating a variety of scenarios for the accumulation and transformation of materials (see Faber, Proops 1990).

The supplementary tables for energy in calorific values and for air emissions contained in the tables section are the most important **further development** of PIOT in tonnes. Because of their potential to pollute the environment, the weighting of air emissions in particular is a valuable additional piece of qualitative information. It shows the contribution of individual polluters to the total man-made effect on particular environmental problems.

6 Outlook

The work on the PIOT for 1990 has shown that the **quality of the data** in the PIOT is not always up to the Federal Statistical Office's usual standard. Moreover, some of the results, such as those for biological metabolism, must be regarded as a first attempt with very rough estimates.

The PIOT data could provide an incentive for further investigations and analyses. We also hope it will suggest ways in which both concepts and data quality can be improved. Such improvements could then be implemented in further PIOT, for 1995 and for Germany as a whole, for example.

The two most important improvements from our point of view would be a link with results from **process chain analysis** or **eco balance sheets** of products and the inclusion of further indices making possible a **qualitative statement** about the environmental pollution associated with material flows.

Results from **process chain analyses** could both improve the quality of the PIOT data and also lead to the development of a second level of presentation with more highly disaggregated data, at least for some branches of production. This would be necessary for a proper material flow analysis of particularly complex branches of production such as the chemical industry. Such a presentation would at the same time preserve the link with total material flows.

In the existing PIOT, the weight of some materials, such as water, mining overburden, energy carriers and building materials, tends to eclipse other **material flows**, some of which are significantly **more dangerous** to the natural environment. To some extent, this difficulty can be overcome by dividing the PIOT into sub-tables, as we have done for water, energy and other materials. One promising but very labour-intensive approach is to apply indices to the material flows in order to arrive at **qualitative statements** similar to those obtained for air emissions. Because of the heterogeneous nature of the contents of those material flows, however, linking in further qualitative indices is likely to be very difficult.

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TABLE SECTION

Physical Input-Output Tables 1990

1 Physical input (use) table 1990
1.1 Total
1000 t

Ser. No.	kinds of materials	Production activities of branches									
		Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	958 041	21 611	95	0	0
	Raw materials for energy carriers	0	0	0	0	0	177 758	0	15 589	0	0
	Soil minerals for plants	710	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	234	83	0	0	0	24 841	0	0	0
	Water raised	248 407	13 800	30 308 574	0	5 513 740	803 159	119 901	22 072	3 146 818	236 662
	Oxygen	30 437	2 640	249 205	632	126	5 722	1 153	1 618	26 792	16 358
	Carbon dioxide	276 964	33 733	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	1 074	0	67	0	0
	Total raw material inputs	556 518	50 407	30 557 862	632	5 513 867	1 945 754	167 506	39 442	3 173 610	253 020
	Product inputs										
1	Agricultural products	99 558	78	0	0	0	0	0	0	36	0
2	Forestry and fishery products, etc.	160	88	180	0	0	0	0	0	62	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	1	159	9 134	630	0	9	286	0	5 241	654
5	Water	59 013	2 870	143 680	0	1 659 561	77 952	1 999	1 219	372 904	19 011
6	Coal, products of coal mining	53	26	142 845	681	0	37 664	38	0	5 707	0
7	Products of mining (excl.coal,crude oil,natural gas)	2 172	399	37	0	0	0	7 266	0	4 876	0
8	Crude oil, natural gas	0	0	81	48 393	0	0	0	453	450	75 507
9	Chemical products (incl. nuclear fuel)	8 451	182	166	31	115	149	16	6	57 766	1 060
10	Refined petroleum products	2 556	602	3 251	57	40	1 041	20	5	14 368	20 263
11	Plastic products	101	2	1	0	0	2	0	0	367	8
12	Rubber products	41	2	1	0	0	4	0	0	9	3
13	Stones and clays, building a. construction materials, etc.	1 012	27	16	0	26	56	18	0	4 114	40
14	Ceramic products	53	11	4	0	0	0	0	0	14	0
15	Glass and glass products	793	8	0	0	0	0	0	0	142	0
16	Iron and steel	0	0	2 228	0	0	791	0	0	2	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	260	0
18	Foundry products	5	0	0	0	0	6	0	0	23	15
19	Products of drawing plants, cold rolling mills, etc.	24	2	0	0	0	48	4	0	13	0
20	Structural metal products, rolling stock	0	0	10	1	0	33	0	0	20	7
21	Machinery and equipment (excl. electrical)	110	7	16	3	4	153	10	6	66	14
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	1	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	10	0	73	8	2	7	3	0	14	2
27	Precision and optical instruments, clocks and watches	0	0	0	3	6	0	0	0	3	0
28	Tools and finished metal products	30	1	2	0	0	18	2	0	466	110
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	1	0
30	Wood	36	0	1	0	0	53	0	0	95	0
31	Wood products	131	12	0	0	0	0	0	0	167	0
32	Pulp, paper and paperboard	48	5	62	0	4	16	0	0	663	0
33	Products of paper and paperboard	90	1	4	0	1	3	1	1	663	0
34	Products of printing and duplicating	44	4	5	0	1	3	0	0	78	1
35	Leather and leather products, footwear	4	1	0	0	0	0	0	1	0	0
36	Textiles	6	0	1	0	1	1	0	0	4	0
37	Wearing apparel	1	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	14 650	186	0	0	0	0	0	0	3 130	12
39	Beverages	51	0	2	0	0	6	0	1	17	2
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	4 747	0	0	0	0	0	0	0	80	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	27	0
56	External environmental protection services	0	0	0	415	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	193 953	4 674	301 802	50 222	1 659 762	118 017	9 664	1 692	471 845	116 710
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	1	0	0	0	0	0	652	18
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	1	0	0	0	0	0	652	18
	Total inputs	750 471	55 080	30 859 665	50 853	7 173 629	2 063 771	177 169	41 133	3 646 107	369 748

1 Physical input (use) table 1990
1.1 Total

1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	2 071	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	1 146	0	0	0	0	0	0	0	0	0	0	0	
0	0	589 389	0	0	0	0	0	0	0	0	0	0	0	
57 787	29 068	320 648	3 013	16 414	663 576	157 456	22 571	27 504	2 787	40 071	1 424	84 674	4 830	
1 995	1 285	17 756	1 688	5 418	40 807	3 938	2 749	2 309	1 097	4 886	243	5 198	189	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
59 782	30 352	931 010	4 701	21 831	704 383	161 393	25 320	29 813	3 884	44 957	1 667	89 872	5 019	
0	0	0	0	0	2	0	0	0	0	1	0	0	0	1
0	236	446	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
311	259	1 272	323	886	2 339	582	285	460	103	484	37	802	32	4
17 311	6 672	171 916	2 765	10 361	88 400	71 606	8 775	31 651	6 767	28 142	4 106	45 169	1 524	5
42	44	3 670	6	18	15 948	316	519	4	12	89	0	168	0	6
0	1	1 279	8	1 191	44 083	3 712	1 226	57	0	0	0	0	0	7
0	0	0	16	16	253	150	0	26	0	50	0	101	0	8
6 358	1 168	404	202	492	4 945	2 335	271	401	715	1 364	16	1 317	479	9
261	135	1 696	149	655	945	188	172	199	221	917	37	698	25	10
721	4	0	10	7	1	0	1	1	66	401	2	309	8	11
1	46	8	0	1	4	0	7	0	6	85	0	455	3	12
2	52	182 506	1 167	6 512	7 215	44	2 025	894	217	350	0	122	0	13
0	0	1	2	0	1	0	0	0	0	0	0	1	0	14
152	0	0	0	1 018	22	0	0	2	53	53	0	357	7	15
4	0	45	0	0	94 032	8	1 564	13 540	2 464	2 779	28	4 317	454	16
0	0	0	0	0	115	3 631	901	467	457	662	1	134	6	17
0	9	5	0	1	196	7	215	57	152	1 320	27	1 156	14	18
0	255	69	0	0	422	1	3	3 709	540	1 879	39	1 752	188	19
1	0	0	0	0	0	0	0	0	12	2	0	0	4	20
48	37	76	48	16	39	8	19	28	88	1 176	7	236	66	21
0	0	0	0	1	0	0	0	0	0	1	16	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	3 665	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
5	1	10	1	0	30	19	10	5	2	314	39	515	30	26
0	0	0	0	0	6	0	6	3	8	11	3	25	6	27
98	13	15	2	16	41	6	11	59	204	189	6	294	30	28
0	0	0	0	1	0	0	0	0	0	1	0	1	0	29
134	0	0	0	0	0	0	0	0	213	323	0	607	104	30
16	16	72	27	140	91	27	49	69	18	599	66	205	48	31
28	30	56	21	20	24	5	6	11	19	231	13	150	4	32
120	42	141	43	182	3	1	2	3	3	148	1	8	2	33
7	3	5	4	5	8	1	1	7	7	71	40	15	1	34
0	1	0	0	0	1	0	1	0	0	3	0	0	0	35
54	55	1	2	1	1	0	1	1	1	16	0	25	7	36
0	0	0	0	0	0	0	0	0	0	0	0	1	0	37
49	0	0	4	0	0	0	0	0	0	0	0	0	0	38
1	1	0	0	1	5	1	0	1	0	5	0	3	0	39
0	0	0	0	0	1	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
215	86	15 630	0	1 791	12 899	1 858	4 802	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	0	0	0	0	0	0	0	1	29	64	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,5 8,59
25 938	9 174	379 327	4 801	23 332	272 072	84 508	20 874	51 654	12 348	41 670	4 513	62 672	3 044	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	10	42	0	0	9	8	0	0	3	6	0	61	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	10	42	0	0	9	8	0	0	3	6	0	61	0	
85 770	39 537	1 310 378	9 502	45 164	976 464	245 910	46 194	81 467	16 236	86 634	6 179	152 605	8 063	

1 Physical input (use) table 1990
1.1 Total

1000 t

Ser. No.	kinds of materials	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	2 964	57 497	1 486	13 081	738	13 911	4 009	333 126	67 351	7 002
	Oxygen	252	3 966	497	2 386	204	1 715	2 065	8 173	1 531	985
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	3 216	61 464	1 983	15 466	942	15 626	6 074	341 299	68 883	7 988
	Product inputs										
1	Agricultural products	0	1	0	0	0	0	3	12	0	0
2	Forestry and fishery products, etc.	0	0	0	0	34	15 264	2 908	5 320	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	51	369	59	295	21	89	31	1 059	285	177
5	Water	3 051	42 003	8 389	16 596	3 064	3 902	6 013	18 364	9 085	8 837
6	Coal, products of coal mining	4	55	7	19	0	40	11	779	21	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	301	0	0	97	0	0	0	0	0
8	Crude oil, natural gas	0	50	0	26	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	146	659	170	398	117	216	284	431	356	588
10	Refined petroleum products	22	840	98	375	40	214	389	672	149	113
11	Plastic products	11	231	28	62	105	1	100	1	38	31
12	Rubber products	1	41	7	27	17	1	13	0	0	2
13	Stones and clays, building a. construction materials, etc.	1	772	79	771	48	4	22	2 085	47	0
14	Ceramic products	0	16	15	0	0	1	2	0	0	0
15	Glass and glass products	3	205	43	138	19	24	238	17	0	0
16	Iron and steel	21	574	5	5 411	2	72	73	0	71	0
17	Non-ferrous metals, semi-finished products thereof	29	1 035	7	792	2	0	0	0	0	0
18	Foundry products	0	161	32	63	0	0	0	17	0	0
19	Products of drawing plants, cold rolling mills, etc.	20	488	68	1 043	125	13	187	6	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	7	114	16	64	2	20	29	28	15	35
22	Office machinery, automatic data processing equipment	0	1	0	0	1	0	0	0	0	2
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	7	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	14	825	3	6	2	0	4	1	3	5
27	Precision and optical instruments, clocks and watches	6	3	63	3	0	0	0	0	0	0
28	Tools and finished metal products	13	305	14	605	12	8	268	0	33	15
29	Musical instruments, games and toys, sports goods etc	0	2	0	0	5	0	1	0	0	0
30	Wood	1	237	27	389	22	1 990	7 220	0	29	0
31	Wood products	13	54	53	150	17	103	688	54	10	10
32	Pulp, paper and paperboard	1	223	55	89	45	115	125	2 666	7 323	5 172
33	Products of paper and paperboard	0	316	71	136	48	9	107	99	2 472	233
34	Products of printing and duplicating	3	98	48	11	4	3	48	1	32	695
35	Leather and leather products, footwear	1	0	1	0	0	1	11	0	1	0
36	Textiles	6	15	9	9	8	0	120	0	43	2
37	Wearing apparel	0	0	0	1	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	2	0	0	0	74	5
39	Beverages	0	3	0	3	0	0	0	1	0	2
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	5 158	0	6 697	345	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	38	16	0	16	0	8	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	3 431	50 038	9 385	27 482	3 875	27 249	18 904	38 310	20 432	15 925
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	11	2	3	6	623	633	1 179	1	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	11	2	3	6	623	633	1 179	1	0
	Total inputs	6 646	111 512	11 370	42 952	4 823	43 498	25 612	380 788	89 316	23 912

1 Physical input (use) table 1990
1.1 Total

1000 t

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	168 854	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 732	71 693	1 942	240 093	80 573	1 390	3 641	487	1 056	1 787	1 624	27	393	596	
248	3 551	558	12 738	3 365	154	5 833	2 277	12 014	11 730	2 159	9 540	1 288	36 900	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 979	75 244	2 500	252 830	83 938	1 544	178 328	2 764	13 070	13 517	3 783	9 567	1 681	37 496	
1	264	0	64 759	3 751	129	2	0	5	2	0	7	0	0	1
24	0	10	508	0	0	1 070	0	0	12	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
17	571	39	1 582	378	16	35	17	447	986	56	0	47	19	4
2 354	26 432	3 471	188 330	61 686	926	15 438	1 727	3 742	6 333	5 757	96	1 391	2 111	5
1	135	7	409	46	5	38	28	27	30	27	0	6	0	6
0	0	0	2 079	0	0	11	0	0	0	99	0	0	99	7
0	17	0	14	0	0	0	0	0	0	0	0	0	0	8
126	1 067	55	500	111	28	384	1 469	19	21	54	4	18	5	9
59	370	127	1 925	580	29	4 080	627	3 090	2 413	581	3 042	327	10 037	10
13	33	31	717	196	9	671	739	183	338	1	0	1	0	11
19	15	26	10	3	1	26	25	27	26	1	0	3	28	12
29	27	1	87	7	0	533 647	15 459	0	0	0	0	0	0	13
0	0	0	0	0	0	32	1 559	0	0	1	0	0	0	14
0	0	1	1 161	1 603	0	47	373	80	24	0	0	0	0	15
0	1	0	97	0	0	3 541	167	0	0	0	1	0	2	16
0	0	0	0	0	0	33	91	0	0	0	0	0	0	17
0	0	0	1	0	0	153	137	0	0	17	0	0	0	18
21	0	14	3	0	0	2 696	170	3	0	86	9	11	6	19
0	0	0	1	0	0	641	339	0	0	33	0	0	0	20
13	66	2	47	12	4	36	119	10	19	22	12	3	15	21
0	1	0	0	1	0	0	0	2	3	1	0	1	1	22
0	0	0	0	0	0	0	0	0	0	0	0	0	136	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	2	25
1	4	2	5	0	0	8	823	5	6	14	1	15	6	26
0	0	0	0	0	0	0	0	0	0	3	0	3	3	27
19	25	15	550	113	2	81	1 087	59	82	5	1	4	20	28
0	0	1	0	1	0	1	0	2	5	0	0	0	2	29
6	0	0	0	0	0	5 695	2 241	1	0	0	0	1	3	30
16	44	6	114	76	49	210	640	3	35	5	0	1	3	31
61	116	78	135	36	31	57	12	629	513	32	13	60	17	32
94	325	74	758	171	127	11	50	422	474	13	2	18	5	33
3	22	34	104	31	18	24	18	99	376	34	13	78	86	34
26	1	3	1	0	0	1	0	0	1	2	0	4	1	35
17	1 164	281	5	2	0	1	23	18	30	5	4	7	9	36
0	0	24	0	0	0	0	0	0	0	1	0	0	1	37
0	4	1	24 971	1 036	12	1	0	3	1	0	18	0	26	38
0	1	1	453	2 666	1	4	2	21	10	0	116	0	13	39
0	0	0	0	0	14	1	0	1	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
88	0	39	1 168	0	0	21 112	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	8	32	24	4	11	13	39	8	0	4	8	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,5 8,59
3 007	30 713	4 345	290 503	72 540	1 424	589 793	27 954	8 910	11 780	6 859	3 339	2 005	12 665	
0	0	0	0	0	0	0	0	104 413	0	0	0	0	0	
0	0	1	26	0	1	27	5	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	1	26	0	1	27	5	104 413	0	0	0	0	0	
7 986	105 957	6 846	543 359	156 478	2 969	768 148	30 722	126 393	25 297	10 642	12 906	3 685	50 161	

1 Physical input (use) table 1990
1.1 Total

. 1000 t

Ser. No.	kinds of materials	Production activities of branches									Productio
		Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government	Social security funds
		49	50	51	52	53	54	55	56	57	58
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	663	0
	Water raised	501	162	0	5 685	393	8 771	7 404	3 500 037	82 419	203
	Oxygen	1 254	651	254	3 245	1 179	1 640	7 990	9 771	10 979	524
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	1 755	814	254	8 931	1 571	10 411	15 394	3 509 808	94 061	727
	Product inputs										
1	Agricultural products	0	0	0	1 585	0	16	0	0	100	5
2	Forestry and fishery products, etc.	0	0	0	17	0	0	14	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	120	50	0	242	33	32	257	144	2 895	9
5	Water	1 775	576	0	20 150	1 391	31 089	26 061	16 606	333 029	720
6	Coal, products of coal mining	0	0	0	24	0	0	7	12	250	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	98	12	0	302	0	8	160	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	2	0
9	Chemical products (incl. nuclear fuel)	9	9	0	92	50	77	397	3	347	194
10	Refined petroleum products	244	140	73	691	315	444	2 005	585	2 684	141
11	Plastic products	1	1	0	13	3	12	4	4	119	0
12	Rubber products	1	0	4	1	0	9	26	2	49	4
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	3	0	0	10 382	0
14	Ceramic products	0	0	0	2	0	4	0	0	1	0
15	Glass and glass products	0	0	7	46	0	48	0	0	3	0
16	Iron and steel	0	0	0	0	0	0	0	0	152	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	1	0
18	Foundry products	0	0	0	0	0	0	28	0	1	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	1	0	0	0	0	0	7	0
20	Structural metal products, rolling stock	0	0	1	0	0	0	1	0	2	0
21	Machinery and equipment (excl. electrical)	1	2	2	8	0	2	5	2	27	0
22	Office machinery, automatic data processing equipment	0	1	0	1	1	0	1	0	6	0
23	Road vehicles	0	0	0	0	0	0	2	7	118	3
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	1	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	1	9	0
26	Electrical machinery, equipment and appliances	1	0	0	17	1	2	13	1	51	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	39	8	0	19	0
28	Tools and finished metal products	2	2	1	15	0	1	10	0	19	1
29	Musical instruments, games and toys, sports goods etc	0	0	0	1	0	0	4	0	5	0
30	Wood	0	0	0	0	0	0	0	1	15	0
31	Wood products	3	0	0	10	0	0	9	2	60	0
32	Pulp, paper and paperboard	42	49	1	113	233	79	224	14	417	51
33	Products of paper and paperboard	10	11	0	122	269	4	167	4	90	7
34	Products of printing and duplicating	87	22	5	41	1 821	21	184	11	681	11
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	10	0
36	Textiles	4	6	0	16	3	8	15	1	42	1
37	Wearing apparel	0	0	0	4	0	0	2	0	5	0
38	Food products (excl. beverages)	0	0	0	3 640	0	26	112	0	424	18
39	Beverages	2	3	0	6 269	3	0	3	0	6	2
40	Tobacco products	0	0	0	17	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	5 737	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	324	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	63	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	29	4	0	10	76	1	39	0	4	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58 ,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	2 332	878	194	33 161	4 202	32 222	29 596	17 409	358 316	1 168
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	1	0	30 506	5	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	4 396 166	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	1	0	4 426 672	5	0
	Total inputs	4 087	1 691	448	42 092	5 773	42 634	44 990	7 953 889	452 382	1 895

1 Physical input (use) table 1990
1.1 Total

1000 t

... activities of branches		House-hold con-sumption activities	Accumulation									Rest of the world	Total material inputs	Ser. No.
			Man-made assets						Non-produced natural assets	Totals				
						Fixed assets		Produced natural assets						
Private non-profit institutions, private households	Totals		Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment							
59	60	61	62	63	64	65	66	67	68	69	70	71	
0	981 818	0	0	0	0	0	0	0	0	0	0	981 818	
0	193 347	0	0	0	0	0	0	0	0	0	0	193 347	
0	710	0	0	0	0	0	0	0	0	0	0	710	
0	170 000	0	0	0	0	0	0	0	0	0	0	170 000	
0	615 210	0	0	0	0	0	0	0	0	0	0	615 210	
6 851	46 368 580	59 000	0	0	0	0	0	0	0	0	0	46 427 580	
2 599	588 454	221 401	0	0	0	0	0	0	0	0	0	809 855	
0	310 697	0	0	0	0	0	0	0	0	0	0	310 697	
0	1 141	0	0	0	0	0	0	0	0	0	0	1 141	
9 450	49 229 957	280 401	0	0	0	0	0	0	0	0	0	49 510 358	
35	170 353	18 271	0	- 995	0	0	0	227 357	0	226 362	6 715	421 701	1
1	26 355	2 949	0	20 008	0	0	0	23 000	0	43 008	3 467	75 779	2
0	0	0	0	0	0	0	0	0	0	0	0	0	3
63	34 782	13 727	0	245	0	0	0	0	0	245	953	49 707	4
24 282	3 728 153	2 925 973	0	73	0	0	0	0	0	73	7 715	6 661 914	5
0	209 838	2 453	0	203	0	0	0	0	0	203	9 467	221 961	6
0	69 573	1 303	0	983	0	0	0	0	0	983	7 554	79 413	7
0	125 603	0	0	- 106	0	0	0	0	0	- 106	1 100	126 597	8
52	96 869	2 415	0	684	0	0	0	0	0	684	29 143	129 111	9
701	86 723	42 973	0	- 1 412	0	0	0	0	0	- 1 412	11 969	140 253	10
4	5 714	581	42	38	0	156	0	0	0	236	2 048	8 579	11
2	1 096	302	5	- 3	0	0	0	0	0	2	618	2 018	12
0	769 887	6	0	3 546	0	0	0	0	0	3 546	43 502	816 941	13
0	1 722	263	5	12	0	0	0	0	0	17	496	2 499	14
0	6 689	192	31	54	0	0	0	0	0	85	1 765	8 730	15
0	132 451	0	0	234	0	0	0	0	0	234	18 685	151 370	16
0	8 623	0	0	149	0	11	0	0	0	160	1 735	10 519	17
0	3 819	0	0	30	0	0	275	0	0	305	461	4 585	18
0	13 925	7	0	147	0	0	0	0	0	147	2 316	16 395	19
0	1 109	0	0	0	0	1 941	499	0	0	2 439	728	4 276	20
0	3 039	27	11	87	0	80	3 390	0	0	3 568	4 010	10 644	21
0	44	50	6	2	0	0	108	0	0	116	74	284	22
0	3 932	314	3 016	132	0	0	2 440	0	0	5 588	6 557	16 390	23
0	1	0	6	- 174	0	0	502	0	0	334	734	1 070	24
0	19	0	0	0	0	0	4	0	0	4	18	41	25
1	2 944	147	995	18	0	181	672	0	0	1 866	2 097	7 055	26
3	228	58	19	5	0	0	110	0	0	134	124	544	27
0	5 005	287	794	30	0	365	1 998	0	0	3 187	1 677	10 155	28
0	36	445	22	- 2	0	0	57	0	0	77	125	683	29
0	19 443	400	0	136	0	0	0	0	0	136	2 053	22 032	30
1	4 190	989	1 869	48	0	113	841	0	0	2 870	1 039	9 088	31
4	20 249	149	0	32	0	0	0	0	0	32	4 163	24 593	32
0	8 184	1 052	0	53	0	0	0	0	0	53	1 347	10 636	33
36	5 113	37	0	15	0	0	0	0	0	15	388	5 553	34
0	80	324	0	2	0	0	0	0	0	2	104	511	35
2	2 058	423	302	- 140	0	0	47	0	0	209	1 499	4 189	36
2	44	683	0	4	0	0	0	0	0	4	128	859	37
241	48 652	33 213	0	1 316	0	0	0	0	0	1 316	14 833	98 013	38
1	9 679	16 688	0	166	0	0	0	0	0	166	1 432	27 966	39
0	34	191	0	6	0	0	0	0	0	6	89	320	40
0	5 737	0	0	0	0	510 790	0	0	0	510 790	23	516 551	41
0	324	0	0	0	0	23 456	0	0	0	23 456	0	23 780	42
0	76 780	157	0	- 279	0	0	0	0	6 816	6 538	12 686	96 159	43
0	0	178	0	0	0	0	0	0	0	0	0	178	44
0	0	7 047	0	0	0	0	0	0	0	0	0	7 047	52
1	530	571	0	- 7	0	0	0	0	0	- 7	306	1 400	53
0	415	0	0	0	0	0	0	0	0	0	0	415	56
0	0	17	0	0	0	16 520	54	0	0	16 574	0	16 591	57
0	0	175	0	0	0	0	0	0	0	0	0	175	54,5 8,59
25 433	5 710 044	3 075 037	7 123	25 341	0	553 614	10 996	250 357	6 816	854 247	205 943	9 845 270	
0	104 413	0	0	0	0	0	0	0	0	0	0	104 413	
3	33 893	0	0	0	0	0	0	0	32 421	32 421	2 143	68 457	
0	0	0	0	0	117 349	0	0	0	0	117 349	0	117 349	
0	0	0	0	0	0	0	0	0	981 800	981 800	0	981 800	
0	0	0	0	0	0	0	0	0	581 372	581 372	0	581 372	
0	4 396 166	0	0	0	0	0	0	0	0	0	0	4 396 166	
0	0	0	0	0	0	0	0	0	44 846 589	44 846 589	0	44 846 589	
0	0	0	0	0	0	0	0	0	1 565 925	1 565 925	0	1 565 925	
0	0	0	0	0	0	0	0	0	226 052	226 052	0	226 052	
0	0	0	0	0	0	0	0	0	777 849	777 849	0	777 849	
0	0	0	0	0	0	0	0	0	33 806	33 806	0	33 806	
3	4 534 472	0	0	0	117 349	0	0	0	49 045 814	49 163 163	2 143	53 699 778	
34 885	59 474 473	3 355 438	7 123	25 341	117 349	553 614	10 996	250 357	49 052 631	50 017 410	208 086	113 055 407	

1 Physical input (use) table 1990
1.2 Energy

1000 t

Ser. No.	kinds of materials	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	958 041	0	95	0	0
	Raw materials for energy carriers	0	0	0	0	0	177 758	0	15 589	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	8 645	2 640	249 205	632	126	5 722	1 153	1 618	26 792	16 358
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	1 074	0	67	0	0
	Total raw material inputs	8 645	2 640	249 205	632	126	1 142 595	1 153	17 369	26 792	16 358
	Product inputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	180	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	1	159	9 134	630	0	9	286	0	5 241	654
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	53	26	142 845	681	0	37 664	38	0	5 707	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	81	48 393	0	0	0	453	450	75 507
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	149	0	0	0	1 060
10	Refined petroleum products	2 556	602	3 251	57	40	1 041	20	5	14 368	20 263
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	2 226	0	0	781	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	415	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	2 610	787	157 717	50 175	40	39 644	344	458	25 765	97 484
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	1	0	0	0	0	0	652	18
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	1	0	0	0	0	0	652	18
	Total inputs	11 255	3 426	406 924	50 807	167	1 182 239	1 496	17 827	53 210	113 860

1 Physical input (use) table 1990
1.2 Energy

1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1 995	1 285	17 756	1 688	5 418	40 807	3 938	2 749	2 309	1 097	4 886	243	5 198	189	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1 995	1 285	17 756	1 688	5 418	40 807	3 938	2 749	2 309	1 097	4 886	243	5 198	189	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
311	259	1 272	323	886	2 339	582	285	460	103	484	37	802	32	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
42	44	3 670	6	18	15 948	316	519	4	12	89	0	168	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	16	16	253	150	0	26	0	50	0	101	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
261	135	1 696	149	655	945	188	172	199	221	917	37	698	25	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	3 055	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
614	438	6 638	495	1 576	22 539	1 236	976	688	336	1 541	74	1 769	57	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	10	42	0	0	9	8	0	0	3	6	0	61	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
50	10	42	0	0	9	8	0	0	3	6	0	61	0	
2 659	1 734	24 435	2 183	6 993	63 355	5 181	3 725	2 998	1 437	6 433	317	7 028	246	

1 Physical input (use) table 1990
1.2 Energy

1000 t

Ser. No.	kinds of materials	Production activities of branches									
		Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	252	3 966	497	2 386	204	1 715	2 065	8 173	1 531	985
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	252	3 966	497	2 386	204	1 715	2 065	8 173	1 531	985
	Product inputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	80	120	80	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	51	369	59	295	21	89	31	1 059	285	177
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	4	55	7	19	0	40	11	779	21	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	50	0	26	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	22	840	98	375	40	214	389	672	149	113
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	77	1 314	164	714	61	423	551	2 590	455	290
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	11	2	3	6	623	633	1 179	1	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	11	2	3	6	623	633	1 179	1	0
	Total inputs	328	5 291	663	3 103	271	2 761	3 249	11 942	1 987	1 275

1 Physical input (use) table 1990
1.2 Energy

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Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
248	3 551	558	12 738	3 365	154	5 833	2 277	12 014	11 730	2 159	9 540	1 288	36 900	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
248	3 551	558	12 738	3 365	154	5 833	2 277	12 014	11 730	2 159	9 540	1 288	36 900	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
17	571	39	1 582	378	16	35	17	447	986	56	0	47	19	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
1	135	7	409	46	5	38	28	27	30	27	0	6	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	17	0	14	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
59	370	127	1 925	580	29	4 080	627	3 090	2 413	581	3 042	327	10 037	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
77	1 094	173	3 930	1 004	50	4 153	672	3 564	3 429	664	3 042	380	10 056	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	1	26	0	1	27	5	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	1	26	0	1	27	5	0	0	0	0	0	0	
325	4 645	732	16 693	4 369	205	10 012	2 953	15 578	15 159	2 823	12 582	1 668	46 956	

1 Physical input (use) table 1990
1.2 Energy

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Ser. No.	kinds of materials	Production activities of branches									Productio
		Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government	Social security funds
		49	50	51	52	53	54	55	56	57	58
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	1 254	651	254	3 245	1 179	1 640	7 990	9 771	10 979	524
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	1 254	651	254	3 245	1 179	1 640	7 990	9 771	10 979	524
	Product inputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	120	50	0	242	33	32	257	144	2 895	9
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	24	0	0	7	12	250	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	2	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	244	140	73	691	315	444	2 005	585	2 684	141
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	364	190	73	957	348	476	2 269	741	5 831	150
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	1	0	8 970	5	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	1	0	8 970	5	0
	Total inputs	1 618	841	327	4 202	1 527	2 117	10 259	19 482	16 815	675

1 Physical input (use) table 1990
1.2 Energy

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…n activities of branches			Accumulation										
			Man-made assets										
						Fixed assets							
Private non-profit institutions, private households	Totals	House-hold con-sumption activities	Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets	Non-produced natural assets	Totals	Rest of the world	Total material inputs	Ser. No.
59	60	61	62	63	64	65	66	67	68	69	70	71	
0	958 136	0	0	0	0	0	0	0	0	0	0	958 136	
0	193 347	0	0	0	0	0	0	0	0	0	0	193 347	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
2 599	566 662	204 963	0	0	0	0	0	0	0	0	0	771 625	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	1 141	0	0	0	0	0	0	0	0	0	0	1 141	
2 599	1 719 286	204 963	0	0	0	0	0	0	0	0	0	1 924 249	
0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	460	2 390	0	0	0	0	0	0	0	0	230	3 080	2
0	0	0	0	0	0	0	0	0	0	0	0	0	3
63	34 782	13 727	0	245	0	0	0	0	0	245	953	49 707	4
0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	209 838	2 453	0	203	0	0	0	0	0	203	9 467	221 961	6
0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	125 603	0	0	- 106	0	0	0	0	0	- 106	1 100	126 597	8
0	1 209	0	0	0	0	0	0	0	0	0	0	1 209	9
701	86 723	42 973	0	- 1 412	0	0	0	0	0	- 1 412	11 969	140 253	10
0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	6 062	0	0	339	0	0	0	0	0	339	0	6 400	16
0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	415	0	0	0	0	0	0	0	0	0	0	415	56
0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
764	465 092	61 543	0	- 732	0	0	0	0	0	- 732	23 719	549 622	
0	0	0	0	0	0	0	0	0	0	0	0	0	
3	12 358	0	0	0	0	0	0	0	0	0	0	12 358	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	958 118	958 118	0	958 118	
0	0	0	0	0	0	0	0	0	13 345	13 345	0	13 345	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	338 531	338 531	0	338 531	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	734 711	734 711	0	734 711	
0	0	0	0	0	0	0	0	0	12 348	12 348	0	12 348	
3	12 358	0	0	0	0	0	0	0	2 057 053	2 057 053	0	2 069 411	
3 366	2 196 736	266 506	0	- 732	0	0	0	0	2 057 053	2 056 322	23 719	4 543 282	

1 Physical input (use) table 1990
1.3 Water

1000 t

Ser. No.	kinds of materials	Production activities of branches									
		Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	248 407	13 800	30 308 574	0	5 513 740	803 159	119 901	22 072	3 146 818	236 662
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	248 407	13 800	30 308 574	0	5 513 740	803 159	119 901	22 072	3 146 818	236 662
	Product inputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	59 013	2 870	143 680	0	1 659 561	77 952	1 999	1 219	372 904	19 011
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	59 013	2 870	143 680	0	1 659 561	77 952	1 999	1 219	372 904	19 011
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	0	0	0	0	0
	Total inputs	307 420	16 670	30 452 254	0	7 173 301	881 111	121 900	23 291	3 519 722	255 673

1 Physical input (use) table 1990
1.3 Water

1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
57 787	29 068	320 648	3 013	16 414	663 576	157 456	22 571	27 504	2 787	40 071	1 424	84 674	4 830	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
57 787	29 068	320 648	3 013	16 414	663 576	157 456	22 571	27 504	2 787	40 071	1 424	84 674	4 830	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
17 311	6 672	171 916	2 765	10 361	88 400	71 606	8 775	31 651	6 767	28 142	4 106	45 169	1 524	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
17 311	6 672	171 916	2 765	10 361	88 400	71 606	8 775	31 651	6 767	28 142	4 106	45 169	1 524	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
75 098	35 740	492 564	5 778	26 775	751 975	229 062	31 346	59 155	9 554	68 213	5 530	129 843	6 354	

1 Physical input (use) table 1990
1.3 Water

1000 t

Ser. No.	kinds of materials	Production activities of branches									
		Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	2 964	57 497	1 486	13 081	738	13 911	4 009	333 126	67 351	7 002
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	2 964	57 497	1 486	13 081	738	13 911	4 009	333 126	67 351	7 002
	Product inputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	3 051	42 003	8 389	16 596	3 064	3 902	6 013	18 364	9 085	8 837
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	3 051	42 003	8 389	16 596	3 064	3 902	6 013	18 364	9 085	8 837
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	0	0	0	0	0
	Total inputs	6 015	99 500	9 875	29 677	3 802	17 813	10 022	351 490	76 437	15 839

1 Physical input (use) table 1990
1.3 Water

1000 t

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 732	71 693	1 942	240 093	80 573	1 390	3 641	487	1 056	1 787	1 624	27	393	596	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 732	71 693	1 942	240 093	80 573	1 390	3 641	487	1 056	1 787	1 624	27	393	596	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
2 354	26 432	3 471	188 330	61 686	926	15 438	1 727	3 742	6 333	5 757	96	1 391	2 111	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
2 354	26 432	3 471	188 330	61 686	926	15 438	1 727	3 742	6 333	5 757	96	1 391	2 111	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7 085	98 124	5 413	428 423	142 259	2 316	19 080	2 214	4 798	8 120	7 381	123	1 784	2 707	

1 Physical input (use) table 1990
1.3 Water

1000 t

Ser. No.	kinds of materials	Production activities of branches: Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government	Productioı: Social security funds
		49	50	51	52	53	54	55	56	57	58
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	501	162	0	5 685	393	8 771	7 404	3 500 037	82 419	203
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	501	162	0	5 685	393	8 771	7 404	3 500 037	82 419	203
	Product inputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	1 775	576	0	20 150	1 391	31 089	26 061	16 606	333 029	720
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	1 775	576	0	20 150	1 391	31 089	26 061	16 606	333 029	720
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	4 396 166	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	0	0	4 396 166	0	0
	Total inputs	2 276	738	0	25 835	1 784	39 860	33 465	7 912 810	415 448	923

1 Physical input (use) table 1990
1.3 Water

. 1000 t

...n activities of branches			Accumulation											
			Man-made assets											
						Fixed assets								
Private non-profit institutions, private households	Totals	House-hold con-sumption activities	Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets	Non-produced natural assets	Totals	Rest of the world	Total material inputs	Ser. No.
59	60	61	62	63	64	65	66	67	68	69	70	71	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
6 851	46 368 580	59 000	0	0	0	0	0	0	0	0	0	46 427 580	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
6 851	46 368 580	59 000	0	0	0	0	0	0	0	0	0	46 427 580	
0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	4
24 282	3 728 153	2 925 973	0	73	0	0	0	0	0	73	7 715	6 661 914	5
0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
24 282	3 728 153	2 925 973	0	73	0	0	0	0	0	73	7 715	6 661 914	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	174 666	174 666	0	174 666	
0	4 396 166	0	0	0	0	0	0	0	0	0	0	4 396 166	
0	0	0	0	0	0	0	0	0	44 846 589	44 846 589	0	44 846 589	
0	0	0	0	0	0	0	0	0	1 197 071	1 197 071	0	1 197 071	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	4 396 166	0	0	0	0	0	0	0	46 218 325	46 218 325	0	50 614 492	
31 133	54 492 900	2 984 973	0	73	0	0	0	0	46 218 325	46 218 398	7 715	103 703 986	

1 Physical input (use) table 1990
1.4 Other materials

1000 t

Ser. No.	kinds of materials	Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		Production activities of branches									
		1	2	3	4	5	6	7	8	9	10
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	21 611	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	710	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	234	83	0	0	0	24 841	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	21 792	0	0	0	0	0	0	0	0	0
	Carbon dioxide	276 964	33 733	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	299 466	33 967	83	0	0	0	46 452	0	0	0
	Product inputs										
1	Agricultural products	99 558	78	0	0	0	0	0	0	36	0
2	Forestry and fishery products, etc.	160	88	0	0	0	0	0	0	62	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	2 172	399	37	0	0	0	7 266	0	4 876	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	8 451	182	166	31	115	0	16	6	57 766	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	101	2	1	0	0	2	0	0	367	8
12	Rubber products	41	2	1	0	0	4	0	0	9	3
13	Stones and clays, building a. construction materials, etc.	1 012	27	16	0	26	56	18	0	4 114	40
14	Ceramic products	53	11	4	0	0	0	0	0	14	0
15	Glass and glass products	793	8	0	0	0	0	0	0	142	0
16	Iron and steel	0	0	1	0	0	11	0	0	2	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	260	0
18	Foundry products	5	0	0	0	0	6	0	0	23	15
19	Products of drawing plants, cold rolling mills, etc.	24	2	0	0	0	48	4	0	13	0
20	Structural metal products, rolling stock	0	0	10	1	0	33	0	0	20	7
21	Machinery and equipment (excl. electrical)	110	7	16	3	4	153	10	6	66	14
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	1	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	10	0	73	8	2	7	3	0	14	2
27	Precision and optical instruments, clocks and watches	0	0	0	3	6	0	0	0	3	0
28	Tools and finished metal products	30	1	2	0	0	18	2	0	466	110
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	1	0
30	Wood	36	0	1	0	0	53	0	0	95	0
31	Wood products	131	12	0	0	0	0	0	0	167	0
32	Pulp, paper and paperboard	48	5	62	0	4	16	0	0	663	0
33	Products of paper and paperboard	90	1	4	0	1	3	1	1	663	0
34	Products of printing and duplicating	44	4	5	0	1	3	0	0	78	1
35	Leather and leather products, footwear	4	1	0	0	0	0	0	1	0	0
36	Textiles	6	0	1	0	1	1	0	0	4	0
37	Wearing apparel	1	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	14 650	186	0	0	0	0	0	0	3 130	12
39	Beverages	51	0	2	0	0	6	0	1	17	2
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	4 747	0	0	0	0	0	0	0	80	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	27	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	132 330	1 017	404	46	161	420	7 321	15	73 176	215
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	0	0	0	0	0
	Total inputs	431 796	34 984	487	46	161	420	53 773	15	73 176	215

1 Physical input (use) table 1990
1.4 Other materials

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Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	2 071	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	1 146	0	0	0	0	0	0	0	0	0	0	0	
0	0	589 389	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	592 606	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	2	0	0	0	0	1	0	0	0	1
0	236	446	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	1	1 279	8	1 191	44 083	3 712	1 226	57	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
6 358	1 168	404	202	492	4 945	2 335	271	401	715	1 364	16	1 317	479	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
721	4	0	10	7	1	0	1	1	66	401	2	309	8	11
1	46	8	0	1	4	0	7	0	6	85	0	455	3	12
2	52	182 506	1 167	6 512	7 215	44	2 025	894	217	350	0	122	0	13
0	0	1	2	0	1	0	0	0	0	0	0	1	0	14
152	0	0	0	1 018	22	0	0	2	53	53	0	357	7	15
4	0	45	0	0	90 977	8	1 564	13 540	2 464	2 779	28	4 317	454	16
0	0	0	0	0	115	3 631	901	467	457	662	1	134	6	17
0	9	5	0	1	196	7	215	57	152	1 320	27	1 156	14	18
0	255	69	0	0	422	1	3	3 709	540	1 879	39	1 752	188	19
1	0	0	0	0	0	0	0	0	12	2	0	0	4	20
48	37	76	48	16	39	8	19	28	88	1 176	7	236	66	21
0	0	0	0	1	0	0	0	0	0	1	16	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	3 665	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
5	1	10	1	0	30	19	10	5	2	314	39	515	30	26
0	0	0	0	0	6	0	6	3	8	11	3	25	6	27
98	13	15	2	16	41	6	11	59	204	189	6	294	30	28
0	0	0	0	1	0	0	0	0	0	1	0	1	0	29
134	0	0	0	0	0	0	0	0	213	323	0	607	104	30
16	16	72	27	140	91	27	49	69	18	599	66	205	48	31
28	30	56	21	20	24	5	6	11	19	231	13	150	4	32
120	42	141	43	182	3	1	2	3	3	148	1	8	2	33
7	3	5	4	5	8	1	1	7	7	71	40	15	1	34
0	1	0	0	0	1	0	1	0	0	3	0	0	0	35
54	55	1	2	1	1	0	1	1	1	16	0	25	7	36
0	0	0	0	0	0	0	0	0	0	0	0	1	0	37
49	0	0	4	0	0	0	0	0	0	0	0	0	0	38
1	1	0	0	1	5	1	0	1	0	5	0	3	0	39
0	0	0	0	0	1	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
215	86	15 630	0	1 791	12 899	1 858	4 802	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	0	0	0	0	0	0	0	1	29	64	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
8 013	2 063	200 773	1 541	11 396	161 133	11 666	11 122	19 315	5 245	11 987	333	15 733	1 463	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
8 013	2 063	793 379	1 541	11 396	161 133	11 666	11 122	19 315	5 245	11 987	333	15 733	1 463	

1 Physical input (use) table 1990
1.4 Other materials

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Ser. No.	kinds of materials	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material inputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	0	0	0	0	0	0	0	0	0	0
	Product inputs										
1	Agricultural products	0	1	0	0	0	0	3	12	0	0
2	Forestry and fishery products, etc.	0	0	0	0	34	15 184	2 788	5 240	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	301	0	0	97	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	146	659	170	398	117	216	284	431	356	588
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	11	231	28	62	105	1	100	1	38	31
12	Rubber products	1	41	7	27	17	1	13	0	0	2
13	Stones and clays, building a. construction materials, etc.	1	772	79	771	48	4	22	2 085	47	0
14	Ceramic products	0	16	15	0	0	1	2	0	0	0
15	Glass and glass products	3	205	43	138	19	24	238	17	0	0
16	Iron and steel	21	574	5	5 411	2	72	73	0	71	0
17	Non-ferrous metals, semi-finished products thereof	29	1 035	7	792	2	0	0	0	0	0
18	Foundry products	0	161	32	63	0	0	0	17	0	0
19	Products of drawing plants, cold rolling mills, etc.	20	488	68	1 043	125	13	187	6	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	7	114	16	64	2	20	29	28	15	35
22	Office machinery, automatic data processing equipment	0	1	0	0	1	0	0	0	0	2
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	7	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	14	825	3	6	2	0	4	1	3	5
27	Precision and optical instruments, clocks and watches	6	3	63	3	0	0	0	0	0	0
28	Tools and finished metal products	13	305	14	605	12	8	268	0	33	15
29	Musical instruments, games and toys, sports goods etc	0	2	0	0	5	0	1	0	0	0
30	Wood	1	237	27	389	22	1 990	7 220	0	29	0
31	Wood products	13	54	53	150	17	103	688	54	10	10
32	Pulp, paper and paperboard	1	223	55	89	45	115	125	2 666	7 323	5 172
33	Products of paper and paperboard	0	316	71	136	48	9	107	99	2 472	233
34	Products of printing and duplicating	3	98	48	11	4	3	48	1	32	695
35	Leather and leather products, footwear	1	0	1	0	0	1	11	0	1	0
36	Textiles	6	15	9	9	8	0	120	0	43	2
37	Wearing apparel	0	0	0	1	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	2	0	0	0	74	5
39	Beverages	0	3	0	3	0	0	0	1	0	2
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	5 158	0	6 697	345	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	38	16	0	16	0	8	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product inputs	303	6 721	832	10 171	750	22 923	12 341	17 356	10 892	6 797
	Residual inputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	0	0	0	0	0
	Total inputs	303	6 721	832	10 171	750	22 923	12 341	17 356	10 892	6 797

1.4 Other materials

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Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	168 854	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	168 854	0	0	0	0	0	0	0	
1	264	0	64 759	3 751	129	2	0	5	2	0	7	0	0	1
24	0	10	508	0	0	1 070	0	0	12	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	2 079	0	0	11	0	0	0	99	0	0	99	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
126	1 067	55	500	111	28	384	1 469	19	21	54	4	18	5	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
13	33	31	717	196	9	671	739	183	338	1	0	1	0	11
19	15	26	10	3	1	26	25	27	26	1	0	3	28	12
29	27	1	87	7	0	533 647	15 459	0	0	0	0	0	0	13
0	0	0	0	0	0	32	1 559	0	0	1	0	0	0	14
0	0	1	1 161	1 603	0	47	373	80	24	0	0	0	0	15
0	1	0	97	0	0	3 541	167	0	0	0	1	0	2	16
0	0	0	0	0	0	33	91	0	0	0	0	0	0	17
0	0	0	1	0	0	153	137	0	0	17	0	0	0	18
21	0	14	3	0	0	2 696	170	3	0	86	9	11	6	19
0	0	0	1	0	0	641	339	0	0	33	0	0	0	20
13	66	2	47	12	4	36	119	10	19	22	12	3	15	21
0	1	0	0	1	0	0	0	2	3	1	0	1	1	22
0	0	0	0	0	0	0	0	0	0	0	0	0	136	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	2	25
1	4	2	5	0	0	8	823	5	6	14	1	15	6	26
0	0	0	0	0	0	0	0	0	0	3	0	3	3	27
19	25	15	550	113	2	81	1 087	59	82	5	1	4	20	28
0	0	1	0	1	0	1	0	2	5	0	0	0	2	29
6	0	0	0	0	0	5 695	2 241	1	0	0	0	1	3	30
16	44	6	114	76	49	210	640	3	35	5	0	1	3	31
61	116	78	135	36	31	57	12	629	513	32	13	60	17	32
94	325	74	758	171	127	11	50	422	474	13	2	18	5	33
3	22	34	104	31	18	24	18	99	376	34	13	78	86	34
26	1	3	1	0	0	1	0	0	1	2	0	4	1	35
17	1 164	281	5	2	0	1	23	18	30	5	4	7	9	36
0	0	24	0	0	0	0	0	0	0	1	0	0	1	37
0	4	1	24 971	1 036	12	1	0	3	1	0	18	0	26	38
0	1	1	453	2 666	1	4	2	21	10	0	116	0	13	39
0	0	0	0	0	14	1	0	1	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
88	0	39	1 168	0	0	21 112	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	8	32	24	4	11	13	39	8	0	4	8	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
577	3 188	701	98 243	9 849	448	570 202	25 554	1 604	2 018	437	201	233	498	
0	0	0	0	0	0	0	0	104 413	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	104 413	0	0	0	0	0	
577	3 188	701	98 243	9 849	448	739 056	25 554	106 017	2 018	437	201	233	498	

1 Physical input (use) table 1990
1.4 Other materials

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Ser. No.	kinds of materials	Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government
		Production activities of branches								
		49	50	51	52	53	54	55	56	57
	Raw material inputs									
	Raw materials, not used	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	663
	Water raised	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0
	Total raw material inputs	0	0	0	0	0	0	0	0	663
	Product inputs									
1	Agricultural products	0	0	0	1 585	0	16	0	0	100
2	Forestry and fishery products, etc.	0	0	0	17	0	0	14	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	98	12	0	302	0	8	160
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	9	9	0	92	50	77	397	3	347
10	Refined petroleum products	0	0	0	0	0	0	0	0	0
11	Plastic products	1	1	0	13	3	12	4	4	119
12	Rubber products	1	0	4	1	0	9	26	2	49
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	3	0	0	10 382
14	Ceramic products	0	0	0	2	0	4	0	0	1
15	Glass and glass products	0	0	7	46	0	48	0	0	3
16	Iron and steel	0	0	0	0	0	0	0	0	152
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	1
18	Foundry products	0	0	0	0	0	0	28	0	1
19	Products of drawing plants, cold rolling mills, etc.	0	0	1	0	0	0	0	0	7
20	Structural metal products, rolling stock	0	0	1	0	0	0	1	0	2
21	Machinery and equipment (excl. electrical)	1	2	2	8	0	2	5	2	27
22	Office machinery, automatic data processing equipment	0	1	0	1	1	0	1	0	6
23	Road vehicles	0	0	0	0	0	0	2	7	118
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	1
25	Aircraft and spacecraft	0	0	0	0	0	0	0	1	9
26	Electrical machinery, equipment and appliances	1	0	0	17	1	2	13	1	51
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	39	8	0	19
28	Tools and finished metal products	2	2	1	15	0	1	10	0	19
29	Musical instruments, games and toys, sports goods etc	0	0	0	1	0	0	4	0	5
30	Wood	0	0	0	0	0	0	0	1	15
31	Wood products	3	0	0	10	0	0	9	2	60
32	Pulp, paper and paperboard	42	49	1	113	233	79	224	14	417
33	Products of paper and paperboard	10	11	0	122	269	4	167	4	90
34	Products of printing and duplicating	87	22	5	41	1 821	21	184	11	681
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	10
36	Textiles	4	6	0	16	3	8	15	1	42
37	Wearing apparel	0	0	0	4	0	0	2	0	5
38	Food products (excl. beverages)	0	0	0	3 640	0	26	112	0	424
39	Beverages	2	3	0	6 269	3	0	3	0	6
40	Tobacco products	0	0	0	17	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	5 737
42	Installation and building completion works	0	0	0	0	0	0	0	0	324
43	Secondary raw materials	0	0	0	0	0	0	0	0	63
44	Retail trade	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	29	4	0	10	76	1	39	0	4
56	External environmental protection services	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0
	Total product inputs	193	112	121	12 054	2 463	657	1 266	62	19 456
	Residual inputs									
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	21 535	0
	Wastes for storage	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0
	Waste water for treatment	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0
	Total residual inputs	0	0	0	0	0	0	0	21 535	0
	Total inputs	193	112	121	12 054	2 463	657	1 266	21 597	20 119

1 Physical input (use) table 1990
1.4 Other materials

1000 t

Production activities of branches: Social security funds	Production activities of branches: Private non-profit institutions, private households	Production activities of branches: Totals	Household consumption activities	Accumulation: Man-made assets: Consumer durables	Accumulation: Man-made assets: Change in stocks	Accumulation: Man-made assets: Controlled landfills	Accumulation: Man-made assets: Fixed assets: Buildings	Accumulation: Man-made assets: Fixed assets: Machinery, equipment	Accumulation: Man-made assets: Produced natural assets	Accumulation: Non-produced natural assets	Accumulation: Totals	Rest of the world	Total material inputs	Ser. No.
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
0	0	23 682	0	0	0	0	0	0	0	0	0	0	23 682	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	710	0	0	0	0	0	0	0	0	0	0	710	
0	0	170 000	0	0	0	0	0	0	0	0	0	0	170 000	
0	0	615 210	0	0	0	0	0	0	0	0	0	0	615 210	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	21 792	16 438	0	0	0	0	0	0	0	0	0	38 230	
0	0	310 697	0	0	0	0	0	0	0	0	0	0	310 697	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	1 142 091	16 438	0	0	0	0	0	0	0	0	0	1 158 529	
5	35	170 353	18 271	0	- 995	0	0	0	227 357	0	226 362	6 715	421 701	1
0	1	25 895	559	0	20 008	0	0	0	23 000	0	43 008	3 237	72 699	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	69 573	1 303	0	983	0	0	0	0	0	983	7 554	79 413	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
194	52	95 660	2 415	0	684	0	0	0	0	0	684	29 143	127 902	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	4	5 714	581	42	38	0	156	0	0	0	236	2 048	8 579	11
4	2	1 096	302	5	- 3	0	0	0	0	0	2	618	2 018	12
0	0	769 887	6	0	3 546	0	0	0	0	0	3 546	43 502	816 941	13
0	0	1 722	263	5	12	0	0	0	0	0	17	496	2 499	14
0	0	6 689	192	31	54	0	0	0	0	0	85	1 765	8 730	15
0	0	126 390	0	0	- 105	0	0	0	0	0	- 105	18 685	144 970	16
0	0	8 623	0	0	149	0	11	0	0	0	160	1 735	10 519	17
0	0	3 819	0	0	30	0	0	275	0	0	305	461	4 585	18
0	0	13 925	7	0	147	0	0	0	0	0	147	2 316	16 395	19
0	0	1 109	0	0	0	0	1 941	499	0	0	2 439	728	4 276	20
0	0	3 039	27	11	87	0	80	3 390	0	0	3 568	4 010	10 644	21
0	0	44	50	6	2	0	0	108	0	0	116	74	284	22
3	0	3 932	314	3 016	132	0	0	2 440	0	0	5 588	6 557	16 390	23
0	0	1	0	6	- 174	0	0	502	0	0	334	734	1 070	24
0	0	19	0	0	0	0	0	4	0	0	4	18	41	25
0	1	2 944	147	995	18	0	181	672	0	0	1 866	2 097	7 055	26
0	3	228	58	19	5	0	0	110	0	0	134	124	544	27
1	0	5 005	287	794	30	0	365	1 998	0	0	3 187	1 677	10 155	28
0	0	36	445	22	- 2	0	0	57	0	0	77	125	683	29
0	0	19 443	400	0	136	0	0	0	0	0	136	2 053	22 032	30
0	1	4 190	989	1 869	48	0	113	841	0	0	2 870	1 039	9 088	31
51	4	20 249	149	0	32	0	0	0	0	0	32	4 163	24 593	32
7	0	8 184	1 052	0	53	0	0	0	0	0	53	1 347	10 636	33
11	36	5 113	37	0	15	0	0	0	0	0	15	388	5 553	34
0	0	80	324	0	2	0	0	0	0	0	2	104	511	35
1	2	2 058	423	302	- 140	0	0	47	0	0	209	1 499	4 189	36
0	2	44	683	0	4	0	0	0	0	0	4	128	859	37
18	241	48 652	33 213	0	1 316	0	0	0	0	0	1 316	14 833	98 013	38
2	1	9 679	16 688	0	166	0	0	0	0	0	166	1 432	27 966	39
0	0	34	191	0	6	0	0	0	0	0	6	89	320	40
0	0	5 737	0	0	0	0	510 790	0	0	0	510 790	23	516 551	41
0	0	324	0	0	0	0	23 456	0	0	0	23 456	0	23 780	42
0	0	76 780	157	0	- 279	0	0	0	0	6 816	6 538	12 686	96 159	43
0	0	0	178	0	0	0	0	0	0	0	0	0	178	44
0	0	0	7 047	0	0	0	0	0	0	0	0	0	7 047	52
0	1	530	571	0	- 7	0	0	0	0	0	- 7	306	1 400	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	17	0	0	0	16 520	54	0	0	16 574	0	16 591	57
0	0	0	175	0	0	0	0	0	0	0	0	0	175	54,58,59
298	386	1 516 799	87 522	7 123	25 999	0	553 614	10 996	250 357	6 816	854 905	174 509	2 633 734	
0	0	104 413	0	0	0	0	0	0	0	0	0	0	104 413	
0	0	21 535	0	0	0	0	0	0	0	32 421	32 421	2 143	56 099	
0	0	0	0	0	0	117 349	0	0	0	0	117 349	0	117 349	
0	0	0	0	0	0	0	0	0	0	23 682	23 682	0	23 682	
0	0	0	0	0	0	0	0	0	0	393 361	393 361	0	393 361	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	30 323	30 323	0	30 323	
0	0	0	0	0	0	0	0	0	0	226 052	226 052	0	226 052	
0	0	0	0	0	0	0	0	0	0	43 138	43 138	0	43 138	
0	0	0	0	0	0	0	0	0	0	21 458	21 458	0	21 458	
0	0	125 948	0	0	0	117 349	0	0	0	770 436	887 785	2 143	1 015 875	
298	386	2 784 838	103 960	7 123	25 999	117 349	553 614	10 996	250 357	777 252	1 742 690	176 652	4 808 139	

2 Physical output (supply) table 1990
2.1 Total

1000 t

Ser. No.	kinds of materials	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	228 134	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	23 234	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	49 707	0	0	0	0	0	0
5	Water	0	0	0	0	6 661 841	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	206 223	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	27 603	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	15 589	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	100 526	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	92 663
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	228 134	23 234	0	49 707	6 661 841	206 223	27 603	15 589	100 526	92 663
	Residual outputs										
	Wastes for economic re-use	0	0	6 173	9	98	17	5	4	1 176	58
	Wastes for treatment	23	1	2 922	20	77	234	40	46	1 541	61
	Wastes for storage	54	2	3 611	19	342	342	166	54	3 506	39
	Raw materials, not used	0	0	0	0	0	958 041	21 611	77	0	0
	Other materials discharged into nature	251 495	961	52	125	50	9 167	4 397	7	11 682	92
	Waste water for treatment	25 117	2 119	50 234	0	0	39 584	737	428	243 864	5 771
	Waste water discharged into nature	0	0	30 034 875	0	429 899	821 078	116 983	21 481	3 218 400	232 819
	Water vaporised	10 817	1 804	495 030	336	81 202	21 809	4 801	2 315	40 675	24 656
	Oxygen	201 428	24 624	0	0	0	0	0	0	0	0
	Carbon dioxide	31 503	2 324	266 041	452	117	5 963	822	1 063	22 429	13 263
	Other air emissions	1 900	12	728	185	2	1 313	4	69	2 309	325
	Total residual outputs	522 337	31 846	30 859 665	1 146	511 788	1 857 548	149 566	25 544	3 545 581	277 085
	Total outputs	750 471	55 080	30 859 665	50 853	7 173 629	2 063 771	177 169	41 133	3 646 107	369 748
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.1) minus Outputs (Table 2.1)

2 Physical output (supply) table 1990
2.1 Total

. 1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
7 113	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	1 324	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	786 360	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	1 153	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	7 069	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	134 432	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	7 351	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	4 257	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	14 529	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	3 645	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	8 595	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	145	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	12 343	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	562	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
7 113	1 324	786 360	1 153	7 069	134 432	7 351	4 257	14 529	3 645	8 595	145	12 343	562	
233	121	1 315	65	164	14 164	320	2 535	3 045	504	1 002	36	1 412	112	
315	179	1 518	93	96	101	243	780	564	86	534	15	623	33	
362	54	3 408	138	146	2 007	408	1 122	581	139	658	26	719	44	
0	0	2 071	0	0	0	0	0	0	0	0	0	0	0	
77	493	28 863	127	3 905	12 691	3 324	2 476	325	395	1 156	119	628	286	
22 097	10 796	10 951	2 970	12 739	53 527	49 310	9 147	37 109	7 628	41 922	4 107	53 531	1 845	
47 761	21 831	426 695	2 004	9 804	655 019	163 404	16 913	17 568	1 413	24 226	870	73 499	4 508	
6 212	3 759	31 739	1 702	6 959	52 855	18 275	6 156	5 744	914	4 214	669	5 453	97	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1 590	974	17 149	1 226	4 191	46 998	3 141	2 721	1 682	923	4 046	189	4 038	144	
8	5	310	25	91	4 671	133	87	321	589	280	3	359	431	
78 656	38 213	524 018	8 349	38 094	842 032	238 559	41 937	66 938	12 591	78 039	6 034	140 261	7 501	
85 770	39 537	1 310 378	9 502	45 164	976 464	245 910	46 194	81 467	16 236	86 634	6 179	152 605	8 063	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.1) minus Outputs (Table 2.1)

2 Physical output (supply) table 1990
2.1 Total

1000 t

Ser. No.	kinds of materials	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	15	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	5 163	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	431	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	8 741	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	473	0	0	0	0	0
30	Wood	0	0	0	0	0	16 934	0	0	0	0
31	Wood products	0	0	0	0	0	0	7 296	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	14 431	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	9 661	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	5 397
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	15	5 163	431	8 741	473	16 934	7 296	14 431	9 661	5 397
	Residual outputs										
	Wastes for economic re-use	21	553	49	920	35	4 838	954	735	762	1 052
	Wastes for treatment	25	319	40	194	28	740	925	1 797	218	104
	Wastes for storage	31	466	73	244	38	172	423	619	201	152
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	75	383	265	53	180	497	2 981	476	33	26
	Waste water for treatment	3 041	54 744	9 305	21 258	3 582	4 961	6 819	58 682	15 855	10 551
	Waste water discharged into nature	2 721	40 922	108	6 960	78	10 741	1 750	285 305	57 404	3 694
	Water vaporised	388	5 559	683	2 592	232	2 816	2 250	11 228	3 983	2 113
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	188	3 311	407	1 917	171	1 785	2 144	7 463	1 165	743
	Other air emissions	140	93	9	73	6	14	70	52	33	79
	Total residual outputs	6 631	106 349	10 939	34 211	4 350	26 563	18 316	366 357	79 655	18 515
	Total outputs	6 646	111 512	11 370	42 952	4 823	43 498	25 612	380 788	89 316	23 912
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.1) minus Outputs (Table 2.1)

2.1 Total

. 1000 t

Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
Production activities of branches														
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
212	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	2 492	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	347	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	80 914	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	26 541	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	280	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	516 481	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	23 780	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	90 943	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	178	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
212	2 492	347	80 914	26 541	280	516 481	23 780	90 943	178	0	0	0	0	
103	117	59	7 250	2 212	17	22 816	82	290	379	28	6	51	45	
51	198	52	588	106	13	31 749	211	1 143	340	62	16	43	72	
48	257	76	2 449	113	19	54 877	218	760	789	144	37	101	167	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
166	257	181	22 378	2 893	124	115 607	579	12 922	365	225	33	41	254	
4 243	87 542	4 773	232 047	83 536	1 132	14 089	1 886	4 085	6 914	6 285	105	1 519	2 305	
2 366	9 534	335	165 555	22 730	633	0	0	0	0	0	0	0	0	
576	2 725	532	21 493	15 514	619	7 027	1 124	5 289	6 219	1 887	3 546	755	13 658	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
216	2 818	483	10 564	2 793	131	5 334	2 076	10 679	9 869	1 966	8 985	1 155	33 099	
3	18	9	122	40	1	168	765	283	244	44	179	20	562	
7 774	103 465	6 498	462 445	129 937	2 689	251 666	6 942	35 450	25 119	10 642	12 906	3 685	50 161	
7 986	105 957	6 846	543 359	156 478	2 969	768 148	30 722	126 393	25 297	10 642	12 906	3 685	50 161	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.1) minus Outputs (Table 2.1)

2 Physical output (supply) table 1990
2.1 Total

1000 t

Ser. No.	kinds of materials	Production activities of branches									Productio
		Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government	Social security funds
		49	50	51	52	53	54	55	56	57	58
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	7 047	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	1 257	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	415	0	0
57	Military goods	0	0	0	0	0	0	0	0	16 591	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	13	0	0	0	147
	Total product outputs	0	0	0	7 047	1 257	13	0	415	16 591	147
	Residual outputs										
	Wastes for economic re-use	46	27	1	59	492	41	174	6 005	438	30
	Wastes for treatment	36	20	5	442	212	79	217	4 372	934	26
	Wastes for storage	82	47	10	1 025	492	161	502	1 859	1 818	55
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	28	16	109	976	8	63	234	10 578	370	14
	Waste water for treatment	1 938	629	0	21 998	1 519	33 940	28 650	300	318 910	786
	Waste water discharged into nature	0	0	0	0	0	0	0	7 894 704	0	0
	Water vaporised	897	391	104	5 937	716	6 845	8 067	21 957	101 783	360
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	1 044	554	218	2 776	1 058	1 453	6 869	12 257	11 436	463
	Other air emissions	16	7	1	1 831	20	40	278	1 443	102	14
	Total residual outputs	4 087	1 691	448	35 045	4 516	42 621	44 990	7 953 474	435 791	1 748
	Total outputs	4 087	1 691	448	42 092	5 773	42 634	44 990	7 953 889	452 382	1 895
	Memorandum Item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.1) minus Outputs (Table 2.1)

2 Physical output (supply) table 1990
2.1 Total

1000 t

activities of branches		House-hold con-sumption activities	Accumulation								Rest of the world	Total material inputs	Ser. No.
			Man-made assets						Non-produced natural assets	Totals			
Private non-profit institutions, private households	Totals		Consumer durables	Change in stocks	Controlled landfills	Fixed assets: Buildings	Fixed assets: Machinery, equipment	Produced natural assets					
59	60	61	62	63	64	65	66	67	68	69	70	71	
0	0	0	0	0	0	0	0	0	981 818	981 818	0	981 818	
0	0	0	0	0	0	0	0	0	193 347	193 347	0	193 347	
0	0	0	0	0	0	0	0	0	710	710	0	710	
0	0	0	0	0	0	0	0	0	170 000	170 000	0	170 000	
0	0	0	0	0	0	0	0	0	615 210	615 210	0	615 210	
0	0	0	0	0	0	0	0	0	46 427 580	46 427 580	0	46 427 580	
0	0	0	0	0	0	0	0	0	809 855	809 855	0	809 855	
0	0	0	0	0	0	0	0	0	310 697	310 697	0	310 697	
0	0	0	0	0	0	0	0	0	1 141	1 141	0	1 141	
0	0	0	0	0	0	0	0	0	49 510 358	49 510 358	0	49 510 358	
0	228 134	0	0	0	0	0	0	171 743	0	171 743	21 824	421 701	1
0	23 234	0	0	0	0	0	0	49 915	0	49 915	2 630	75 779	2
0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	49 707	0	0	0	0	0	0	0	0	0	0	49 707	4
0	6 661 841	0	0	0	0	0	0	0	0	0	73	6 661 914	5
0	206 223	0	0	0	0	0	0	0	0	0	15 738	221 961	6
0	27 603	0	0	0	0	0	0	0	0	0	51 810	79 413	7
0	15 589	0	0	0	0	0	0	0	0	0	111 008	126 597	8
0	100 526	0	0	0	0	0	0	0	0	0	28 585	129 111	9
0	92 663	0	0	0	0	0	0	0	0	0	47 590	140 253	10
0	7 113	0	0	0	0	0	0	0	0	0	1 466	8 579	11
0	1 324	0	0	0	0	0	0	0	0	0	694	2 018	12
0	786 360	0	0	0	0	0	0	0	0	0	30 581	816 941	13
0	1 153	0	0	0	0	0	0	0	0	0	1 346	2 499	14
0	7 069	0	0	0	0	0	0	0	0	0	1 661	8 730	15
0	134 432	0	0	0	0	0	0	0	0	0	16 939	151 370	16
0	7 351	0	0	0	0	0	0	0	0	0	3 168	10 519	17
0	4 257	0	0	0	0	0	0	0	0	0	328	4 585	18
0	14 529	0	0	0	0	0	0	0	0	0	1 866	16 395	19
0	3 645	0	0	0	0	0	0	0	0	0	632	4 276	20
0	8 595	0	0	0	0	0	0	0	0	0	2 049	10 644	21
0	145	0	0	0	0	0	0	0	0	0	138	284	22
0	12 343	0	107	0	0	0	208	0	0	315	3 732	16 390	23
0	562	0	0	0	0	0	134	0	0	134	374	1 070	24
0	15	0	0	0	0	0	0	0	0	0	26	41	25
0	5 163	0	0	0	0	0	0	0	0	0	1 891	7 055	26
0	431	0	0	0	0	0	0	0	0	0	112	544	27
0	8 741	0	0	0	0	0	0	0	0	0	1 414	10 155	28
0	473	0	0	0	0	0	0	0	0	0	210	683	29
0	16 934	0	0	0	0	0	0	0	0	0	5 098	22 032	30
0	7 296	0	0	0	0	0	0	0	0	0	1 792	9 088	31
0	14 431	0	0	0	0	0	0	0	0	0	10 162	24 593	32
0	9 661	0	0	0	0	0	0	0	0	0	975	10 636	33
0	5 397	0	0	0	0	0	0	0	0	0	155	5 553	34
0	212	0	0	0	0	0	0	0	0	0	299	511	35
0	2 492	0	0	0	0	0	0	0	0	0	1 697	4 189	36
0	347	0	0	0	0	0	0	0	0	0	511	859	37
0	80 914	0	0	0	0	0	0	0	0	0	17 100	98 013	38
0	26 541	0	0	0	0	0	0	0	0	0	1 425	27 966	39
0	280	0	0	0	0	0	0	0	0	0	40	320	40
0	516 481	0	0	0	0	0	0	0	0	0	70	516 551	41
0	23 780	0	0	0	0	0	0	0	0	0	0	23 780	42
0	90 943	0	0	0	0	0	0	0	0	0	5 216	96 159	43
0	178	0	0	0	0	0	0	0	0	0	0	178	44
0	7 047	0	0	0	0	0	0	0	0	0	0	7 047	52
0	1 257	0	0	0	0	0	0	0	0	0	143	1 400	53
0	415	0	0	0	0	0	0	0	0	0	0	415	56
0	16 591	0	0	0	0	0	0	0	0	0	0	16 591	57
15	175	0	0	0	0	0	0	0	0	0	0	175	54,5 8,59
15	9 230 596	0	107	0	0	0	342	221 658	0	222 107	392 567	9 845 270	
61	83 314	4 405	2 165	0	0	6 547	7 981	0	0	16 693	0	104 413	
105	55 629	4 437	380	0	0	8 011	0	0	0	8 391	0	68 457	
184	86 655	10 910	1 565	0	0	17 979	239	0	0	19 784	0	117 349	
0	981 800	0	0	0	0	0	0	0	0	0	0	981 800	
23	506 304	19 473	0	0	0	0	0	55 595	0	55 595	0	581 372	
26 509	1 759 966	2 636 200	0	0	0	0	0	0	0	0	0	4 396 166	
0	44 846 589	0	0	0	0	0	0	0	0	0	0	44 846 589	
5 608	1 093 665	472 261	0	0	0	0	0	0	0	0	0	1 565 925	
0	226 052	0	0	0	0	0	0	0	0	0	0	226 052	
2 356	582 939	194 910	0	0	0	0	0	0	0	0	0	777 849	
23	20 964	12 842	0	0	0	0	0	0	0	0	0	33 806	
34 870	50 243 877	3 355 438	4 110	0	0	32 537	8 221	55 595	0	100 463	0	53 699 778	
34 885	59 474 473	3 355 438	4 217	0	0	32 537	8 563	277 253	49 510 358	49 832 928	392 567	113 055 407	
0	0	0	2 906	25 341	117 349	521 077	2 433	- 26 896	- 457 727	184 482	- 184 482	0	

1) Inputs (Table 1.1) minus Outputs (Table 2.1)

2 Physical output (supply) table 1990
2.2 Energy

1000 t

Ser. No.	kinds of materials	Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		Production activities of branches									
		1	2	3	4	5	6	7	8	9	10
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	49 707	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	206 223	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	15 589	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	16 500	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	92 663
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	0	0	0	49 707	0	206 223	0	15 589	16 500	92 663
	Residual outputs										
	Wastes for economic re-use	0	0	6 014	0	0	0	0	3	122	3
	Wastes for treatment	0	0	2 565	6	0	97	20	36	219	2
	Wastes for storage	0	0	3 234	9	0	145	30	54	328	2
	Raw materials, not used	0	0	0	0	0	958 041	0	77	0	0
	Other materials discharged into nature	156	37	29	111	3	9 104	1	2	275	30
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	2 978	1 053	128 313	336	44	1 353	622	932	13 208	7 571
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	7 870	2 324	266 041	452	117	5 963	822	1 063	22 429	13 263
	Other air emissions	251	12	728	185	2	1 313	2	69	130	325
	Total residual outputs	11 255	3 426	406 924	1 100	167	976 016	1 496	2 238	36 710	21 197
	Total outputs	11 255	3 426	406 924	50 807	167	1 182 239	1 496	17 827	53 210	113 860
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.2) minus Outputs (Table 2.2)

2 Physical output (supply) table 1990
2.2 Energy

1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	6 400	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	200	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
0	0	0	0	0	6 400	0	0	0	0	0	0	200	0	
9	2	8	0	0	2	2	0	0	1	1	0	11	0	
17	21	58	17	9	0	33	20	8	35	42	2	39	0	
25	31	87	25	13	0	49	29	12	52	63	3	59	1	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
37	55	27	9	4	7	17	11	24	14	84	4	8	3	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
972	646	6 820	898	2 726	9 420	1 926	869	1 265	401	2 144	116	2 637	96	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
1 590	974	17 149	1 226	4 191	46 998	3 141	2 721	1 682	923	4 046	189	4 038	144	
8	5	286	9	50	529	14	75	6	11	53	2	36	1	
2 659	1 734	24 435	2 183	6 993	56 955	5 181	3 725	2 998	1 437	6 433	317	6 828	246	
2 659	1 734	24 435	2 183	6 993	63 355	5 181	3 725	2 998	1 437	6 433	317	7 028	246	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.2) minus Outputs (Table 2.2)

2 Physical output (supply) table 1990
2.2 Energy

1000 t

Ser. No.	kinds of materials	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	100	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58 ,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	0	100	0	0	0	0	0	0	0	0
	Residual outputs										
	Wastes for economic re-use	0	2	0	1	1	116	118	220	0	0
	Wastes for treatment	0	27	4	8	1	56	52	133	0	0
	Wastes for storage	0	40	6	12	2	83	79	199	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	3	48	19	19	3	4	19	160	7	7
	Waste water for treatment	0	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	135	1 722	221	1 130	90	705	797	3 725	806	516
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	188	3 311	407	1 917	171	1 785	2 144	7 463	1 165	743
	Other air emissions	1	42	6	16	3	13	39	43	9	9
	Total residual outputs	328	5 191	663	3 103	271	2 761	3 249	11 942	1 987	1 275
	Total outputs	328	5 291	663	3 103	271	2 761	3 249	11 942	1 987	1 275
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.2) minus Outputs (Table 2.2)

2.2 Energy

1000 t

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	5	0	0	5	1	0	0	0	0	0	0	
0	48	3	121	4	0	9	4	2	7	1	0	1	0	
1	72	4	181	6	1	14	6	4	10	1	0	1	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4	14	8	55	10	4	2 456	6	57	30	22	6	1	54	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
100	1 675	226	5 671	1 520	67	2 033	793	4 556	5 004	791	3 527	490	13 243	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
216	2 818	483	10 564	2 793	131	5 334	2 076	10 679	9 869	1 966	8 985	1 155	33 099	
3	18	8	96	37	1	161	67	280	239	41	64	20	561	
325	4 645	732	16 693	4 369	205	10 012	2 953	15 578	15 159	2 823	12 582	1 668	46 956	
325	4 645	732	16 693	4 369	205	10 012	2 953	15 578	15 159	2 823	12 582	1 668	46 956	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.2) minus Outputs (Table 2.2)

2 Physical output (supply) table 1990
2.2 Energy

1000 t

Ser. No.	kinds of materials	Production activities of branches: Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government
		49	50	51	52	53	54	55	56	57
	Raw material outputs									
	Raw materials, not used	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0
	Product outputs									
1	Agricultural products	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0
	Total product outputs	0	0	0	0	0	0	0	0	0
	Residual outputs									
	Wastes for economic re-use	0	0	0	0	0	0	0	1 134	0
	Wastes for treatment	0	0	0	5	0	0	3	762	38
	Wastes for storage	0	0	0	8	0	0	5	1 144	56
	Raw materials, not used	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	1	1	4	7	4	7	16	0	32
	Waste water for treatment	0	0	0	0	0	0	0	0	0
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0
	Water vaporised	557	279	104	1 370	446	618	3 096	4 151	5 151
	Oxygen	0	0	0	0	0	0	0	0	0
	Carbon dioxide	1 044	554	218	2 776	1 058	1 453	6 869	12 257	11 436
	Other air emissions	16	7	1	36	19	39	270	35	102
	Total residual outputs	1 618	841	327	4 202	1 527	2 117	10 259	19 482	16 815
	Total outputs	1 618	841	327	4 202	1 527	2 117	10 259	19 482	16 815
	Memorandum item:									
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.2) minus Outputs (Table 2.2)

2 Physical output (supply) table 1990
2.2 Energy

1000 t

Production activities of branches: Social security funds	Production activities of branches: Private non-profit institutions, private households	Production activities of branches: Totals	Household consumption activities	Accumulation: Man-made assets: Consumer durables	Accumulation: Man-made assets: Change in stocks	Accumulation: Man-made assets: Controlled landfills	Accumulation: Man-made assets: Fixed assets: Buildings	Accumulation: Man-made assets: Fixed assets: Machinery, equipment	Accumulation: Produced natural assets	Accumulation: Non-produced natural assets	Accumulation: Totals	Rest of the world	Total material inputs	Ser. No.
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
0	0	0	0	0	0	0	0	0	0	958 136	958 136	0	958 136	
0	0	0	0	0	0	0	0	0	0	193 347	193 347	0	193 347	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	771 625	771 625	0	771 625	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	1 141	1 141	0	1 141	
0	0	0	0	0	0	0	0	0	0	1 924 249	1 924 249	0	1 924 249	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	3 080	0	3 080	0	3 080	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	49 707	0	0	0	0	0	0	0	0	0	0	49 707	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	206 223	0	0	0	0	0	0	0	0	0	15 738	221 961	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	15 589	0	0	0	0	0	0	0	0	0	111 008	126 597	8
0	0	16 500	0	0	0	0	0	0	0	0	0	0	16 500	9
0	0	92 663	0	0	0	0	0	0	0	0	0	47 590	140 253	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	6 400	0	0	0	0	0	0	0	0	0	0	6 400	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	200	0	0	0	0	0	0	0	0	0	0	200	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	100	0	0	0	0	0	0	0	0	0	0	100	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
0	0	387 382	0	0	0	0	0	0	3 080	0	3 080	174 336	564 798	
0	0	7 782	0	0	0	0	0	0	0	0	0	0	7 782	
3	3	4 540	116	0	0	0	0	0	0	0	0	0	4 656	
4	5	6 195	174	0	0	0	0	0	0	0	0	0	6 369	
0	0	958 118	0	0	0	0	0	0	0	0	0	0	958 118	
1	2	13 144	201	0	0	0	0	0	0	0	0	0	13 345	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
190	978	253 829	84 703	0	0	0	0	0	0	0	0	0	338 531	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
463	2 356	559 306	175 405	0	0	0	0	0	0	0	0	0	734 711	
14	23	6 441	5 907	0	0	0	0	0	0	0	0	0	12 348	
675	3 366	1 809 354	266 506	0	0	0	0	0	0	0	0	0	2 075 860	
675	3 366	2 196 736	266 506	0	0	0	0	0	3 080	1 924 249	1 927 329	174 336	4 564 907	
0	0	0	0	0	- 732	0	0	0	- 3 080	132 804	128 993	- 150 617	- 21 625	

1) Inputs (Table 1.2) minus Outputs (Table 2.2)

2 Physical output (supply) table 1990
2.3 Water

. 1000 t

Ser. No.	kinds of materials	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	107 638	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	13 800	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	6 661 753	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	30 000	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	107 638	13 800	0	0	6 661 753	0	0	0	30 000	0
	Residual outputs										
	Wastes for economic re-use	0	0	5	0	94	0	0	0	0	0
	Wastes for treatment	0	0	64	0	60	0	0	0	0	0
	Wastes for storage	0	0	361	0	337	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	174 666	0	0	0	0	0	0	0	0	0
	Waste water for treatment	25 117	2 119	50 232	0	0	39 579	737	428	243 855	5 769
	Waste water discharged into nature	0	0	30 034 875	0	429 899	821 078	116 983	21 481	3 218 400	232 819
	Water vaporised	0	751	366 718	0	81 158	20 455	4 180	1 382	27 467	17 085
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual outputs	199 782	2 870	30 452 254	0	511 548	881 111	121 900	23 291	3 489 722	255 673
	Total outputs	307 420	16 670	30 452 254	0	7 173 301	881 111	121 900	23 291	3 519 722	255 673
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.3) minus Outputs (Table 2.3)

2 Physical output (supply) table 1990
2.3 Water

. 1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	30 000	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
0	0	30 000	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
22 097	10 795	10 951	2 970	12 738	53 522	49 309	9 147	37 109	7 628	41 917	4 107	53 528	1 845	
47 761	21 831	426 695	2 004	9 804	655 019	163 404	16 913	17 568	1 413	24 226	870	73 499	4 508	
5 240	3 113	24 919	805	4 233	43 434	16 349	5 286	4 478	513	2 070	553	2 817	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
75 098	35 740	462 564	5 778	26 775	751 975	229 062	31 346	59 155	9 554	68 213	5 530	129 843	6 354	
75 098	35 740	492 564	5 778	26 775	751 975	229 062	31 346	59 155	9 554	68 213	5 530	129 843	6 354	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.3) minus Outputs (Table 2.3)

2 Physical output (supply) table 1990
2.3 Water

1000 t

Ser. No.	kinds of materials	Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		Production activities of branches									
		25	26	27	28	29	30	31	32	33	34
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	0	0	0	0	0	0	0	0	0	0
	Residual outputs										
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0	0
	Waste water for treatment	3 041	54 741	9 305	21 255	3 582	4 961	6 819	58 681	15 855	10 549
	Waste water discharged into nature	2 721	40 922	108	6 960	78	10 741	1 750	285 305	57 404	3 694
	Water vaporised	253	3 837	462	1 461	142	2 111	1 453	7 503	3 177	1 597
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0	0
	Total residual outputs	6 015	99 500	9 875	29 677	3 802	17 813	10 022	351 490	76 437	15 839
	Total outputs	6 015	99 500	9 875	29 677	3 802	17 813	10 022	351 490	76 437	15 839
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.3) minus Outputs (Table 2.3)

2 Physical output (supply) table 1990
2.3 Water

1000 t

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	15 000	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	22 000	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
0	0	0	15 000	22 000	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 243	87 541	4 772	232 047	83 536	1 131	14 086	1 884	4 065	6 904	6 285	105	1 519	2 292	
2 366	9 534	335	165 555	22 730	633	0	0	0	0	0	0	0	0	
476	1 050	306	15 821	13 994	552	4 994	331	733	1 216	1 096	18	265	415	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
7 085	98 124	5 413	413 423	120 259	2 316	19 080	2 214	4 798	8 120	7 381	123	1 784	2 707	
7 085	98 124	5 413	428 423	142 259	2 316	19 080	2 214	4 798	8 120	7 381	123	1 784	2 707	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.3) minus Outputs (Table 2.3)

2 Physical output (supply) table 1990
2.3 Water

1000 t

Ser. No.	kinds of materials	Production activities of branches								
		Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government
		49	50	51	52	53	54	55	56	57
	Raw material outputs									
	Raw materials, not used	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0
	Product outputs									
1	Agricultural products	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0
	Total product outputs	0	0	0	0	0	0	0	0	0
	Residual outputs									
	Wastes for economic re-use	0	0	0	0	0	0	0	0	0
	Wastes for treatment	0	0	0	0	0	0	0	0	0
	Wastes for storage	0	0	0	0	0	0	0	0	0
	Raw materials, not used	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	0	0	0	0	0	0	0	0	0
	Waste water for treatment	1 936	626	0	21 268	1 514	33 633	28 494	300	318 816
	Waste water discharged into nature	0	0	0	0	0	0	0	7 894 704	0
	Water vaporised	340	113	0	4 567	270	6 227	4 971	17 806	96 632
	Oxygen	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	0	0	0	0	0	0
	Total residual outputs	2 276	738	0	25 835	1 784	39 860	33 465	7 912 810	415 448
	Total outputs	2 276	738	0	25 835	1 784	39 860	33 465	7 912 810	415 448
	Memorandum item:									
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.3) minus Outputs (Table 2.3)

2 Physical output (supply) table 1990
2.3 Water

. 1000 t

Production activities of branches			House-hold con-sumption activities	Accumulation								Rest of the world	Total material inputs	Ser. No.
				Man-made assets						Non-produced natural assets	Totals			
							Fixed assets							
Social security funds	Private non-profit institutions, private households	Totals		Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets					
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	46 427 580	46 427 580	0	46 427 580	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	46 427 580	46 427 580	0	46 427 580	
0	0	107 638	0	0	0	0	0	0	0	0	0	0	107 638	1
0	0	13 800	0	0	0	0	0	0	0	0	0	0	13 800	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	6 661 753	0	0	0	0	0	0	0	0	0	73	6 661 826	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	30 000	0	0	0	0	0	0	0	0	0	0	30 000	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	30 000	0	0	0	0	0	0	0	0	0	0	30 000	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	15 000	0	0	0	0	0	0	0	0	0	0	15 000	38
0	0	22 000	0	0	0	0	0	0	0	0	0	0	22 000	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,5 8,59
0	0	6 880 191	0	0	0	0	0	0	0	0	0	73	6 880 264	
0	0	99	0	0	0	0	0	0	0	0	0	0	99	
0	0	123	0	0	0	0	0	0	0	0	0	0	123	
0	0	699	0	0	0	0	0	0	0	0	0	0	699	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	174 666	0	0	0	0	0	0	0	0	0	0	174 666	
753	26 502	1 758 536	2 619 899	0	0	0	0	0	0	0	0	0	4 378 435	
0	0	44 846 589	0	0	0	0	0	0	0	0	0	0	44 846 589	
170	4 631	831 997	365 074	0	0	0	0	0	0	0	0	0	1 197 071	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
923	31 133	47 612 709	2 984 973	0	0	0	0	0	0	0	0	0	50 597 682	
923	31 133	54 492 900	2 984 973	0	0	0	0	0	0	46 427 580	46 427 580	73	103 905 526	
0	0	0	0	0	73	0	0	0	0	- 209 255	- 209 182	7 642	- 201 540	

1) Inputs (Table 1.3) minus Outputs (Table 2.3)

2 Physical output (supply) table 1990
2.4 Other materials

1000 t

Ser. No.	kinds of materials	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	120 496	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	9 434	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	88	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	27 603	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	54 026	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	120 496	9 434	0	0	88	0	27 603	0	54 026	0
	Residual outputs										
	Wastes for economic re-use	0	0	153	9	4	17	5	1	1 055	55
	Wastes for treatment	23	1	292	14	18	138	20	10	1 322	60
	Wastes for storage	54	2	16	10	5	197	137	0	3 178	36
	Raw materials, not used	0	0	0	0	0	0	21 611	0	0	0
	Other materials discharged into nature	76 673	924	23	14	47	63	4 396	4	11 407	62
	Waste water for treatment	0	0	2	0	0	6	0	0	9	2
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	7 839	0	0	0	0	0	0	0	0	0
	Oxygen	201 428	24 624	0	0	0	0	0	0	0	0
	Carbon dioxide	23 633	0	0	0	0	0	0	0	0	0
	Other air emissions	1 649	0	0	0	0	0	1	0	2 179	0
	Total residual outputs	311 300	25 550	487	46	73	420	26 170	15	19 150	215
	Total outputs	431 796	34 984	487	46	161	420	53 773	15	73 176	215
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.4) minus Outputs (Table 2.4)

2 Physical output (supply) table 1990
2.4 Other materials

1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery and equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
7 113	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	1 324	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	756 360	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	1 153	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	7 069	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	128 032	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	7 351	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	4 257	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	14 529	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	3 645	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	8 595	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	145	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	12 143	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	562	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
0	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	0	0	0	0	0	0	0	0	0	0	0	0	0	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
7 113	1 324	756 360	1 153	7 069	128 032	7 351	4 257	14 529	3 645	8 595	145	12 143	562	
224	119	1 307	65	164	14 163	318	2 535	3 045	503	1 001	36	1 400	112	
298	158	1 460	76	87	101	210	760	556	51	492	13	584	33	
337	23	3 321	113	132	2 007	358	1 093	569	87	595	23	660	44	
0	0	2 071	0	0	0	0	0	0	0	0	0	0	0	
40	438	28 836	118	3 901	12 684	3 307	2 465	301	381	1 072	115	620	283	
0	0	0	0	0	5	1	0	0	0	5	0	3	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	24	16	42	4 142	120	12	315	578	227	2	323	430	
900	739	37 019	387	4 327	33 102	4 315	6 865	4 786	1 600	3 393	188	3 590	902	
8 013	2 063	793 379	1 541	11 396	161 133	11 666	11 122	19 315	5 245	11 987	333	15 733	1 463	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.4) minus Outputs (Table 2.4)

2 Physical output (supply) table 1990
2.4 Other materials

1000 t

Ser. No.	kinds of materials	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	15	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	5 063	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	431	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	8 741	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	473	0	0	0	0	0
30	Wood	0	0	0	0	0	16 934	0	0	0	0
31	Wood products	0	0	0	0	0	0	7 296	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0		14 431	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	9 661	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	5 397
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	0	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Military goods	0	0	0	0	0	0	0	0	0	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	0	0	0	0	0
	Total product outputs	15	5 063	431	8 741	473	16 934	7 296	14 431	9 661	5 397
	Residual outputs										
	Wastes for economic re-use	21	551	49	920	33	4 721	836	515	762	1 052
	Wastes for treatment	25	292	36	186	27	684	872	1 664	218	104
	Wastes for storage	31	426	67	231	36	88	344	420	201	152
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	72	335	246	34	177	493	2 962	316	26	19
	Waste water for treatment	0	3	0	3	0	0	0	0	0	2
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	139	51	3	57	3	1	31	10	24	70
	Total residual outputs	288	1 658	401	1 430	277	5 989	5 044	2 925	1 231	1 400
	Total outputs	303	6 721	832	10 171	750	22 923	12 341	17 356	10 892	6 797
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1)]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.4) minus Outputs (Table 2.4)

2 Physical output (supply) table 1990
2.4 Other materials

. 1000 t

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	11
0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
0	0	0	0	0	0	0	0	0	0	0	0	0	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
0	0	0	0	0	0	0	0	0	0	0	0	0	0	15
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	17
0	0	0	0	0	0	0	0	0	0	0	0	0	0	18
0	0	0	0	0	0	0	0	0	0	0	0	0	0	19
0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
0	0	0	0	0	0	0	0	0	0	0	0	0	0	21
0	0	0	0	0	0	0	0	0	0	0	0	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
0	0	0	0	0	0	0	0	0	0	0	0	0	0	30
0	0	0	0	0	0	0	0	0	0	0	0	0	0	31
0	0	0	0	0	0	0	0	0	0	0	0	0	0	32
0	0	0	0	0	0	0	0	0	0	0	0	0	0	33
0	0	0	0	0	0	0	0	0	0	0	0	0	0	34
212	0	0	0	0	0	0	0	0	0	0	0	0	0	35
0	2 492	0	0	0	0	0	0	0	0	0	0	0	0	36
0		347	0	0	0	0	0	0	0	0	0	0	0	37
0	0	0	65 914	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	4 541	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	280	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	516 481	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	23 780	0	0	0	0	0	0	42
0	0	0	0	0	0	0	0	90 943	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	178	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	0	0	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54,58,59
212	2 492	347	65 914	4 541	280	516 481	23 780	90 943	178	0	0	0	0	
103	117	59	7 245	2 212	17	22 811	81	290	379	28	6	51	45	
51	150	49	468	102	13	31 739	207	1 141	333	61	16	43	72	
47	185	72	2 268	108	18	54 863	212	756	778	143	37	99	167	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
162	243	173	22 323	2 883	120	113 151	573	12 865	335	203	27	40	200	
0	1	0	0	0	0	4	2	20	10	0	0	0	13	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	25	3	0	7	698	3	5	3	115	0	1	
364	696	353	32 329	5 309	168	222 574	1 774	15 074	1 840	437	201	233	498	
577	3 188	701	98 243	9 849	448	739 056	25 554	106 017	2 018	437	201	233	498	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

1) Inputs (Table 1.4) minus Outputs (Table 2.4)

2 Physical output (supply) table 1990
2.4 Other materials

1000 t

Ser. No.	kinds of materials	Production activities of branches									Productio
		Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government	Social security funds
		49	50	51	52	53	54	55	56	57	58
	Raw material outputs										
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Soil minerals for plants	0	0	0	0	0	0	0	0	0	0
	Soil excavation for structures	0	0	0	0	0	0	0	0	0	0
	Other solid materials (stones, clay etc.)	0	0	0	0	0	0	0	0	0	0
	Water raised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air components (nitrogene etc.)	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
1	Agricultural products	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
5	Water	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
7	Products of mining (excl.coal,crude oil,natural gas)	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
11	Plastic products	0	0	0	0	0	0	0	0	0	0
12	Rubber products	0	0	0	0	0	0	0	0	0	0
13	Stones and clays, building a. construction materials, etc.	0	0	0	0	0	0	0	0	0	0
14	Ceramic products	0	0	0	0	0	0	0	0	0	0
15	Glass and glass products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
17	Non-ferrous metals, semi-finished products thereof	0	0	0	0	0	0	0	0	0	0
18	Foundry products	0	0	0	0	0	0	0	0	0	0
19	Products of drawing plants, cold rolling mills, etc.	0	0	0	0	0	0	0	0	0	0
20	Structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Machinery and equipment (excl. electrical)	0	0	0	0	0	0	0	0	0	0
22	Office machinery, automatic data processing equipment	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
24	Ships, boats and floating structures	0	0	0	0	0	0	0	0	0	0
25	Aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
27	Precision and optical instruments, clocks and watches	0	0	0	0	0	0	0	0	0	0
28	Tools and finished metal products	0	0	0	0	0	0	0	0	0	0
29	Musical instruments, games and toys, sports goods etc	0	0	0	0	0	0	0	0	0	0
30	Wood	0	0	0	0	0	0	0	0	0	0
31	Wood products	0	0	0	0	0	0	0	0	0	0
32	Pulp, paper and paperboard	0	0	0	0	0	0	0	0	0	0
33	Products of paper and paperboard	0	0	0	0	0	0	0	0	0	0
34	Products of printing and duplicating	0	0	0	0	0	0	0	0	0	0
35	Leather and leather products, footwear	0	0	0	0	0	0	0	0	0	0
36	Textiles	0	0	0	0	0	0	0	0	0	0
37	Wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Food products (excl. beverages)	0	0	0	0	0	0	0	0	0	0
39	Beverages	0	0	0	0	0	0	0	0	0	0
40	Tobacco products	0	0	0	0	0	0	0	0	0	0
41	Building and civil engineering works, etc.	0	0	0	0	0	0	0	0	0	0
42	Installation and building completion works	0	0	0	0	0	0	0	0	0	0
43	Secondary raw materials	0	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
52	Meals of hotels, restaurants, cantines	0	0	0	7 047	0	0	0	0	0	0
53	Works of art, books, magazines, newspapers	0	0	0	0	1 257	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	415	0	0
57	Military goods	0	0	0	0	0	0	0	0	16 591	0
54,58,59	Social insurance benefits in kind	0	0	0	0	0	13	0	0	0	147
	Total product outputs	0	0	0	7 047	1 257	13	0	415	16 591	147
	Residual outputs										
	Wastes for economic re-use	46	27	1	59	492	41	174	4 871	438	30
	Wastes for treatment	35	20	5	437	212	79	214	3 610	897	24
	Wastes for storage	82	47	11	1 017	492	160	497	716	1 762	51
	Raw materials, not used	0	0	0	0	0	0	0	0	0	0
	Other materials discharged into nature	27	15	105	969	4	56	218	10 578	338	13
	Waste water for treatment	2	3	0	730	5	307	156	0	94	33
	Waste water discharged into nature	0	0	0	0	0	0	0	0	0	0
	Water vaporised	0	0	0	0	0	0	0	0	0	0
	Oxygen	0	0	0	0	0	0	0	0	0	0
	Carbon dioxide	0	0	0	0	0	0	0	0	0	0
	Other air emissions	0	0	0	1 795	0	1	8	1 408	0	0
	Total residual outputs	193	112	121	5 007	1 206	644	1 266	21 182	3 528	151
	Total outputs	193	112	121	12 054	2 463	657	1 266	21 597	20 119	298
	Memorandum item:										
	Material accumulation resp. Foreign trade balance[1]	0	0	0	0	0	0	0	0	0	0

1) Inputs (Table 1.4) minus Outputs (Table 2.4)

2 Physical output (supply) table 1990
2.4 Other materials

. 1000 t

ı activities of branches			Accumulation										
			Man-made assets										
						Fixed assets							
Private non-profit institutions, private households	Totals	House-hold con-sumption activities	Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets	Non-produced natural assets	Totals	Rest of the world	Total material inputs	Ser. No.
59	60	61	62	63	64	65	66	67	68	69	70	71	
0	0	0	0	0	0	0	0	0	23 682	23 682	0	23 682	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	710	710	0	710	
0	0	0	0	0	0	0	0	0	170 000	170 000	0	170 000	
0	0	0	0	0	0	0	0	0	615 210	615 210	0	615 210	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	38 230	38 230	0	38 230	
0	0	0	0	0	0	0	0	0	310 697	310 697	0	310 697	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	1 158 529	1 158 529	0	1 158 529	
0	120 496	0	0	0	0	0	0	171 743	0	171 743	21 824	314 063	1
0	9 434	0	0	0	0	0	0	46 835	0	46 835	2 630	58 899	2
0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	88	0	0	0	0	0	0	0	0	0	0	88	5
0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	27 603	0	0	0	0	0	0	0	0	0	51 810	79 413	7
0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	54 026	0	0	0	0	0	0	0	0	0	28 585	82 611	9
0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	7 113	0	0	0	0	0	0	0	0	0	1 466	8 579	11
0	1 324	0	0	0	0	0	0	0	0	0	694	2 018	12
0	756 360	0	0	0	0	0	0	0	0	0	30 581	786 941	13
0	1 153	0	0	0	0	0	0	0	0	0	1 346	2 499	14
0	7 069	0	0	0	0	0	0	0	0	0	1 661	8 730	15
0	128 032	0	0	0	0	0	0	0	0	0	16 939	144 970	16
0	7 351	0	0	0	0	0	0	0	0	0	3 168	10 519	17
0	4 257	0	0	0	0	0	0	0	0	0	328	4 585	18
0	14 529	0	0	0	0	0	0	0	0	0	1 866	16 395	19
0	3 645	0	0	0	0	0	0	0	0	0	632	4 276	20
0	8 595	0	0	0	0	0	0	0	0	0	2 049	10 644	21
0	145	0	0	0	0	0	0	0	0	0	138	284	22
0	12 143	0	107	0	0	0	208	0	0	315	3 732	16 190	23
0	562	0	0	0	0	0	134	0	0	134	374	1 070	24
0	15	0	0	0	0	0	0	0	0	0	26	41	25
0	5 063	0	0	0	0	0	0	0	0	0	1 891	6 955	26
0	431	0	0	0	0	0	0	0	0	0	112	544	27
0	8 741	0	0	0	0	0	0	0	0	0	1 414	10 155	28
0	473	0	0	0	0	0	0	0	0	0	210	683	29
0	16 934	0	0	0	0	0	0	0	0	0	5 098	22 032	30
0	7 296	0	0	0	0	0	0	0	0	0	1 792	9 088	31
0	14 431	0	0	0	0	0	0	0	0	0	10 162	24 593	32
0	9 661	0	0	0	0	0	0	0	0	0	975	10 636	33
0	5 397	0	0	0	0	0	0	0	0	0	155	5 553	34
0	212	0	0	0	0	0	0	0	0	0	299	511	35
0	2 492	0	0	0	0	0	0	0	0	0	1 697	4 189	36
0	347	0	0	0	0	0	0	0	0	0	511	859	37
0	65 914	0	0	0	0	0	0	0	0	0	17 100	83 013	38
0	4 541	0	0	0	0	0	0	0	0	0	1 425	5 966	39
0	280	0	0	0	0	0	0	0	0	0	40	320	40
0	516 481	0	0	0	0	0	0	0	0	0	70	516 551	41
0	23 780	0	0	0	0	0	0	0	0	0	0	23 780	42
0	90 943	0	0	0	0	0	0	0	0	0	5 216	96 159	43
0	178	0	0	0	0	0	0	0	0	0	0	178	44
0	7 047	0	0	0	0	0	0	0	0	0	0	7 047	52
0	1 257	0	0	0	0	0	0	0	0	0	143	1 400	53
0	415	0	0	0	0	0	0	0	0	0	0	415	56
0	16 591	0	0	0	0	0	0	0	0	0	0	16 591	57
15	175	0	0	0	0	0	0	0	0	0	0	175	54,58,59
15	1 963 023	0	107	0	0	0	342	218 578	0	219 027	218 158	2 400 208	
61	75 433	4 405	2 165	0	0	6 547	7 981	0	0	16 693	0	96 532	
102	50 966	4 321	380	0	0	8 011	0	0	0	8 391	0	63 678	
180	79 761	10 736	1 565	0	0	17 979	239	0	0	19 784	0	110 281	
0	23 682	0	0	0	0	0	0	0	0	0	0	23 682	
21	318 494	19 272	0	0	0	0	0	55 595	0	55 595	0	393 361	
6	1 430	16 301	0	0	0	0	0	0	0	0	0	17 731	
0	0	0	0	0	0	0	0	0	0	0	0	0	
0	7 839	22 484	0	0	0	0	0	0	0	0	0	30 323	
0	226 052	0	0	0	0	0	0	0	0	0	0	226 052	
0	23 633	19 505	0	0	0	0	0	0	0	0	0	43 138	
0	14 523	6 935	0	0	0	0	0	0	0	0	0	21 458	
371	821 814	103 960	4 110	0	0	32 537	8 221	55 595	0	100 463	0	1 026 237	
386	2 784 838	103 960	4 217	0	0	32 537	8 563	274 173	1 158 529	1 478 019	218 158	4 584 974	
0	0	0	2 906	25 999	117 349	521 077	2 433	- 23 816	- 381 277	264 671	- 41 506	223 165	

1) Inputs (Table 1.4) minus Outputs (Table 2.4)

3 Material integration (input-output) table 1990
3.1 Total - domestic production and imports

1000 t

Ser. No.	Supply \ Use	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
1	Agriculture	99 558	78	1	0	0	0	0	0	36	0
2	Forestry and fishing etc.	160	88	180	0	0	0	0	0	62	0
3	Electricity, steam, hot water supply	0	0	1	0	0	0	0	0	0	0
4	Gas supply	1	159	9 134	630	0	9	286	0	5 241	655
5	Water supply	59 013	2 870	143 680	0	1 659 561	77 952	1 999	1 219	372 904	19 011
6	Coal mining	53	26	142 845	681	0	37 664	38	0	5 707	0
7	Other mining (excl. coal, crude oil, nat. gas)	2 172	399	37	0	0	0	7 266	0	4 876	0
8	Extract. of crude oil, natural gas	0	0	81	48 393	0	0	0	453	450	75 507
9	Man. of chemical products (incl. nuclear fuel)	8 451	182	166	31	115	149	16	6	58 418	1 060
10	Man. of refined petroleum products	2 556	602	3 251	57	40	1 041	20	5	14 368	20 281
11	Man. of plastic products	101	2	1	0	0	2	0	0	367	8
12	Man. of rubber products	41	2	1	0	0	4	0	0	9	3
13	Quarr. of stones a. clays, man. of building a. constr.	1 012	27	16	0	26	56	18	0	4 114	40
14	Man. of ceramic products	53	11	4	0	0	0	0	0	14	0
15	Man. of glass and glass products	793	8	0	0	0	0	0	0	142	0
16	Man. of iron and steel	0	0	2 228	0	0	791	0	0	2	0
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	0	0	0	0	260	0
18	Man. of foundry products	5	0	0	0	0	6	0	0	23	15
19	Man. of drawing plants prod., cold rolling mills etc.	24	2	0	0	0	48	4	0	13	0
20	Man. of structural metal products, rolling stock	0	0	10	1	0	33	0	0	20	7
21	Man. of machinery and equipment (excl. electrical)	110	7	16	3	4	153	10	6	66	14
22	Man. of office machinery autom. data process. equipment	0	0	0	0	0	0	1	0	0	0
23	Man. of road vehicles	0	0	0	0	0	0	0	0	0	0
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Man. of electrical machinery equipment and appliances	10	0	73	8	2	7	3	0	14	2
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	3	6	0	0	0	3	0
28	Man. of tools and finished metal products	30	1	2	0	0	18	2	0	466	110
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	0	0	0	0	0	1	0
30	Man. of wood	36	0	1	0	0	53	0	0	95	0
31	Man. of wood products	131	12	0	0	0	0	0	0	167	0
32	Man. of pulp, paper and paperboard	48	5	62	0	4	16	0	0	663	0
33	Man. of paper and paperboard products	90	1	4	0	1	3	1	1	663	0
34	Printing and duplicating	44	4	5	0	1	3	0	0	78	1
35	Man. of leather and leather products, footwear	4	1	0	0	0	0	0	1	0	0
36	Man. of textiles	6	0	1	0	1	1	0	0	4	0
37	Man. of wearing apparel	1	0	0	0	0	0	0	0	0	0
38	Man. of food products (excl. beverages)	14 650	186	0	0	0	0	0	0	3 130	12
39	Man. of beverages	51	0	2	0	0	6	0	1	17	2
40	Man. of tobacco products	0	0	0	0	0	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	4 747	0	0	0	0	0	0	0	80	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	0	0	0	0	0	0	0	0	27	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	415	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0	0
60	Totals	193 953	4 674	301 803	50 222	1 659 762	118 017	9 664	1 692	472 497	116 728
61	Household consumption activities	0	0	0	0	0	0	0	0	0	0
62	Consumer durables	0	0	0	0	0	0	0	0	0	0
63	Change in stocks	0	0	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0	0	0
68	Non-produced natural assets	556 518	50 407	30 557 862	632	5 513 867	1 945 754	167 506	39 442	3 173 610	253 020
69	Total material input (= domestic material output)	750 471	55 080	30 859 665	50 853	7 173 629	2 063 771	177 169	41 133	3 646 107	369 748
70	+ Imports of similar products	21 824	2 630	0	0	73	15 738	51 810	111 008	28 585	47 590
71	- Material accumulation resp. foreign trade balance	0	0	0	0	0	0	0	0	0	0
73	= Total material supply	772 295	57 710	30 859 665	50 853	7 173 702	2 079 509	228 979	152 141	3 674 693	417 338

3 Material integration (input-output) table 1990
3.1 Total - domestic production and imports

1000 t

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery a. equipment (excl. electrical)	Man. of office mach., auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	2	0	0	0	0	1	0	1	0	1
0	236	446	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
311	259	1 272	323	886	2 339	582	285	460	103	484	37	802	32	4
17 311	6 672	171 916	2 765	10 361	88 400	71 606	8 775	31 651	6 767	28 142	4 106	45 169	1 524	5
42	44	3 670	6	18	15 948	316	519	4	12	89	0	168	0	6
0	1	1 279	8	1 191	44 083	3 712	1 226	57	0	0	0	0	0	7
0	0	0	16	16	253	150	0	26	0	50	0	101	0	8
6 358	1 168	404	202	492	4 945	2 335	271	401	715	1 364	16	1 317	479	9
261	135	1 696	149	655	945	188	172	199	221	917	37	698	25	10
770	4	0	10	7	1	0	1	1	66	401	2	309	8	11
1	56	8	0	1	4	0	7	0	6	85	0	455	3	12
2	52	182 548	1 167	6 512	7 215	44	2 025	894	217	350	0	122	0	13
0	0	1	2	0	1	0	0	0	0	0	0	1	0	14
152	0	0	0	1 018	22	0	0	2	53	53	0	357	7	15
4	0	45	0	0	94 041	8	1 564	13 540	2 464	2 779	28	4 317	454	16
0	0	0	0	0	115	3 639	901	467	457	662	1	134	6	17
0	9	5	0	1	196	7	215	57	152	1 320	27	1 156	14	18
0	255	69	0	0	422	1	3	3 709	540	1 879	39	1 752	188	19
1	0	0	0	0	0	0	0	0	16	2	0	0	4	20
48	37	76	48	16	39	8	19	28	88	1 182	7	236	66	21
0	0	0	0	1	0	0	0	0	0	1	16	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	3 725	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
5	1	10	1	0	30	19	10	5	2	314	39	515	30	26
0	0	0	0	0	6	0	6	3	8	11	3	25	6	27
98	13	15	2	16	41	6	11	59	204	189	6	294	30	28
0	0	0	0	1	0	0	0	0	0	1	0	1	0	29
134	0	0	0	0	0	0	0	0	213	323	0	607	104	30
16	16	72	27	140	91	27	49	69	18	599	66	205	48	31
28	30	56	21	20	24	5	6	11	19	231	13	150	4	32
120	42	141	43	182	3	1	2	3	3	148	1	8	2	33
7	3	5	4	5	8	1	1	7	7	71	40	15	1	34
0	1	0	0	0	1	0	1	0	0	3	0	0	0	35
54	55	1	2	1	1	0	1	1	1	16	0	25	7	36
0	0	0	0	0	0	0	0	0	0	0	0	1	0	37
49	0	0	4	0	0	0	0	0	0	0	0	0	0	38
1	1	0	0	1	5	1	0	1	0	5	0	3	0	39
0	0	0	0	0	1	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
215	86	15 630	0	1 791	12 899	1 858	4 802	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	0	0	0	0	0	0	0	1	29	64	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
25 988	9 184	379 368	4 801	23 332	272 081	84 516	20 874	51 654	12 351	41 677	4 513	62 733	3 044	60
0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
0	0	0	0	0	0	0	0	0	0	0	0	0	0	62
0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
0	0	0	0	0	0	0	0	0	0	0	0	0	0	66
0	0	0	0	0	0	0	0	0	0	0	0	0	0	67
59 782	30 352	931 010	4 701	21 831	704 383	161 393	25 320	29 813	3 884	44 957	1 667	89 872	5 019	68
85 770	39 537	1 310 378	9 502	45 164	976 464	245 910	46 194	81 467	16 236	86 634	6 179	152 605	8 063	69
1 465	694	30 581	1 346	1 661	16 939	3 168	328	1 866	632	2 049	138	3 732	374	70
0	0	0	0	0	0	0	0	0	0	0	0	0	0	71
87 235	40 231	1 340 960	10 848	46 824	993 403	249 077	46 522	83 333	16 867	88 683	6 318	156 336	8 437	73

3 Material integration (input-output) table 1990
3.1 Total - domestic production and imports

1000 t

Ser. No.	Supply \ Use	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
1	Agriculture	0	1	0	1	0	0	3	12	0	0
2	Forestry and fishing etc	0	0	0	0	34	15 264	2 908	5 320	0	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0	0
4	Gas supply	51	369	59	295	21	89	31	1 059	285	177
5	Water supply	3 051	42 003	8 389	16 596	3 064	3 902	6 013	18 364	9 085	8 837
6	Coal mining	4	55	7	19	0	40	11	779	21	0
7	Other mining (excl. coal, crude oil, nat. gas)	0	301	0	0	97	0	0	0	0	0
8	Extract. of crude oil, natural gas	0	50	0	26	0	0	0	0	0	0
9	Man. of chemical products (incl. nuclear fuel)	146	659	170	398	117	216	284	431	356	588
10	Man. of refined petroleum products	22	840	98	375	40	214	389	672	149	113
11	Man. of plastic products	11	231	28	62	105	1	100	1	38	31
12	Man. of rubber products	1	41	7	27	17	1	13	0	0	2
13	Quarr. of stones a. clays, man. of building a. constr.	1	772	79	771	48	4	22	2 085	47	0
14	Man. of ceramic products	0	16	15	0	0	1	2	0	0	0
15	Man. of glass and glass products	3	205	43	138	19	24	238	17	0	0
16	Man. of iron and steel	21	574	5	5 411	2	72	73	0	71	0
17	Man. of non-ferr. metals, semifin. products thereof	29	1 035	7	792	2	0	0	0	0	0
18	Man. of foundry products	0	161	32	63	0	0	0	17	0	0
19	Man. of drawing plants prod., cold rolling mills etc	20	488	68	1 043	125	13	187	6	0	0
20	Man. of structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Man. of machinery and equipment (excl. electrical)	7	114	16	64	2	20	29	28	15	35
22	Man. of office machinery autom. data process. equipment	0	1	0	0	1	0	0	0	0	2
23	Man. of road vehicles	0	0	0	0	0	0	0	0	0	0
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	7	0	0	0	0	0	0	0	0	0
26	Man. of electrical machinery equipment and appliances	14	836	3	6	2	0	4	1	3	5
27	Man. of precis. and optical instrum., clocks a. watches	6	3	65	3	0	0	0	0	0	0
28	Man. of tools and finished metal products	13	305	14	608	12	8	268	0	33	15
29	Man. of musical instrum., games a. toys, sport goods etc.	0	2	0	0	11	0	1	0	0	0
30	Man. of wood	1	237	27	389	22	2 612	7 220	0	29	0
31	Man. of wood products	13	54	53	150	17	103	1 321	54	10	10
32	Man. of pulp, paper and paperboard	1	223	55	89	45	115	125	3 845	7 323	5 172
33	Man. of paper and paperboard products	0	316	71	136	48	9	107	99	2 473	233
34	Printing and duplicating	3	98	48	11	4	3	48	1	32	695
35	Man. of leather and leather products, footwear	1	0	1	0	0	1	11	0	1	0
36	Man. of textiles	6	15	9	9	8	0	120	0	43	2
37	Man. of wearing apparel	0	0	0	1	0	0	0	0	0	0
38	Man. of food products (excl. beverages)	0	0	0	0	2	0	0	0	74	5
39	Man. of beverages	0	3	0	3	0	0	0	1	0	2
40	Man. of tobacco products	0	0	0	0	0	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	0	0	0	0	0	5 158	0	6 697	345	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	0	38	16	0	16	0	8	0	0	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ	0	0	0	0	0	0	0	0	0	0
60	Totals	3 431	50 048	9 387	27 485	3 881	27 872	19 537	39 489	20 433	15 925
61	Household consumption activities	0	0	0	0	0	0	0	0	0	0
62	Consumer durables	0	0	0	0	0	0	0	0	0	0
63	Change in stocks	0	0	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0	0	0
68	Non-produced natural assets	3 216	61 464	1 983	15 466	942	15 626	6 074	341 299	68 883	7 988
69	Total material input (= domestic material output)	6 646	111 512	11 370	42 952	4 823	43 498	25 612	380 788	89 316	23 912
70	+ Imports of similar products	26	1 891	112	1 414	210	5 097	1 792	10 162	975	155
71	- Material accumulation resp. foreign trade balance	0	0	0	0	0	0	0	0	0	0
73	= Total material supply	6 672	113 404	11 482	44 366	5 033	48 595	27 404	390 950	90 291	24 068

3 Material integration (input-output) table 1990
3.1 Total - domestic production and imports

1000 t

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommunication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
1	264	0	64 759	3 751	129	2	0	5	3	0	7	0	1	1
24	0	10	508	0	0	1 070	0	0	12	0	0	0	0	2
0	0	0	0	0	0	0	0	6 173	0	0	0	0	0	3
17	571	39	1 582	378	16	35	17	455	986	56	0	47	19	4
2 354	26 432	3 471	188 330	61 686	926	15 438	1 727	3 840	6 333	5 757	96	1 391	2 111	5
1	135	7	409	46	5	38	28	44	30	27	0	6	0	6
0	0	0	2 079	0	0	11	0	5	0	99	0	0	99	7
0	17	0	14	0	0	0	0	4	0	0	0	0	0	8
126	1 067	55	500	111	28	384	1 469	1 195	21	54	4	18	5	9
59	370	127	1 925	580	29	4 080	627	3 148	2 413	581	3 042	327	10 037	10
13	33	31	717	196	9	671	739	417	338	1	0	1	0	11
19	15	26	10	3	1	26	25	148	26	1	0	3	28	12
29	27	1	87	7	0	533 647	15 459	1 315	0	0	0	0	0	13
0	0	0	0	0	0	32	1 559	65	0	1	0	0	0	14
0	0	1	1 161	1 603	0	47	373	244	24	0	0	0	0	15
0	1	0	97	0	0	3 541	167	14 164	0	0	1	0	2	16
0	0	0	0	0	0	33	91	320	0	0	0	0	0	17
0	0	0	1	0	0	153	137	2 535	0	17	0	0	0	18
21	0	14	3	0	0	2 696	170	3 048	0	86	9	11	6	19
0	0	0	1	0	0	641	339	504	0	33	0	0	0	20
13	66	2	47	12	4	36	119	1 012	19	22	12	3	15	21
0	1	0	0	1	0	0	0	38	3	1	0	1	1	22
0	0	0	0	0	0	0	0	1 412	0	0	0	0	136	23
0	0	0	0	0	0	0	0	112	0	0	0	0	0	24
0	0	0	0	0	0	0	0	21	0	0	0	0	2	25
1	4	2	5	0	0	8	823	558	6	14	1	15	6	26
0	0	0	0	0	0	0	0	49	0	3	0	3	3	27
19	25	15	550	113	2	81	1 087	980	82	5	1	4	20	28
0	0	1	0	1	0	1	0	37	5	0	0	0	2	29
6	0	0	0	0	0	5 695	2 241	4 839	0	0	0	1	3	30
16	44	6	114	76	49	210	640	956	35	5	0	1	3	31
61	116	78	135	36	31	57	12	1 364	513	32	13	60	17	32
94	325	74	758	171	127	11	50	1 184	474	13	2	18	5	33
3	22	34	104	31	18	24	18	1 152	376	34	13	78	86	34
26	1	3	1	0	0	1	0	103	1	2	0	4	1	35
17	1 164	281	5	2	0	1	23	135	30	5	4	7	9	36
0	0	25	0	0	0	0	0	59	0	1	0	0	1	37
0	4	1	24 996	1 036	12	1	0	7 253	1	0	18	0	26	38
0	1	1	453	2 666	1	4	2	2 233	10	0	116	0	13	39
0	0	0	0	0	15	1	0	18	0	0	0	0	0	40
0	0	0	0	0	0	27	0	22 816	0	0	0	0	0	41
0	0	0	0	0	0	0	5	82	0	0	0	0	0	42
88	0	39	1 168	0	0	21 112	0	290	0	0	0	0	0	43
0	0	0	0	0	0	0	0	379	0	0	0	0	0	44
0	0	0	0	0	0	0	0	28	0	0	0	0	0	45
0	0	0	0	0	0	0	0	6	0	0	0	0	0	46
0	0	0	0	0	0	0	0	51	0	0	0	0	0	47
0	0	0	0	0	0	0	0	45	0	0	0	0	0	48
0	0	0	0	0	0	0	0	46	0	0	0	0	0	49
0	0	0	0	0	0	0	0	27	0	0	0	0	0	50
0	0	0	0	0	0	0	0	1	0	0	0	0	0	51
0	0	0	0	0	0	0	0	59	0	0	0	0	0	52
0	8	0	8	32	24	4	11	505	39	8	0	4	8	53
0	0	0	0	0	0	0	0	41	0	0	0	0	0	54
0	0	0	0	0	0	0	0	174	0	0	0	0	0	55
0	0	0	0	0	0	0	0	6 005	0	0	0	0	0	56
0	0	0	0	0	0	0	0	438	0	0	0	0	0	57
0	0	0	0	0	0	0	0	30	0	0	0	0	0	58
0	0	0	0	0	0	0	0	61	0	0	0	0	0	59
3 007	30 713	4 346	290 528	72 540	1 425	589 820	27 958	92 224	11 780	6 859	3 339	2 005	12 665	60
0	0	0	0	0	0	0	0	4 405	0	0	0	0	0	61
0	0	0	0	0	0	0	0	2 165	0	0	0	0	0	62
0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	0	0	0	0	0	0	6 547	0	0	0	0	0	65
0	0	0	0	0	0	0	0	7 981	0	0	0	0	0	66
0	0	0	0	0	0	0	0	0	0	0	0	0	0	67
4 979	75 244	2 500	252 830	83 938	1 544	178 328	2 764	13 070	13 517	3 783	9 567	1 681	37 496	68
7 986	105 957	6 846	543 359	156 478	2 969	768 148	30 722	126 393	25 297	10 642	12 906	3 685	50 161	69
299	1 697	511	17 100	1 425	40	70	0	5 217	0	0	0	0	0	70
0	0	0	0	0	0	0	0	0	0	0	0	0	0	71
8 285	107 654	7 357	560 458	157 903	3 009	768 217	30 722	131 610	25 297	10 642	12 906	3 685	50 161	73

3 Material integration (input-output) table 1990
3.1 Total - domestic production and imports

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Ser. No.	Supply \ Use	Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services a. publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government
		Production activities of branches								
		49	50	51	52	53	54	55	56	57
1	Agriculture	0	0	0	1 585	1	17	0	25 140	100
2	Forestry and fishing etc.	0	0	0	17	0	0	14	2 120	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	53 154	0
4	Gas supply	120	50	0	242	33	32	257	164	2 895
5	Water supply	1 775	576	0	20 150	1 391	31 089	26 061	16 683	333 029
6	Coal mining	0	0	0	24	0	0	7	39 830	250
7	Other mining (excl. coal, crude oil, nat. gas)	0	0	98	12	0	302	0	785	160
8	Extract. of crude oil, natural gas	0	0	0	0	0	0	0	474	2
9	Man. of chemical products (incl. nuclear fuel)	9	9	0	92	50	77	397	244 756	347
10	Man. of refined petroleum products	244	140	73	691	315	444	2 005	6 400	2 684
11	Man. of plastic products	1	1	0	13	3	12	4	22 366	119
12	Man. of rubber products	1	0	4	1	0	9	26	10 966	49
13	Quarr. of stones a. clays, man. of building a. constr.	0	0	0	0	0	3	0	12 427	10 382
14	Man. of ceramic products	0	0	0	2	0	4	0	3 063	1
15	Man. of glass and glass products	0	0	7	46	0	48	0	12 834	3
16	Man. of iron and steel	0	0	0	0	0	0	0	53 619	152
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	0	0	0	49 545	1
18	Man. of foundry products	0	0	0	0	0	0	28	9 926	1
19	Man. of drawing plants prod., cold rolling mills etc.	0	0	1	0	0	0	0	37 674	7
20	Man. of structural metal products, rolling stock	0	0	1	0	0	0	1	7 711	2
21	Man. of machinery and equipment (excl. electrical)	1	2	2	8	0	2	5	42 452	27
22	Man. of office machinery autom. data process. equipment	0	1	0	1	1	0	1	4 123	6
23	Man. of road vehicles	0	0	0	0	0	0	2	54 100	118
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	1 879	1
25	Man. of aircraft and spacecraft	0	0	0	0	0	0	0	3 066	9
26	Man. of electrical machinery equipment and appliances	1	0	0	17	1	2	13	55 053	51
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	0	0	39	8	9 343	19
28	Man. of tools and finished metal products	2	2	1	15	0	1	10	21 449	19
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	1	0	0	4	3 604	5
30	Man. of wood	0	0	0	0	0	0	0	5 079	15
31	Man. of wood products	3	0	0	10	0	0	9	7 113	60
32	Man. of pulp, paper and paperboard	42	49	1	113	233	79	224	59 314	417
33	Man. of paper and paperboard products	10	11	0	122	269	4	167	16 076	90
34	Printing and duplicating	87	22	5	41	1 821	21	184	10 666	681
35	Man. of leather and leather products, footwear	0	0	0	0	0	0	0	4 294	10
36	Man. of textiles	4	6	0	16	3	8	15	87 741	42
37	Man. of wearing apparel	0	0	0	4	0	0	2	4 824	5
38	Man. of food products (excl. beverages)	0	0	0	3 640	0	26	112	232 609	424
39	Man. of beverages	2	3	0	6 269	3	0	3	83 642	6
40	Man. of tobacco products	0	0	0	17	0	0	0	1 143	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	16 041	5 737
42	Installation and building, completion	0	0	0	0	0	0	0	2 092	324
43	Wholesale trade, etc., recycling	0	0	0	0	0	0	0	5 229	63
44	Retail trade	0	0	0	0	0	0	0	7 254	0
45	Railway transport	0	0	0	0	0	0	0	6 347	0
46	Water transport, ports	0	0	0	0	0	0	0	121	0
47	Post and telecommunication	0	0	0	0	0	0	0	1 562	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	2 376	0
49	Banking	0	0	0	0	0	0	0	1 973	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	649	0
51	Renting of reale state	0	0	0	0	0	0	0	5	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	22 440	0
53	Educat., research, cultural services and publishing	29	4	0	10	76	1	39	1 731	4
54	Health a. veterinary market service activities	0	0	0	0	0	1	0	34 018	0
55	Other market service activities, etc.	0	0	0	0	0	0	0	28 866	0
56	External environmental protection services	0	0	0	0	0	0	0	2 530	0
57	Central and local government	0	0	0	0	0	0	0	319 839	5
58	Social security funds	0	0	0	0	0	0	0	812	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	26 611	0
60	Totals	2 332	878	194	33 161	4 202	32 223	29 596	1 797 705	358 322
61	Household consumption activities	0	0	0	0	0	0	0	2 640 637	0
62	Consumer durables	0	0	0	0	0	0	0	380	0
63	Change in stocks	0	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	5 360	0
66	Machinery, equipment	0	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0	0
68	Non-produced natural assets	1 755	814	254	8 931	1 571	10 411	15 394	3 509 808	94 061
69	Total material input (= domestic material output)	4 087	1 691	448	42 092	5 773	42 634	44 990	7 953 889	452 382
70	+ Imports of similar products	0	0	0	0	143	0	0	1	0
71	- Material accumulation resp. foreign trade balance	0	0	0	0	0	0	0	0	0
73	= Total material supply	4 087	1 691	448	42 092	5 916	42 634	44 990	7 953 889	452 382

3 Material integration (input-output) table 1990
3.1 Total - domestic production and imports

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Production activities of branches				Accumulation										
				Man-made assets										
							Fixed assets							
Social security funds	Private non-profit institutions, private households	Totals	House-hold con-sumption activities	Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets	Non-produced natural assets	Totals	Rest of the world	Total material inputs	Ser. No.
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
5	35	195 493	18 271	0	- 995	54	0	0	55 614	497 143	551 816	6 715	772 295	1
0	1	28 475	2 949	0	20 008	2	0	0	- 26 915	29 724	22 819	3 467	57 710	2
0	0	59 328	0	0	0	3 611	0	0	0	30 796 726	30 800 337	0	30 859 665	3
9	63	34 811	13 727	0	245	19	0	0	0	1 099	1 362	953	50 853	4
720	24 282	3 728 328	2 925 973	0	73	342	0	0	0	511 270	511 686	7 715	7 173 702	5
0	0	249 673	2 453	0	203	342	0	0	0	1 817 371	1 817 916	9 467	2 079 509	6
0	0	70 355	1 303	0	983	166	0	0	0	148 618	149 767	7 554	228 979	7
0	0	126 081	0	0	- 106	54	0	0	0	25 012	24 960	1 100	152 141	8
194	52	343 450	2 415	0	684	3 506	0	0	0	3 295 494	3 299 684	29 143	3 674 693	9
141	701	92 613	42 973	0	- 1 412	39	0	0	0	271 156	269 782	11 969	417 338	10
0	4	28 359	581	42	38	362	156	0	0	55 649	56 247	2 048	87 235	11
4	2	12 192	302	5	- 3	54	0	0	0	27 062	27 119	618	40 231	12
0	0	783 671	6	0	3 546	3 408	0	0	0	506 827	513 781	43 502	1 340 960	13
0	0	4 850	263	5	12	138	0	0	0	5 083	5 238	496	10 848	14
0	0	19 687	192	31	54	146	0	0	0	24 950	25 180	1 765	46 824	15
0	0	200 244	0	0	234	2 007	0	0	0	772 233	774 474	18 685	993 403	16
0	0	58 496	0	0	149	408	11	0	0	188 278	188 846	1 735	249 077	17
0	0	16 281	0	0	30	1 122	0	275	0	28 353	29 780	461	46 522	18
0	0	54 644	7	0	147	581	0	0	0	25 639	26 367	2 316	83 333	19
0	0	9 326	0	0	0	139	1 941	499	0	4 234	6 813	728	16 867	20
0	0	46 497	27	11	87	658	80	3 390	0	33 923	38 149	4 010	88 683	21
0	0	4 202	50	6	2	26	0	108	0	1 850	1 992	74	6 318	22
3	0	59 497	314	3 016	132	719	0	2 440	0	83 977	90 284	6 242	156 336	23
0	0	1 992	0	6	- 174	44	0	502	0	5 467	5 845	600	8 437	24
0	0	3 106	0	0	0	31	0	4	0	3 513	3 548	18	6 672	25
0	1	58 559	147	995	18	466	181	672	0	50 268	52 600	2 097	113 404	26
0	3	9 622	58	19	5	73	0	110	0	1 472	1 679	124	11 482	27
1	0	27 377	287	794	30	244	365	1 998	0	11 595	15 025	1 677	44 366	28
0	0	3 681	445	22	- 2	38	0	57	0	668	782	125	5 033	29
0	0	29 981	400	0	136	172	0	0	0	15 853	16 161	2 053	48 595	30
0	1	12 888	989	1 869	48	423	113	841	0	9 195	12 488	1 039	27 404	31
51	4	81 463	149	0	32	619	0	0	0	304 525	305 175	4 163	390 950	32
7	0	25 019	1 052	0	53	201	0	0	0	62 619	62 873	1 347	90 291	33
11	36	16 821	37	0	15	152	0	0	0	6 655	6 822	388	24 068	34
0	0	4 478	324	0	2	48	0	0	0	3 328	3 378	104	8 285	35
1	2	89 915	423	302	- 140	257	0	47	0	15 351	15 817	1 499	107 654	36
0	2	4 927	683	0	4	76	0	0	0	1 539	1 619	128	7 357	37
18	241	288 536	33 213	0	1 316	2 449	0	0	0	220 111	223 876	14 833	560 458	38
2	1	95 533	16 688	0	166	113	0	0	0	43 970	44 249	1 432	157 903	39
0	0	1 195	191	0	6	19	0	0	0	1 509	1 533	89	3 009	40
0	0	44 621	0	0	0	54 877	510 790	0	0	157 906	723 573	23	768 217	41
0	0	2 503	0	0	0	218	23 456	0	0	4 545	28 220	0	30 722	42
0	0	82 298	157	0	- 279	760	0	0	0	35 989	36 469	12 686	131 610	43
0	0	7 633	178	0	0	789	0	0	0	16 697	17 485	0	25 297	44
0	0	6 375	0	0	0	144	0	0	0	4 123	4 267	0	10 642	45
0	0	127	0	0	0	37	0	0	0	12 742	12 779	0	12 906	46
0	0	1 614	0	0	0	101	0	0	0	1 971	2 072	0	3 685	47
0	0	2 422	0	0	0	167	0	0	0	47 573	47 739	0	50 161	48
0	0	2 019	0	0	0	82	0	0	0	1 985	2 068	0	4 087	49
0	0	675	0	0	0	47	0	0	0	969	1 016	0	1 691	50
0	0	6	0	0	0	10	0	0	0	431	442	0	448	51
0	0	22 500	7 047	0	0	1 025	0	0	0	11 520	12 545	0	42 092	52
0	1	2 753	571	0	- 7	492	0	0	0	1 801	2 286	306	5 916	53
0	0	34 059	13	0	0	161	0	0	0	8 401	8 561	0	42 634	54
0	0	29 040	0	0	0	502	0	0	0	15 447	15 949	0	44 990	55
0	0	8 950	0	0	0	1 859	0	0	0	7 940 937	7 942 797	2 143	7 953 889	56
0	0	320 282	17	0	0	1 818	16 520	54	0	113 691	132 083	0	452 382	57
0	0	842	147	0	0	55	0	0	0	851	906	0	1 895	58
0	3	26 675	15	0	0	184	0	0	0	8 011	8 195	0	34 885	59
1 168	25 435	7 577 041	3 075 037	7 123	25 341	86 655	553 614	10 996	28 699	48 294 898	49 007 326	207 637	59 867 041	60
0	0	2 645 042	0	0	0	10 910	0	0	0	699 486	710 396	0	3 355 438	61
0	0	2 545	0	0	0	1 565	0	0	0	0	1 565	107	4 217	62
0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	11 907	0	0	0	17 979	0	0	0	2 651	20 630	0	32 537	65
0	0	7 981	0	0	0	239	0	0	0	0	239	342	8 563	66
0	0	0	0	0	0	0	0	0	0	55 595	55 595	0	55 595	67
727	9 450	49 229 957	280 401	0	0	0	0	0	0	0	0	0	49 510 358	68
1 895	34 885	59 474 473	3 355 438	7 123	25 341	117 349	553 614	10 996	28 699	49 052 631	49 795 752	208 086	112 833 749	69
0	0	392 568										- 392 568	0	70
0	0	0	0	2 906	25 341	117 349	521 077	2 433	- 26 896	- 457 727	184 482	- 184 482	0	71
1 895	34 885	59 867 041	3 355 438	4 217	0	0	32 537	8 563	55 595	49 510 358	49 611 270	0	112 833 749	73

3 Material integration (input-output) table 1990
3.2 Uses of commodities and raw materials - domestic production

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Ser. No.	Supply \ Use	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude petrol., nat. gas)	Extract. of crude petroleum, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
1	Agriculture	98 085	39	0	0	0	0	0	0	6	0
2	Forestry and fishing etc.	155	57	180	0	0	0	0	0	3	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0	0
4	Gas supply	1	159	9 134	630	0	9	286	0	5 241	654
5	Water supply	59 013	2 870	143 680	0	1 659 488	77 952	1 999	1 219	372 904	19 011
6	Coal mining	12	6	133 989	681	0	37 253	38	0	4 080	0
7	Other mining (excl. coal, crude petrol., nat. gas)	2 082	340	31	0	0	0	7 105	0	3 887	0
8	Extract. of crude petroleum, natural gas	0	0	18	10 996	0	0	0	146	144	2 535
9	Man. of chemical products (incl. nuclear fuel)	2 825	69	104	29	65	85	11	5	45 314	850
10	Man. of refined petroleum products	1 892	363	2 233	40	25	470	12	2	7 402	13 056
11	Man. of plastic products	73	0	1	0	0	2	0	0	317	5
12	Man. of rubber products	13	1	0	0	0	3	0	0	7	2
13	Quarr. of stones a. clays, man. of building a. constr.	1 011	27	13	0	26	36	17	0	3 445	40
14	Man. of ceramic products	42	8	2	0	0	0	0	0	5	0
15	Man. of glass and glass products	671	7	0	0	0	0	0	0	125	0
16	Man. of iron and steel	0	0	2 227	0	0	787	0	0	2	0
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	0	0	0	0	146	0
18	Man. of foundry products	5	0	0	0	0	5	0	0	21	14
19	Man. of drawing plants prod., cold rolling mills etc.	22	2	0	0	0	42	4	0	10	0
20	Man. of structural metal products, rolling stock	0	0	9	1	0	33	0	0	20	7
21	Man. of machinery and equipment (excl. electrical)	78	6	11	3	2	121	7	3	43	11
22	Man. of office machinery autom. data process. equipment	0	0	0	0	0	0	1	0	0	0
23	Man. of road vehicles	0	0	0	0	0	0	0	0	0	0
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Man. of electrical machinery equipment and appliances	5	0	67	7	2	5	3	0	11	1
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	3	5	0	0	0	2	0
28	Man. of tools and finished metal products	20	0	2	0	0	16	2	0	394	93
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	0	0	0	0	0	1	0
30	Man. of wood	34	0	1	0	0	34	0	0	68	0
31	Man. of wood products	105	10	0	0	0	0	0	0	131	0
32	Man. of pulp, paper and -board	32	4	39	0	3	11	0	0	313	0
33	Man. of paper and -board products	73	1	3	0	1	2	1	1	604	0
34	Printing and duplicating	43	3	5	0	1	3	0	0	74	1
35	Man. of leather and leather products, footwear	0	1	0	0	0	0	0	1	0	0
36	Man. of textiles	1	0	0	0	1	0	0	0	1	0
37	Man. of wearing apparel	1	0	0	0	0	0	0	0	0	0
38	Man. of food products (excl. beverages)	12 994	172	0	0	0	0	0	0	2 161	6
39	Man. of beverages	51	0	2	0	0	6	0	0	7	2
40	Man. of tobacco products	0	0	0	0	0	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	4 719	0	0	0	0	0	0	0	72	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	0	0	0	0	0	0	0	0	26	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc.	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	415	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0	0
60	Totals	184 056	4 145	291 751	12 805	1 659 618	116 876	9 485	1 378	446 986	36 289
61	Household consumption activities	0	0	0	0	0	0	0	0	0	0
62	Consumer durables	0	0	0	0	0	0	0	0	0	0
63	Change in stocks	0	0	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0	0	0
68	Non-produced natural assets	556 518	50 407	30 557 862	632	5 513 867	1 945 754	167 506	39 442	3 173 610	253 020
69	Total material input (domestic origin)	740 575	54 551	30 849 613	13 436	7 173 485	2 062 630	176 991	40 820	3 620 596	289 309

3 Material integration (input-output) table 1990

3.2 Uses of commodities and raw materials - domestic production

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Production activities of branches: Man. of plastic products	Man. of rubber products	Quarr. of stones a. clays, man. of building a. constr.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Production activities of branches: Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machin-ery and equipment (excl. electrical)	Man. of office machinery autom. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating struc-tures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
0	9	446	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
311	259	1 272	323	886	2 339	582	285	460	103	484	37	802	32	4
17 311	6 672	171 916	2 765	10 361	88 400	71 606	8 775	31 651	6 767	28 142	4 106	45 169	1 524	5
21	28	2 132	3	0	15 582	247	421	0	5	72	0	123	0	6
0	1	437	4	486	1 128	659	151	20	0	0	0	0	0	7
0	0	0	4	4	57	34	0	6	0	11	0	23	0	8
3 672	848	245	92	382	4 718	1 875	215	372	631	906	6	839	379	9
155	71	1 131	104	463	640	120	103	117	141	585	22	455	16	10
682	4	0	5	2	1	0	1	1	63	359	2	297	8	11
1	42	3	0	0	3	0	6	0	5	64	0	274	2	12
2	25	176 566	728	6 008	6 651	38	1 814	839	205	317	0	116	0	13
0	0	0	0	0	0	0	0	0	0	0	0	0	0	14
126	0	0	0	741	12	0	0	1	31	35	0	250	4	15
4	0	45	0	0	90 574	3	818	10 217	1 060	1 448	20	2 705	216	16
0	0	0	0	0	32	2 018	567	298	345	515	1	92	4	17
0	8	4	0	1	175	7	201	52	138	1 230	24	1 098	12	18
0	213	60	0	0	342	1	3	3 305	451	1 605	31	1 561	151	19
1	0	0	0	0	0	0	0	0	11	2	0	0	4	20
35	27	64	41	12	18	5	10	20	63	897	6	172	42	21
0	0	0	0	1	0	0	0	0	0	1	8	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	2 592	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
4	1	8	1	0	0	0	2	4	0	224	21	374	22	26
0	0	0	0	0	5	0	5	3	8	9	3	21	5	27
76	11	13	2	15	37	5	10	52	167	159	6	263	28	28
0	0	0	0	1	0	0	0	0	0	1	0	1	0	29
96	0	0	0	0	0	0	0	0	155	230	0	436	75	30
12	12	56	21	109	72	21	39	56	15	475	48	177	47	31
16	19	30	11	12	17	4	4	8	13	138	9	89	3	32
107	38	123	41	172	2	1	1	2	2	135	1	5	2	33
7	3	5	4	5	8	1	1	7	7	68	37	14	1	34
0	1	0	0	0	1	0	0	0	0	3	0	0	0	35
26	28	0	1	0	0	0	0	0	0	6	0	14	4	36
0	0	0	0	0	0	0	0	0	0	0	0	0	0	37
24	0	0	2	0	0	0	0	0	0	0	0	0	0	38
1	0	0	0	0	5	1	0	0	0	5	0	3	0	39
0	0	0	0	0	1	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
179	39	15 474	0	1 678	12 329	1 095	4 616	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	0	0	0	0	0	0	0	1	28	63	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
22 868	8 369	370 028	4 152	21 338	223 148	78 325	18 049	47 489	10 386	38 129	4 412	58 029	2 580	60
0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
0	0	0	0	0	0	0	0	0	0	0	0	0	0	62
0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
0	0	0	0	0	0	0	0	0	0	0	0	0	0	66
0	0	0	0	0	0	0	0	0	0	0	0	0	0	67
59 782	30 352	931 010	4 701	21 831	704 383	161 393	25 320	29 813	3 884	44 957	1 667	89 872	5 019	68
82 650	38 721	1 301 038	8 854	43 169	927 531	239 718	43 369	77 302	14 270	83 087	6 079	147 901	7 598	69

3.2 Uses of commodities and raw materials - domestic production

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Ser. No.	Supply \ Use	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and board	Man. of paper and -board products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
1	Agriculture	0	0	0	0	0	0	0	0	0	0
2	Forestry and fishing etc.	0	0	0	0	3	14 378	2 706	5 164	0	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0	0
4	Gas supply	51	369	59	295	21	89	31	1 059	285	177
5	Water supply	3 051	42 003	8 389	16 596	3 064	3 902	6 013	18 364	9 085	8 837
6	Coal mining	2	20	2	4	0	12	0	506	13	0
7	Other mining (excl. coal, crude oil, nat. gas)	0	126	0	0	73	0	0	0	0	0
8	Extract. of crude oil, natural gas	0	11	0	6	0	0	0	0	0	0
9	Man. of chemical products (incl. nuclear fuel)	144	274	58	208	24	144	175	260	250	512
10	Man. of refined petroleum products	13	533	59	233	25	140	276	374	99	74
11	Man. of plastic products	11	227	27	56	70	1	86	1	24	20
12	Man. of rubber products	1	31	6	18	9	1	6	0	0	2
13	Quarr. of stones a. clays, man. of building a. constr.	1	546	79	705	3	3	16	1 321	21	0
14	Man. of ceramic products	0	12	0	0	0	0	0	0	0	0
15	Man. of glass and glass products	2	153	20	121	17	13	172	9	0	0
16	Man. of iron and steel	15	242	4	3 786	2	38	39	0	37	0
17	Man. of non-ferr. metals, semifin. products thereof	23	761	2	632	2	0	0	0	0	0
18	Man. of foundry products	0	152	29	57	0	0	0	15	0	0
19	Man. of drawing plants prod., cold rolling mills etc.	13	418	56	880	104	10	168	5	0	0
20	Man. of structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Man. of machinery and equipment (excl. electrical)	6	89	12	50	2	16	21	11	10	28
22	Man. of office machinery autom. data process. equipment	0	1	0	0	1	0	0	0	0	1
23	Man. of road vehicles	0	0	0	0	0	0	0	0	0	0
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	3	0	0	0	0	0	0	0	0	0
26	Man. of electrical machinery equipment and appliances	13	476	2	4	1	0	3	1	2	4
27	Man. of precis. and optical instrum., clocks a. watches	5	2	55	3	0	0	0	0	0	0
28	Man. of tools and finished metal products	13	302	12	484	9	7	224	0	25	10
29	Man. of musical instrum., games a. toys, sport goods etc.	0	2	0	0	2	0	1	0	0	0
30	Man. of wood	1	161	19	265	6	1 448	5 683	0	20	0
31	Man. of wood products	13	49	44	122	14	101	572	42	9	9
32	Man. of pulp, paper and paperboard	1	142	34	53	31	66	68	389	4 450	2 874
33	Man. of paper and paperboard products	0	295	67	126	46	9	100	88	2 354	213
34	Printing and duplicating	3	92	45	10	4	3	45	1	30	667
35	Man. of leather and leather products, footwear	1	0	0	0	0	1	8	0	1	0
36	Man. of textiles	3	6	4	6	4	0	94	0	40	1
37	Man. of wearing apparel	0	0	0	1	0	0	0	0	0	0
38	Man. of food products (excl. beverages)	0	0	0	0	2	0	0	0	74	3
39	Man. of beverages	0	3	0	3	0	0	0	0	0	2
40	Man. of tobacco products	0	0	0	0	0	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	0	0	0	0	0	4 535	0	5 974	307	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	0	37	16	0	16	0	8	0	0	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc.	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0	0
60	Totals	3 386	47 535	9 099	24 725	3 553	24 914	16 513	33 586	17 136	13 435
61	Household consumption activities	0	0	0	0	0	0	0	0	0	0
62	Consumer durables	0	0	0	0	0	0	0	0	0	0
63	Change in stocks	0	0	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0	0	0
68	Non-produced natural assets	3 216	61 464	1 983	15 466	942	15 626	6 074	341 299	68 883	7 988
69	Total material input (domestic origin)	6 602	108 999	11 082	40 191	4 496	40 541	22 587	374 884	86 019	21 422

3 Material integration (input-output) table 1990
3.2 Uses of commodities and raw materials - domestic production
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Man. of leather and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and build. completion)	Installation and building, completion	Wholesale trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommunication	Transport activities n.e.c.	Ser. No.
Production activities of branches						Production activities of branches								
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
1	0	0	54 330	3 100	0	0	0	1	1	0	4	0	0	1
1	0	0	120	0	0	822	0	0	10	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
17	571	39	1 582	378	16	35	17	447	986	56	0	47	19	4
2 354	26 432	3 471	188 330	61 686	926	15 438	1 727	3 742	6 333	5 757	96	1 391	2 111	5
1	85	3	305	29	3	9	7	6	5	13	0	1	0	6
0	0	0	1 729	0	0	11	0	0	0	87	0	0	87	7
0	4	0	3	0	0	0	0	0	0	0	0	0	0	8
49	653	31	379	43	14	282	1 234	14	12	30	4	12	3	9
38	242	82	1 287	413	19	3 291	434	2 301	1 658	444	2 259	237	4 588	10
2	19	19	512	169	3	593	604	143	257	1	0	1	0	11
16	5	2	6	1	1	15	15	10	15	1	0	1	14	12
16	27	1	69	7	0	514 899	14 848	0	0	0	0	0	0	13
0	0	0	0	0	0	13	479	0	0	1	0	0	0	14
0	0	1	1 011	1 354	0	29	178	68	20	0	0	0	0	15
0	1	0	71	0	0	1 687	86	0	0	0	1	0	1	16
0	0	0	0	0	0	17	73	0	0	0	0	0	0	17
0	0	0	1	0	0	138	125	0	0	15	0	0	0	18
21	0	13	3	0	0	2 404	136	3	0	76	8	11	4	19
0	0	0	1	0	0	618	236	0	0	28	0	0	0	20
9	54	2	33	8	3	25	92	6	14	17	7	3	12	21
0	1	0	0	1	0	0	0	1	1	1	0	0	1	22
0	0	0	0	0	0	0	0	0	0	0	0	0	85	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
1	3	2	4	0	0	7	666	4	4	6	1	11	4	26
0	0	0	0	0	0	0	0	0	0	3	0	3	3	27
16	21	10	500	92	1	71	931	48	67	5	1	4	17	28
0	0	1	0	1	0	1	0	2	3	0	0	0	2	29
3	0	0	0	0	0	4 002	1 781	1	0	0	0	1	3	30
11	36	4	90	59	40	164	512	2	30	5	0	1	3	31
42	70	45	87	20	18	38	8	354	361	24	9	46	16	32
89	295	69	682	159	113	7	40	389	427	7	1	11	3	33
3	22	32	101	30	17	23	18	95	354	32	13	76	78	34
0	0	1	1	0	0	0	0	0	1	0	0	2	1	35
8	620	237	0	0	0	0	17	1	0	1	1	2	0	36
0	0	22	0	0	0	0	0	0	0	1	0	0	0	37
0	2	1	18 163	670	12	1	0	3	1	0	6	0	15	38
0	1	0	412	2 234	0	3	2	19	9	0	111	0	13	39
0	0	0	0	0	7	1	0	1	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
46	0	20	1 128	0	0	20 701	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	8	0	8	31	23	3	9	11	33	8	0	3	8	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
2 742	29 171	4 108	270 949	70 485	1 216	565 351	24 275	7 671	10 601	6 617	2 521	1 864	7 089	60
0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
0	0	0	0	0	0	0	0	0	0	0	0	0	0	62
0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
0	0	0	0	0	0	0	0	0	0	0	0	0	0	66
0	0	0	0	0	0	0	0	0	0	0	0	0	0	67
4 979	75 244	2 500	252 830	83 938	1 544	178 328	2 764	13 070	13 517	3 783	9 567	1 681	37 496	68
7 722	104 415	6 608	523 779	154 423	2 760	743 679	27 040	20 741	24 118	10 400	12 088	3 545	44 585	69

3 Material integration (input-output) table 1990
3.2 Uses of commodities and raw materials - domestic production

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Ser. No.	Supply \ Use	Production activities of branches: Banking	Insurance (excl. social security funds)	Renting of reale state	Hotels and restaurants, homes and hostels	Educat. research, cultural services and publishing	Health a. veterinary market service activities	Other market service activities, etc.	External environmental protection services	Central and local government
		49	50	51	52	53	54	55	56	57
1	Agriculture	0	0	0	816	0	10	0	0	51
2	Forestry and fishing etc.	0	0	0	0	0	0	7	0	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0
4	Gas supply	120	50	0	242	33	32	257	144	2 895
5	Water supply	1 775	576	0	20 150	1 391	31 089	26 061	16 606	333 029
6	Coal mining	0	0	0	5	0	0	2	11	225
7	Other mining (excl. coal, crude oil, nat. gas)	0	0	86	12	0	302	0	7	143
8	Extract. of crude oil, natural gas	0	0	0	0	0	0	0	0	0
9	Man. of chemical products (incl. nuclear fuel)	6	6	0	71	27	56	234	2	238
10	Man. of refined petroleum products	154	87	44	434	200	285	1 361	383	1 488
11	Man. of plastic products	1	1	0	10	3	10	4	3	92
12	Man. of rubber products	1	0	3	0	0	6	21	1	31
13	Quarr. of stones a. clays, man. of building a. constr.	0	0	0	0	0	3	0	0	10 077
14	Man. of ceramic products	0	0	0	0	0	0	0	0	0
15	Man. of glass and glass products	0	0	6	3	0	43	0	0	1
16	Man. of iron and steel	0	0	0	0	0	0	0	0	79
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	0	0	0	0	0
18	Man. of foundry products	0	0	0	0	0	0	25	0	1
19	Man. of drawing plants prod., cold rolling mills etc.	0	0	1	0	0	0	0	0	5
20	Man. of structural metal products, rolling stock	0	0	1	0	0	0	1	0	2
21	Man. of machinery and equipment (excl. electrical)	1	2	1	6	0	2	4	2	19
22	Man. of office machinery autom. data process. equipment	0	1	0	0	1	0	0	0	3
23	Man. of road vehicles	0	0	0	0	0	0	1	2	38
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	0	0	0	0	0	0	0	0	1
26	Man. of electrical machinery equipment and appliances	1	0	0	8	1	0	5	0	30
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	0	0	27	8	0	16
28	Man. of tools and finished metal products	2	2	1	12	0	1	7	0	14
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	1	0	0	2	0	2
30	Man. of wood	0	0	0	0	0	0	0	1	13
31	Man. of wood products	2	0	0	9	0	0	8	2	53
32	Man. of pulp, paper and paperboard	31	37	1	67	52	46	136	10	292
33	Man. of paper and paperboard products	6	6	0	91	247	2	147	2	57
34	Printing and duplicating	86	21	5	40	1 808	21	174	10	658
35	Man. of leather and leather products, footwear	0	0	0	0	0	0	0	0	3
36	Man. of textiles	0	1	0	6	1	1	3	0	12
37	Man. of wearing apparel	0	0	0	1	0	0	1	0	2
38	Man. of food products (excl. beverages)	0	0	0	2 827	0	20	97	0	362
39	Man. of beverages	2	3	0	6 033	3	0	2	0	5
40	Man. of tobacco products	0	0	0	10	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	5 737
42	Installation and building, completion	0	0	0	0	0	0	0	0	324
43	Wholesale trade, etc., recycling	0	0	0	0	0	0	0	0	63
44	Retail trade	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	28	3	0	10	67	0	29	0	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc.	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0
60	Totals	2 215	796	149	30 863	3 835	31 956	28 598	17 188	356 060
61	Household consumption activities	0	0	0	0	0	0	0	0	0
62	Consumer durables	0	0	0	0	0	0	0	0	0
63	Change in stocks	0	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0	0
68	Non-produced natural assets	1 755	814	254	8 931	1 571	10 411	15 394	3 509 808	94 061
69	Total material input (domestic origin)	3 970	1 609	403	39 793	5 406	42 367	43 992	3 526 996	450 121

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3 Material integration (input-output) table 1990

3.2 Uses of commodities and raw materials - domestic production

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oduction activities of branches				Accumulation	Accumulation									
				Man-made assets			Man-made assets							
							Fixed assets							
Social security funds	Private non-profit institutions, private househ.	Totals	House-hold con-sumption activities	Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets	Non produced natural assets	Totals	Rest of the world	Total material uses	Ser. No.
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
4	15	156 464	11 473	0	- 1 485	0	0	0	55 614	0	54 129	6 068	228 134	1
0	1	24 062	2 841	0	19 915	0	0	0	- 26 915	0	- 7 000	3 331	23 234	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
9	63	34 782	13 727	0	245	0	0	0	0	0	245	953	49 707	4
720	24 282	3 728 080	2 925 973	0	73	0	0	0	0	0	73	7 715	6 661 841	5
0	0	195 962	1 991	0	- 1 197	0	0	0	0	0	- 1 197	9 467	206 223	6
0	0	18 994	1 241	0	141	0	0	0	0	0	141	7 227	27 603	7
0	0	14 004	0	0	485	0	0	0	0	0	485	1 100	15 589	8
169	31	70 182	1 898	0	497	0	0	0	0	0	497	27 950	100 526	9
99	433	53 704	28 001	0	- 1 011	0	0	0	0	0	- 1 011	11 969	92 663	10
0	4	4 795	379	17	- 195	0	146	0	0	0	- 32	1 972	7 113	11
3	1	666	106	3	- 15	0	0	0	0	0	- 12	565	1 324	12
0	0	740 564	4	0	2 890	0	0	0	0	0	2 890	42 903	786 360	13
0	0	560	132	5	- 7	0	0	0	0	0	- 2	463	1 153	14
0	0	5 223	101	24	49	0	0	0	0	0	73	1 673	7 069	15
0	0	116 215	0	0	151	0	0	0	0	0	151	18 065	134 432	16
0	0	5 528	0	0	139	0	10	0	0	0	148	1 675	7 351	17
0	0	3 553	0	0	30	0	0	242	0	0	273	432	4 257	18
0	0	12 140	3	0	147	0	0	0	0	0	147	2 238	14 529	19
0	0	976	0	0	- 11	0	1 553	420	0	0	1 962	707	3 645	20
0	0	2 260	21	0	- 106	0	66	2 544	0	0	2 503	3 811	8 595	21
0	0	20	50	0	- 2	0	0	31	0	0	29	46	145	22
2	0	2 720	108	1 544	112	0	0	1 814	0	0	3 470	6 046	12 343	23
0	0	0	0	0	57	0	0	376	0	0	433	128	562	24
0	0	4	0	0	- 6	0	0	0	0	0	- 6	17	15	25
0	0	2 028	104	534	- 46	0	156	486	0	0	1 131	1 901	5 163	26
0	2	194	56	4	- 12	0	0	89	0	0	81	101	431	27
1	0	4 281	197	747	- 159	0	324	1 761	0	0	2 673	1 589	8 741	28
0	0	26	310	10	- 6	0	0	38	0	0	42	95	473	29
0	0	14 536	296	0	136	0	0	0	0	0	136	1 966	16 934	30
0	1	3 414	734	1 340	47	0	99	699	0	0	2 186	962	7 296	31
35	3	10 728	115	0	- 521	0	0	0	0	0	- 521	4 109	14 431	32
5	0	7 469	828	0	53	0	0	0	0	0	53	1 310	9 661	33
10	35	4 963	36	0	15	0	0	0	0	0	15	384	5 397	34
0	0	23	132	0	- 18	0	0	0	0	0	- 18	75	212	35
0	0	1 152	145	175	- 240	0	0	0	0	0	- 64	1 260	2 492	36
0	0	27	275	0	3	0	0	0	0	0	3	42	347	37
13	210	37 845	28 243	0	934	0	0	0	0	0	934	13 892	80 914	38
2	0	8 947	16 015	0	166	0	0	0	0	0	166	1 412	26 541	39
0	0	19	170	0	6	0	0	0	0	0	6	85	280	40
0	0	5 737	0	0	0	0	510 721	0	0	0	510 721	22	516 481	41
0	0	324	0	0	0	0	23 456	0	0	0	23 456	0	23 780	42
0	0	72 976	157	0	- 254	0	0	0	0	6 816	6 562	11 248	90 943	43
0	0	0	178	0	0	0	0	0	0	0	0	0	178	44
0	0	. 0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	7 047	0	0	0	0	0	0	0	0	0	7 047	52
0	1	484	484	0	- 6	0	0	0	0	0	- 6	295	1 257	53
0	0	0	13	0	0	0	0	0	0	0	0	0	13	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	415	0	0	0	0	0	0	0	0	0	0	415	56
0	0	0	17	0	0	0	16 520	54	0	0	16 574	0	16 591	57
0	0	0	147	0	0	0	0	0	0	0	0	0	147	58
0	0	0	15	0	0	0	0	0	0	0	0	0	15	59
1 072	25 080	5 367 045	3 043 762	4 404	20 992	0	553 052	8 555	28 699	6 816	622 518	197 271	9 230 596	60
0	0	0	0	0	0	0	0	0	0	0	0	0	0	61
0	0	0	0	0	0	0	0	0	0	0	0	107	107	62
0	0	0	0	0	0	0	0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	0	0	0	0	0	0	0	64
0	0	0	0	0	0	0	0	0	0	0	0	0	0	65
0	0	0	0	0	0	0	0	0	0	0	0	342	342	66
0	0	0	0	0	0	0	0	0	0	0	0	0	0	67
727	9 450	49 229 957	280 401	0	0	0	0	0	0	0	0	0	49 510 358	68
1 799	34 530	54 597 003	3 324 163	4 404	20 992	0	553 052	8 555	28 699	6 816	622 518	197 720	58 741 403	69

3 Material integration (input-output) table 1990
3.3 Uses of residuals - domestic production
3.3.1 Total

1000 t

Ser. No.	Supply \ Use	Production activities of branches: Man. of chemical products (incl. nuclear fuel)	Man. of wood	Man. of wood products	Man. of pulp, paper and paperboard	Whole-sale trade, etc., recycling	External environ-mental protection services	Other branches	Total
		9	30	31	32	43	56	1-8, 10-29, 33-42, 44-55, 57-	60
1	Agriculture	0	0	0	0	0	25 140	0	25 140
2	Forestry and fishing etc.	0	0	0	0	0	2 120	0	2 120
3	Electricity, steam, hot water supply	0	0	0	0	6 173	53 154	1	59 328
4	Gas supply	0	0	0	0	9	20	0	29
5	Water supply	0	0	0	0	98	77	0	175
6	Coal mining	0	0	0	0	17	39 818	0	39 835
7	Other mining (excl. coal, crude petrol., nat. gas)	0	0	0	0	5	778	0	782
8	Extract. of crude petroleum, natural gas	0	0	0	0	4	474	0	478
9	Man. of chemical products (incl. nuclear fuel)	652	0	0	0	1 176	244 753	0	246 581
10	Man. of refined petroleum products	0	0	0	0	58	5 815	18	5 890
11	Man. of plastic products	0	0	0	0	233	22 363	50	22 646
12	Man. of rubber products	0	0	0	0	121	10 964	10	11 096
13	Quarr. of stones a. clays, man. of building a. constr.	0	0	0	0	1 315	12 427	42	13 783
14	Man. of ceramic products	0	0	0	0	65	3 063	0	3 128
15	Man. of glass and glass products	0	0	0	0	164	12 834	0	12 999
16	Man. of iron and steel	0	0	0	0	14 164	53 619	9	67 792
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	320	49 545	8	49 873
18	Man. of foundry products	0	0	0	0	2 535	9 926	0	12 461
19	Man. of drawing plants prod., cold rolling mills etc.	0	0	0	0	3 045	37 674	0	40 719
20	Man. of structural metal products, rolling stock	0	0	0	0	504	7 710	3	8 218
21	Man. of machinery and equipment (excl. electrical)	0	0	0	0	1 002	42 450	6	43 458
22	Man. of office machinery autom. data process. equipment.	0	0	0	0	36	4 122	0	4 158
23	Man. of road vehicles	0	0	0	0	1 412	54 093	61	55 565
24	Building of ships, boats a. floating structures	0	0	0	0	112	1 879	0	1 990
25	Man. of aircraft and spacecraft	0	0	0	0	21	3 066	0	3 087
26	Man. of electrical machinery equipment and appliances	0	0	0	0	553	55 052	11	55 615
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	0	49	9 343	2	9 394
28	Man. of tools and finished metal products	0	0	0	0	920	21 449	3	22 373
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	0	35	3 604	6	3 645
30	Man. of wood	0	623	0	0	4 838	5 078	0	10 539
31	Man. of wood products	0	0	633	0	954	7 111	0	8 698
32	Man. of pulp, paper and paperboard	0	0	0	1 179	735	59 299	0	61 213
33	Man. of paper and paperboard products	0	0	0	0	762	16 072	1	16 835
34	Printing and duplicating	0	0	0	0	1 052	10 655	0	11 708
35	Man. of leather and leather products, footwear	0	0	0	0	103	4 294	0	4 398
36	Man. of textiles	0	0	0	0	117	87 740	0	87 857
37	Man. of wearing apparel	0	0	0	0	59	4 824	1	4 884
38	Man. of food products (excl. beverages)	0	0	0	0	7 250	232 609	26	239 885
39	Man. of beverages	0	0	0	0	2 212	83 642	0	85 854
40	Man. of tobacco products	0	0	0	0	17	1 143	1	1 162
41	Construct. (excl. install. and build. completion)	0	0	0	0	22 816	16 041	27	38 884
42	Installation and building, completion	0	0	0	0	82	2 092	5	2 179
43	Wholesale trade, etc., recycling	0	0	0	0	290	5 229	0	5 518
44	Retail trade	0	0	0	0	379	7 254	0	7 633
45	Railway transport	0	0	0	0	28	6 347	0	6 375
46	Water transport, ports	0	0	0	0	6	121	0	127
47	Post and telecommunication	0	0	0	0	51	1 562	0	1 614
48	Transport activities n.e.c.	0	0	0	0	45	2 376	0	2 422
49	Banking	0	0	0	0	46	1 973	0	2 019
50	Insurance (excl. social security funds)	0	0	0	0	27	649	0	675
51	Renting of reale state	0	0	0	0	1	5	0	6
52	Hotels and restaurants, homes and hostels	0	0	0	0	59	22 440	0	22 500
53	Educat., research, cultural services and publishing	0	0	0	0	492	1 731	0	2 223
54	Health a. veterinary market service activities	0	0	0	0	41	34 018	1	34 059
55	Other market service activities, etc	0	0	0	0	174	28 866	0	29 040
56	External environmental protection services	0	0	0	0	6 005	2 530	0	8 535
57	Central and local government	0	0	0	0	438	319 839	5	320 282
58	Social security funds	0	0	0	0	30	812	0	842
59	Private non-profit institutions, private househ	0	0	0	0	61	26 611	3	26 675
60	Totals	652	623	633	1 179	83 314	1 780 296	300	1 866 997
61	Household consumption activities	0	0	0	0	4 405	2 640 637	0	2 645 042
62	Consumer durables	0	0	0	0	2 165	380	0	2 545
63	Change in stocks	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	6 547	5 360	0	11 907
66	Machinery, equipment	0	0	0	0	7 981	0	0	7 981
67	Produced natural assets	0	0	0	0	0	0	0	0
68	Non-produced natural assets	0	0	0	0	0	0	0	0
69	Total material input (domestic origin)	652	623	633	1 179	104 413	4 426 672	300	4 534 473

3.3 Uses of residuals - domestic production

3.3.1 Total

1000 t

House-hold consumption activities	Accumulation: Man-made assets: Controlled landfills	Accumulation: Man-made assets: Other assets	Accumulation: Non produced natural assets	Accumulation: Totals	Rest of the world (exports)	Total material uses	Ser. No.
61	64	62, 63, 65-67	68	69	70	71	
0	54	0	497 143	497 197	0	522 337	1
0	2	0	29 724	29 726	0	31 846	2
0	3 611	0	30 796 726	30 800 337	0	30 859 665	3
0	19	0	1 099	1 117	0	1 146	4
0	342	0	511 270	511 613	0	511 788	5
0	342	0	1 817 371	1 817 713	0	1 857 548	6
0	166	0	148 618	148 784	0	149 566	7
0	54	0	25 012	25 066	0	25 544	8
0	3 506	0	3 295 494	3 299 000	0	3 545 581	9
0	39	0	271 156	271 194	0	277 085	10
0	362	0	55 649	56 011	0	78 656	11
0	54	0	27 062	27 117	0	38 213	12
0	3 408	0	506 827	510 235	0	524 018	13
0	138	0	5 083	5 221	0	8 349	14
0	146	0	24 950	25 096	0	38 094	15
0	2 007	0	772 233	774 240	0	842 032	16
0	408	0	188 278	188 686	0	238 559	17
0	1 122	0	28 353	29 475	0	41 937	18
0	581	0	25 639	26 220	0	66 938	19
0	139	0	4 234	4 373	0	12 591	20
0	658	0	33 923	34 581	0	78 039	21
0	26	0	1 850	1 876	0	6 034	22
0	719	0	83 977	84 696	0	140 261	23
0	44	0	5 467	5 511	0	7 501	24
0	31	0	3 513	3 544	0	6 631	25
0	466	0	50 268	50 734	0	106 349	26
0	73	0	1 472	1 545	0	10 939	27
0	244	0	11 595	11 838	0	34 211	28
0	38	0	668	705	0	4 350	29
0	172	0	15 853	16 025	0	26 563	30
0	423	0	9 195	9 618	0	18 316	31
0	619	0	304 525	305 143	0	366 357	32
0	201	0	62 619	62 820	0	79 655	33
0	152	0	6 655	6 807	0	18 515	34
0	48	0	3 328	3 376	0	7 774	35
0	257	0	15 351	15 608	0	103 465	36
0	76	0	1 539	1 615	0	6 498	37
0	2 449	0	220 111	222 560	0	462 445	38
0	113	0	43 970	44 083	0	129 937	39
0	19	0	1 509	1 527	0	2 689	40
0	54 877	0	157 906	212 783	0	251 666	41
0	218	0	4 545	4 764	0	6 942	42
0	760	0	29 172	29 932	0	35 450	43
0	789	0	16 697	17 485	0	25 119	44
0	144	0	4 123	4 267	0	10 642	45
0	37	0	12 742	12 779	0	12 906	46
0	101	0	1 971	2 072	0	3 685	47
0	167	0	47 573	47 739	0	50 161	48
0	82	0	1 985	2 068	0	4 087	49
0	47	0	969	1 016	0	1 691	50
0	10	0	431	442	0	448	51
0	1 025	0	11 520	12 545	0	35 045	52
0	492	0	1 801	2 293	0	4 516	53
0	161	0	8 401	8 561	0	42 621	54
0	502	0	15 447	15 949	0	44 990	55
0	1 859	0	7 940 937	7 942 797	2 143	7 953 474	56
0	1 818	0	113 691	115 509	0	435 791	57
0	55	0	851	906	0	1 748	58
0	184	0	8 011	8 195	0	34 870	59
0	86 655	0	48 288 082	48 374 737	2 143	50 243 877	60
0	10 910	0	699 486	710 396	0	3 355 438	61
0	1 565	0	0	1 565	0	4 110	62
0	0	0	0	0	0	0	63
0	0	0	0	0	0	0	64
0	17 979	0	2 651	20 630	0	32 537	65
0	239	0	0	239	0	8 221	66
0	0	0	55 595	55 595	0	55 595	67
0	0	0	0	0	0	0	68
0	117 349	0	49 045 815	49 163 163	2 143	53 699 778	69

3 Material integration (input-output) table 1990
3.3 Uses of residuals - domestic production
3.3.2 Energy

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Ser. No.	Use / Supply	Production activities of branches: Man. of chemical products (incl. nuclear fuel)	Man. of wood	Man. of wood products	Man. of pulp, paper and paperboard	External environmental protection services	Other branches	Accumulation: Non produced natural assets	Material outputs of residuals
		9	30	31	32	56	1-8, 10-29, 33-42, 44-55, 57-59	68	71
1	Agriculture	0	0	0	0	15	0	11 255	11 271
2	Forestry and fishing etc.	0	0	0	0	1	0	3 426	3 427
3	Electricity, steam, hot water supply	0	0	0	0	200	1	395 110	395 311
4	Gas supply	0	0	0	0	13	0	1 085	1 099
5	Water supply	0	0	0	0	10	0	166	177
6	Coal mining	0	0	0	0	8	0	975 774	975 782
7	Other mining (excl. coal, crude petrol., nat. gas)	0	0	0	0	6	0	1 447	1 453
8	Extract. of crude petroleum, natural gas	0	0	0	0	2	0	2 145	2 147
9	Man. of chemical products (incl. nuclear fuel)	652	0	0	0	185	0	36 042	36 879
10	Man. of refined petroleum products	0	0	0	0	8	18	21 190	21 215
11	Man. of plastic products	0	0	0	0	84	50	2 607	2 741
12	Man. of rubber products	0	0	0	0	21	10	1 680	1 712
13	Quarr. of stones a. clays, man. of building a. constr.	0	0	0	0	66	42	24 282	24 390
14	Man. of ceramic products	0	0	0	0	11	0	2 141	2 152
15	Man. of glass and glass products	0	0	0	0	23	0	6 971	6 994
16	Man. of iron and steel	0	0	0	0	22	9	56 954	56 985
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	43	8	5 098	5 149
18	Man. of foundry products	0	0	0	0	63	0	3 676	3 739
19	Man. of drawing plants prod., cold rolling mills etc.	0	0	0	0	124	0	2 977	3 101
20	Man. of structural metal products, rolling stock	0	0	0	0	23	3	1 349	1 375
21	Man. of machinery and equipment (excl. electrical)	0	0	0	0	137	6	6 327	6 470
22	Man. of office machinery autom. data process. equipment	0	0	0	0	7	0	311	317
23	Man. of road vehicles	0	0	0	0	160	61	6 719	6 940
24	Building of ships, boats a. floating structures	0	0	0	0	12	0	245	257
25	Man. of aircraft and spacecraft	0	0	0	0	9	0	328	337
26	Man. of electrical machinery equipment and appliances	0	0	0	0	116	11	5 123	5 250
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	0	19	2	654	674
28	Man. of tools and finished metal products	0	0	0	0	61	3	3 082	3 147
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	0	10	6	267	283
30	Man. of wood	0	623	0	0	33	0	2 506	3 162
31	Man. of wood products	0	0	633	0	100	0	2 999	3 733
32	Man. of pulp, paper and paperboard	0	0	0	1 179	28	0	11 390	12 597
33	Man. of paper and paperboard products	0	0	0	0	35	1	1 987	2 023
34	Printing and duplicating	0	0	0	0	40	0	1 276	1 316
35	Man. of leather and leather products, footwear	0	0	0	0	11	0	324	335
36	Man. of textiles	0	0	0	0	40	0	4 525	4 565
37	Man. of wearing apparel	0	0	0	0	17	1	725	743
38	Man. of food products (excl. beverages)	0	0	0	0	222	26	16 387	16 634
39	Man. of beverages	0	0	0	0	25	0	4 360	4 385
40	Man. of tobacco products	0	0	0	0	4	1	204	210
41	Construct. (excl. install. and build. completion)	0	0	0	0	83	27	9 984	10 094
42	Installation and building, completion	0	0	0	0	52	5	2 942	2 999
43	Wholesale trade, etc., recycling	0	0	0	0	33	0	15 572	15 605
44	Retail trade	0	0	0	0	223	0	15 141	15 364
45	Railway transport	0	0	0	0	41	0	2 821	2 862
46	Water transport, ports	0	0	0	0	11	0	12 582	12 593
47	Post and telecommunication	0	0	0	0	28	0	1 666	1 694
48	Transport activities n.e.c.	0	0	0	0	47	0	46 956	47 003
49	Banking	0	0	0	0	23	0	1 617	1 641
50	Insurance (excl. social security funds)	0	0	0	0	13	0	841	854
51	Renting of reale state	0	0	0	0	3	0	327	330
52	Hotels and restaurants, homes and hostels	0	0	0	0	290	0	4 189	4 479
53	Educat., research, cultural services and publishing	0	0	0	0	139	0	1 527	1 666
54	Health a. veterinary market service activities	0	0	0	0	44	1	2 117	2 162
55	Other market service activities, etc.	0	0	0	0	142	0	10 251	10 393
56	External environmental protection services	0	0	0	0	416	0	16 442	16 858
57	Central and local government	0	0	0	0	487	5	16 721	17 213
58	Social security funds	0	0	0	0	15	0	668	683
59	Private non-profit institutions, private househ.	0	0	0	0	49	3	3 358	3 410
60	Totals	652	623	633	1 179	4 154	300	1 790 838	1 798 378
61	Household consumption activities	0	0	0	0	4 437	0	266 216	270 653
62	Consumer durables	0	0	0	0	380	0	0	380
63	Change in stocks	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0
65	Buildings	0	0	0	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0	0	0	0
68	Non-produced natural assets	0	0	0	0	0	0	0	0
69	Total material input (domestic origin)	652	623	633	1 179	8 970	300	2 057 054	2 069 411

3 Material integration (input-output) table 1990
3.3 Uses of residuals - domestic production
3.3.3 Water

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Ser. No.	Use / Supply	Production activities of branches		Accumulation		Material outputs of Residuals
		External environ-mental protection services	Other branches	Non produced natural assets	Other assets	
		56	1-55, 57-59	68	62-67	71
1	Agriculture	25 117	0	174 666	0	199 782
2	Forestry and fishing etc.	2 119	0	751	0	2 870
3	Electricity, steam, hot water supply	50 234	0	30 401 592	0	30 451 826
4	Gas supply	0	0	0	0	0
5	Water supply	0	0	511 057	0	511 057
6	Coal mining	39 584	0	841 533	0	881 117
7	Other mining (excl. coal, crude petrol., nat. gas)	737	0	121 162	0	121 900
8	Extract. of crude petroleum, natural gas	428	0	22 863	0	23 292
9	Man. of chemical products (incl. nuclear fuel)	243 864	0	3 245 867	0	3 489 731
10	Man. of refined petroleum products	5 771	0	249 904	0	255 675
11	Man. of plastic products	22 097	0	53 001	0	75 098
12	Man. of rubber products	10 796	0	24 944	0	35 740
13	Quarr. of stones a. clays, man. of building a. constr.	10 951	0	451 614	0	462 564
14	Man. of ceramic products	2 970	0	2 809	0	5 778
15	Man. of glass and glass products	12 739	0	14 036	0	26 775
16	Man. of iron and steel	53 527	0	698 453	0	751 980
17	Man. of non-ferr. metals, semifin. products thereof	49 310	0	179 753	0	229 063
18	Man. of foundry products	9 147	0	22 199	0	31 346
19	Man. of drawing plants prod., cold rolling mills etc.	37 109	0	22 046	0	59 155
20	Man. of structural metal products, rolling stock	7 628	0	1 926	0	9 554
21	Man. of machinery and equipment (excl. electrical)	41 922	0	26 296	0	68 218
22	Man. of office machinery autom. data process. equipment	4 107	0	1 423	0	5 530
23	Man. of road vehicles	53 531	0	76 315	0	129 846
24	Building of ships, boats a. floating structures	1 845	0	4 508	0	6 354
25	Man. of aircraft and spacecraft	3 041	0	2 974	0	6 015
26	Man. of electrical machinery equipment and appliances	54 744	0	44 759	0	99 503
27	Man. of precis. and optical instrum., clocks a. watches	9 305	0	570	0	9 875
28	Man. of tools and finished metal products	21 258	0	8 422	0	29 680
29	Man. of musical instrum., games a. toys, sport goods etc.	3 582	0	220	0	3 802
30	Man. of wood	4 961	0	12 853	0	17 813
31	Man. of wood products	6 819	0	3 203	0	10 022
32	Man. of pulp, paper and paperboard	58 682	0	292 809	0	351 491
33	Man. of paper and paperboard products	15 855	0	60 581	0	76 437
34	Printing and duplicating	10 551	0	5 290	0	15 841
35	Man. of leather and leather products, footwear	4 243	0	2 842	0	7 085
36	Man. of textiles	87 542	0	10 584	0	98 125
37	Man. of wearing apparel	4 773	0	641	0	5 414
38	Man. of food products (excl. beverages)	232 047	0	181 376	0	413 423
39	Man. of beverages	83 536	0	36 724	0	120 259
40	Man. of tobacco products	1 132	0	1 185	0	2 316
41	Construct. (excl. install. and build. completion)	14 089	0	4 994	0	19 083
42	Installation and building, completion	1 886	0	331	0	2 216
43	Wholesale trade, etc., recycling	4 085	0	733	0	4 818
44	Retail trade	6 914	0	1 216	0	8 129
45	Railway transport	6 285	0	1 096	0	7 381
46	Water transport, ports	105	0	18	0	123
47	Post and telecommunication	1 519	0	265	0	1 784
48	Transport activities n.e.c.	2 305	0	415	0	2 720
49	Banking	1 938	0	340	0	2 278
50	Insurance (excl. social security funds)	629	0	113	0	741
51	Renting of reale state	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	21 998	0	4 567	0	26 565
53	Educat., research, cultural services and publishing	1 519	0	270	0	1 789
54	Health a. veterinary market service activities	33 940	0	6 227	0	40 167
55	Other market service activities, etc.	28 650	0	4 971	0	33 621
56	External environmental protection services	300	0	7 912 510	0	7 912 810
57	Central and local government	318 910	0	96 632	0	415 542
58	Social security funds	786	0	170	0	956
59	Private non-profit institutions, private househ.	26 509	0	4 631	0	31 139
60	Totals	1 759 966	0	45 853 251	0	47 613 218
61	Household consumption activities	2 636 200	0	365 074	0	3 001 274
62	Consumer durables	0	0	0	0	0
63	Change in stocks	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0
65	Buildings	0	0	0	0	0
66	Machinery, equipment	0	0	0	0	0
67	Produced natural assets	0	0	0	0	0
68	Non-produced natural assets	0	0	0	0	0
69	Total material input (domestic origin)	4 396 166	0	46 218 326	0	50 614 492

3 Material integration (input-output) table 1990
3.3 Uses of residuals - domestic production
3.3.4 Other materials

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Ser. No.	Use / Supply	Production activities of branches: Man. of pulp, paper and paperboard	Production activities of branches: External environ-mental protection services	Production activities of branches: Other branches	Accumulation: Man-made assets: Controlled landfills	Accumulation: Man-made assets: Other assets	Accumulation: Non produced natural assets	Rest of the world (exports)	Total material uses
		43	56	1-42, 44-55, 57-59	64	62-63, 65-67	68	70	71
1	Agriculture	0	8	0	54	0	311 222	0	311 284
2	Forestry and fishing etc.	0	0	0	2	0	25 548	0	25 550
3	Electricity, steam, hot water supply	6 173	2 721	0	3 611	0	23	0	12 528
4	Gas supply	9	7	0	19	0	14	0	48
5	Water supply	98	67	0	342	0	47	0	554
6	Coal mining	17	226	0	342	0	63	0	649
7	Other mining (excl. coal, crude petrol., nat. gas)	5	34	0	166	0	26 009	0	26 214
8	Extract. of crude petroleum, natural gas	4	44	0	54	0	4	0	106
9	Man. of chemical products (incl. nuclear fuel)	1 176	704	0	3 506	0	13 586	0	18 972
10	Man. of refined petroleum products	58	36	0	39	0	62	0	195
11	Man. of plastic products	233	181	0	362	0	40	0	817
12	Man. of rubber products	121	147	0	54	0	438	0	761
13	Quarr. of stones a. clays, man. of building a. constr.	1 315	1 410	0	3 408	0	30 931	0	37 064
14	Man. of ceramic products	65	82	0	138	0	134	0	418
15	Man. of glass and glass products	164	73	0	146	0	3 943	0	4 325
16	Man. of iron and steel	14 164	70	0	2 007	0	16 826	0	33 067
17	Man. of non-ferr. metals, semifin. products thereof	320	192	0	408	0	3 427	0	4 346
18	Man. of foundry products	2 535	717	0	1 122	0	2 477	0	6 851
19	Man. of drawing plants prod., cold rolling mills etc.	3 045	440	0	581	0	616	0	4 681
20	Man. of structural metal products, rolling stock	504	60	0	139	0	959	0	1 661
21	Man. of machinery and equipment (excl. electrical)	1 002	391	0	658	0	1 300	0	3 351
22	Man. of office machinery autom. data process. equipment	36	9	0	26	0	116	0	187
23	Man. of road vehicles	1 412	402	0	719	0	943	0	3 475
24	Building of ships, boats a. floating structures	112	21	0	44	0	713	0	891
25	Man. of aircraft and spacecraft	21	16	0	31	0	211	0	279
26	Man. of electrical machinery equipment and appliances	553	192	0	466	0	386	0	1 596
27	Man. of precis. and optical instrum., clocks a. watches	49	19	0	73	0	248	0	390
28	Man. of tools and finished metal products	920	130	0	244	0	91	0	1 384
29	Man. of musical instrum., games a. toys, sport goods etc.	35	12	0	38	0	181	0	265
30	Man. of wood	4 838	84	0	172	0	494	0	5 588
31	Man. of wood products	954	191	0	423	0	2 992	0	4 561
32	Man. of pulp, paper and paperboard	735	590	0	619	0	326	0	2 269
33	Man. of paper and paperboard products	762	182	0	201	0	50	0	1 196
34	Printing and duplicating	1 052	64	0	152	0	89	0	1 358
35	Man. of leather and leather products, footwear	103	41	0	48	0	162	0	354
36	Man. of textiles	117	158	0	257	0	243	0	774
37	Man. of wearing apparel	59	34	0	76	0	173	0	341
38	Man. of food products (excl. beverages)	7 250	341	0	2 449	0	22 348	0	32 388
39	Man. of beverages	2 212	81	0	113	0	2 886	0	5 294
40	Man. of tobacco products	17	7	0	19	0	120	0	163
41	Construct. (excl. install. and build. completion)	22 816	1 869	0	54 877	0	142 928	0	222 489
42	Installation and building, completion	82	155	0	218	0	1 272	0	1 727
43	Wholesale trade, etc., recycling	290	1 110	0	760	0	12 868	0	15 027
44	Retail trade	379	117	0	789	0	340	0	1 625
45	Railway transport	28	21	0	144	0	206	0	399
46	Water transport, ports	6	6	0	37	0	142	0	191
47	Post and telecommunication	51	15	0	101	0	40	0	207
48	Transport activities n.e.c.	45	25	0	167	0	201	0	438
49	Banking	46	12	0	82	0	28	0	168
50	Insurance (excl. social security funds)	27	7	0	47	0	15	0	96
51	Renting of reale state	1	2	0	10	0	105	0	118
52	Hotels and restaurants, homes and hostels	59	153	0	1 025	0	2 764	0	4 000
53	Educat., research, cultural services and publishing	492	73	0	492	0	5	0	1 062
54	Health a. veterinary market service activities	41	34	0	161	0	57	0	292
55	Other market service activities, etc.	174	75	0	502	0	226	0	976
56	External environmental protection services	6 005	1 813	0	1 859	0	11 986	2 143	23 806
57	Central and local government	438	442	0	1 818	0	338	0	3 036
58	Social security funds	30	11	0	55	0	13	0	109
59	Private non-profit institutions, private househ.	61	54	0	184	0	22	0	321
60	Totals	83 314	16 176	0	86 655	0	643 993	2 143	832 282
61	Household consumption activities	4 405	0	0	10 910	0	68 196	0	83 511
62	Consumer durables	2 165	0	0	1 565	0	0	0	3 730
63	Change in stocks	0	0	0	0	0	0	0	0
64	Controlled landfills	0	0	0	0	0	0	0	0
65	Buildings	6 547	5 360	0	17 979	0	2 651	0	32 537
66	Machinery, equipment	7 981	0	0	239	0	0	0	8 221
67	Produced natural assets	0	0	0	0	0	55 595	0	55 595
68	Non-produced natural assets	0	0	0	0	0	0	0	0
69	Total material input (domestic origin)	104 413	21 535	0	117 349	0	770 436	2 143	1 015 875

3 Material integration (input-output) table 1990
3.4 Uses of imported commodities

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Ser. No.	Supply \ Use	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
1	Agriculture	1 473	39	1	0	0	0	0	0	29	0
2	Forestry and fishing etc.	5	31	0	0	0	0	0	0	59	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0	0
4	Gas supply	0	0	0	0	0	0	0	0	0	0
5	Water supply	0	0	0	0	73	0	0	0	0	0
6	Coal mining	41	20	8 856	0	0	411	0	0	1 627	0
7	Other mining (excl. coal, crude oil, nat. gas)	90	59	7	0	0	0	161	0	989	0
8	Extract. of crude oil, natural gas	0	0	63	37 396	0	0	0	306	305	72 972
9	Man. of chemical products (incl. nuclear fuel)	5 626	113	62	2	50	64	5	1	12 452	210
10	Man. of refined petroleum products	664	239	1 018	17	15	571	8	3	6 966	7 207
11	Man. of plastic products	28	2	0	0	0	0	0	0	51	3
12	Man. of rubber products	29	1	1	0	0	1	0	0	3	1
13	Quarr. of stones a. clays, man. of building a. constr.	1	0	3	0	0	20	1	0	670	0
14	Man. of ceramic products	12	3	2	0	0	0	0	0	9	0
15	Man. of glass and glass products	122	2	0	0	0	0	0	0	16	0
16	Man. of iron and steel	0	0	1	0	0	4	0	0	0	0
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	0	0	0	0	114	0
18	Man. of foundry products	1	0	0	0	0	1	0	0	2	2
19	Man. of drawing plants prod., cold rolling mills etc.	2	0	0	0	0	6	0	0	3	0
20	Man. of structural metal products, rolling stock	0	0	1	0	0	0	0	0	0	0
21	Man. of machinery and equipment (excl. electrical)	32	2	5	1	2	32	2	3	23	3
22	Man. of office machinery autom. data process. equipment	0	0	0	0	0	0	0	0	0	0
23	Man. of road vehicles	0	0	0	0	0	0	0	0	0	0
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	0	0	0	0	0	0	0	0	0	0
26	Man. of electrical machinery equipment and appliances	5	0	6	1	0	2	0	0	3	1
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	0	0	0	0	0	1	0
28	Man. of tools and finished metal products	10	1	0	0	0	2	0	0	72	17
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	0	0	0	0	0	0	0
30	Man. of wood	2	0	0	0	0	19	0	0	27	0
31	Man. of wood products	26	2	0	0	0	0	0	0	36	0
32	Man. of pulp, paper and paperboard	16	1	23	0	1	5	0	0	350	0
33	Man. of paper and paperboard products	17	0	2	0	0	1	0	0	59	0
34	Printing and duplicating	0	1	0	0	0	0	0	0	3	0
35	Man. of leather and leather products, footwear	4	0	0	0	0	0	0	0	0	0
36	Man. of textiles	5	0	1	0	0	1	0	0	3	0
37	Man. of wearing apparel	1	0	0	0	0	0	0	0	0	0
38	Man. of food products (excl. beverages)	1 656	14	0	0	0	0	0	0	969	6
39	Man. of beverages	0	0	0	0	0	0	0	0	10	0
40	Man. of tobacco products	0	0	0	0	0	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	28	0	0	0	0	0	0	0	8	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	0	0	0	0	0	0	0	0	1	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0	0
69	Total material input (imported)	9 897	529	10 051	37 417	143	1 141	179	314	24 860	80 421

3 Material integration (input-output) table 1990
3.4 Uses of imported commodities

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Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery a. equipment (excl. electrical)	Man. of office mach., auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
0	0	0	0	0	1	0	0	0	0	1	0	1	0	1
0	227	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
21	16	1 538	3	18	366	69	98	4	7	17	0	45	0	6
0	0	842	4	705	42 955	3 053	1 075	38	0	0	0	0	0	7
0	0	0	13	13	195	115	0	20	0	39	0	77	0	8
2 686	320	159	111	110	227	460	56	29	84	458	10	478	100	9
106	64	565	45	192	305	68	69	82	80	332	15	243	9	10
38	0	0	4	4	0	0	0	0	3	42	0	11	0	11
0	3	5	0	1	1	0	1	0	1	21	0	181	1	12
0	27	5 940	439	505	564	6	211	55	12	33	0	6	0	13
0	0	1	2	0	1	0	0	0	0	0	0	1	0	14
26	0	0	0	278	10	0	0	1	21	18	0	107	3	15
0	0	1	0	0	3 458	5	746	3 323	1 404	1 331	8	1 612	238	16
0	0	0	0	0	83	1 612	334	169	112	147	0	41	2	17
0	1	2	0	0	21	0	13	5	14	90	3	58	2	18
0	42	9	0	0	80	0	0	404	89	274	8	192	38	19
0	0	0	0	0	0	0	0	0	1	0	0	0	0	20
12	10	13	7	4	22	3	10	8	25	278	1	64	24	21
0	0	0	0	0	0	0	0	0	0	0	8	0	0	22
0	0	0	0	0	0	0	0	0	0	0	0	1 072	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
1	0	2	0	0	30	19	8	1	2	91	18	140	9	26
0	0	0	0	0	0	0	0	0	1	2	0	3	1	27
22	2	3	0	1	4	1	1	7	36	30	1	31	2	28
0	0	0	0	0	0	0	0	0	0	0	0	0	0	29
38	0	0	0	0	0	0	0	0	57	93	0	171	29	30
3	3	16	6	31	19	6	10	13	3	124	18	28	1	31
12	11	26	10	8	7	1	2	3	6	93	4	61	1	32
13	4	18	2	10	1	0	1	1	2	13	0	3	0	33
0	0	0	0	0	0	0	0	0	0	3	3	0	0	34
0	0	0	0	0	1	0	1	0	0	1	0	0	0	35
28	27	1	1	1	1	0	1	1	1	10	0	11	4	36
0	0	0	0	0	0	0	0	0	0	0	0	1	0	37
25	0	0	2	0	0	0	0	0	0	0	0	0	0	38
0	0	0	0	0	0	0	0	0	0	0	0	0	0	39
0	0	0	0	0	0	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
37	47	157	0	113	570	763	187	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	0	0	0	0	0	0	0	1	1	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
3 070	805	9 299	648	1 995	48 924	6 183	2 825	4 165	1 962	3 541	100	4 642	465	69

3.4 Uses of imported commodities

1000 t

Ser. No.	Supply \ Use	Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		Production activities of branches									
		25	26	27	28	29	30	31	32	33	34
1	Agriculture	0	1	0	1	0	0	3	12	0	0
2	Forestry and fishing etc.	0	0	0	0	31	887	203	156	0	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0	0
4	Gas supply	0	0	0	0	0	0	0	0	0	0
5	Water supply	0	0	0	0	0	0	0	0	0	0
6	Coal mining	2	35	5	15	0	28	11	273	8	0
7	Other mining (excl. coal, crude oil, nat. gas)	0	175	0	0	24	0	0	0	0	0
8	Extract. of crude oil, natural gas	0	39	0	20	0	0	0	0	0	0
9	Man. of chemical products (incl. nuclear fuel)	2	385	112	190	93	72	109	171	106	77
10	Man. of refined petroleum products	9	307	39	142	15	74	113	298	50	39
11	Man. of plastic products	0	4	1	6	35	0	14	0	14	11
12	Man. of rubber products	0	10	2	9	7	0	7	0	0	0
13	Quarr. of stones a. clays, man. of building a. constr.	0	226	0	66	45	1	6	764	26	0
14	Man. of ceramic products	0	5	16	0	0	1	2	0	0	0
15	Man. of glass and glass products	1	51	23	16	2	11	66	8	0	0
16	Man. of iron and steel	6	333	1	1 625	0	35	35	0	35	0
17	Man. of non-ferr. metals, semifin. products thereof	6	274	5	160	0	0	0	0	0	0
18	Man. of foundry products	0	10	3	6	0	0	0	2	0	0
19	Man. of drawing plants prod., cold rolling mills etc.	6	71	12	163	20	3	19	0	0	0
20	Man. of structural metal products, rolling stock	0	0	0	0	0	0	0	0	0	0
21	Man. of machinery and equipment (excl. electrical)	2	25	4	13	0	4	8	16	5	7
22	Man. of office machinery autom. data process. equipment	0	1	0	0	0	0	0	0	0	1
23	Man. of road vehicles	0	0	0	0	0	0	0	0	0	0
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	0	0
25	Man. of aircraft and spacecraft	4	0	0	0	0	0	0	0	0	0
26	Man. of electrical machinery equipment and appliances	1	349	2	2	1	0	1	0	1	1
27	Man. of precis. and optical instrum., clocks a. watches	0	0	8	0	0	0	0	0	0	0
28	Man. of tools and finished metal products	0	3	2	121	3	1	44	0	9	5
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	0	3	0	0	0	0	0
30	Man. of wood	1	75	9	123	16	542	1 538	0	9	0
31	Man. of wood products	0	5	9	28	3	2	116	12	2	2
32	Man. of pulp, paper and paperboard	0	81	21	36	14	49	58	2 277	2 872	2 297
33	Man. of paper and paperboard products	0	20	4	10	2	1	6	11	117	19
34	Printing and duplicating	0	5	3	0	0	0	3	0	2	27
35	Man. of leather and leather products, footwear	0	0	1	0	0	0	3	0	0	0
36	Man. of textiles	4	9	5	4	4	0	26	0	2	1
37	Man. of wearing apparel	0	0	0	0	0	0	0	0	0	0
38	Man. of food products (excl. beverages)	0	0	0	0	1	0	0	0	1	2
39	Man. of beverages	0	0	0	0	0	0	0	0	0	0
40	Man. of tobacco products	0	0	0	0	0	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	0	0	0	0	0	622	0	723	38	0
44	Retail trade	0	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	0	2	0	0	0	0	0	0	0	0
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0	0
69	Total material input (imported)	44	2 503	286	2 757	321	2 334	2 391	4 724	3 297	2 490

3 Material integration (input-output) table 1990
3.4 Uses of imported commodities

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Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
0	263	0	10 429	651	129	1	0	4	2	0	3	0	1	1
23	0	10	388	0	0	248	0	0	2	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
0	50	4	104	17	2	29	21	21	25	14	0	5	0	6
0	0	0	350	0	0	0	0	0	0	12	0	0	12	7
0	13	0	11	0	0	0	0	0	0	0	0	0	0	8
77	414	24	121	68	14	102	236	5	9	25	0	6	2	9
21	128	45	638	167	10	789	193	789	755	137	783	90	5 449	10
11	13	13	205	27	6	77	135	40	81	0	0	0	0	11
2	10	24	5	2	0	11	10	17	11	0	0	2	14	12
13	0	0	18	0	0	18 748	610	0	0	0	0	0	0	13
0	0	0	0	0	0	18	1 080	0	0	0	0	0	0	14
0	0	0	150	249	0	18	195	12	4	0	0	0	0	15
0	0	0	26	0	0	1 854	82	0	0	0	1	0	1	16
0	0	0	0	0	0	16	18	0	0	0	0	0	0	17
0	0	0	0	0	0	15	12	0	0	2	0	0	0	18
0	0	1	0	0	0	292	34	0	0	10	1	0	2	19
0	0	0	0	0	0	24	102	0	0	5	0	0	0	20
4	12	0	14	3	1	11	26	3	5	6	5	1	3	21
0	0	0	0	0	0	0	0	1	2	1	0	1	0	22
0	0	0	0	0	0	0	0	0	0	0	0	0	52	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	24
0	0	0	0	0	0	0	0	0	0	0	0	0	2	25
0	1	1	1	0	0	1	158	2	2	8	0	3	2	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	27
3	4	5	50	22	1	9	155	11	15	1	0	0	4	28
0	0	0	0	0	0	0	0	0	2	0	0	0	0	29
3	0	0	0	0	0	1 693	460	0	0	0	0	0	0	30
4	8	2	24	17	10	45	127	0	5	0	0	0	0	31
19	46	33	48	16	13	19	4	274	152	8	4	14	1	32
5	30	5	76	12	14	4	10	34	47	6	1	7	2	33
0	1	2	3	1	1	0	0	4	23	1	0	2	8	34
26	1	2	0	0	0	1	0	0	0	2	0	2	0	35
9	545	44	5	2	0	1	6	17	30	4	3	5	9	36
0	0	2	0	0	0	0	0	0	0	0	0	0	1	37
0	2	0	6 807	367	0	0	0	0	0	0	12	0	11	38
0	0	0	41	433	0	0	0	2	1	0	5	0	1	39
0	0	0	0	0	7	0	0	0	0	0	0	0	0	40
0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
43	0	18	40	0	0	411	0	0	0	0	0	0	0	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	0	0	0	1	0	1	2	2	6	0	0	1	0	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
265	1 542	237	19 554	2 055	208	24 442	3 678	1 239	1 178	242	819	141	5 577	69

3.4 Uses of imported commodities

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Ser. No.	Supply \ Use	Production activities of branches: Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services a. publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government
		49	50	51	52	53	54	55	56	57
1	Agriculture	0	0	0	769	1	6	0	0	48
2	Forestry and fishing etc.	0	0	0	17	0	0	7	0	0
3	Electricity, steam, hot water supply	0	0	0	0	0	0	0	0	0
4	Gas supply	0	0	0	0	0	0	0	0	0
5	Water supply	0	0	0	0	0	0	0	0	0
6	Coal mining	0	0	0	19	0	0	5	1	25
7	Other mining (excl. coal, crude oil, nat. gas)	0	0	12	0	0	0	0	1	16
8	Extract. of crude oil, natural gas	0	0	0	0	0	0	0	0	1
9	Man. of chemical products (incl. nuclear fuel)	3	3	0	21	23	21	164	1	109
10	Man. of refined petroleum products	90	53	29	257	115	159	644	202	1 196
11	Man. of plastic products	0	0	0	3	0	2	0	1	26
12	Man. of rubber products	0	0	2	1	0	3	5	1	19
13	Quarr. of stones a. clays, man. of building a. constr.	0	0	0	0	0	0	0	0	305
14	Man. of ceramic products	0	0	0	2	0	4	0	0	1
15	Man. of glass and glass products	0	0	2	43	0	5	0	0	2
16	Man. of iron and steel	0	0	0	0	0	0	0	0	73
17	Man. of non-ferr. metals, semifin. products thereof	0	0	0	0	0	0	0	0	1
18	Man. of foundry products	0	0	0	0	0	0	2	0	0
19	Man. of drawing plants prod., cold rolling mills etc.	0	0	0	0	0	0	0	0	2
20	Man. of structural metal products, rolling stock	0	0	0	0	0	0	0	0	0
21	Man. of machinery and equipment (excl. electrical)	0	0	1	2	0	0	1	1	8
22	Man. of office machinery autom. data process. equipment	0	0	0	1	0	0	1	0	3
23	Man. of road vehicles	0	0	0	0	0	0	1	5	80
24	Building of ships, boats a. floating structures	0	0	0	0	0	0	0	0	1
25	Man. of aircraft and spacecraft	0	0	0	0	0	0	0	1	8
26	Man. of electrical machinery equipment and appliances	0	0	0	9	0	2	8	0	20
27	Man. of precis. and optical instrum., clocks a. watches	0	0	0	0	0	12	0	0	3
28	Man. of tools and finished metal products	0	0	0	3	0	0	3	0	5
29	Man. of musical instrum., games a. toys, sport goods etc.	0	0	0	1	0	0	1	0	3
30	Man. of wood	0	0	0	0	0	0	0	0	2
31	Man. of wood products	0	0	0	1	0	0	1	0	8
32	Man. of pulp, paper and paperboard	11	12	0	47	181	33	88	4	125
33	Man. of paper and paperboard products	5	5	0	32	22	2	20	1	33
34	Printing and duplicating	1	1	0	1	14	0	11	0	23
35	Man. of leather and leather products, footwear	0	0	0	0	0	0	0	0	7
36	Man. of textiles	4	5	0	10	2	7	12	1	31
37	Man. of wearing apparel	0	0	0	3	0	0	1	0	3
38	Man. of food products (excl. beverages)	0	0	0	813	0	7	15	0	62
39	Man. of beverages	0	0	0	236	0	0	0	0	0
40	Man. of tobacco products	0	0	0	8	0	0	0	0	0
41	Construct. (excl. install. and build. completion)	0	0	0	0	0	0	0	0	0
42	Installation and building, completion	0	0	0	0	0	0	0	0	0
43	Wholesale trade, etc., recycling	0	0	0	0	0	0	0	0	0
44	Retail trade	0	0	0	0	0	0	0	0	0
45	Railway transport	0	0	0	0	0	0	0	0	0
46	Water transport, ports	0	0	0	0	0	0	0	0	0
47	Post and telecommunication	0	0	0	0	0	0	0	0	0
48	Transport activities n.e.c.	0	0	0	0	0	0	0	0	0
49	Banking	0	0	0	0	0	0	0	0	0
50	Insurance (excl. social security funds)	0	0	0	0	0	0	0	0	0
51	Renting of reale state	0	0	0	0	0	0	0	0	0
52	Hotels and restaurants, homes and hostels	0	0	0	0	0	0	0	0	0
53	Educat., research, cultural services and publishing	1	1	0	1	9	1	10	0	4
54	Health a. veterinary market service activities	0	0	0	0	0	0	0	0	0
55	Other market service activities, etc	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0
57	Central and local government	0	0	0	0	0	0	0	0	0
58	Social security funds	0	0	0	0	0	0	0	0	0
59	Private non-profit institutions, private househ.	0	0	0	0	0	0	0	0	0
69	Total material input (imported)	117	82	45	2 299	367	266	998	221	2 256

3 Material integration (input-output) table 1990
3.4 Uses of imported commodities

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Production activities of branches				Accumulation										
				Man-made assets										
							Fixed assets							
Social security funds	Private non-profit institutions, private households	Totals	House-hold con-sumption activities	Consumer durables	Change in stocks	Controlled landfills	Buildings	Machinery, equipment	Produced natural assets	Non-produced natural assets	Totals	Rest of the world	Total material inputs	Ser. No.
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
1	20	13 889	6 798	0	490	0	0	0	0	0	490	647	21 824	1
0	0	2 293	108	0	93	0	0	0	0	0	93	136	2 630	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	73	0	0	0	0	0	0	0	0	0	0	73	5
0	0	13 876	462	0	1 400	0	0	0	0	0	1 400	0	15 738	6
0	0	50 579	61	0	842	0	0	0	0	0	842	327	51 810	7
0	0	111 599	0	0	- 591	0	0	0	0	0	- 591	0	111 008	8
25	21	26 686	518	0	188	0	0	0	0	0	188	1 193	28 585	9
42	268	33 019	14 972	0	- 401	0	0	0	0	0	- 401	0	47 590	10
0	1	918	203	25	233	0	10	0	0	0	268	76	1 465	11
1	1	430	196	2	13	0	0	0	0	0	15	53	694	12
0	0	29 324	2	0	656	0	0	0	0	0	656	599	30 581	13
0	0	1 162	131	0	19	0	0	0	0	0	19	33	1 346	14
0	0	1 466	91	7	5	0	0	0	0	0	12	92	1 661	15
0	0	16 236	0	0	83	0	0	0	0	0	83	620	16 939	16
0	0	3 095	0	0	11	0	2	0	0	0	12	60	3 168	17
0	0	266	0	0	0	0	0	32	0	0	32	29	328	18
0	0	1 785	3	0	1	0	0	0	0	0	1	78	1 866	19
0	0	133	0	0	11	0	388	78	0	0	477	21	632	20
0	0	779	6	11	193	0	14	847	0	0	1 065	199	2 049	21
0	0	24	0	6	4	0	0	77	0	0	87	28	138	22
1	0	1 212	206	1 472	20	0	0	626	0	0	2 118	196	3 732	23
0	0	1	0	6	- 231	0	0	126	0	0	- 99	472	374	24
0	0	15	0	0	6	0	0	4	0	0	10	1	26	25
0	1	916	43	461	64	0	25	186	0	0	736	196	1 891	26
0	1	34	2	15	17	0	0	21	0	0	52	23	112	27
0	0	724	89	46	189	0	42	237	0	0	514	88	1 414	28
0	0	10	135	12	4	0	0	19	0	0	34	30	210	29
0	0	4 907	104	0	0	0	0	0	0	0	0	87	5 097	30
0	0	776	255	529	0	0	13	141	0	0	684	77	1 792	31
16	1	9 521	34	0	553	0	0	0	0	0	553	54	10 162	32
3	0	714	224	0	0	0	0	0	0	0	0	37	975	33
0	1	151	1	0	0	0	0	0	0	0	0	4	155	34
0	0	58	193	0	20	0	0	0	0	0	20	29	299	35
1	2	906	279	127	100	0	0	47	0	0	273	239	1 697	36
0	2	16	408	0	1	0	0	0	0	0	1	86	511	37
5	32	10 807	4 970	0	382	0	0	0	0	0	382	941	17 100	38
0	0	732	674	0	0	0	0	0	0	0	0	20	1 425	39
0	0	15	21	0	0	0	0	0	0	0	0	4	40	40
0	0	0	0	0	0	0	69	0	0	0	69	1	70	41
0	0	0	0	0	0	0	0	0	0	0	0	0	0	42
0	0	3 804	0	0	- 25	0	0	0	0	0	- 25	1 438	5 217	43
0	0	0	0	0	0	0	0	0	0	0	0	0	0	44
0	0	0	0	0	0	0	0	0	0	0	0	0	0	45
0	0	0	0	0	0	0	0	0	0	0	0	0	0	46
0	0	0	0	0	0	0	0	0	0	0	0	0	0	47
0	0	0	0	0	0	0	0	0	0	0	0	0	0	48
0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
0	0	0	0	0	0	0	0	0	0	0	0	0	0	50
0	0	0	0	0	0	0	0	0	0	0	0	0	0	51
0	0	0	0	0	0	0	0	0	0	0	0	0	0	52
0	1	46	87	0	- 1	0	0	0	0	0	- 1	11	143	53
0	0	0	0	0	0	0	0	0	0	0	0	0	0	54
0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
0	0	0	0	0	0	0	0	0	0	0	0	0	1	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
0	0	0	0	0	0	0	0	0	0	0	0	0	0	58
0	0	0	0	0	0	0	0	0	0	0	0	0	0	59
96	353	342 998	31 276	2 719	4 349	0	562	2 441	0	0	10 070	8 223	392 568	69

4 Physical input- (uses) und output- (supply) table 1990 for energy
- Energy content in calorific value -

Terajoule

Ser. No.	kinds of materials	Production activities of branches: Agriculture	Forestry and fishing etc.	Electricity, steam, hot water supply	Gas supply	Water supply	Coal mining	Other mining (excl. coal, crude oil, nat. gas)	Extract. of crude oil, natural gas	Man. of chemical products (incl. nuclear fuel)	Man. of refined petroleum products
		1	2	3	4	5	6	7	8	9	10
						Inputs (uses)					
	Raw material inputs										
	Raw materials for energy carriers	0	0	0	0	0	3 006 884	0	644 922	0	0
	Energy from hydropower	0	0	149 440	0	0	0	0	0	0	0
	Total raw material inputs	0	0	149 440	0	0	3 006 884	0	644 922	0	0
	Product inputs										
2	Forestry and fishery products, etc.	0	0	2 638	0	0	0	0	0	0	0
3	Electric power, steam, hot water	15 361	3 530	121 691	299	15 494	46 454	4 312	1 703	166 122	23 462
4	Gas	32	6 538	376 705	28 040	0	395	11 774	0	216 006	26 976
6	Coal, products of coal mining	1 451	730	2 202 057	45 003	0	863 627	1 106	0	165 260	0
8	Crude oil, natural gas	0	0	3 332	1 981 693	0	0	0	18 784	18 647	3 218 258
9	Chemical products (incl. nuclear fuel)	0	0	1 382 998	0	0	3 600	0	0	0	42 400
10	Refined petroleum products	109 212	25 706	134 185	2 475	1 699	31 376	830	204	612 023	897 047
16	Iron and steel	0	0	57 567	0	0	20 187	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	27 502	0	0	0	0	0	0
	Total product inputs	126 056	36 504	4 281 173	2 085 012	17 193	965 639	18 022	20 691	1 178 058	4 208 143
	Waste for incineration	0	0	6	0	0	0	0	0	4 181	115
	useful energy (to nature)	0	0	0	0	0	0	0	0	0	0
	Energy losses (to nature)	0	0	0	0	0	0	0	0	0	0
	Total inputs	126 056	36 504	4 430 619	2 085 012	17 193	3 972 523	18 022	665 613	1 182 239	4 208 258
						Outputs (supply)					
	Raw material outputs										
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Energy from hydropower	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	1 839 078	0	0	0	0	0	0	0
4	Gas	0	0	0	2 061 186	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	3 880 218	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	644 922	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	700 000	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	3 962 909
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
	Total product outputs	0	0	1 839 078	2 061 186	0	3 880 218	0	644 922	700 000	3 962 909
	Waste for incineration	0	0	0	0	0	0	0	0	0	0
	useful energy	44 498	16 459	54 289	5 001	8 349	67 636	10 311	12 026	268 365	127 530
	Energy losses	81 558	20 045	2 537 252	18 825	8 844	24 669	7 711	8 665	213 874	117 819
	Total outputs	126 056	36 504	4 430 619	2 085 012	17 193	3 972 523	18 022	665 613	1 182 239	4 208 258
	Inputs minus Outputs	0	0	0	0	0	0	0	0	0	0

4 Physical input- (uses) und output- (supply) table 1990 for energy
- Energy content in calorific value -
Terajoule

Production activities of branches														
Man. of plastic products	Man. of rubber products	Quarr. of stones and clays, man. of building a. constr. mat.	Man. of ceramic products	Man. of glass and glass products	Man. of iron and steel	Man. of non-ferr. metals, semifin. products thereof	Man. of foundry products	Man. of drawing plants prod., cold rolling mills etc.	Man. of structural metal products, rolling stock	Man. of machinery a. equipment (excl. electrical)	Man. of office machinery auto. data process. equipment	Man. of road vehicles	Building of ships, boats a. floating structures	Ser. No.
11	12	13	14	15	16	17	18	19	20	21	22	23	24	
						Inputs (uses)								
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
27 954	6 584	27 969	2 526	11 891	63 553	70 692	16 901	17 937	3 117	28 594	5 753	54 885	1 224	3
12 821	10 695	52 428	13 329	36 528	96 414	23 992	11 742	18 946	4 253	19 962	1 523	33 069	1 333	4
1 247	1 195	93 689	107	508	480 741	9 017	14 844	117	300	1 805	0	3 593	0	6
0	0	0	666	666	10 346	6 125	0	1 047	0	2 063	0	4 126	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
11 235	5 987	68 896	6 512	27 592	39 026	8 037	7 301	8 448	9 436	39 128	1 570	29 253	1 053	10
0	0	0	0	0	78 994	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
53 257	24 461	242 982	23 140	77 185	769 074	117 863	50 788	46 495	17 106	91 552	8 846	124 926	3 610	
321	64	269	0	0	58	51	0	0	19	38	0	391	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
53 578	24 525	243 251	23 140	77 185	769 132	117 914	50 788	46 495	17 125	91 590	8 846	125 317	3 610	
						Outputs (supply)								
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	165 505	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	8 000	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	165 505	0	0	0	0	0	0	8 000	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
27 794	12 259	129 716	12 161	42 407	340 780	67 071	29 287	26 242	9 164	47 259	4 505	65 384	1 913	
25 784	12 266	113 535	10 979	34 778	262 847	50 843	21 501	20 253	7 961	44 331	4 341	51 933	1 697	
53 578	24 525	243 251	23 140	77 185	769 132	117 914	50 788	46 495	17 125	91 590	8 846	125 317	3 610	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

4 Physical input- (uses) und output- (supply) table 1990 for energy
- Energy content in calorific value -
Terajoule

Ser. No.	kinds of materials	Production activities of branches: Man. of aircraft and spacecraft	Man. of electrical machinery equipment and appliances	Man. of precis. and optical instrum., clocks a. watches	Man. of tools and finished metal products	Man. of musical instrum., games a. toys, sport goods etc.	Man. of wood	Man. of wood products	Man. of pulp, paper and paper board	Man. of paper and paperboard products	Printing and duplicating
		25	26	27	28	29	30	31	32	33	34
							Inputs (uses)				
	Raw material inputs										
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Energy from hydropower	0	0	0	0	0	0	0	0	0	0
	Total raw material inputs	0	0	0	0	0	0	0	0	0	0
	Product inputs										
2	Forestry and fishery products, etc.	0	0	0	0	0	1 172	1 758	1 172	0	0
3	Electric power, steam, hot water	2 146	27 176	3 600	12 623	1 721	7 606	6 556	45 215	5 710	9 950
4	Gas	2 095	15 202	2 444	12 155	857	3 681	1 269	43 637	11 742	7 299
6	Coal, products of coal mining	119	1 549	206	535	0	1 116	303	21 085	625	0
8	Crude oil, natural gas	0	2 063	0	1 047	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	926	35 691	4 132	16 025	1 702	9 046	16 589	28 210	6 298	4 815
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
	Total product inputs	5 286	81 681	10 382	42 385	4 280	22 621	26 475	139 319	24 375	22 064
	Waste for incineration	0	71	13	19	38	3 996	4 059	7 561	6	0
	useful energy (to nature)	0	0	0	0	0	0	0	0	0	0
	Energy losses (to nature)	0	0	0	0	0	0	0	0	0	0
	Total inputs	5 286	81 752	10 395	42 404	4 318	26 617	30 534	146 880	24 381	22 064
							Outputs (supply)				
	Raw material outputs										
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0	0
	Energy from hydropower	0	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0	0
	Product outputs										
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	4 000	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0	0
	Total product outputs	0	4 000	0	0	0	0	0	0	0	0
	Waste for incineration	0	0	0	0	0	0	0	0	0	0
	useful energy	2 849	40 908	5 199	24 051	2 219	12 422	10 381	72 428	13 493	11 257
	Energy losses	2 437	36 844	5 196	18 353	2 099	14 195	20 153	74 452	10 888	10 807
	Total outputs	5 286	81 752	10 395	42 404	4 318	26 617	30 534	146 880	24 381	22 064
	Inputs minus Outputs	0	0	0	0	0	0	0	0	0	0

4 Physical input- (uses) und output- (supply) table 1990 for energy
- Energy content in calorific value -
Terajoule

Production activities of branches														
Man. of leather, and leather products, footwear	Man. of textiles	Man. of wearing apparel	Man. of food products (excl. beverages)	Man. of beverages	Man. of tobacco products	Construct. (excl. install. and buildung completion)	Installation and building completion	Whole sale, trade, etc., recycling	Retail trade	Railway transport	Water transport, ports	Post and telecommu-nication	Transport activities n.e.c.	Ser. No.
35	36	37	38	39	40	41	42	43	44	45	46	47	48	
						Inputs (uses)								
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
954	20 154	3 071	43 856	7 154	868	3 102	241	21 917	60 677	29 959	515	10 344	10 249	3
698	23 548	1 619	65 186	15 582	666	1 428	698	18 407	40 622	2 317	0	1 936	793	4
29	3 692	153	9 851	1 308	149	1 042	779	760	849	735	0	175	0	6
0	698	0	571	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
2 487	15 551	5 401	81 542	24 682	1 218	174 427	27 011	132 090	103 549	24 783	126 964	13 986	428 446	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
4 168	63 643	10 244	201 006	48 726	2 901	179 999	28 729	173 174	205 697	57 794	127 479	26 441	439 488	
0	0	6	167	0	6	173	32	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
4 168	63 643	10 250	201 173	48 726	2 907	180 172	28 761	173 174	205 697	57 794	127 479	26 441	439 488	
						Outputs (supply)								
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
0	0	0	0	0	0	0	0	0	0	0	0	0	0	6
0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
0	0	0	0	0	0	0	0	0	0	0	0	0	0	10
0	0	0	0	0	0	0	0	0	0	0	0	0	0	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2 156	35 747	5 337	107 469	22 788	1 378	25 443	12 110	62 008	96 385	9 352	23 179	10 905	82 737	
2 012	27 896	4 913	93 704	25 938	1 529	154 729	16 651	111 166	109 312	48 442	104 300	15 536	356 751	
4 168	63 643	10 250	201 173	48 726	2 907	180 172	28 761	173 174	205 697	57 794	127 479	26 441	439 488	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	

4 Physical input- (uses) und output- (supply) table 1990 for energy
- Energy content in calorific value -
Terajoule

Ser. No.	kinds of materials	Production activities of branches								
		Banking	Insurance (excl. social security funds)	Renting of real estate	Hotels and restaurants homes and hostels	Educat. research, cultural services and publishing	Health and veterinary market service activities	Other market service activities, etc.	External environ-mental protection services	Central and local government
		49	50	51	52	53	54	55	56	57
						Inputs (uses)				
	Raw material inputs									
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0
	Energy from hydropower	0	0	0	0	0	0	0	0	0
	Total raw material inputs	0	0	0	0	0	0	0	0	0
	Product inputs									
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	7 512	3 215	8 881	25 422	3 780	4 902	20 530	5 443	107 941
4	Gas	4 951	2 063	0	9 965	1 365	1 333	10 570	6 338	127 257
6	Coal, products of coal mining	0	0	0	682	0	0	184	364	7 358
8	Crude oil, natural gas	0	0	0	0	0	0	0	3	60
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	10 463	5 995	3 103	29 710	13 495	19 063	87 351	20 048	118 909
16	Iron and steel	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0
	Total product inputs	22 926	11 273	11 984	65 779	18 640	25 298	118 636	32 196	361 525
	Waste for incineration	0	0	0	0	0	6	0	57 518	32
	useful energy (to nature)	0	0	0	0	0	0	0	0	0
	Energy losses (to nature)	0	0	0	0	0	0	0	0	0
	Total inputs	22 926	11 273	11 984	65 779	18 640	25 304	118 636	89 714	361 557
						Outputs (supply)				
	Raw material outputs									
	Raw materials for energy carriers	0	0	0	0	0	0	0	0	0
	Energy from hydropower	0	0	0	0	0	0	0	0	0
	Total raw material outputs	0	0	0	0	0	0	0	0	0
	Product outputs									
2	Forestry and fishery products, etc.	0	0	0	0	0	0	0	0	0
3	Electric power, steam, hot water	0	0	0	0	0	0	0	0	0
4	Gas	0	0	0	0	0	0	0	0	0
6	Coal, products of coal mining	0	0	0	0	0	0	0	0	0
8	Crude oil, natural gas	0	0	0	0	0	0	0	0	0
9	Chemical products (incl. nuclear fuel)	0	0	0	0	0	0	0	0	0
10	Refined petroleum products	0	0	0	0	0	0	0	0	0
16	Iron and steel	0	0	0	0	0	0	0	0	0
23	Road vehicles	0	0	0	0	0	0	0	0	0
26	Electrical machinery, equipment and appliances	0	0	0	0	0	0	0	0	0
56	External environmental protection services	0	0	0	0	0	0	0	0	0
	Total product outputs	0	0	0	0	0	0	0	0	0
	Waste for incineration	0	0	0	0	0	0	0	0	0
	useful energy	13 309	6 645	5 099	37 775	9 445	10 495	44 964	10 243	203 709
	Energy losses	9 617	4 628	6 885	28 004	9 195	14 809	73 672	79 471	157 848
	Total outputs	22 926	11 273	11 984	65 779	18 640	25 304	118 636	89 714	361 557
	Inputs minus Outputs	0	0	0	0	0	0	0	0	0

4 Physical input- (uses) und output- (supply) table 1990 for energy
- Energy content in calorific value -
Terajoule

Production activities of branches: Social security funds	Production activities of branches: Private non-profit institutions, private households	Production activities of branches: Totals	Household consumption activities	Accumulation: Man-made assets: Consumer durables	Accumulation: Man-made assets: Change in stocks	Accumulation: Man-made assets: Controlled landfills	Accumulation: Man-made assets: Fixed assets: Buildings	Accumulation: Man-made assets: Fixed assets: Machinery, equipment	Accumulation: Man-made assets: Produced natural assets	Accumulation: Non-produced natural assets	Accumulation: Totals	Rest of the world	Total material inputs	Ser. No.
58	59	60	61	62	63	64	65	66	67	68	69	70	71	
		Inputs (uses)								Inputs (uses)				
0	0	3 651 806	0	0	0	0	0	0	0	0	0	0	3 651 806	
0	0	149 440	0	0	0	0	0	0	0	0	0	0	149 440	
0	0	3 801 246	0	0	0	0	0	0	0	0	0	0	3 801 246	
0	0	6 740	35 015	0	1	0	0	0	0	0	1	3 274	45 030	2
364	7 825	1 269 187	449 810	0	110 453	0	0	0	0	0	110 453	247 879	2 077 329	3
381	2 602	1 444 207	565 758	0	11 932	0	0	0	0	0	11 932	39 289	2 061 186	4
0	0	3 940 045	59 300	0	40 433	0	0	0	0	0	40 433	273 870	4 313 648	6
0	0	5 270 195	0	0	- 5 334	0	0	0	0	0	- 5 334	46 884	5 311 745	8
0	0	1 428 998	0	0	0	0	0	0	0	0	0	0	1 428 998	9
6 051	29 983	3 707 974	1 854 324	0	- 71 270	0	0	0	0	0	- 71 270	517 839	6 008 867	10
0	0	156 748	0	0	8 757	0	0	0	0	0	8 757	0	165 505	16
0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
0	0	0	0	0	0	0	0	0	0	0	0	0	0	26
0	0	27 502	0	0	0	0	0	0	0	0	0	0	27 502	56
6 796	40 410	17 251 596	2 964 207	0	94 972	0	0	0	0	0	94 972	1 129 035	21 439 810	
0	19	79 235	0	0	0	0	0	0	0	0	0	0	79 235	
0	0	0	0	0	0	0	0	0	0	3 924 487	3 924 487	0	3 924 487	
0	0	0	0	0	0	0	0	0	0	6 905 979	6 905 979	0	6 905 979	
6 796	40 429	21 132 077	2 964 207	0	94 972	0	0	0	0	10 830 466	10 925 438	1 129 035	36 150 757	
		Outputs (supply)								Outputs (supply)				
0	0	0	0	0	0	0	0	0	0	3 651 806	3 651 806	0	3 651 806	
0	0	0	0	0	0	0	0	0	0	149 440	149 440	0	149 440	
0	0	0	0	0	0	0	0	0	0	3 801 246	3 801 246	0	3 801 246	
0	0	0	0	0	0	0	0	0	45 030	0	45 030	0	45 030	2
0	0	1 839 078	0	0	0	0	0	0	0	0	0	238 251	2 077 329	3
0	0	2 061 186	0	0	0	0	0	0	0	0	0	0	2 061 186	4
0	0	3 880 218	0	0	0	0	0	0	0	0	0	433 430	4 313 648	6
0	0	644 922	0	0	0	0	0	0	0	0	0	4 666 823	5 311 745	8
0	0	700 000	0	0	0	0	0	0	0	0	0	1 382 998	2 082 998	9
0	0	3 962 909	0	0	0	0	0	0	0	0	0	2 045 958	6 008 867	10
0	0	165 505	0	0	0	0	0	0	0	0	0	0	165 505	16
0	0	8 000	0	0	0	0	0	0	0	0	0	0	8 000	23
0	0	4 000	0	0	0	0	0	0	0	0	0	0	4 000	26
0	0	0	0	0	0	0	0	0	0	0	0	0	0	56
0	0	13 265 818	0	0	0	0	0	0	45 030	0	45 030	8 767 460	22 078 308	
0	0	0	0	0	0	0	0	0	0	0	0	0	0	
2 532	24 089	2 490 913	1 433 573	0	0	0	0	0	0	0	0	0	3 924 487	
4 264	16 340	5 375 346	1 530 634	0	0	0	0	0	0	0	0	0	6 905 979	
6 796	40 429	21 132 077	2 964 207	0	0	0	0	0	45 030	3 801 246	3 846 276	8 767 460	36 710 020	
0	0	0	0	0	94 972	0	0	0	- 45 030	7 029 220	7 079 162	- 7 638 425	- 559 263	

5 Air emissions 1990

Ser. Nr.	Origin	Air emissions: Carbon dioxide (CO_2)	Carbon-monoxide (CO)	Nitrogen oxides (NO_x)	Sulphur dioxide (SO_2)	Particulate matter	Nitrogen dioxide (N_2O)	Volatile organic compounds (VOC)	Methene (CH_4)	Other	Total
		1000 t									
1	Agriculture	31 503	106	104	8	88	56	28	1 510	0	33 403
2	Forestry and fishing etc.	2 324	6	3	2	0	0	1	0	0	2 336
3	Electricity, steam, hot water supply	266 041	43	328	324	21	3	6	6	0	266 769
4	Gas supply	452	1	1	0	0	0	0	182	0	637
5	Water supply	117	1	1	0	0	0	0	0	0	119
6	Coal mining	5 963	36	19	21	106	0	6	1 122	3	7 276
7	Other mining (excl. coal, crude petrol., nat. gas)	822	0	1	1	1	0	0	0	0	826
8	Extract. of crude petroleum, natural gas	1 063	0	1	20	0	0	0	47	0	1 132
9	Man. of chemical products (incl. nuclear fuel)	22 429	23	47	88	9	77	56	2	2 005	24 738
10	Man. of refined petroleum products	13 263	6	24	87	1	0	198	3	5	13 588
11	Man. of plastic products	1 590	2	3	2	0	0	0	0	0	1 598
12	Man. of rubber products	974	1	2	2	0	0	0	0	0	979
13	Quarr. of stones a. clays, man. of building a. constr.	17 149	166	90	18	20	1	11	2	4	17 459
14	Man. of ceramic products	1 226	3	4	0	0	0	1	0	16	1 251
15	Man. of glass and glass products	4 191	7	31	25	4	0	2	0	22	4 282
16	Man. of iron and steel	46 998	921	35	56	64	2	6	3	3 584	51 669
17	Man. of non-ferr. metals, semifin. products thereof	3 141	111	5	12	5	0	0	0	0	3 274
18	Man. of foundry products	2 721	70	2	3	8	0	2	0	2	2 808
19	Man. of drawing plants prod., cold rolling mills etc.	1 682	2	3	1	0	0	0	0	315	2 003
20	Man. of structural metal products, rolling stock	923	6	3	1	0	0	1	0	578	1 512
21	Man. of machinery and equipment (excl. electrical)	4 046	28	15	4	1	0	5	0	226	4 326
22	Man. of office machinery autom. data process. equipment	189	1	0	0	0	0	0	0	2	192
23	Man. of road vehicles	4 038	19	10	3	0	0	3	0	322	4 397
24	Building of ships, boats a. floating structures	144	1	0	0	0	0	0	0	430	575
25	Man. of aircraft and spacecraft	188	1	0	0	0	0	0	0	139	328
26	Man. of electrical machinery equipment and appliances	3 311	22	11	4	1	0	4	0	50	3 404
27	Man. of precis. and optical instrum., clocks a. watches	407	4	2	0	0	0	1	0	2	416
28	Man. of tools and finished metal products	1 917	8	4	2	0	0	1	0	56	1 990
29	Man. of musical instrum., games a. toys, sport goods etc.	171	2	1	0	0	0	0	0	3	177
30	Man. of wood	1 785	5	3	3	0	0	1	0	1	1 799
31	Man. of wood products	2 144	19	13	2	1	0	4	0	30	2 214
32	Man. of pulp, paper and paperboard	7 463	7	10	24	5	0	5	1	0	7 515
33	Man. of paper and paperboard products	1 165	4	3	2	0	0	1	0	24	1 198
34	Printing and duplicating	743	5	3	0	0	0	1	0	70	822
35	Man. of leather and leather products, footwear	216	2	1	1	0	0	0	0	0	219
36	Man. of textiles	2 818	5	5	7	0	0	1	0	0	2 836
37	Man. of wearing apparel	483	5	2	1	0	0	1	0	0	492
38	Man. of food products (excl. beverages)	10 564	29	36	22	10	0	23	1	0	10 686
39	Man. of beverages	2 793	9	19	4	1	0	6	0	0	2 833
40	Man. of tobacco products	131	0	1	0	0	0	0	0	0	132
41	Construct. (excl. install. and build. completion)	5 334	75	61	5	4	0	18	1	5	5 502
42	Installation and building, completion	2 076	42	16	2	1	0	417	0	287	2 841
43	Wholesale trade, etc., recycling	10 679	104	129	10	9	0	30	1	0	10 962
44	Retail trade	9 869	141	65	7	3	0	26	2	0	10 113
45	Railway transport	1 966	9	24	2	2	0	5	0	3	2 010
46	Water transport, ports	8 985	15	34	3	3	0	8	0	115	9 164
47	Post and telecommunication	1 155	9	7	1	1	0	3	0	0	1 175
48	Transport activities n.e.c.	33 099	153	307	20	21	1	59	2	0	33 661
49	Banking	1 044	10	3	1	0	0	2	0	0	1 060
50	Insurance (excl. social security funds)	554	5	1	0	0	0	1	0	0	561
51	Renting of reale state	218	0	0	0	0	0	0	0	0	219
52	Hotels and restaurants, homes and hostels	2 776	24	6	2	0	0	3	0	1 794	4 607
53	Educat., research, cultural services and publishing	1 058	13	3	1	0	0	2	0	0	1 078
54	Health a. veterinary market service activities	1 453	28	6	1	0	0	4	0	0	1 493
55	Other market service activities, etc.	6 869	194	47	4	1	0	31	2	0	7 147
56	External environmental protection services	12 257	15	9	7	3	0	0	1 407	1	13 700
57	Central and local government	11 436	44	38	12	1	1	8	1	0	11 538
58	Social security funds	463	8	4	0	0	0	2	0	0	477
59	Private non-profit institutions, private househ.	2 356	13	5	2	0	0	2	0	0	2 379
60	Totals	582 939	2 588	1 614	832	399	143	997	4 300	10 096	603 903
61	Household consumption activities	194 910	4 461	803	98	33	5	605	97	6 741	207 752
62	Totals	777 849	7 049	2 417	930	432	148	1 602	4 397	16 837	811 655

1) Weighting factors: $CO_2 = 1$, $N_2O = 320$ und $CH_4 = 24.5$

2) Weighting factors: $SO_2 = 1$ und $NO_x = 0.7$

	Air emissions weighted according to			
	global warming potential [1] (CO_2, N_2O and CH_4)		Acidification [2] (SO_2 und NO_x)	
%	1000 t	%	1000 t	%
4.1	86 351	9.3	80	3.1
0.3	2 345	0.3	5	0.2
32.9	267 104	28.6	553	21.1
0.1	4 921	0.5	1	0.0
0.0	119	0.0	1	0.0
0.9	33 513	3.6	34	1.3
0.1	831	0.1	2	0.1
0.1	2 230	0.2	21	0.8
3.0	47 132	5.1	122	4.7
1.7	13 478	1.4	104	4.0
0.2	1 606	0.2	4	0.2
0.1	985	0.1	3	0.1
2.2	17 400	1.9	80	3.1
0.2	1 239	0.1	4	0.1
0.5	4 236	0.5	47	1.8
6.4	47 646	5.1	80	3.1
0.4	3 178	0.3	15	0.6
0.3	2 759	0.3	4	0.2
0.2	1 698	0.2	3	0.1
0.2	933	0.1	3	0.1
0.5	4 090	0.4	15	0.6
0.0	191	0.0	0	0.0
0.5	4 081	0.4	10	0.4
0.1	146	0.0	0	0.0
0.0	190	0.0	1	0.0
0.4	3 347	0.4	12	0.5
0.1	412	0.0	2	0.1
0.2	1 936	0.2	5	0.2
0.0	173	0.0	1	0.0
0.2	1 799	0.2	6	0.2
0.3	2 165	0.2	11	0.4
0.9	7 547	0.8	32	1.2
0.1	1 178	0.1	4	0.1
0.1	751	0.1	2	0.1
0.0	219	0.0	1	0.0
0.3	2 850	0.3	11	0.4
0.1	488	0.1	2	0.1
1.3	10 681	1.1	47	1.8
0.3	2 821	0.3	17	0.7
0.0	133	0.0	1	0.0
0.7	5 400	0.6	48	1.8
0.3	2 105	0.2	13	0.5
1.4	10 800	1.2	100	3.8
1.2	9 990	1.1	52	2.0
0.2	1 987	0.2	19	0.7
1.1	9 012	1.0	27	1.0
0.1	1 167	0.1	6	0.2
4.1	33 417	3.6	235	9.0
0.1	1 055	0.1	3	0.1
0.1	560	0.1	1	0.1
0.0	220	0.0	0	0.0
0.6	2 806	0.3	7	0.3
0.1	1 069	0.1	3	0.1
0.2	1 472	0.2	5	0.2
0.9	6 978	0.7	36	1.4
1.7	46 730	5.0	14	0.5
1.4	11 670	1.3	38	1.4
0.1	469	0.1	3	0.1
0.3	2 378	0.3	6	0.2
74.4	734 187	78.7	1 962	74.8
25.6	198 868	21.3	660	25.2
100.0	933 055	100.0	2 622	100.0

Anhang: Statuten

1. Satzung des Beirats

§ 1 Aufgaben des Beirates

Der Beirat soll den Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit ehrenamtlich in allen Fragen, die im Zusammenhang mit der Umweltökonomischen Gesamtrechnung stehen, wissenschaftlich beraten. Der Beirat wird diese Aufgabe zunächst für drei Jahre übernehmen. Der Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit wird unter Berücksichtigung der Vorschläge des Beirats rechtzeitig über eine Verlängerung des Mandats entscheiden.

§ 2 Zusammensetzung des Beirats

Der Beirat besteht aus Wissenschaftlern, die grundsätzlich Hochschullehrer mit besonderen Fachkenntnissen auf den für die Ausarbeitung der UGR relevanten Gebieten sein sollen, sowie aus jeweils einem vom Bundesminister für Wirtschaft und vom Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit entsandten Mitarbeiter. Die Zahl der Mitglieder soll 15 nicht übersteigen. Mitarbeiter des Statistischen Bundesamtes und des Umweltbundesamtes nehmen ohne Stimmrecht an den Beratungen teil.

§ 3 Berufung und Abberufung der Mitglieder des Beirates

Die Mitglieder werden vom Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit berufen bzw. abberufen. Er wird dabei Vorschläge des Beirats berücksichtigen.

§ 4 Begleitkreis

Dem Beirat wird ein Begleitkreis mit beratender Funktion zugeordnet, der aus sachkundigen Vertretern gesellschaftlicher und wirtschaftlicher Gruppen mit besonderem Bezug zur Umweltökonomischen Gesamtrechnung besteht. Die Zahl der Mitglieder soll 15 nicht übersteigen.
Die Mitglieder des Begleitkreises werden vom Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit berufen bzw. abberufen. Er wird dabei Vorschläge des Beirats berücksichtigen.

§ 5 Vorsitz im Beirat

Der Beirat bestellt aus seiner Mitte einen Vorsitzenden und einen stellvertretenden Vorsitzenden. Der Vorsitzende des Beirates ist auch für die Zuladung des Begleitkreises zuständig und leitet die gemeinsamen Sitzungen von Beirat und Begleitkreis.

§ 6 Beratungen des Beirats

Der Beirat kann zu seinen Sitzungen Gäste und Sachverständige einladen.
Der Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit versieht den Beirat mit den zur sachdienlichen Behandlung seiner Beratungsgegenstände erforderlichen Informationen.
Der Beirat tagt mindestens einmal im Jahr mit dem Begleitkreis.

§ 7 Gutachterliche Äußerungen des Beirats

Die Ergebnisse seiner Beratungen teilt der Beirat dem Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit in Form gutachterlicher Äußerungen mit.
Wird eine Mehrauffassung im Beirat nicht oder nicht in allen Punkten erzielt, so sollen in der gutachterlichen Äußerung die unterschiedlichen Meinungen dargelegt werden. Eine Minderheit kann ihre abweichende Auffassung in einem Minderheitsgutachten zum Ausdruck bringen.
Die gutachtlichen Äußerungen des Beirats sind grundsätzlich zu veröffentlichen. Den Zeitpunkt bestimmt der Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit; die Veröffentlichung soll in der Regel nicht später als vier Monate nach der Übergabe an den Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit vorgenommen werden. Vor Abgabe eines jeden Gutachtens wird der Beirat den Begleitkreis anhören. Es liegt im Ermessen des Beirates, inwieweit er die Stellungnahmen und Anregungen in seine gutachterlichen Äußerungen einfließen läßt.

§ 8 Verpflichtung zur Verschwiegenheit

Die Mitgleider des Beirats und des Begleitkreises haben über die ihnen zur Verfügung gestellten Informationen Verschwiegenheit zu bewahren. Darüber hinaus sind sie verpflichtet, den Gegenstand der Beratungen sowie die gutachtlichen Äußerungen des Beirats vertraulich zu behandeln, es sei denn, daß der Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit die Verschwiegenheitspflicht aufhebt.
Die Mitglieder werden bei ihrer Berufung auf die gewissenhafte Erfüllung der in Absatz 1 bezeichneten Pflicht durch Handschlag verpflichtet.

§ 9 Sekretariat des Beirats

Das Sekretariat des Beirats wird beim Statistischen Bundesamt eingerichtet.

§ 10 Inkrafttreten

Diese Satzung gilt mit Wirkung vom 1. Januar 1993.

gez. Professor Dr. Klaus Töpfer

Bundesminister für Umwelt, Naturschutz und Reaktorsicherheit

2. Mitglieder des Begleitkreises

Dr. Thomas Becker *)	Bundesverband der Deutschen Industsrie e. V.
Bernd Heins	IG Chemie-Papier-Keramik
Prof. Dr. Rudi Kurz	Bund für Umwelt und Naturschutz Deutschland
Helmut Röscheisen	Deutscher Naturschutzring
Dr. Peter Pascher**)	Deutscher Bauernverband e. V.
Reiner Meister	Deutscher Gewerkschaftsbund
Dr. Armin Rockholz	Deutscher Industrie- und Handelstag
Prof. Dr.Dr. Gerd Wegener	Arbeitsgemeinschaft Deutscher Waldbesitzer
Udo Weiß	World Wildlife Found Deutschland

*) Nachfolger von Dr. Markus Racke **) Mitglied seit 1995

3. Mitglieder des Beirats

Prof. Dr. Dietrich Dickertmann **Vorsitzender**	Universität Trier
Prof. Dr. Paul Klemmer **Stellvertretender Vorsitzender**	Rheinisch-Westfälisches Institut für Wirtschaftsforschung, Essen
Prof. Dr. Dieter Cansier	Universität Tübingen
Prof. Dr. Ulrich Hampicke	Universität Gesamthochschule Kassel
Prof. Dr. Siegfried Heiler	Universität Konstanz
Prof. Dr. Joachim Klaus	Universität Nürnberg
Prof. Dr. Jürgen Kromphardt	Technische Universität Berlin
Dr. Eberhard K. Seifert*)	Wuppertal Institut für Klima, Umwelt und Energie GmbH, Wuppertal
Prof. Dr. Hans-Ulrich Zabel	Universität Halle
Prof. Dr. Horst Zimmermann	Universität Marburg
Reg.Dr. Thomas Stratenwerth **) MinR Alfred Walter**)	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit
RR'n z. A. Christa Ratte	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit
MinR L.Wilhelm Weber	Bundesministerium für Wirtschaft
Dr. Werner Schulz Ständiger Vertreter: Dr. Andreas Burger	Umweltbundesamt, Berlin
Abt. Präs. Oswald Angermann	Statistisches Bundesamt
Reg.Dir. Walter Radermacher	Statistisches Bundesamt
Reg.Dir.Dr. Carsten Stahmer	Statistisches Bundesamt

*) Mitglied seit 9. Mai 1994 **) Mitglied bis Ende Mai 1995 ***) Mitglied seit Anfang Juni 1995

Federal Statistical Office April 1999

Implementation of SERIEE in Germany, reporting year 1995

Final report of a Eurostat research project under contract

97/616/3040/GA/B4/MM

Wolfgang Riege-Wcislo

Federal Statistical Office

German Environmental Economic Accounting (GEEA)

2/27

Contents

1. Summary

The project's objective is to construct the series of tables for the environmental protection expenditure account of the European System for the Collection of Economic Information on the Environment (SERIEE) for Germany for the 1995 reporting year. The findings and concepts used in the Federal Statistical Office's 1996 SERIEE Report for Germany[1] *(reporting year 1991)* provided the general framework for drawing up the various SERIEE tables, having been updated or expanded where necessary.

The starting point are the existing data on environmental protection expenditure in Germany, many of which come from the *stock of fixed capital* account for environmental protection. These must gradually be transposed into the SERIEE core tables B "Production of Characteristic Services", in order that, building on those tables, Tables A "National Expenditure" and C "Financing of Environmental Protection" can be compiled. In order to obtain SERIEE results for Germany as a whole, the first step was to extend the existing *stock of fixed capital* account for environmental protection to the new Länder. This was done in three stages; first, *for the General Government in the new Länder* an adequate inventory of gross assets for environmental protection at the end of 1990 was estimated by analogy with the existing structure of the *fixed asset accounts for former Germany*. The second stage *was to link* that inventory to new base data from the primary surveys of environmental statistics and extrapolate them for the new Länder. Finally, the blocks of results of the fixed assets account for the old and new Länder were combined into figures for Germany as a whole.

This provided us with the most important benchmark figures for the SERIEE tables of the production of characteristic services, such as capital formation, consumption of fixed *capital*, current material expenditure and staff costs.

The tables themselves were compiled in particular from a differentiated evaluation of the financial statistics of public-sector budgets, the environmental protection fixed assets account and a third new data source not included in the old SERIEE Report, the statistics of the annual financial statements of public enterprises. This enabled data on privatised state operations (public utilities) and other private-sector forms of business organisation in which the State has a majority holding, to be included for the first time in the tables for water management and protection and waste management, which are the dominant environmental domains in terms of quantity.

In addition to this major innovation, the following expansions or changes were made to the previous report:

[1] M. Kuhn and U. Lauber, Ansätze zur Implementierung von SERIEE in Deutschland [Approaches to the Implementation of SERIEE in Germany], Eurostat Research Project, Wiesbaden 1996.

- In the general government sector, monetary information on the protection of biodiversity and landscape, environmental research and the omnibus item "Other environmental protection activities" *is now in addition shown* to the domains water management and protection and waste management.
- Both the production tables B and table types A "National Expenditure" and C "Financing of Environmental Protection" are now shown for all five environmental domains.

However, we must also mention certain limitations of the present SERIEE tables for 1995 as compared to the scope of environmental protection required to be shown by the SERIEE Handbook:

- In Manufacturing Industry, no information is available for the CEPA categories "Protection of soil and groundwater" and "Protection of biodiversity and landscape".
- Information on expenditure for connected and adapted ("clean") products proved unobtainable.
- It was not possible to show the value of subsidies in the form of cheap loans for environmental protection purposes.
- The tables do not show purely private disposal firms in the waste and waste water sector or enterprises in Manufacturing Industry offering environmental protection services as a secondary activity. They contain only data from those *private* disposal enterprises in which the state holds more than 50% of the capital. An initial comparison with various statistics and association data on sales suggests that, in water management and protection at least, these account for a large part of the characteristic services provided in Germany. In the waste domain, on the other hand, there still seems to be an appreciable under-recording.

In all, National Expenditure on Characteristic Services in Germany in 1995 amounted to approx. DM 100 billion, with water management and protection taking 50%, followed by waste management (30%) and other environmental protection activities (18%); on the basis of the primary statistical definitions, the latter include noise abatement and ambient air protection measures taken by manufacturing industry. The present SERIEE tables therefore cover the major part of characteristic services in Germany. There are, however, still significant gaps, especially in the coverage of private disposal enterprises in the waste sector.

Our experience in compiling the various types of SERIEE tables and the problems encountered show that a thorough knowledge of the SERIEE approach and its accounting rules, if possible combined with a knowledge of the ESA, is necessary in order to arrive at national tables conforming to SERIEE. Compiling the tables is also *rather* time-consuming. In the light of this, it is doubtful whether there is any point in future in presenting SERIEE-based Eurostat/OECD questionnaires on environmental protection expenditure to primary statisticians direct without providing them with further explanatory notes and "national accounts know-how". Consideration should be given to further streamlining the existing SERIEE *tables* and at the same time simplifying them.

2. Introduction

The project's objective is to construct the series of tables for the environmental protection expenditure account of the European System for the Collection of Economic Information on the Environment (SERIEE) for Germany for the reporting year 1995. The starting point is Germany's existing benchmark figures on environmental protection expenditure, which must gradually be integrated into the corresponding SERIEE tables. At the same time, any gaps and shortcomings must be identified and, where possible, made good by plausible estimates or else possible solutions outlined. This work draws on the methodological and empirical approach of an earlier project [2] for Eurostat, in which the first ever SERIEE tables were compiled for the year 1991, albeit only for the former West Germany. The procedure developed at the time for transposing the SERIEE approach now serves as a general framework for the present task.

By way of introduction, Section 3 outlines the data currently available in Germany on environmental protection expenditure and the surveys that will be newly added or amended starting from the reporting year 1996. As with the earlier project, the results of the fixed assets account for environmental protection are the starting point. However, since the objective is now SERIEE tables for Germany as a whole for the reporting year 1995, we must first have an expanded capital account taking in the new Länder. Most of the necessary work for this has in the meantime been completed. Section 4 describes in detail the steps taken to obtain a capital account for Germany. It deals in particular with the problems of "calculating the environmental protection assets of the former GDR". Section 5 describes the stages in the work leading to the SERIEE tables for Germany. It begins by referring to the most important limitations of the data and the changes as compared to the earlier Eurostat project. This is followed by a description of how we arrive at the SERIEE core tables A-C.

To conclude, there is a brief description of the findings, followed by a summary and a review of the steps necessary to implement the SERIEE scheme of tables in full.

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[2] M. Kuhn and U. Lauber, Ansätze zur Implementierung von SERIEE in Deutschland [Approaches to the Implementation of SERIEE in Germany], Eurostat Research Project, Wiesbaden 1996.

3. Present and future data provision on environmental protection expenditure, costs and fixed assets in Germany - comparison with the SERIEE concept

Most monetary indicators relating to environmental protection in Germany that are suitable for further processing according to the SERIEE concept either come directly from the environmental protection fixed assets account or are derived from it. Starting from 1975, the macroeconomic expenditure, costs and gross fixed assets for the environmental protection domains waste management, water management and protection, ambient air protection and noise abatement are obtained for the former West Germany. Corresponding time series are available for the sectors of Manufacturing Industry and for General Government. The data on consumption of fixed capital necessary for the expenditure concept are calculated directly in the fixed assets account. This is at the same time also the basis for determining current expenditure (as the sum of intermediate consumption and staff costs). While, in the case of general government, figures are available from the financial statistics of public authorities, there are no such primary statistical data for Manufacturing Industry. When constructing the fixed assets account for environmental protection, the approach of obtaining current expenditure from the running costs according to various cost types as percentages of gross fixed economic and environmental assets was developed. The two most important sources of statistical information for the fixed assets account are the annual survey of capital expenditure for environmental protection in Manufacturing Industry and the financial statistics of public authorities. Since 1991, both series of statistics have also provided data from the new Länder. In order to arrive at figures for the whole of Germany by the SERIEE approach, the environmental capital account must first be extended to the new Länder. Only when this has been done do we have the basic data required for completing the SERIEE tables for Germany as a whole. The steps required for extending the capital account are described in detail in Chapter 4.

While the capital account raw data of relevance for the period 1975 to 1995, including the subsection for the New Länder 1991-1995, were based on the two sets of statistics referred to above, which in the period in question were largely unchanged, starting with reporting year 1996 a large number of changes will be made to the data structure and new sources introduced, which have to be incorporated in the near future into the environmental protection fixed assets account for Germany as a whole. The main reason for this is the revision of the Environmental Statistics Act in 1994, as a result of which new findings concerning environmental protection measures and expenditure will be available for the first time for the reporting year 1996. In this context, new or amended data can be expected in four areas:

- The survey of capital expenditure for environmental protection purposes in Manufacturing Industry now also asks for expenditures for nature conservation and soil decontamination. This means that the corresponding headings of the SERIEE CEPA classification can be filled in for the first time. Unlike the old survey, expenditure for integrated measures is no longer asked for.

- Current expenditure (staff costs, material costs, consumption of fixed assets, etc.) is now for the first time sought from the enterprises and units of manufacturing industry direct. The reporting circle is the same as for the capital expenditure survey.
- While the previous surveys were all concerned with the demand side of environmental protection activities, new statistics of "goods and services for environmental protection" are geared to the supply side. Basically, they ask about sales of goods and services for environmental protection purposes by units in Manufacturing Industry and in the service and general government sectors. This does not, however, include sales by units such as disposal enterprises connected with government functions or statutory responsibilities. This restriction imposed by the legislator makes it much more difficult to obtain the fullest possible statistical picture of private-sector disposal.
- Another new survey is the statistics of the "breakdown of capital expenditure for environmental protection", in which investors in environmental protection are asked about the goods, structural works and services going into the investments actually made.

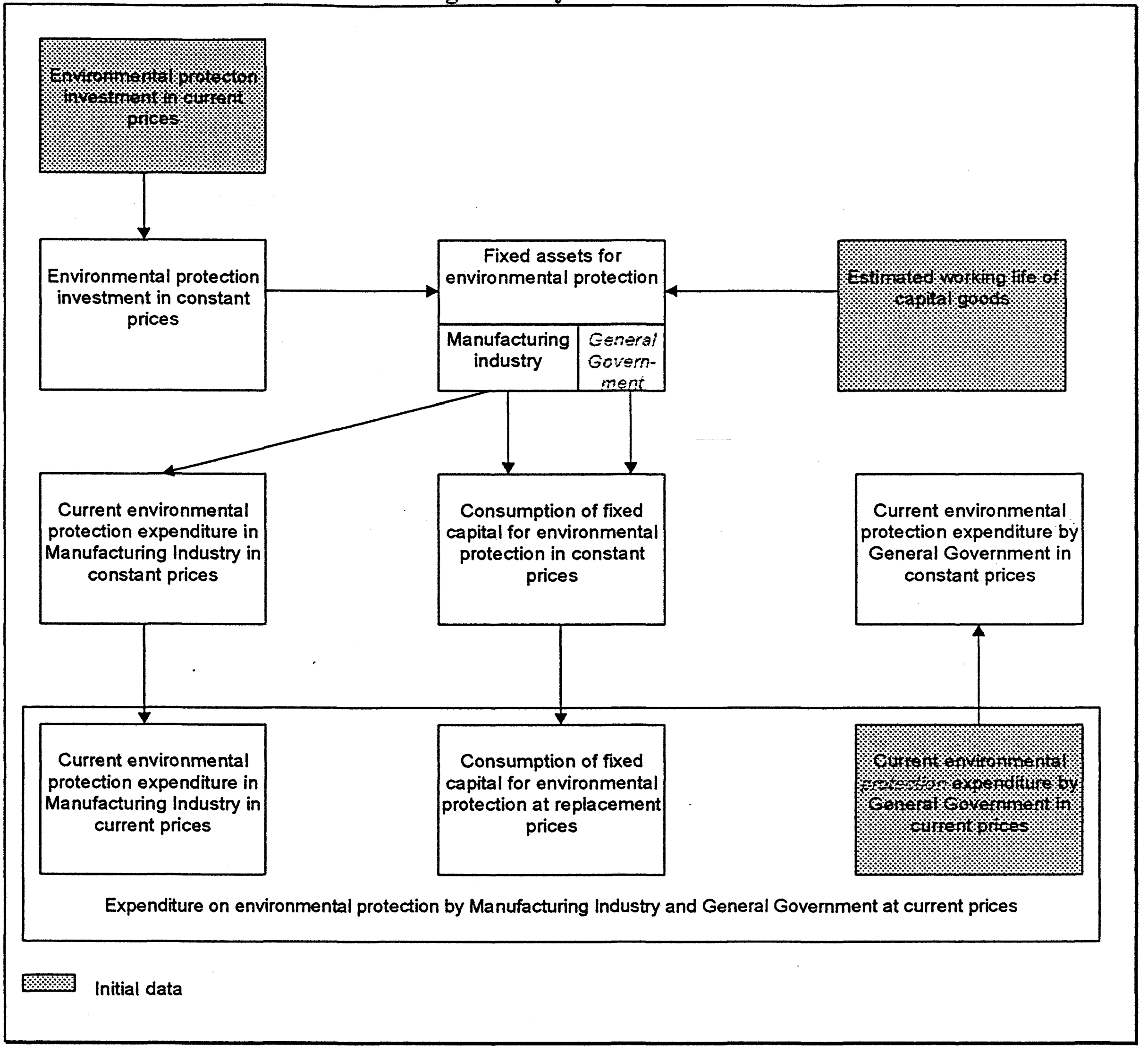
The extended scope of the investment survey and the data on the structure of goods involved in environmental protection capital formation are particularly important for updating the environmental protection fixed assets account. Compared with the conceptual and empirical requirements of the SERIEE environmental protection expenditure account it becomes clear, however, that even when the new data successively available since 1996 are included, it will not be possible simply to transfer the figures into SERIEE core tables. Since SERIEE is closely related conceptually to ESA 95, national accounts principles, concepts and accounting rules are, so far as possible, applied; for example, output values are required instead of environmental protection expenditure. The environmental protection expenditure data currently available are of use primarily only for the SERIEE presentation of "Production of characteristic services (core table B)". Neither Table A "National Expenditure by components and by users/beneficiaries" nor, especially, core Table C "Financing of national expenditure for environmental protection" can be completed using the existing data direct. A large number of additional evaluations and estimates are necessary. These are discussed in detail in Section 5.

4. Extension of the environmental protection fixed assets account to the New Länder

4.1. Principles and basic structure of the existing capital account - specifications for the New Länder

The environmental protection fixed assets account developed in the mid 1980s shows the reproducible fixed assets, i.e. the inventory of durable, reproducible means of production used entirely or predominantly for environmental protection purposes. Depending on the basic statistics, it distinguishes between the environmental domains waste disposal, water management and protection, noise abatement and protection of ambient air. The German environmental assets account uses the perpetual inventory method. According to this method, the inventory of fixed assets is calculated by cumulation of the additions, that is the environmental protection investments of previous years, having regard to the specific working life of the fixed assets goods. The starting point is therefore time series of environmental protection investments in current prices reaching far back into the past, and these are price-adjusted by dividing them into categories of goods and applying specific price indices. The inventory of reproducible fixed assets at constant prices is then calculated from the capital formation series in constant prices. The figure below represents the calculation sequence. The same sequence is followed for every economic and environmental domain included.

Figure 1: Calculation of Expenditure and Fixed Assets for Environmental Protection for Manufacturing Industry and General Government



Source: Federal Statistical Office, Fachserie 19 Reihe 6, Umweltökonomische Gesamtrechnungen - Ausgaben und Anlagevermögen für Umweltschutz [Environmental Economic Accounts - Expenditure and Fixed Assets for Environmental Protection] p. 7, Wiesbaden 1997.

We shall not at this point describe the various stages in the calculation of the existing assets *account* in detail, but simply list the associated essential conditions and data characteristics which are relevant for constructing and choosing the method for the capital account for the new Länder[3]:

[3] A detailed description of the fixed assets account for environmental protection is given in the publication by Ryll, A. and Schäfer, D.: Bausteine für eine monetäre Umweltberichterstattung [Building blocks for monetary environmental reporting], in: Zeitschrift für Umweltpolitik und Umweltrecht No. 2/1986. A summary may be found in the general and methodological notes to the corresponding Fachserie 19, Reihe 6 "Ausgaben und Anlagevermögen für Umweltschutz" published by the Federal Statistical Office, 1997 edition.

- Identical data sources for capital formation in environmental protection from 1991 for Manufacturing Industry and General Government, i.e. any environmental protection domains of particular significance for the new Länder, such as cleaning up contaminated sites, can no longer be considered separately.
- No independent information on the commodity structure of capital expenditure on environmental protection for the New Länder, i.e. both the structure of the goods by activity and environmental domain and the respective assumptions about working life are the same. It is therefore possible to adopt the same procedure as for the former West Germany unchanged.
- The running costs as a proportion of gross fixed assets from the existing account are used to determine current expenditure.
- Since there are no significant differences between the capital account parameters independent of the pure level of capital expenditure for the former West Germany and the New Länder, or there is insufficient information in the matter, the basic structure of the existing account for the former West Germany can be carried over.

Despite this transferability, however, we cannot simply calculate for the whole of Germany direct as from 1991. For reasons of content, in particular the need to incorporate *the existing stock of fixed capital* of the GDR in 1990, we first need to construct a separate account for the New Länder for the period 1991 to 1995. The two sub-accounts are then linked. From *reporting year* 1996 there will then be only one uniform capital account for Germany as a whole.

4.2 Calculation of the 1990 existing inventory, the 91-95 inventory for the New Länder and results for the whole of Germany

The starting point for the capital account for Germany is the existing *stock of fixed capital* in 1990 in the former GDR. The former GDR's existing environmental protection assets must be recorded and given a monetary value (in DM) before the figures can be projected, in a second step, together with the capital goods for environmental protection purposes newly acquired since 1991. The merger of the accounts for the old and new Länder planned for 1996, however, presupposes approximately similar classificational structures, i.e. the existing inventory must be determined separately for Manufacturing Industry and General Government for the four environmental protection domains. Buildings and capital equipment must also be considered separately if at all possible.

The *General Government* portion of "public environmental protection assets in the New Länder in 1990" was estimated by an external research institute as part of a research project on environmental economic accounting [4]. At this point we shall mention only the main stages in the work for determining the existing inventory, since the details can be found in Section 5 of the publication in question [5]. Because there were two projects on similar subjects and in particular because of the close institutional link with local authorities and associations of local authorities, the German Institute for Urbanistics (DIFU) was charged with this task.

By analogy with the existing capital account, the starting point was to try to determine series for local authority capital expenditure relating to environmental protection for the territory of the New Länder extending far back into the past. Obviously, the investigation concentrated on the domains of water management and protection (sewerage and purification plants) and waste disposal. Expenditure on noise abatement and ambient air protection is of minor importance for General Government. In a step-by-step analytical process, the DIFU tried to bring together adequate data on capital formation in the waste water and waste domain for the periods before 1913, 1913-1945 and the time after 1945. Apart from series on capital expenditure, there was also a need for plausible information about the working life of the capital goods in question, local authority capital expenditures had to be clearly divided between the domains water management and protection and waste disposal, and the problem of converting GDR marks into DM had to be resolved. If there were appreciable problems in determining the key indicators of the *fixed assets account* in the former West Germany for the period prior to 1957, the gaps in the data for the New Länder were many times greater.

"In the interim, it must be said that the approach of determining earlier capital formation in environmental protection in the territory of the New Länder as long time series from the various sources of information available does not yield any satisfactory results."[6]

As an alternative, the DIFU tried to estimate the 1990 fixed assets in the general government waste and waste water domain directly by means of a physical quantity structure *(inventory)* and prices for each type of goods; basically, this method is only a kind of preliminary to the accumulation method. If the existing inventory is to be incorporated in the present calculation model and then updated, it is in fact absolutely essential to convert the assets held in 1990 into capital formation series again, together with assumptions about the respective asset retirement distributions.

As a starting point there was the analysis of the assets held, which had a monetary value even in the time of the GDR, but this was of no help. Of particular interest were the opening balance sheets of the local authority supply and disposal companies, also known as WAB [=VEB Wasserversorgung und Abwasserbehandlung = water supply and waste water treatment enterprises], prepared in DM as part of

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[4] Reidenbach, M.: Umweltschutzausgaben und Umweltschutzvermögen des öffentlichen Bereichs in den neuen Bundesländern [Public sector environmental protection expenditure and environmental protection assets in the new Länder], Volume 3 of the series Beiträge zu den Umweltökonomischen Gesamtrechnungen [Contributions to Environmental Economic Accounts], Wiesbaden 1998.

[5] ibid, p. 58 ff.

[6] From: ibid, p. 72.

the unification process. This source had the crucial disadvantage that the opening balances were not required to show the assets broken down into water supply and disposal, which meant that the environmentally relevant part could not be identified.

Since the value of the fixed assets could not be determined directly, the DIFU began by recording the waste and waste water disposal facilities physically (e.g. in metres of pipes), then arriving at a monetary value based on estimated prices for individual goods or categories of goods (DM per metre of pipe). The result was then the gross fixed assets held at the end of 1990 in 1991 prices. For the dominant domain of water management and protection, this gave gross fixed assets of DM 29.4 billion, with only DM 1.2 billion for waste disposal. The DIFU was unable to identify any significant ambient air protection or noise abatement measures, and a symbolic figure (DM 1 million and 5 million respectively) was taken for the record. In all, the gross fixed assets for General Government environmental protection in the New Länder were thus put at DM 30.6 billion in 1990 (for comparison, the corresponding figure for the former West Germany was around DM 242 billion).

If these values are to be updated and subsequently integrated into the existing capital account, the gross 1990 position so obtained must be linked with corresponding capital expenditure series for earlier years. "This time distribution may be produced by combining the information about the age structure or the total capital formation made in the past ... This method gives the actual age structure more or less accurately, if few if any replacement investments have been made in the past. This is likely to be true of the GDR..."[7]. As the above figures show, if investments are distributed according to the age structure for water management and protection alone, that is basically sufficient. The Federal Statistical Office then gradually constructed a capital account -- in line with the *structure* for the former West Germany *assets account*-- from the DIFU information on the gross inventory and age structure and the capital expenditure series derived from them. After a number of "trial runs" in which the computational parameters of the capital account were varied, we were able to calculate approximately the same results as the 1990 gross inventories given by the DIFU in constant prices.

Now that we have a 1990 initial inventory for waste disposal and water management and protection in the *General Government* sector, obtained as it were from a "reverse-modelled" fixed assets account, the next step is to continue the account to the year 1995 for all four environmental protection domains. While the current values can more or less be appended to the 1950-1990 or 1970-1990 capital formation series obtained in the trial runs for the blocks "water management and protection" and "waste disposal", for the environmental domains "noise abatement" and "ambient air protection" the capital account does not begin until 1991. The assumptions regarding asset structure and working life in the former West Germany are taken for all domains.

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[7] From: ibid, p. 74.

The final step is then to include special retirements from the extrapolated 1990 GDR inventories for the years 1991 and 1992 in order to take account of early retirements and closures. The method chosen for this follows the normal national accounts procedure for the macroeconomic capital account.
The following special retirements were calculated on the basis of DIFU Institute estimates:

- Water management and protection: For purification plants, special retirement from gross fixed assets of 15% for plant and buildings equally, i.e. 7.5% special retirement for each of 1991 and 1992. For sewerage systems 5% special retirement only for buildings evenly distributed over 1991 and 1992.
- Waste: For plant special retirement from gross fixed assets of 21% distributed over 1991 and 1992.

For the *second subsector*: "Environmental protection assets of Manufacturing Industry", it proved impossible to obtain a plausible value for the GDR's existing inventory in 1990. In this case, there were neither usable statistical information for estimating an inventory, as used in the two DIFU methods described, nor expert findings from research institutes, and the initial inventory had therefore to be set at 0. There were no doubt still some minor environment-specific assets in selected branches of Manufacturing Industry in 1990, but in view of the collapse of the existing industries and associated structural change, most of these "residuals" would have had to be recorded as special retirements in subsequent years.[8]
Since an existing inventory could not be estimated for 1990, unlike the General Government sector the capital account consists of only *one* calculation module, which takes equal account of all four environmental protection domains for the years 1991 to 1995. As with the General Government section, here, too, there are no specific assumptions or information on the asset structure or working life for the New Länder. Both the general sequence of the programme stages (see Figure 1) and the programme structure within the individual steps in the calculation were largely taken over from the existing account.

In order then to arrive at *results for Germany as a whole* for the period 1991 to 1995, the two sub-accounts for the Former West Germany and the New Länder must be linked together. Since, as described above, the method and parameters of the two capital accounts are largely identical, the simplest method of linking them can be chosen, namely simply adding the final results or indicators of the capital account. These comprise the following data or accounting procedures:
Gross inventory at start of year + capital expenditure - retirements = gross inventory at end of year, and
Net inventory at start of year + capital expenditure - consumption of fixed capital = net inventory at end of year.

[8] For example, the DIW assumed that about two thirds of all the fixed assets present in 1991 would have to be scrapped by 1995. See Görzig, B., Auslastung des Produktionspotentials weiterhin auf hohem Niveau [Utilization of production capacity still high], in: DIW-Wochenberichte, vol. 61, p. 61, 1994.

The figure below again summarises the path described above to obtain the environmental fixed assets for Germany for 1995.

Figure 2: Calculation modules for the environmental fixed assets account

Module	GENERAL GOVERNMENT Waste Water Noise Air	Manufacturing Industry Waste Water Noise Air
I.	Existing *stock* GDR 1990 DM billion from DIFU (in P=91) Capital formation series 50 - 90 *1.2* *29.6* 0 0	Existing *stock* GDR 1990 DM billion (in P = 91) 0 0 0 0
	+	+
II.	Additions 91 - 95 Waste Water Noise Air Extension of existing inventories - special retirements / New calculation	Additions 91 - 95 Waste Water Noise Air New calculations for all domains
	=	=
III.	Inventory of fixed assets New Länder 91 - 95	Inventory of fixed assets New Länder 91 - 95
	+	+
IV.	Inventory of fixed assets Former West Germany 91 - 95	Inventory of fixed assets Former West Germany 91 - 95
	=	=
V.	Inventory of fixed assets Germany 91 - 95	Inventory of fixed assets Germany 91 - 95

Overall, we get the following picture of gross fixed assets for the former West Germany and the New Länder in 1995.

Table 1: Gross fixed assets for environmental protection, Germany, 1995

in million DM

Environmental protection domains	Total		Manufacturing Industry		General Government	
	Former WG	New Länder	Former WG	New Länder	Former WG	New Länder
Waste management	31910	2870	10400	530	21510	2350
Water management and protection	321170	44510	31680	4460	289500	40060
Noise abatement	10750	360	5780	250	4970	110
Protection of ambient air	59690	5820	59290	5760	400	60

5. SERIEE environmental protection expenditure account for Germany, reporting year 1995

5.1 Basic structure and scope, and changes as compared to the estimates in the 1996 SERIEE Report (reporting year 1991)

As already noted in the introduction, the work on compiling the SERIEE tables follows closely the sequence used in the old SERIEE project. Accordingly, the B Tables on production were compiled first. These form the basis for calculating the table types A and C. Two of the present three main sources of data for table type B were already used before, namely the environmental protection fixed assets account described above and the financial statistics of public authorities. The latter were again evaluated in a detailed classification in order to present the corresponding environment-related monetary flows between the various levels of General Government (federal government, Länder, municipalities and special-purpose agencies) and also with other branches of the economy (where recorded). This information was required in particular for SERIEE level C "Financing". The third important and new source of data is the "statistics of the annual financial statements of public enterprises". These provide important key quantities concerning production, capital formation and expenditure for environmental protection for the increasingly important branch of public disposal enterprises[9], which are no longer

[9] The public utility form of enterprises in e.g. water management and protection now covers 44% of the supplied population in Germany. There are now hardly any government enterprises, which still operate within the general government budget, in the new Länder. For details, see: Bäumer, A., Lohaus, J.: Stand und

posted in the state budgets and are therefore missing from the statistics of the annual accounting results of public authorities. We therefore now have available for the first time information about so-called public utilities [Eigenbetriebe] and other types of private-law disposal companies, provided the state holds more than 50% of their capital. These enterprises are shown in the tables in the "Public-sector enterprises" column.

The present SERIEE tables for 1995 fall short of the scope of environmental protection required by the SERIEE handbook in the following respects:

- There is no information on the CEPA categories "protection of soil and groundwater" and "protection of biodiversity and landscape" in Manufacturing Industry.
- It was not possible to obtain any information about expenditure on connected and adapted products.
- It was not possible to show the amounts of subsidies in the form of cheap loans for environmental protection purposes.
- Completely private waste and waste water disposal enterprises and enterprises in Manufacturing Industry that offer environmental protection services as a secondary activity are not shown in the tables. They contain only data on disposal enterprises in which the state has a stake of over 50% in the capital. An initial comparison with various statistics and association data on sales indicators suggests that, in water management and protection at least, these cover a major part of the characteristic services offered in Germany. In waste, however, there still seems to be appreciable under-recording.

The first two reservations already applied for the 1991 SERIEE assessment. However, apart from the inclusion of public-sector disposal enterprises, the following expansions or changes were made as compared to the scope of the old report:

- *In addition to* the domains of water management and protection and waste management, monetary information on protection of biodiversity and landscape, environmental research and the blanket heading "other environmental protection activities" is now also shown for the General Government sector. All the data are taken from the public finance statistics. In the environmental field, its classification according to functions of General Government tallies, with some reservations, with the corresponding categories of the SERIEE CEPA classification.
- The tables for "Other environmental protection activities" are an exception. In the column "non-specialised producers in Manufacturing Industry" they contain only the data on noise abatement and protection of ambient air, which are not shown as a separate environmental domain. The reason for this is that there is no separately identifiable information for these domains in the general government

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Finanzierung der Abwasserentsorgung [State and financing of waste water disposal] in: Schriftenreihe der Abwassertechnischen Vereinigung (ATV), No. 08, Hennef 1997.

sector; instead, most of the values are included in the results for "other environmental protection activities". Overall, measures for the protection of ambient air by enterprises of Manufacturing Industry predominate here in volume terms. Their results can be clearly identified in the corresponding tables.

- Both the production tables B and the table types A "National expenditure" and C "Financing of environmental protection" are now shown for all five environmental domains referred to.

5.2 Estimate of the production of characteristic services

The general conceptual assumptions and the empirical steps derived from them for compiling the B tables were, after scrutiny, taken over from the old SERIEE report, and so they are not described in any more detail here (see section 4 of the 1996 Report). The data for the new environmental domains, which are found only for General Government, were obtained and recorded using the same procedure as for the water management and protection and the waste management tables. However, since no sales worth mentioning are made in the protection of biodiversity and landscape, environmental research or other environmental activities, the respective outputs were calculated by adding production costs.

In the case of *specialised producers* in water management and protection and waste management, a distinction is made, as described above, between purely state-owned operations and public-sector enterprises. Because of the limited amount of data, the only parameters available for the latter are intermediate consumption, compensation of employees, consumption of fixed capital, total output and capital formation (investment). There are no data on taxes on production or subsidies for current use, and no information on investment grants and capital transfers in the capital transactions section. It was therefore impossible to complete the entries for net operating surplus and financing by producers. The lack of this information made it particularly difficult to compile the C tables on financing. In the case of output, there could be some double counting here, but it could not be further quantified owing to lack of information concerning financial interpenetration especially in the statistics of the annual financial statements of public enterprises, but also in the financial statistics.
The consumption of fixed capital shown for enterprises is taken from the statistics of annual financial statements, which are compiled from the balance sheets of public-sector enterprises. They were therefore obtained by managerial or tax calculation. The consumption of fixed capital of general government, on the other hand, was obtained by the perpetual inventory method according to national accounts criteria in connection with the fixed assets account, which means that it is based on the actual working life of the assets. It was not possible to correct the managerial depreciations in this direction, as a result of which the two parameters are not easily compared.

In *Manufacturing Industry*, the characteristic services provided are by definition always an activity ancillary to a different main production; the output according to the SERIEE concept is therefore obtained by adding the corresponding production costs. As in the old report, it was here, too, assumed that only a small proportion of such characteristic services is provided for other enterprises or sectors of activity. The federal German statistics contain no monetary data capable of quantifying these flows.

5.3 Estimate of National Expenditure for Characteristic Services

The main conceptual steps in moving from the production table B to Table A "National Expenditure for Environmental Protection" was again taken from the old Report (see Section 5, 1996 Report). In simplified terms, the outputs have to be revalued, added to the gross fixed capital formations, and the outputs distributed between the various buyers or user units.

Most of the outputs obtained for *specialised producers* of General Government in water management and protection and waste services come from fees and charges. These are distributed among the respective purchasers using data on the use of external environmental protection services from the monetary environmental input-output table for 1990 [10], reconciled with the physical results of the 1995 waste and waste water statistics. It was possible at the same time to make a breakdown according to the categories Other Producers, subdivided into non-specialised and non-characteristic producers, and Private households. No such information was obtainable for General Government as a collective consumer.

The key obtained in this way was then also used to distribute the output of public-sector enterprises. This was on the assumption that the structure of purchasers of services from a state-controlled enterprise is no different - or differs only insignificantly - from that of a privatised utility.

The characteristic services produced by *enterprises of Manufacturing Industry* itself (for water management and protection, waste management, ambient air protection and noise abatement) are all declared as activities ancillary to their market production and therefore recorded in Tables A as intermediate consumption. In the domain "Other environmental protection activities" they appear as a significant value in the "Other producers/not specialised" column. The expenditure also shown here for other environmental protection activities produced exclusively by General Government units is

[10] See Kuhn, M.: Umwelt-Input-Output Tabelle für Deutschland 1990, Ergebnisse eines Forschungsprojektes für Eurostat [Environmental Input-Output Table for Germany 1990, Results of a Research Project for Eurostat], DOK. ECO-IND/97/3, Luxembourg 1997.

consumed by those units direct and is therefore posted in the item "General Government as collective consumer". The environment-related outputs for protection of biodiversity and landscape and environmental research, obtained by adding production costs, are treated in the same way and posted under General Government as direct consumer.

5.4 Financing of National Expenditure for characteristic services

The national expenditure by user obtained in Table A is not necessarily the same units as finance environmental protection to that amount. The data from Tables A and B are used to allocate the national expenditure for characteristic services to the financing units. Here, too, the reposting rules and approaches from the old Report were taken as a guide and updated where necessary. Basically, we find that those units that use characteristic services also finance them in most cases.

There were difficulties with public-sector enterprises since - as already mentioned in 5.2 - a lot of important information for determining financial flows was lacking. In order to arrive at a complete picture of the financing of national expenditure at all, a pragmatic solution was adopted. Since the construction of Table A depends on the assumption that there are no major differences in the structure of purchasers of services from state-run and privatised utilities, this assumption may also - with some reservations - be transferred to the financing structures of both types of enterprise. By analogy with the procedure for table type A, where the output of public-sector enterprises was broken down among users by means of the key for state utilities, the information first obtained about the units financing purely state-sector disposal enterprises was converted into proportions and those proportions applied to public-sector enterprises. The financing provided by the general government levels increases appreciably as a result, but at the same time the value shown for specialised enterprises/producers is too small. However, the above assumption of transferability still needs to be underpinned, and changed if necessary, by more extensive investigations and empirical data, and the tables for the financing of the domains water management and protection and waste management are only provisional.

In the other environmental domains (protection of biodiversity and landscape, environmental research, other environmental protection activities), the financing tables are much easier to compile, either because the General Government levels also finance much environmental protection expenditure direct or, as in the case of noise abatement and protection of ambient air, the enterprises pay for these services themselves. As mentioned at the beginning, information on state investment grants or soft loans to enterprises proved impossible to obtain and was not therefore included in Table C.

6. Findings

The output of characteristic services of General Government, public-sector enterprises and Manufacturing Industry in Germany in 1995 is shown in summary form in the following table.

Table 2: Output of characteristic services in Germany in 1995

Million DM

Transactions	**Environmental domains**					
	Water management and protection	Waste management	Other environmental protection activities, incl. protection of ambient air and noise abatement	Protection of biodiversity and landscape	Environmental research and development	Total
1 **Output of environmental protection**	28460	27714	13647	624	68	70513
of which:						
General Government	13169	13604	1822	624	68	29287
Public-sector enterprises	7130	10253	0	0	0	17383
Manufacturing Industry	8162	3857	11825	0	0	23844
2 **Gross fixed capital formation**	19441	5416	4264	357	6	29484
of which:						
General Government	9826	1447	575	357	6	12211
Public-sector enterprises	6846	3229	0	0	0	10075
Manufacturing Industry	2769	740	3689	0	0	7198
3 **Revaluation and special transfers**	23	-182	71	195	0	108
4 **National expenditure for environmental protection** (1 + 2 + 3)	47925	32948	17982	1176	74	100106

Before going into the figures in detail, attention must be drawn to the limits to the depiction of environmental protection described in section 5.2. Most importantly, we lack environmental protection activities in the service sector and in particular the purely private disposal enterprises already mentioned.

Overall, however, it can be assumed that the above grand total of approx. DM 100 billion covers most national expenditure for environmental protection with the exception of waste management.

As in 1991, expenditure for water management and protection predominates with nearly 50%, followed by waste management with around 30% and other environmental protection activities (18%). The latter are clearly dominated by expenditure by Manufacturing Industry on measures to protect ambient air, which is no longer shown separately. Protection of biodiversity and landscape and environmental research in particular are of only subordinate importance overall.
The outputs of the General Government levels and public-sector enterprises are divided almost equally between water management and protection and waste management, while the protection of ambient air, noise abatement and water management and protection predominate in Manufacturing Industry. Water management and protection measures naturally have the greatest weight in capital expenditure in the general government sector. They are about seven times higher than in the waste sector. The position with public enterprises is different, with waste management accounting for a much greater proportion of capital formation. The shift in responsibility from state-owned utilities to public utilities and private-sector enterprises is seen clearly here. In the remaining environmental domains - protection of biodiversity and landscape, environmental research and other activities, not including protection of ambient air and noise abatement - capital formation is made by General Government alone, at least according to our appraisal of the official statistics included in the analysis.

We shall now briefly describe the most important results of Tables A, B and C, which are given in the Annex for each of the five environmental protection domains.

Table B for water management and protection shows a total output of DM 28.4 billion, with the General Government sector showing a negative net operating surplus of DM 212 million. The old report, too, showed a negative net operating surplus here (albeit a higher one), going briefly into the possible causes (see section 6, 1996 Report). The significant decline in the negative surplus may be related to the shift in responsibilities to public-sector enterprises. Since their operating surplus cannot be shown, however, the explanation remains open.
In waste management, on the other hand, the local authorities (Gemeinden) have a positive operating surplus, and, in accordance with SERIEE rules, no net operating surplus was shown here for the Länder, since the output was arrived at by adding the production costs. When analysing capital transactions, it is striking that in water management and protection exactly one half of the capital formation of General Government units is subsidised, while the corresponding proportion in waste management is only 21%. It must at this point again be emphasised that such information is not available for public-sector enterprises.

Table A on National Expenditure shows, in the case of water management and protection, that Private Households account for the greatest proportion of purchases of characteristic services provided by specialised producers (DM 12.1 billion), followed by the business sector with around DM 6 billion. Producers with their own purification plants but also making use of state services paid DM 9.5 billion. General Government as a collective consumer pays only around DM 500 million. Adding the gross capital formation for water management and protection (DM 19.4 billion) and the sum of specific transfers (DM 250 million), we arrive at the grand total of nearly DM 50 billion.
In the case of waste management, Other Producers pay around DM 15 billion, and private households pay DM 7.8 billion for waste management services. Non-specialised enterprises spend DM 4.1 billion as intermediate consumption for their main activity. Together with the DM 5.4 billion fixed capital formation and the negligible specific transfers and collective General Government consumption (together DM 0.4 billion), this gives a total expenditure for waste management services of just under DM 33 billion.
In the other environmental protection domains, the producer of the service is normally also the one who makes the expenditure, and it must be remembered that expenditure on noise abatement and ambient air protection by manufacturing enterprises accounts for a large proportion (80%) of total national expenditure for the three remaining environmental domains.

The *C Tables on financing* in the Annex show the dominance of the business sector as funder in the important domains of water management and protection and waste management, financing 43% and 61% of National Expenditure respectively. General Government follows with 28% of water management and protection and only 15% of waste management. Private Households have a greater weight here (23%). This must be qualified by pointing out the provisional nature of these figures, since the assumptions about the financial structure of the important public-sector enterprises, described in section 5.4, are not empirically substantiated. In the remaining environmental domains, financing is assumed by General Government, in line with its determining role in the Production and National Expenditure accounts. Noise abatement and protection of ambient air, among other environmental protection activities, are exceptions to this, since they are financed by enterprises alone.

7. Conclusion and outlook

The present SERIEE tables cover most of Germany's characteristic services. There are still significant gaps, especially in the depiction of private disposal enterprises in the waste sector, presumably fewer in the water management and protection domain. In this respect, the possibilities for evaluating the statistics of the annual financial statements of public enterprises will have to be further improved in the future, or else ancillary characteristics *included*, in order to estimate key turnover data for private disposal companies from more differentiated information about the turnover indicators for the various legal forms, linked with the contents of the turnover tax statistics. Further important data on private disposal companies, such as e.g. consumption of fixed capital, *current expenditure*, etc. can probably be obtained only from the fixed capital account for environmental protection. However, for this it is absolutely essential that the capital account be expanded or supplemented to take in "private disposal companies". This is planned for the near future.

The detailed evaluation of the annual accounting results of public authorities proved very fruitful, despite the inadequacies in the scope of depiction outlined above, but at the same time it was the most labour-intensive part of compiling the SERIEE tables. The SERIEE requirement for compatible results in the different General Government levels in particular entailed a lot of extra work. Appropriately structured EXCEL worksheets were used in an attempt to read in the basic financial statistics data, which are available only at mainframe level in the Federal Statistical Office [11], at EXCEL level and then evaluate it largely automatically for the B tables. This so far promising route will certainly have to be further developed and optimised for future years if the work is to be organised efficiently.

Our experience in compiling the various types of SERIEE tables and the problems encountered show that a thorough knowledge of the SERIEE approach and its accounting rules, if possible combined with a knowledge of the ESA, is necessary in order to arrive at national tables conforming to SERIEE. Compiling the tables is also rather time-consuming. In the light of this, it is doubtful whether there is any point in future in presenting SERIEE-based Eurostat/OECD questionnaires on environmental protection expenditure to primary statisticians direct without providing them with further explanatory notes and "national accounts know-how". Consideration should be given to further streamlining the existing SERIEE tables and at the same time simplifying them.

[11] All data sets are filed on the BS2000 mainframe computer with the so-called STATIS-BUND programming language.

Annex 1: SERIEE tables for Germany by environmental domains, reporting year 1995

Annex

Tables for the former West Germany

???

Valuation of degradation

D Cost-based methods to derive macro-aggregates

8.109 Actions which may be taken to prevent environmental deterioration or to restore environmental quality include:

(a) Reduction of, or abstention from, economic activities

(b) Substitution of the outcomes of economic activities, that is to say, production of other products or modification of household consumption patterns;

(c) Substitution of the inputs of economic activities without modifying their outcomes (outputs) by applying environmental benign technologies;

(d) Activities to prevent environmental deterioration without modifying the activities themselves (for example, end-of-pipe technologies);

(e) Restoration of the environment and measures taken to diminish the environmental impacts of economic activities.

8.110 The ways of measuring the costs associated with these actions were described in section B. The heading of avoidance costs covers structural adjustment costs (corresponding to (a), (b) and (c) above) and abatement costs (d), and the heading of restoration costs covers (e). This section considers how these costs, if incurred, would be reflected in the macro-economic aggregates. The method suggested in the 1993 SEEA, and implemented in a number of countries since then, relies on an accounting procedure called the "maintenance cost" approach. Other countries have adopted an alternative, modelling, approach to the question, usually called "greened economy" modelling. Each of these is discussed in turn below.

1 The philosophy of maintenance costing

8.111 Increasingly more and more firms are incurring actual costs to mitigate their impacts on the environment, either as a result of governmental legislation or simply pressure from the general public favouring producers seen to be "green". For example, as the recent COP 6 negotiations illustrated, corporations, with or without government intervention, are taking increasingly many initiatives in reducing CO_2 emissions either in anticipation of future market intervention, to improve their image or to realise resource-saving potentials. These actual costs are captured in the type of accounts discussed in chapter V. The present section is concerned with trying to evaluate the costs associated with environmental degradation which is not, or not yet, being controlled.

8.112 The philosophy of the maintenance cost approach is to try to estimate what the accounting entries would have been for the same level of activity if all the costs associated with environmental degradation had been incurred and internalised within market prices. That is, it is an attempt to put a value on environmental sink functions which are currently free. As such it is a hypothetical exercise and should be interpreted as such rather than, as is sometimes portrayed, a "correction" to the standard national accounts. Indeed, various levels of adjustment can be calculated depending on how much or how little degradation is to be permitted under the hypothetical scenario as it is sometimes unrealistic to assume no degradation at all takes place and this is unnecessary in any case when there are natural assimilation processes at work to absorb some of the emissions.

8.113 Maintenance cost is sometimes interpreted as a proxy for the value of the environmental functions which are used up. Under this latter assumption, allocating the costs to those who cause the deterioration in the function is in accordance with the polluter pays principle and may suggest the level at which market instruments for cost internalisation could be set.

8.114 Another possibility is to regard maintenance cost as a proxy for the environmental damage caused by economic activities during the accounting period. This is behind the assumption that the value of the maintenance cost represents the "wear and tear" on the environment just as the consumption of fixed capital represents the wear and tear on produced assets, and like consumption of fixed capital, should be deducted from GDP to reach a measure of net domestic product or income.

8.115 Under either scenario, maintenance costs can be held to provide a snapshot of the immediate environmental impacts of economic activity without entering the realm of modelling. The closer the economy is to the desired environmental standards, the smaller the adjustment and the better this snapshot will be.

2 *Measuring maintenance costs*

8.116 The 1993 SEEA first defines maintenance costs as those that "would have been incurred if the environment had been used in such a way as not to have affected its future use" (para 50). In fact, this position is somewhat modified just a few paragraphs later when the calculation of maintenance cost is described in a manner parallel to the consumption of fixed capital. That is maintenance cost is set to the value of the costs which would have had to be incurred to remedy the environmental degradation that current production and consumption practices in the year caused. If the environment had been in a perfect state at the start of the year, these two formulations would correspond. If, however, the environment is already impaired at the start of the year, the initial definition is over-stated.

8.117 This description Maintenance costing is the only method described in the 1993 SEEA and in the SEEA operational manual for deriving alternative macro-economic aggregates. In those manuals the term EDP is used for the concept described here as eaNDP (environmentally adjusted NDP). Although the definition used implies that no environmental degradation is allowed when using maintenance cost methods, in fact it can also be applied to a given environmental standard which may be less than perfectly clean.

8.118 The different ways of combating degradation imply different costs and different accounting impacts for each.

8.119 ***Avoidance costs - structural adjustment option.*** One example might be to stop using fertilisers and pesticides, which would lead to a reduction in intermediate consumption but a greater reduction in output. GDP would therefore be lower than previously. Further, if the fertilisers and pesticides are domestically produced, there are likely to be second round effects further reducing GDP. Another possible means of reducing environmental damage is to change from environmentally damaging products and technologies to more environmentally benign ones. Here the impact on GDP will depend in the main on the relative cost of the more benign products as compared with the former ones.

8.120 ***Abatement and restoration costs***[4]. These do not involve cessation or change in activity but embarking on new activity to either inhibit the production of pollution or to clean it up once it has taken place.

8.121 In general, the immediate effect of structural adjustment costs lead to decreases in NDP while those for abatement and restoration costs lead to increases. Restoration costs may arise from a variety of causes, including natural events, domestic economic activities in the past or economic activities in other countries. They may also be spread over several time periods if actually carried out. Avoidance costs refer to the present emissions and to domestic economic activity. (Either if actually carried out may bring benefits in the future.)

8.122 In preparing estimates of costs, the choice of activities for calculating the maintenance costs depends on relative costs and efficiencies, that is on best available technologies. Avoidance costs of industries should thus be based on the most efficient methods for not degrading the environment or for meeting environmental standards. Such standard setting is in line with the more practicable approaches to approximating optimal tax rates for cost internalisation (see notably Baumol and Oates 1971).

4. The 1993 SEEA used the expression "repercussion costs" to cover costs due to environmental damage which has not been restored. In this manual, such costs are treated under damage-based estimates as described below.

Restoration costs need to be carefully attributed to the current emissions and the anticipated effects of emissions discharged during the current accounting period. This is to ensure that environmental costs refer to the current wear and tear of natural capital and not to past environmental degradation.

8.123 In practice, even the best-available technologies applied to current production and consumption processes may not always be capable of abating all the emissions generated during the accounting period. The remaining emissions would have to be "tolerated" as their removal would be sub-optimal (owing to marginal costs exceeding social standards) in simulated markets. It is often assumed that these remaining emissions are safely absorbed by the environment, or are within the set standards. If this is not acceptable, the cost of avoiding the polluting activity altogether, in order to meet a given standard, has to be estimated.

8.124 Care must be taken not to use both avoidance and restoration costs which refer to the same environmental damage, such as reducing acidifying pollutants at the source and counteracting the acidifying effects of this year's emissions by liming.

3 Accounting for maintenance costs

8.125 A maintenance cost based measure of eaNDP can be described as the attempt to answer the question

> *What would the value of net domestic product be if hypothetical environmental standards had been met using current costs and current technologies?*

8.126 Table 8.1 shows in schematic form a number of variations on the production account. P stands for production (output), IC for intermediate consumption, M for maintenance costs, CFC for consumption of fixed capital, D for net depletion; dpNDP is depletion adjusted NDP (as in chapter VI); eaGDP and eaNDP are environmentally adjusted versions of GDP and NDP.

Table 8.1 Schema showing the derivation of domestic product measures

	Gross domestic product	Net domestic product
Option 1	GDP = P - IC	NDP = GDP - CFC
Option 2	GDP = P - IC	dpNDP = GDP - CFC - D
Option 3	eaGDP = P - IC - M = GDP - M	eaNDP = eaGDP - CFC - D = GDP - CFC - D - M
Option 4	eaGDP = P - IC - M = GDP - M	eaNDP = eaGDP - CFC - D = GDP - CFC - D - M
Option 5	eaGDP = P - IC + M = GDP + M	eaNDP = eaGDP - CFC - D - M = GDP - CFC - D

8.127 The row for Option 1 in Table 8.1 shows the standard SNA derivation of gross and net domestic products with no allowances for either depletion or degradation of environmental assets. GDP is defined simply as output (P) less intermediate consumption (IC). NDP is equal to GDP less consumption of fixed capital (CFC).

8.128 The row for Option 2 corresponds to the elaboration of accounts in chapter VI where net depletion is taken into account in the difference between GDP and NDP but no allowance is made for degradation. The expression "net depletion" here should be interpreted as encompassing all the adjustments for the effects of extraction, natural growth, replenishment and return to natural capital as detailed in chapter VI. No adjustment to the measure of GDP is involved if depletion only is considered.

Responses to Peter Bartelmus' article:

Karl Schoer: There won't be a green GDP

Peter Bartelmus presents in his article a green GDP, or more specifically an "Eco-Domestic Product" (EDP). In his view, this compilation of a German EDP is a boon that the Federal Statistical Office has so far withheld from the public. The Federal Statistical Office originally also hoped to realise such a calculation in the foreseeable future. However, when constructing the environmental accounts, it soon became apparent that various problems stand in the way of a reliable measurement of such a depreciated magnitude. The result is that there will not be a "green GDP" in the form of *one* figure in the official statistics. The object of study (the value of environmental consumption) is too complex to be assessed using one single methodical approach. The modular construction of the environmental accounts and the methodological pluralism used by the Federal Statistical Office suitably reflect these difficulties.

Peter Bartelmus failed to specify in his article precisely how he calculated the EDP. I am familiar with the main features of his approach from a previous conference, in Weimar. My criticism of his approach is based on two points. Firstly, the product label "EDP" is misleading. Secondly, the "direct avoidance costs" are merely an intermediate product, which should not be marketed in its present form.

The basic idea behind the calculation of the EDP is the adjustment of the traditional domestic product by accounting for the consumption of natural assets, which is ignored. The intention is to integrate two components of natural assets: the quantitative aspect of natural resource *depletion*, and the qualitative degradation of natural assets that are caused by economic activity. This aspect of qualitative change is especially important in Germany. Peter Bartelmus uses avoidance costs to measure capital consumption. As far as I know, he takes two components into consideration for the assessment of degradation: the emissions of carbon dioxide and nitrogen oxides. For these impacts, he calculated *ex post* hypothetical direct avoidance costs on the basis of certain reduction standards.

In principle, there is nothing to criticise about calculating avoidance costs, although a lot depends on the details of how the calculations are performed. However, as soon as the term "EDP" is used, the claim is made that natural asset depletion has been comprehensively taken into account. But if such a claim is made, all other important impacts, apart from carbon dioxide and nitrogen oxide emissions, would also have to be considered. They include, for example, other material impacts, the way and intensity of using land and space, and other structural interference that affects the quality of landscapes, ecosystems or biodiversity. Especially these last impacts can hardly be valued in monetary terms. The figure that Peter Bartelmus proposes as the corrective for calculating EDP (he suggests 2 to 3 percent of the NDP for environmental consumption in Germany), is misleading. At best this figure takes into only part of our environmental problems.

The choice of the environmental standard affects greatly the result of such calculation: to what extent are current emissions to be reduced? Furthermore, it is important to remember that the avoidance costs at first only indicate how much those responsible for environmental impacts have saved by exploiting the environment as a free-of-charge absorption sink. This exploitation is defined by the environmental standards applied in the calculations. Thus, the avoidance costs provide information that is by all means relevant, but they do not necessarily measure the decrease of natural assets.

Let me come to my second point of criticism: Peter Bartelmus' approach is limited to the assessment of direct avoidance costs, and so neglects the indirect costs.

The direct avoidance costs are the hypothetical additional costs that would be incurred for meeting a given target of emission reduction. Possible measures to be taken are above all technical adjustments or changes in production or input structures. Graphs that illustrate the course of hypothetical avoidance costs form an important basis for such cost calculations. For particular impacts, technical avoidance costs, which represent the relationship between costs incurred and environmental impact, can be compiled and plotted on graphs, also at the level of the national economy. As part of a research project, the Federal Statistical Office calculated such graphs of hypothetical technical avoidance costs for different types of air pollutants. These graphs provide information about the additional costs that would be necessary to reduce emissions of a substance by a certain amount with currently available technology.

However, the problem is that measures to reduce emissions affect the total system generally non- marginally. That means that apart from the direct effects there are also important indirect effects on input and output structures, and prices. Peter Bartelmus' descriptive ex-post approach neglects these indirect effects. Let me elaborate, using the example of the reduction of carbon dioxide emissions. A reduction of emissions could be achieved, for instance, by means of a large-scale substitution of high-carbon lignite by less carbonic natural gas. Apart from the direct costs, taking such a step would have important effects on the whole economy. The reason is that domestically produced lignite would have to be substituted by imported natural gas. Such processes can be assessed comprehensively only by econometric models that would suitably include a time element for a dynamic process of adjustment. Some research institutes have already carried out such analyses for Germany. This type of scenario modelling illustrates paths of economic development that comply with politically determined environmental standards. Such scenarios seem to us the most sensible way to estimate the costs of avoiding certain environmental damages for the national economy. According to the division of labor that is common practice in Germany, official statistics provides the necessary data, while scientific research institutes carry out model calculations.

Water Flow Accounts as Part of Material and Energy Flow Accounts in Germany

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By Dr. Karl Schoer and Christine Flachmann

Keywords:

water flow accounts – water abstraction – water discharge – material flow - Environmental-Economic Accounting – homogenous branches

Abstract

This article describes the concepts, data sources and methods of the water flow accounts of the Federal Statistical Office as a part of the German material and energy flow accounts [2].
The water flow accounting system represents in physical units the water flows - caused by economic activities - from nature to the economic system (raw materials), within the economic system, and from the economic system to nature (residuals). In the second part of this article data are presented on the development of important national-economy aggregates of the water flow accounts for 1960 to 1995. In addition, detailed results in a breakdown by homogeneous branches are shown for the year 1995.

1. Introductory note

The purpose of material and energy flow accounts is to produce a comprehensive picture of, first, the utilisation of natural assets in connection with economic activities through the abstraction of materials from nature and the discharge of residuals into nature and, second, the material flows between economic units. Material flows are measured in physical units and generally presented in tonnes. Where suitable, the flows are additionally shown in other units; for example, water and waste water are also presented in cubic metres. The material and energy flow accounts are closely related to the system of national accounts. This means that the concepts and calculation methods of the two systems are coordinated, which ensures full compatibility of their results.

It is planned to present the material flows in the form of a physical input-output table (PIOT) at regular intervals. Due to the physical law of the conservation of matter (1st fundamental law of thermodynamics), completely and consistently combining all material flows in the PIOT will lead to identical material inputs and outputs for every single homogeneous branch and for the consumption activities of private households. The first complete physical input-output table worldwide was compiled by the Federal Statistical Office in 1997 under a research project, referring to the former territory of the Federal Republic and reference year 1990 [3]. In this context, first results in a detailed breakdown have been published for the material types water and waste water.

The calculations and the data management for the material and energy flow accounts of the Federal Statistical Office are supported by the Material and Energy Flow Information System (MEFIS), which is currently being set up. The pattern of that reporting system is represented in the form of the "MEFIS cube" in Figure 1 (Annex). The activities of the domestic economy are subdivided according to the homogeneous branches as used in monetary input-output table, an additional homogeneous branch for external environmental protection activities, and the consumption activities of households. Other items presented are changes in tangible assets – among other things, additions and abstractions of produced tangible assets (construction, machinery and equipment) and of natural assets – and the transactions with the rest of the world.

When represented in monetary units within the framework of the monetary input-output table, those different materials can be aggregated on the basis of market prices. Although representation in physical units generally allows aggregation too – for example through the weight unit – and provides useful information to some extent, it must be supplemented by presenting individual types or categories of material. Therefore, the MEFIS cube contains not only the two axes used in the monetary input-output table – forming the top side of the cube – but also a third axis showing the types of material, that is, every type of material forms a horizontal layer within the cube. This allows showing in physical units and for the total economy the abstraction of material from nature, the discharge into nature, and the material-related interaction within the economic system in a detailed breakdown by types of material.

What will be described in the following is the concepts as well as the data sources and methods of calculation to obtain the material flows for the two material types of water and waste water [4]. The material flow including water flow is shown in an aggregated form in Figure 2 (Annex). From the aspect of the MEFIS cube, water is a "raw material" used as input for the production activities of the economic branches and the consumption activities of households. Waste water belongs to the material type of "residuals" and is created as output of those activities.

2. The concept of water flow accounts

Water is one of the most important economic and ecological resources. Water serves not only as drinking water for man; it is also an essential basis of all life and of economic development [5]. On a multi-annual average, the quantity of water available per year in Germany is estimated at about 182 bn m³ [6]. For comparison, 49 bn m³ of water were withdrawn from nature for economic purposes in 1995. This means, at present, water generally is not a scarce resource in Germany, but the figures demonstrate water use for economic purposes is a substantial intervention in natural processes.

Considering especially the goal of "sustainable development", such intervention needs continuous statistical monitoring.

The goal of water flow accounts as part of Environmental-Economic Accounting (EEA) is to show in particular the water flows between the natural and the economic system and within the economic system in close relation to the concepts of national accounts. Consequently, there are conceptual differences between this and other kinds of presentation of water flows, such as water and waste water statistics or systems with a hydrologic orientation.

The main difference between the *EEA* representation and the water and waste water statistics of the Federal Statistical Office (statistics of public water supply and waste water discharge, and statistics of water supply and waste water discharge in mining and manufacturing as well as at thermal power stations for public supply) results from the accounting approach of *EEA*:

EEA is based on a complete coverage of all water and waste water flows which are relevant for the economic process. The specialised water and waste water statistics, however, includes only larger enterprises (20 or more employees) and does not cover all economic branches. Another important difference refers to the breakdown of production activities by branches. Parallel to the approach applied in setting up the monetary input-output table, the unit of analysis in *EEA* water flow accounts is the homogeneous branch, which is delimited on the basis of homogeneous product groups. For the specialised water and waste water statistics, however, allocation to economic branches is done according to the enterprise concept, that is, on an institutional basis (smallest unit drawing up a balance sheet).

Major differences between the water accounts presented here and the hydrologic concepts, which aim at complete balancing, too, refer to the system boundaries. In material and energy flow accounts, domestic nature is considered as a complementary quantity for the domestic economy. Material flows are monitored from the point of transition from the natural to the economic system up to the point of discharge into the natural system. With regard to water this means that the water withdrawn from nature in various forms for economic activities – both in the context of the production process and in the context of consumption by households – is monitored during the entire period of passing through the economic process (abstraction and distribution, utilisation for production and consumption, exportation, waste water discharge, transition into other materials) up to its discharge into nature, e.g. as waste water or as vapour through vaporisation. The hydrologic concept, however, is aimed at the representation of water flows within nature (hydrologic water cycle), the formation of hydrologic water outlets, and the creation of water resources.

The water flow pattern shown in Figure 3 (Annex) gives a more detailed picture for water than Figure 2. It serves to explain the basic technical terms of the water flow accounts of the Federal Statistical Office. In a simplified form, the pattern presents for the national economy the abstraction of water from nature, its circulation within the economic system and, finally, its discharge back into nature. The pattern shows in an aggregated form the various connections generally defined in the MEFIS cube. The presentation is limited to the flows which, in methodological terms, are most important for showing the water flow.

The transformation of the used materials into other types of materials is a major characteristic of production and in part also of consumption. The MEFIS cube presentation shows this phenomenon as the transition of a specific material to another layer of material. The basic principle of material conservation across all stages of the economic process can be represented only at the aggregation level of all types of material. In this context, water is a special case. If water is monitored at the level of the aggregated material type of water/waste water, the water flow may be presented continuously all the way from abstraction to discharge into nature. Both at the level of the overall economy and at the level of individual homogeneous branches, the quantity of water withdrawn equals the quantity of water discharged – except for some transition of water from or into other materials and water exports and imports, which however is not very relevant in terms of quantity.

Starting from the natural condition, water typically goes through the following stages of production: abstraction from nature, treatment/distribution, use in production or consumption, waste water discharge, and discharge into nature; individual stages may be left out. In terms of material and energy flow accounts, there is a different type of material at every stage. Within any stage of production, further subdivision of the material type is possible and appropriate – as is shown in Figure 3. Following the pattern of production stages, the production activities of water treatment and distribution as well as waste water discharge are presented separately in the chart. The other production activities are shown in Figure 3 under the summary heading "other production". Another activity shown is final consumption of households.

Water withdrawn from nature in the context of economic activities is, first, ground, spring, and surface water as well as bank filtrate and, second, foreign and rain water. Ground, spring, and surface water as well as bank filtrate are withdrawn by the homogeneous branch of water supply, by the other homogeneous branches, and also by private households. Water withdrawn includes irrigation water used in agriculture, but excludes water taken up by plants without artificial irrigation.

Most of the water withdrawn from nature by the homogeneous branch of water supply (collection, purification and distribution of water) is treated to become drinking water and is distributed to the homogeneous branches and private households. A small part is used by the water supply branch for their own consumption before being transported directly to waste water discharge. Water from water supply may also be exported, thus leaving the domestic economy. The Figure shows the balance of water exports and imports. Losses occurring in water distribution through percolation and evaporation are recorded as discharge of water into nature.

Water recorded as foreign and rain water is rain water which does not naturally percolate into the soil but is discharged through the sewage system. That heading is allocated to the homogeneous branch of waste water discharge as abstraction from nature and simultaneous discharge into nature. Although foreign and rain water is not used in the economic process, it is withdrawn from nature to the extent that it is taken from its natural place through the technological system (soil sealing, discharge through sewage system).

Generally, private households transfer the water used in consumption to the branch of waste water discharge (indirect discharge); after treatment in a sewage plant, it is discharged into nature. Only a small part of waste water is discharged directly into nature by households. Evaporation, too, is of some importance here (e.g. in garden irrigation).

Most of the water used in other production (homogeneous branches other than water supply and waste water discharge) is discharged into nature in the form of waste water; this is done either directly from the relevant homogeneous branch or by transferring it to the homogeneous branch of waste water discharge (indirect discharge). Another part is discharged into nature in the form of vapour (evaporation) or through percolation. The heading "waste water directly discharged" includes water which has been withdrawn by the homogeneous branches as mine water and has not been used further but has been discharged directly into nature, and the cooling water coming from processes of electricity production.

Part of the water used in production is incorporated into other types of material. Water incorporation means that water is transformed from the material type "water" into another type of material. Water incorporation is of importance especially in agriculture (incorporation of irrigation water into plants, water incorporation into meat, milk, farm manure) and in the production of beverages and food (incorporation into beverages). Water removal occurs above all in the food industry, and especially in households through the consumption of beverages and food. For simplification, water incorporation and water removal are shown as a balance in the water flow pattern because the individual flows regarding water incorporation and removal account for just a small part of the overall system when compared with other water flows. Under results (table 2), those flows are shown in greater detail.

3. Bases and methods of calculation

Parallel to the approach applied in national accounting, the results of water flow accounts are not obtained directly through primary statistics but by utilizing all available statistical sources. The results of the basic statistics are adjusted to the definitions and concepts of material and energy flow accounts. Data gaps that may occur are filled through estimates.

For the years 1960 to 1991, only important aggregates at the level of the overall economy referring to the former territory of the Federal Republic of Germany were calculated, and only for those years for which results of water statistics were available. The most important data source for the computations were the water surveys of the Federal Statistical Office, which have been compiled since the late 1950s.

For the territory of Germany from 1991 to 1994, too, only data for the overall economy were calculated; for the years for which no data from water statistics were available (1992 to 1994), an estimation procedure was developed on the basis of data on production trends and data compiled by economic associations as well as other information. The calculation procedure for the years for which data of the water statistics of the Federal Statistical Office were available is basically identical with the approach for 1995, which is described in detail in the following.

For the year 1995, the water flow was calculated in a detailed breakdown by homogeneous branches. The most important basis for calculating the water data according to the system of material and energy flow accounts are the results of the statistics of public water supply and waste water discharge and the statistics of water supply and waste water discharge in mining, manufacturing and thermal power plants for public supply. Those sources cover more than 90% of the entire area to be represented.

To achieve the transition from the economic branches as defined in the specialised water and waste water statistics to the homogeneous branches as used in the input-output table and in

Environmental-Economic Accounting (branch of homogeneous production producing goods of a specific product group only), some reallocation has to be performed. Contrary to the production activity of enterprises, the production activity of a homogeneous branch does not include secondary activities, such as power generation by an enterprise whose main activity is something else. Secondary activities are allocated to the homogeneous branches which produce the relevant goods as a main activity. However, ancillary activities such as administrative services, own-account transport or repair services which are typically performed in every similar homogeneous unit and are performed for that very unit only are not separated from the main or secondary activity to which they belong.

As part of water accounts, those secondary activities of the economic branches were identified which have some quantitative importance for the water flow. Such secondary activities include "power generation" and "supply of water". The water flows connected with those secondary activities were allocated to the relevant homogeneous branches of energy supply and water supply. Waste water treatment by enterprises in their own sewage plants is considered as an auxiliary activity and is thus not reallocated.

Figure 4 (Annex) gives an overview of the data source available for calculating the quantity of water withdrawn from nature. The situation of sources available for calculating the quantity of water discharged is similar. The statistics of public water supply provides data on water supplied in general by that area. However, those data are just roughly broken down by private and commercial customers. Data in a detailed breakdown by economic branches and data on water directly withdrawn by homogeneous branches and households can be obtained on the basis of the water statistics for mining and manufacturing and from other sources.

In the following, the sources and calculation methods will be explained in detail which were applied for the individual aggregates shown in Figure 3. As mentioned before, the abstraction of water from nature consists of two components: first, foreign and rain water and, second, the heading of ground, spring, and surface water as well as bank filtrate. The data on foreign and rain water can be taken directly from the statistics of public waste water discharge. The calculation of the abstraction of ground, spring, and surface water as well as bank filtrate is based on several sources. The statistics of public water supply provides the amount of water withdrawn from nature by public water distribution .

Figures on direct water abstraction by private households are estimated on the basis of information on the number of households not connected to the public water supply network. It is assumed in this context that water consumption per household not connected corresponds to the average consumption of connected households. Direct water abstraction by households amounts to just about 1.5% of the total quantity of water received by households. The amount of water received by connected households can be obtained from the statistics of public water supply.

The water quantity extracted by homogeneous branches consists of several components. The water statistics for mining and manufacturing provides data on the water quantity which enterprises of mining, energy supply, and manufacturing with 20 or more employees either withdrew directly from nature or received from other branches. Water abstraction by enterprises with less than 20 employees of those economic branches and of the branches not covered (agriculture, forestry, fisheries, construction industry, services) is estimated step by step. Basically, the amount of water received by these remaining branches is calculated as the difference between the total quantity of water supplied by public water supply and the amount of water received by the branches covered by water statistics. For those remaining branches, it is assumed that they did not withdraw water directly from nature, except for agriculture (water abstraction for irrigation purposes) and some specific economic branches of mining and manufacturing (small enterprises).

As regards the distribution of the received water to the individual branches, the following approaches are applied, which are coordinated with the above calculation. The entire amount of water used by the small enterprises of mining and manufacturing is obtained by means of turnover data for small enterprises; here, the assumption is made that water consumption per DM of turnover of small enterprises corresponds to the relevant water consumption of enterprises with 20 or more employees of the economic branch concerned. The share of small enterprises in the water consumption in mining and manufacturing amounts to about 2.5%.

In agriculture, water consumption is calculated separately for irrigation and livestock farming. The amount of water withdrawn by agriculture for irrigation is determined on the basis of data provided by the Federal Association for Agricultural Irrigation (about 1.5% of the total quantity of water withdrawn from nature). Water consumption in livestock farming is estimated by means of ratios provided by the Committee for Technology and Construction in Agriculture and regarding cultivated animals' average demand for drinking water. Those ratios are combined with data on the stock of such animals, taken from agricultural statistics (just under 2% of the total quantity of water withdrawn from nature).

Data on water used in the construction industry and in the service branches are derived from information on the purchases of water from the monetary input-output table. Those branches together account for slightly less than 1.5% of the total amount of water.

Discharge of water into nature is composed of several elements. Discharge of foreign and rain water corresponds to the amount withdrawn. Information on losses occurring in water distribution are taken from the statistics of public water supply. Data on the total amount of water indirectly discharged are provided by the statistics of public waste water discharge. That statistics also offers information on how much waste water was received by public waste water discharge from households or from commercial dischargers in general.

Ascertaining the amount of water directly discharged was similar to the approach applied for the quantity of water directly withdrawn. The amount of waste water directly discharged by private households was estimated by means of the number of households not connected and the average quantity of waste water of connected households. The water directly discharged by the homogeneous branches is obtained as the difference between the total amount of waste water of those branches and the share of waste water discharged through the public waste water discharge system.

Data availability for determining the waste water amount discharged by the other homogeneous branches is similar to that for water received. Direct information for enterprises of mining, energy supply, and manufacturing with 20 or more employees is provided by the water statistics for mining and manufacturing. The entire volume of waste water in public water supply, in a breakdown by households and commercial dischargers, is obtained from the statistics of public water supply. The difference between waste water discharge by the covered branches and the waste water volume received by public waste water discharge from the commercial sector forms the reference frame for determining the waste water volume of the remaining branches. Waste water discharge by small enterprises in energy supply and in mining and manufacturing (less than 20 employees) and by the branches not covered (agriculture, forestry and fisheries, construction industry, services) is ascertained through various methods, parallel to the approach followed for water received. For the small enterprises in mining and manufacturing, turnover data are used, while for the other branches data on the use structure of the monetary input-output table are taken as a basis (waste water charges).

As far as evaporation and other losses are concerned, direct information or estimation approaches are available only for some homogeneous branches and some items. An example is the estimation approach for the share of evaporation in the use of irrigation water in agriculture. Therefore, that value is obtained – both for the level of the overall economy and the level of homogeneous branches – as a residual value between water abstraction from nature on the one hand and, on the other hand, the sum total of the remaining components of water discharge into nature, the balance of water exports less water imports, and the balance of water incorporation into other materials less water removal from other materials. Data on water exports and imports are obtained from the statistics of public water supply.

Water incorporation into other materials and water removal from other materials occurs especially in the homogeneous branches of agriculture, the food industry and beverages production, and in private households. Water incorporation in agriculture is calculated separately for the following components: For the incorporation of irrigation water, it is assumed that 1% of the water used is incorporated into the plants and that the remaining share evaporates. The incorporation of water into animal products (meat, milk, eggs) is determined on the basis of the quantities produced and the average water contents of such products. Incorporation of water into farm manure (liquid manure, slurry) is ascertained through the number of animals and ratios regarding the average manure production of the animals. In the food industry, both water incorporation and removal occur. What was explicitly estimated was only water incorporation during the production of beverages, taking as a basis the quantities of beverages produced. Water removal in households was determined through the water content of the beverages and food consumed.

4. Results

4.1. Total economy

For the former territory of the Federal Republic, results are available for the period from 1960 to 1991. In addition, all-German data are shown from reference year 1991. In the former territory of the Federal Republic, the annual abstraction of water from nature for economic purposes (production and consumption) increased from 20,260 m³ in 1960 to 45,881 m³ in 1991. This is a rise by 127% (table 1, Annex). The increase in the use of water was especially strong between 1960 and 1979. Afterwards, consumption varied between the reference years and, altogether, rose just slightly until 1991.

When examined over the entire period from 1960 to 1991, the efficiency of the economic use of water as a natural resource improved to a rather small extent. Water productivity – measured as the gross domestic product in real terms per unit of water withdrawn from nature – increased 17% between 1960 and 1991, although, in the first phase until 1979, productivity declined 10% (Figure 5). This means that in that period water consumption rose more rapidly than economic output. Until 1987, productivity remained largely unchanged. In the late 1980s, however, the connection between economic growth and water consumption was clearly broken up. Water productivity rose sharply in that period.

Between 1960 and 1991, the trend of the abstraction of ground, spring, and surface water is similar to that of the total water abstraction from nature. Ground, spring, and surface water withdrawn from nature amounted to 18,990 mn m³ in 1960. In 1991, 42,698 mn m³ of ground, spring, and surface water were withdrawn (+125%). The volume of foreign and rain water was 1,270 mn m³ in 1960. For 1991, the quantity was 3,183 mn m³. This was an increase by 151%. The volume of foreign and rain water is influenced by a number of different factors, such as in particular the precipitation and the length of the sewerage network.

The development of the total quantity of water discharged into nature is nearly identical with that of the quantity of water withdrawn because the two figures differ only by the balances of water exports less imports (8 mn m³ in 1991) and of water incorporation less removal (162 mn m³ in 1991). Waste water discharged directly or indirectly is the largest category in terms of quantity within water discharge into nature. In 1960, the figure was 17,524 mn m³ and until

1991 it rose 131%, reaching 40,484 mn m³. Water losses in the public supply network altogether decreased slightly between 1960 and 1991 (-8 %). The quantity of evaporated and percolated water which, as mentioned before, has to be determined largely as a residual value, doubled between 1960 and 1991.

From 1991, results are available for Germany as a whole. In 1991, 51,344 mn m³ of water were withdrawn from nature for economic purposes in Germany. In 1995, that quantity was down by nearly 5% to 48,909 mn m³.

Gross domestic product rose a good 5% in real terms between 1991 and 1995. In that period, water productivity increased 10.5%. That rise in productivity is due to several factors. First, the use of the raw material of water became more economical as a result of technological measures such as using low-consumption equipment in households, replacing water by other materials in production, and improving the in-plant water cycle. Second, a major influence on the overall consumption was exerted by the clear decrease in the quantity of irrigation water used in agriculture in the new Länder.

Among the components of water abstraction, the consumption of ground, spring, and surface water decreased 9% in the period examined, reaching 43,636 mn m³, while the volume of foreign and rain water rose 57% to 5,273 mn m³. The increase in the amount of foreign and rain water was mainly caused by the expansion of the sewerage network and the construction of rain retention ponds.

The amount of water discharged into nature decreased between 1991 and 1995 to nearly the same extent as did the quantity withdrawn, that is by just under 5%, reaching 48,724 mn m³. The amount of waste water declined a good 7%. The quantity of evaporated water was down 35% to 2,000 mn m³ in 1995. A major factor influencing that development was the decreasing use of water for irrigation, as mentioned before. About 99% of the irrigation water evaporates or percolates, while just about 1% is incorporated into the plants.

4.2. Homogeneous branches

Table 2 (Annex) shows the water flow through the economic system in Germany for the year 1995 in a breakdown by homogeneous branches and private households, from the abstraction from nature all the way up to the discharge into nature. Regarding water abstraction from nature, the branch of energy supply has the largest share (61%), corresponding to a volume of 29,715 mn m^3. This refers almost entirely to cooling water required for power generation, which is discharged back into nature practically unchanged, though a little warmer. The homogeneous branch of water supply withdraws 6,448 mn m^3 (13%) of water from nature to produce drinking water, while water abstraction by the chemical industry amounts to 2,723 mn m^3 (6%). The branch of mining/extraction of energy sources withdraws 1,369 mn m^3 (3%) of water, most of which is mine water discharged without having been used. Water abstraction by the homogeneous branch of agriculture – mainly for irrigation – amounts to 764 mn m^3. For the waste water discharge branch, a quantity of 5,273 mn m^3 of withdrawn water was calculated, which is foreign and rain water.

The column water received from other branches shows the water received by the homogeneous branches and households from the branch of water supply. The major part of the water delivered by water supply (5,613 mn m^3) is received by households (58%). The entire volume of water used by the individual homogeneous branches is calculated as the sum total of water abstraction from nature and water received from other branches. What is shown here for the branch of water supply is just the water losses occurring in the distribution network (711 mn m^3) and internal supply (124 mn m^3). Water removal from other materials is shown only for households (152 mn m^3). Water incorporation into other materials occurs mainly in the homogeneous branch of agriculture (290 mn m^3) and in the food industry (39 mn m^3).

Water discharge by the homogeneous branches is calculated on the basis of the total volume of water, taking account of water incorporation and removal. Part of the discharged water is discharged into nature via the homogeneous branch of waste water discharge (indirect discharge), while another part is discharged into nature directly by the homogeneous branches or gets back into nature through evaporation and percolation. Indirect discharge amounts to a total of 4,689 mn m^3, the largest share of which (2,930 mn m^3 or 62%) comes from private households. Other important indirect dischargers are the homogeneous branches of the food industry (240 mn m^3), the paper, publishing and printing industry (104 mn m^3), and the chemical industry (223 mn m^3). As regards direct discharge of water into nature, the homogeneous branches that are most important are again those which had the largest shares in water abstraction, such as energy supply (29,987 mn m³), the chemical industry (2,935 mn m³), and mining (1,461 mn m³). An additional branch here is waste water discharge, which discharges into nature the waste water received from the other branches and from households after having purified it, and the foreign and rain water (9,962 mn m³).

Table 3 (Annex) gives a detailed presentation of water discharge of the homogeneous branches and of private households. The discharged water is subdivided into the categories of waste water discharged directly and indirectly, water losses in distribution, evaporation and percolation, and foreign and rain water. The table shows the total volume of waste water (direct and indirect) by branches. As mentioned before, water losses occurring in distribution are allocated to the homogeneous branch of water supply, while the quantity of foreign and rain water is allocated to the homogeneous branch of waste water discharge. Evaporation and percolation of water, amounting to a total of 2,000 mn m³, is mainly concentrated in the homogeneous branches of energy supply (701 mn m³) and agriculture (596 mn m³); the two branches together account for about two thirds of total evaporation and percolation.

Table 4 (Annex) shows the waste water directly discharged by types of treatment and homogeneous branches. Out of the total of 36,051 mn m³ of discharged waste water, 1,273 mn m³ are treated in sewage plants owned by the enterprise concerned. Waste water treatment in such company-owned sewage plants is of importance especially in the chemical industry (513 mn m³), the paper, publishing and printing industry (226 mn m³), and in metal production (232 mn m³). Of the total volume of waste water, 34,778 mn m³ are not treated before discharge into nature; 92 % of that quantity are cooling water, most of which (91%) comes from energy supply. 7 % of the cooling water comes from the chemical industry. The remaining waste water amounts to 2,619 mn m³. About half of that quantity is mine water, which occurs in mining and is discharged without being used.

5. Outlook

A major data basis for the water flow accounts as part of Environmental-Economic Accounting is the water statistics of the Federal Statistical Office. Results of that statistics are produced every three years. When the results for reference year 1998 will have become available, it will be possible to update the presented series.

It is intended for the future to sophisticate the current estimation method used in water flow accounts to determine data for the overall economy on water consumption for those years for which water statistics are not available. In particular, technical coefficients will be calculated which establish a connection between water consumption and suitable indicators in a detailed breakdown by homogeneous branches.

Efforts will also be increased to include more quality aspects into the quantitative reference frame now presented for water flows caused by economic action. Parallel to the intentions of the European Statistical Office, the focus might first be put on water emissions.

References and Notes

[1]This article has already been published in a similar version in German language in the journal of the Federal Statistical Office (1999), *Wirtschaft und Statistik,* Vol. 11, pp. 891-900

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Figure 1

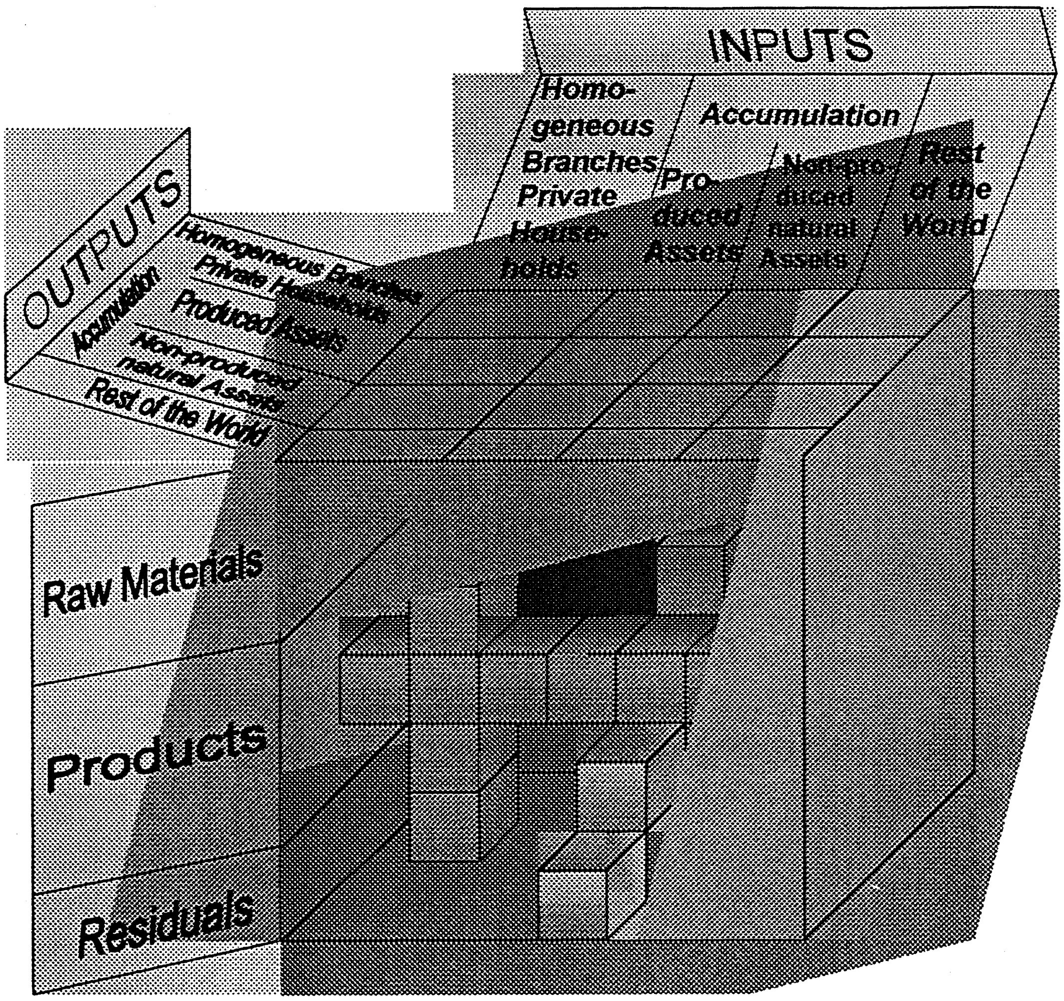

INPUTS
Homo-geneous Branches Private House-holds
Accumulation
Pro-duced Assets
Non-pro-duced natural Assets
Rest of the World
OUTPUTS
Accumulation
Homogeneous Branches Private Households
Produced Assets
Non-produced natural Assets
Rest of the World
Raw Materials
Products
Residuals

Figure 2: Material Flow

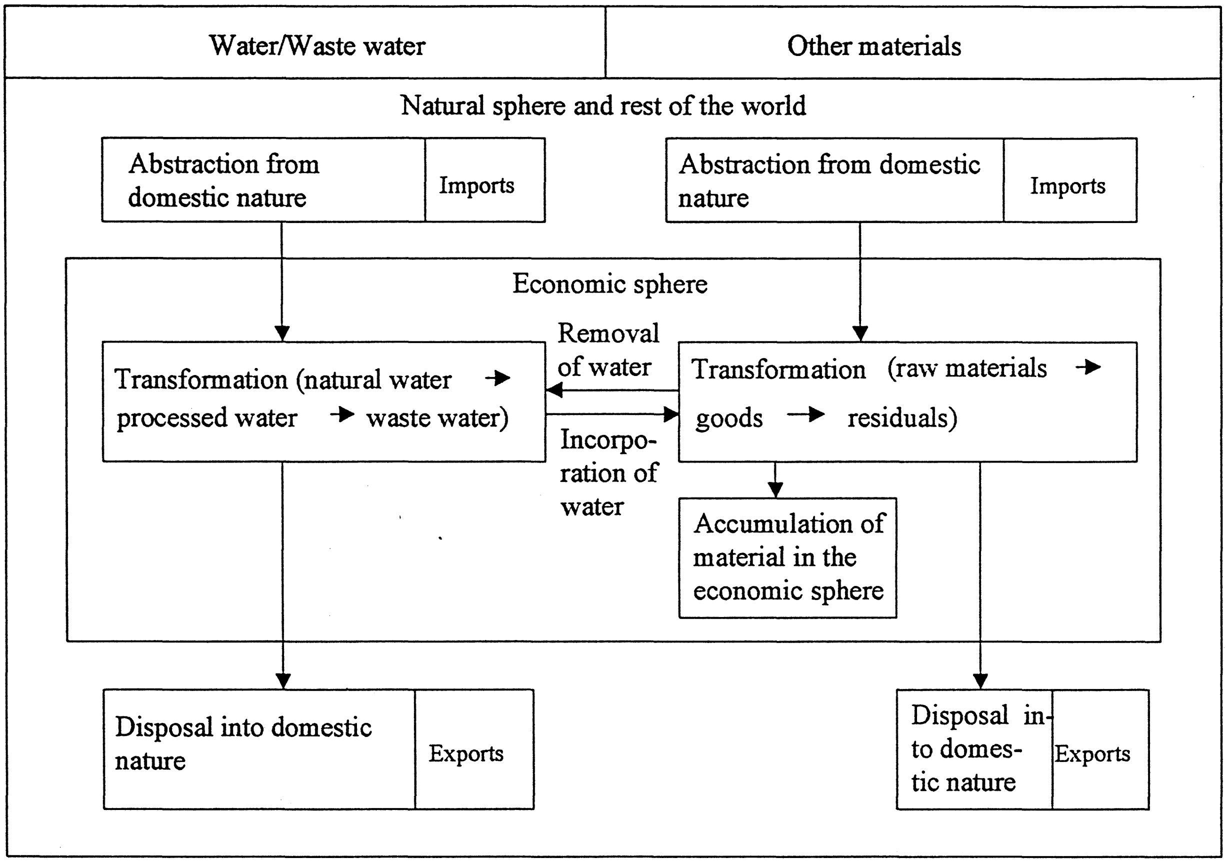
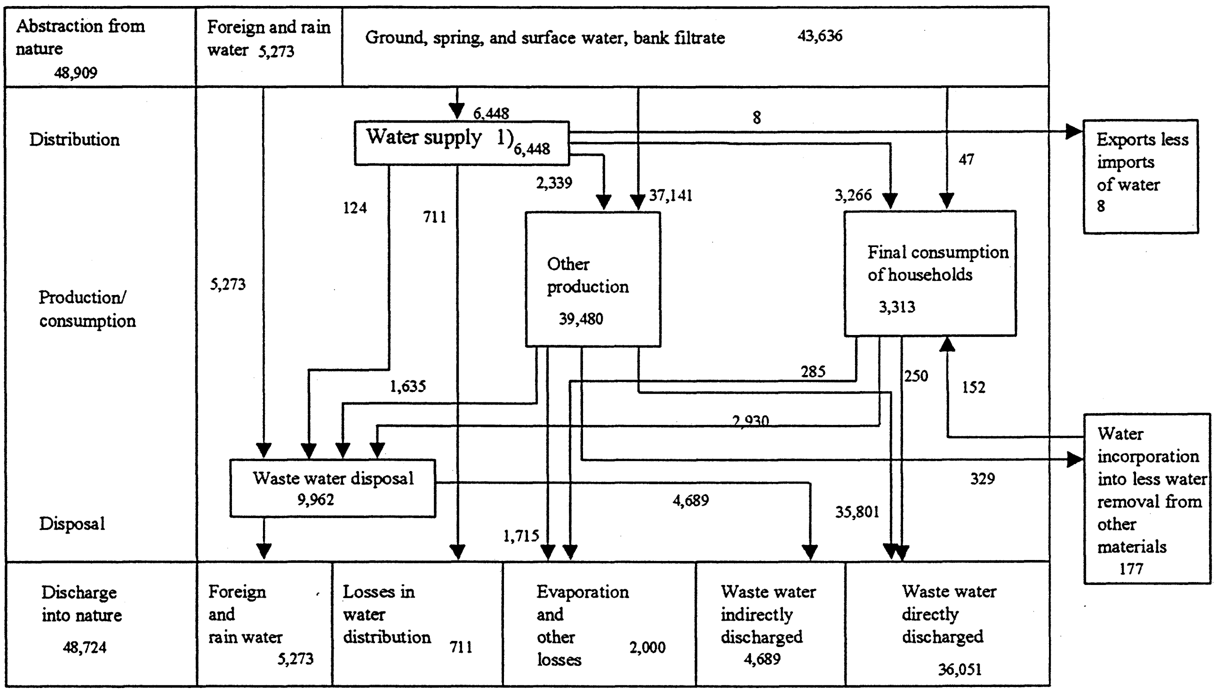


Figure 3: Water flow between nature and the economy as well as within the economy, 1995

mn m³



1) Collection, purification and distribution of water

Differences in the sum totals are due to rounding of figures

Figure 4: Data sourcesfor calculating the amount of water used

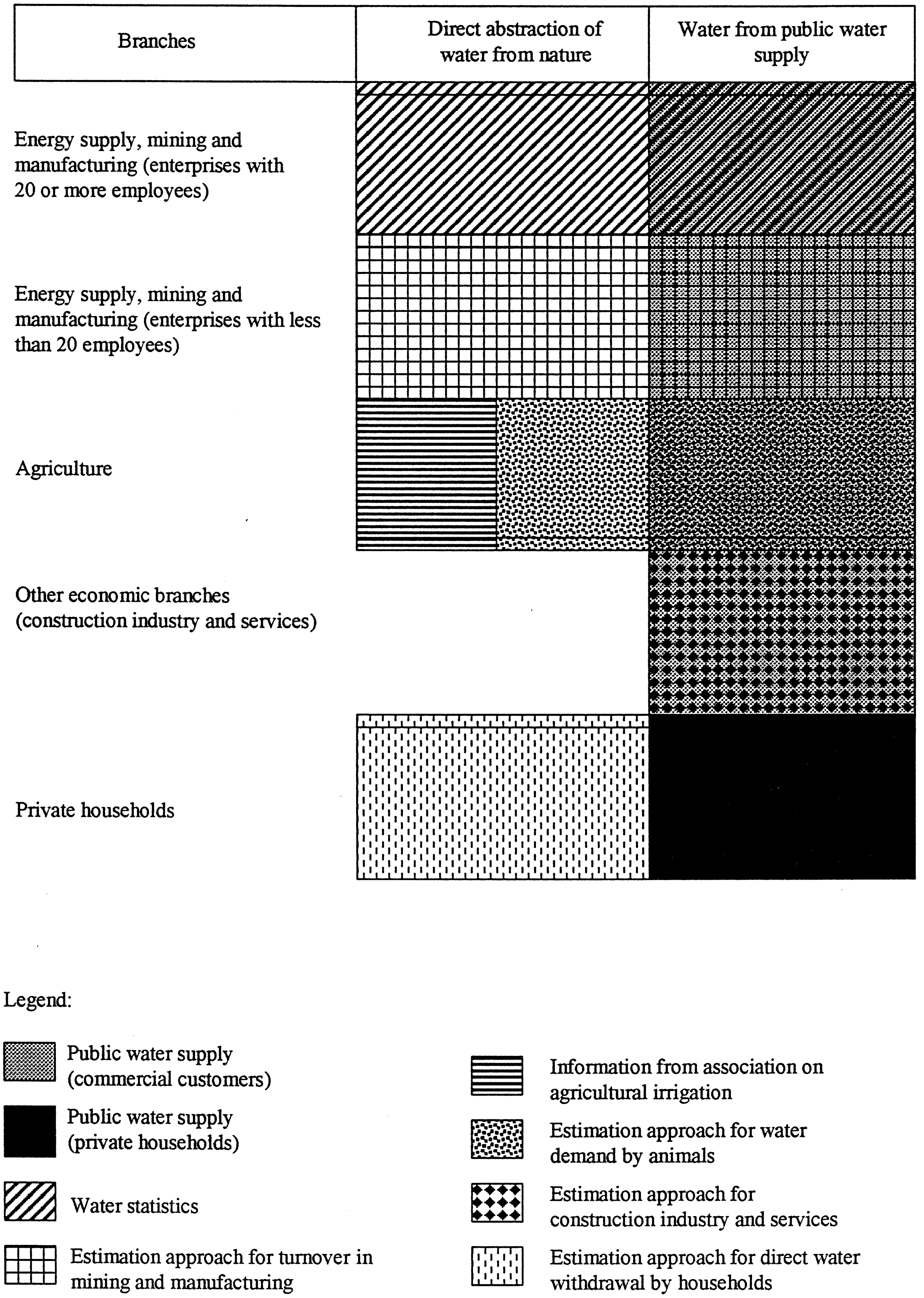
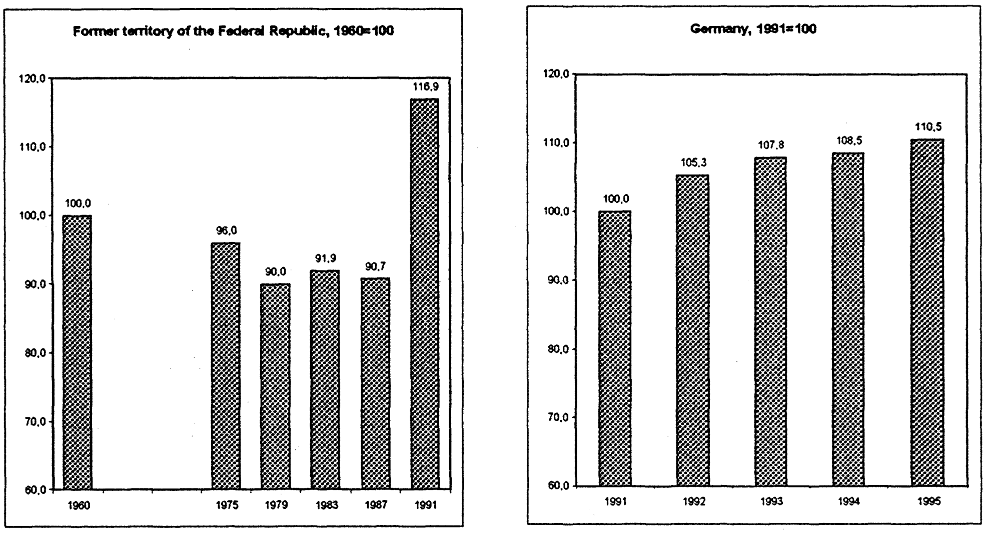


Figure 5: Water productivity [1)]



1) Gross domestic product in relation to water withdrawal from nature (former territory of the Federal Republic: GDP at prices of 1991; Germany: GDP at prices of 1995)

Table 1: Withdrawal of water from, and discharge of water into nature for Germany

Year	Withdrawal from nature			Discharge into nature					Exports less imports of water	Water incorporation into other materials less water removal from other materials
	Total	Ground, spring and surface water	Foreign and rain water	Total	Waste water (directly and indirectly discharged)	Foreign and rain water	Losses in water distribution 1)	Evaporation		
Former territory of the Federal Republic										
in mm³										
1960	20.260	18.990	1.270	20.121	17.524	1.270	505	822	2	137
1975	36.270	34.086	2.185	36.112	32.419	2.185	598	911	6	152
1979	44.996	42.568	2.428	44.831	40.574	2.428	482	1.347	5	160
1983	44.886	41.553	3.333	44.703	39.582	3.333	482	1.306	6	178
1987	49.530	44.885	4.645	49.361	42.822	4.645	482	1.411	7	163
1991	45.881	42.698	3.183	45.712	40.484	3.183	463	1.582	8	162
1960=100										
1960	100	100	100	100	100	100	100	100	100	100
1975	179	179	172	179	185	172	118	111	299	111
1979	222	224	191	223	232	191	95	164	273	117
1983	222	219	262	222	226	262	95	159	294	129
1987	244	236	366	245	244	366	95	172	339	119
1991	226	225	251	227	231	251	92	193	395	118
Germany										
in mm³										
1991	51.344	47.990	3.354	51.148	43.971	3.354	758	3.064	8	189
1992	49.852	46.088	3.764	49.665	42.375	3.764	746	2.780	8	179
1993	48.150	43.976	4.174	47.966	40.758	4.174	735	2.300	8	176
1994	48.972	44.389	4.583	48.787	41.270	4.583	723	2.210	8	177
1995	48.909	43.636	5.273	48.724	40.740	5.273	711	2.000	8	177
1991=100										
1991	100	100	100	100	100	100	100	100	100	100
1992	97	96	112	97	96	112	98	91	103	95
1993	94	92	124	94	93	124	97	75	103	93
1994	95	92	137	95	94	137	95	72	103	94
1995	95	91	157	95	93	157	94	65	103	94

1) 1960 and 1975 including own consumption of water supply branch.

Table 2: Withdrawal of water from, and discharge of water into nature by homogeneous branches and private households, 1995

Code	Homogeneous branches 1) and private households (Mf. = Manufacture)	Withdrawal of water from nature	Water received from other branches 2)	Water used (1)+(2)	Water removal	Water incorporation into other materials	Water discharge (3)+(4)-(5)	Transfer to waste water disposal	Discharge of water into nature (6)-(7)
		mn m³							
		1	2	3	4	5	6	7	8
A, B	Agriculture, forestry, fisheries	764	152	916	0	290	626	31	596
CA	Mining of energy sources	1369	115	1484	0	0	1484	22	1461
CB	Mining of ores and minerals	648	4	652	0	0	652	7	645
DA	Mf. of food products, beverages, tobacco	316	218	534	0	39	495	240	255
DB	Mf. of textiles and textile products	52	20	73	0	0	73	56	17
DC	Mf. of leather and leather products	4	1	4	0	0	4	3	2
DD	Mf. of wood and wood products	11	4	15	0	0	15	3	11
DE	Mf. of pulp, paper, paper products; publishing and printing	379	70	449	0	0	449	104	345
DF	Mf. of coke, refined petroleum products and nuclear fuel	231	43	274	0	0	274	36	238
DG	Mf. of chemicals, chemical products and man-made fibres	2723	435	3158	0	0	3158	223	2935
DH	Mf. of rubber and plastic products	77	21	98	0	0	98	23	75
DI	Mf. of other non-metallic mineral products	147	53	200	0	0	200	33	166
DJ	Mf. of basic metals and fabricated metal products	543	149	693	0	0	693	92	601
DK	Mf. of machinery and equipment n.e.c.	31	27	59	0	0	59	29	29
DL	Mf. of electrical and optical equipment	59	40	99	0	0	99	41	57
DM	Mf. of transport equipment	67	31	98	0	0	98	32	66
DN	Manufacturing n.e.c.	4	6	11	0	0	11	6	5
40	Electricity, gas, steam and hot water supply	29715	332	30046	0	0	30046	59	29987
41	Water supply	6448	-5613	835	0	0	835	124	711
90 (part)	Waste water disposal	5273	0	5273	0	0	5273	-4689	9962
F-O*	Construction and other service branches (excl. households)	0	618	618	0	0	618	594	24
	All homogeneous branches	48862	-3274	45588	0	329	45259	-2930	48189
P	Private households	47	3266	3313	152	0	3465	2930	535
	Homogeneous branches and households together	48909	-8	48901	152	329	48724	0	48724

1) Based on the national classification of economic activities, 1993 edition (WZ 93) and the Statistical Classification of Economic Activities in the European Community (NACE Rev. 1).

2) Water discharged or delivered by water works or other establishments.

Table 3: Discharge of water, 1995

Code	Homogeneous branches 1) and private households (Mf. = Manufacture)	Total	Waste water total	Waste water directly discharged	Waste water indirectly discharged	Water losses	Evaporation	Foreign and rain water
		mn m³						
A, B	Agriculture, forestry, fisheries	626	31	0	31	0	596	0
CA	Mining of energy sources	1484	1437	1415	22	0	46	0
CB	Mining of ores and minerals	652	621	614	7	0	31	0
DA	Mf. of food products, beverages, tobacco	495	465	225	240	0	30	0
DB	Mf. of textiles and textile products	73	63	7	56	0	10	0
DC	Mf. of leather and leather products	4	4	2	3	0	0	0
DD	Mf. of wood and wood products	15	11	8	3	0	3	0
DE	Mf. of pulp, paper, paper products; publishing and printing	449	431	328	104	0	18	0
DF	Mf. of coke, refined petroleum products and nuclear fuel	274	211	175	36	0	63	0
DG	Mf. of chemicals, chemical products and man-made fibres	3158	3109	2887	223	0	48	0
DH	Mf. of rubber and plastic products	98	90	67	23	0	8	0
DI	Mf. of other non-metallic mineral products	200	146	112	33	0	54	0
DJ	Mf. of basic metals and fabricated metal products	693	635	543	92	0	58	0
DK	Mf. of machinery and equipment n.e.c.	59	54	24	29	0	5	0
DL	Mf. of electrical and optical equipment	99	94	52	41	0	5	0
DM	Mf. of transport equipment	98	87	55	32	0	11	0
DN	Manufacturing n.e.c.	11	8	2	6	0	2	0
40	Electricity, gas, steam and hot water supply	30046	29345	29286	59	0	701	0
41	Water supply	835	124	0	124	711	0	0
90 (part)	Waste water disposal	5273	0	0	0	0	0	5273
F-O*	Construction and other service branches (excl. households)	618	594	0	594	0	24	0
	All homogeneous branches	45259	37560	35801	1759	711	1715	5273
P	**Private households**	3465	3180	250	2930	0	285	0
	Homogeneous branches and households together	48724	40740	36051	4689	711	2000	5273

1) Based on the national classification of economic activities, 1993 edition (WZ 93) and the Statistical Classification of Economic Activities in the European Community (NACE Rev. 1).

Table 4: Waste water directly discharged, 1995

Code	Homogeneous branches1) and private households (Mf.= Manufacture)	Total	for treatment	not for treatment		
				total	cooling water	other waste water
		mn m³				
A, B	Agriculture, forestry, fisheries	0	0	0	0	0
CA	Mining of energy sources	1415	54	1361	6	1355
CB	Mining of ores and minerals	614	21	593	63	530
DA	Mf. of food products, beverages, tobacco	225	57	168	138	30
DB	Mf. of textiles and textile products	7	3	3	2	1
DC	Mf. of leather and leather products	2	2	0	0	0
DD	Mf. of wood and wood products	8	0	8	5	3
DE	Mf. of pulp, paper, paper products; publishing and printing	328	226	101	95	6
DF	Mf. of coke, refined petroleum products and nuclear fuel	175	81	94	82	12
DG	Mf. of chemicals, chemical products and man-made fibres	2887	513	2374	2134	240
DH	Mf. of rubber and plastic products	67	7	60	59	1
DI	Mf. of other non-metallic mineral products	112	11	102	23	79
DJ	Mf. of basic metals and fabricated metal products	543	232	311	262	50
DK	Mf. of machinery and equipment n.e.c.	24	1	23	16	7
DL	Mf. of electrical and optical equipment	52	1	51	50	1
DM	Mf. of transport equipment	55	10	45	38	7
DN	Manufacturing n.e.c.	2	0	2	2	0
40	Electricity, gas, steam and hot water supply	29286	54	29232	29184	48
41	Water supply	0	0	0	0	0
90 (part)	Waste water disposal	0	0	0	0	0
F-O*	Construction and other service branches (excl. households)	0	0	0	0	0
	All homogeneous branches	35801	1273	34528	32159	2369
P	**Private households**	250	0	250	0	250
	Homogeneous branches and households together	36051	1273	34778	32159	2619

1) Based on the national classification of economic activities, 1993 edition (WZ 93) and the Statistical Classification of Economic Activities in the European Community (NACE Rev. 1).

FINAL SUMMARY REPORT

METHODOLOGICAL PROBLEMS IN THE

CALCULATION OF

ENVIRONMENTALLY ADJUSTED NATIONAL INCOME FIGURES

Report for the European Commission Directorate General XII
Contract No. EV5V-CT94-0363
July 1997

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Project Duration : November 1994 until July 1996

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I. General objectives

The purpose of this project has been to develop recommendations for useful ways in which National Accounting Systems can be adapted and exploited to construct indicators of macro-economic performance vis-à-vis the environment. The main task was to appraise options for the definition and estimation of environmentally adjusted national income figures (henceforth 'green GDP', for short). This has to be viewed against the backdrop of a wider concern that national accounting systems be developed as sources of information for evaluating policy and investment alternatives in the pursuit of economic, social and environmental sustainability goals.

The project set out initially to resolve a set of methodological and practical problems with identifying and quantifying 'environmental costs,' consisting of environmentally defensive expenditures and avoidance costs. The expectation was that, once having established how to calculate these expenditures and costs, they could be estimated for any real economy on a sector-by-sector basis. Then, when these costs were subtracted from traditionally measured national income (GDP), the resulting environmentally adjusted national income figure would provide policy makers with a better compass for macroeconomic performance evaluation.

In the course of the project, these identification and quantification problems were recognized to form just one part of a much more complex issue. Investigating the range of existing proposals for adjusting gross domestic product (GDP) brought to light the remarkable range of propositions about what makes GDP a useful policy indicator and what the role could be of an environmentally adjusted GDP figure in policy decision-making processes. The project at this stage became a process of reflection and clarification around existing work, as well as the development of some original ideas and applications.

Within the project, rigorous statistical procedures were developed and tested empirically for the construction of abatement cost functions for emissions of various nitrogen compounds in a national economy. The experiences gained in the calculation of avoidance costs for these specific pollutants made it clear that calculations based on sector-by-sector statistical information are not, on their own, an adequate basis to come to a meaningful adjustment of a macro-economic aggregate like GDP to obtain a sustainability indicator. This led us also to reconsider what figures for avoidance costs actually represent within an adjusted GDP figure. As a result, the role proposed for the calculation of costs to respect environmental norms, as a component in estimation of an environmentally-adjusted national income figure, changed considerably between the beginning and the end of the project.

We summarize the evolution of our thinking as follows. Most proposals for adjusting GDP, including the ones coming initially from project participants, seek to turn a short term indicator derived from a periodic accounting system of the economy in the past (namely GDP), into a long term indicator of economic and environmental success. This transformation is achieved, in theory, by putting prices on the intertemporal scarcity of environmental assets (natural resources, ecosystem services, etc.). The calculation of a 'green GDP', sometimes also supposed to be a 'sustainable national income' figure, by making deductions from current period GDP is the main example of this.

After making an appraisal of the difficulties, both theoretical and practical, in making inventories of environmental services and their possible depreciation and in estimating a set of shadow prices that might be proposed to induce market actors to behave in a sustainable way, we abandoned this deduction-based approach. The project's perspective shifted from delivering estimates based on welfare-theoretic "optimizing" criteria, to estimation procedures based on cost-effectiveness relative to "satisfycing" criteria.

A satisfycing approach seeks a « good » result while acknowledging that uncertainties, complexities and the variety of principles for judgment make it impossible to decide what is 'the best'. Cost-effectiveness analysis in environmental policy seeks to estimate a « least cost » way of achieving specified environmental goals. For our project, the objective became to develop procedures for the definition and empirical estimation of a highest-possible national income consistent with respect of a specified set of goals representing long-term maintenance of key environmental services. We consider this satisfycing approach to constitute « best practice » for providing macro-economic policy-relevant information concerning efficient and equitable use of the environment.

The project's objective thus became more complex than initially envisaged. It is, of course, still proposed that the environmentally adjusted national accounting system should support traditional accounting uses such as defining the money value of national output, sectoral statistics, employment, and so on. But in relation to environmental and economic sustainability concerns, we do not propose the simple calculation of a green GDP. Rather than using environmentally adjusted national accounts as merely a descriptive instrument permitting calculation of a 'corrected' macroeconomic indicator, we suggest that it should be developed as a policy support data bank for a variety of analyses and modelling purposes aimed at clarifying prospects of ecological-economic sustainability.

II. Methodology

There are many perspectives on the questions of green GDP and indicators for sustainability. We have sought in our project reporting to state very explicitly the approaches that we have adopted and the reasons why we consider them best practice. This section provides a short recapitulation.

ECONOMIC THEORY, ENVIRONMENTAL SCIENCE & STATISTICAL PRACTICE

The call for sustainable development at all scales (North-South, European Union, national and sub-national levels) signals the emergence of a set of policy preoccupations quite distinct from the post-World War Two fiscal management and macroeconomic performance preoccupations that were the backdrop for the original systems of national accounts. The new requirement is for use of national accounts statistics to explore long-term environmental prospects as well as economic performance prospects. This new application of national statistics is emerging within political contexts where conflicts emerge and must be resolved between competing economic and environmental interests, between people holding different value systems and different principles of judgment, and also between different representations of future states and visions of the world.

The approach to calculation of environmentally adjusted national income figures that we adopt responds to four broad sets of considerations in an integrated manner:

- *scientific adequacy:* do the description and evaluation methods deal well with the important features of the natural world and of the ecological, technological and social change processes in question?

- *social adequacy:* do the methods furnish information in ways that respond to stake-holders' needs and that support social processes of decisionmaking?
- *economic rationality:* do the suggested choices or courses of action that emerge from the valuation, statistical analysis and modelling procedures respect economic efficiency, in the sense of appearing to be reasonably cost-effective ways for moving in the desired directions or for arriving at the envisaged outcomes?
- *statistical adequation:* can the methods and measurements proposed be implemented in conformity with established quality standards in statistical work, within the budgets available for this work?

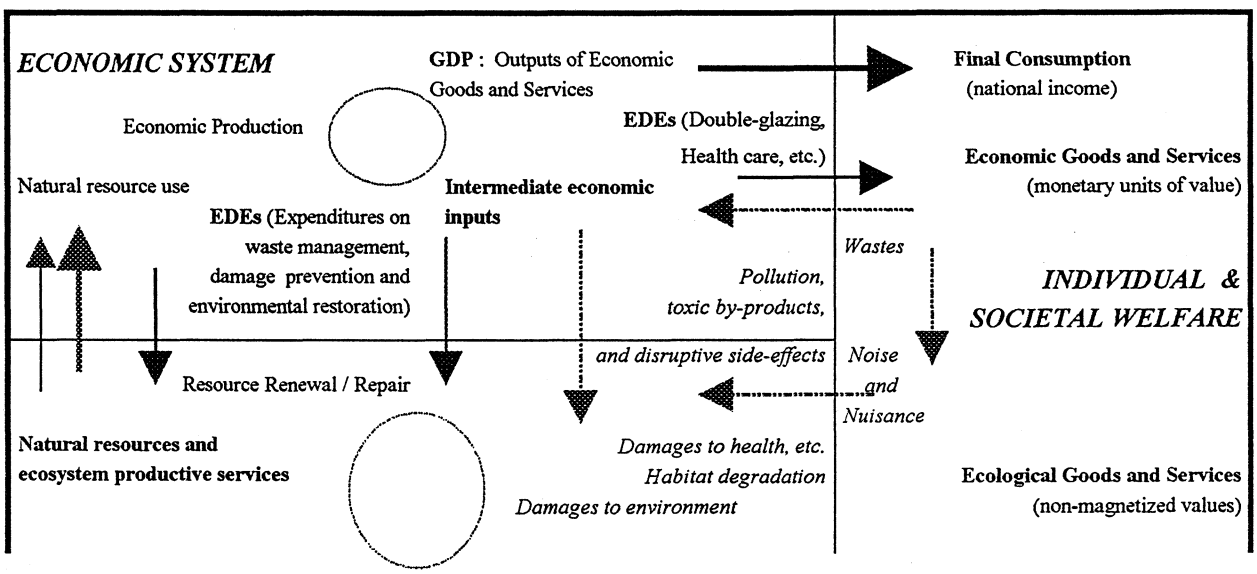
No one of these four criteria, on its own, is enough to judge the adequacy of an approach to development of macro-economic indicators for sustainability. Our work has consisted of a process of « tuning » theory, statistical concepts, actual measurement and the corresponding interpretation and use of results. When it has turned out that a theoretical concept is not applicable to the situation being analyzed, or that it cannot be measured in a reliable way, then we have abandoned it as inadequate for offering policy guidelines.

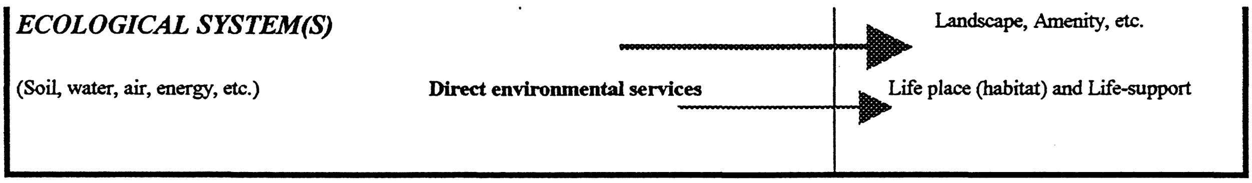
We summarize in this section the perspective on sustainability that underpins our work, and the way it assigns complementary roles to monetary and non-monetary information in sustainability analyses, and then we restate our favoured approach to defining an environmentally adjusted national income. In the next section we will provide a synthetic set of recommendations deriving directly from the project work, and mention some fields of further research that we judge as very important though they were not specifically addressed within our own project.

ECONOMIC AND ECOLOGICAL DIMENSIONS OF SUSTAINABILITY

We have adopted an ecological economics perspective, suggested in the figure below, from which point of view economic resource management must fulfill two complementary functions:

- the delivery of an ecological welfare base through assuring maintenance of critical environmental functions and amenity (lower portion of the diagram), and
- the delivery of an economic welfare base through production of economic goods and services (upper portion of the diagram).





In this perspective, a basic design criterion for « greening » national accounts should be to furnish an information base allowing cost-effectiveness in the allocation of economic resources for the pursuit of economic and environmental output goals. This means information sets covering production and exchanges of economic goods and services (including final consumption), changes in the state of the environment, and the economy-environment interfaces which bear on these two domains. The question is, how should monetary and non-monetary information be applied?

Many manuals on the construction of environmentally adjusted accounts suggest procedures for making monetary estimates of the value of environmental benefits and damages, in order to quantify natural capital depreciation in monetary terms. Our study does not endorse this perspective for the calculation of a green GDP.

The committing of scarce resources in order to maintain or recover the desirable level of environmental quality corresponds to a kind of « social demand » for maintenance of environmental functions (i.e. sustainability). In economics it is habitual to ask, is the value of the benefit obtained, or of the loss avoided, worth the investment of economic goods and labour needed to obtain it? Yet this 'demand' for environmental quality, which will include provision for future generations and a demand for protection from environmental harms, cannot easily be expressed as a value in monetary terms. Even if such estimates can be made, the numbers obtained often have very large error bars and can be highly sensitive to underlying parameter assumptions (e.g., concerning possibilities and elasticities of substitution, endowment and income distribution, technological progress prospects). So the application of traditional cost-benefit analysis aimed at identifying a Pareto-efficient allocation of resources is difficult and often controversial. Many environmental decisions involve problems of risk distribution, management of uncertainties, and conflict of interests that cannot be dealt with very well as cost-benefit « optimizing » problem. Attempts to put monetary values on environmental benefits and damages that are spread over time, and whose significance is sometimes as much ethical as biophysical, are often quite artificial.

For project appraisals and localized cost-benefit policy problems, the magnetization of environmental benefits/damages can be extremely useful. However, for purposes of macroeconomic performance analysis we recommend that statistical work in monetary units should be confined to the stocks and flows of produced economic goods and services (the upper portion of the diagram), but not be generalized to environmental functions and services (the lower portion of the diagram). At macro-economic levels of analysis, the best operational specification for a society's 'demand for environmental quality' will be in non-monetary terms, through defining environmental standards that express the society's priorities for the delivery of the ecological welfare base to both present and future generations.

Of course, any society's environmental performance goals will involve compromises which will be the product or explicit and implicit negotiations. The debates over priority-setting may to some extent be aided by attempts to quantify in monetary terms the relative welfare significance of natural resources and of different environmental amenities, life-support functions and other services. Nonetheless, for the various reasons discussed at length in our report, we have concluded that in empirical work supporting the calculation of environmentally adjusted national income figures, full monetary valuation of environmental benefits and deterioration is not needed and should not be the objective.

Multi-criteria decision-support approaches that bring together cost-effectiveness frameworks with non-monetary information on environmental changes contained in satellite accounts, will be an effective way to organize the information needed to calculate macro-economic performance indicators adequate for the purposes wanted – a single-period green GDP, or a time-series of green GDPs, or several scenario time-series of green GDPs. Also, the matrix structures of environmental satellite accounts linked to the monetary national accounts in aggregate or sector-by-sector can be an effective and highly communicative way for presenting the costs and benefits associated with environmental policy and other development options. The multi-criteria perspective provides for the presentation of information for discussion and support of decisionmaking procedures in ways that do not yield a unique ranking of options, but that help make explicit the sorts of social choices and ecological and economic trade-offs that underpin the macro-economic aggregates and time-series that are constructed.

DEFINING AN ENVIRONMENTALLY ADJUSTED NATIONAL INCOME

The intuitive idea of an environmentally adjusted national income figure (a 'green GDP') is quite simple. It is an estimate of the level of output (or of consumption, or of national income, etc., depending on the exact measure proposed) that a national economy would be able to achieve while simultaneously respecting the environmental quality and resource husbandry requirements for sustaining welfare levels in the long-term.

Although the idea is simple, good empirical estimations of 'green GDP' and, by extension, of a 'sustainable national income' (SNI) are not simple matters, for several reasons. First, the estimations do not involve only the measurement of a level of real aggregated economic activity, rather they are inferences about what is or might be feasible for the future. Second, there are a lot of differences of opinions, including social/ethical value judgments as well as scientific uncertainty, about the ecological and economic determinants of feasibility -- technological change possibilities and risks, new natural resource discoveries, the resiliency and stability of ecosystems, the importance of biodiversity conservation, and so on.

In the course of the project, we distinguished and discussed three main approaches to the calculation of an environmentally-adjusted national income figure considered as a macroeconomic indicator for sustainability. These are:

- Estimation of an environmental net national product (ENNP) as defined in neoclassical growth-with-natural-capital, and interpretation as an estimate for a « sustainable national income » (SNI). The ENNP can, in theory, be estimated through making deductions from the economy's GDP, these deductions representing the depreciation of capital stocks, including economic (produced or machine) capital, human capital, and, most importantly in this context, natural capital.
- Estimation of an environmentally-adjusted GDP figure as initially proposed by Hueting and colleagues in 1992, through making deductions from conventional GDP representing the economic costs of achieving independently specified environmental quality and conservation standards (e.g., costs associated with pollution emission reductions) sufficient for achieving long-run sustainability of all important environmental functions.
- Estimation of a 'green GDP' and, by extension, of a sustainable national income (SNI) based directly on empirically calibrated modelling of a national economy in order to calculate feasible economic output subject to respect for environmental quality (ecological-economic sustainability) norms.

The first approach depends strongly on imputation of monetary values to all flows of benefits and damages from natural resources and environmental functions during present and future periods of economic activity. The second and third approaches, by contrast, do not monetize the social demand for environmental goods and services. Rather they designate environmental sustainability standards in non-monetary terms (e.g., critical thresholds for pollutants).

It may also be noted that both the first and second approaches are consistent, each in their own way, with a neoclassical welfare theoretic interpretation of the environmentally adjusted national product figure as an aggregate indicator for overall welfare optimization. By contrast the third approach, based on modelling, estimates a "shadow GDP" — an aggregate measure of a feasible economic output — without any particular welfare-theoretic significance. In the modelling approach, economic output and environmental quality are dealt with as complementary but incommensurate objectives, so no welfare aggregation across ecological and economic domains is needed.

After careful review of theoretical and empirical estimation issues, we have concluded that that the first approach, the production of a figure for "green GDP" obtained through deductions of « natural capital depreciation » from conventional GDP, and, more particularly, interpretation of this figure as an estimate for SNI, is largely illusory for providing a meaningful indicator for sustainability.

Turning to the second approach, we are in sympathy with Hueting's arguments for defining economic adjustment costs associated with respect of environmental sustainability standards defined in non-monetary terms. This was indeed the starting point for our project in 1994. However, Hueting's 1992 approach, while it avoided some of the difficulties associated with quantifying in welfare-theoretic terms the significance of complex and far-reaching environmental changes, did not in our view resolve adequately the methodological problems involved in (a) defining environmental quality standards and priorities, and (b) estimating economic opportunity costs associated with meeting sustainability standards. In particular, we do not think that the subtraction of avoidance costs (including defensive expenditures actually made and also the 'costs' that would hypothetically be incurred to respecting the sustainability standards) from real national income figures is a satisfactory procedure for estimating the feasible national income for a (hypothetical) sustainable economy.

We thus favour the third approach, which is to make estimates of environmentally adjusted national income using multi-sector national economic models. This approach unites several sorts of analytical and statistical work, including: (1) avoidance-cost analysis at firm and branch/sectoral level which is the basis for calculating the resource implications of a (hypothetical) reduction of a specific environmental pressure (such as CO_2 emissions, or a heavy metal residue); and (2) whole-economy multi-sectoral modelling, either dynamic simulation or comparative static. In the *full Project Final Report* we have set out to demonstrate how these several sorts of analysis can be brought together in a way that can provide useful information on requirements and prospects for achieving sustainability.

III. Main Results of the Project

Our preferred approach to defining 'green GDP' figures is based on the idea of defining cost-effective resource allocation strategies in the achievement of environmental goals alongside the delivery of economic goods and services. Working in this way, opportunity costs or « trade-offs », in both static and dynamic perspectives, between production output and environmental quality maintenance goals can be identified without the requirement to impute monetary values for ecosystem characteristics and their change over time in the traditional neo-classical economic way. In our main report we show how the modified national accounts system can in this way become a support tool for empirically meaningful appraisal of environmental policy options. Here we summarize the main findings.

DEFINITION OF ENVIRONMENTALLY ADJUSTED NATIONAL INCOME

We have worked with the following definition of an environmentally adjusted national product (green GDP) *:*

the value (in money units) of the highest (or « best ») feasible economic production for the accounting period in question, subject to the condition that the economy is respecting a specified set of environmental standards.

It is important to note that : (i) this definition may apply to a real or model situation, (ii) it provides for the construction of time-series of green GDP figures (on a period by period basis), and (iii) it allows that more than one green GDP (environmentally adjusted national product figure) might be calculated, or more than one time-series might be calculated, as a function of the environmental standards specified. We emphasize that a green GDP, as we define it, usually does not measure actual economic performance or welfare delivery. Rather it offers an estimate based on multi-sector economic modelling (or somesuch), of the level and composition of environmentally respectful economic output that, for each accounting period being considered, may be feasible with currently known technology or under hypotheses about future technological innovation.

CALCULATION OF ENVIRONMENTALLY ADJUSTED NATIONAL INCOME

Useful calculations of « green GDP » figures can be based on comparative static modelling or on dynamic modelling.

In the case of dynamic modelling, the model output is a time-series for the aggregate national product that is attainable while respecting, for each period, the specified sustainability guidelines. Such figures are potentially valuable inputs into policy debates, but certainly they are not the basis in themselves for policy choices. The figures obtained will depend on, among other things the environmental standards imposed. Given that uncertainties are quite large, and that the range of different effects of a decision extends to many different ecological, social and economic domains, the processes of standard setting, statistical estimation and aggregation to produce such figures involve a whole range of caveats and contingencies.

The investigation of policy options and the search for "good" options necessarily involves an element of scenario construction. This implies the construction not one but many "green GDP" figures, usually in the form of time-series.

The decision support information of most value is not found in the aggregate figure themselves, but in the richness of information through comparison of the different model outputs and scenarios.

THE ROLES OF STATISTICAL OFFICES AND RESEARCH INSTITUTIONS

In this project, based on the cost-effectiveness approach, a procedure for the construction of abatement cost curves (ACCs), showing the direct effects of technical abatement measures, was developed and empirically tested for various nitrogen compounds. The empirical work demonstrated that an adequate official comprehensive database for construction of ACCs is not yet available in Germany, the country of application. The required information originates in different (economic and technical) spheres and institutional sources, each with their own data classification and categorization systems, which have to be brought together. The final aim in the ACC estimation procedure is to have results for the 'homogeneous production processes' as the statistical accounting unit.

Following the lines set out in the *Manual on The Construction of Abatement Cost Curves* produced in the course of the project, the necessary time to construct one ACC for one pollutant is approximately three-quarters of a person-year. In the empirical study, only the direct micro-economic effects of abatement measures have been estimated. To get to macro-economic results, as are required for the linking of the data with the national accounts, a more comprehensive modelling approach is needed. In the future, statistics offices can offer basic data about abatement costs for selected environmental pollutants, which then have to be linked with modelling-calculations by research institutes. In view of the limited financial resources and the generally poor data situation (relative to the immense complexity of the pollution and environment domain), a full coverage of all processes, products and environmental themes seems unreachable. With the help of a statistical selection procedure (the details of which have still to be developed), a sample of environmental pressures and of polluting economic sectors should be chosen, including the most important environmental pressures and harmful economic processes with a high technical abatement potential. The proposed methodology for calculating ACCs with integrated techniques/changes of production processes may then be implemented empirically.

Having made this assessment of statistical feasibility, the roles that we have identified for statistical offices in greened national accounts preparation are:

1. Estimations of the direct costs of cost-effective responses to environmental deterioration on a sector-by-sector and pollutant-by-pollutant basis involving the use of available technologies under existing economic conditions;

2. The information base for estimations of the indirect effects of cost-effective responses on the individual economic sectors and the economy as a whole, based on the available information in statistical offices about the input-output structure of a nation's economy in a certain accounting year (that is, with the help of « ex post » modelling using fixed Leontief-coefficients).

These two suggestions do not exhaust all possibilities. They are, however, enough to demonstrate the basis for implementing our « cost-effectiveness » perspective on resource management for sustainability. The information obtained in the two categories mentioned can furnish preliminary indications of the required economic re-orientations in order to respect environmental standards.

In addition we recommend the development of scenario modelling that goes beyond the simple compiling of statistics and exploitation of *ex post* data, to the quantification *ex ante* of the feasibility space for possible national economic trajectories. This is work properly carried out by research institutions, in cooperation with policy and statistics agencies. Scenario modelling work permits the quantification of the 'feasibility space' for possible future national economic trajectories, including the calculation of time-series for environmentally adjusted national income (that is, time-series for future green GDPs) based on explicit hypotheses about the environmental quality (ecological-economic sustainability) standards to be respected, the available natural and manufactured resources, consumption patterns to be maintained or changed, and the available technological options.

We emphasize that the figures obtained in each of these three analysis categories have to be interpreted cautiously.

First, there is often a lack of information about possible interactions (synergy or incompatibilities) between technical measures included in the direct cost calculations.

Second, estimates of direct costs usually focus on a particular type of pollutant emission or environmental quality goal, whereas in reality there are often interactions between environmental pollutants that make estimation of environmental damage strongly site specific. Although several careful studies are proceeding, we still seem to be far away from being able to calculate cost-effective responses in a rigorous way for a set of complicated environmental problems. These estimation difficulties also carry over to the calculations of indirect (cross-sectoral) effects associated with environmental policy implementations.

Third, the statistical data for the costs and the technical measures to reduce environmental pressures stem from different data sources, and often these sources do not correspond with the economic sectors distinguished within the usual SNA. As we will recommend below, integrating this information in a meaningful and useful way is perhaps the most important task that can be organized by Statistical Offices.

IV. Implications and Recommendations for Policy

Within the project, four major methodological research areas were distinguished, as reflected in the structure of the full final Project Report. These were: (a) Review of the theoretical and statistical basis for deriving sustainability indicators; (b) Defensive expenditures; (c) The construction of avoidance cost curves; (d) Micro-macro aspects of environmental-economic accounting.

Keeping in mind this four-way division, we provide a synthetic set of recommendations deriving directly from the project work.

METHODOLOGICAL PERSPECTIVES

There are a range of different concepts of, and ways of estimating, an environmentally adjusted national product (green GDP). For the construction of useful macro-economic performance indicators, we recommend adoption of the following definition :

> ***R.1*** *An environmentally adjusted national product (green GDP) is the value (in money units) of the highest (« best ») feasible economic production for the accounting period in question, subject to the condition that the economy is respecting a specified set of environmental standards.*

This definition may apply to a real or model situation, and it provides for the construction of time-series of green GDP figures on a period by period basis. Moreover it allows that more than one green GDP might be calculated, or more than one time-series as the case may be, as a function of the environmental standards specified.

> ***R.2*** *Useful calculations of « green GDP » figures can be based on comparative static modelling or on dynamic modelling.*

In particular, scenario modelling work permits the quantification of the feasibility space for possible future national economic trajectories, including the calculation of time-series for environmentally adjusted national income, based on explicit hypotheses about acceptable pollution emissions levels, the available natural and manufactured resources, consumption patterns to be maintained or changed, and technological options. This sort of approach provides, in our view, a much richer and empirically more robust information base for appraisal of macro-economic and sectoral policy options than can be provided by an indicator based on subtracting imputed money values of natural capital stocks from GDP.

EUROPEAN CONTEXTS FOR STATISTICS COLLECTION & IMPLEMENTATION

The EU through the Commission and the Parliament has committed member countries to the production of modified national accounts that allow measures of economic performance to be put in relation with information on environmental change. In December 1994, the European Commission in its Report COM(94) 670 Final set out a plan for analysis and implementation over several stages for the development of systems of environmental indicators and « green accounting » in Europe. The European Parliament, in its resolution A4-0209/95, affirmed the general elements of the action plan, while requesting some fine tuning, such as provision for the specificity of each country's environmental preoccupations within a common framework and an environmental accounting framework that allows actual and potential causes of environmental deterioration to be identified. Three stages of green accounting were envisaged:

- The systematization of environmental pressure information through agreeing on accounting framework conventions (ESEA) and through implementing a common system of environmental pressure indices (ESEPI);
- The creation of a set of integrated economic and environmental indices (ESI);
- Implementation of methods for placing monetary values on natural resources and environmental deterioration categories, permitting full « integration » of economic and environmental accounts in monetary terms.

Recent work, including our project, has made clear that the greening of national accounts is not only a question of economic theory and of accounting concepts, but also a question of data availability and information technology. The good organization of data processing, the improvement of statistical services by means of standardization and the documentation of data quality by meta-information (pedigree of data, reliability etc.) is essential. A precondition for further progress is the organization of a « cost-effectiveness information system » close to the sectoral structure of input-output tables of national accounting. The European activities ESI, ESEPI and ESIS under the leadership of Eurostat, are good starting points for this purpose. We recommend:

> ***R.3*** *The available economic and technical data-sets should be organized and linked in such a way that they can readily be used for both the calculation of direct economic costs (e.g., changes of weights within the distribution of available techniques) and the multi-sectoral economic modelling (e.g., changes of the average production technique).*
>
> ***R.4*** *In addition to ESI and ESEPI, some European countries and Eurostat have started developing an Emission Structure Information System (ESIS). We recommend that these sorts of initiatives be continued.*
>
> ***R.5*** *It would be useful to pool current experience, at present fragmented across Europe, concerning the estimation of sector-by-sector and pollutant-by-pollutant*

avoidance cost curves. This could be promoted through an EC DG-XII Concerted Action or research programme accompanying measure.

R.6 *Country applications of model-based calculations of environmentally-adjusted national income figures (that is, comparative static or scenario time-series of green GDP figures) must be carried out for several different EU countries in order to gain real experience with the diversity of environmental-economic conditions and with the adequacy (or not) of country data bases and information formats for the calculation of green GDPs.*

ENVIRONMENTAL DEFENSIVE EXPENDITURES

The project has dealt intensively with the question which role the environmental protection expenditures should play in an environmentally adjusted GDP. This role depends generally on the objective of the adjustment procedure and correspondingly on the interpretation of the environment-related expenditures in the adjusted domestic product.

In this area, the first question that we have addressed is: for the purposes of green GDP estimation, what is the right way to take account of the welfare significance of the flows of environmental goods/services during the accounting period? The issue to be surmounted is that real GDP as traditionally measured rises as a result of increased production that disregards the environment, and rises still further when environmental damages are then mitigated through further economic activities. This is a perverse characteristic of GDP as a macro-economic performance indicator.

The interpretation of certain expenditures categories as (environmentally) defensive expenditures, or EDEs, is rooted in the debate about analytical deficiencies of the conventional GDP as an economic welfare measure. It has sometimes been proposed that, in order to 'correct' the GDP as a performance indicator, deductions from the conventionally measured GDP should be made for the 'environmental defensive expenditures' (EDEs) aimed at maintaining or improving the level of environmental services (or reducing harm). In effect, this procedure would involve a reclassification of the EDEs as intermediate goods/services in national accounts systems, whereas they have conventionally (for essentially pragmatic reasons) been included in final consumption.

On the one hand, if environmental or natural 'capital' is considered as a factor of production, this reclassification procedure makes sense. However such a correction is difficult to implement in statistical practice, because it is very difficult to draw the line between expenditures conducted for defensive reasons as opposed to productive reasons, or in tandem with productivity gain objectives.

On the other hand, if the environmental goods/services in question are regarded as themselves contributing directly to welfare, the deductions should not be made in a periodic accounting procedure. One question that then arises from a welfare-theoretic point of view, is how to construct a welfare measure that aggregates the value of environmental goods/services together with the conventional consumption of economics goods and services.

In this project, we have adopted the convention that economic and ecological sources of welfare should be treated as complementary but not commensurate. We note that the positive environmental effects of environmental protection expenditures are not monetarized in the existing SNA and are, consequently, not represented as a separate output category in the GDP volume figure. This is actually consistent with our cost-effectiveness framework, where a green GDP figure or time-series is considered simply as an indicator of feasible economic activity and there is no compelling welfare-theoretic reason to quantify EDEs separately for the adjustment to national income figures. So we conclude:

> ***R.7*** *The environmental outputs of environmental protection activities should not be monetarized for macro-economic accounting purposes. (There are also statistics quality reasons for this, to considering the well-known uncertainties and degree of arbitrariness of monetary estimates of many environmental damages and benefits.)*

On the other hand, environmental functions and services should be identified in qualitative or multi-criteria terms for their welfare significance, but they do not need to be evaluated in monetary terms. It is necessary and urgent to supplement the data on monetary environmental protection expenditures (and costs) by physical data. Useful information about the environmental effects of actual environmental protection expenditures is only obtained when this information can be linked to physical environmental indicators. So we further recommend:

> ***R.8*** *The current European initiatives for EDE data collection should be pursued, and high priority should be given to defining ways that this information can really be used in environmental policy priority-setting and policy evaluation.*

> ***R.9*** *In particular, Eurostat should pave the way for including environment-orientated in-process modifications (integrated environmental protection measures) in the SERIEE data system on environmental protection expenditures. It is well-known that these measures are becoming increasingly important in the environmental management strategy of enterprises, substituting more and more the dominating role of end-of-the-pipe-measures.*

> ***R.10*** *Eurostat should work out with high priority the 'natural resources use and management account' foreseen as a part of SERIEE.*

We add the following remarks. Measures of enterprises to increase the efficiency of energy and materials use in the production processes are becoming more and more important. These measures are often included in the environmental cost accounting of enterprises. In many cases they are the most important integrated option for reducing environmental pollution induced by the production process. They are not included in the Environmental Protection Expenditures Account (EPEA) of SERIEE, because they do not fulfill the causa finalis criterion. So it seems necessary and urgent to develop an operational concept and classification of this type of measures and to record reliable data as well. Otherwise SERIEE will publish data on environmental protection expenditures in the near and further future which are less and less representative of the total array of efforts to reduce pollution and material and energy consumption.

Also, we have a few observations about terminology. In some accounting approaches, guided by a notion of 'optimizing' resource allocation (where marginal cost is equal to marginal benefit obtained), information on EDEs is considered as a proxy for the money value of environmental degradation that is being avoided or repaired or compensated for. Of course, this is valid only to the extent that the EDEs reflect real marginal benefits. For several reasons including the diffuse nature of environmental damages and services, free-rider behaviour, limited expenditure budgets of economic actors, irreversibilities, lack of information and so on, EDEs will often relate to a very incomplete set of benefits to be regained or damages to be avoided.

We do not favour the interpretation of EDE or 'avoidance cost' information as a proxy measure for the value of environmental services maintained or regained. Rather, we place the emphasis directly on the quantification of economic costs that are, or that would be necessary to reach or regain desired environmental quality. This is considered the most appropriate way to deal with environmental deterioration in a periodic accounting system.

Calculations of the costs of improving environmental quality or avoiding environmental degradation depend crucially on the environmental quality to be reached serving as a standard for these cost calculations. The reference level proposed in the existing SEEA is that the nation's domestic economic activities during the actual period should not impair the environmental quality as it exists at the beginning of the period. Of course other reference standards are thinkable. For example in the *Sustainable National Income* project at Statistics Netherlands, ecological sustainability standards are established for a number of environmental problems in a scientific way within certain uncertainty ranges. Contrary to the standard advocated in the SEEA, this sustainability standard does not refer to the state of the environment at the beginning of some accounting period, but to an ecologically sustainable state — that is, the sustainable rate and type of use of environmental systems and their products and services.

The two categories of costs — prevention costs actually incurred and potential prevention costs not undertaken by the actors while justifiable from a social welfare or sustainability point of view — directly complement each other. In any one period, without the activities financed by the actual prevention expenditures the degradation of the environment would have been higher than is actually the case. However, if a zero-degradation or stronger sustainability standard is the reference point, then additional avoidance and restoration costs would be needed to fill the gap between the environmental quality actually reached and the more ambitious period standard. Estimates of these additional costs of avoidance and restoration must be made through inferences based on data about available technologies or lifestyle changes and so on — the various estimates of direct and indirect costs as discussed elsewhere in this report.

ENVIRONMENTAL PERFORMANCE AND REPORTING AT FIRM LEVEL

One of the key tasks of our project was to investigate the extent to which information at the firm or « micro » level on environmental pressures and abatement prospects can become a useful data source for green national accounting purposes. Our investigations of empirical estimation of cost curves and of the data requirements for modelling confirm the importance of such information. At the same time, our research shows that enterprise-level monitoring, quality control and reporting practices produce information that is extremely heterogeneous. There is not a simple 'translation' from this heterogeneous information to the technological data base and cost-accounting categories relevant to calculations of green GDP. In addition, much information is commercially sensitive, which can limit its accessibility to researchers.

> ***R.11*** *It is useful to distinguish two different senses in which environmental consequences of economic activity are 'taken into account' or internalized. The first is a qualitative sense of internalization that is reflected in the information categories and reporting purposes of economic actors. The second is the attempt to produce quantitative indicators at sectoral and national levels.*

In qualitative terms, a direct parallel can be drawn between the normative interest in « green GDP » as an indicator of prospects for national economy activity to respect defined environmental norms (including sustainability-related standards), and the increased attention within the private sector for documenting company environmental performance and product environmental quality (for example eco-reporting, best available technology, ISO-14000 protocols). The macro-economic accounting adjustments and the new firm reporting practices are two different ways in which the burden of proof is being shifted from relative neglect of environmental consequences of economic activity towards the obligation to take the « best reasonable measures » in favour of environmental quality.

However, the 'bridge' between firm-level (micro) data and the statistical categories for greened national accounting (macro) is not a simple passage of collection and aggregation. In fact this key finding is common to the three different domains of our project empirical work — the estimation of abatement cost curves, the classification and estimation of environmental defensive expenditures, and environmental information at firm level.

Let us summarize the micro-macro link from the point of view of constructing national accounts and of calculating figures for environmentally adjusted national income (green GDP). The required information comes from many different economic and technical domains, each having their own classification systems. Data about emissions and about major raw materials and energy inputs is usually available at an aggregated level for firms, sectors and the economy as a whole. This sort of data then has to be supplemented by very detailed and disaggregated technical information (where available) about abatement measures and their costs. Such data often derive from various research projects, some within the private sector, much of it within publicly funded institutions. Thus there is a big gap between this detailed but fragmented information on the one hand, and statistically useful figures for abatement potential and costs for representative firms or sectors on the other hand. Bridging this gap depends on the cooperation of researchers, technicians and process managers, and statisticians to share their specialized knowledge and arrive at mutual understanding of their contrasting needs.

There is not a simple accounting or reporting procedure to ensure this 'bridge' between technical-economic research, firm information and statistical figures. What is most important is to encourage a permanent interaction based on the assertion of a public interest in the production and dissemination of high quality information on technical potentials for abatement at firm level, and the costs involved.

> ***R.12*** *We recommend that work should be encouraged involving partnerships between private sector actors, researchers and policymakers, to further define how this reorientation of priorities and reporting conventions at 'micro' level can be promoted and exploited for more effective policymaking for sustainability in the public domain. A permanent interaction between researchers, statisticians, public policymakers and private sector stakeholders is essential for good progress in this field.*

The production and sharing of information can be promoted by publicly funded clearing houses such as the European Environment Agency and by giving a high profile to specialized data sets with particular policy importance (such as BATNEEC information as provided for under recent EC Directives). In addition, the development of internationally recognized standards and quality certification, through public policy and corporate protocols (such as the ISO 14000 series) can promote the process of 'internalization through information'.

Empirical data at the 'micro' levels (that is, technical research data and firm-level information) is an essential input for construction of abatement cost curves. It is also needed as underlying data for the more comprehensive modelling work required to calculate the economy-wide effects of changing production patterns brought about by introducing emission abatement techniques on a large scale. As already discussed elsewhere in the report, the economy-wide modelling must be developed on a basis of hypotheses about rates and types of technical change and final consumption change, on a sector-by-sector and pollutant-by-pollutant basis. These hypotheses reflect knowledge about new technologies available or in prospect (process efficiency improvements, new products) and judgments about the responses of economic actors (firms, financial intermediaries and households) to the new technological opportunities, policy signals, and so on. In these behavioural respects also, a permanent interaction between researchers, statistical offices, policymakers and a variety of producer and consumer stakeholders is a pre-requisite for quality and pertinence of work.

V. Collaboration

This project has been notable for the extensive formal and informal collaboration involving researchers from academic institutions, private sector firms and industry representatives concerned with environmental reporting and information systems, national and European statistical offices, and policy advisors.

We mention some of these collaborations. The project team worked closely together with the National Accounts departments of the statistical offices of the Netherlands and Germany. The project's outcomes correspond in many respects with work and ideas developed independently at these offices. Members of the C3ED team (formerly C3E at Université de Paris I) developed some of the same ideas in a Working Group on environmental accounting in France coordinated by the IFEN. At each meeting of the project participants, members of the European Statistical Office (EUROSTAT) were present. The Wuppertal Institute research team developed and maintained important contact with industry standards groups at German and international levels. Also, although officially not a project member, Peter Rørmose-Jensen from Statistics Denmark (Environment and Energy Department) joined our group in January 1995 until the end.

Thanks are due to all those colleagues within the partner institutions and in the European and international communities who furnished their support through comment, collaborative work, and discussions.

VI. Publications from the Project

VI.1 Already Published

Title:	Le Revenu National Soutenable, est-il un indicateur de soutenabilité?
Author(s):	S. Faucheux and G. Froger
Status:	Article in *Revue Française d'Economie* (1994, 9(2): p.3-37)
Title:	Decision-making under environmental uncertainty
Author(s):	S. Faucheux and G. Froger
Status:	Article in *Ecological Economics* (1995, 15, pp.29-42)
Title:	Quelle révision, de la comptabilité nationale pour la prise en compte de la soutenabilité écologique?
Author(s):	S. Faucheux and G. Froger
Status:	Chapter in E. Archambault & O. Arkhipoff (eds.), *Mesure et Valeur en Comptabilité Nationale*, Paris, Economica, 1996.
Title:	The Costs of Achieving Sustainability: The Differences between 'Environmentally Corrected National Accounts' and 'Sustainable National Income' as information for sustainability policy
Author(s):	S. Faucheux, G. Froger, M. O'Connor
Status:	Cahier du C3ED no. 94-18

Title:	La Contribution de la Théorie du Capital Naturel en Matière d'Indicateurs de Développement Durable: une appréciation critique
Author(s):	S. Faucheux, E. Muir, M. O'Connor
Status:	Cahiers du C3ED No.96-05 (novembre 1996); submitted for journal publication.
Title:	Valuation concepts for calculating « green GDP »: complementary not exclusive
Author(s):	C. Stahmer and E.K. Seifert
Status:	Paper in Proc. of International Symposium Models of Sustainable Development, Paris, March 1994, Vol.II
Title:	General aspects of the maintenance cost approach in the EU-project on methodological problems in the construction of an adjusted income figure
Author(s):	W. Radermacher
Status:	Paper presented at the meeting of the London Group on National Accounts and the Environment, held in Washington (March 15-17 1995)
Title:	Bewertung externen Kosten in den Umwelt-konomischen Gesamtrechnungen (UGR) des Statistischen Bundesamtes - Konzept und erste Ergebnisse
Author(s):	W. Riege-Wcislo
Status:	Paper presented at the meeting of the VDI (Verein Deutscher Ingenieure) - Gesellschaft Energietechnik about Externe Kosten von Energieversorgung und Verkehr (March 5-6 1996)

Title: Defining cost-effective responses to environmental deterioration in a periodic accounting system
Author(s): R. Brouwer, M. O'Connor, W. Radermacher
Status: Paper in the Proceedings volume of the Third Meeting of the London Group on Natural Resource and Environmental Accounting (held at Stockholm, May 28-31 1996), pp.397-422, published by Statistics Sweden, Stockholm.

Title: The Environment and National Product in Economic Growth Theory [in Dutch]
Author(s): B. de Boer, R. Brouwer, K. Zeelenberg
Status: Document Statistics Netherlands (March 1995)

Title: Sustainability in growth models [in Dutch]
Author(s): B. de Boer, R. Brouwer, K. Zeelenberg
Status: Document Statistics Netherlands (August 1996)

Title: Defensive expenditures
Author(s): C. Leipert
Status: Chapter 11 (p.175-186) in: *Taking Nature into Account, A report to the Club of Rome*, W. van Dieren (editor), 1995

Title: Auf dem Wege zum kosozialprodukt?
Author(s): C. Leipert
Status: Article in *Informationsdienst Institut fr kologische Wirtschafts-forschung*, Nr.2, Jg.10, March/April 1995, p.17-20

Title: Auf dem Wege zum kosozialprodukt?
Author(s): C. Leipert
Status: pp.328-339 in W. Fricke (ed., 1996), *Jahrbuch Arbeit und Technik 1996*, Bonn. March/April 1995, p.17-20

Title: Environmental protection expenditure and its representation in National Accounts
Author(s): G. Gi, C. Leipert, C. Pasurka, D. Schäfer, A. Steurer
Status: Paper presented at the Special International Association for Research in Income and Wealth (IARIW) Conference in Tokyo (March 5-8 1996)

Title: Indicators for measuring welfare
Author(s): E.K. Seifert
Status: Chapter 9 (p.142-156) in: *Taking Nature into Account, A report to the Club of Rome*, W. van Dieren (editor), 1995

Title: Proposals and materials to the ad hoc-group on macro-micro linkage for the consideration of ISO TC207/SC4 (Subcommittee 4, Technical Committee 207, International Standardization Organization)
Author(s): E.K. Seifert and A. Nöh
Status: ISO document no. 177 (May 1996)

VI.2 In press (forthcoming) :

Title: Neoclassical theory of natural capital and « weak » indicators for sustainability
Author(s): S. Faucheux, E. Muir, M. O'Connor
Status: Article (forthcoming in *Land Economics Vol.73(4),* November 1997)

Title: Towards a Green National Income?
Author(s): S. Faucheux, M. O'Connor, and Sybille van den Hove
Status: Chapter 11 in book *Valuation for Sustainable Development: Methods and Policy Indicators*, edited by S. Faucheux and M. O'Connor (forthcoming Edward Elgar, Cheltenham, 1997)

Title: From EMAS to SMAS, Charting the course from Environmental Management and Auditing to Sustainability Management
Author(s): E.K. Seifert
Status: European Partners for the Environment (EPE) Workbook version 2.1, A. Spencer-Cooke (editor), (forthcoming 1997).

Title: *The Construction of Abatement Cost Curves: Methodological Steps and Empirical Experiences*
Authors: Wolfgang Riege-Wcislo and Angela Heinze

Status: Manual produced by the Federal Statistical Office of Germany, Wiesbaden, Germany

VII. Diffusion of the Work

- Preliminary presentations of the main perspectives and results of the project have already taken place at a number of national and international meetings, including the London Group on National Accounts and the Environment in Washington (March 1995) and Stockholm (May 1996), and at the European Environmental Agency (EEA) in Copenhagen (April 1996). Further presentations are envisaged during 1997, including outlines for methodological work on cost curves and multi-sector macro-economic scenario modelling, with various country applications.
- A Manual designed for use by statistical offices, on **The Construction of Abatement Cost Curves: Methodological Steps and Empirical Experiences** has been produced by the Federal Statistical Office of Germany (contact the authors Wolfgang Riege-Wcislo and Angela Heinze), Gustav-Stresemann-Ring 11, D-65180 Wiesbaden, Germany, fax +49 611 724000.
- As indicated by the above list (Section VI), there are already several papers/articles/abstracts published or forthcoming that present and discuss work done during the project; others are anticipated.
- The work has already had an important influence on green accounting thinking amongst official agencies in several countries, including France, the Netherlands, Germany, the UK and Sweden. In addition, researchers and officials from several non-European countries (as far away as New Zealand) and from several international agencies including the WWF have expressed interest.
- Since completion of the project, several funding proposals have been developed by individual project partners within several EU countries. . Positive responses at national levels by statistical and environmental policy offices, and by research funders (e.g., in France from the Ministry for the Environment to the C3ED) show that the approach is being viewed as potentially useful and practicable at a public policy level.
- A joint project proposal for research into *« Cost-effective responses to environmental deterioration in a periodic accounting system »* was made in January 1997 to the EC DG-XII Environment and Climate programme, led by the Statistisches Bundesamt with participation by the C3ED and the CBS and also by partners from Sweden, the UK and Germany not involved in the project just completed. This proposal has been placed on the reserve list (as of July 1997) and may yet be reconsidered for funding. Further proposals along these lines will be developed in the future.
- Some of the issues associated with evaluation of environmental assets and natural capital depreciation will be discussed during a European *Symposium on Environmental Valuation* (4-7 October 1997, Vaux de Cernay, France, sponsored by the EC DG-XII with support from the French Ministry for the Environment, the CNRS, the ESEE and the UVSQ).
- Options are being discussed to organize, perhaps together with DG XII, Eurostat and the EEA, a stakeholders' workshop about the outcomes of the project, possibly in late 1997.
- A preliminary agreement has been reached with the publisher Inderscience (Geneva) for inclusion of several papers in a 1998 special issue of the *International Journal of Sustainable Development*, as an integrated presentation of the main conceptual, methodological and empirical results of the project.

VIII. Other Observations

Our approach to defining environmentally adjusted macro-economic indicators emphasizes the pragmatic and evolving character of policy-oriented analyses.

For example, environmental and technological-prospect data sets will never be comprehensive in the sense of responding to all analytical or policy-evaluation needs. Modelling approaches are important and, in particular, *ex ante* scenario modelling has a major role for the exploration of domains of possibility and constraints on the development of a national economy through time. Yet in the face of data limitations and the indeterminacies of future studies, some results will be less robust than others. The task is not to pursue an illusion of precision, but to understand the quantified results and the uncertainties in a dialectical way. Scenario modelling approaches do not lead to one unique figure for an 'environmentally corrected national income' (green GDP) for a nation but, rather, to many sets of time series for possible green GDPs. The information of most value is not found in the aggregate figures themselves — which are always open to alteration through changing assumptions — but in the richness of information and understanding obtained through construction and comparison of the different model outputs and scenarios.

We also want to mention some fields of further research that were not specifically addressed within our own project but that we consider to be particularly important for the tuning of national accounts systems for sustainability policy concerns.

The empirical results presented in our project (notably in Part II of the full Project Final Report) relate mainly to one broad category of environmental pressures: atmospheric pollutant emissions related to fuel combustion (e.g., CO_2, NOx, SOx). We have insisted that, faced with the range and complexity of environmental problems, pragmatic answers must be found for the following questions: Which types of environmental pressure are most relevant? Which industrial or other productive activities are important? How can we ensure representativeness and significance if, within a reasonable budget, data collection and analysis is limited to relatively small samples?

In future work, avoidance cost curve estimation and scenario analyses should be widened in scope to cover also the environmental pressures arising in such categories as: heavy metals emissions; chemical pollutant emissions from agricultural practices (such as nitrates, phosphates and pesticides) into land and water systems; and others.

Some applied work has already been carried out in some EU countries, for example within the NAMEA framework in the Netherlands. However experience is as-yet fragmented and there will be advantages to be gained through pooling knowledge. The quantification for macro-economic modelling purposes of different sorts of environmental pressures can pose a diversity of problems. For example, the doses of chemical pollutants entering water systems from agriculture depend on a variety of local factors including the particular agricultural practices, rainfall patterns, the dynamics of water transport on the surface, in rivers and underground, and any adjacent non-agricultural land and water resource uses. Development of an adequate data base and the incorporation in the simulation model of environmental standards information relating to agricultural soil and water quality targets, poses a number of challenges for the modelling specifications and empirical calibration.

Another dimension that has not been addressed in detail within our project is the international dimension of environmental pressures. We have noted (in chapter 7 of the full report) that issues such as climate change and large-scale deforestation must be treated with proper regard to their global political-ecological scale. An important task for policy-scenario studies and green accounting is to represent not only the volumes of international trade in different categories of goods and services but also the corresponding 'trade' — actual or imputed by origins — in environmental burdens. A purely national focus could lead to quite erroneous conclusions.

A highly developed country with a significant component of service industries, banks, insurances and so on, may look perfectly sustainable in a separated national ecobalance because it imports its needed (depletable) primary materials and energy and has succeeded in exporting the polluting production industries. Statistical trends over the last 30 years are, in fact, widely in accordance with such a pattern of unequal development: an increasing amount of total international trade combined with a decreasing share of imports of raw materials into the industrialized countries and a decreasing share in toxic pollutants. For example in Japan, relatively more aluminium is imported today from countries such as Canada where hydroelectricity is very cheap than in the 1970s. Similarly, Japan has for some time been developing hydroelectric power in countries such as Brazil and Indonesia. A part of the pollution and ecological damage associated with Japan's economic dynamism is, in effect, being shifted offshore.

In addition to environmental statistics for nationally registered environmental pressures (such as energy resource exploitation, forest cutting, fish catch, pollutant emissions and land use changes), the corresponding effects have to be calculated which are linked with imports and exports of raw materials and goods. A number of analysis tools are being actively developed which can respond to this need. Ecological 'rucksacks' can — in principle — be calculated by a combination of life cycle analysis (for the pressures of the excavation and production of energy and raw materials) and input-output analysis (for the international trade of goods, which are already composed of different raw materials). Since international input-output tables which are up-to-date and of high quality are not available, this sort of work is still in a quite early state of development. Yet the outlines are already clear. In Germany, for instance, some institutions have established a working group for co-operation in material and energy flow accounting, including international trade. Elsewhere, preliminary analyses have been conducted for a range of countries to quantify the 'ecological footprints' left by production and consumption in rich countries, in terms of land area, water and photosynthesis requirements, compared with the availability of these resources in the producing and consuming countries. The 'sink' capacity of different regions of the planet for carbon dioxide emissions, compared to the anthropogenic sources of these gases, has recently become the object of international debate. (It has been argued that the industrialised countries have appropriated the environmental services in an historically inequitable way, in this sense taking from their less developed neighbours as well as imposing a cost on future generations).

Finally, it may be mentioned that the inter-national or trans-boundary transactions of capital in various forms (mostly electronically transmitted) greatly outweigh in money value, for any given period (a day, a month, a year), the flows of tangible goods and services. In the context of national income measures and their interpretation, some increased attention should be given to international capital movements and their driving roles for national economic activity and, by transmission effects, environmental pressures at national and international levels.

These suggestions are by no means exhaustive, but they do signal important fields for analysis, the data requirements for which should be integrated within greened national accounting systems. These brief remarks also highlight the point made throughout this project, that quantitative results from sectoral studies or macro-economic multi-sector modelling scenario analyses exploring prospects for economic and environmental sustainability, must be interpreted in an open ended way. The insights that can be obtained are among the many inputs to policy debate. Indicators must not be taken out of context of the assumptions, measurement frameworks and appraisal purposes within which they are constructed. Scenarios are not definitive representations of what will or should occur. Explorations of sustainability (and unsustainability) deal with an historically open future.

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The full ***Final Project Report*** *(in two volumes) is also available, prepared principally by
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