

**ENVIRONMENT DIRECTORATE
ENVIRONMENT POLICY COMMITTEE**

**Working Group on Waste Prevention and Recycling
Working Group on Environmental Information and Outlooks**

TOWARDS WASTE PREVENTION PERFORMANCE INDICATORS:

PART 1: Pressure Indicators and Drivers for Waste Generation

PART 2: Response Indicators

PART 3: Indicators Based on Material Flow Accounts

This paper was adopted and declassified by the Delegates of the Working Group on Waste Prevention and Recycling in May 2004.

Part 1 identifies drivers for the generation of municipal waste, its components and some other waste streams. A set of pressure indicators for waste prevention are proposed for trial use by OECD and its member countries.

Part 2 assesses whether the available information would suffice the development of response indicators for waste prevention. Some generic response indicators are proposed for further discussion.

Part 3 explores linkages between material use, waste generation, economic development and waste prevention policies towards the development of MFA-based waste prevention indicators. Some MFA-based indicators are proposed for measuring the effectiveness of waste policies.

Contact: Henrik Harjula; Tel: +33 1 45 24 98 18; Fax: +33 1 44 30 61 79;
Email: henrik.harjula@oecd.org

JT00170442

FOREWORD

Waste prevention and minimisation objectives have been widely embraced by OECD and other governments as key elements of a strategy aiming for environmental sustainability. Nevertheless, the amounts of waste generated have increased substantially throughout the OECD area during the last twenty years. For example, the generation of municipal waste has increased by approximately 54 % between 1980 and 2000 according to the 2002 statistics of OECD, and is expected to increase further by 2020, although at a slightly lower rate. This is due to the observed weak de-coupling of municipal waste generation from the economic growth during 1990s.

It is somewhat of a paradox that even with the high political priority attributed to waste prevention, and that even with approximately three decades of environment and waste policy efforts, there still exist no widely accepted indicators to evaluate macro-level waste prevention performance. To address this fundamental problem, and as a direct follow-up to the published *OECD Reference Manual on Strategic Waste Prevention*, member countries endorsed in 2000 a multi-year project devoted to examining and developing waste prevention performance indicators. The project is being carried out jointly by the **Working Group on Waste Prevention and Recycling (WGWPR)** and the **Working Group on Environmental Information and Outlooks (WGEIO)**.

To launch this project, the OECD held a first international workshop on waste prevention performance indicators in Paris on 8-10 October 2001. Based on the workshop recommendations, work was initiated on drivers for waste generation with the aim to develop pressure indicators for waste prevention. Also work has been undertaken on response indicators and on material flow accounts aiming towards the development of indirect pressure and response indicators for waste prevention. This paper provides the final outcome of these three work areas. The project still continues.

Part 1 of this publication was prepared at Tellus Institute, Boston, MA, USA., Part 2 at “Det Danske Temacenter for Affald” and the “National Environmental Research Institute”, Copenhagen, Denmark and Part 3 at Statistics Finland.

The OECD wishes to express special thanks to the Governments of Denmark, Switzerland and The United States for their financial support to these projects. This final report was compiled within the OECD Secretariat by Heung-Jin Choi and Harjula Henrik.

The report is published on the responsibility of the Secretary-General of the OECD.

Copyright OECD, 2004

Applications for permission to reproduce or translate all or part of this material should be addressed to Head of Publications Service, OECD, 2, rue Andre-Pascal, 75775 Paris Cedex 16, France.

TABLE OF CONTENTS

| | |
|-------------------------|---|
| FOREWORD | 2 |
| LIST OF FIGURES | 6 |
| LIST OF TABLES | 7 |
| EXECUTIVE SUMMARY | 8 |

PART 1

PRESSURE INDICATORS AND DRIVERS FOR WASTE GENERATION

| | |
|--|----|
| TABLE OF ACRONYMS FOR PART 1 | 19 |
| 1. INTRODUCTION | 20 |
| 2. BACKGROUND | 22 |
| 2.1 Key Terms and Concepts | 22 |
| 2.2 Modelling Waste Generation..... | 23 |
| 2.3 Explaining Waste Generation..... | 26 |
| 2.4 Selecting Good Drivers | 28 |
| 3. MUNICIPAL WASTE..... | 30 |
| 3.1 Information on MW..... | 30 |
| 3.2 Drivers for the Full MW Stream | 32 |
| 3.3 Performance of the Standard Drivers | 34 |
| 3.4 Drivers for MW Components..... | 38 |
| 3.5 Drivers and Qualitative Issues..... | 41 |
| 3.6 An Application | 41 |
| 4. OTHER WASTE STREAMS | 43 |
| 4.1 Key Differences..... | 43 |
| 4.2 Selecting Drivers | 43 |
| 4.3 An Application | 45 |
| 5. RECOMMENDATIONS | 46 |
| REFERENCES | 47 |
| ANNEX 1: SIMULATION MODEL FOR WASTE GENERATION | 49 |
| ANNEX 2: INDEXED VALUES OF MW GENERATION AND DRIVERS | 54 |

PART 2
RESPONSE INDICATORS

| | | |
|--------|--|----|
| 6. | INTRODUCTION | 62 |
| 6.1 | Objectives | 62 |
| 6.2 | Obstacles encountered | 63 |
| 7. | BACKGROUND | 64 |
| 7.1 | Environmental indicators..... | 64 |
| 7.2 | Waste prevention indicators | 65 |
| 8. | RESPONSE INDICATORS FOR WASTE PREVENTION..... | 67 |
| 8.1 | The concept of waste prevention..... | 67 |
| 8.2 | Definition and categorisation of response indicators | 68 |
| 8.3 | Identification of existing response indicators..... | 70 |
| 8.4 | Time lag in waste prevention | 72 |
| 8.5 | Identification of possible response indicators for waste prevention..... | 72 |
| 9. | WASTE PREVENTION OBJECTIVES | 77 |
| 9.1 | Municipal waste | 77 |
| 9.2 | Batteries..... | 78 |
| 9.3 | Packaging | 79 |
| 9.4 | Paper..... | 79 |
| 9.5 | Construction and demolition (C&D) waste..... | 79 |
| 10. | WASTE PREVENTION POLICIES AND INSTRUMENTS..... | 81 |
| 10.1 | Municipal waste..... | 81 |
| 10.1.1 | Regulations and plans | 81 |
| 10.1.2 | Economic instruments..... | 81 |
| 10.1.3 | Suasive measures | 82 |
| 10.2 | Batteries | 82 |
| 10.3 | Packaging..... | 83 |
| 10.4 | Paper | 83 |
| 10.5 | Construction and demolition (C&D) waste | 83 |
| 10.6 | Eco-labels..... | 84 |
| 10.7 | Environmental management systems..... | 84 |
| 11. | ASSESSMENT OF DATA AVAILABILITY..... | 85 |
| 11.1 | Municipal waste..... | 85 |
| 11.2 | Batteries | 86 |
| 11.3 | Packaging..... | 86 |
| 11.4 | Paper | 86 |
| 11.5 | Construction and demolition (C&D) waste | 87 |
| 11.6 | Eco-labels..... | 87 |
| 11.7 | Environmental management systems..... | 87 |
| 12. | PROPOSED SET OF RESPONSE INDICATORS | 88 |
| 12.1 | Introduction..... | 88 |
| 12.2 | Background..... | 89 |
| 12.3 | Policies on waste prevention..... | 90 |
| 12.3.1 | Plans and strategies for waste prevention | 91 |

| | | |
|------------------|--|-----|
| 12.3.2 | Extended Producer Responsibility Schemes (EPR)..... | 92 |
| 12.3.3 | Environmental management systems (EMS)..... | 93 |
| 12.3.4 | Charges and fees in waste management..... | 94 |
| 12.3.5 | Landfill tax..... | 95 |
| 12.3.6 | Awareness-raising campaigns..... | 96 |
| 12.4 | Proposed set of indicators..... | 97 |
| 12.4.1 | Indicators recommended for the short-to-medium-term..... | 97 |
| 12.4.2 | Indicators recommended for the long-term..... | 98 |
| 12.5 | Conclusions and recommendations..... | 99 |
| REFERENCES | | 100 |
| ANNEX | | 103 |

PART 3

INDICATORS BASED ON MATERIAL FLOW ACCOUNTS

| | | |
|------------------|--|-----|
| 13. | INTRODUCTION | 110 |
| 14. | FRAMEWORK OF THE STUDY | 112 |
| 14.1 | Material balances | 112 |
| 14.2 | Data on total material requirement (TMR)..... | 114 |
| 14.3 | Waste data..... | 114 |
| 14.4 | Foreign data sources | 115 |
| 15. | FINNISH WASTE DATA AND MATERIAL FLOW ACCOUNTS | 117 |
| 15.1 | Waste as domestic hidden flows | 119 |
| 15.2 | Waste from production and consumption..... | 119 |
| 15.3 | Waste from primary production..... | 119 |
| 16. | STRUCTURAL WASTE PREVENTION INDICATORS..... | 120 |
| 17. | TECHNICAL WASTE PREVENTION INDICATORS | 128 |
| 17.1 | Data and Classifications..... | 128 |
| 17.2 | Aggregation and presentation of the data | 129 |
| 17.3 | Results..... | 130 |
| 18. | CONCLUSIONS..... | 131 |
| 18.1 | Applicability of the method in other OECD countries | 131 |
| 18.2 | Indicators for measuring the effectiveness of the waste policy | 132 |
| REFERENCES | | 134 |
| ANNEX 1 | | 136 |
| ANNEX 2 | | 153 |

LIST OF FIGURES

| | |
|--|-----|
| Figure 1. MW Generation and its Drivers for the Whole OECD | 25 |
| Figure 2. Example of Simulation | 28 |
| Figure 3. MW and Drivers for OECD-Europe | 35 |
| Figure 4. MW and Drivers for OECD-North America | 35 |
| Figure 5. MW and Drivers for the United Kingdom | 36 |
| Figure 6. MW and Drivers for Japan | 37 |
| Figure 7. MW and Drivers for Sweden | 37 |
| Figure 8. MW and Drivers for Turkey | 38 |
| Figure 9. Indexed Values of MW and Components for Japan | 39 |
| Figure 10. An outline of the three types of waste prevention actions: strict prevention (SP), reduction at source (<i>R@S</i>) and reuse (RU). | 67 |
| Figure 11. Actual vs. projected generation of municipal waste | 71 |
| Figure 12. Change in GDP and total waste supply between 1985 and 2000 (inclusive) | 72 |
| Figure 13. Scheme of the production – consumption cycle | 73 |
| Figure 14. Schematic economy-wide material balance (excluding air and water flows). | 112 |
| Figure 15. Cumulative waste generation in Finland in 2000 (million tonnes) | 117 |
| Figure 16. Gross domestic production, direct material inputs, domestic hidden flows and waste management strategies in Finland | 120 |
| Figure 17. Treatment of industrial waste in Finland (%) | 121 |
| Figure 18. Trends in environmentally related taxes, charges and fees, direct material inputs and domestic hidden flows (1980=100) | 122 |
| Figure 19. Environmental expenditures on waste management by industrial branches in 2000 prices (EUR) | 122 |

| | |
|---|-----|
| Figure 20. Waste generation by branch of industry related to EWC categories | 123 |
| Figure 21. Proportion of gross domestic product by industry 1975-2001 | 124 |
| Figure 22. ICT production* ¹) as a proportion of total value of manufacturing industry, 1991–2000 | 124 |
| Figure 23. Gross domestic product and material requirement (1975=100) | 125 |
| Figure 24. Total material input in tonnes per GDP in EU countries 1980-2000 | 126 |
| Figure 25. Domestic hidden flows in 1970-2001 | 127 |
| Figure 26. Hidden flows of imports in 1970-2001 | 127 |

LIST OF TABLES

| | |
|--|-----|
| Table 1. Ranking by Percent Growth: 1980-2000 | 34 |
| Table 2. The OECD core set of waste indicators | 65 |
| Table 3. Source reduction of municipal waste in the United States (million tons) | 71 |
| Table 4. Reasons for implementing waste taxes | 96 |
| Table 5. Composite economy-wide material balance with derived resource use indicators (excludes water and air flows) | 113 |
| Table 6. Material balance in Finland in 1997 (million tonnes) | 116 |
| Table 7. Generation of waste in Finland in 1997 (1 000 tonnes) | 118 |
| Table 8. Aggregation of industrial branches | 128 |
| Table 9. Agriculture A01 | 129 |
| Table 10. Agriculture A01 | 129 |

EXECUTIVE SUMMARY

INTRODUCTION

Background

The October 2001 waste prevention indicator workshop pointed out that the OECD work on waste prevention indicators is an essential factor for increasing waste prevention and resource productivity. Workshop discussions emphasized the need to closely scrutinise the macro-level **drivers** explaining waste generation (and by inference waste prevention). Examples of potential drivers include economic measures, such as GDP, private final consumption, private incomes, population and sector-specific employment. Also, it was recognised that the OECD “**Pressure-State-Response**” (PSR) model offers a useful theoretical framework for organising discussions on waste prevention indicators. Human activities exert **pressures** (in this case, waste generation) on the environment which change the condition of the environment (the **state**) and stimulate the governments and other social actors to **respond** to the observed changes through a wide range of activities, including policies and expenditures.

Based on the workshop discussions, a series of recommendations were made including three action points for attention in the short term by the OECD:

- a) Conduct in-depth studies to: i) **assess drivers for waste generation**, such as GDP, private final consumption, population, employment; ii) **construct trial “pressure” and “response” indicators** using available OECD and Member country data;
- b) Review and select **sample waste prevention indicators** for OECD use, on the basis of the analysis undertaken; and
- c) Explore possibilities of **material flow analysis** to provide indications for waste generation and its relation to economic development.

Municipal waste (MW), also called municipal solid waste (MSW), was chosen as an initial candidate waste stream for action points (a) and (b) above. Action point (c) would address not only municipal waste but also some other material flows of interest.

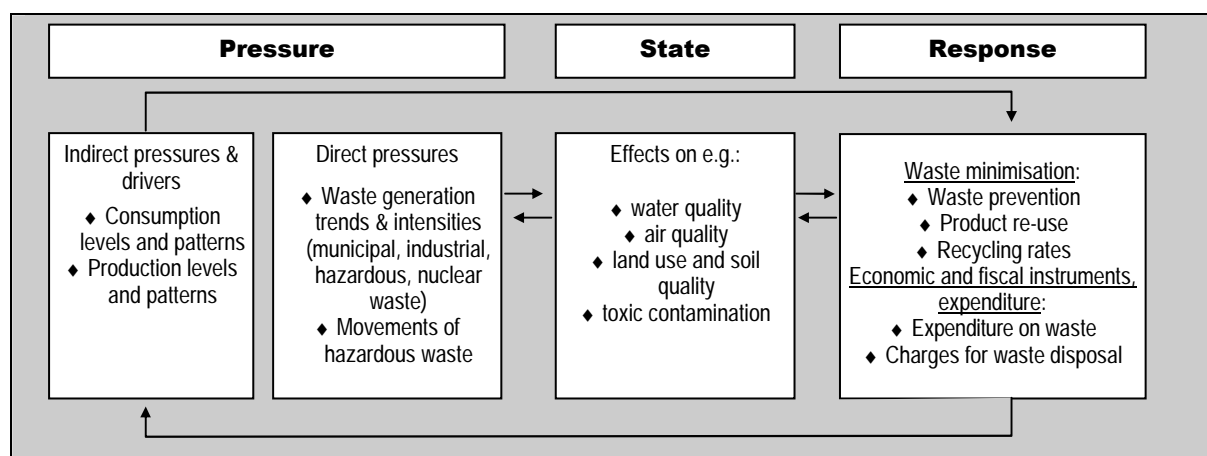
Objectives

For the development of waste prevention indicators, the 2002 work programme of the OECD included the following three projects:

- i) **Assessment of Drivers and Development of Trial Pressure Indicators** for Waste Prevention;
- ii) **Development of Trial Response Indicators** for Waste Prevention; and
- iii) **Development of Indirect Pressure and Response Indicators**, such as Direct Material Input (DMI) and Total Material Requirement (TMR) and linking those with relevant economic variables.

State indicators were not addressed in the context of these OECD projects, since they focused on the short-term action recommended by the 2001 workshop. The workshop, however, recommended that also the state indicators be addressed, but in the context of a longer-term action programme on waste prevention indicators.

PSR Model for Waste



Source: OECD

The Work Undertaken

The first project (Part 1) was carried out in 2002 and it provides the identification and selection of drivers for the generation of municipal waste, its components, construction and demolition waste and non-hazardous industrial waste (manufacturing waste, ISIC 15-37). It was prepared by Dr. John Stutz and Ms. Rachel Cleetus from Tellus Institute, Boston, MA, USA., as consultants to OECD.

The second project was carried out in 2002-2003 (Part 2) and it explores OECD Member country objectives of waste prevention, the instruments in use, or planned for achieving these objectives and includes an assessment on whether the available information could serve as a basis for the development of response indicators for waste prevention. Primary focus is on municipal waste, although a few related waste streams are also included, such as paper, cardboard, packaging, batteries and construction and demolition waste. This part provides a set of response indicators for further discussion. The report was prepared in by Ms. Mette Skovgaard and Naja Peabody from "Det Danske Temacenter for Affald", and Niels Christensen and Lennart Emborg from the "National Environmental Research Institute", Denmark.

The third project (Part 3) was undertaken in 2003 and it provides the identification of linkages between material use, waste generation, economic development and waste prevention policies, and uses the found linkages in the development of indirect pressure and response indicators for waste prevention. The study was carried out by Statistics Finland as a consultant to the OECD. The report was compiled by Mr. Jukka Muukkonen, Mr. Simo Vahvelainen and Ms. Johanna Sisto. As this is a pilot study, the data and figures presented cannot be considered as official statistics of Statistics Finland or other organisations mentioned as data sources. Conclusions and views expressed in the report are those of the authors and thus do not necessarily reflect the official opinion of Statistics Finland or the governmental authorities of Finland.

IDENTIFIED DRIVERS AND PROPOSED INDICATORS

Drivers for waste generation

The role of drivers is to help explain waste generation. Pressure indicators for waste prevention are closely linked to patterns of production and consumption, and particularly useful in revealing various forms of decoupling. The main objective of the study was to identify and select possible good drivers (pressures) for the generation of municipal waste (MW) and its components, as well as construction and demolition waste (C&D) and non-hazardous industrial waste (NHI), suitable for use OECD-wide and at the national level in the OECD countries. The primary focus was on MW. Candidates for drivers were selected from among those factors exogenous to the waste stream which explain part of change in the waste stream, such as population, GDP, employment, private final consumption, etc.

In the process of identifying and selecting drivers for the generation of MW and its components, both a graphical method and a statistical technique were used. The method of graphing indexed waste streams and drivers provides a basic tool for the selection of drivers. In addition, application of a simple material flow model and a linear regression enabled to clarify the process of identifying and selecting drivers. **Seven criteria** were developed and used to address the driver selection. **A good driver** should be independent, logical, well understood, relatively cheap, policy relevant, coupled with the waste stream history and predictable.

Based on a careful analyses and evaluations, **Population (Pop)** and **private final consumption (PFC)** were chosen as the **standard drivers** for both the **MW and its components**. Even though also other candidates, such as the number of households, GDP and components of PFC, satisfy five of the criteria for a “good driver” and could be considered appropriate for particular analyses, they are not suitable drivers for standard use due to lack of available data and logical relevance. Related to the performance of the standard drivers, both PFC and Pop may perform equally well, but **PFC is a better choice** than Pop, based on the last two criteria, coupling and predictability. Also, component-specific drivers are recommended for the analysis of MW components.

Drivers for other significant waste streams, such as **construction and demolition waste (C&D)** and **non-hazardous industrial waste (NHI)**, can be analyzed in general by the same approaches as MW. Key differences are however numerous and far-reaching, such as sources difference, general absence of time series and the stock effect. Candidate drivers are the construction component of GDP per capita for C&D and industrial production expressed in real dollars or in physical units for NHI. Also, C&D can be divided into components, such as roads and associated infrastructures, and the corresponding candidate drivers could be kilometres of road constructed or repaired, and buildings permits issued for construction or renovation. In selecting drivers, **GDP** is recommended as a **standard driver for C&D and NHI**. Even though **population** lacks a clear logical connection to the generation of C&D and NHI, it could be considered as an **additional standard driver** for C&D and NHI based on its wide use.

Pressure Indicators

Consistent with the drivers described above, the following **standard pressure indicators for waste prevention** are suggested for trial use within the OECD and its member countries:

- **Municipal waste generation** (tonnes/a), municipal waste generation/population (**MW/Pop**), and municipal waste generation/private final consumption (**MW/PFC**) for municipal waste and its components;

- **Generation of construction and demolition waste** (tonnes/a), generation of construction and demolition waste/gross domestic product (**C&D/GDP**) for construction and demolition waste; and
- **Generation of non-hazardous industrial waste** (tonnes/a), generation of non-hazardous industrial waste/gross domestic product (**NHI/GDP**) for non-hazardous industrial waste.

Response Indicators

The proposed methodology of the project was to identify a number of indicators to measure the implementation of OECD Member countries' objectives and instruments relating to waste prevention. However, this approach has proved less suitable, since policies and instruments vary greatly among the countries surveyed. It was demonstrated that very few countries have targets that go beyond the general objective of waste prevention. Furthermore, relatively few measurable targets have been set for municipal waste, let alone other waste streams such as paper and packaging. The survey of policies and instruments implemented in member countries revealed that the choices of instruments differ widely from one country to another. The intention was to study similarities among policies and use them to develop response indicators. However, with the differences in policies, this did not seem to be a feasible approach. Fees and charges in municipal waste management seemed to be the only type of instrument that is in wide use.

Moreover, measures targeting the design and production process are considered very important to achieve waste prevention. If waste is to be made less hazardous, if reuse systems are to be set up and, as the third element in the OECD waste prevention definition, if a reduction in waste quantities is to take place, then several responses and incentives have to be implemented upstream, especially in the phases of design, manufacturing and distribution of products. The development of response indicators on waste prevention should therefore include all phases of the product life cycle. Unless measures are targeted within particular sectors, upstream measures are often of a generic nature, which makes it difficult to assign them to specific waste streams.

Consequently, when waste prevention indicators were proposed in this study, the waste stream specific focus was abandoned and replaced by a focus on societal responses, i.e. generic measures on reducing waste generation, as well quantitatively as qualitatively.

This study should be seen as a starting-point for the development of response indicators. Hence the focus was placed on the instruments that have either a proved or a perceived effect on the prevention of waste generation. Some instruments cover the entire range of environmental issues and are perceived to result in a generally improved environmental performance. Moreover, the final choice of indicators would depend on the cost and administrative burden of data collection. This is why the development of response indicators should be seen as an ongoing process whereby indicators can be improved when further information and experiences become available.

Based on the experiences collected and the considerations made, three short-to-medium-term and another three long-term response indicators for waste prevention were recommended for further discussion and consideration. **For both sets, indicators demonstrating the trend in the generation of selected waste streams: municipal waste, its components and C&D waste, expressed either in tonnes per capita, per GDP (C&D waste), per private final consumption (municipal waste and its components) or per gross value added (C&D waste from C&D sector), are considered natural members.** Within the OECD, it is also recommended that environmental indicators be supplemented with case specific background information, data and explanation that would help the interpretation of the particular indicator. To this end, the proposed indicators were accompanied with suggested additional information to facilitate the interpretation.

Suggested response indicators for **the short-to-medium-term** purposes are:

i) Certified environmental management systems (EMS)

Indicator: Number of companies with a certified environmental management system (EMS), total number, per capita, or per GDP.

Additional information:

- Public programmes to support or ease implementation of EMS;
- EMS distribution across the economic sectors;
- Share of small and medium sized enterprises (SME) with a certified EMS of total companies with certified EMS; and
- Annual turnover of the companies with EMS.

Upstream waste reduction is important even though it will not directly affect the quantity of municipal waste. Thus, the number of certifications could be used as a signal about enterprises' interest in incorporating environmental considerations, including waste prevention, into the manufacturing industry.

ii) Consumption and recycling of selected materials

In general, recycling of materials will save resources and eventually reduce the generation of waste. Exactly how much, depends on the kind of material, where it is extracted, produced, used energy sources, waste management practises, etc.

Indicator: Consumption of virgin material and (collection for) recycling of the material. For selected materials only, e.g. glass, paper and metals.

Additional information:

- Description of legislation, requirement for separate collection (e.g. kerbside, bring scheme, other), extent of deposit-refund systems;
- Recycling targets for the material in question;
- Development in prices for recycled products; and
- Development in GDP and production volume using this particular material.

iii) 'No thanks'-sticker for unsolicited mail

Indicator: 'No thanks'-stickers handed out, in percentage of total households or by type of households (single-family, multi-family, other).

Additional information:

- Year of introduction;
- Legislation or coverage of the measure, e.g. how widely stickers are circulated and used, possible registration requirements and compliance requirements for the mail provider, etc;
- Launched information campaigns; and
- Monitoring arrangements.

Suggested response indicators for **the long-term** purposes are:

i) National waste prevention strategies and plans

Indicator: Existence of a national waste prevention plan or strategy (yes/no).

Additional information:

- Year of issue;
- Is the plan/strategy subjected to a regular revision process;
- Target audience of the plan or strategy;
- Public annual expenditure on cleaner production programmes in % of GDP; and
- Public annual expenditure per capita on consumer awareness-raising.

ii) Extended Producer Responsibility Schemes (EPR)

Indicator: This would be a qualitative indicator that shows the extent to which EPRs are implemented. In this case a relevant indicator could be a list of (a number of) of products and/or product groups targeted by EPR nationally or regionally.

Additional information:

- The share of companies participating in a compliance scheme over those targeted by EPR (by law or by voluntary agreement with industry organisation, etc.);
- In some cases, third-party organisations (PROs) finance prevention programmes directly by devoting a part of their budget to this activity. These expenses can be a useful indicator to be compared with the amount products or product groups put on the market;
- Information on possible waste prevention targets; and
- Information on costs and revenues of EPR, *i.e.* total revenues minus total costs of the system.

iii) Households with variable-rate pricing

Indicator: Number of households with variable-rate pricing, in total or as share of total number of households.

Additional information:

- Share of volume-based, weight-based pricing and hybrids vs. other payment systems, including the number of households with a reduced fee for home composting, etc.; and
- Fees per tonne waste covering full costs or comparable tax subsidies.

Indicators based on Material Flow Accounts

Researchers, governments and international organisations have increasingly expressed concerns on the increasing and expanding use of natural resources both in production and consumption. The economic growth, supplemented with parallel growth in resource use is considered to be inconsistent with sustainable development. The only sustainable way to solve this problem is to motivate reductions in the use of natural resources. Reductions in emissions to air and water and in waste generation are the first step towards this goal. The second step is to improve the durability of products and to reduce the material use in their production.

Waste generation is based on the extraction and use of virgin physical materials that could be studied in the framework of material flow accounting (MFA) and balances. This framework offers a comprehensive basis for the data on material flows behind the waste generation. MFA enables examination of waste by producer, *e.g.* whether the waste is generated in extraction, technical process, manufacturing or consumption. The input side of MFA describes the activity of the economy and use of materials, while the output side focuses on the impact of waste and emissions on environment, and the increase of the material stock within a society. Regarding the environment, the amount of waste and other emissions have been considered as indicators derived from the output side of MFA.

This study provided a new attempt to find **practical ways** for linking existing data and statistics on material flows, waste and economic trends to develop **efficiency indicators** for material use and **response indicators** for demonstrating the effect of policies and other measures aimed at preventing waste generation.

One purpose of the study was to **disaggregate** the existing data on physical material flows by **branches of industry**, to be able to directly link material flows with **economic key figures** both at the economy-wide and industrial branches level.

The economy-wide (national) analysis shows quite clearly that a simple comparison between material use and economic development in the European Union Member States can be made on the basis of **Direct Material Input (DMI)** for total material use and **DMI/GDP** for the material use intensity of the economy. The growth of Direct Material Inputs (DMI) and the growth of domestic hidden flows in Finland have been in 1975-2000 much slower than the growth of GDP. The experienced decoupling between economic growth and material use (and hidden flows) at national level is largely due to the relative increase of the sectors: “manufacturing of machinery and equipment” and trade and services. These sectors produce relatively small amount of waste and do not require much imported hidden flows. Without the rapid growth of these “low-waste” sectors, decoupling between material use and GDP would not have occurred in Finland. The environmentally related taxes, charges, fees and expenditures on waste prevention seem to have only a modest implication on the decrease of overall material requirement.

The MFA-analyses based on industrial branches show that **the re-arrangement and re-grouping of the TMR data by re-aggregated industrial branches is an applicable method** to make data on waste, material flows, economics and waste prevention policies comparable. The existing definition of waste does not take into account the fact that there is more than one waste type, or the fact that waste types differ considerably from each others in respect to their amount, producer and origin. Based on the framework of material flow accounting, three different correlations can be found between material requirement, domestic hidden flows (amounts of waste from primary production and construction) and economic growth. The correlations are based on the possibilities to reduce waste generation when the production volumes grow, processes change or the economy grows:

Within the first group (**steady correlation**) the generation of waste, *e.g.* manure or wood cuttings, normally increases along with the increase of production. In case of rising or decreasing prices, the correlation between material use and gross value of production will vary accordingly. Such branches of industry are primarily agriculture and forestry. **Possibilities to prevent waste generation and decouple it from the economic growth are limited.**

In general, the branches of industry included in the group of ‘**alterable correlation**’, have technological possibilities to improve their processes, to substitute the materials used or recycle the waste generated. Typically such branches of industry are the manufacturing of food products, wood and paper products, energy supply and construction. Municipal waste is typically included in this group. **Possibilities**

to decouple waste prevention from economic growth vary according to technical possibilities, but theoretical possibilities to prevent waste generation are relatively high.

In group 3 (**insignificant correlation**) the industrial branches do not normally need much input material and do not necessarily generate more waste, while increasing their gross value of production. These are typically 'high-tech' industries, such as the manufacturing of electrical, medical, optical or communication equipment. For the development of successful waste prevention policies and for the creation of waste prevention indicators, these branches should be addressed separately. **Within these hi-tech but low-waste sectors preventive measures should primarily be focused on the reduction of hazardous components and constituents, rather than the volume of waste generated. However, decoupling is relatively easy to reach.**

On the basis of this study it was proposed that the indicators based on material flow accounts that are developed to reflect waste prevention policies, instruments and the effects of applied instruments, should take into account:

- The structure of the economy;
- The proportion of material intensive branches vs. proportion of low material intensive branches; and
- Technical possibilities to reuse and recycle materials.

Further, it was proposed that such indicators also take into consideration the necessity to divide waste and closely related materials into three main categories:

- Materials generated in the extraction of natural resources and soil excavation;
- Waste generated in production and consumption activities; and
- Dissipative flows of materials from animal husbandry.

When taking these considerations into account, it would be relatively easy to develop waste prevention indicators that would link material use with waste generation and economic development. The developed indicators would compare the amount of waste generated with the amount of material inputs or with the amount of accumulated material (stocks). In this respect it should be noted that changes in the material use *within* the economy, such as recycling, are included in the indicators because recycling has an impact on the effectiveness of material use.

The index "*material intensive branches/low material intensive branches*" (in physical and/or monetary terms) would be a natural and informative national indicator for waste prevention. In addition, the following waste prevention indicators were proposed based on material flow accounts:

(1) Hidden flow index:

Domestic hidden flows / Total material input (TMI) describes the changes in material effectiveness especially in the branches of primary production and construction;

(2) Waste disposal index:

Waste disposed of / Net additions to stock reflects the efficiency of the use of materials in and recovery of the waste from the production and consumption processes; and

(3) Manure utilisation index:

Dissipative use of manure / Total generation of manure describes the magnitude and development of waste utilisation in agriculture leading to productive use of high amounts of waste.

CONCLUSIONS

Three studies were carried out to identify possibilities to develop “Direct and Indirect Pressure and Response Indicators” for waste prevention. Some of the identified waste prevention indicators are already in use, such as a pressure indicator for municipal waste in USA, a pressure indicator for packaging waste in Canada, pressure and response indicators for household waste in Belgium, etc.

One major conclusion is that further relevant and cost effective indicators can be developed based on the time series of waste and economic data available in OECD member countries. However, the development of more sophisticated waste prevention pressure and response indicators would need better and more frequently collected data. The development of “state” indicators for waste prevention is not yet considered feasible, since data requirements would go far beyond the present possibilities.

Also, the method developed for linking material use, waste generation, economic development and waste prevention policies in developing indicators for waste prevention, seems promising. It is based on **material flow accounting** using the re-arranged and re-grouped data by re-aggregated industrial branches and a modified waste definition that would facilitate the linkages between the waste, economic and material data.

Major conclusions on the basis of these three studies are the following:

- It seems possible to develop **pressure indicators** for waste prevention that would reveal various forms of waste prevention and decoupling of the generation of municipal waste (MW) and its components from the economic development. The said refers also to construction and demolition waste (C&D) and non-hazardous industrial waste (NHI).
- It also seems possible to develop direct **response indicators** for waste prevention. However, the indicators presented in this study are only meant to provide a basis for further discussion and development of response indicators for waste prevention, since some of the proposed indicators would need further elaboration and clearly also more data. For example, during the search for experiences gained on various measures to achieve waste prevention, no information on expenditures for awareness campaigns and cleaner technology were found. In theory expenditure should reflect rather well societal responses to waste related concerns. The main reason for this annoying observation may lie in the fact that environmental expenditures are not normally recorded and published in such a detailed level that they could be used to indicate changes in waste generation.
- The study concerning the development of **MFA-based indirect pressure and response indicators** provides a pilot methodology for linking material use, waste generation and economic development. Based on this method, it seems possible to develop indirect pressure and response indicators for waste prevention. However, further work is needed to verify whether the developed method based on material flow accounts would be applicable also to other OECD countries, since the pilot study was based only on the Finnish data. Also, the proposed indicators will need to be carefully tested and evaluated before the final proposal on their use in the OECD context can be made. Further studies are also recommended for the identification of other suitable MFA-based indicators for waste prevention.

RECOMMENDATIONS

Based on the findings of the three studies undertaken, the following **waste prevention indicators** are recommended for trial use by OECD and its member countries:

i) Direct pressure indicators for waste prevention:

- **Municipal waste generation** (tonnes/a), municipal waste generation/population (**MW/Pop**), and municipal waste generation/private final consumption (**MW/PFC**); the said also refers to components;
- **Generation of construction and demolition waste** (tonnes/a), generation of construction and demolition waste/gross domestic product (**C&D/GDP**); and
- **Generation of non-hazardous industrial waste** (tonnes/a), generation of non-hazardous industrial waste/gross domestic product (**NHI/GDP**).

ii) Direct response indicators for waste prevention:

For short, medium and long-term purposes, indicators demonstrating the trend in the generation of selected waste streams: municipal waste, its components and C&D waste, expressed either in tonnes per capita, per GDP (C&D waste), per private final consumption (municipal waste and its components) or per gross value added (C&D waste from C&D sector), were considered natural members. In addition, the following response indicators were proposed:

For short-to-medium-term:

- Number of companies with a certified environmental management system, total number, per capita, or per GDP;
- Consumption of virgin material and (collection for) recycling of the material. For selected materials only, *e.g.* glass, paper and metals; and
- “No thanks”-stickers handed out, in percentage of total households or by type of households (single-family, multi-family, other).

For long-term purposes:

- Existence of a national waste prevention plan or strategy (yes/no);
- A number of products and/or product groups targeted by EPR nationally or regionally; and
- A number of households with variable-rate pricing, in total or as share of the total number of households.

It needs to be strongly emphasised that these response indicators are proposed only for further discussion and development, taking into account the gained experiences and availability of data across the OECD area. In addition, each of the proposed indicators, to render meaningful, would need a considerable amount of supporting information.

iii) MFA-based indirect pressure and response indicators for waste prevention:

- **Hidden Flow Index** (Domestic hidden flows / Total material input TMI) describes the changes of material effectiveness especially in the primary production, extraction of materials and construction;
- **Waste Disposal Index** (Waste disposed of / Net additions to stock) reflects the efficiency of materials use in the society; and
- **Manure Utilisation Index** (Dissipative use of manure / Total generation of manure) describes mainly the magnitude and development of waste utilisation in agriculture leading to a productive use of high waste amounts.

PART 1

PRESSURE INDICATORS AND DRIVERS FOR WASTE GENERATION

TABLE OF ACRONYMS FOR PART 1

| | |
|--------|--|
| C&D | Construction and demolition waste |
| D | Driver |
| EEA | European Environment Agency |
| EF | Explanatory factor |
| GDP | Gross Domestic Product |
| GNP | Gross National Product |
| HHW | Household waste |
| MW | Municipal waste (also Municipal solid waste, MSW) |
| NHI | Non-hazardous industrial waste |
| OECD | Organisation for Economic Co-operation and Development |
| OVAM | Flemish Public Waste Agency |
| PFC | Private Final Consumption |
| Pop | Population |
| PSR | Pressure-State-Response-model |
| UK | United Kingdom |
| US | United States |
| US EPA | United States Environmental Protection Agency |
| W | Waste stream |

1. INTRODUCTION

Waste issues are at the environmental centre stage in many countries. Waste prevention and minimisation are increasingly embraced by OECD and other governments as important elements of their sustainable development strategies. Integration of environmental policies with economic and social policies is the key for sustainable development and underscores the importance of the initiation and use of economic and social drivers in developing environmental indicators, *e.g.*, for waste prevention.

This paper is part of the OECD's on-going effort to assist governments with actions that support sustainable development (OECD, 2001). Vigorous government pursuit of waste prevention is an essential component of a strategy for a sustainable future. Accordingly, waste prevention has become an important focus of OECD activity (OECD, 2000). In order to address waste prevention, an understanding of the factors that drive waste generation is required. This paper focuses on drivers for waste generation. The scope of work for the paper is as follows:

A study on drivers for the generation of waste streams. The study will identify possible drivers for the generation of municipal waste and its components, including household waste. Drivers for non-hazardous industrial waste and for construction and demolition waste will also be addressed. The primary focus will be on municipal waste. Selection of drivers will be addressed at the OECD level and for 4-6 member countries. Finally, based on the study, a set of pressure indicators for waste prevention is proposed for a trial use of OECD and its member countries.

This paper builds on the discussion of drivers presented in the OECD's *Synthesis, Discussion and Recommendations Report* and in the accompanying workshop papers from the **Workshop on Waste Prevention: Toward Performance Indicators**, held on October 8 to 10, 2001 at OECD Headquarters in Paris, and continues the effort towards a portfolio of waste prevention indicators for OECD and its member countries (OECD, 2002). This workshop was referred to as **the 2001 Workshop**.

Identifying drivers for municipal waste is not a new issue. Researchers have been working on this issue for some time. At this point, most of the "candidate drivers" are well known. Here, building on past research conducted for the OECD, the EEA (EEA, 1999a; EEA 1999b) and the US EPA (US EPA, 1999), the aim is to develop a deeper level of understanding concerning the selection, development and use of drivers for municipal waste and some other waste streams. Building on this foundation, the paper proposes drivers and associated quantitative waste prevention indicators for initial test use by OECD member countries. The proposed OECD-wide indicators are compared with the OECD criteria for indicator selection: policy relevance, analytical soundness and measurability.

The paper begins with a discussion of background issues. Specific areas on which attention is focused are the following:

- Definition of waste generation and of a waste generation driver. Discussion of the connection between waste generation drivers and waste prevention indicators.
- Introduction of a method of graphing indexed waste streams and drivers, which provides a basic tool for use in the selection of drivers.
- Description of simple time series models and associated statistical techniques including linear regression which can be helpful in the process of selecting waste generation drivers for municipal waste and its components (*Note: Municipal waste is in North America referred to as municipal solid waste, MSW*).
- Introduction of a simple material flow model for waste generation, applicable to municipal waste and its components. Using this model to clarify the process of identifying and selecting drivers.

These issues are addressed in Chapter 2. The result is the development of seven **criteria for a good driver** which are applied to municipal waste and other waste streams in Chapters 3 and 4.

The role of drivers is to help explain waste generation. The framework for such an explanation is some type of a model, conceptual, explanatory, statistical, etc., for waste generation. Thus, modelling is an important aspect of Chapter 2. Discussion of modelling requires consideration of technical issues, particularly mathematical modelling and statistical analysis. However, in the body of the paper, mathematical modelling and statistical analysis are discussed only at the general level.

As indicated in the scope of work, the basic objective of this paper is to identify possible drivers for the generation of municipal waste and its components, suitable for use OECD-wide and at the national level for OECD member countries. Chapter 3 reviews background information on municipal waste and its components for OECD member countries. The criteria for good drivers are then applied using the techniques identified in Chapter 2. As a result, it is recommended that the OECD and its member countries continue to analyze MW generation using population and real Private Final Consumption (PFC) as **standard drivers**. Quantitative waste prevention indicators corresponding to the standard drivers are identified and considered in light of the OECD's criteria for indicator selection.

In addition to identifying drivers for the full MW stream, Chapter 3 addresses the selection of drivers for components of MW, particularly household waste, paper and paperboard, and recycled materials. It also addresses the selection and use of drivers for analyses related to qualitative waste prevention. However, the focus of Chapter 3 is on the selection of drivers for the full MW stream.

The treatment of drivers for waste streams other than municipal waste is limited. However, the paper does address the selection of drivers for non-hazardous industrial (NHI) and construction and demolition (C&D) waste. This discussion, presented in Chapter 4 of the paper, draws on concepts and techniques introduced earlier in the paper. GDP is proposed as a standard driver for these two waste streams. The paper concludes with a list of recommendations presented in Chapter 5.

2. BACKGROUND

Before turning to the discussion of drivers for the generation of specific waste streams, it is useful to consider what one means by waste generation and by “a driver,” in general and for waste streams in particular. It is also useful to examine simple models of waste generation, to see the role a driver plays in such a model. These issues are addressed in this section. Discussion of these issues provides the framework for the analysis of drivers for municipal waste and its components presented in Chapter 3, and for other waste streams presented in Chapter 4 of the paper.

2.1 Key Terms and Concepts

The basic purpose of this section is to define what is meant by a waste generation driver. However, before turning to the discussion of drivers, it is necessary to say a word about the meaning of **waste generation**. Waste is generated when a product or material begins to be treated as waste and managed as such. Thus, waste generation includes material that is generated, collected and then recycled, composted, burned with or without energy recovery, or landfilled. The portions of a waste stream that are managed by each of these methods are generally considered as components of the full waste stream. Of course, it is possible to focus, for example, on waste that is recycled, select drivers solely for that component of a stream, and use those drivers to perform various analyses. Here, it is simply important to understand that, when referring to a waste stream such as municipal waste, it is the full stream and not a component of it, such as the portion recycled or landfilled, which is meant.

Deciding when products or materials begin to be treated as waste can be difficult and is to some extent arbitrary. To appreciate the issues involved, it is useful to consider an example:

“Increasingly, there is an effort to foster the remanufacturing of products, such as copiers, automotive components etc., so that the production of new products can be reduced (Lund, 1996). One can treat remanufacturing as reuse, and exclude remanufactured products from the waste stream. Alternatively, one can treat it as recycling and include them. The choice will affect waste generation”.

The example illustrates what are generally referred to as **boundary issues**. Such boundary issues are a major concern when dealing with municipal waste. In this section, however, we will step back from these concerns and assume that we have a well-defined waste stream for which historical data on generation are available.

When one addresses waste generation, the issue of **measurement** always arises. Throughout this paper, unless stated to the contrary, we assumed that waste was measured in tonnes. Units for the measurement of drivers were specified if there were no “standard unit” for measuring the driver in question. The use of tonnes should not be taken as an indication that the discussion in the paper is relevant to quantitative but not qualitative waste prevention as defined by the OECD. This paper does focus primarily on quantitative issues because that is the aspect of waste prevention with which drivers are most commonly linked. However, the approaches discussed in the paper are applicable, in a number of different ways, to issues involving qualitative waste prevention. The use of drivers as part of an effort to address qualitative issues is discussed in Chapter 3 of this paper.

Having clarified what is meant by waste generation, we can now turn to the definition of a waste generation driver. In the context of waste generation, use of the term driver reflects the following common meaning of the term:

“Driver: a mechanical piece for imparting motion to another piece”.

The key idea is that a driver “imparts motion”: change in the driver leads to change elsewhere. It is this notion of linkage among changes which underlies the notion of a waste generation driver as discussed in the proceedings of the 2001 Workshop and elsewhere in the literature on waste generation (OECD, 2002).

In the OECD’s work on waste, the notion of a driver arises in the application of the “Pressure-State-Response” (PSR) Model (OECD, 2002b). Application of this model includes the development of indicators of environmental pressure which the OECD divides into direct and indirect components. In applying the PSR Model to waste management, the OECD identifies the direct pressures as waste generation, measured in a variety of ways, and the indirect pressures as underlying variables causally linked to waste generation. The indirect pressures are referred to by the OECD as the drivers of the waste streams. In some cases, the term economic drivers is used, conveying the point that waste generation is driven by changes in socio-economic factors such as population, GDP, employment, etc. The OECD’s use of waste stream drivers in the PSR Model for waste management suggests the following definition:

“A waste generation driver is an exogenous factor which explains part of the change in a waste stream”.

In order to “explain change,” a waste stream driver needs to be part of an explanatory framework model for waste generation. The next section introduces and discusses such models.

2.2 Modelling Waste Generation

The requirement that the driver be exogenous means simply that it is not itself determined by the waste stream. A bit more technically, it means that the driver, D , can be treated as an independent variable in an equation in which the waste stream, W , is the dependent variable. Such an equation would take the following very general form:

$$1) \quad W = f(D, x, y, z, \dots)$$

In Equation 1), x, y, z , etc. are simply the factors, other than D , required to explain the behaviour of the waste stream W . The requirement that the waste generation driver explains part of the change in the waste stream means that, in selecting drivers, one looks for a logical and/or empirical relationship between a waste generation driver and the waste stream. Thus, for example, population is often the choice of driver for a waste stream because waste generation of all types depends on the scale of human activity which, in turn, reflects population. Real GDP or other similar economic data are used as drivers for the same reason: they reflect the scale of human activity directly.

Since the late 1990s, the European Environment Agency (EEA) has produced a number of papers (EEA, 1999a; EEA, 1999b), that address waste stream growth and a variety of related issues. The EEA work suggests a simplification of the equation relating a waste stream and driver, rewriting 1) as:

$$2) \quad W = D \cdot ef(x, y, z, \dots)$$

As the EEA explains, the idea behind equation 2) is to treat the waste stream W , as “proportional” to its driver D . The EEA refers to ef as the “explanatory factor,” which one must evaluate in order to understand fully how the change in D translates into change in W .

The framework developed by the EEA in equation 2) is essentially the same as that used by the OECD in the PSR Model for waste management. In the background paper for the 2001 Workshop, “*Developing Waste Prevention Indicators*”, the choice of a driver was linked to the specification of a quantitative waste prevention indicator (OECD, 2002). For a waste stream W , and a driver D , the waste prevention indicator is W/D . As the background paper for the 2001 Workshop explains, the trends in W and W/D provide indicators of absolute and relative waste prevention. As shown in Figure 6 in the OECD report on the 2001 Workshop, W and W/D provide direct pressure indicators for use in the PSR model. The driver D provides the corresponding indirect pressure indicator.

Equations similar to equation 2) are used extensively to model change. For example, they are used in the analysis of energy use; an area which the OECD report on the 2001 Workshop suggests may be a source of insight into methods useful for the analysis of waste generation. Energy analysts have developed fairly standard methods for analysing and forecasting growth in residential and commercial electricity use (Bolet, 1985). In these forecasting analyses, the drivers are the number of households and the floor area of commercial buildings (*i.e.*, stores, offices, government buildings, etc.) which are, in turn, analysed on the basis of employment in appropriate sectors. Energy analysts have developed elaborate models to explain use per household and per unit area of commercial space. This work in the electricity sector provides an example, illustrating success in applying equation 2).

In equation 2), one must account for the variation in W which is not due to the variation in the driver, D . As a first step, it is natural to examine historical data, to see if any **time trends** in W/D are apparent. As the EEA explains (EEA, 1999a), this takes the form of efforts to “fit” historical data for W/D to one of the following two equations:

$$3) \quad W/D = a + bt$$

$$4) \quad \ln(W/D) = a + bt$$

In equations 3) and 4), a and b are constants, usually determined by linear regression, and \ln is the natural logarithm. The time trend captured by equation 3) is quite simple and well known: W/D changes linearly, growing (or falling) by b units over each time period. For equation 4), the trend is also simple, but a bit less well known: W/D changes exponentially, growing or falling over time in the same fashion as a loan repayment grows as the term for the loan becomes longer.

Equations 3) and 4) are useful for a number of purposes, including analysis of coupling and decoupling.¹ W and D are said to be **coupled** if W and D change in a proportional fashion. For data that fit equation 3) or 4), perfect coupling occurs if b is zero. More generally, the closer b is to zero, the more closely W and D are coupled. W and D are said to be **decoupled** if W grows more slowly than its driver. For data that fit equations 3) or 4), decoupling occurs only when b is negative. The extent of decoupling is reflected in the magnitude of b .

If one is going to use the framework of equation 2) to analyze waste generation, then, all else equal, one would prefer a driver, D , that historically has been closely coupled to the waste stream, W . In

¹ On the notions of coupling and decoupling, see “Indicators to Measure Decoupling of Environmental Pressure from Economic Growth” SG/SD (2002)1 / FINAL, OECD, Paris. W/D is a “decoupling indicator” in the sense defined in this paper.

many cases, one has a limited amount of historical data for a waste stream. In this situation, it is often appropriate to replace detailed statistical analyses with a simple graphical analysis. One can graph W, D, and W/D, using indexed values so that there is a common scale for the graph. If W is closely coupled to D, one expects the graphs for W and D to be close, and W/D to remain near 100, the initial value of the index. Graphical comparisons of the degree of coupling can often help with choices between drivers.

Anticipating the discussion of MW in Chapter 3, we present Figure 1 below. It provides a **graphical analysis**, comparing the population (Pop) and PFC as drivers for MW in the OECD. As the figure shows, waste generation is coupled to PFC, but not to population:

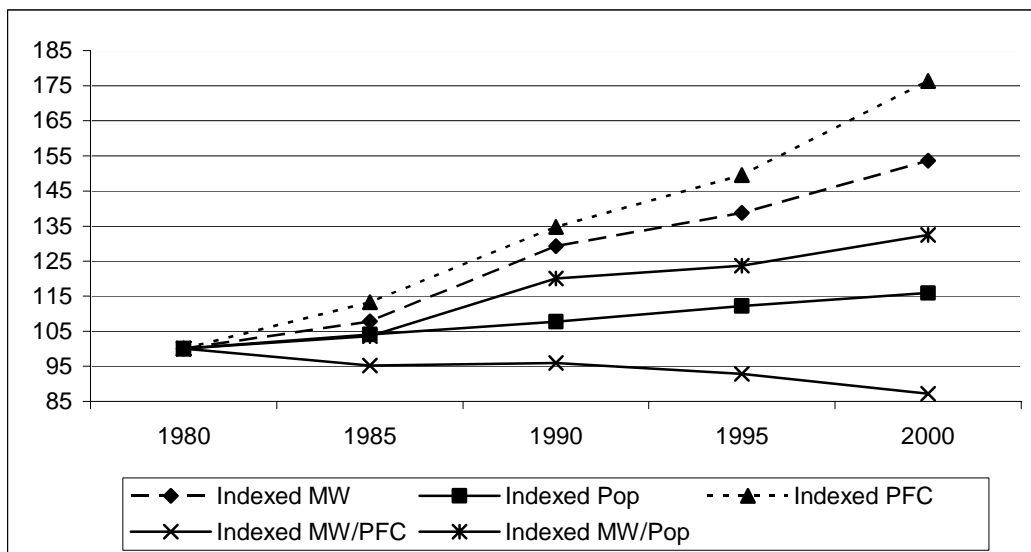
- The magnitude of growth in PFC is closer to the growth in MW than is the growth in population. For example, after 20 years, growth in MW and PFC differ by 20 percentage points, while growth in MW and population differ by 60 points. (Indices starting at 100 show growth, so these data can be read off the figure.)
- MW and PFC show similar variations in growth: between 1980 and 1985 both grow slowly, between 1985 and 1990 they grow more rapidly. Growth in population does not show variations in growth similar to those in MW.

Figure 1 shows that PFC accounts for most, but not all, of the historical change in MW. In addition, there is modest but visible decoupling, indicated by the downward slope in the graph of MW/PFC. Statistical analysis picks this decoupling up quite well, producing the following version of equation 4):

$$4a) \ln (MW/PFC) = 3.790 - 0.006t$$

Equation 4a) has an adjusted R² of 0.83 and t statistics far over 2.0 for both coefficients, indicating that the time trend is a very good fit. Of course, graphical and statistical analyses of the type just described are not the only criterion for driver selection. A broad set of criteria are discussed at the end of this section.

Figure 1. MW Generation and its Drivers for the Whole OECD



In all of the preceding discussion, and indeed throughout this paper, the focus is on the selection and use of drivers as part of an effort to explain the changing behaviour of waste generation **over time**. In the immediately preceding discussion, the claim is that PFC accounts for much of the change over time in MW generation for the OECD as a whole. There is no reason to assume that PFC will also account for other types of variation in MW. In fact, work by the EEA shows that, while PFC per capita is closely correlated with MW generation per capita, PFC per capita does not explain much of the observed variation in MW per capita across the OECD member countries (EEA, 1999a). This result is not surprising. The OECD has a common definition of MW, but the member countries operationalise this definition in a variety of different ways. Diversity in MW definition and measurement, as well as other differences, such as the average size and type of residential dwellings or households, cause differences in MW generation among OECD countries which are not picked up by PFC per capita. It is important to note that failure to explain such cross-sectional variation indicates a limitation, but not a problem for drivers such as PFC.

2.3 Explaining Waste Generation

In many cases, the dynamics of waste generation are quite simple. For example, waste generation often results more or less directly from the purchase and consumption of products or materials by households, commercial enterprises and industry. It is easy to give examples of such waste generation:

- Households purchase foodstuffs, such as vegetables. Subsequently, wastes from food preparation and uneaten portions of the food may enter the household waste stream.
- Construction or renovation of buildings leads to the purchase of building materials such as sheets of plywood. Some unused plywood may enter the C&D waste stream.
- Materials such as plastic sheet are used to manufacture some products. Portions of the plastic which are not usable may enter the non-hazardous manufacturing waste stream.

These examples are all instances of what can be referred to colloquially as the **Stuff Model** of waste generation:

- Over time, modern society produces more and more products and materials (*i.e.*, “stuff”). Sooner or later, much of this stuff becomes waste.

The Stuff Model links consumption, D , to the generation of waste, W (D rather than C is used for consumption because, in this model, consumption is the driver). The model is expressed by the following two simple equations:

$$5) \quad D(t) = g(t) \cdot D(t-1)$$

$$6) \quad W(t) = d(t) \cdot D(t-1)$$

In equations 5) and 6), t is time. For convenience, models are usually arranged so that the modelling starts with $t=0$ and continues for $t=1, 2$, and so on. Equation 5) determines the level of consumption over time based on the function $g(t)$. Equation 6) links waste generation to consumption: a portion of the material “consumed” (or, more precisely, purchased for consumption) at time $t-1$ enters the waste stream at time t .² The function $d(t)$ simply specifies the portion “discarded.” Equations 5) and 6) may look a bit formal and abstract. However, they simply express the two basic ideas about waste

² The role of time in analyses of waste generation, and particularly the importance of lags, is discussed in the paper by Dr. Lifset in the reference document (OECD, 2002).

generation captured in the Stuff Model: over time, consumption grows and, after a lag, part of what is consumed becomes waste.

In addition to expressing a common, intuitive relationship between consumption and waste generation, the model specified by equations 5) and 6) is simple in a technical sense. In particular, one can determine precisely how $W(t)$ is related to $D(t)$. The relationship is as follows:

$$7) \quad W(t) = [d(t)/g(t)] \cdot D(t)$$

Equation 7) tells us that $D(t)$ can be treated as a waste stream driver for $W(t)$. Once one identifies $D(t)$ as the driver, one can also see that equation 7) has the same general form as equation 2), and that the general proportionality factor, *ef*, used in equation 2) is simply $d(t)/g(t)$. Initially one might think that the development of equation 7) depends on the fact that current consumption leads to waste only in the following period. However, that is not the case. Even if current consumption leads to a complex pattern of future waste generation, one can still link waste generation directly to current consumption.

The Stuff Model is important in part because it provides an example of a waste generation model of the type shown in equation 2), in which the behaviour of the waste stream is **explained** in the common sense meaning of the term. In equation 7), the explanatory factor is not something one tries to estimate based on a statistical analysis of historical behaviour. Instead, it is explicitly determined by consumption and disposal. In fact, one can write down exactly how waste generation will change over time:

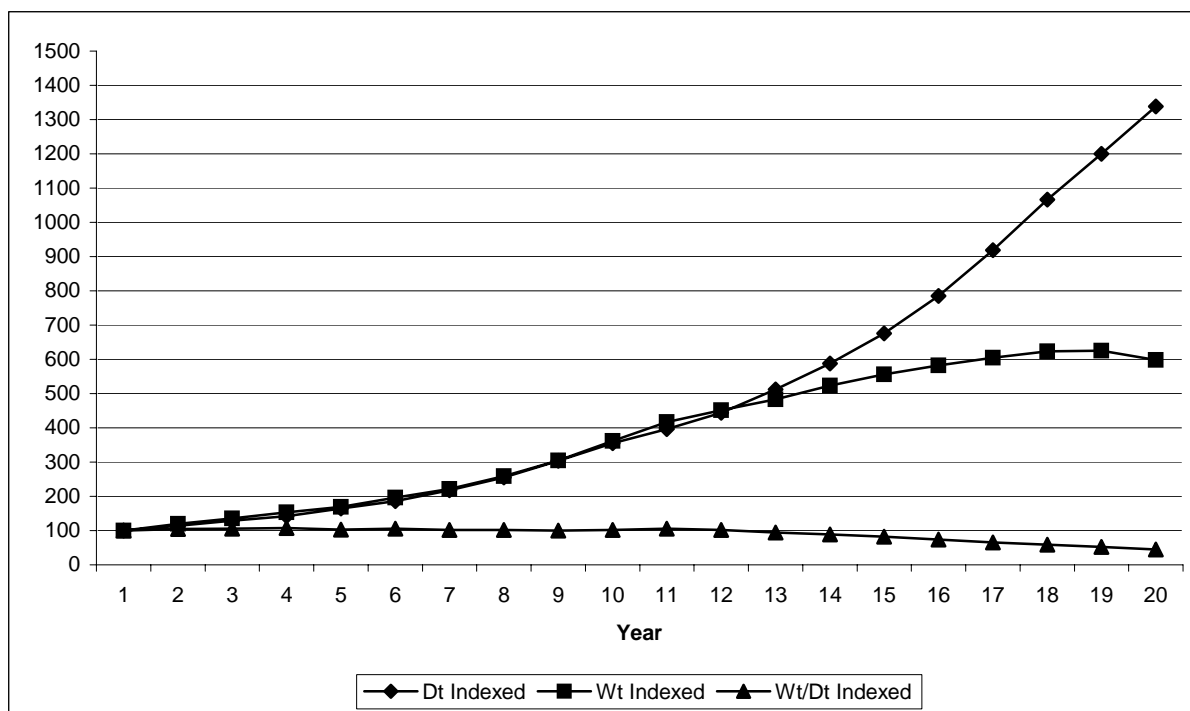
$$8) \quad W(t)/W(t-1) = [d(t)/d(t-1)] \cdot g(t-1)$$

From equation 8), it follows that, when $d(t)$ is constant, waste generation will only decline if the consumption driving declines over time. In order for waste generation to fall while consumption is rising, $d(t)$ must decline substantially. To illustrate this point, assume that $g(t) = 1 + g$ and $d(t)/d(t-1) = 1-d$, where g and d are small positive numbers. With these assumptions, consumption, $D(t)$, grows exponentially, while the fraction of it that becomes waste falls exponentially. This produces two effects:

- There is a strong decoupling between $W(t)$ and its driver, $D(t)$. In fact, $W(t)/D(t)$ tends toward zero as t increases.
- $W(t)$ rises or falls, depending on whether d is less than or more than g .

There is a good deal more that could be said about the behaviour of the Stuff Model. However, it rapidly becomes a bit technical. Here, the behaviour of the model will simply be illustrated through a simple **simulation exercise**. Figure 2 below shows the result of a simulation in which $D(t)$ grows at 3 percent per year plus or minus a bit of random variation for “realism.” For the period $t=0$ to 10, $d(t)$ is constant. After that $d(t)$ declines. Where $d(t)$ is constant, $W(t)$ is closely coupled to $D(t)$. $W(t)$ begins to decouple from $D(t)$ as soon as $d(t)$ begins to fall (at $t=0$). When $d(t)$ has fallen enough to balance the growth in $D(t)$ (at $t=15$), waste generation actually begins to decline. As Figure 2 shows, decoupling waste generation from a driver can be an important first step in reducing waste generation. However, even substantial decoupling may not be sufficient to reduce waste generation. Decoupling must be sufficient to offset growth in the driver if waste generation is to fall. Details concerning the simulation are provided in Annex 1.

Figure 2. Example of Simulation



The simulation shown in Figure 2 provides some insight into the difficulties analysts face in trying to **forecast waste generation**.³ As the EEA points out, relationships of the form shown in equation 2) provide a basis for forecasting waste generation, given anticipated changes in the driver selected. Ideally, in making such a forecast, one would have a model, such as the energy analysts' models for unit usage per household or square meter of commercial space, which explains the behaviour of W/D. If that is not available, one might select a D for which one can develop a statistically sound basis for extrapolating the historical behaviour of W/D into the future. However, care must be taken in using this approach. Historical behaviour may not reflect future behaviour. As the simulation in Figure 2 shows, an analysis based on experience for $t=0$ to 10 would completely miss the complex behaviour of W in the period $t=11$ to 20.

2.4 Selecting Good Drivers

The role of a driver is to facilitate a range of waste stream analyses including explanations of historical behaviour, forecasts of future waste generation, and scenario analyses, exploring the way a waste stream might change in the future. The **research strategy** for performing these analyses has two parts:

- Candidates for drivers are selected from among those factors exogenous to the waste stream which explain part of the change in the waste stream.
- As in equation 2), the waste stream W is partitioned into the driver D, and a residual for which analyses need to account, by the construction of an explanatory model or through statistical analysis of the historical behaviour of W/D.

³ Please see the reference document (EEA, 1999a) for a discussion of such forecasting.

Assuming these two steps are successful, the remainder of the analysis consists simply of assembling the information on the changes in D and W/D.

With the research strategy just described in mind, how might one go about making a good selection for a driver? Selection should be guided by the following **seven criteria**:

- **Independence.** The behaviour (*i.e.*, pattern of change) of the waste stream should not affect the behaviour of the driver to any significant extent.
- **Connection.** The behaviour of the driver should be clearly relevant to the behaviour of the waste stream. “Logic” should support the choice of a driver.
- **Background.** The driver should be well understood. Reliable historical data on the driver should be available. Forecasts of future values for the driver should be available or easy to develop.
- **Effort.** The cost, in time and money, for the acquisition of data on a driver and the associated modelling of the residual W/D should be “reasonable,” judged in light of the importance of the analyses in which the information will be used.
- **Policy Relevance.** W/D should be consistent with, or useful for, policy purposes, such as setting of waste prevention targets and evaluating progress toward them.
- **Coupling.** The driver should explain as much as possible of the historical variation in the waste stream.
- **Predictability.** Future behaviour of W/D should be predictable on the basis of analysis of historic data or, preferably, on the basis of an explanatory model.

The first two criteria are reflected in the definition of a waste stream driver proposed earlier in this section. The third is a logical extension of that definition. The fourth is simply “common sense.” In practice, any serious candidate for a waste stream driver will meet the first four criteria fully.

It is likely to be the last three criteria that actually decide which among a group of plausible candidates are selected for use as a driver in a particular waste stream analysis. How one weights these criteria will depend on the details of the situation. For example, consider the choice between population and PFC as a driver for MW. For purposes of analysis, the results in Figure 1 suggest one would prefer PFC to population as a driver for OECD-wide MW generation. However, if it were important for reasons of policy to have a simple, easy-to-understand measure of the intensity of waste generation, population would be the better choice of driver. Here it is useful to note, as pointed out in the paper by Mr. Kit Strange at the OECD’s 2001 workshop (OECD, 2002), that **EU policy goals** for MW are based on MW generation per capita.

The seven criteria listed above have a direct relationship with the OECD criteria for the selection of environmental indicators: Independence and Connection address the OECD criterion of Analytical Soundness; Background and Effort address the OECD criterion of Measurability; Policy Relevance is the same as the third OECD criterion. Thus, a driver, D, that meets the first five criteria can be used to develop a qualitative indicator of waste prevention, W/D, which satisfies the OECD criteria. The last two criteria for drivers, Coupling and Predictability, fit under the OECD criterion of Analytical Soundness. However, they go beyond the OECD requirement that indicators lend themselves to linkage with economic models, forecasting and information systems. Coupling and Predictability require that the decomposition, $W = D \cdot (W/D)$, provides a framework within which one can explain the past behaviour of the waste stream and forecast or analyze its future behaviour with some confidence.

3. MUNICIPAL WASTE

This chapter addresses the selection of drivers for the municipal waste (*in North America municipal solid waste, MSW*) stream and its components. Discussion begins in Section 3.1 with a review of the information and data available on the MW stream. While MW is the most studied and best documented of the major waste streams, the available information on MW is limited and in various respects incomplete. These limitations need to be well understood when approaching the selection of drivers for MW. Next, in Section 3.2, the choice of drivers for the full MW stream is considered. Discussion of this choice is the central focus of this section. The continued use of two standard drivers for MW, PFC and population, is recommended. Section 3.3 applies the criterion of Coupling, using the graphical technique introduced in Section 2 to compare the performance of the two standard drivers. Section 3.4 addresses drivers for the components of MW. In Section 3.5 there is a brief discussion of the selection and use of drivers for analyses involving wastes which are hazardous to humans or the environment. Finally, in Section 3.6, an application of the ideas introduced in this section by the Flemish Public Waste Agency (OVAM) is described.

3.1 Information on MW

The selection of drivers is part of an effort to explain MW generation. To understand the issues that underlie any such attempt, it is helpful to begin by recognizing that there are different **dimensions** to MW. The term “dimensions” is used to suggest an analogy with the height, width, and breadth of a solid object. Descriptions based on each of an object’s dimensions can produce quite different conceptions of an object as well as very different estimates of the object’s size. For MW, the following four dimensions are relevant:

- **Source.** The MW stream contains wastes generated by households as well as “similar wastes” produced by certain types of commercial establishments, small business and government facilities.
- **Composition.** MW generally contains wastes that derive from durable and non-durable goods, packaging, food and yard materials. Certain items, such as “bulky wastes” from large home appliances (*i.e.*, refrigerators, ranges, washers and dryers, etc.), may or may not be included.
- **Responsible Party.** MW is generally limited to waste which is collected by or on behalf of a municipality. This may exclude items that are managed by business (*i.e.*, some packaging) as well as commercial, business or government waste “similar” to household waste, for which municipal waste managers are not responsible.
- **Management.** MW may include all of the waste managed by facilities such as “MW landfills” that accept primarily MW, but may also receive other materials.

The multiple dimensions of MW have important effects in a variety of areas, beginning with the definition of MW. Definitions of MW used by the OECD (OECD, 1999), the EU and its member states (EEA, 2000), the US (US EPA, 2002), and Canada (Environment Canada, 2000) combine references to most, and in some cases all, of the four dimensions. The dimensions do not provide similar views of MW.

In addition, each dimension introduces some elements of uncertainty. As a result, definitions of MW in OECD member countries differ from each other and from the commonly accepted OECD definition. As a consequence of the difference in the definitions of MW, there is a lack of harmonization concerning the inclusion or exclusion of certain specific types of waste in MW. As one might expect, differences in definition and issues of composition lead to variations in the tonnage of MW reported. The EEA shows that part, but not all, of the observed variation in national-level data on MW generated per capita is due to these effects (EEA, 2000).

EEA analyses of variation in MW address only the “official MW data” that is provided by countries in response to the OECD survey. When one looks beyond the official data, even greater variation emerges. For example, in the US, both the US EPA (US EPA, 2002) and *BioCycle* (Goldstein and Madtes, 2001), a well-known journal in the waste field, publish data on US generation of MW. For 2000 the data on MW generation from these two sources differ by over 100 million tonnes. The *BioCycle* data come from the state-level government agencies which, in the US, have direct responsibility for the oversight of MW management. Summing the data produced by the states—basically the approach followed by *BioCycle*—produces a result that differs dramatically from the official figure produced by the US EPA. The reason for the difference is quite simple. Analyses of MW generation by the EPA and the states focus on different dimensions of MW. The US EPA estimates are based primarily on Composition. The states base their estimates on various combinations of information on Source, Responsible Party and Management. As a result, the states include waste which is collected or managed like MW, but is not part of the official US data on MW. The states could remove such waste from their MW estimates; however, this would create problems for them. For example, it would create discrepancies when the state-level MW is divided into portions recovered, burned and landfilled, since the landfilled portion is expected to match deposits at “MW landfills” which, under US regulations, sometimes accept wastes other than official MW.

The example of the US has been discussed at some length because it has some clear implications for the consideration of information and data on MW at the OECD level:

- The OECD’s development of MW data is roughly analogous to that of *BioCycle* in the US: data are obtained from a survey of the OECD member countries. As the experience in the US shows, use of this “bottom-up” approach can be expected to have a major impact on the estimates of the tonnage produced by the OECD as a whole.
- Work by the EEA (EEA, 2000) suggests that it may be possible to produce more consistent national-level “MW data.” If the EEA’s approach were followed, then, when one compared data across countries or aggregated national data, the results would have more internal consistency and logic. Such efforts are certainly worthwhile. However, as in the US experience, differences in MW definitions and measurement procedures among OECD members may reflect real differences in national needs and goals. Adoption of a truly uniform approach to the definition and measurement of MW may result in the “US situation,” in which there are multiple candidates for the tonnage of the national MW stream.

How does all this discussion bear on the selection of drivers for the MW streams? As the definition of waste stream drivers and the criteria for their selection make clear, driver selection is part of one effort to **understand** a waste stream and analyze its behaviour. Due to the multiple dimensions relevant to the definition of MW and its measurement, it is very hard to form a clear understanding of MW, even at the national or OECD-wide level. The general meaning of municipal waste is clear, but beyond that things get “quite fuzzy.” Further, as the US example makes clear, the multiple dimensions reflect differences in data sources and measurement strategies associated with MW. The selection of drivers for MW needs to take all of this into account.

Given the many dimensions of MW, it is natural to expect that more than one driver will be useful. Employing **multiple drivers** does not mean that, for any particular type of analysis or specific undertaking, it is not possible to discriminate, selecting the best driver in that instance. Rather, the point is that different drivers may fit better or worse with different MW dimensions, and may satisfy the individual criteria for driver selection more or less well. Which dimensions and criteria are most relevant will vary from case to case, and so, likely, will the appropriate driver selection.

Finally, before turning to the discussion of drivers for MW, it is useful to say a few words about the actual data on MW which are available for OECD and its member countries. The OECD routinely inquires and the OECD member countries routinely provide data concerning the size and composition and management of their MW streams. This information appears as part of a standard OECD statistical publication.⁴ However, when one first examines the data on MW published by OECD, the result is a bit of a shock. The data series presented are short, contain gaps, and are accompanied by footnotes that often inform the reader that data are for years other than those indicated, or are subject to a variety of caveats. For some countries, the basic time series presented in the OECD data is household waste, which is only a component of MW. The limitations in the data submitted to OECD do not facilitate publication of more complete or consistent data. This has important implications for the selection of drivers and for the development of waste indicators.

3.2 Drivers for the Full MW Stream

The point of departure for any discussion of drivers for MW is a choice of **candidate drivers**. Candidates include the drivers currently in use at the OECD: population and PFC. Each of these, in turn, suggests one or more “similar” candidates.

- Related to population one might consider the number of households, though OECD-wide data may not be easily available.
- Related to PFC one might consider GDP or those components of PFC, expenditures on food, clothing and durable goods, which the EEA report (EEA, 1999a) shows, are linked most directly to MW generation.

All of the candidate drivers satisfy five of the criteria for a “good” driver: Independence, Connection, Background, Effort and Policy Relevance. This should not be taken to mean that all of the candidate drivers satisfy each of the named criteria equally well:

- As shown in the US EPA report (US EPA, 1999), based on statistical analyses, PFC and GDP are both well coupled to MW. However, PFC meets the criterion of (logical) connection to MW generation better than GDP.
- All components of PFC contribute something to MW generation, even if some components contribute more than others.
- Number of households is a natural choice to drive household waste. Its use to drive MW which may contain significant amounts of non-household waste is less well supported.

Based on past experience, it is suggested that the OECD as a whole and its member countries continue using population and PFC as the **standard drivers** for MW. In addition, the member countries

⁴ Please see the reference document (OECD, 1999). It shows the general type and form of the OECD data. For this paper a 2002 update of the OECD data is being used.

should be encouraged to use the other candidate drivers as appropriate for particular analyses. Consideration of Policy Relevance supports this approach. In the OECD member countries there is a wide range of policies and efforts to foster increasing waste prevention. Analyses involving a wide range of drivers, including all of the candidates listed above, are relevant to these efforts. On the other hand, formulating policies for the OECD countries as a whole will benefit from the limited standardization provided by the continued common use of the two recommended standard drivers.

Having standard drivers permits the development of **roughly comparable** information on MW generation for the OECD regions and member countries. Having such information is useful. For example, consider Table 1. It was developed using the OECD's recent (unpublished) data on MW, as well as current data on population (Pop), and PFC. Currently, consistent data on MW generation is available for 1980, 1985, 1990, 1995, and 2000 for eleven OECD member countries, for all OECD regions and for OECD as whole. In addition, there are five countries for which household waste generation is available for all 5 years. Table 1 shows the countries and regions for which these data are available. Using the available data, the percentage growth in MW, MW/Pop, and MW/PFC between 1980 and 2000 was computed. For the countries indicated by asterisks, household waste was used in place of MW because it provided the more complete data series. Only countries with the full 5 years of data were considered so that, when the discussion turns to time series data below, a common set of countries can continue to be considered. The numerical rankings in Table 1 indicate the growth relative to the other countries or regions. Thus, for example, the "3" for the Netherlands shown under MW means that, among the 16 countries, the Netherlands' growth in MW from 1980 to 2000 was third from the bottom, (*i.e.*, above growth in Japan and France but below the growth of the rest). To make the pattern in the country rankings clearer, the countries are listed based on their ranking for MW, and divided in quartiles.

MW, MW/Pop and MW/PFC provide conceptually different measures of growth. Do these different measures produce the same or different rankings based on growth? As Table 1 shows, the answer is a bit of both:

- For the OECD countries with the highest and lowest growth in MW, all three approaches produce very similar rankings
- For the OECD and its broad regions, and for the member countries with "mid-range" growth in MW, there is great diversity in the ranking produced by the three methods.

The point of Table 1 is **not** to comment, favourably or unfavourably, on the waste growth in the OECD, the regions, or its member countries. The point of the table is simply to show how the consideration of two standard drivers facilitates the development of OECD-wide overviews such as that provided in Table 1.

Table 1. Ranking by Percent Growth: 1980-2000

| | MW | MW/Pop | MW/PFC |
|----------------------|----|--------|--------|
| Japan | 1 | 1 | 1 |
| France* | 2 | 2 | 4 |
| Netherlands | 3 | 3 | 3 |
| USA | 4 | 4 | 2 |
| Sweden | 5 | 8 | 11 |
| Belgium | 6 | 9 | 8 |
| Norway | 7 | 6 | 6 |
| Switzerland | 8 | 7 | 15 |
| Greece | 9 | 10 | 10 |
| UK* | 10 | 12 | 5 |
| Austria* | 11 | 11 | 9 |
| Turkey | 12 | 5 | 7 |
| Spain* | 13 | 14 | 13 |
| Italy | 14 | 15 | 16 |
| Luxembourg | 15 | 13 | 12 |
| Portugal | 16 | 16 | 14 |
| EU | 1 | 4 | 3 |
| OECD-All | 2 | 2 | 2 |
| OECD-Europe | 3 | 3 | 4 |
| North America | 4 | 1 | 1 |

*= HHW instead of MW

3.3 Performance of the Standard Drivers

Consideration of two criteria – Coupling and Predictability – provides a basis for distinguishing among the standard drivers as a basis for analytical exercises. Consideration of Coupling and Predictability generally suggests that PFC is a better driver choice than population. In the consideration of Coupling and Predictability as criteria, we will apply the graphical analyses introduced in Figure 1 in Chapter 2.

Figures 3 and 4 provide graphs for indexed values of MW, Pop, PFC, MW/Pop and MW/PFC, based on data for OECD-Europe and for OECD-North America. Inspection of Figure 3 shows that, for OECD-Europe, PFC and MW are closely coupled. In contrast, there is no discernible relationship between the magnitude and pattern of the growth in population and the growth in MW. Thus, on the basis of Coupling, one would select PFC, not population, as a driver. What about Predictability? The time trends in MW/PFC and \ln (MW/PFC) for OECD-Europe show no discernible time trend (i.e., the R^2 statistics are near zero). However, inspection of Figure 3 shows that MW/PFC is essentially constant, so the failure to discern a trend is exactly what one would expect. The low R^2 is no problem in this situation.

Figure 4 shows the same data for OECD-North America. In this figure, there is again close coupling between MW and PFC, but only up to about 1995; after 1995 they appear to decouple. In fact, this appearance is precisely correct. The behaviour of the North American data is dominated by the behaviour of the US data. There, examination of the time trend in \ln (MW/PFC) using a much longer US EPA data series (US EPA, 2002) covering the period 1960 to 2000 with significant detail in the period

1995 to 2000, shows decoupling between MW and PFC between 1960 and 1990, followed by decoupling between 1990 and 2000. This decoupling coincides with policy efforts to foster waste prevention in the US. Once one understands in detail what is going on in the US, the data for North America also supports the choice of PFC over population as a driver for MW generation.

Figure 3. MW and Drivers for OECD-Europe

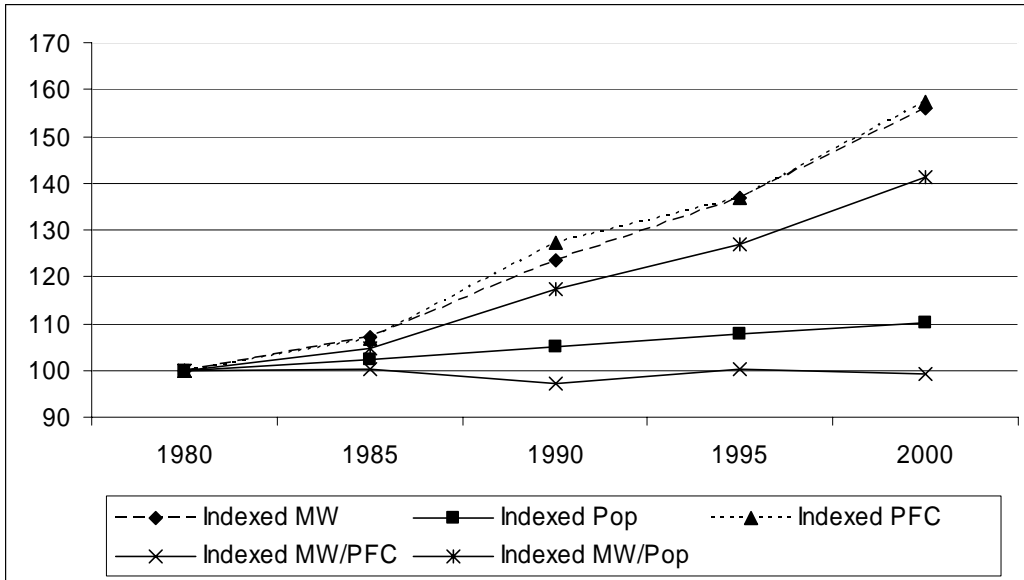
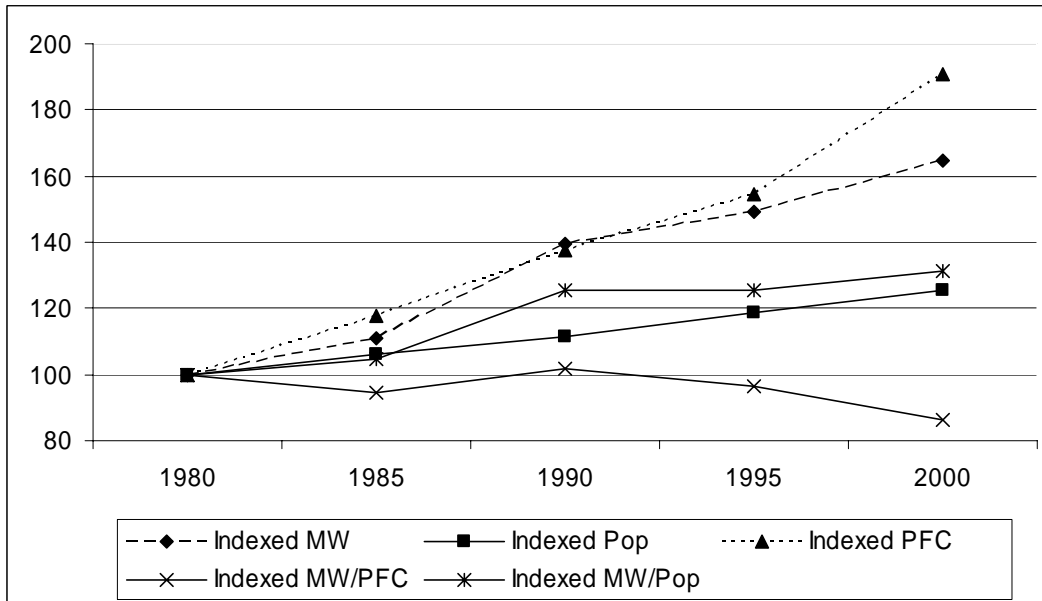


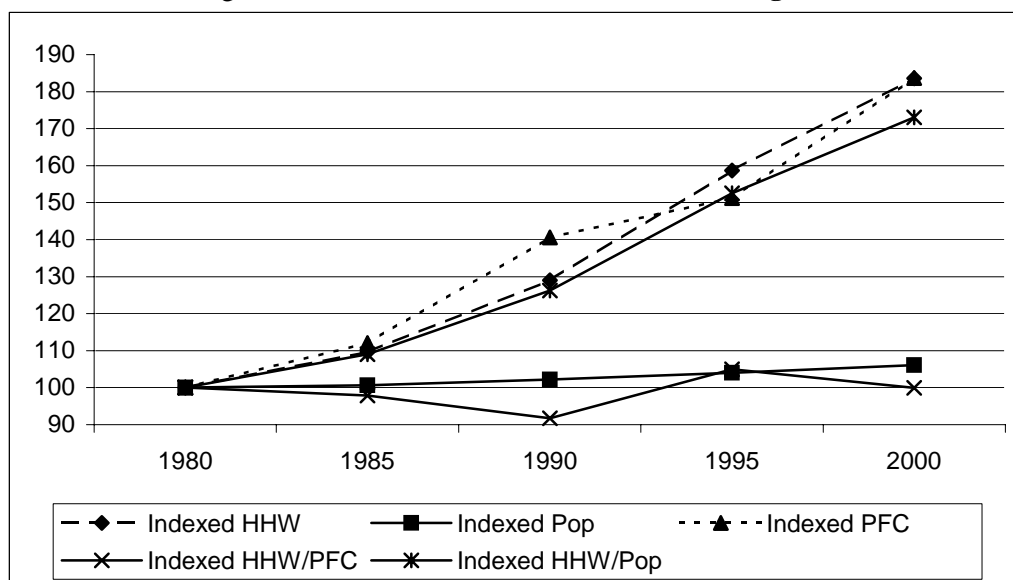
Figure 4. MW and Drivers for OECD-North America



The type of graphical analysis just discussed for the OECD regions can be applied to the 16 OECD member countries listed in Table 1. The 16 graphs required for that analysis are provided in Annex 2. Readers are urged to examine the full set of graphs, to see how diverse national-level MW growth patterns can be. Here we will comment on four countries which show a wide variation in their behavior. Graphs for these four countries—UK, Japan, Sweden, and Turkey—are provided in Figures 5 to 8 below.

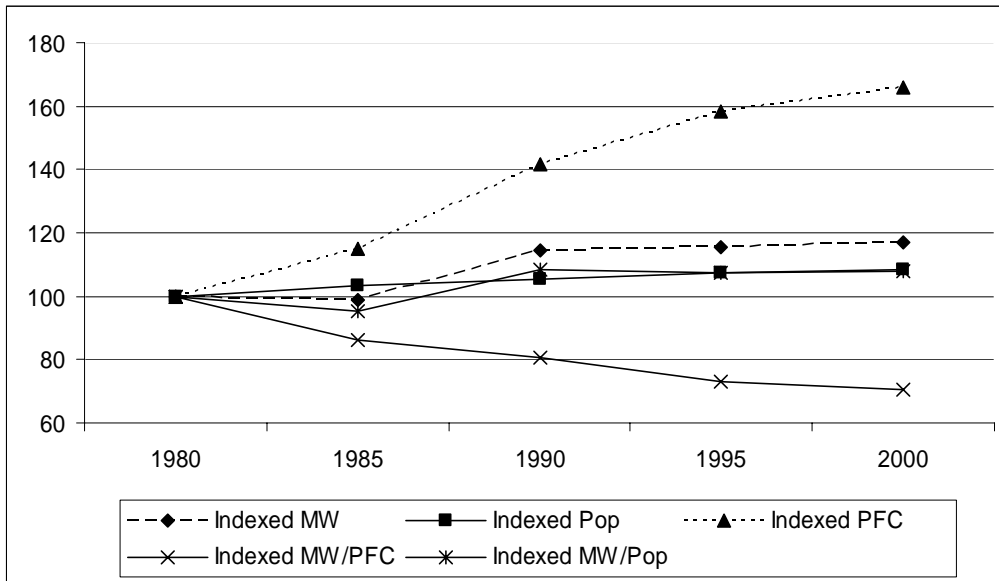
- United Kingdom (UK)** The UK had substantial growth in household waste (HHW) generation between 1980 and 2000, matched reasonably closely by substantial growth in PFC. In contrast, population growth was quite small. Thus, even though the pattern of growth in PFC does not exactly match that in HHW, PFC appears the better choice of driver for the UK data. The results of statistical analysis of the time trend in HHW/PFC are what one would expect given the “flat” graph shown in Figure 5: R^2 's are very low, as are the t statistics for the time terms, indicating no significant time trend in HHW/PFC. It should also be noted that the UK waste data is to a large extent based on estimates, which are not necessarily comparable for different years.

Figure 5. MW and Drivers for the United Kingdom



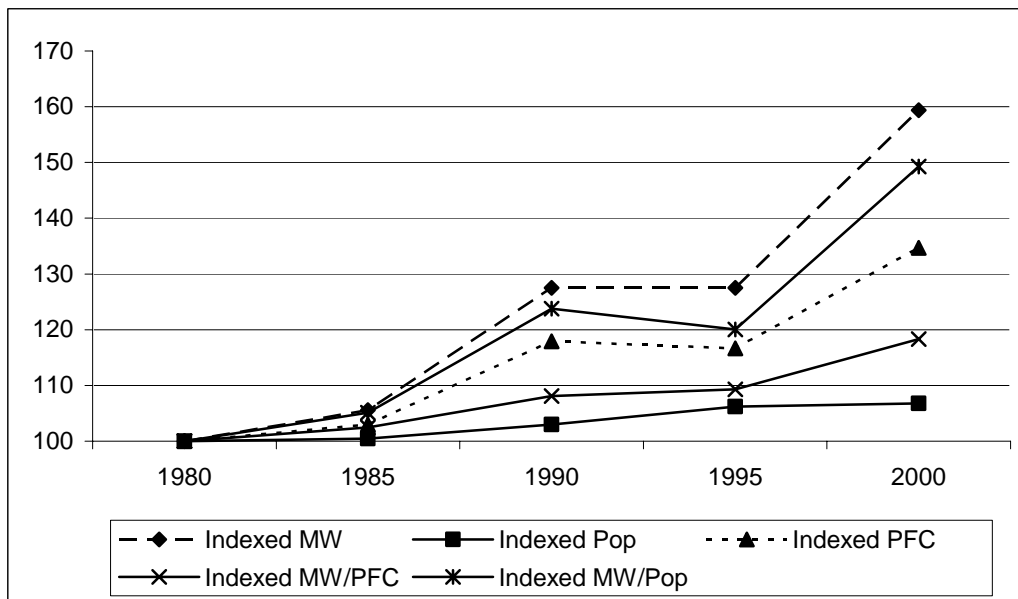
- Japan.** Based on Figure 6, it would be hard to argue that either PFC or population explains MW generation in Japan very well. Both MW and population grow slowly. However, population growth does not show the variations in growth that are clear for MW. MW generation follows a pattern somewhat similarly to PFC. However, use of PFC does not really help explain Japan's MW growth (or lack of it). Use of PFC as a driver simply produces a strong, highly statistically significant, decoupling trend.

Figure 6. MW and Drivers for Japan



- Sweden.** The similarity in the magnitude and pattern of growth between MW and PFC is quite clear, indicating that PFC, not population, is driving the generation of MW in Sweden. Use of PFC as a driver highlights a strong, upward trend in MW/PFC.

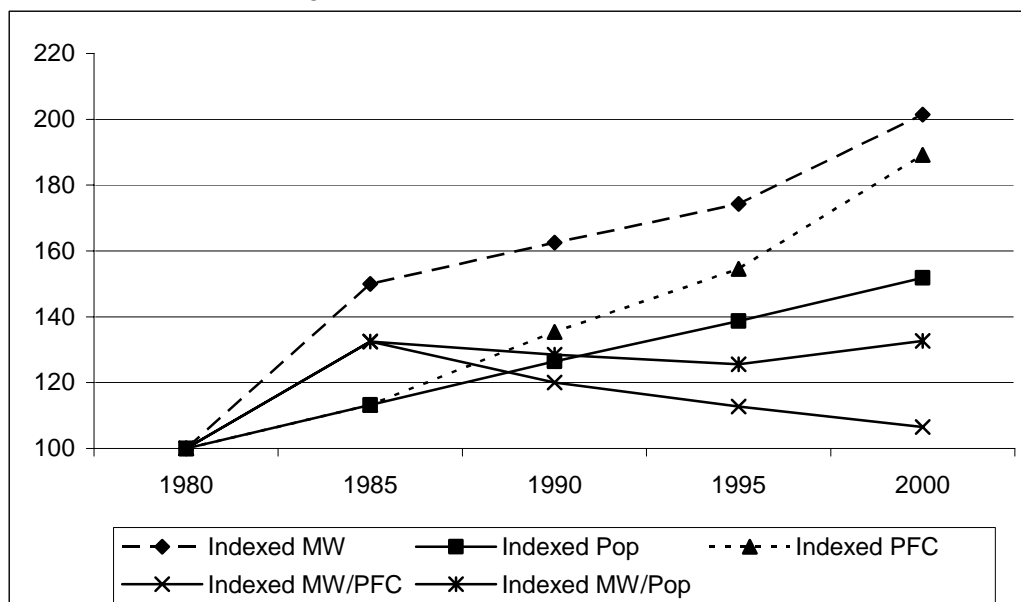
Figure 7. MW and Drivers for Sweden



- Turkey.** For Turkey, both population and PFC grow strongly over the entire 1980-2000 period. For MW, there is truly dramatic growth from 1980 to 1985, followed by much slower growth between 1985 and 2000. During the 1985-2000 period, PFC appears to explain MW growth a bit better than population. For example, after 10 years of reasonably uniform growth, growth in MW and PFC both pick up in the 1995-2000 period. There is no comparable acceleration in population growth. However, the most interesting feature of the data for Turkey is the observed slower growth in MW after 1985. Neither the behaviour of

population nor that of PFC explains this feature of the data. It should be noted that the Turkish waste data are, to a large extent, based on estimates.

Figure 8. MW and Drivers for Turkey



The UK, Japan, Sweden and Turkey provide a representative sample of what one finds in the full set of graphs presented in Annex 2. For most countries, the information suggests that, based on Coupling and, where a time trend might be possible, Predictability, PFC is a better choice of driver for MW than is population. In a few cases, such as Japan, the two may perform equally well (or equally poorly) as drivers.

The results presented underline some of the limitations of statistical time trends. For Japan and Sweden, the time trends for MW/PFC are about as good as one can get (high R^2 , t statistics well over 2.0). This **might** make one comfortable forecasting the behaviour of MW in these countries based on the expected future value of PFC and a time trend. However, there is the possibility that these relationships will shift, as they apparently did in Turkey, and as they clearly did in the US, as the earlier discussion based on the “long” US EPA data series for MW showed. And, even if the time trends are stable, their existence does not help policy-makers understand why in Japan MW/PFC falls, while in Sweden it rises.

3.4 Drivers for MW Components

MW can be divided into components in a number of different ways, reflecting the four dimensions of MW discussed in Section 3.1. Divisions based on the dimensions of Source and Composition is particularly relevant to issues of driver selection. They provide the framework for the discussion of drivers of MW components presented here. For the reasons discussed at the end of the section, divisions based on the dimensions of Management and Responsible Party are less relevant to driver selection.

From the perspective of Source, the obvious division of MW is into household and non-household waste. Both of these components are driven by PFC and population. Using the standard drivers could allow one to make cross country comparisons, such as those shown in Table 1 that would not be possible if different drivers were used for these two components. However, one can also choose additional drivers for use specifically with each of the two components:

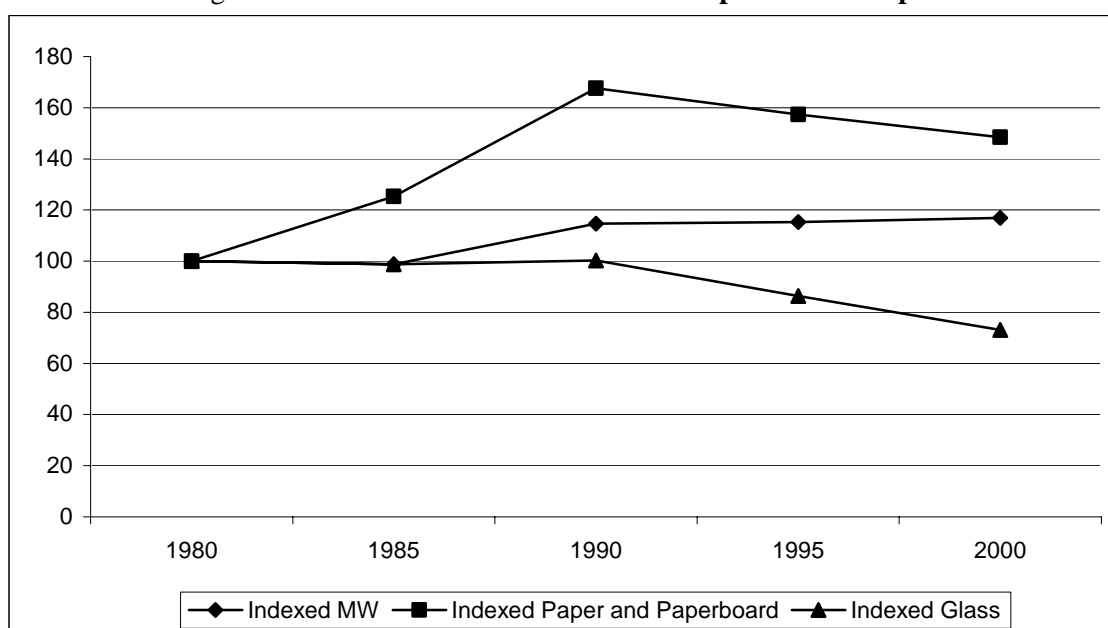
- In place of population, one might use number of households as a driver for household waste, and sectoral data on employment as a driver of non-household waste. This approach would mirror the successful approach to the forecasting of electricity use mentioned earlier in Section 2.2.
- One could divide PFC into residential and business-related components and use these components as drivers for the household and non-household components of MW.

The usefulness of such component-specific drivers will likely vary between countries, and will depend on the issues of particular concern. Some consumption behaviour may be influenced by household size, and household size can vary greatly over time. Finland found that taking this into account was quite useful (Vahvelainen, 2002). However, as Canada has noted, the greater general availability of standardized population data may make population a better choice than households in analyses of residential waste generation (Environment Canada, 2000).

Finally, it needs to be emphasized that analysing MW based on the behaviour of its household and non-household components is only useful if MW can be separated into those components. A glance at the OECD data shows that, while there is an attempt to make such a separation, very few countries have complete (*i.e.*, data series covering 1980 to 2000 at 5-year intervals), for both MW and household waste. Further, as EEA survey work has shown, there is reason to believe that, given current data collection arrangements, it is often not possible to divide municipal waste into these components (EEA, 2000).

Composition refers to the division of waste into material types—paper and paperboard, glass, etc.—and further into products and materials—office paper, glass, beverage containers, etc. The OECD provides information on the division of MW into material types. However, there are often gaps in these data. The graph provided in Figure 9 shows the growth, in Japan's MW and its paper and paperboard and glass components, for the period 1980 to 2000. As the graph shows, growth in these two components of MW is quite different from that of MW as a whole. This can often be the case.

Figure 9. Indexed Values of MW and Components for Japan



Note: 1995 Data is based on interpolation between 1990 and 2000 data

In addition to broad material categories, it may be useful to conduct Composition-based analyses which consider components of MW containing only specific durable or non-durable goods or types of packaging. This more disaggregated level of analysis would permit use of the Stuff Model approach discussed in Chapter 2. Rather than trying to find drivers for rather heterogeneous categories, such as paper and paperboard, one could use production statistics or trade data to drive narrower categories such as corrugated cardboard or “office paper” (*i.e.*, the standard-size paper used in computer printers and copiers). Working at this more detailed level might be useful because waste prevention efforts often focus on specific materials or products, not broad material categories. Unfortunately, the information required for such detailed analyses is not available in the standard OECD waste data.

Focusing on materials or products allows one to consider drivers measured in real monetary units or in physical units (*i.e.*, weight or volume). The choice between these options can influence the results obtained using the driver. For example, consider an analysis of food waste. The food waste stream could be driven by food purchases, measured in real monetary units or in weight. Assume, for purposes of illustration, that consumers decide to purchase the same total amount (*i.e.*, weight) of food, but to shift to a mix of foods with a higher average real price. Assume further, that the fraction of the food purchased which ends up as food waste is constant. In this situation there will be decoupling if the driver is measured in real monetary units, but not if the driver is measured in weight. The choice of measurement for the driver will depend on the purpose of the analysis being undertaken. What is important is to understand that the behaviour of W/D will depend on the choice of D **and** how it is measured.

One can also divide MW into components based on the Responsible Party or Management. In fact, focusing on Management, MW is often divided into the components which are recycled, composted, burned with or without energy recovery, and landfilled (EEA, 2002).⁵ There is certainly interest, for example, in explaining changes in the portion of MW which is recycled. However, recycling is best approached by first analysing generation as a whole, and then separately considering the portion recycled. This does not mean that concerns about recycling or other waste management options lack a connection to the choice of waste stream drivers. However, the connection comes about indirectly, through the identification of materials or products (*i.e.*, components of MW deferred relative to Composition, not Management) for which drivers need to be selected.

The points just made for MW components defined based on Management can be repeated more or less verbatim for those defined based on Responsible Party.

Based on the preceding discussion, what drivers should the OECD and its member countries adopt for use with MW components? The recommendations made with respect to the full MW stream apply as well to its components: the OECD and its members should adopt the standard drivers, population and PFC recommended for the full MW stream. In addition, member countries should identify and use component-specific drivers for analysis of the components of MW:

- Use of standard drivers will make shifts in composition, such as from glass to plastic for food and beverage containers, visible.
- Studies, such as the waste factor analysis by EEA (EEA, 1999a), has identified material-specific drivers and fit them into the framework defined by equation 2). Such studies can be very useful.

⁵ Please see also the discussion of waste in the reference document “Indicators to Measure Decoupling of Environmental Pressure from Economic Growth” SG/SD (2002)1 / FINAL.

3.5 Drivers and Qualitative Issues

Qualitative issues arise when one focuses on the impact of waste generation on human health and the environment. As was the case with analyses involving waste stream components defined by Responsible Party or Management, qualitative issues are only linked indirectly to the selection of waste generation drivers. When considering qualitative issues, the key concern is identifying the products and materials for which entry into the MW stream will give rise to qualitative concerns. Because the materials that give rise to such concerns are rather narrowly defined—fluorescent bulbs, consumer electronics, batteries, treated wood products, etc.—the most natural way to address the driver issue is to use consumption of the **specific products** as the driver, and to model the linkage to waste generation as in the Stuff Model. In that model, the linkage depends on the lag between purchase and “discard,” as well as the portion of the discards which enter the MW stream rather than being returned to the manufacturer, captured for remanufacturing, or processed by a specialized waste management program outside the MW management system.

In analyses involving qualitative issues it may be better to rely on **physical drivers** (*i.e.*, numbers of units of certain materials or products sold), rather than financial data on the value of sales.⁶ Also, driver data may need to be much more disaggregated and detailed than is usually used in waste stream analyses. Fortunately, recent developments in the development of **bar code data on sales** may provide just the type of information needed (Raftery *et al.*, 2002).⁷

3.6 An Application

After the 2001 Workshop, the Flemish Public Waste Agency (OVAM) made a study of waste prevention indicators. This study focused on the Flemish region of Belgium. OVAM addressed both MW and industrial waste in its study. As one would expect, the study involved the selection and use of drivers. In response to the previous version of this paper, the OVAM provided a summary of the results of its study. This section discusses the OVAM results related to MW. The OVAM results related to industrial waste are discussed in Section 4.3.

The OVAM results related to MW are quite interesting. They illustrate many of the points discussed in this paper:

- **Definition of MW and Drivers.** OVAM did not consider the entire MW stream. Instead, it focused on the portion of MW arising from the consumption of products at home. Similarly, the OVAM used only those components of PFC that include expenditures for products that households consume at home. Using these definitions, the OVAM found that MW per capita exhibits a rising trend over the period 1991 to 2001, while MW per unit of PFC shows a declining trend for the period 1996 to 2000.
- **Explanation.** OVAM also studied the behaviour of packaging waste, the prevalence of home composting, and the weight of reused products sold to the public. This portion of the OVAM analysis shows how one might try to explain decoupling (*i.e.*, a decline in MW per unit of PFC) as a consequence of policies fostering composting, packaging reduction, and reuse.

⁶ Please see the paper by Mr. Stutz in the reference document (OECD, 2002) for an example of the use of a physical driver.

⁷ Please see in particular the session of Statistics and Marketing.

- **Data Limitations.** Most of the OVAM analyses are based on short time series (*i.e.*, 1997 to 2001) for which disaggregation into useful components is difficult. These “data limitations” were an important concern for the OVAM, as they are in this paper.
- **Graphical Analysis.** The OVAM analysed its results using graphical analyses designed to allow one to see trends and linkages among the various factors under consideration.

While the OVAM approach and analyses differed in many details from this paper, the underlying approach is quite similar. OVAM used the standard drivers recommended here to address issues such as explanation of decoupling that are central to our discussion. OVAM encountered the same problem, data limitations, and used the same method, graphical analysis, suggested in this paper.

4. OTHER WASTE STREAMS

MW is only a small portion of the waste tonnage produced by the OECD member countries. Other significant waste streams include construction and demolition waste (C&D) and non-hazardous industrial waste (NHI). In principle, one can analyze these streams using the general approach outlined in Chapter 2. However, in practice, any such effort will differ significantly from the analyses of MW generation discussed in the preceding chapter. Section 4.1 below provides a discussion of **key differences** between MW and C&D or NHI. Section 4.2 addresses the identification of **candidate drivers** for these two waste streams. There is a bit more detail on C&D than on NHI. Division of the C&D stream into components and the selection of drivers for those components are treated, following closely the discussion and papers presented at the 2001 Workshop.

4.1 Key Differences

How do C&D and NHI differ from MW? Responding to this question is difficult because the differences are so numerous and so far-reaching. The four dimensions introduced for MW, Source, Composition, Responsible Party, and Management, provide a conceptual framework within which one can at least begin to see the enormity of the differences based on the definitions of the streams. One can view the C&D and NHI streams along the same dimensions as MW. However, what one sees is quite different. Here, a comparison of MW and C&D along the first dimension, Source, may be useful. MW is generated by households and certain other establishments. C&D comes from construction and demolition projects involving all types of buildings and infrastructures (*i.e.*, roads, bridges, airports, etc.). Additional differences related to waste stream definitions emerge as the other dimensions are considered.

A second type of difference between MW and C&D or NHI is a result of the **general absence** of historical, time series data for C&D and NHI. Some OECD member countries apparently have time series data for non-MW streams, but some do not. The absence of time series data is important because Coupling and Predictability, the two criteria for good drivers that allowed for the analysis and comparison of drivers for MW, cannot be brought into play without time series data on waste generation. Thus, the selection of drivers for other waste streams falls back on the remaining five criteria. However, as was the case for MW, application of these criteria is only sufficient to identify a reasonable pool of **candidate drivers** for a waste stream.

A third type of difference emerges if one tries to apply the Stuff Model, introduced in Chapter 2, to the C&D and NHI generation. In such applications, one must account for the **stock effect**: in construction and industrial activity, much of what is consumed (*i.e.*, purchased for use) ends up in stock (*i.e.*, the built environment for C&D and the products produced for NHI). Sooner or later, the stock does become waste. However, for C&D, the lag is measured in decades. For NHI, the discarded products are often part of a different waste stream. The Stuff Model remains relevant to the consideration of C&D and NHI. However, its application is conceptually much more difficult.

4.2 Selecting Drivers

In thinking about the selection of drivers for C&D or NHI, it is useful to return to the basic framework provided by equation 2), and to recast the framework slightly as follows:

$$2 a) W = D \cdot p$$

In equation 2 a), a **constant** proportionality factor, p , replaces the explanatory factor, ef .⁸ In practice, this factor will often be determined by selecting a plausible candidate driver D , and computing $p = W/D$, using a single year's data for W . In the use of 2 a), D is simply a measure of physical or economic activity which, based on the criteria of Independence, Connection, Background, and Effort, is a good candidate driver for W . One uses 2a) primarily for **scenario analysis** to see how W will change if its relationship to D remains proportional, or if it is varied in some fashion to simulate the impact of a waste prevention policy initiative or other concerns.

In the very simple framework just described, the criterion of Connection often plays a primary role. One selects drivers which are **logically related** to C&D or NHI generation. For NHI, this suggests the use of government data on industrial production expressed in real dollars, or in physical units for key industrial sectors (*i.e.*, tons of steel or cements, numbers of cars and trucks, etc.).⁹ For C&D, a bit more can be said. C&D is far less well studied than MW. However, the EEA (EEA, 1999a; EEA, 1999b), the UK,¹⁰ and the US (US EPA, 1998) have all conducted such studies. The available studies do suggest drivers for C&D:

- The cited studies by the EEA have shown that C&D generation per capita is strongly correlated with the construction component of GDP expressed on a per-capita basis. This suggests that this component of GDP may provide a driver for C&D generation. Logic also supports this choice.
- C&D divides naturally into waste from roads and associated infrastructure such as bridges, and that from building construction or renovation. Measures directly related to these component streams, such as kilometres of road constructed or repaired, and building permits issued for construction or renovation, provide possible drivers for these component streams.

The cited studies by the UK and the US also provide the basis for estimating the constant, p , which together with the selection of a driver, is crucial to scenario analysis of C&D generation.

GDP is a reasonable choice for a standard driver of C&D and NHI. Use of GDP would cause the associated waste prevention indicators, C&D/GDP and NHI/GDP, to pick up "waste prevention" due to changes in the structure of the economy; for example, from a further shift from manufacturing to services or from the conclusion of a major road construction program. Use of GDP as a driver for C&D and NHI would be consistent with the EEA's practice of analysing growth of total waste generation in relation to growth in GDP.¹¹ Population, the other potential standard driver for MW, lacks a clear logical connection to the generation of C&D or NHI. However, it should be noted that a recently published EEA paper (Brodersen *et al.*, 2002) indicates an interest in C&D and NHI per capita for use as waste prevention indicators. If consistency with the EEA is particularly important to the OECD and its members, population might be considered as an **additional standard driver** for C&D and NHI.

⁸ As the EEA points out in the reference documents (EEA, 1999a; EEA, 1999b), reducing ef to a constant is often necessitated, due to data limitations.

⁹ Please see the OECD data compendium in the reference document (OECD, 1999) for such data. Also see the EEA studies (EEA, 1999a) for additional data sources.

¹⁰ Please see the paper by Ms. Hobbs in the reference document (OECD, 2002).

¹¹ Please see the discussion of total waste generation in Section 12.2 of the reference document (EEA, 2002).

4.3 An Application

The OVAM addressed industrial waste as well as MW. As was the case for MW, the OVAM results for industrial waste show differences in detail as well as broad agreement in approach with this paper. The OVAM used GNP as a driver for total industrial and for the associated hazardous waste. Interestingly they had time series data for 1992-2000 and GNP data for 1995-1999. Thus, their analysis of the residual, Waste/GNP, was not as limited as suggested by the discussion in this section. The OVAM analysis showed no decoupling for total industrial waste and an increasing trend in hazardous waste/GNP.

Consistent with the discussion in this section (and indeed this entire paper), the OVAM did not rely on GNP as the sole driver for use in its analyses. Instead, the OVAM used a variety of drivers. The drivers selected by the OVAM appear to be suggested primarily by the criterion on Consistency, as was suggested would be the case in Section 4.2 above. The analyses of industrial waste generation conducted by the OVAM were also concerned with decoupling (or its absence) and prediction. Presumably the OVAM's selection of specific drivers was guided in part by these concerns, as the paper suggests should be the case. In addition, the OVAM's discussion indicates the policy relevance was a concern. The OVAM asks, but is currently unable to determine, the extent to which observed trends are the result of "prevention".

5. RECOMMENDATIONS

Based on the discussion in the preceding sections, the following recommendations are suggested:

- The OECD should continue working towards harmonization of waste data collection across member countries, seeking better consistency of the data provided with the OECD waste definitions.
- The OECD and its member countries should strive to provide longer and more complete time series data for MW, and for MW components such as household waste, specific materials and amounts recycled that are of particular interest.
- The OECD should adopt the seven criteria proposed in Chapter 2 as a general basis for selecting good drivers for waste streams.
- The OECD should continue using population and PFC as standard drivers for MW.
- The OECD should adopt GDP as a standard driver for C&D and NHI. As noted in Section 4.2, population could be another standard driver for these waste streams.

The recommendations stated above suggest population (Pop) and PFC as standard drivers for MW, and GDP as a standard driver for C&D and NHI. The OECD should encourage member countries to conduct and share studies using these drivers. Studies using the other candidate drivers identified in Chapters 3 and 4 should be encouraged as well, but should not replace efforts based on the standard drivers.

Consistent with these recommendations, the OECD and its member countries should adopt the corresponding intensities of waste generation, MW/Pop, MW/PFC, C&D/GDP, and NHI/GDP, as waste prevention indicators for **trial use**. These indicators should complement the use of the present indicators on the generation of MW, C&D and NHI.

REFERENCES

- Bolet, A. M. (eds.) (1985), *Forecasting US Electricity Demand – Trends and Methodologies*, CSIS Energy Policy Series, Westview Press.
- Brodersen, J. *et al.* (2002), “Towards a core set of indicators on waste and material flows”, Draft paper presenting the core set of indicators prepared by the European Topic Centre on Waste and Material Flows (ETC/WMF), April, Received from Gitte Hansen, ETC Administrator (etcw-grh@MST.DK).
- EEA (European Environment Agency) (1999a), *Baseline projections of selected waste streams – Development of a methodology*, Technical report No. 28, Copenhagen.
- EEA (1999b), *Development and application of waste factors – an overview*, Technical report No. 37, Copenhagen.
- EEA (2000), *Household and municipal waste: Comparability of data in EEA member countries*, Topic report No. 3, Copenhagen.
- EEA (2002), *Environmental signals 2002 – Benchmarking the millennium*, Environmental assessment report No. 9, Copenhagen.
- Environment Canada (2000), *Manual on Generally Accepted Principles (GAP) for Calculating Municipal Solid Waste System Flow*, Development of a Methodology for Measurement of Residential Diversion in Canada.
- Goldstein N. and Madtes C. (2001), “The State of Garbage in America –13th Annual Nationwide Biocycle Survey”, *BioCycle*, Vol. 42, No. 12, PA.
- Lund, R. T. (1996), *The Remanufacturing Industry: Hidden Giant*, Boston University, Boston.
- OECD (1999), *OECD Environmental Data – Compendium 1999*, OECD, Paris.
- OECD (2000), *Strategic Waste Prevention – OECD Reference Manual*, ENV/EPOC/PPC(2000)5 /FINAL, OECD, Paris, www.oecd.org/env/waste.
- OECD (2001), *OECD Environmental Strategy for the First Decade of the 21st Century*, OECD, Paris, www.oecd.org/env/waste.
- OECD (2002), *OECD Workshop on Waste Prevention: Toward Performance Indicators*, ENV/EPOC/WGWPR/SE(2002)1/FINAL, OECD, Paris, www.oecd.org/env/waste.
- Raftery, A. E. *et al.* (eds.) (2002), “Statistics in the 21st Century”, Monographs on Statistics and Applied Probability, American Statistical Association, 93.

US EPA (1998), *Characterization of Building-Related Construction and Demolition Debris in the United States*, Franklin Associates, Washington DC.

US EPA (1999), *National Source Reduction Characterization Report For Municipal Solid Waste in the United States*, EPA530-R-99-034, Washington DC.

US EPA (2002), *Municipal Solid Waste in the United States: 2000 Facts and Figures*, EPA530-R-02-001, Washington DC.

Vahvelainen, S. (2002), "Industrial and Consumption Waste: How to Meet the Indicator Needs: Experiences from Finland", *Statistical Journal of the UNECE*, 19, Geneva.

ANNEX 1: SIMULATION MODEL FOR WASTE GENERATION

The following pages show the equations and parameter values used in the simulation modelling exercise based on the Stuff Model for which results are provided in Figure 2. As indicated in the text of the paper, the behaviour of the Stuff Model is determined by two functions: $g(t)$ which determines the growth in consumption; and $d(t)$ which determines the portion of consumption which after a lag becomes waste. In the simulation, $g(t)$ is set based on a constant growth rate g , set at 1.5 percent per year for illustrative purposes, and modified by yearly fluctuations of + or - 30 percent. The size of these random fluctuations is determined by the constant, b , which is set at .3.

As described in the paper, for the first 10 years $d(t)$ is a constant, a , set at 1.0 in the simulation. Starting in year 11, $d(t)$ begins to fall following the formula shown in equation 7 on the next page. How fast $d(t)$ falls is controlled by the choice of the constant, c , which in the simulation is set at .1. By the end of the simulation, only 42 percent of the previous year's consumption ends up as waste. This leads to substantial decoupling, with the ratio $W(t)/D(t)$ falling from 85 to 89 percent in the first 10 years, to 32 percent in year 20. However, even with this level of decoupling, growth in the waste stream is only checked. Waste generation does not fall substantially.

Simulation Model For Waste Generation

Equations:

- 1 $D_t = (1+g(t))D_{t-1}$
- 2 $W_t = d(t)D_{t-1}$
- 3 $W_t/D_t = d(t)/(1+g(t))$
- 4 $W_t/W_{t-1} = [d(t)/d(t-1)]*[1+g(t-1)]$
- 4a $W_t/W_{t-1} = (1-d) (1+g) \sim 1+(g-d)$
- 3a $W_t/D_t = [d_0(1-d)^t]/(1+g)$
- 5 $g(t) = g^* (1+ b^* e(t))$
- 6 $d(t) = a, t=1...10$
- 7 $d(t) = a [1-c^*g^*(t-10)]*d(t-1), t=11...20$

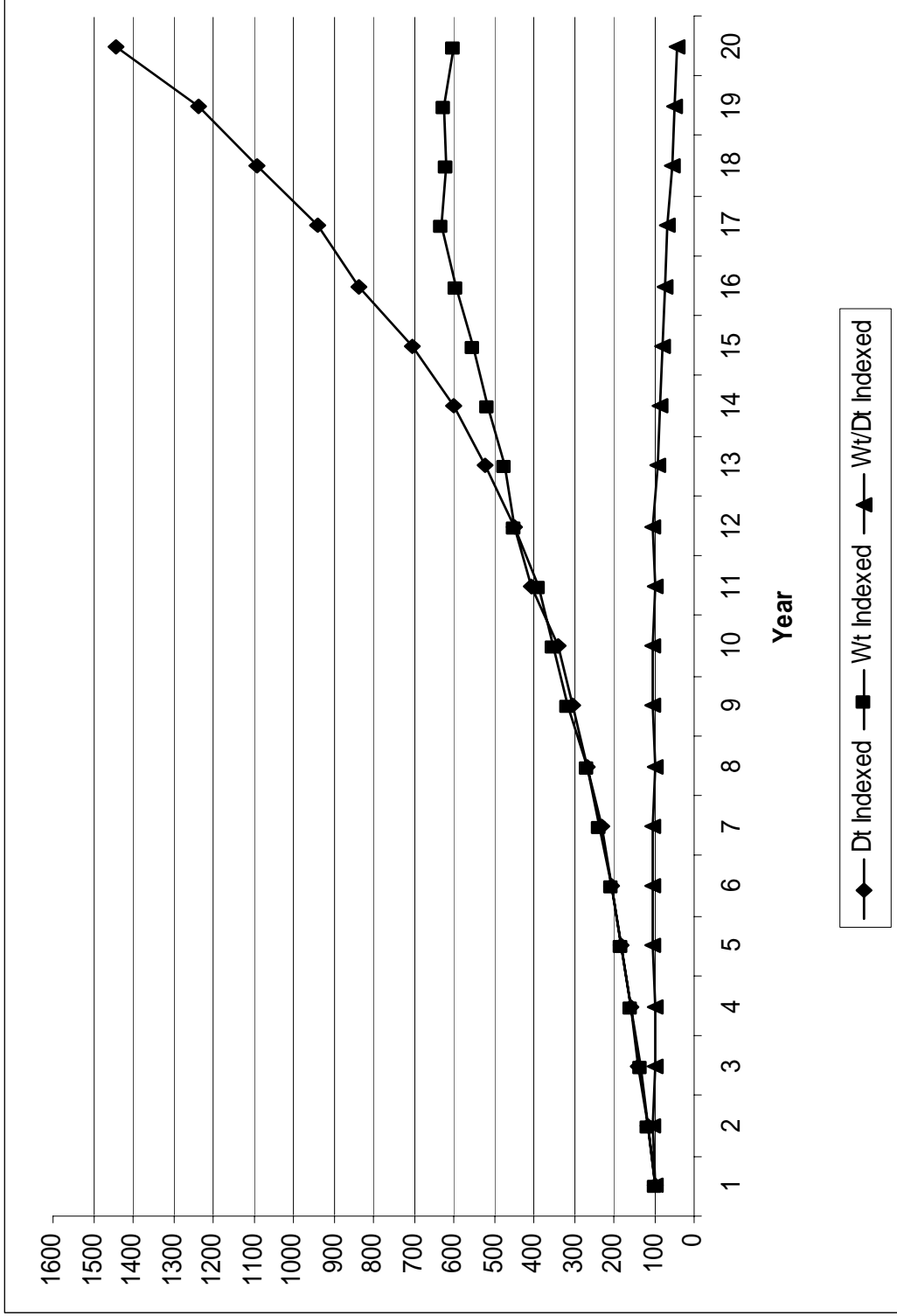
Parameters:

| | |
|------------------|------|
| g = | 0.15 |
| D ₀ = | 100 |
| a = | 1 |
| b = | 0.3 |
| c = | 0.1 |

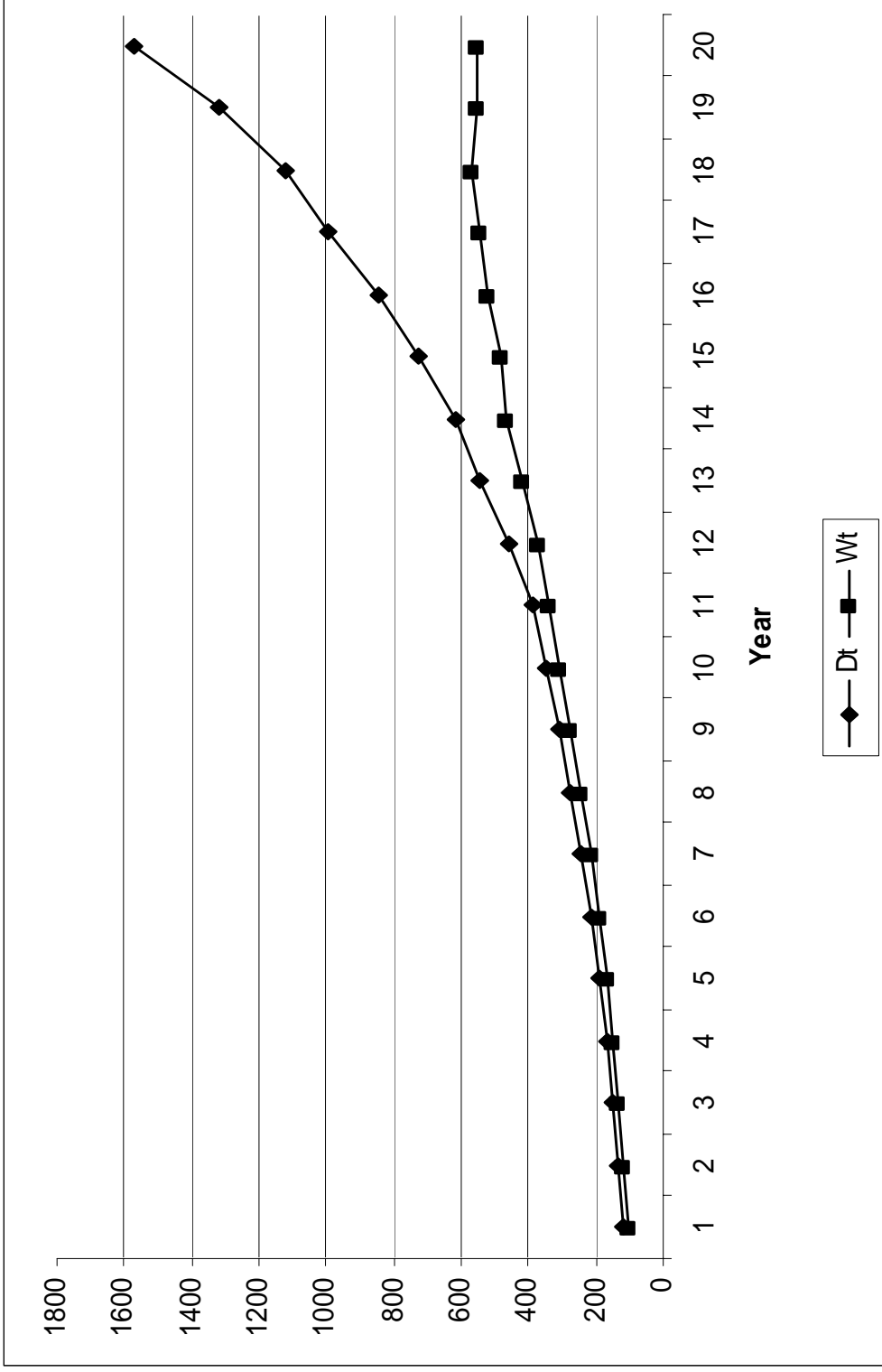
These can be changed and will flow through to the spreadsheet and graphs below

| Year | g | D ₀ | d(t) | e(t) | g(t) | D _t | W _t | W _t /D _t | W _t /W _{t-1} | D _t | | W _t | | W _t /D _t | |
|------|------|----------------|------|-------|------|----------------|----------------|--------------------------------|----------------------------------|----------------|---------|----------------|---------|--------------------------------|---------|
| | | | | | | | | | | Indexed | Indexed | Indexed | Indexed | Indexed | Indexed |
| 1 | 0.15 | 100 | 1 | 0.28 | 0.16 | 116.24 | 100.00 | 0.86 | 1.16 | 100 | 100 | 100 | 100 | 100 | 100 |
| 2 | 0.15 | 100 | 1 | 0.15 | 0.16 | 134.47 | 116.24 | 0.86 | 1.16 | 115.68 | 116.24 | 100.48 | 100.48 | 100.48 | 100.48 |
| 3 | 0.15 | 100 | 1 | 0.70 | 0.18 | 158.89 | 134.47 | 0.85 | 1.16 | 136.69 | 134.47 | 98.38 | 98.38 | 98.38 | 98.38 |
| 4 | 0.15 | 100 | 1 | 0.29 | 0.16 | 184.78 | 158.89 | 0.86 | 1.18 | 158.96 | 158.89 | 99.95 | 99.95 | 99.95 | 99.95 |
| 5 | 0.15 | 100 | 1 | -0.50 | 0.13 | 208.32 | 184.78 | 0.89 | 1.16 | 179.21 | 184.78 | 103.11 | 103.11 | 103.11 | 103.11 |
| 6 | 0.15 | 100 | 1 | -0.30 | 0.14 | 236.77 | 208.32 | 0.88 | 1.13 | 203.68 | 208.32 | 102.28 | 102.28 | 102.28 | 102.28 |
| 7 | 0.15 | 100 | 1 | -0.60 | 0.12 | 265.88 | 236.77 | 0.89 | 1.14 | 228.73 | 236.77 | 103.51 | 103.51 | 103.51 | 103.51 |
| 8 | 0.15 | 100 | 1 | 0.58 | 0.18 | 312.66 | 265.88 | 0.85 | 1.12 | 268.97 | 265.88 | 98.85 | 98.85 | 98.85 | 98.85 |
| 9 | 0.15 | 100 | 1 | -0.55 | 0.13 | 351.82 | 312.66 | 0.89 | 1.18 | 302.66 | 312.66 | 103.30 | 103.30 | 103.30 | 103.30 |
| 10 | 0.15 | 100 | 1 | -0.64 | 0.12 | 394.44 | 351.82 | 0.89 | 1.13 | 339.33 | 351.82 | 103.68 | 103.68 | 103.68 | 103.68 |
| 11 | 0.15 | 100 | 0.99 | 0.88 | 0.19 | 469.28 | 388.52 | 0.83 | 1.10 | 403.70 | 388.52 | 96.24 | 96.24 | 96.24 | 96.24 |
| 12 | 0.15 | 100 | 0.96 | -0.96 | 0.11 | 519.34 | 448.37 | 0.86 | 1.15 | 446.77 | 448.37 | 100.36 | 100.36 | 100.36 | 100.36 |
| 13 | 0.15 | 100 | 0.91 | 0.24 | 0.16 | 602.80 | 473.87 | 0.79 | 1.06 | 518.57 | 473.87 | 91.38 | 91.38 | 91.38 | 91.38 |
| 14 | 0.15 | 100 | 0.86 | 0.12 | 0.16 | 696.57 | 517.02 | 0.74 | 1.09 | 599.24 | 517.02 | 86.28 | 86.28 | 86.28 | 86.28 |
| 15 | 0.15 | 100 | 0.79 | 0.60 | 0.18 | 819.93 | 552.65 | 0.67 | 1.07 | 705.36 | 552.65 | 78.35 | 78.35 | 78.35 | 78.35 |
| 16 | 0.15 | 100 | 0.72 | 0.86 | 0.19 | 974.61 | 591.97 | 0.61 | 1.07 | 838.43 | 591.97 | 70.60 | 70.60 | 70.60 | 70.60 |
| 17 | 0.15 | 100 | 0.65 | -0.65 | 0.12 | 1092.23 | 629.76 | 0.58 | 1.06 | 939.61 | 629.76 | 67.02 | 67.02 | 67.02 | 67.02 |
| 18 | 0.15 | 100 | 0.57 | 0.31 | 0.16 | 1271.26 | 621.07 | 0.49 | 0.99 | 1093.62 | 621.07 | 56.79 | 56.79 | 56.79 | 56.79 |
| 19 | 0.15 | 100 | 0.49 | -0.41 | 0.13 | 1438.25 | 625.28 | 0.43 | 1.01 | 1237.28 | 625.28 | 50.54 | 50.54 | 50.54 | 50.54 |
| 20 | 0.15 | 100 | 0.42 | 0.36 | 0.17 | 1677.11 | 601.31 | 0.36 | 0.96 | 1442.77 | 601.31 | 41.68 | 41.68 | 41.68 | 41.68 |

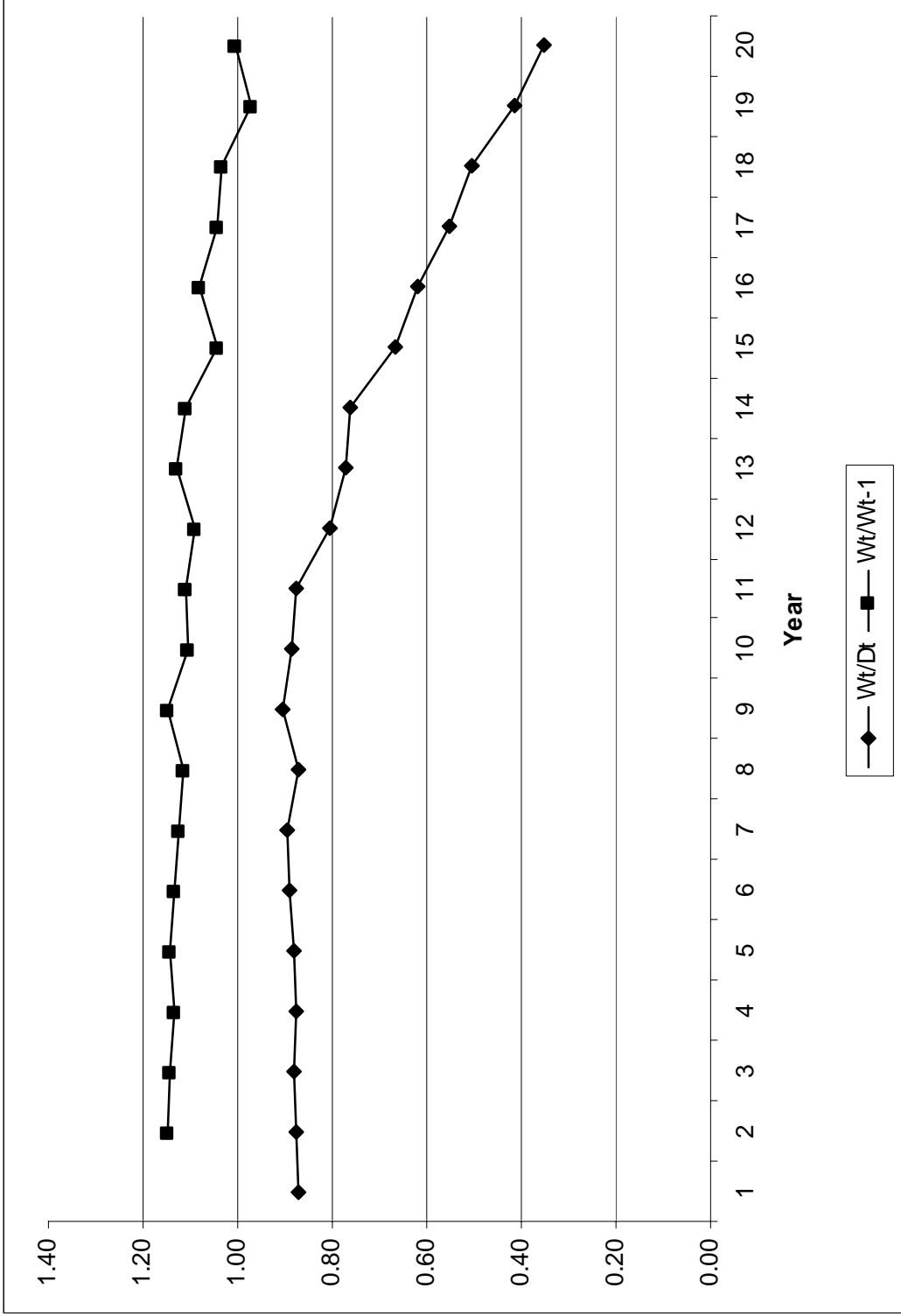
Graph of D_t (Indexed), W_t (Indexed) and W_t/D_t (Indexed) from Simulation



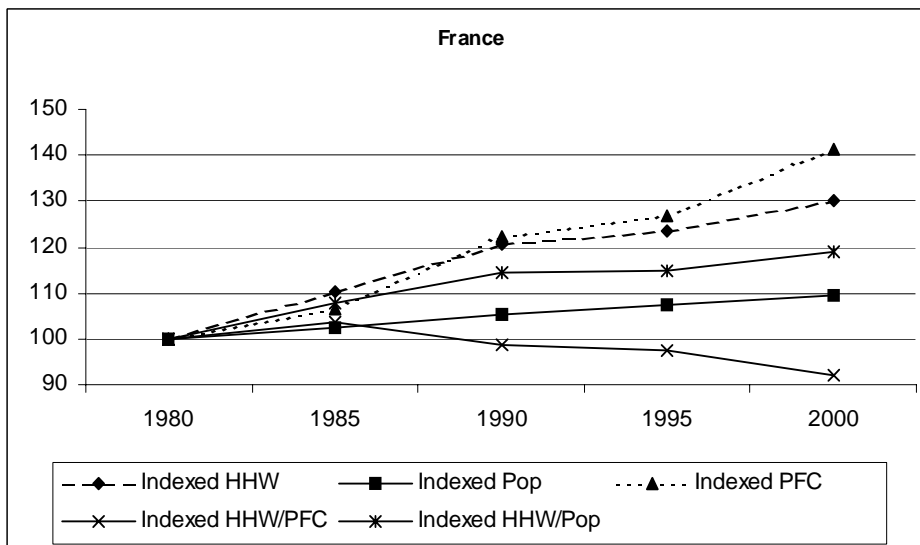
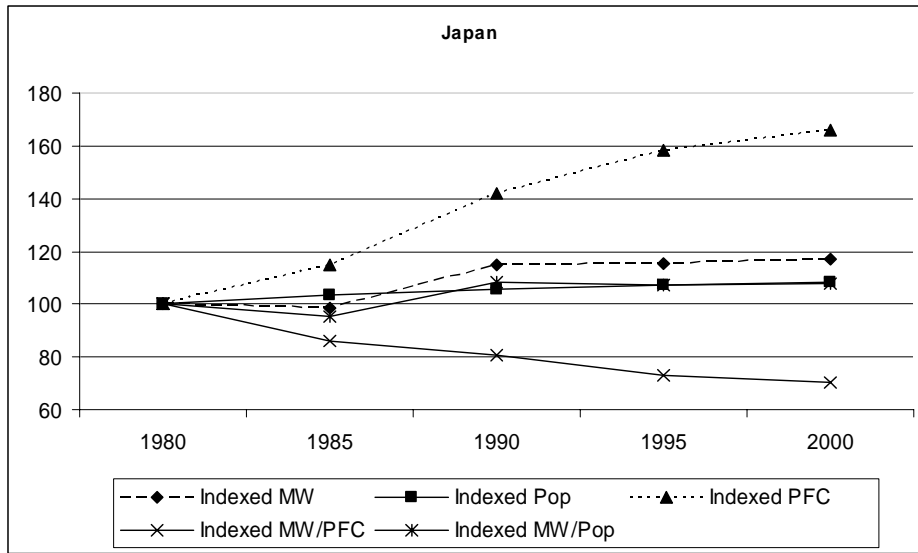
Graph of D_t and W_t from the Simulation

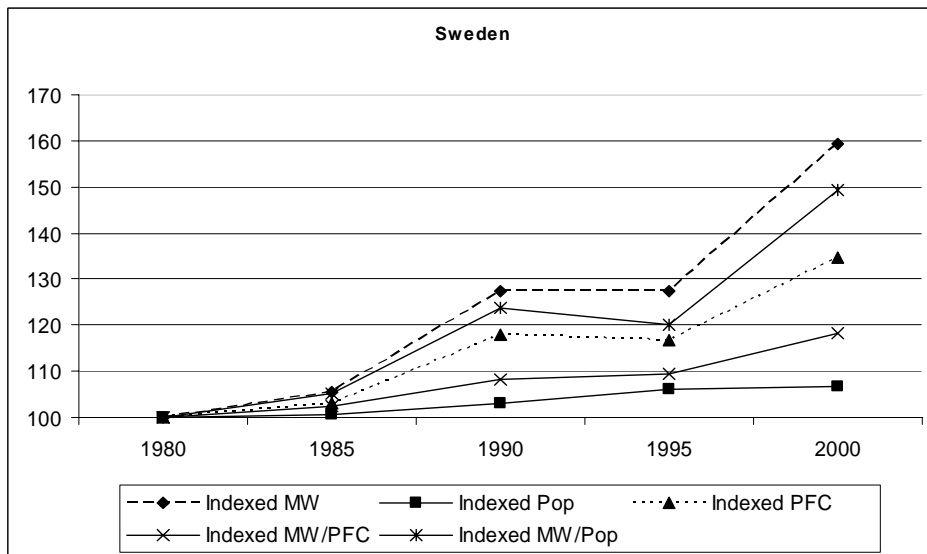
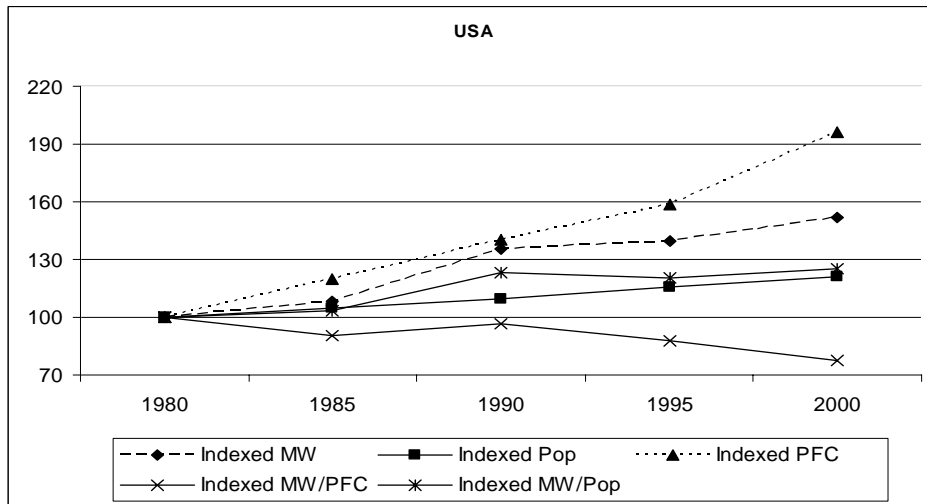
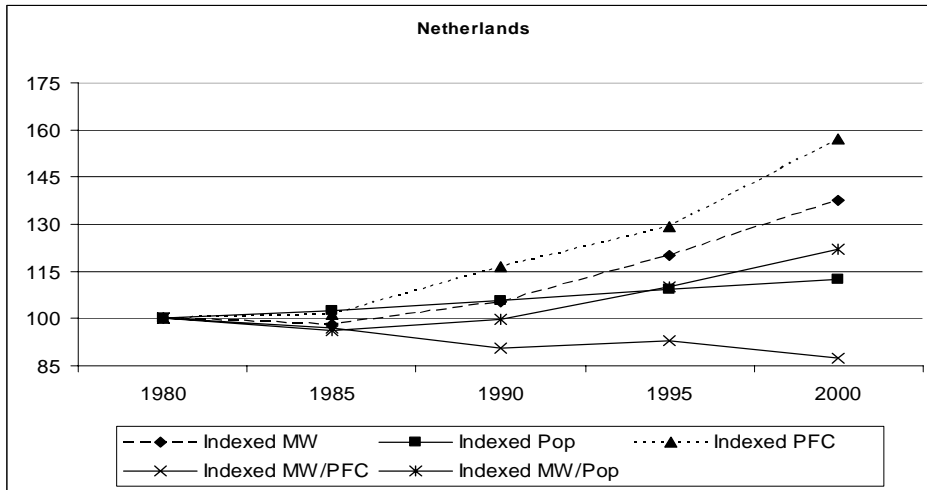


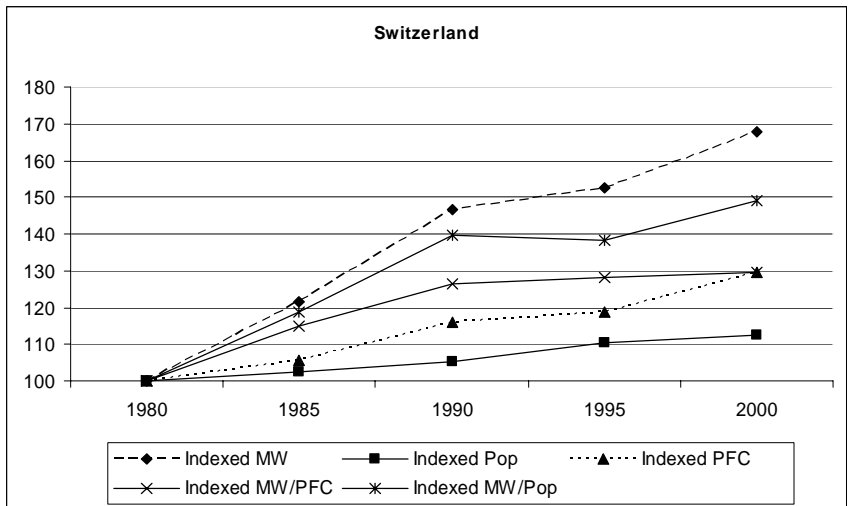
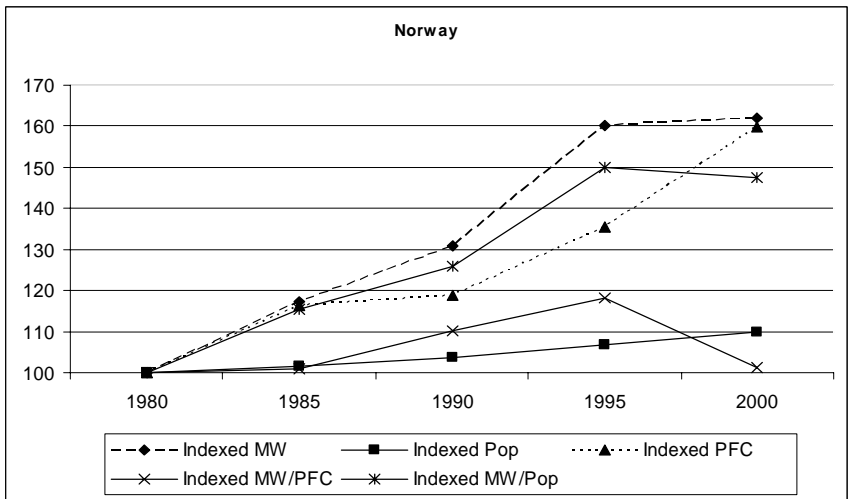
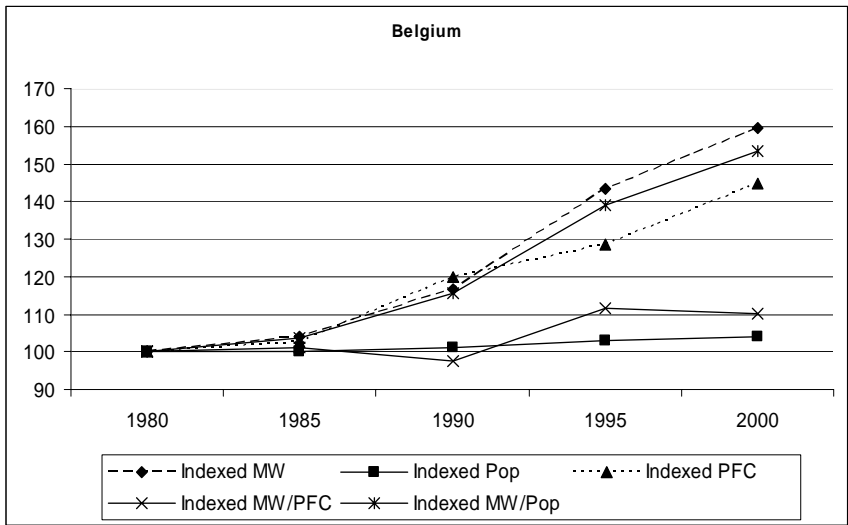
Graph of W_t/D_t and W_t/W_{t-1} from the Simulation

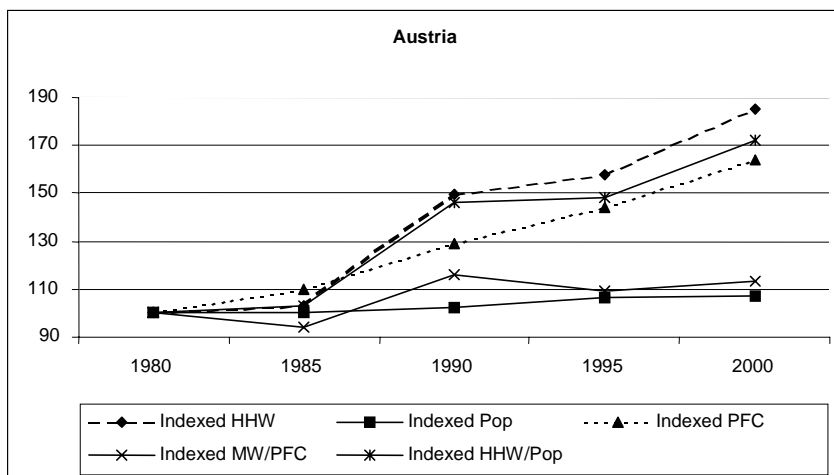
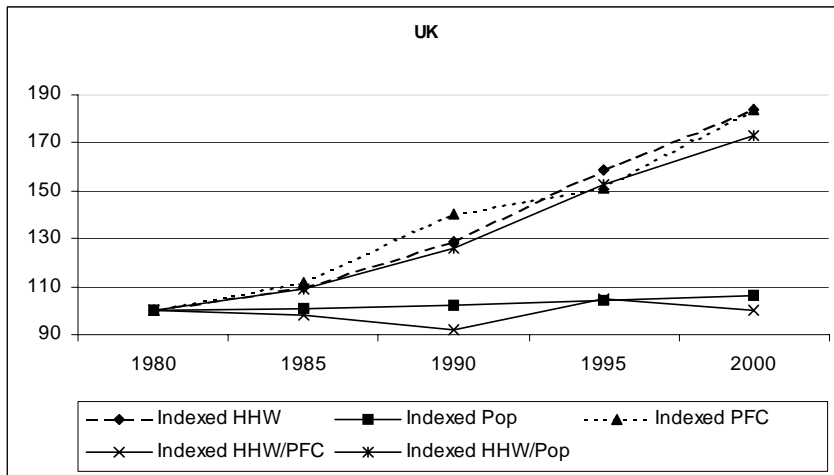
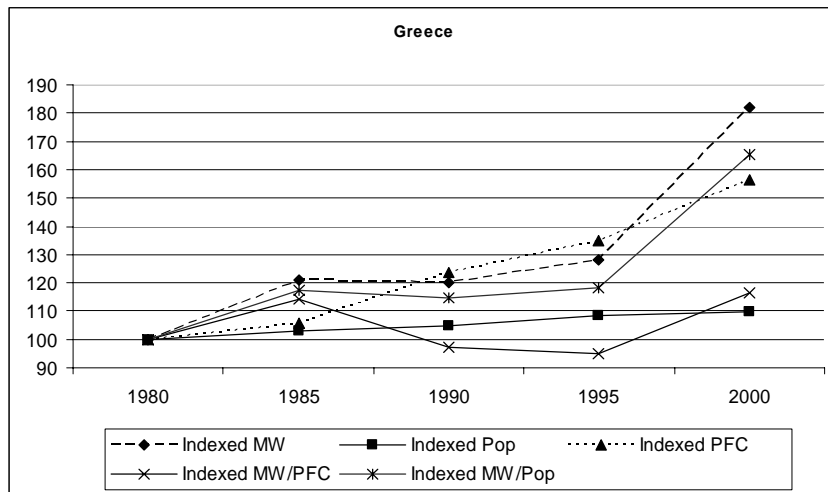


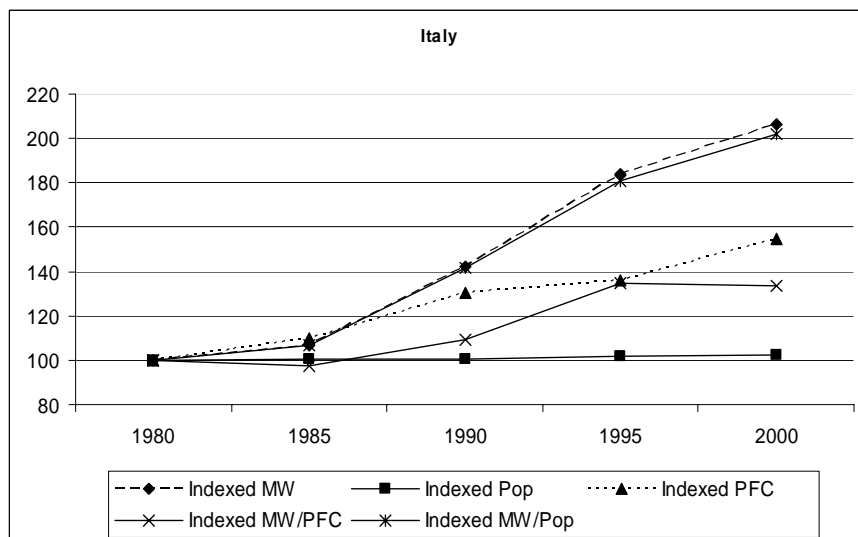
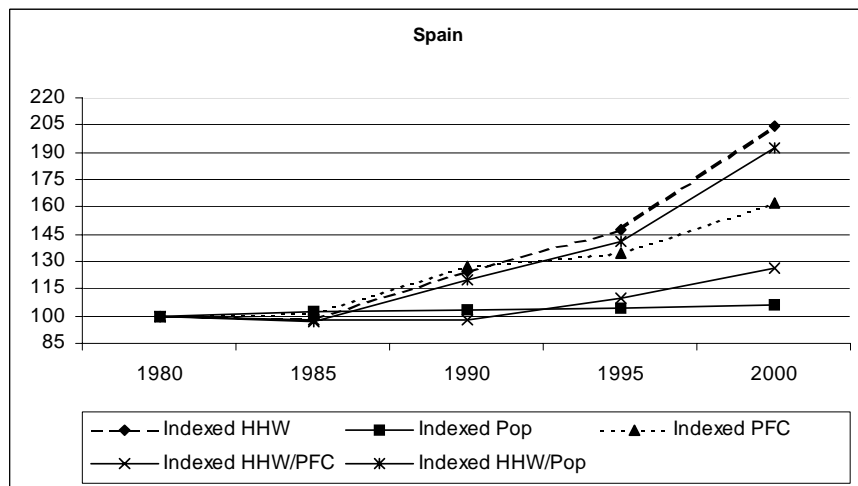
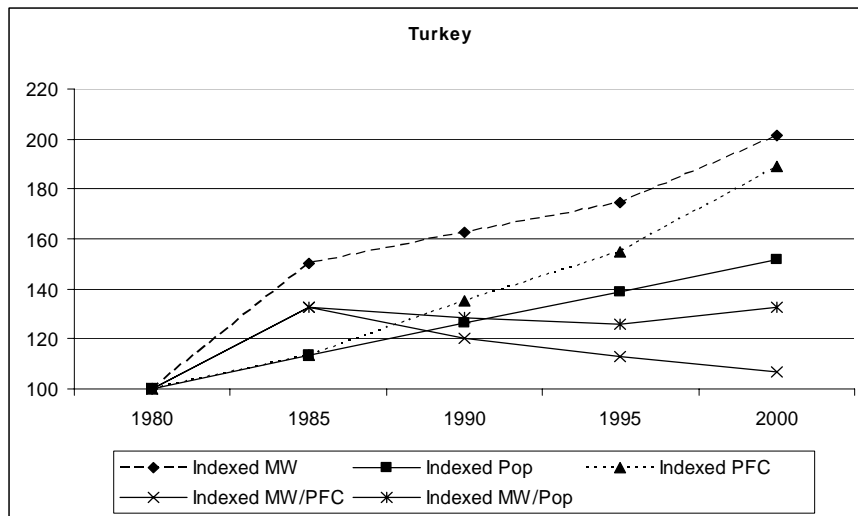
ANNEX 2: INDEXED VALUES OF MW GENERATION AND DRIVERS

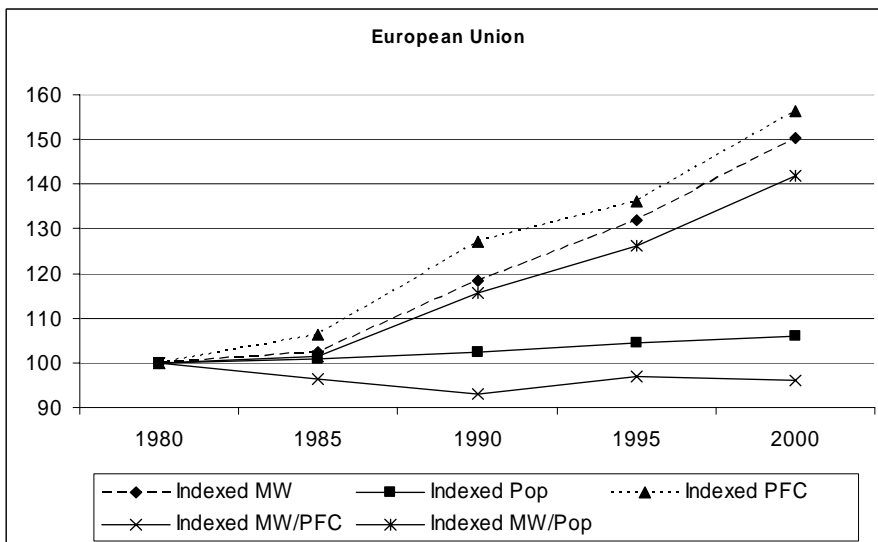
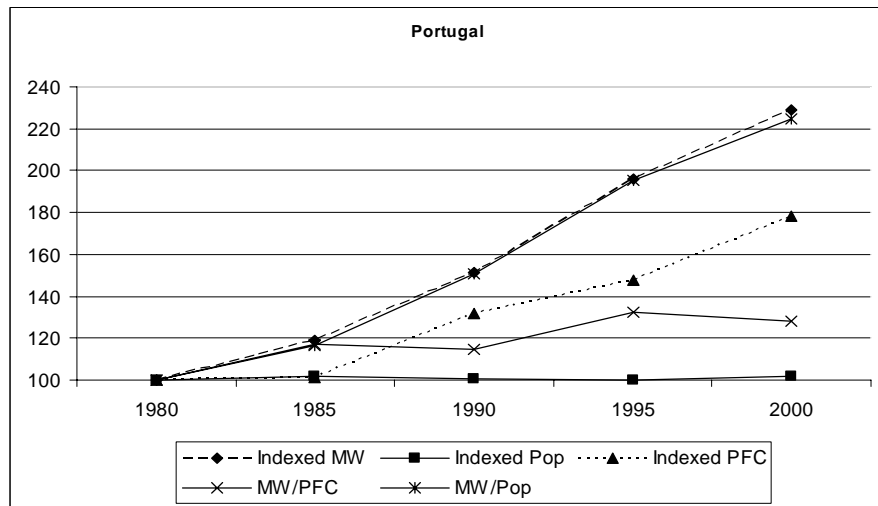
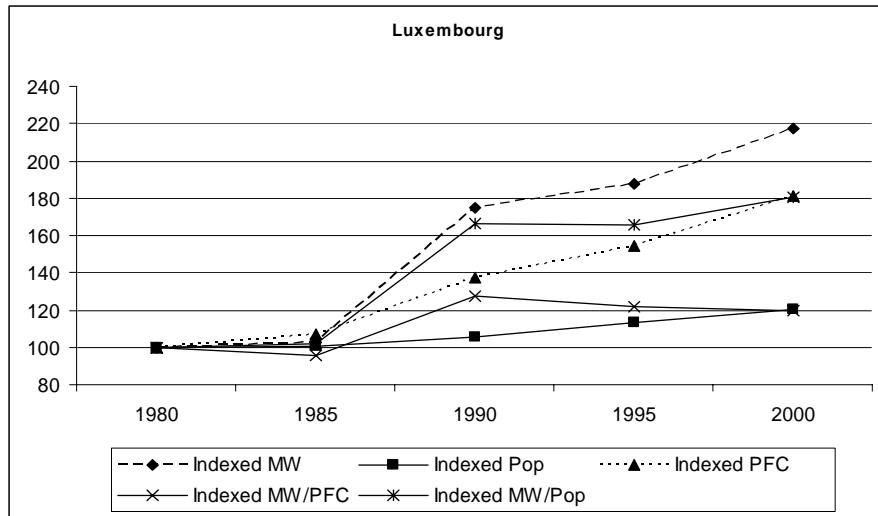


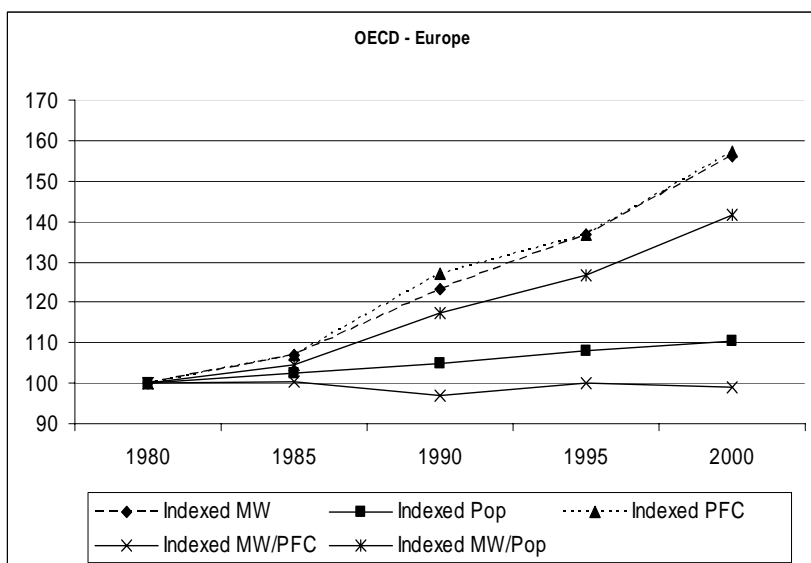
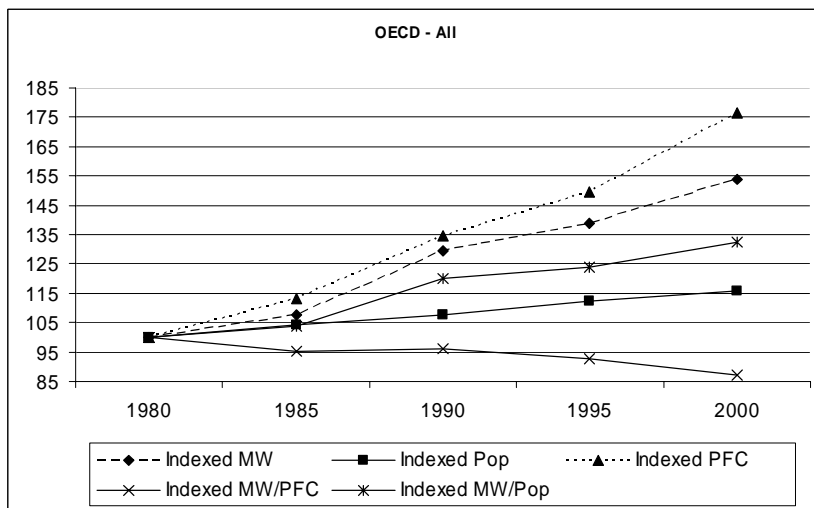
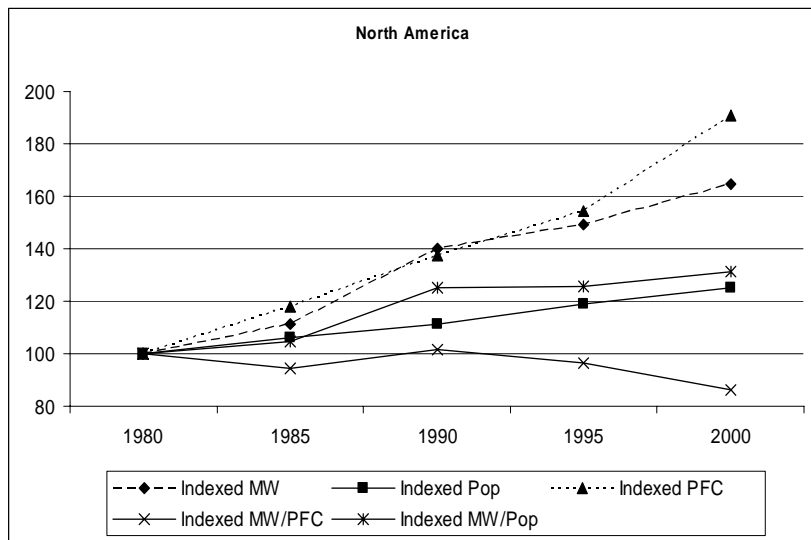












PART 2

RESPONSE INDICATORS

6. INTRODUCTION

Response indicators address the extent of societal responses to environmental concerns. They refer to individual and collective actions taken to prevent or mitigate the consequences of environmental pressures. They aim at demonstrating the effectiveness of the policy measures taken, and thus in this context attempt to evaluate how policy measures taken affect the direction, the quality, the volume and impact of a specific waste or resource stream.

6.1 Objectives

This study aims at analysing OECD member country objectives on waste prevention, the instruments in use and planned to achieve these objectives, and the availability of data for a number of selected waste streams. The analysis also includes an assessment of whether this information suffices the development of response indicators.

According to the OECD definition, waste prevention consists of three components, all of which have been taken into account in the development of a proposal for response indicators:

- Prevention of waste generation (strict avoidance)
- Minimising the use of dangerous substances; and
- Product reuse.

Primary focus is on municipal waste following the 2001 Workshop recommendations (OECD, 2002e). Related waste streams include paper and cardboard, packaging, domestic (portable) batteries, as well as construction and demolition waste. Concerning municipal waste and paper and cardboard, main focus is on *policies that aim at strict avoidance* of waste generation. Indicators for domestic (portable) batteries mainly focus on *minimising the dangerous substances* in products. Packaging has been included to illustrate *reuse of products*. Special attention is given to refillable plastic and glass bottles. With regard to construction and demolition waste, all three components are included: *strict avoidance*, several *dangerous or problematic materials* (e.g. asbestos, PVC) and the potential for *reuse* may realize during the demolition.

The suggested *methodology* for the development of indicators is based on a four-step approach:

1. Identification of waste policy objectives and targets in OECD member countries;
2. Identification of the most common waste policy instruments and measures in OECD member countries;
3. Assessment of the availability of data in OECD member countries; and
4. Identification of a number of indicators that can measure the implementation of these objectives and instruments for each waste stream. The final selection of indicators depends on data availability.

Finally, a proposal for a set of response indicators for the waste streams is presented. This proposal should be seen as a preliminary set of response indicators for waste prevention, subject to further discussion and analysis of data availability in OECD countries and evaluation of future data needs.

The purpose of this study is not to develop a single instrument evaluation. For indicators that would aim at measuring the impact of the response, the entire policy package is addressed. Other indicators would show the efforts of authorities by identifying the implementation of various kinds of

measures or the extent of such measures. The study does not include policy effects in broad sense, *e.g.* employment and innovation, although the latter may be the way through which policies are achieved (Simeone *et al.*, 2003). It should be noted that the focus is on policies directly aiming at waste prevention. This means that the issue of efficient resource use is not explicitly dealt with, although efficient resource use is an important element in waste prevention, also according to many national strategies towards sustainable development. In addition, the issue of using renewable or non-renewable resources in the production is not covered by this study, basically because it would be far too extensive to include the objectives, instruments and information on this topic for all 30 OECD member countries.

The study of national objectives and measures is based on information¹² available from:

- Internet websites of Environment Ministries and Environmental Protection Agencies;
- National Statistical Offices;
- WasteBase (the ETC/WMF database);
- OECD/EU Database on Environmentally Related Taxes; and
- OECD/EEA database on economic instruments and voluntary approaches used in environmental policy and natural resources management.

6.2 Obstacles encountered

In principle, the indicators should be closely linked to the waste policy objectives and targets in OECD countries. Since the purpose is to develop OECD response indicators, the primary starting point should be OECD policy documents related to waste. However, these have proved to be of very general nature and hence are not suitable for identifying response indicators.

The overview of national policy objectives and measures prepared for this study has revealed that several countries do not have a national policy specifically targeting waste prevention. However, it has proved feasible to group the national objectives according to the three generic components of the OECD definition of waste prevention. Therefore, the OECD definition of waste prevention and the life cycle approach has been used to identify a list of possible response indicators.

There are a number of policies that influence the generation of waste, which should be kept in mind when evaluating waste prevention. Some policies are targeted towards prevention of specific waste streams, or in certain economic sectors and households. On top of these policies are the cross-cutting policies, such as sustainable consumption and production patterns, integrated product policy and cleaner technology. As a third layer, there are a number of policies, such as energy, labour and health policies, that do not directly target waste prevention, but still may have a considerable impact on it.

In addition to this Introduction, the report includes six chapters: Chapter 7 presents the OECD work on environmental and waste prevention indicators. Chapter 8 introduces the used methodology. Chapters 9 and 10 outline the policy objectives and the measures to achieve the objectives for the five waste streams included. The availability of data for the proposed indicators is described in Chapter 11. Finally, in Chapter 12 the proposed set of indicators is presented.

¹² Mainly based on information available in English.

7. BACKGROUND

Along with the increasing income, overall wealth and consumption, the generation of wastes has greatly increased during the last twenty years. At the same time recovery of materials and energy from wastes has increased considerably, but not enough to compensate the accelerating generation of waste (OECD, 2001d). Waste prevention and minimisation objectives have been widely embraced by OECD and other governments as key elements of a strategy aiming for environmental sustainability. In spite of this, waste prevention programmes have not been successful and even though there have been positive results in waste recycling, the amount of municipal waste going to final disposal is still growing, as well as generation of the total amount of waste (OECD, 2002d). This may partly be due to the fact that there has been only limited effort devoted to the establishment of evaluation tools, such as indicators, with which countries may assess their performance in waste prevention. Insufficient attention to this issue is likely to have contributed to a lack of awareness of and investment in waste prevention.

The above development demonstrates the importance to strengthen waste minimisation activities and the generation of waste prevention indicators. In this process one of the central considerations is the possible role of different socio-economic variables (*e.g.* population, GDP, private final consumption, public expenditure, average household size, degree of urbanisation) as “drivers” for waste generation. This is particularly true since drivers would potentially explain why waste prevention did or did not take place.

7.1 Environmental indicators

In recent years, concern whether development is sustainable from an economic, environmental and social point of view has led to the development of environmental indicators. The OECD, with the support of its member countries, has long been a pioneer in the field of environmental indicators with the development and publication of the first international sets of environmental indicators (OECD, 2001c).

The OECD has three criteria for selecting environmental indicators:

- Their policy relevance and utility to users;
- Their analytical soundness; and
- Their measurability.

During the 1990s environmental indicators gained significant importance and are now widely used in many OECD member countries. The developed environmental indicator sets have proved to be very useful in policy and reporting work (OECD, 2002e). Environmental indicators are cost-effective and powerful tools and they have three major purposes:

- Measure environmental progress and performance;
- Monitor policy integration; and
- Allow effective international comparisons.

7.2 Waste prevention indicators

The OECD 2001 workshop on waste prevention indicators clearly demonstrated that there is a strong and legitimate need for waste prevention indicators as a complement to other environmental sustainability indicators being used by OECD and other countries, since no internationally accepted macro-level indicators for waste prevention yet exist (OECD, 2002e). The present OECD core set of waste indicators is presented in Table 2.

Table 2. The OECD core set of waste indicators

| Pressures | State/Conditions | Response |
|--|---|--|
| Indirect pressures, <i>e.g.</i> : <ul style="list-style-type: none"> • Consumption levels and patterns • Production levels and patterns Direct pressures, <i>e.g.</i> : <ul style="list-style-type: none"> • Waste generation trends & intensities <ul style="list-style-type: none"> • Municipal waste • Industrial waste • Hazardous waste • Nuclear waste • Movements of hazardous waste | Effects on <i>e.g.</i> : <ul style="list-style-type: none"> • Water quality • Air quality • Land use and soil quality • Toxic contamination | Waste minimisation: <ul style="list-style-type: none"> • Waste prevention • Product re-use • Recycling rates Economic and fiscal instruments, expenditures: <ul style="list-style-type: none"> • Expenditure for waste • Charges for waste disposal |

Source: OECD, 2001c.

The three main recommendations of the 2001 workshop were:

- Choose municipal waste as the waste stream for initial analytical consideration;
- Use the Pressure-State-Response-model as a common framework for constructing a typology for waste prevention indicators; and
- Accept Material Flow Accounting (MFA) as a means for consistent accounting of waste material flows.

It was also specifically requested that the OECD focus in the first instance on developing sample waste prevention “pressure” and “response” indicators for municipal waste (MW). This waste stream was chosen as present data are a) readily available, b) relatively (though not fully) comparable, and c) existing for the majority of member countries.

Furthermore, the workshop identified the following “response areas” to be of particular relevance when considering response indicators:

1. Regulations and plans for waste prevention, *e.g.*, waste policy concepts, product take-back requirements, material or product bans, disposal bans. Number, quality, and implementation of selected types of regulations and plans;
2. Expenditures for waste prevention, *e.g.*, funding for household compost bins; avoided expenditures for waste management, *e.g.*, transport, storage, processing, disposal costs;
3. Economic instruments potentially supporting waste prevention, *e.g.*, unit-based fees, level, deposit-refund, advance-disposal fees, taxes on raw materials, subsidies;
4. Changes in technology and product design, *e.g.*, market share of waste preventing processes and products; number of ‘design-for-environment’ programmes;

5. Educational and communication tools for waste prevention, *e.g.*, newspaper and television ads; waste prevention indicators themselves; and
6. Behavioural change in consumers, producers, and government bodies, *e.g.*, rates of participation in on-site composting; reaction to door-to-door awareness raising campaigns, number of “visitors” to waste prevention Internet sites, extent of “greener procurement” of products and services by government entities.

8. RESPONSE INDICATORS FOR WASTE PREVENTION

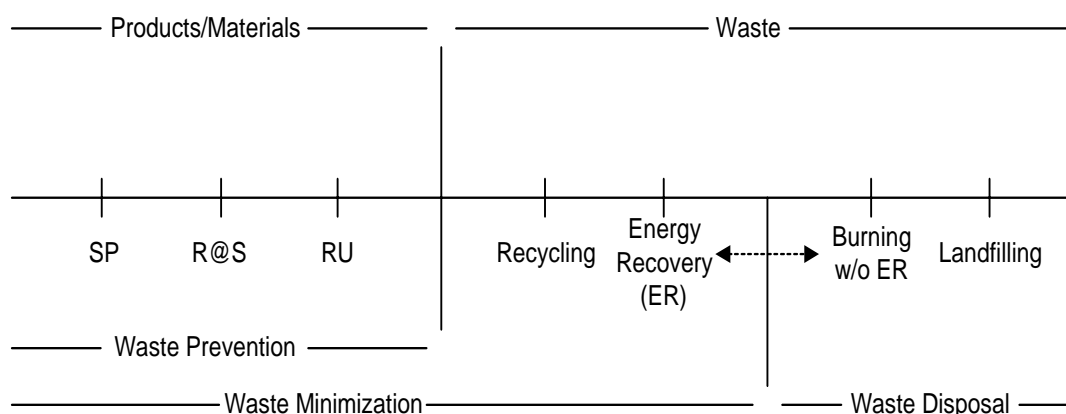
8.1 The concept of waste prevention

Waste prevention aims at reducing the amount, the risk to the environment and human health and energy content of products or materials before they enter the waste stream. The OECD breaks down waste prevention into three components (OECD, 2002e):

1. Strict avoidance involves the complete prevention of waste generation by virtual elimination of hazardous substances, or by reducing material or energy intensity in production, consumption and distribution;
2. Reduction at source involves minimising the use of hazardous substances and/or minimising material or energy consumption; and
3. Product re-use involves the multiple use of a product in its original form, for its original or alternative purpose, with or without reconditioning.

Consequently, waste prevention is distinct from recycling and other waste management efforts, which are applied only when products and materials are recognised as waste. According to the OECD, waste prevention is part of the broader concept waste minimisation (OECD, 2000). Figure 10 further clarifies the concept of waste prevention and minimisation though listing the included activities.

Figure 10. An outline of the three types of waste prevention actions: strict prevention (SP), reduction at source (R@S) and reuse (RU).



Source: OECD (2002f)

According to this terminology, reuse, but not recycling, is a part of waste prevention. Waste diversion, not mentioned in the chart, refers to the reduction in the quantity of waste managed through disposal activities. As shown graphically in the figure, incineration of waste with energy recovery should be distinguished from incineration without energy recovery. However, it is not yet finally solved whether all energy recovery should be considered as recovery, or only part of it.

This definition of waste prevention highlights a number of issues, which are of importance especially in the response indicator context. First of all the definition illustrates, that waste prevention

is somewhat elusive and can only be measured indirectly as a counterfactual (as the amount of waste that probably would have been generated in the absence of a waste prevention policy).

Secondly, although traditional waste management policies may have waste preventive effects, waste prevention as defined by the OECD, emphasises policies that are directed up-stream, *i.e.* towards influencing the waste generating behaviour of primarily producers and consumers.

Thirdly, the definition states that waste prevention is not just about reducing tonnage. It is equally important to reduce the possible risks that the waste imposes on the environment and human health as well as the energy content of the waste. This turns the focus of waste prevention policies further towards production processes and the characteristics of individual products as waste potentials and makes waste prevention policy mingle with well established policy areas, such as product policies, chemical policies, and clean technology policies. Waste prevention indicators should reflect qualitative as well as quantitative impacts of policies and highlight possible trade-offs.

Finally, the waste prevention definition directs the focus towards which kinds of and how much waste that is going to be handled by the waste sector. This is why reuse is a part of waste prevention, whereas recycling, which mostly takes place within the boundaries of the waste sector, is not. However, if the ultimate goal for waste prevention policies is at a certain level of economic activity to minimise the demand for input of materials into the economic system, then reuse and recycling play an equal role for waste prevention. Therefore, for some purposes it might be worth to consider whether waste minimisation¹³ is a more appropriate strategic concept than waste prevention to utilise. In the following, however, when dealing with societal responses to waste generation and waste prevention response indicators, the original OECD waste prevention definition is used.

8.2 Definition and categorisation of response indicators

Response indicators are used to describe and measure the response of the society to specific (environmental) problems. It follows that waste prevention response indicators should describe and measure society's efforts to promote waste prevention. Response indicators can be defined and categorised in many ways. Classification of response indicators into three broad categories is suggested below:

a) Number of policies/instruments applied with the explicit purpose to promote waste prevention

This response indicator focuses on the question whether the society is addressing waste prevention and how.¹⁴ This indicator is a trivial one, and can be used for cross-country comparisons between countries at the same level of socio-economic development (like most OECD-countries), albeit possible structural and cultural differences must be taken into account. It is based on the compilation of inventories of waste prevention policies/instruments, which should also include a description of the effect of various responses (policies/instruments) on waste prevention.

Naturally, a number of policies and instruments belonging to other 'policy regimes' than waste and waste prevention may also have an impact on waste prevention. It is important to keep this fact in mind when evaluating the impact of policies launched explicitly for waste prevention purposes. It should further be added that target setting, in terms of waste generation or waste prevention, is likely to have an impact in itself and must therefore also be considered as a response.

¹³ Waste minimisation equals waste prevention plus recycling. Sometimes incineration with energy recovery is included in waste minimisation.

¹⁴ Fulfils the OECD definition of response indicators, OECD (2003).

b) Indicators that measure the actual implementation of policies

The purpose of these indicators is to measure the policy efforts themselves. One thing is to have a set-up of targets and instruments to achieve these targets, another thing is to actually implement and enforce these responses (OECD, 2003). Waste tax revenues, amount of subsidies granted for waste prevention pilot projects, coverage of awareness campaigns, charges and fees effectuated by public and private bodies, establishment of waste prevention advisory boards, provide examples of response indicators belonging to this category. These indicators reflect the actual importance ascribed to waste prevention. These indicators can be seen in some cases only as proxies for the actual influence of a policy, since they do not often provide an unambiguous evidence of the effectiveness of the policies.

Also, and with the same reservations as under a) above, these indicators may be used for cross-country comparisons, although structural and cultural differences probably play an even bigger role within these indicators.

c) Indicators that measure the impact of the responses on waste prevention

These indicators would answer the question whether the responses imposed by a society actually have an effect on waste prevention. Consequently, this refers to *ex post* evaluations rather than *ex ante* evaluations. *Ex ante* refers to a forward-looking assessment of the effects of new waste prevention policies and target for waste generation in comparison with a business-as-usual scenario. *Ex post* evaluation relies on the information of what has actually happened following the implementation of a particular responsive measure. This evaluation would allow judgements on whether the expected objectives and targets of the policy measures have been achieved, and with what effectiveness.

Often this response indicator category is divided into two subcategories¹⁵, namely:

- Generic indicators; and
- Policy specific indicators.

Generic indicators (c1) aspire to detect the combined effect from all policies/instruments directly or indirectly affecting waste prevention, hence also including possible effects from non-waste or non-environmental policies. Thus, these indicators intend to answer the question whether you do experience actual waste prevention and (in some cases even) how much. Consequently, generic response indicators do not intend to detect the specific impact from a single waste prevention policy or instrument (this is the task of policy specific indicators).

The most immediate generic waste prevention response indicator is simply the amount of waste generated (of a certain kind) formulated either as tonnes per year, or alternatively as the distance between that amount and the targeted waste generation limit. There is, however, no unambiguous link between waste generation development and waste prevention. Even if waste generation continues to increase, some waste prevention may have been achieved. The effect of the waste prevention efforts has just been offset by the increase in waste generation due to the development in the various factors driving waste generation. A number of analyses have been made to identify drivers for waste generation (EEA, 1999; Stutz, 2002¹⁶).

Waste generation is also influenced by various structural changes (*e.g.* in consumption). If data availability allows for it, these influences can be detected to see how much of the waste prevention is in fact due to structural changes only.

¹⁵ A somewhat similar categorisation is found in the report from the OECD Workshop on waste prevention indicators, OECD (2002e).

¹⁶ See also Part 1.

Finally, quantitative waste prevention may be achieved at the expense of the environmental hazards of the waste. The typical example here is the exchange of glass beverage containers for aluminium containers. Waste tonnage is reduced, but the energy content of the waste is increased implying an increase in greenhouse gas (GHG) emissions. Thus, calculations of the development of the energy contents of waste provide indicators that are indispensable when looking for a more complete picture of the waste prevention performance.

Policy specific indicators (c2) aspire to measure whether a specific waste prevention policy, programme or instrument has affected waste prevention and how much. However, the fact that the waste generation and the waste prevention taking place at a given point of time is affected by all waste prevention policies implemented as well as all other policies indirectly affecting waste prevention, makes this task very difficult. It will require rather advanced modelling and statistical analyses, which probably only exceptionally will be feasible and/or cost-effective. The task, however, becomes less difficult the smaller the waste fraction targeted and the more waste-stream-specific the instrument in question is.

In many cases, more indirect approaches must be applied. Basically all responses taken are meant to change the behaviour of consumers, producers, governmental bodies and/or other agents involved in the generation of the waste in question, with the expectation that the initiated response will lead to reduced waste generation all other things being equal. Examples of such indicators are the extent of greener procurement, reuse of certain products, participation rate in waste prevention demonstration projects and market share of less packaged products. As the behavioural changes are closely connected to the instruments applied, they can be used as policy specific indicators.

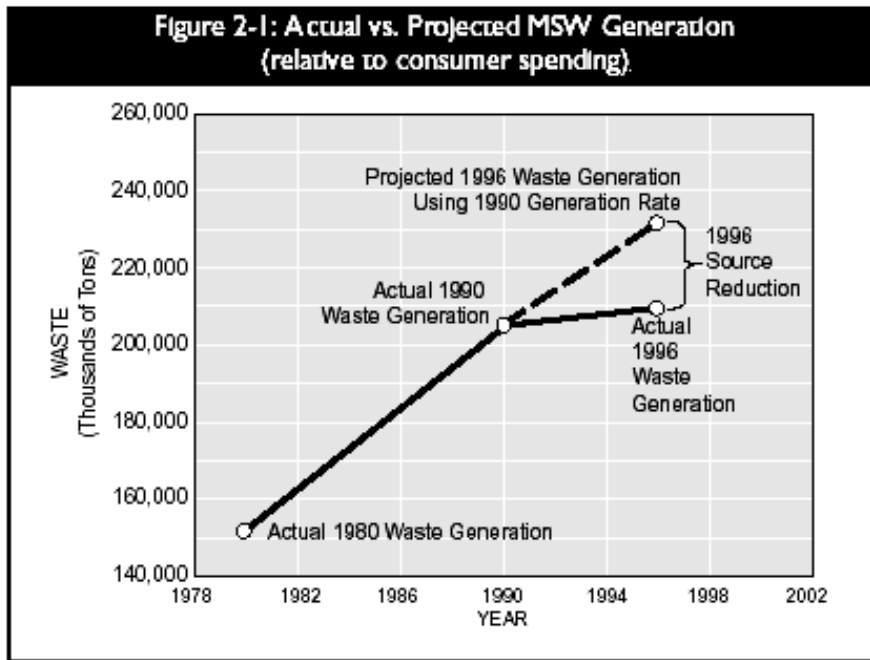
8.3 Identification of existing response indicators

The United States and the Netherlands have both developed indicators on waste prevention. The US has estimated the quantity of waste reduced at source, while the Netherlands shows the decoupling of total waste generation from GDP.

The US indicator is an attempt to estimate the quantity of municipal waste that might have been produced assuming a constant relationship between private final consumption and waste generation. The difference between the projected quantity and the actual waste generation is the estimated source reduction (Figure 11).

One problem in estimating strict avoidance is clearly to quantify something that is not there. Thus this indicator is a proxy of the reduced waste generation. However, since the projection is made using historical data to determine the relationship (*i.e.* the coefficient) between waste generation and private consumer spending, the indicator does not take into account any structural changes that may have taken place and could influence the consumer preferences or the general activity in the economy.

Figure 11. Actual vs. projected generation of municipal waste



Source: Redrawn according to US EPA, 1999.

The quantity of source reduction in the United States has been estimated for the years 1992-2000 and is presented in Table 3. As can be seen in the table, the source reduction has been steadily increasing over the years.

Table 3. Source reduction of municipal waste in the United States (million tons)

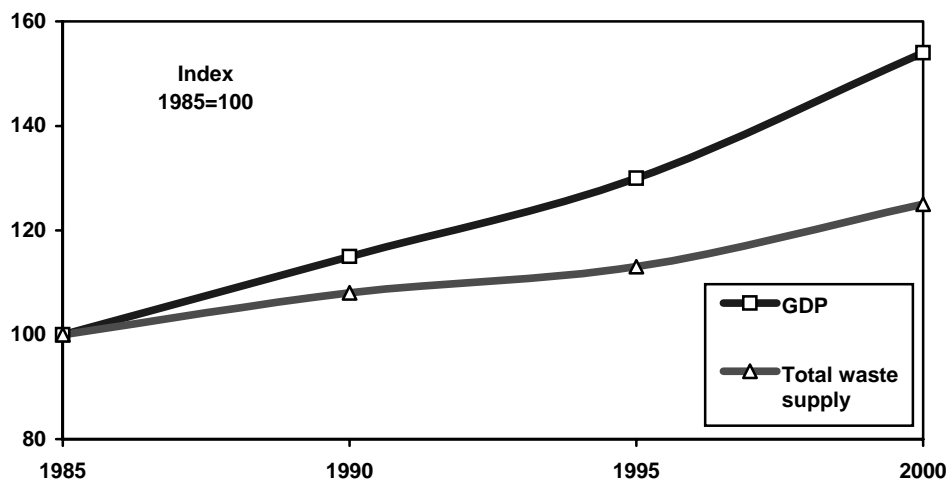
| 1992 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 |
|------|------|------|------|------|------|------|------|
| 0.6 | 8.0 | 21.4 | 31.0 | 31.8 | 37.3 | 42.8 | 55.1 |

Source: US EPA, 2002.

The Dutch indicator is closely coupled to the target on waste prevention, *i.e.* to restrict the growth of waste supply from 57 million tonnes in 2000 to 66 million tonnes in 2012, corresponding to a limitation of 16% in connection with forecasted economic growth of 38%.¹⁷ The development in GDP and total waste quantity is shown in Figure 12. Between 1985-2000, the GDP rose by 54%, while the total waste quantity only increased by about 24%, *i.e.* achieving a relatively decoupling and a prevention of 20%. The argument is that if the waste quantity had risen by the same rate as GDP, the quantity would have been 71 million tonnes, instead of the actual generation of 57 million tonnes.

¹⁷ Growth of 23% serves as a reference.

Figure 12. Change in GDP and total waste supply between 1985 and 2000 (inclusive)



Source: Ministry of Housing, Spatial Planning and the Environment, the Netherlands (2002).

8.4 Time lag in waste prevention

The country-screening of policy objectives and policy instruments for municipal waste has revealed (OECD, 1998a) that regulations dealing directly with downstream issues, such as household waste and municipal waste, are normally the responsibility of regional and local authorities, whereas product-oriented waste prevention policies normally require the involvement of the national government and an increasingly vertical integration of actions from national to local level. The whole area of actors or target levels for policy action now includes the national or economy-wide level, sector-level, firm-level, local or municipal level and the household level and may include considerable time lags between the introduction of a legislation and its effect on the waste in question.

As pointed out by Lifset (OECD, 2002e) up- and downstream waste regulations have an important time dimension that must be taken into account when waste prevention indicators are interpreted. At the upstream side, the time-dependent effects of the introduction of change in product design or material composition on the product retirement from the market depend on the residence time of the product in the economy. This could be as much as tens of years for some consumer durables, but only a few days for non-durables such as food for human consumption, non-refillable beverage containers or newspapers.

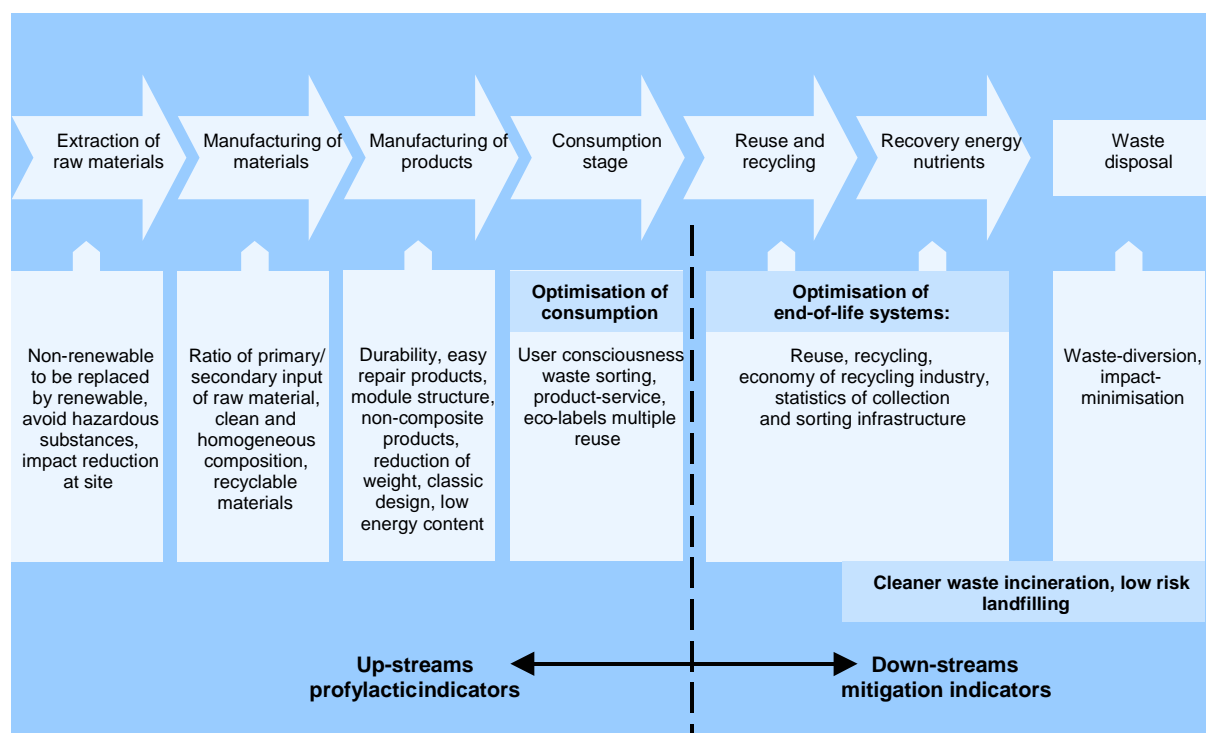
Durability and redundant reuse¹⁸ are both implicit targets of waste prevention, but there is too little information about product life spans and change in durability as response to waste prevention. Thus, opposite to an end-of-pipeline policy, prophylactic or “start-of-pipeline policy” upstream the life-cycle chain introduces in many cases a time lag problem which makes it difficult to select performance indicators for waste prevention and measure them.

8.5 Identification of possible response indicators for waste prevention

Figure 13 depicts the adjustment of the linear process downstream the life-cycle chain of a product towards a process with a more cyclic character initiated by waste prevention actions. The figure

¹⁸ Increasing the number of uses.

Figure 13. Scheme of the production – consumption cycle



only indicates important measures and indicators for the different life cycle phases, in order to demonstrate the possible use of complementary policy instruments along the product chain.

For example, by applying user fees and other economic or technological instruments upstream, reductions in household waste generation may be stimulated. However, disposal fees applied downstream may also have waste prevention effects by stimulating reuse and recycling upwards the product chain.

In principle, upstream waste prevention and downstream waste recovery are complementary measures. Waste prevention can also promote recycling indirectly by making products more recyclable as illustrated by two examples: i) use of more non-composite and non-toxic materials in beverage- and food consumption containers makes sorting and collection easier; and ii) in automobile manufacturing, introduction of change in product design towards products with module structure, may facilitate recycling, remanufacturing of engines, etc., reducing the over-all generation of waste. However, downstream measures may also foster upstream waste prevention, since the introduction of more rigorous safety standards for final waste disposal or of a disposal fee, normally stimulates waste prevention and recycling.

Consequently, a set of indicators measuring the performance of a macro-level waste prevention policy (response indicators) should cover the whole life-cycle of products and materials according to the broad model presented in Figure 13.

Identified possible response indicators for each of the stages shown in Figure 13 are presented below. It should be borne in mind that this is a first screening of potential waste prevention response indicators for selected waste streams.

Stage: extraction of raw materials [c1, in section 8.2.]

- Extraction/production/sale of dangerous substances (tonnes/year) which end up in the selected waste stream. The substances should be taken from national priority lists of chemicals, *e.g.* heavy metals such as cadmium, lead, mercury, chromium, nickel and copper.
- Calculation of national material balances or consumption rates (national level) to estimate development in significant sources and sinks (*i.e.* emissions to air, water, soil, etc.).

Stage: manufacturing of materials and products:

Development in input ratio between primary and secondary materials for [c1, but recycling]

- Aluminium;
- Glass;
- Plastic;
- Selected metals;
- Paper; and
- Construction materials.

Development in import/production/sale of composite materials and products containing dangerous substances or sale of products with non-toxic substitutions: [c1 or c2, depending on whether specific policies/instruments exist or not]

- PE-plastic vs. PVC (polyvinylchloride);
- Cadmium-, chromium pigments in paint, toys and paper products; and
- Phtalates and cadmium in plastic stabilisers, etc.

Cleaner production programmes:

- Expenditure for cleaner production programmes, including subsidies for research and development (public and private) [b]; and
- Number of enterprises with environmental management system [b].

Product claim for new products

- The length of manufacturer's guarantee on defective products (lack of conformity¹⁹).

Company statistics or national statistics for sale of a product with improved environmental characteristics compared to reference products: [c, and probably in most cases c1]

- Longer product life;
- Lower weight and more concentrated products;
- Easily recyclable products or products with elements that are easily reused, *e.g.* modular products [recycling (see example discussed in the text)];
- Dismantling included in design;
- Products with low energy content;

¹⁹ Wording taken from EU Directive 1999/44/EC on certain aspects of the sale of consumer goods and associated guarantees.

- Easily repairable products; and
- Sale of products with eco-label.

Batteries:

- Limit values for certain hazardous substances [b].

Construction and demolition waste:

- Generation of construction waste in tonnes/capita/year [c1];
- Generation of demolition waste in tonnes/capita/year [c1];
- Generation of C&D waste/Gross value added (GVA) in the C&D sector or C&D waste/GDP [c1];
- Development in ratio between reused and new building materials C&D waste/GVA in the C&D sector [c1 or c2, depending on whether specific policies/instruments exist];
- Sales of used building materials [c1 or c2, depending on whether specific policies/instruments exist or not]; and
- Revenue of possible C&D waste deposit fees [b].

Consumption stage:

- Density (number/km²) of bring scheme collection sites for household waste in urban areas (recycling);
- Number of municipalities with collection-at-source scheme (recycling);
- Sales of equipment for home composting purposes [c2];
- Household participation in home composting schemes [c2];
- Green public procurement per GDP [b];
- Expenditure for awareness raising campaigns, etc. [b]; and
- Expenditure on subsidies for cheaper repair of products [b].

Packaging waste:

- Collection rate in deposit refund schemes for beverage containers [c1, maybe c2 depending of existence of specific policy]; and
- Number of trips for reused packaging [b].

Batteries: [c1 or c2, depending on whether specific policies/instruments exist or not]

- Market share of Ni-Cd batteries and mercury containing batteries in % of total;
- Statistics on sorting and collection of used batteries [recycling]; and
- Market share of rechargeable batteries.

The waste stage:

Response indicators for waste prevention measured as *subsequent changes* in waste generation (tonnage) and waste composition and quality.

Municipal waste: [c1]

- Generation of municipal waste and its fractions:

- Total MW destined for incineration;
 - Total biodegradable MW (tonnes/year, carbon or energy content, GHG emissions²⁰);
 - Food waste;
 - Garden waste;
 - Paper and cardboard;
 - Plastic and glass;
 - Metals;
-
- Statistics for treatment facilities: landfills, incinerators, composting facilities;
 - Cost of waste management by main recovery categories (\$/tonnes);
 - Effect or impact of waste minimisation (including energy recovery) on waste going to landfill (changes in tonnage and quality for different fractions); and
 - Change in the intensity of MW (ratio of MW/PFC, private final consumption).

²⁰ Depends on how waste is managed.

9. WASTE PREVENTION OBJECTIVES

Over the last ten years, the OECD has conducted a number of surveys among its member countries, for example on waste minimisation, waste prevention and drivers for waste generation. These surveys could provide a useful input for the development of indicators. One survey among OECD member countries (OECD, 1998b) showed that 11 countries give equal priority to reduction of the hazard of the waste generated as to reducing the total quantity of waste. Six countries favoured reduction of the hazard of waste while 3 countries favoured the reduction of the total quantity. The basis for these surveys, the OECD working definition on waste minimisation and prevention, was discussed and agreed to at the OECD Berlin workshop in October 1996 (OECD, 1998c; OECD, 2000).

It should also be emphasised that in countries with a federal political and administrative structure, such as Australia, Belgium, Canada, Germany, and the United States, waste prevention approaches and the use of instruments in individual states or provinces may differ considerably (OECD, 1998a).

9.1 Municipal waste

Several OECD countries do not have specific objectives for the prevention of municipal waste generation. However, most countries have a general objective on reducing or preventing the generation of either the total amount of waste or the municipal waste stream. Some countries even have a quantitative waste reduction target.

In Finland, the objective is that by 2005, at least 15% less waste is generated than forecasted. The Polish target is to maintain the level of annual municipal waste generation of 300 kg per capita.

In Australia the objectives for waste prevention are set at the state level. In New South Wales the total waste generation shall not increase the present level during the next 5 years (Australia New South Wales, 2003). In Victoria the strategy is to reduce waste generation by 15% compared to the situation in July 2013, if the economy grows at 3.5% per annum and no new programmes are undertaken (Australia Ecocycle Victoria, 2003).

The Netherlands, Norway, and the United Kingdom have coupled their waste reduction targets to the economic growth. The Dutch target is to allow waste generation to grow from 57 million tonnes in 2000 to 66 million tonnes in 2012, corresponding to a 16% growth, while the corresponding economic growth is forecasted to be 38%.²¹ The Norwegian target is to keep the growth in waste generation well beyond the rate of economic growth. The United Kingdom target is simply to break the link between economic growth and waste generation.

In the Spanish draft waste management plan, it is suggested to reduce the total waste generation by approximately 6% by 2006 in order to keep the total waste generation at the 1996 level.

Some countries also have specific objectives on the hazardous household waste. In Finland, products and materials which are particularly harmful to the environment or problematic to manage as waste must no longer be used. France, Iceland, Sweden and Switzerland have objectives to reduce the

²¹ Growth of 23% serves as a reference.

hazardous nature of waste or reduce the amount of dangerous substances disposed of with household waste. In Luxembourg the objective is to minimise waste generation and waste hazards through prevention. The Italian strategy for sustainable development includes a target to reduce hazardous waste generation 20% by 2010 and 50% by 2020.

A number of countries have objectives to reduce waste from the public administration. In Belgium, the Federal Public Administrations are committed to reduce the quantity of unsorted waste by 30 kg per civil servant by 2003 compared with 1999. The French government is going to ask each ministry and each state-owned enterprise to implement a plan to reduce waste arisings by 5% each year for the next 5 years. A similar policy is in place in Australia (Australia New South Wales, 2003) where the Waste Reduction & Purchasing Policy (WRAPP) requires all government agencies to commit to waste minimisation through the development and implementation of a WRAPP plan.

In addition to the objectives on the reduction of waste, a number of countries have listed other targets as well. These include:

- Reduction of waste going to landfill;
- Favouring the purchase of products which avoid the generation of waste;
- Ensuring the consumers' possibilities to choose products that helps waste prevention;
- Introducing the principle of cost coverage/recovery in waste management; and
- Broadening R&D activities to cover new technologies in the reuse and recovery of waste.

9.2 Batteries

Batteries have been chosen as one of the waste streams to be examined, since they represent the hazardous element of the OECD waste prevention definition. Only information on objectives for domestic batteries has been collected, *i.e.* nickel-cadmium batteries, and button cells.

In the USA the Battery Act from 1996 aims to prevent the release of hazardous substances into the environment. The law serves two purposes: to phase out the use of mercury in batteries, and to provide for the efficient and cost-effective collection and recycling, or proper disposal, of used nickel-cadmium (Ni-Cd) batteries, used small sealed lead-acid (SSLA) batteries and certain other regulated batteries. The Battery Act also establishes national, uniform labelling requirements for "regulated batteries" and for "rechargeable consumer products" that are manufactured domestically or imported and sold for use in the United States.²²

The aim of the EU Directive is to approximate the laws of the Member States on the recovery and controlled disposal of spent batteries and accumulators containing dangerous substances. The Directive covers batteries and accumulators put on the market as of 1 January 1999 containing more than 0.0005% of mercury by weight, and batteries and accumulators put on the market as of 18 September 1992 containing more than 25 mg mercury per cell (except alkaline manganese batteries), more than 0.025% cadmium by weight, and more than 0.4% lead by weight. It also covers alkaline manganese batteries containing more than 0.025% mercury. As of 1 January 2000, EU Member States shall prohibit the marketing of batteries and accumulators, containing more than 0.0005% of mercury by weight, including the cases where these batteries and accumulators are incorporated into appliances. Button cells and batteries composed of button cells with mercury content of no more than 2% by weight shall be exempted from the prohibition.

In the Netherlands, as of 1 January 2003, mercury-containing products cannot be stored for trade or production purposes. This implies that businesses have been given time for a period of three

²² Batteries are regarded as Federal Universal Wastes.

years to use existing stocks (products made before 2000). This is a consequence of the resolution on mercury containing products implemented in November 1998. Furthermore, the Netherlands implemented on 1 June 1999 a new Cadmium decree. The decree prohibits the manufacture and sale of products containing cadmium.

9.3 Packaging

The primary purpose of including packaging in this project was to illustrate the reuse component of the OECD waste prevention definition. However, very few countries seem to have established targets on reuse and prevention of certain packaging, and even fewer countries seem to have data in this respect. The majority of policy objectives relate to recycling and recovery rather than prevention and reuse.

The EU Directive on Packaging and Packaging Waste²³ aims to, as a first priority, prevent the generation of packaging waste and, secondly reuse packaging and finally recycle and recover packaging waste. The Directive sets targets for the recycling and recovery of packaging waste, but contains no targets for prevention or reuse. The Netherlands, Finland, Spain and Belgium have introduced targets for prevention, and Denmark, Germany, Portugal, Finland and Austria have introduced targets for reuse (ARGUS, 2001).

9.4 Paper

Paper has been chosen for examination, since this waste stream represents a substantial part of municipal waste and most OECD countries have objectives or targets for paper recycling.

The EU Council Recommendation on the recycling of waste paper and use of recycled paper recommends that the EU Member States and Community institutions define and implement policies to promote the use of recycled paper and paperboard. However, most EU countries have not identified objectives or targets on the use of the recycled paper.²⁴ Only a few countries have these specific objectives and targets. The United Kingdom has set targets for the Governmental green procurement. For example, white copier paper procured annually should include recycled fibre at least 35% of the weight of paper by 2003/4 and the requirement would increase to 75% by 2006/7. Ireland has a target for the routine use of recycled paper by all public authorities within two years. In Luxembourg, the "Superdreckskescht" waste system has proved to be an effective organisation for the collection and recovery of special waste from households and industries. The system also promotes the use of recycled products, such as recycled paper in internal correspondence of businesses.

France has an objective for the public administration to extend the use of electronic mail to reduce the paper use. Belgium has an objective to simplify government administration, *e.g.* through significantly reducing the consumption of paper. The United States has objectives for the redesign of paper products and for the reduction of paper consumption. Australia, New Zealand and Canada have objectives on the diversion of paper products from landfills.

9.5 Construction and demolition (C&D) waste

Construction and demolition (C&D) waste has been chosen for the examination since it represents all three components of the OECD waste prevention definition: exists in large quantities, includes hazardous substances and products, and can potentially be reused.

²³ Council Directive 94/62/EC of 15 December 1994 on packaging and packaging waste.

²⁴ 81/972/EEC Council Recommendation of 3 December 1981 concerning the re-use of waste paper and the use of recycled paper.

Information on objectives regarding C&D waste reveals that only a few OECD countries have qualitative objectives for the prevention and reduction of C&D waste, and only the Netherlands and Finland have quantitative objectives for the prevention and reduction of C&D waste. The Netherlands wants to achieve 10% prevention rate, whereas Finland's target is to achieve 15% reduction by 2005.

Luxembourg is going to strengthen the prevention of inert waste arisings, particularly by integrating this requirement in the planning of construction projects. A key objective for the government of the United Kingdom is to improve the overall efficiency of the construction industry, *e.g.* by reducing waste generation in all stages of construction.

Approximately one third of the OECD countries have recycling or recovery objectives and two countries, New Zealand and Canada, have a qualitative objective to divert C&D waste from landfills. In New Zealand all territorial local authorities will have to institute a programme to identify existing C&D waste quantities and set local targets for diversion from landfills by 2005. Canada has no time limit for their diversion objective.

10. WASTE PREVENTION POLICIES AND INSTRUMENTS

This section provides an overview of available information of policies and instruments on waste prevention in OECD member countries for each of the included waste streams. Moreover, the most common policy instruments used in OECD member countries to target the driving forces (economic structure, consumption patterns) and the pressures (waste amounts and management) are identified.

10.1 Municipal waste

User charges are clearly the most common measure in the field of municipal waste management. Other widely used measures to tackle the issue of waste prevention are traditional regulation, taxes (especially on disposal of waste), and other instruments, which aim at changing behaviour through awareness-raising campaigns.

10.1.1 *Regulations and plans*

The variety of applied regulatory measures is extensive. A requirement for local authorities to arrange for the collection of separately collected wastes and hazardous household waste is a common regulation. Producer responsibility or voluntary agreements with industry regarding selected waste streams (mainly packaging waste) are used by several countries. A few countries also mention development of a waste prevention plan.

Austria and Norway invite stakeholders to participate in the description and quantification of waste prevention and recovery potentials for various sectors. They are also running programmes to implement waste prevention in selected companies.

Korea has developed guidelines for food waste reduction in private households, restaurants and group-meal facilities. Japan has also established standards for the generation and recycling of food waste.

10.1.2 *Economic instruments*

Measures to reflect expenditures, *i.e.* user charges and especially charges that reflect the actual cost of waste management such as pay-as-you-throw schemes, are without doubt the most used measures since almost all countries have implemented a waste tariff structure.

Australia is working towards charging structures which will adequately reflect the full economic and environmental costs of waste disposal, while assisting the funding of rehabilitation and maintenance of facilities for waste disposal. Iceland is introducing processing charges on domestically produced products and imports to cover the recycling costs.

In 1997, 42% of municipalities in Japan had a fee on municipal waste collection and treatment, while 78% had the comparable fee for industrial waste. Volumetric charging, requiring the use of pre-paid rubbish bags or stickers, is the predominant method. Fixed charges are relatively rarely used in Japan. Introduction of pay-as-you-throw systems in Japan has caused substantial reductions in municipal waste generation, although experience shows that the positive effect is gradually weakening over the years (OECD, 2002b).

Italy is introducing a new charging system during the period of 2000-08. The charge has a fixed component based on operational and maintenance costs, and a variable component based on the quantity of waste sent to disposal. A landfill tax was introduced in 1995 to promote waste reduction at source, separate collection and recovery. This tax is based on the quantity and type of waste being landfilled and is also applied to waste incineration without energy recovery and to waste from mechanical waste sorting plants. The owner of the disposal facility pays the tax, while the revenue is shared between the regions (90%) and provinces (10%). The landfill tax on municipal waste will be replaced by the new charging system when fully introduced (OECD, 2002a).

Twelve OECD countries have introduced a tax on final disposal of non-hazardous waste. Although the tax varies in design, the main objective is to divert waste from landfills to material and energy recovery. In Australia and the USA a tax on municipal waste accepted for disposal has been implemented at state level.²⁵ Hungary has a non-compliance levy for hazardous waste and the Czech Republic has a tax on disposal of hazardous waste.

In the wider resource perspective, Norway considers introducing a tax on the utilisation of materials in production, while Denmark has had a tax on the use of certain raw materials since 1990.

Measures to promote technological change and product design mainly include subsidies for research and development (R&D). For example, France is going to establish a network of 100 pilot enterprises for testing possibilities to generate 10 % less waste than today.

10.1.3 Suasive measures

Education, training and information sharing play also a critical role in efforts towards reduced waste generation. Citizens are not normally co-operative in programmes, for which there is no, or only limited information available. Information is needed on the availability and use of separate collection schemes, on the impact of consumption on waste generation, on possibilities to avoid unsolicited mail and on possibilities and usefulness of buying environmentally friendly products, *e.g.* products that are eco-labelled. Majority of the OECD countries are using a wide variety of suasive measures in promoting sustainable consumption and waste reduction.

10.2 Batteries

Regulation, including take-back requirements and voluntary agreements, is by far the most common way to manage used batteries. These include obligatory take-back systems where producers, importers or retailers are responsible for the collection and/or recycling of batteries.

The regulation in the USA has streamlined hazardous waste management standards for the federal universal wastes such as batteries, and regulations govern the collection and management of these widely generated wastes. The Battery Act facilitated and encouraged voluntary industry programmes for recycling Ni-Cd batteries.

European Union Member States shall establish programmes to achieve the following objectives:

- Reduction of the heavy-metal content of batteries and accumulators;
- Promotion of marketing of batteries and accumulators containing less dangerous substances and/or polluting substances;
- Gradual reduction, in household waste, of spent batteries and accumulators;
- Promotion of research aimed at reducing the content of dangerous substances and favouring the use of less-polluting substitutes in batteries and accumulators, and

²⁵ Australia: New South Wales and Victoria. USA: New Jersey.

- Separate disposal of spent batteries and accumulators.

10.3 Packaging

Extended producer responsibility (EPR) seems to be the most popular policy applied to packaging waste. It has been implemented in various ways in different countries. Several countries have implemented EPR through a deposit-refund scheme, *e.g.* for beverage packaging.

The United Kingdom has introduced a mandatory EPR system for packaging through tradable certificates called packaging recovery notes (PRNs). These notes are issued by reprocessors to prove that a certain tonnage of reprocessing has taken place (OECD, 2002c). The businesses covered by the packaging regulations can then buy or sell these notes depending on whether they have already fulfilled their recovery obligation or not. The responsibility is shared among the players of the packaging chain: municipalities are responsible for the collection and sorting and industries producing or using the packaging are responsible for the recovery of packaging waste. Each part of the supply chain has a percentage share of the full responsibility.

The Dutch Ministry of Housing, Spatial Planning and the Environment reached an agreement with the industry on the third Packaging Covenant in 2002. A major element of the protocol is the requirement for the industry to ensure “that the total weight of glass, paper, cardboard, metal and plastic packaging” does not grow by 2005 more than two-thirds of the comparable increase in GDP when using 1999 as a reference year.

The Canadian National Packaging Protocol introduced voluntary requirements for the industry. The set targets were well achieved, and some packaging was eliminated and more reusable packaging was introduced and the recycling infrastructure was greatly expanded. Australia has also a voluntary packaging agreement with industry, although it does not include any quantitative targets. This National Packaging Covenant (1999) is the leading instrument for managing packaging waste in Australia and is based on the principles of shared responsibility through product stewardship, although businesses are not required to take back materials from kerbside collection programmes.

Taxes and charges are also used to limit packaging waste generation. Several countries have taxes on beverage packaging. Ireland, Italy and Denmark have levies on plastic shopping bags. Korea has a Waste Deposit Fund, which includes charges for several kinds of packaging, such as cosmetics, glass and PET beverage bottles, paper packs and confectionery packaging.

10.4 Paper

Almost all OECD countries have in use a variety of instruments for reaching the recycling objectives for paper and/or cardboard. However, no country has been identified to have particular policy instruments for preventing the generation of paper waste. Perhaps the only instrument in wide use is the information circulated to households to remind them of the possibility to say no for the unsolicited mail.

10.5 Construction and demolition (C&D) waste

Almost all OECD countries have policies and instruments in place to reach the recovery objectives of C&D waste. However, only a few countries have set objectives or targets for the prevention of C&D waste and introduced specific instruments to meet these prevention targets.

The Netherlands has introduced a landfill ban for recoverable C&D waste. New South Wales in Australia launched in 1998 a Construction and Demolition Waste Action Plan that provides a framework for all key stakeholders to achieve better waste management and waste reduction. The Japanese Construction Material Recycling Act requires the party that has received an order to

demolish a building to separate certain construction materials (concrete, wood, etc.) for reuse and recycling.

Half of the OECD countries are using landfill taxes to achieve diversion targets for C&D waste. Most often this tax covers all or several waste streams, but some countries have introduced a specific landfill tax for C&D waste, such as Austria. Instruments have also been introduced to ban the use of harmful substances in construction and construction materials, and for sorting out dangerous substances, materials and components from C&D waste, such as PCB, impregnated wood and asbestos.

10.6 Eco-labels

Eco-labelling is a voluntary method of environmental performance certification and labelling that is practised around the world. An eco-label is a label which identifies overall environmental preference of a product or service within a specific product/service category based on life cycle considerations. In contrast to "green" symbols or claim statements developed by manufacturers and service providers, an eco-label is awarded by an impartial third party in relation to certain products or services that are independently determined to meet environmental leadership criteria. Many OECD countries use eco-labelling as an instrument towards waste prevention.

10.7 Environmental management systems

An environmental management system is a voluntary management tool for companies and other organisations to evaluate, report and improve their environmental performance. Companies do not have to have a certified environmental management system, but two systems have proven to be of particular interest: the international environmental management system standard (ISO 14001) and the European eco-management and audit scheme (EMAS). They were opened for registrations in 1996 and 1995²⁶ respectively. EMAS goes beyond ISO 14001 in a number of ways, *e.g.* by requiring an initial environmental review, and the publication of relevant information to the public and other interested parties. When looking at environmental management systems, it should be emphasised that waste prevention is only one issue among all the environmental issues pertaining to a company. Since much of the 'real' waste prevention would take place during the production phase, the existence of environmental management systems is at least an indicator for businesses' interest in environment issues (including waste) and their willingness to take action.

²⁶ From 1995, the scope of EMAS restricted participation to sites operating industrial activities. From 2001, it was extended to include all sectors of economic activity including local authorities.

11. ASSESSMENT OF DATA AVAILABILITY

Information on policy objectives and instruments is not the only determinant for the selection of indicators. If indicators are to be an effective communication tool, data on waste generation is essential. The measurability of indicators is one of the OECD criteria for selecting environmental indicators.

A first condition for the development of response indicators for waste prevention is that data on the generation of the waste stream in question are available. Thus, the availability of waste generation data for the selected five waste streams is reviewed in this chapter. The detailed information is provided in the annexed Tables A.1-A.5. In addition, availability of additional relevant information for the establishment of response indicators is presented.

11.1 Municipal waste

The OECD 2001 workshop recommended focusing on the development of indicators for municipal waste, because at present data for this waste stream are readily available, relatively comparable and existing for the majority of the member countries. The available data on municipal waste are shown in Table A.1.

Data on municipal waste in OECD member countries are collected via the biennial joint OECD and Eurostat questionnaire. National data from statistical offices and environment ministries have been included in some cases to provide more complete time series.

Municipal waste is a complex waste stream since it may include waste from households, commercial activities, public services, offices and small size industry. The composition of waste from these activities varies from country to country. It has been demonstrated that due to differences in the composition of the waste collected by or on behalf of different local authorities, data on municipal waste is expected to be incomparable by nature. However, certain well-defined fractions of municipal waste can be compared (EEA, 2000). These are traditionally collected waste fractions (bagged mixed waste) and separately collected fractions (*e.g.* packaging, paper, glass and organic waste).

In general, data for municipal waste are available for the majority of OECD member countries. However, some countries only have data for one or two years, which makes it impossible to see any possible trends in waste prevention. The most complete data sets are available for the period of 1995-2000.

Relying on municipal waste as an indicator for overall waste prevention has the disadvantage of being only one waste stream representing 14 %²⁷ of total waste. In addition, due to the interpretation of the term municipal waste as “waste collected by or on behalf of municipalities”, there is a risk that part of the relevant waste stream ends up in other waste streams because of a change in the waste management structure.²⁸

The United States is the only OECD country that has systematically calculated the quantity of source reduction in municipal waste since 1982. The overall source reduction is further divided to 14 major components of municipal waste and one major observation is that yard trimmings provide a major contribution to source reduction, if utilized on site.

²⁷ 15% for EU countries.

²⁸ In Germany, packaging is not included in the statistic for municipal waste as it is being managed by the private company, Duales System Deutschland AG.

11.2 Batteries

There is no uniform way of estimating the consumption, collection and recycling of used batteries and therefore available data are based entirely on national sources. In addition, batteries include several different chemistries, such as nickel-cadmium, manganese alkaline and lithium. Cross-country comparisons of data on batteries may therefore only be made in a limited context.

For 13 European countries data on the recycling of portable Ni-Cd batteries are available for the years 1994-1999. Sweden and Switzerland have rather complete time series for battery quantities put on the market, as well as collected for treatment. The US has data on the battery units sold from 1985 to 2001 and Japan has data available for both recycling and sales of Ni-Cd batteries. The relevant data are shown in Table A.2.

Data for total sales in Europe of primary portable batteries (in units) and of portable rechargeable batteries (in units/cells) are available for 2000 at the European Portable Battery Association. This data shows that rechargeable batteries account for 8% of total battery sales.

11.3 Packaging

Almost all OECD countries have data on collected packaging for recovery, usually divided into the following materials: glass, paper and cardboard, aluminium and steel. However, rather few countries have data for new packaging put on the market.

Since 1997, EU Member States have been required to report to the European Commission on an annual basis on the quantity of packaging put on the market, recycled and recovered. The latest year with available data is 2001. The acceding countries have a transition period till 2005 to fulfil this obligation. However, only three countries have reported on the reusable packaging: Germany, Denmark and the United Kingdom.

11.4 Paper

Data on consumption and recycling of paper are mainly available from the paper industry. For the EU14, Norway and Switzerland, the trend in apparent consumption and recycling of paper can be assessed on the basis of statistics provided by CEPI (Corporation of European Paper Industries) for the years 1990-2000.

The Australian Paper Industry Council has data for the total apparent consumption and total wastepaper collected for 1991/92 – 2000/01. For Canada, data are available from the Paper Recycling Association (PRA) on Canadian paper and cardboard consumption, recovered paper from domestic sources, and the recovery rate for 1990-2001. It is assumed that similar data would be available from the American Forest and Paper Association and the Japan Paper Association.

Mexico is a member of the paper and cardboard association "Cicepla"²⁹ with nine other Latin American countries. Data is not available at a disaggregated level but is available as a total of all the member countries. This data exists on the apparent consumption for 1998-2000. Mexico also has a national establishment called "CNICP",³⁰ which collaborates with "Cicepla" on the collection of data. The data were not made available on the Internet.

In several OECD countries paper statistics is also available at national EPAs or at national statistical offices. However some of these statistics are not available free of charge. The FAO Forestry Department also has 2001 statistics from all the OECD countries on the "Production, Trade and Consumption of Forest Products" and also the 1993-2001 data on the "Forest Products Production".

²⁹ Please see www.andi.com.co/cicepla/81/972/EEC for more information.

³⁰ Please see www.cnicp.org.mx/quienes.html for more information.

11.5 Construction and demolition (C&D) waste

Through the joint biennial OECD/Eurostat questionnaire, data on C&D waste is collected from all OECD countries. This data is presented in annexed Table A.3. As the Table reveals, 21 countries have reported data, and two countries have data only at the state level. Approximately half of the countries have data for more than four years. Most reported figures from European countries are approximations and/or estimates and collection methods vary widely among the Member States (Symonds *et al.*, 1999).

There are differences in the inclusion of different fractions of C&D waste in the statistics. For instance, in Austria excavated soil is included in the C&D statistics, which is not the case in the majority of other Member States. Countries also have different interpretations of the joint questionnaire, which influence the way it is completed. As a result, C&D waste that is generated in other sectors, may not always be included appropriately in the statistics and not all C&D waste or waste from the C&D sector seems to be included in the statistics.

11.6 Eco-labels

An eco-label is a label which identifies overall environmental preference of a product or service within a specific product/service category based on life cycle considerations. In contrast to "green" symbols or claim statements developed by manufacturers and service providers, an eco-label is awarded by an impartial third party in relation to certain products or services that are independently determined to meet environmental leadership criteria.

In Europe, "the EU Flower" is the standardised eco-label. It is awarded to 21 product groups and has 134 licenses. Several of the European countries also have a national eco-label, *e.g.* Germany has "the Blue Angel", Czech Republic has the "Environmental friendly product" and the Nordic countries (Norway, Sweden, Denmark, Finland and Iceland) have "the Nordic Swan". "The Nordic Swan" has 74 product groups and 858 licenses.

Also outside Europe several OECD countries have national eco-labelling programmes. Australia, Canada New Zealand all have "The Environmental Choice" programme. In Japan it is called "The Eco Mark" and has a total of 5476 products and in Korea it is called "Kela" and covers 606 products. The United States have "the Green Seal" programme.

Most of the eco-label programmes have a website where the public can search for information on the various products covered by the eco-labelling.³¹

11.7 Environmental management systems

Data for the number of enterprises with a certificate from the environmental management system, ISO14001, are available through the International Organization for Standardization in Geneva. The organisation has published the number of certificates for all OECD countries for the period December 1997-December 2002 (ISO, 2002).

³¹ Please see www.gen.gr.jp/product_link.html for more information.

12. PROPOSED SET OF RESPONSE INDICATORS

12.1 Introduction

All three types of indicators described in Section 8.2 are generally relevant when developing a core set, or portfolio, of response indicators for waste prevention. Indicators on the use of instruments (a) are often needed to indicate whether and how waste prevention is addressed, while indicators that measure the implementation of policies (b) relate to the society's efforts to prevent waste. Indicators that measure the impact of policies (c) can for example be used to measure whether the amount of hazardous substances released to the environment is reduced.

As described in Chapter 6, the proposed methodology of the project is to identify a number of indicators to measure the implementation of OECD Member countries' objectives and instruments relating to waste prevention. However, this approach has proved less suitable, since policies and instruments vary greatly among the countries surveyed. Chapter 9 demonstrates that very few countries have targets that go beyond the general objective of waste prevention. Furthermore, relatively few measurable targets have been set for municipal waste, let alone other waste streams such as paper and packaging. The survey of policies and instruments implemented in Member countries revealed that the choices of instruments differ widely from one country to another. The intention was to study similarities among policies and use them to develop response indicators. However, with the differences in policies, this does not seem to be a feasible approach. Fees and charges in municipal waste management seem to be the only type of instrument that is in wide use.

Moreover, measures targeting the design and production process are considered very important to achieve waste prevention. If waste is to be made less hazardous, if reuse systems are to be set up and, as the third element in the OECD waste prevention definition, if a reduction in waste quantities is to take place, then several responses and incentives have to be implemented upstream, especially in the phases of design, manufacturing and distribution of products. The development of response indicators on waste prevention should therefore include all phases of the product life cycle. Unless measures are targeted at particular sectors, upstream measures are often of a generic nature, which makes it difficult to assign them to specific waste streams.

Consequently, when proposing indicators in this section, the waste stream specific focus has been abandoned and replaced by a focus on societal responses, i.e. generic measures on reducing waste generation, as well quantitatively as qualitatively.

Hence the first search is focusing on the type of policies and measures with the purpose of preventing waste generation, and their actual implementation. These types of indicators are preferred over the quantities of generated waste or environmental impacts from the management of waste, as in the OECD context those are being considered pressure and state indicators rather than response indicators. This definition is also in accordance with the OECD Reference Paper (OECD, 2003) on environmental indicators where response indicators in the P-S-R framework are reflecting societal responses to changes in the state of the environment. Societal responses are for example environmental expenditures, environment-related taxes, price structures of waste services, market shares of environmentally friendly products and services and enforcement and compliance rates.

The second search is focusing on the experiences gained from various measures to achieve waste prevention. In principle, the best way of developing good and pertinent response indicators would be to assess which policies have been effective in reducing the generation of municipal waste.

However, except for variable-rate pricing schemes, not many such experiences at the national level have been identified that have proved successful in reducing the quantity of municipal waste.

The third search is focusing on the short-to-medium-term and long-term perspectives of the use and development of response indicators. For the recommended short-to-medium-term indicators, data is currently available for a majority of OECD countries, but in some cases further efforts are called for to improve their quality (consistency, timeliness, comparability), and geographical coverage. For the long-term indicators not enough high quality data is currently available and consequently further efforts are needed to increase the collection of data and improvement of its quality. Otherwise it will not be possible to design this type of response indicators.

This study should be seen as a starting-point for the development of response indicators. Hence the focus is placed on the instruments that have either a proved or a perceived effect on the prevention of waste generation. Some instruments cover the entire range of environmental issues and are perceived to result in a generally improved environmental performance. Moreover, the final choice of indicators would depend on the cost and administrative burden of data collection. This is why the development of response indicators should be seen as an ongoing process whereby indicators can be improved when further information and experiences become available.

Waste prevention is a complex issue, and it is important to note that a wide range of measures will be necessary to achieve results. It will require initiatives in and towards all levels of the consumption cycle, some more far-reaching than others. The most simple response indicator would be to list all the implemented measures on waste prevention as a yes/no indicator, perhaps grouped according to the 'response areas' in Section 7.2.

Often-mentioned examples of initiatives that could be taken to halt the increasing waste generation are:

- Change product design towards longer life and better quality products;
- Produce easily repairable and dismountable products to facilitate reuse;
- Establish or promote markets for reusable products;
- Move from a product economy towards a service economy; and
- Design products with less material and lower weight.

12.2 Background

Before addressing the proposals for waste prevention response indicators, three issues that are relevant to the selection of the indicators will need to be briefly discussed: i) the difficulty of measuring prevention in municipal waste stream; ii) the relation between waste prevention and minimisation; and iii) the limitations of developing response indicators for cross-country comparisons.

Municipal waste stream (MW) is the recipient of used products from households, commerce and services. However, measuring prevention within the municipal waste stream itself is a difficult task because it is heavily affected by initiatives taken in other phases of the product life-cycle. To reduce the risk of municipal waste to human health and the environment, initiatives to be considered will have to take place in the design and production of dangerous products in question. Likewise, establishment of a comprehensive reuse system will affect the design, production and distribution of the product. Thus, to achieve reduction in municipal waste generation, the majority incentives will most likely have to target the design, manufacturing and distribution of products. The development of response indicators on waste prevention for municipal waste should therefore include the whole life cycle of products.

According to the OECD definition of waste prevention, strict avoidance involves the complete prevention of waste generation by virtual elimination of hazardous substances from a product or by reducing its material or energy intensity in production, consumption and distribution. Recovery is not considered prevention by this definition. However, true replacement of virgin materials by secondary materials (recycled) in the production of goods reduces the energy consumption and resource extraction and thus reduces waste generation. The energy consumption in the production of aluminium from scrap is known to be considerably less (up to 95 %) than from bauxite. The same applies (although to lesser degree) to other materials such as paper.³² Thus, the response indicators for waste prevention should also reflect the waste prevention arising from the use of secondary raw materials.

If the waste prevention indicators are to be used for cross-country comparisons, they must be aggregated to the national level. Then, the necessary data must be available and data sets between countries must be compatible. As mentioned previously, availability of data is a limiting factor even if a small number of OECD countries should be compared. In addition to the data compatibility also the countries should be or made comparable. Technically, this could be achieved by normalising the data in terms of expressing the value per unit of population, GDP or area, etc. However, demographic differences between countries may also reduce the comparability, such as different stages of policy development and implementation, economic development and indicator selection. Overall, cross-country comparison may work well for a small number of countries. However, comparisons in a larger scale may lead to serious distortions. This problem might be solved by making inter-comparison within clusters of countries sharing some common benchmarking criteria. It is however outside the scope of this report to try to make such a cluster-classification between countries for the waste prevention purposes, but it is quite obvious that the “level” of waste prevention policy between the OECD countries is rather diverse.

The degree of difficulty for evaluating environmental performance between countries depends also on the chosen comparison method. “*Distance-to-target evaluation*” should be relatively easy between countries for which there exist internationally agreed environmental targets. An example of that are emissions targets under the Kyoto Protocol for controlling the emissions of greenhouse gases, or waste recovery and recycling targets for EU countries, or development in market share of batteries containing more than 0.0005 % mercury, etc.

For a “*Performance comparison in relation to an average*”, data need to be normalised in order to make them comparable. The average could be an OECD or global average for a certain year. However, by calculating the relative rate of change between a reference year and a later year for a certain country and comparing the change with the average change for the OECD as a whole, normalisation is not necessary, but, as mentioned above, the countries as such must be comparable. A clear advantage with this method is that it can be applied to all available indicators and does not involve target setting.

12.3 Policies on waste prevention

In this chapter a number of experiences and good practices are presented in detail for the implementation of policy measures. It is also assessed whether these measures could serve as a response indicator. At the end of the chapter, the proposed indicators for the short-to-medium-term and long-term are presented along with additional information to support the interpretation and understanding of the indicator.

³² In Grant et al. (2001), the results of a LCA for paper and packaging waste in Victoria, Australia, indicate a 22-34% reduction of energy consumption for recycled paper (cardboard, newsprint) compared to virgin products. Assurre (2003) states that recycling of paper can reduce energy consumption by 40%.

The vast majority of waste policies deal with diversion of waste from landfills, increase of recycling and recovery, and management of hazardous waste. Although prevention, or reduction at source, is at the top of the waste hierarchy, efficient and effective measures have been difficult to implement without hampering economic growth and competition. In this section, member countries' experiences with measures which might have an effect on waste prevention have been studied. The aim is to draw on these experiences in the development of response indicators.

The examples presented in this section do not give a full picture of the analyses made of measures or the impacts of such measures as this would be far too extensive task. Instead, examples should be seen as best practices and inspiration for the development of response indicators.

12.3.1 Plans and strategies for waste prevention

Some countries have started to develop specific plans for waste prevention while others devote a section in a general waste management plan for this issue.

The Norwegian Ministry for the Environment has established a committee with the aim to investigate options and make recommendations for waste prevention. A report from the committee, presented in November 2002, concludes that if the necessary political will is present to implement a variety of measures at all stages of consumption, there are good opportunities to achieve the following recommendations (Ministry of the Environment, Norway, 2002):

1. Consumers will need to become aware that various needs may be fulfilled through also other means than buying goods. Increased quality of life is not equal to continuously increasing consumption;
2. Professional procurers should to an increasing degree demand services rather than goods;
3. The retailers should to an increasing degree enhance information services, and open markets for alternatives to new goods, *i.e.* for services and used and recycled products;
4. The manufacturing industry should to an increasing degree design products for recycling and with a longer lifetime; the use of recycled materials should be encouraged in the production of new goods; and
5. Waste should be considered as a resource and used to substitute virgin raw materials.

The report also outlines a wide range of specific measures that could be implemented to promote waste prevention. Among these are the enhancement of environmental aspects in school education, increased use of green public purchasing, possibility for mandatory environmental management systems and the use of producer responsibility systems and especially the ones focusing on waste prevention.

France launched a national, municipal waste prevention plan in February 2004 (Ministry of the Environment, France, 2004). Among the actions are:

- Mobilising all players:
 - National awareness-building campaign;
 - Two symbolic roads: voluntary reduction of plastic carrier bags and introduction of a “no thanks” sticker for unsolicited mail; and

- Better commitment of producers through extended producer responsibility programmes.
- Responsible consumption and more environmentally friendly products:
 - National guidelines for responsible consumption, focusing on waste prevention;
 - Eco-labels for more product types;
 - Promotion of eco-design; and
 - Better information to consumers on the durability of a product through a norm.
- Environmental management and industrial processes:
 - Promotion of environmental management by integrated product design;
 - Promotion and recognition of enterprises' voluntary commitments;
 - Call for tender concerning two projects: i) eco-design; and ii) low-waste technologies; and
 - Promotion of waste prevention through Producer Responsibility Organisations (PROs).

The existence of a plan and/or strategy can indicate whether a country has an overall approach to waste prevention. Further, it indicates the anticipated initiatives to be taken towards various groups in the society, *e.g.* actions targeting consumers and private companies.

12.3.2 Extended Producer Responsibility Schemes (EPR)

Extended producer responsibility implies that a producer's responsibility (financial and/or physical) is extended to cover the post-consumer stage of a product's life cycle (OECD, 2001b).³³ Assigning such a policy could provide incentives to prevent wastes at source and limit use of resources, promote design for environment (DfE) and increase recycling levels.³⁴

Often the individual producer has an option either to manage the treatment of post-consumer products on his own or to transfer the obligation to a third-party organisation (PRO) in return of paying a fee for the service. The EPR is typically combined with requirements for meeting set targets on recycling and recovery of the product.

A fee paid to a PRO or the costs carried by the producer from managing a take-back obligation on his own, will have similar effects as a product levy. The main difference is that the fees (or costs) cover the actual costs of waste management and are not set for revenue raising or some other purpose.

So far EPR schemes have proved very successful in achieving high recycling rates and perhaps to a lesser degree waste prevention. However, a way of improving the waste prevention aspect would be to include actual targets or requirements for a continuous reduction in waste quantities. In the Dutch Packaging Covenant III, industry is required to ensure that the total volume of typical packaging materials does not rise by more than two-thirds of the comparable increase in GDP by 2005, taking 1999 as the baseline year. To achieve this target, producers are required to undertake

³³ An EPR programme is likely to be most effective and efficient tool in cases where other instruments are unable to provide the appropriate prevention signals up and down the product chain, where it is difficult to target externalities precisely at individual points in the production chain and where the administrative costs of EPR are not excessive in relation to alternative policy instruments.

³⁴ OECD's current work on "Analytical Framework for Evaluating Costs and Benefits of EPR" will contribute to the development of this indicator.

systematic reviews of ways to reduce the environmental impact and to produce annual reports on the performance.

The Italian packaging compliance scheme, CONAI, is responsible for promoting reduction of environmental impacts of packaging. It has launched a range of instruments to promote the prevention of the generation of packaging waste. Some examples are (ETC/WMF, 2003):

- The fee is proportional to the quantities of packaging (and depends on the kind of packaging material) put on the market, thus the fee is an incentive to optimise the packaging;
- Packaging, which is part of a deposit system and a closed loop system, is exempted from the fee;
- CONAI is also encouraging companies to reuse and recover materials taken back under the separate collection schemes; and
- In 2001, CONAI prepared a 'Prevention Dossier' which has reached more than 6,000 companies and other stakeholders. In 2004 a second edition of the Prevention Dossier is being produced.

The exact causality between the above initiatives and developments in product design and waste quantities is difficult to demonstrate because design and waste quantities are influenced also by many other factors. However, CONAI has made some case studies which demonstrate that the weight of aluminium cans, foodstuff trays and aluminium foils during the last ten years has decreased by 9%, 10% and 28% respectively. In the same period the weight of 0.5 kg steel boxes has been reduced by 30% and the weight of plastic bottles for mineral water by 16 %.

Five years after the introduction of the German Packaging Ordinance (which led to the establishment of the 'Green dot' scheme) in 1991, the quantity of total packaging consumption had declined by 12 %. This decline however, has been partly offset by an increase in packaging consumption by 10 % from 1996 to 2000, but the consumed quantity in 2000 was still 430 000 tonnes lower than in 1991.³⁵ Although the Ordinance did not include any specific objectives on prevention, the cost for packaging producers seems to have had some preventive effect. A review of the cost-effectiveness of the scheme is underway (OECD, 2001a).

Extended producer responsibility schemes could act as a driver for reducing waste amounts and promoting eco-design, although more information is necessary for proposing an exact indicator in this area.

12.3.3 Environmental management systems (EMS)

Two environmental management systems have proven to be particularly popular: international environmental management system standard (ISO 14001) and the European eco-management and audit scheme (EMAS). They were opened for registrations since 1996 and 1995³⁶ respectively. According to the latest available figures, the global number of companies having an ISO certification is around 50 000 (different sources give slightly different figures) and the number of organisations registered to the European EMAS is around 3 000 and the number of sites around 4 000. EMAS goes somewhat beyond the ISO 14001 by requiring organisations to carry out an initial environmental review and publish periodically an environmental statement providing the public and other interested parties with information on their environmental performance.

³⁵ Web site of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, www.bmu.de/en/800/js/topics/waste/waste_drinks/

³⁶ As of 2001 the scope of EMAS has covered all sectors of economic activity, including local authorities.

However, neither the International Standardisation Organisation nor the European Commission seems to have conducted evaluation on how well companies having introduced an EMS are performing environmentally. Most of the published studies are either single-company best practices or surveys including a limited number of companies.

The Californian EPA conducted an evaluation of the potentials of EMS in California (California Environmental Protection Agency, 2003). Nine companies were included in a pilot study, and the findings are reported in three sets of indicators: awareness and commitment, systems for environmental protection and environmental performance. The findings of the pilot project support the conclusion that EMSs *can* have a positive effect on environmental protection and increase protection above that provided by a regulated entity's current regulatory requirements. Improvements were observed in each of the three sets of indicators. Regarding waste reduction, three companies had objectives on the reduction of municipal waste.³⁷

A survey (Modahl and Thoresen, 2002) among 198 Norwegian companies indicates that companies certified with either EMAS or ISO14001 are perceived as good environmental performers, and distinctly better than non-certified companies.

In a 1999 study, 7 Danish and 17 international examples demonstrated that the environmental performance evaluation guidelines (ISO, 2002) is a useful tool for establishing simple environmental management systems, focusing the content of EMAS and ISO 14001, and measuring and reporting performance trends over time. Moreover, the project showed that pilots without an EMS only possess only a vague idea on their own environmental performance criteria.

When looking at environmental management systems, it should be emphasised that waste prevention is only one issue among all the environmental issues pertaining to a company. Nevertheless, when implementing an EMS a natural starting point is to review all the processes in a company to find room for environmental improvement, as well as cost reductions, and in this process waste prevention will be an obvious issue to study. Since much of the 'real' waste prevention will take place during the production phase, the existence of an environmental management system is an indicator of business' interest in environmental issues (including waste) and their willingness to take action.

12.3.4 Charges and fees in waste management

If the payment for waste management services is a flat rate or if it is based on a share of property taxes, it is most likely that households do not have an incentive to reduce or recycle more waste. Likewise, if the payment is only due once a year, consumers could tend to lessen their efforts and return to usual habits.

In variable-rate pricing system³⁸ payment for the waste management increases with the amount of (residual) waste generated. Hence, the systems provide an economic incentive for the waste producer (household) to recycle waste and to reduce the total quantity. The systems are either volume-based (bin or bag), weight-based or hybrids (buy tag or sticker, only pay after a threshold amount, etc.).

Below, some examples on charging systems are presented in addition to those in section 12.1.2 on expenditures.

³⁷ For example, 'reduce solid waste disposal and cost by 10%' and 'reduce refuse removal by 5%'. In addition, another company had objectives on reduction of hazardous waste.

³⁸ Pay-as-you-throw (PAYT) systems.

In the United States, variable-rate pricing systems have been implemented in more than 4 100 communities in 42 states reaching an estimated 10% of the US population (National Center for Environmental Economics, 2001). The most widespread systems are volume-based. The experiences from variable-rate pricing systems have shown that some 17% less waste have been disposed of (landfilled), with 8-11% having been diverted to recycling and about 6% are due to source-reduction efforts (Skumatz, 2002). The National Centre for Environmental Economics reports on the outcome of several studies, and most of them show significant but varying reductions in waste disposal.

Korea implemented a nation-wide, volume-based waste fee system in January 1995 imposing a differentiated treatment cost as determined by the amount of residual waste generated by each resident. Wastes are collected in synthetic resin volume-based waste bags that are purchased at the price of the waste treatment cost. Recyclable wastes are sorted and put out in separate bins and collected free of charge. As a result of the system, the quantity of waste per capita fell from 1.33 kg in 1994 to 0.98 kg in 2000.³⁹ Before the introduction of the system, the amount of waste treatment cost levied on each household was proportional to the residence size and the amount of property tax.

These results are supported by the findings of a survey conducted for the European Commission (EC, 1999) to identify best practice examples in industrial and household waste prevention. Among the examples are two towns in Belgium and France which implemented volume-based systems and achieved major reductions in household waste.

A Danish study compared five municipalities with weight-based fee collection schemes with reference municipalities (Danish EPA, 2000). The study concluded that municipalities with weight-based collection schemes do generate less waste than the corresponding reference municipalities. This is partly due to higher home composting in municipalities with weight-based collection schemes. The actual reduction in waste amounts has been difficult to estimate, however. No difference in consumer habits was observed; and some incidences of fly tipping and illegal burning of waste were noticed.

A first step in promoting waste prevention is to charge householders or waste producers for the waste management service provided. Moreover, introducing some kind of variable-rate pricing would enhance their awareness further. Hence, the extent to which such schemes are implemented by countries, might be a good candidate for a response indicator.

12.3.5 *Landfill tax*

Taxes on waste going to landfill have been imposed in several countries with some experience for more than 10 years. The tax rates per tonne of waste vary from EUR 79 in the Netherlands, to EUR 15 in Finland and Ireland, and to approximately \$1 in New Jersey, USA. The tax has mainly contributed to diversion of waste from landfill to recycling and incineration.

Curry and Gregory (2001) concluded that neither in France nor in the UK has there been a real reduction in municipal waste sent to landfill which probably is mainly due to a relatively low tax rate.⁴⁰ Austria and the Netherlands have been successful in making this shift, although the implication of the tax was supported by also some other measures.

An evaluation of the Danish waste tax system concluded that a 26% decrease in waste delivered to municipal waste treatment plants was registered from 1987 to 1996 (Skou Andersen *et al.*, 1997).⁴¹ In a later evaluation a decrease of at least 0.5% was registered from 1997 to 1998 and in that same

³⁹ Web site of the Ministry of Environment, Republic of Korea, www.me.go.kr:8080/eng/index.html.

⁴⁰ The UK Prime Minister's Strategy Unit has recommended that the Landfill Tax should be raised to £35 per tonne (Strategy Unit, 2002).

⁴¹ The report analyses development in taxable residual waste, i.e. waste that is not recycled.

period the growth in production and consumption attained 7% (Skou Andersen and Dingsøe, 1999). The Danish waste tax is also levied on waste destined for incineration, though at a lower rate.

Table 4. **Reasons for implementing waste taxes**

| Country | Stimulating waste reduction, reuse and recycling | Revenue raising | Internalising externalities |
|--------------------|--|-----------------|-----------------------------|
| Austria | | X | X |
| Denmark | X | | |
| Finland | X | | |
| Belgium – Flanders | X | X | |
| France | X | | |
| Italy | X | | |
| Netherlands | X | X | |
| Sweden | X | | |
| United Kingdom | X (now) | | X (start) |
| Norway | X | | X |
| Switzerland | | X | X |
| Belgium – Wallonia | X | | |

Source: Curry and Gregory (2001)

Note: When the UK landfill tax was introduced the rates were based on estimates of the environmental externalities associated with disposal of waste at landfill. However, since that the tax is based on an escalator of regular annual increases to a medium-to-long-term rate of £35/t and it has become more of a 'behavioural tax' designed to reduce the reliance on landfills.

In the United States, surcharges on waste delivered to landfills have been imposed in more than 20 states (National Center for Environmental Economics, 2001). Some of these taxes have been introduced with the purpose of financing the costs associated with closure of landfills. The National Center for Environmental Economics concludes that it is unclear whether the landfill taxes have produced a significant incentive to reduce waste generation or divert waste from landfills. One obvious reason for this conclusion seems to be that private waste operators have been able to transport the waste to other landfills which are not covered by the tax scheme.

It has become clear that while landfill tax can be very effective in diverting recyclable waste from landfills, it is more than uncertain whether the present level of these taxes is sufficient to significantly change the behaviour of households and product manufacturers towards waste prevention. As a result, landfill taxes will not be included in the proposed set of indicators.

12.3.6 Awareness-raising campaigns

Waste prevention information campaign expenditure (campaigns targeting enterprises and households) is a potential candidate for a response indicator. As data for such an indicator is not readily available, a comparable simpler indicator would be presented in this study.

To limit the quantity of unsolicited mail, some countries have or are about to introduce an option for consumers to use a 'no thanks-sticker' on the mailbox. The share of households with such a sticker will indicate the extent to which awareness on waste prevention has increased and whether consumer behaviour is changing. The Public Waste Agency of Flanders (OVAM), Belgium, has explored a number of indicators for municipal waste, including one on the number of anti-advertising stickers handed out.

However, regulation on the use of such a sticker, if any, may vary among countries. As an example, a Danish household can still receive unsolicited mail if it has a sticker because the sender has a right to decide whether to respect the sticker or not. Nevertheless, some 9.5% of all Danish households have such a sticker. Households register at the local post office, Post Denmark updates the list four times a year and publishes it at their website.

The 'no thanks-sticker' should be seen as an awareness-raising initiative and it would probably require an information campaign to launch it and regular ones to maintain interest among consumers. To have a real effect on the amount of mail, this measure should probably be supported by a legislative measure making a sticker legally enforceable.

12.4 Proposed set of indicators

Based on the experiences provided in this chapter and the considerations made in earlier chapters, three short-to-medium-term and another three long-term response indicators for waste prevention are recommended below for further discussion and consideration. **For both sets, indicators demonstrating the trend in the generation of selected waste streams: municipal waste, its components and C&D waste, expressed either in tonnes per capita, per GDP (C&D waste), per private final consumption (municipal waste and its components) or per gross value added (C&D waste from C&D sector) are considered natural members.**

According to the OECD Reference Paper on environmental indicators (OECD, 2003), an indicator should be supplemented with case specific background information, data and explanation that would help the interpretation of the indicator. In this section, the indicator is accompanied with suggested additional information to facilitate the interpretation.

12.4.1 Indicators recommended for the short-to-medium-term

12.4.1.1 Certified environmental management systems (EMS)

Indicator: Number of companies with a certified environmental management system (EMS), total number, per capita, or per GDP.

Additional information:

- Public programmes to support or ease implementation of EMS;
- EMS distribution across the economic sectors;
- Share of small and medium sized enterprises (SME) with a certified EMS of total companies with certified EMS; and
- Annual turnover of the companies with EMS

Upstream waste reduction is important even though it will not directly affect the quantity of municipal waste. Thus, the number of certifications could be used as a signal about enterprises' interest in incorporating environmental considerations, including waste prevention, into the manufacturing industry.

12.4.1.2 Consumption and recycling of selected materials

In general, recycling of materials will save resources and eventually reduce the generation of waste. Exactly how much, depends on the kind of material, where it is extracted, produced, used energy sources, waste management practises, etc.

Indicator: Consumption of virgin material and (collection for) recycling of the material. For selected materials only, *e.g.* glass, paper and metals.

Additional information:

- Description of legislation, requirement for separate collection (*e.g.* kerbside, bring scheme, other), extent of deposit-refund systems;
- Recycling targets for the material in question;
- Development in prices for recycled products; and
- Development in GDP and production volume using this particular material.

12.4.1.3 'No thanks'-sticker for unsolicited mail

Indicator: 'No thanks'-stickers handed out, in percentage of total households or by type of households (single-family, multi-family, other).

Additional information:

- Year of introduction;
- Legislation or coverage of the measure, *e.g.* how widely stickers are circulated and used, possible registration requirements and compliance requirements for the mail provider, etc;
- Launched information campaigns; and
- Monitoring arrangements.

12.4.2 *Indicators recommended for the long-term*

12.4.2.1 National waste prevention plans and strategies

Indicator: Existence of a national waste prevention plan or strategy (yes/no).

Additional information:

- Year of issue;
- Is the plan/strategy subjected to a regular revision process;
- Target audience of the plan or strategy;
- Public annual expenditure on cleaner production programmes in % of GDP; and
- Public annual expenditure per capita on consumer awareness-raising.

12.4.2.2 Extended Producer Responsibility Schemes (EPR)

Indicator: This would be a qualitative indicator that shows the extent to which EPRs are implemented. In this case a relevant indicator could be a list of (a number of) of products and/or product groups targeted by EPR nationally or regionally.

Additional information:

- The share of companies participating in a compliance scheme over those targeted by EPR (by law or by voluntary agreement with industry organisation, etc.);
- In some cases, third-party organisations (PROs) finance prevention programmes directly by devoting a part of their budget to this activity. These expenses can be a useful indicator to be compared with the amount products or product groups put on the market;

- Information on possible waste prevention targets; and
- Information on costs and revenues of EPR, i.e. total revenues minus total costs of the system.

12.4.2.3 *Households with variable-rate pricing*

Indicator: Number of households with variable-rate pricing, in total or as share of the total number of households.

Additional information:

- Share of volume-based, weight-based pricing and hybrids vs. other payment systems, including the number of households with a reduced fee for home composting, etc.; and
- Fees per tonne waste covering full costs or comparable tax subsidies.

12.5 **Conclusions and recommendations**

The indicators presented above are meant to provide a basis for further discussion and development of response indicators for waste prevention in the OECD context. The proposed indicators provide only an example of the portfolio of response indicators that could be developed for OECD purposes. However, within this study it was not possible to explore the issue in full detail, since not all the needed background information was not available, *i.e.* detailed information on national data availability, details on the existing national and international response indicators for waste prevention, details on the existing national and international waste prevention programmes, strategies and plans, etc.

An important aspect in the development of response indicators for waste prevention is to take the entire product life-cycle into consideration, not just the consumption and waste stage, as the decisions regarding design, materials, product durability, etc. are made during the manufacturing process and this will influence both the extraction of raw materials and waste generation.

Another important aspect is that it may be difficult to separate waste prevention and minimisation when developing response indicators. The two concepts are closely interlinked when considering reduction of energy and material intensity and the closure of material cycles.

During the search for experiences on various measures to achieve waste prevention, none were found to relate to expenditure on awareness campaigns and cleaner production. This may be due to the search process, as these “societal responses” would potentially be excellent indicators for waste prevention. Nevertheless, for the time being further information and analysis would be needed before being able to recommend them as waste prevention response indicators.

Development of indicators is an iterative process, meaning that the most informative indicators are naturally preferred, but those may not always be achievable with the currently available data. Hence, the quality of indicators based on currently available data and the possibilities to develop high quality indicators, would always have to be weighted against the cost and efforts needed to collect the required data.

Some of the indicators proposed above would even need data that are not collected via the regular reporting systems. This is especially true for the long-term indicators. Consequently, it is recommended that part of the future discussion in the OECD would focus on the need and possibilities for additional high quality data.

REFERENCES

- ARGUS (2001), *European Packaging Waste Management Systems*, Final report, European Commission DGXIE.3.
- ASSURRE (2003), *Paper and Board Manufacturing and Recycling*, Fact Sheet, ASSURRE, March 2003, www.assurre.org
- Australia Ecocycle Victoria (2003), "Towards Zero Waste, A materials efficiency strategy for Victoria", Draft for Consultation.
- Australia New South Wales (2003), *NSW Waste Avoidance and Resource Recovery Strategy 2003*, www.ressource.nsw.gov.au.
- California Environmental Protection Agency (2003), *Environmental Management and Sustainability Program Innovation Initiative*, Report on the California EPA Environmental Management System Project.
- Curry, R., and B. Gregory (2001), *Introduction of a Landfill Levy*, Department of the Environment and Local Government, Ireland.
- Danish EPA (2000), "Fordele og ulemper ved gebyrdifferentierede indsamlingssystemer for husholdningsaffald" (Pros and Cons of Fee - Differentiated Collection Schemes Exist for Household Waste).
- EC (European Commission) (1999), "Institut für Ökologie" (Waste Prevention and Minimisation), Final Report, Luxembourg.
- EEA (European Environment Agency) (1999), *Baseline Projections of Selected Waste Streams - Development of a Methodology*, Technical Report No. 28, Copenhagen.
- EEA (2000), *Household and Municipal Waste: Comparability of Data in EEA Member Countries*, Topic Report No. 3, Copenhagen.
- ETC/WMF (European Topic Centre on Waste and Material Flows (2003), "Evaluation Analysis of the Implementation of the Packaging Waste Directive", Interim Report, Copenhagen.
- Grant, T., K. James, S. Lundie and K. Sonneveld (2001), *Stage 2 Report for Life Cycle Assessment for Paper and Packaging Waste Management Scenarios in Victoria, Melbourne*, EcoRecycle Victoria, Australia, www.ecorecycle.vic.gov.au
- ISO (International Standardization Organization) (2002), *Twelfth Cycle: Up to and Including 31, The ISO Survey of ISO 9000 and ISO 14001 Certificates*.
- Ministry of the Environment, France (2004), "Prévention de la production de déchets", DTC/W Translation, www.ecologie.gouv.fr/sommaire.php3.
- Ministry of the Environment, Norway (2002), "Avfallsforebygging, En visjon om livskvalitet, forbrukerbewissthet og kretsløpstenkning", NOU 2002:19, www.managenergy.net/actors/A2311.htm.

- Ministry of Housing, Spatial Planning and the Environment, the Netherlands (2002), “Draft National Waste Management Plan”, the Netherlands, Public Enquiry Version, www.vrom.nl/international/.
- Modahl, I.S. and J Thoresen (2002), “Miljøarbeid i norske verksemder - resultat frå spørreundersøking i 198 bedrifter”, Stiftelsen Østfoldforskning.
- National Center for Environmental Economics (2001), *The United States Experiences with Economic Incentives for Protecting the Environment*, <http://yosemite.epa.gov/ee/epa/eed.nsf/webpages/homepage>.
- OECD (1998a), *Waste Minimisation in OECD Countries*, ENV/EPOC/PPC(97)15/REV2, OECD, Paris.
- OECD (1998b), *Waste Minimisation Profiles of OECD Member Countries*, ENV/EPOC/PPC(97)16/REV2, OECD, Paris.
- OECD (1998c), *Considerations for Evaluating Waste Minimisation in OECD Countries*, ENV/EPOC/PPC(97)17/REV2, OECD, Paris.
- OECD (2000), *Strategic Waste Prevention: OECD Reference Manual*, ENV/EPOC/PPC(2000)5/FINAL, OECD, Paris, www.oecd.org/env/waste.
- OECD (2001a), *Environmental Performance Reviews: German*, OECD, Paris.
- OECD (2001b), *Extended Producer Responsibility: A Guidance Manual for Governments*, OECD, Paris.
- OECD (2001c), *Key Environmental Indicators*, OECD, Paris.
- OECD (2001d), “OECD Environmental Outlook”, *Chapter 20: Waste*, OECD, Paris.
- OECD (2002a), *Environmental Performance Reviews: Italy*, OECD, Paris.
- OECD (2002b), *Environmental Performance Reviews: Japan*, OECD, Paris.
- OECD (2002c), *Environmental Performance Reviews: United Kingdom*, OECD, Paris.
- OECD (2002d), “Working Group on Waste Prevention and Recycling: Draft Programme of Work and Budget for 2002 Concerning Waste Prevention Performance Indicators”, ENV/EPOC/WGWPR(2002)2, OECD, Paris, www.oecd.org/env/waste.
- OECD (2002e), *OECD Workshop on Waste Prevention: Toward Performance Indicators*, ENV/EPOC/WGWPR/SE(2002)1/FINAL, OECD, Paris, www.oecd.org/env/waste.
- OECD (2003), “OECD Environmental Indicators: Development, Measurement and Use”, Reference Paper, OECD, Paris. www.oecd.org/env/waste.
- Simeone, A.M. *et al.* (2003): “Policy-Response Indicators for Packaging Waste Policy”, Working Paper, ETC/WMF, Copenhagen.
- Skou Andersen, M. *et al.* (1997), *The Waste Tax 1987-1996 and ex Post Evaluation of Incentives and Environmental Effects*, Danish EPA, Copenhagen.

ENV/EPOC/WGWPR/SE(2004)1/FINAL

Skou Andersen, M. and N Dingsøe (1999), *Effects of the Increase in the Danish Waste Tax – with Special Focus on Waste from Industry and Commerce*, Danish EPA, Copenhagen.

Skumatz, L.A. (2002), *Variable-Rate or ‘Pay-as-You-Throw’ Waste Management: Answers to Frequently Asked Questions*, Reason Foundation.

Symonds *et al.* (1999), *Report to DGXI, European Commission: Construction and Demolition Waste Management Practices, and their Economic Impacts, Final Report*, Brussels.

Stutz, J. (2002), *Developing Waste Prevention Indicators*, (ENV/EPOC/WGWPR/SE(2002)1/FINAL), OECD, Paris.

US EPA (1999), *National Source Reduction Characterisation Report: For Municipal waste in the United States*, US EPA, Washington DC.

US EPA (2002), *Municipal Solid Waste in the United States: 2000 Facts and Figures*, www.epa.gov.

ANNEX

Table A.1. Data on municipal waste

| | |
|-----------------|---|
| Australia | Estimates, early 1990s: 400 kg household waste per capita. Generation, 1978, 1992. Data are available for 4 states. For 2 states data are available as part of total waste stream. |
| Austria | Generation, 1990, 1995-1999 |
| Belgium | Generation, 1980, 1990-1999 |
| Canada | 1980, 1992, 1996. Residential waste 1996, 1998, 2000. Ontario: Backyard composting activity: number of households provided with compost bins and estimated backyard composting, 1994-2001. |
| Czech Republic | Generation, 1987, 1996-2001 |
| Denmark | Generation, 1980, 1985, 1994-2001 |
| Finland | Generation, 1994, 1997 |
| France | Generation, 1989, 1995-2000 |
| Germany | Generation 1996-2000 |
| Greece | Generation (traditionally waste collection), 1980, 1985, 1990-1992, 1995, 1997 |
| Hungary | Generation (transported amounts), 1980, 1985, 1990, 1995-2001 |
| Iceland | Generation of municipal and household waste, 1992-2001 |
| Ireland | Generation, 1980, 1984, 1995, 1998 |
| Italy | Generation, 1980, 1985, 1990, 1995-2000 |
| Japan | Generation, 1980, 1985 Generation, domestic waste 1990-1999. Discharge of municipal waste 1982-2000. |
| Korea | Generation, 1985, 1990 Domestic waste generation, 1992-2001 and recycling, 1992, 1996-2001. Food waste, 1998-2001 |
| Luxembourg | Generation (excl. separate collection), 1980, 1985, 1990 Generation, 1991-1999 |
| Mexico | Generation, 1991 Generation, 1992-1998, in composition: paper, textiles, plastic, metal, glass, organic. |
| Netherlands | Generation, 1980, 1985, 1990, 1995-2001 |
| New Zealand | Generation, 1982 |
| Norway | Generation, 1980, 1985, 1992 Before 1992: excludes similar waste from areas not served by municipality service Generation, 1995-2000 |
| Poland | Generation, 1980, 1985, 1990, 1995-2001 |
| Portugal | Generation, 1980, 1985, 1990, 1995-2000 (1997 estimated data) |
| Slovak Republic | Generation, 1987, 1995-1996, 1998, 2000 |
| Spain | Generation, 1980, 1985, 1990, 1995 Collected, 1990, 1995-2000 |
| Sweden | Generation, 1980, 1985, 1990, 1998, 2000 |
| Switzerland | Generation, 1980, 1985, 1990-2000 |
| Turkey | Collected waste in municipalities with service, 1980, 1985, 1989, 1995 – 72% of population in 1995. Collected, 1994-1998 |
| United Kingdom | Generation, 1995-1999. Estimates for England and Wales. Municipal/household waste arisings, 1996/96 – 2000/01 Recycled and not recycled household waste, 1983/84 – 2000/01. |
| United States | Generation, (1960-), 1995, 1998-2000. Calculated source reduction, 1992-2000. |

Table A.2. **Data on batteries**

| | |
|----------------|--|
| Austria | Sales, 2000, collection 1998-2000 Recycling, 1995, 1999 |
| Belgium | Sales, 2000, collection 1998-2000 Recycling, 1994-1999. |
| Denmark | Estimated consumption of batteries 1990-1997 (according to production, import and export). Recycling of lead and nickel-cadmium batteries 1995-2001 Studies on actual collection of batteries. |
| Finland | Recycling, 1995-1996, 1998-1999 |
| France | Recycling, 1994-1999 |
| Germany | Sales and returns of batteries, 1999-2000. Recycling, 1994-1999 |
| Ireland | Generation of small batteries and lead acid batteries, 1998. |
| Italy | Recycling, 1994, 1997-1999 |
| Japan | Sales, 1992-1996 Recycling, 1991-1995 |
| Netherlands | 1999: quantity of discarded batteries and collected quantity for recycling. Sales in 2000, collection 1998-2000. Recycling, 1994-1999 |
| Norway | Recycling, 1995-1996, 1999 |
| Spain | Recycling, 1995, 1998-1999 |
| Sweden | Quantities put on the market, 1994-1999. Collected quantities, 1990-1999: NiCd and lead batteries Recycling, 1995-1999 |
| Switzerland | Produced in Switzerland and imported quantity, 1987-2000 Consumption and collected quantity, 1993-2001. Recycling, 1994-1999 |
| United Kingdom | Recycling, 1994-1999 |
| United States | Sales in units, 1985-2001 |

Table A.3. Data on construction and demolition (C&D) waste

| | |
|-----------------|--|
| Australia | Disposal of C&D waste are available for 3 states (in financial years). For 3 other states data are only available as part of the total waste stream. |
| Austria | Generation, 1990, 1996, 1997, 1999 |
| Belgium | Flanders: Generation, 1992, 1994-1999 |
| Canada | |
| Czech Republic | Generation, 1995-2001 |
| Denmark | Generation, 1985, 1994-2000 |
| Finland | Generation, 1990, 1992, 1994, 1997 |
| France | Generation, 1991 |
| Germany | C&D wastes 1996-98, incl. soil excavation. Waste volumes disposed of or recycled, 1990, 1993. Production and recycling of PVC for construction, 1997, 1999. |
| Greece | Generation, 1991, 1996 |
| Hungary | Generation, 1980, 1985, 1994, 1996-2000 |
| Ireland | Generation, 1995, 1997 |
| Italy | Generation, 1997, 1999 |
| Korea | Generation, 1996-2001 |
| Luxembourg | Generation, 1994, 1996-1997 |
| Netherlands | Generation, 1985, 1996-1997 |
| Norway | Generation, 1993, 1998 |
| Poland | Generation, 1980, 1985, 1990-2001 |
| Portugal | Generation, 1995, 1997-1999 |
| Slovak Republic | Generation, 1995-1996, 1998-1999 |
| Spain | Generation, 1990, 1999 |
| Sweden | Generation, 1996-1997 |
| Switzerland | Generation, 1990, 1994, 1996, 1998 |
| United Kingdom | Generation, 1990, 1995-1996, 1999 |
| United States | Generation, 1996 |

Table A.4. Data on packaging and packaging waste

| | |
|-----------------|--|
| Austria | Total consumption, 1997-1999 |
| Belgium | Total consumption, 1997-2000 |
| Canada | New packaging used, 1988, 1992, 1996 Recycling 1988, 1992, 1996 |
| Czech Republic | Collected quantity, 1999-2001 |
| Denmark | Total consumption, 1997-2001 Reusable packaging, 1999-2000 |
| Finland | Total consumption, 1997-1999 |
| France | Total consumption, 1997-2000 |
| Germany | Total consumption, 1997-2000 Consumption and recycling of sales packaging for glass, tinfoil, aluminium, plastics, paper and liquids cartons, 1991, 1994, 1996-2000. Share of returnable packaging for beverages in %, 1991, 1993, 1995, 1997-2000 Recycling of glass containers, 1995, 1997, 1999-2000 |
| Greece | Total consumption, 1997-2000 |
| Ireland | Total consumption, 1997-2000 |
| Italy | Total consumption, 1997-2000 |
| Japan | Container/ packaging waste recovery programme: <ul style="list-style-type: none"> • Participating municipalities • Separately collected amounts of packaging/ materials, 1997-2000 |
| Luxembourg | Total consumption, 1997-2000 |
| Mexico | Generation, 1992-1998 and 1993-200, breakdown in composition: paper, textiles, plastic, metal, glass, organic, other. Recycling, 2001 of metals, glass, plastic, paper and cardboard |
| Netherlands | Total consumption, 1998-2000 Total consumption, 1991-1998 |
| New Zealand | Recycled packaging waste, 1994-2000 for aluminium, glass, paper, plastics and steel. |
| Norway | Paper packaging waste, 1985-1999 Glass waste, 1993-1998 Plastic packaging, 1986-1997 |
| Portugal | Total consumption, 1997-2000 Recycling, 1993-1999 of glass, paper and cardboard |
| Slovak Republic | Separate collection of glass, plastics, metals, paper (not necessary packaging only) |
| Spain | Total consumption, 1997-2000 |
| Sweden | Total consumption, 1997-2000 Recycling rates for various materials, 1992-1999 |
| Switzerland | Consumption and separately collected: <ul style="list-style-type: none"> • glass bottles, 1989-2001 • aluminium cans, 1987-2001 • PET bottles, 1991-2001 • tinfoil, 1988-2001 |
| Turkey | 900.000 tons of waste packaging recycled in the last ten years |
| United Kingdom | Total consumption, 1997-2000. Some data on reusable packaging. |
| United States | Generated and recovered containers and packaging, 2000 (very detailed statistics, e.g. for steel, aluminium, glass, paper/board, plastics, wood) |

Table A.5. Data on paper and cardboard

| | |
|----------------|---|
| Australia | Apparent consumption, 1991, 1993-2000 Collected for recycling, 1991, 1993-2000 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Austria | Generation, 1999 (paper) Collected, 2001 (paper) Collected from households, 1995-2000 (paper) Collected from industry, 1995-2000 (paper) Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Belgium | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Canada | Recyclable paper consumption, 1985, 1990-2001 Canadian Paper & Board Consumption, 1985, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Czech Republic | Generation, 1997-2000 Collected for recycling, 1997-2001 Collected paper, 1986-1999 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Denmark | Generation, 1983-2000 Collected for recycling, 1990-2001 Generation, 1999-2000 Potential paper in households Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Finland | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| France | Generation, 1983-2000 Collected for recycling 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Germany | Generation, 1983-2000 Collected for recycling, 1990-2001 Waste paper consumption as % of paper and board production minus export, 1995-2000. Waste paper recovery rate, 1995-2000. Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Greece | Generation, 1990-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Hungary | Generation, 2000 Collected for recycling, 2000-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Iceland | Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Ireland | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Italy | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |

ENV/EPOC/WGWPR/SE(2004)1/FINAL

| | |
|-----------------|--|
| Japan | Generation of waste paper, 1993-1994 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Korea | Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Luxembourg | Paper/cardboard generation, 1996 Quantities put on the market, 1998 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Mexico | Consumption, 1997, 2001 Recovered, 1997 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Netherlands | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| New Zealand | Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Norway | Generation, 1983-2000 Collected for recycling, 1990-1996 and 1999-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Poland | Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Portugal | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Slovak Republic | Production of paper, 1989-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Spain | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Sweden | Generation, 1983-2000 Collected for recycling, 1990-2001 Paper and cardboard for which producer responsibility apply: Collected, 1994-1999 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Switzerland | Generation, 1991-2000 Generation, 2001 Collection and recycling 1960-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| Turkey | Collected for recycling, 1990-1999 Consumption, 1990-1999 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| United Kingdom | Generation, 1983-2000 Collected for recycling, 1990-2001 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |
| United States | Generation from MSW, 1960, 1970, 1980, 1990, 1995, 1998-2000 Production, Trade and Consumption, 2001 Forest Products Production, 1993-2001 |

PART 3

INDICATORS BASED ON MATERIAL FLOW ACCOUNTS

13. INTRODUCTION

Researchers, governments and international organisations have increasingly expressed concerns on the increasing and expanding use of natural resources both in production and consumption. The economic growth, supplemented with parallel growth in resource use is considered to be inconsistent with sustainable development. The only sustainable way to solve this problem is to motivate reductions in the use of natural resources. Reductions in emissions to air and water and in waste generation are the first step towards this goal. The second step is to improve the durability of products and to reduce the material use in their production.

The goals mentioned above are part of a phenomenon that is called “*decoupling waste generation from economic growth*” in the environmental policy planning. ‘Waste prevention’ is an essential element of it. Waste management should no longer be considered only as the last step in the material cycle. Rather, waste management should be considered an integral part of the sustainable materials management, with the aim to return wasted materials to the extent feasible back to commercial material cycles. In this study waste is addressed in the framework of the material flow accounting (MFA) and material balance of societies.

There are many reasons for choosing this approach, but the most important ones are the following:

- Via material flow accounting waste and waste issues can be linked to economic development;
- Waste issues can be split into fractions according to their importance in the accounts;
- Waste generation can be examined in relation to material inputs and material uses;
- Conventional waste definitions need not to be fully respected; and
- Waste indicators can be established as comprehensively as other policy indicators.

The objective of this study is to examine existing data and statistics on Finnish material flows, economic development, and waste in order to find relatively simple and practical ways to:

- a) Estimate waste generation by utilising data on the production and consumption of materials and key economic variables in situations where sufficient waste data do not exist;
- b) Produce efficiency⁴² indicators⁴³ that would describe linkages between material use, waste generation and economic development; and

⁴² Efficiency means essentially that “resources are not wasted and that maximum aggregate well-being is derived from a given stock of resources” (Montgomery and Sanches, 2002). The World Business Council on Sustainable Development (WBCSD) has provided a widely spread and used definition of eco-efficiency: “Eco-efficiency involves the delivery of competitively-priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle, to a level at least in line with the Earth’s estimated carrying capacity.”

⁴³ Indicator is “observed value representative of a phenomenon under study. In general, indicators quantify information by aggregating different and multiple data. In short, indicators simplify information that can help to reveal complex phenomena.” (European Environment Agency (EEA), www.eea.eu.int)

- c) Develop indicators that would reveal the effects of policies and other measures aimed at preventing waste generation.

For carrying out the evaluations, a method is needed to compare the time series in economic development and material flows. Therefore one purpose of this study is to find a method for presenting existing data on material flows by the industrial branches on the basis of the statistical classification of economic activities, NACE (EC, 2002a), and thus be able to directly link material flows with economic key figures at the economic activity level.

The starting-point of this pilot study is that economy-wide statistics on economic development and material flows is not sufficient, if the purpose is to evaluate or enhance waste prevention policies. Waste prevention policies should be evaluated by the industrial branches due to the fact that the branches greatly differ from each others both in respect to material throughput, economic development and environmental protection, and in respect to possibilities to reduce waste generation.

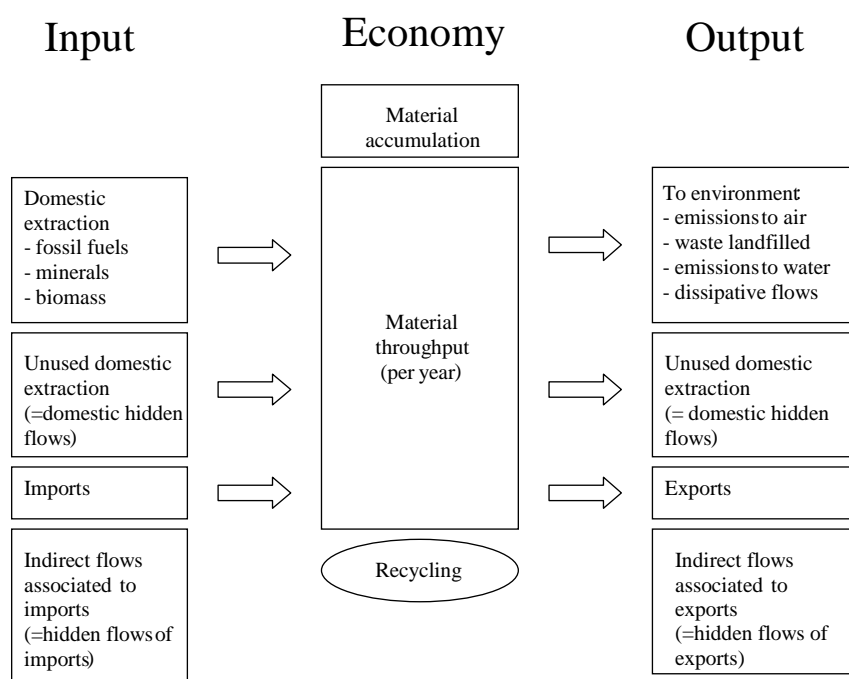
14. FRAMEWORK OF THE STUDY

14.1 Material balances

Economies are connected with the surrounding environment via material and energy flows. Economy-wide material flow accounts (MFA) and balances demonstrate: i) the amounts of physical inputs into an economy; ii) material accumulation in the economy (stocks); and iii) outputs to other economies or back to nature (EC, 2001). A schematic description of the material balance framework at national level is presented in Figure 14.

Eurostat has developed a practical modification of the economy-wide material balance scheme for statistical purposes (EC, 2001). This composite economy-wide material balance with derived resource use indicators and definitions of the basic concepts of the balance is presented in Table 5.

Figure 14. Schematic economy-wide material balance (excluding air and water flows).



Source: EC, 2001 (p. 16).

Table 5. Composite economy-wide material balance with derived resource use indicators (excludes water and air flows)

| INPUTS (origin) | OUTPUTS (destination) |
|---|--|
| Domestic extraction Fossil fuels Minerals Biomass + Imports = DMI - direct material inputs | Emissions and wastes Emissions to air Waste landfilled Emissions to water + Dissipative use of products and losses = DPO - domestic processed output to nature |
| + Unused domestic extraction From mining/quarrying From biomass harvest Soil excavation = TMI - total material input | + Disposal of unused domestic extraction From mining/quarrying From biomass harvest Soil excavation = TDO - total domestic output to nature |
| + Indirect flows associated to imports = TMR - total material requirements | + Exports = TMO - total material output |
| | + Net additions to stock Infrastructures and buildings Other (machinery, durable goods, etc.) |
| | + Indirect flows associated to exports |
| <p><i>Domestic extraction:</i> All solid, liquid and gaseous materials (excluding water and air but including e.g. the water content of materials) that are taken from domestic natural resources and enter the economy for further use in production or consumption processes.</p> <p><i>Imports:</i> Raw materials and manufactured products that are imported and enter the economy for further use.</p> <p><i>Direct Material Inputs (DMI)</i> = Domestic extraction plus Imports.</p> <p><i>Unused domestic extraction (Hidden Flows):</i> Materials that are moved on a nation's territory on purpose and by means of technology but are not fit or intended for use. Unused domestic extraction include such as soil and rock excavated during construction, dredged sediments from harbours, overburden from mining and quarrying and unused biomass from harvest.</p> <p><i>Total Material Inputs (TMI)</i> = Direct material inputs plus Unused domestic extraction (Hidden flows)</p> <p><i>Indirect flows associated to imports (Hidden flows of imports):</i> Direct inputs used and unused extraction generated abroad in producing products for export, <u>but which are not included</u> in the quantities of exported raw materials and manufactured products (e.g. imported into Finland).</p> <p><i>Total material requirements (TMR)</i> = Direct material inputs plus Unused domestic extraction plus Indirect flows associated to imports.</p> <p><i>Emissions and wastes:</i> Gaseous and solid emissions to air, final placement of solid waste to landfills, and emissions of materials to water.</p> <p><i>Dissipative use of products and dissipative losses:</i> Materials which are dispersed deliberately into the environment, or unavoidable consequence of product use. These are mainly use on agricultural land (fertiliser, manure etc.), use on roads (sand, salt etc.), and losses (corrosion and abrasion of products and infrastructures, leakage etc.).</p> <p><i>Disposal of unused domestic extraction</i> equals the Unused domestic extraction in the input side of the balance.</p> <p><i>Domestic processed output to nature (DPO)</i> = Emissions and waste plus Dissipative use of products and losses</p> <p><i>Total domestic output to nature (TDO)</i> = Domestic processed output to nature (DPO) plus Disposal of unused domestic extraction</p> <p><i>Total material output (TMO)</i> = Total domestic output to nature (TDO) plus Exports</p> <p><i>Net additions to stock:</i> Gross additions minus removals of materials in infrastructures and buildings, machinery durable goods etc.. This item does not include stocks related to human bodies and livestock, cultivated forests and landfills, but may include wastes which are stored for treatment in the near future.</p> <p><i>Indirect flows associated to exports (Hidden flows of exports):</i> Defined correspondingly to "Hidden flows of imports".</p> | |

Source: EC, 2001 (p. 25).

In this study, mainly the input side of the economy-wide material balance (data on Total Material Requirement, TMR) has been used as a starting point for empirical analysis on relationships between material use, waste generation and economic development. The reason for this is that time series on a comprehensive balance are not available even at economy-wide level in Finland, and time series of the output side of the balance are presently not available by branches of industry.

The TMR, excluding the hidden flows of imports, offers a comprehensive framework for the data on material flows behind the waste generation. All waste generated in the extraction of domestic natural resources, production processes and final consumption of national economy are derived from the extraction and use of physical materials included in TMR, either as direct inputs or as domestic hidden flows. The TMR time series have been used in this study as a short-cut for describing the trends in material throughput at national level, and by branches of industry.

The need for a short-cut arises from the lack of time series of physical input-output data both at national level and by branches of industry. Time series on physical input-output data would show quite directly possible correlation and links between material flows and waste generation in different branches of industry, and would be directly applicable to analyses with economic data by branches of industry. Unfortunately, compilation of comprehensive physical input-output tables, even on several years intervals, is a very resource intensive effort and, therefore, it is not very likely that such time series will be available in the near future in Finland.

14.2 Data on total material requirement (TMR)

Data on the production and use of materials is first collected from various sources, *e.g.* from agricultural statistics, forest and forestry statistics, industrial statistics, foreign trade statistics and consumption surveys, and then converted to TMR statistics that are normally expressed in metric tonnes. Time series on TMR in Finland are available for 1970-2001 (Mäenpää *et al.*, 2000; see also Appendix 2).

The TMR statistics have been used for the compilation of economy-wide material balances in Finland for the years 1987, 1992 and 1997 (Muukkonen, 2000). In the TMR statistics and economy-wide material balance, the item “*unused domestic extraction*” refers quite closely to waste generated in the extraction of mineral resources, agriculture and forestry and soil excavation in relation to construction activities. Final disposal of waste from production processes and consumption are recorded in the output side of the economy-wide material balance. However, the balance does not provide any direct information about the waste generation in production and consumption.

14.3 Waste data

Statistics Finland has produced waste statistics for almost 20 years. The first statistics containing empirical material was published in 1985. Before this some random surveys were made, mainly to supplement European Commission reports. Before 1969 statistical data on waste were very modest (Vahvelainen, 2002). Initially, waste statistics produced by Statistics Finland concerned only industrial production, *i.e.* manufacturing, energy supply and mining and quarrying. Statistics were compiled based on surveys of large industrial establishments (Vahvelainen & Isaksson, 1992; Statistics Finland, 1995; Vahvelainen & Salomaa, 2000). Nowadays the principal waste data source is the environmental administration monitoring register, VAHTI (Monitoring and Environmental Loading Data System). Since 1997, waste surveys have been accomplished using the Ministry of

Environment waste and hazardous waste catalogue⁴⁴ that is based on the European Waste Catalogue (EWC).⁴⁵

The compilation of data on construction and demolition waste started in Finland in 1991 (Isaksson, 1993; Perälä & Nippala, 1998; Statistics Finland, 1998). Data on demolition, renovation and construction waste, which are compiled separately, also include surplus soil and dredging spoils.

Waste statistics from agriculture and forestry are prepared by the relevant authorities. Although ancillary biomass from agriculture (*e.g.* straw) and forestry (*e.g.* logging residues) are not defined or considered waste in many EU-countries, they are included in the waste statistics in Finland.

Data on municipal waste, or in practice consumption waste, are collected from the environmental administration, monitoring registers and other sources. The Finnish Forest Industries Federation and Paperinkeräys Oy (the biggest collector and merchant of recyclable paper in Finland) compile statistics on consumption and recycling of paper and cardboard. The Finnish Environment Institute and the Environmental Register of Packaging, PYR Ltd, collect information on the quantity and reuse of packaging and management of packaging waste (Statistics Finland, 1994; Statistics Finland, 2000; Statistics Finland, 2001; Statistics Finland, 2002a; Statistics Finland, 2003).

Table 6 illustrates the empirical data of the economy-wide material balance in Finland. The term “hidden flows of imports” equals the term “indirect flows associated to imports” presented in Figure 14 and Table 5. In this study “hidden flows of imports” are presented only as supplementary information in Figure 26.

14.4 Foreign data sources

The main foreign data sources used in this study were the following publications:

Resource flows: The material basis of industrial economies (WRI, 1997);

The weight of nations: Material outflows from industrial economies (WRI, 2000); and

Material use in the European Union 1980-2000: Indicators and analysis (EC, 2002b).

⁴⁴ The Ministry of the Environment decision 1129/2001.

⁴⁵ European Commission Decision 94/3/EC regarding the European Waste Catalogue (EWC), replaced by European Commission Decision 2000/532/EC, Commission Decision 2001/118/EC, Commission Decision 2001/119/EC and Council Decision 2001/573/EC regarding the list of wastes.

Table 6. Material balance in Finland in 1997 (million tonnes)

| Inputs (origin) | 1997 | 1997 |
|--|--------------|--------------|
| | Million tons | % of TMI |
| Domestic extraction | 219.1 | 60.6 |
| Energy mineral (including peat) | 9.5 | 2.6 |
| Other minerals | 86.2 | 23.8 |
| Biomass | 60.4 | 16.7 |
| Oxygen input (related to air emissions) | 63.0 | 17.4 |
| Imports | 52.6 | 14.5 |
| DMI – Direct Material Inputs | 271.1 | 75.1 |
| Unused domestic extraction (hidden flows) | 90.1 | 24.9 |
| Mining and quarrying overburden | 31.4 | 8.7 |
| Soil excavation for construction | 33.8 | 9.3 |
| Logging residues | 21.5 | 5.9 |
| Erosion | 3.4 | 0.9 |
| TMI – Total Material Inputs | 361.8 | 100 |
| Hidden flows of imports | 172.4 | |
| TMR – Total Material Requirement | 534.2 | |
| | | |
| Outputs (destination) | 1997 | 1997 |
| | Million tons | % of TMO |
| Waste and emissions | 109.2 | 30.2 |
| Waste landfilled | 9.9 | 2.7 |
| Bedrock placement of waste | 0.2 | 0.1 |
| Sewage sludge for soil improvement | 0.5 | 0.1 |
| Other: destination not defined | 4.2 | 1.2 |
| Emissions to water | 7.4 | 2.0 |
| Emissions to air | 86.9 | 24.0 |
| Dissipative use of products | 22.5 | 6.2 |
| Fertilizers | 0.3 | 0.1 |
| Pesticides | 0.0 | 0.0 |
| Seeds | 0.3 | 0.1 |
| Lime and horticultural peat | 1.5 | 0.4 |
| Manure and straw from animal husbandry | 19.4 | 5.3 |
| Sand and salt for roads and streets | 1.1 | 0.3 |
| DPO – Domestic Processed Output to nature | 131.7 | 36.4 |
| Disposal of unused dom. extraction (hidden flows) | 90.1 | 24.9 |
| TDO – Total Domestic Output to nature | 221.8 | 61.3 |
| Exports | 33.5 | 9.3 |
| Balancing item: To material stock | 106.5 | 29.4 |
| Including storages to waste | 16.9 | 4.7 |
| TMO – Total Material Output | 361.8 | 100.0 |

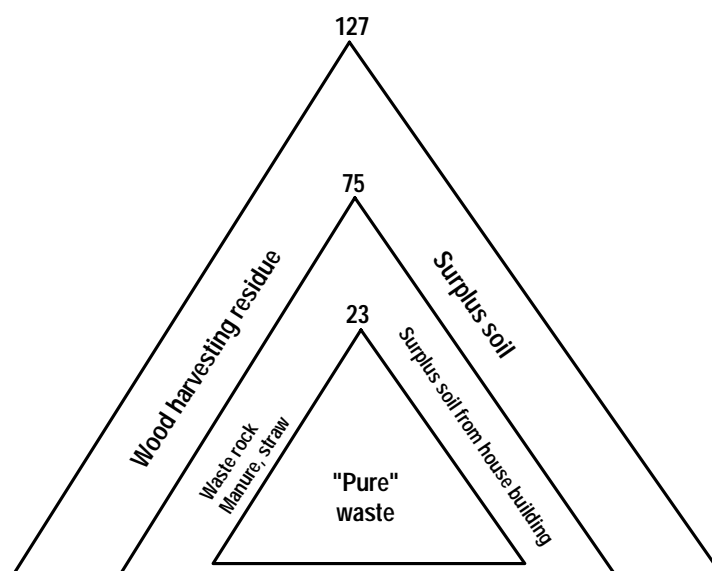
Source: Muukkonen, 2000.

15. FINNISH WASTE DATA AND MATERIAL FLOW ACCOUNTS

The definition of waste has been changed quite often in Finland and, therefore, it is rather difficult to compare waste data between years. Similar situation prevails also in many other countries. Changes in the coverage, data collection methods and incoherent frameworks have considerably decreased the comparability of waste data between countries. In addition, most waste definitions are inappropriate for waste policy purposes because one single definition covers all waste, although it would be totally impossible to target all waste with one policy.

MFA enables examination of waste by producer, *e.g.* whether waste was generated in extraction, technical process, manufacturing or consumption. In fact, the differences in the amounts and variety of waste generated are so vast that it is irrelevant to put all waste under the same definition. For example, the amount of side stone depends on the amount of extracted minerals, not on the means used to extract the mineral. This means that to be effective, the policy instrument(s) to prevent waste generation should be waste type oriented. Figure 15 illustrates that the share of 'pure waste', the object of traditional waste management tools (waste from manufacturing, energy supply, house construction and households), comprises only about 18 % of all waste generated in Finland. Values in the figure are cumulative which means that the total amount of waste generated in 2000 was 127 million tonnes. Pure waste totalled 23 million tonnes and waste rock, manure, straw and surplus soil from house construction totalled 52 million tonnes, as well as wood harvesting residues and surplus soil.

Figure 15. Cumulative waste generation in Finland in 2000 (million tonnes)



Source: Statistics Finland, Environment and Energy

The Finnish waste definition is almost identical to the European Community definition of waste, provided in Council Directive 75/442/EEC on waste as amended by Directive 91/156/EEC of 18 March 1991. In the Directive waste, waste producer, holder, management, disposal and recovery are defined in the same way for every type of waste, making no difference between differing amounts

of waste, different waste generators or processes where the waste is generated. This would give only minor opportunities for policy makers to create effective measures for waste prevention.

Data of the Industrial Waste Statistics 1992 were studied in order to find out how additional information on economic variables, such as industrial sector group, number of personnel, gross value of total output, value added in all operations and purchased heat energy, could be used for better estimates of waste totals.⁴⁶ Results revealed that it is very difficult to find additional information that would help in the estimation of waste totals. Most of the variables made the estimation of some totals easier, but worked poorly with some others (Ollila, 1995). In practice it turned out to be impossible to describe waste generation totals based on economic variables.

To find a way forward in this study, it was suggested that three types of waste should be examined and possibly defined separately: i) waste as domestic hidden flows in the input side; ii) waste generated in production and consumption of materials; and iii) dissipative use of materials in the output side (*e.g.* spreading the straw on the field for soil improvement). The links between material flows (MF) and waste are illustrated in Table 7.

Table 7. **Generation of waste in Finland in 1997 (1 000 tonnes)**

| Waste from production, 1000 tonnes | As waste in material balance | |
|------------------------------------|------------------------------|-------------|
| | input side | output side |
| Agriculture | 25 500 | x |
| Forestry | 20 000 | x (x) |
| Mining and quarrying | 26 400 | x (x) |
| Manufacturing | 16 800 | x |
| Energy and water supply | 780 | x |
| House building | 1 400 | x |
| Civil engineering | 33 500 | x (x) |
| Municipal waste | | |
| Households and other sources | 2 600 | x |
| Sewage sludge | 160 | x |
| Total generation | 127 100 | |

Source: Statistics Finland, Environment and energy.

Note: x = waste are included in that side of material balance and (x) = part of the waste is on that side.

There are many ways to monitor material efficiency, resource use and other similar kind of measures as resource use indicators involved in MFA. The most commonly used are Total Material Requirement (TMR), Domestic Material Input (DMI) and hidden flows. Sometimes these are measured per capita. They are all included in the input side of material balance. The input side describes the activity of the economy and use of materials. The output side describes more the burden of the environment that to some respect is the passive side of the economy. Regarding the environment, the amount of waste and emissions to water and air is used as indicators derived from the output side of MFA.

In practice, the examination of wastes should be based on material flow accounts and divided into three different areas as described above. This approach is discussed in detail below.

⁴⁶ Total amount of waste, total amount of hazardous waste, total amount of waste for 21 different disposal options, total amount of waste for five different reuse methods and total amount of waste in storage.

15.1 Waste as domestic hidden flows

Waste in the form of hidden flows from the extraction of natural resources, agriculture and from construction activities can be used as indicators describing the effectiveness of material use, *i.e.* so-called resource indicators. To address these wastes, the preventive policy measures should be applied in an economy-wide scale. Therefore, we could call indicators addressing these wastes “structure indicators”. These wastes are generated as a result of material exploitation from the environment. They are important in the analysis because their quantities are enormous and time series on their generation are usually available (Figure 20). **In this study, the hidden flows consist of wood harvesting residues, surplus soil from construction activities, surplus soil and side stone from mineral quarrying and ancillary biomass from agriculture** (Figure 25).

15.2 Waste from production and consumption

The output side of material accounts includes waste that is disposed of on landfills or otherwise removed from industrial manufacturing, services or consumption. Materials and products that are recycled, used in energy recovery or reused are not included in this waste stream. This is the reason why the amount of waste landfilled or otherwise removed is substantially lower than the amount of waste generated. The amount of these wastes can be reduced by technical improvements in production and in services, such as organising on-site reuse/recovery and improving the general infrastructure of municipal waste management.

The quality of these wastes is industry-specific and prevention of their generation is dependent on new technical solutions. The generation amounts of these wastes could be considered as “technical indicators” of waste prevention. The share of the landfilled waste of the total growth of the material stock can be used to indicate the “effectiveness of resource use”.

15.3 Waste from primary production

In material flow accounts domestic animals in agriculture are regarded as means of production. Manure and straw (straw as an absorptive material) from animal husbandry are waste generated in the use of those means of production. In the case of Finland, practically all generated manure is spread back on the fields to improve and fertilise the soil. This kind of use of waste makes the manure and straw from animal husbandry quite different compared to waste from other production processes and consumption. Consequently, the policy measures to prevent manure generation should be totally different from the means used in the waste policy to address other waste streams.

16. STRUCTURAL WASTE PREVENTION INDICATORS

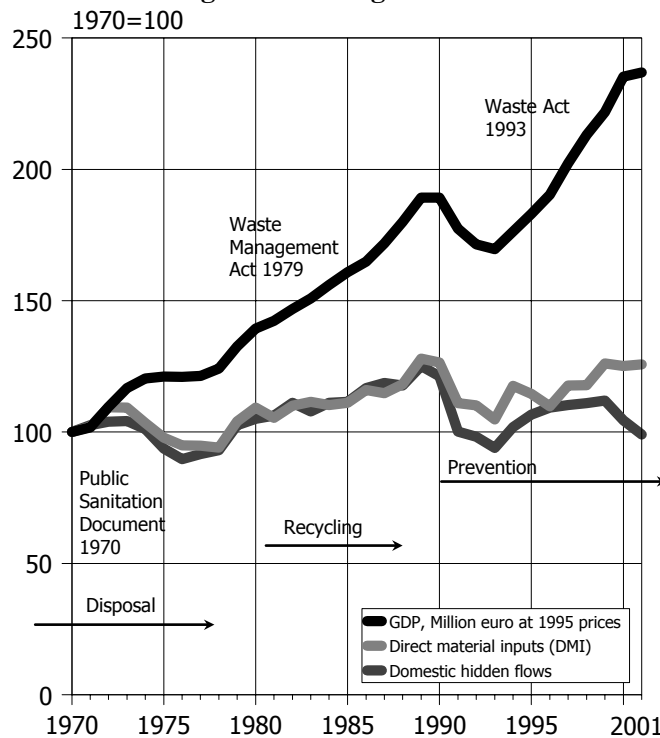
In this section the economic and MFA trends are examined both at the economy-wide level and within branches of industry. The aim is to find out whether resource use is decoupled from economic growth in the Finnish economy, and if it is, what are the reasons.

Economic data and time series on production, value added, investments and employees are regularly compiled by Statistics Finland, as well as data on environmental taxes, charges, fees and environmental expenditures of Finnish industry. Environmental expenditures consist of investments and running costs by environmental domain (air pollution control, water conservation, waste management and other environmental protection). Data on environmental protection expenditure of Finnish industry are available at Statistics Finland for the years 1992-1999. All other economic statistics referred to above are available for 1975-2001, except investments for 1960-2001.

The trends of GDP, direct material input and domestic hidden flows during 1969-2001 are presented in Figure 16, together with the main acts and strategies related to waste management in Finland.

The comparison of the trends reveals quite clearly that the growth of direct material inputs and the growth of domestic hidden flows have been lower than the growth of GDP, especially in the 1990s. It

Figure 16. Gross domestic production, direct material inputs, domestic hidden flows and waste management strategies in Finland



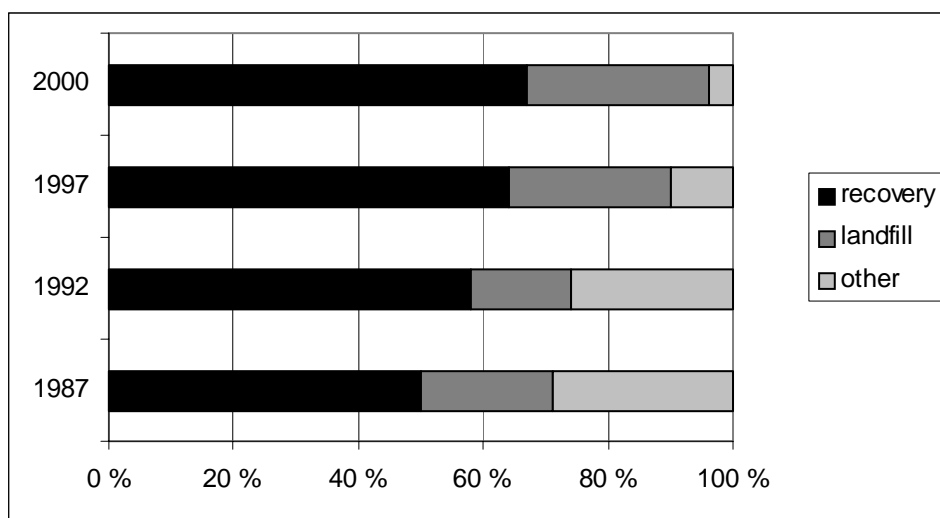
appears that the trend of waste generation (as domestic hidden flows) in the 1990s follow more closely the trend of direct material inputs than the trend of GDP.

Then why do the trends of GDP and material inputs (including both used and unused) differ so radically from each other? As a hypothesis, we state that the following reasons could provide an appropriate answer to the question:

- Taken preventive measures for waste generation, *e.g.* investments in cleaner technology;
- Increased recovery of materials, since that decreases the use of virgin natural resources in production processes;
- The economic regression period in the early 1990s in the whole economy and in particular in construction;
- Closing of some mines;
- The increase in imports of raw materials; and
- Structural changes of the economy due to the rapid growth of branches with low material intensity (*e.g.* electronics).

These hypothetical reasons, however, do not explain why GDP and material use were so strongly decoupled. Reasons that could partly explain the experienced trend are the increased recovery rate of industrial waste, rapid increase of investments in industrial and municipal waste management during the 1990s and increase of revenues from environmentally related taxes and fees since 1980s. Figures 17-19 illustrate the influence of these measures on waste management strategies.

Figure 17. Treatment of industrial waste in Finland (%)



The major part of revenues from environmentally related taxes, charges and fees in Finland arise from taxation of motor fuels and other vehicle-related taxes, and from water and waste water charges. Although the charges on waste disposal and management increased in 1990s, their share of the total amount of environmentally related taxes, charges and fees remained very small. Figure 19 shows, that from the beginning of the 1990s the total amount of environmentally related taxes, charges and fees increased rapidly, but no permanent decrease took place in the trends of direct material inputs and domestic hidden flows.

The proportion of expenditure on waste management has been around 10 % of the total amount of environmental expenditure (investments and running costs) in the Finnish industry. On the other hand, the proportion of running costs of waste management has been approximately one fourth of total environmental running cost. In most branches of the manufacturing industry, the trend of

environmental expenditure on waste management have increased in 1990s (Figure 19), but those expenditures have primarily focused on the recovery and disposal of waste rather than waste prevention.

Figure 18. Trends in environmentally related taxes, charges and fees, direct material inputs and domestic hidden flows (1980=100)

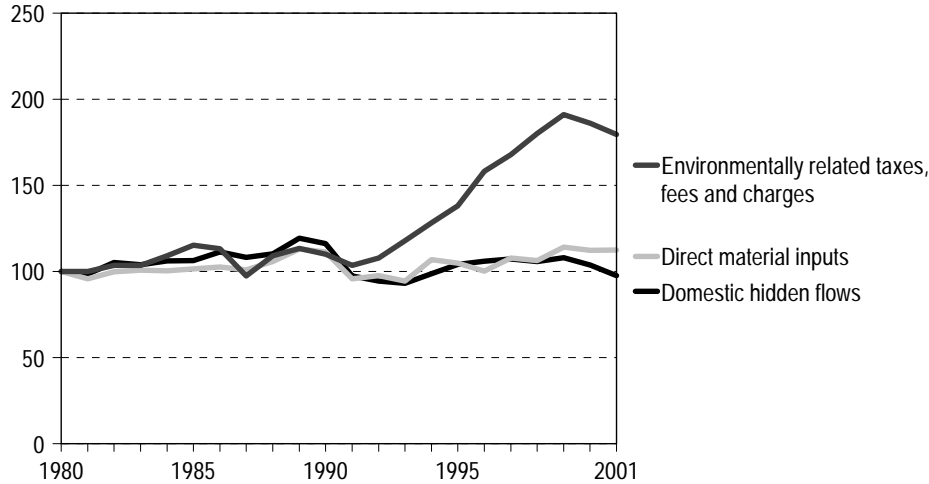


Figure 19. Environmental expenditures on waste management by industrial branches in 2000 prices (EUR)

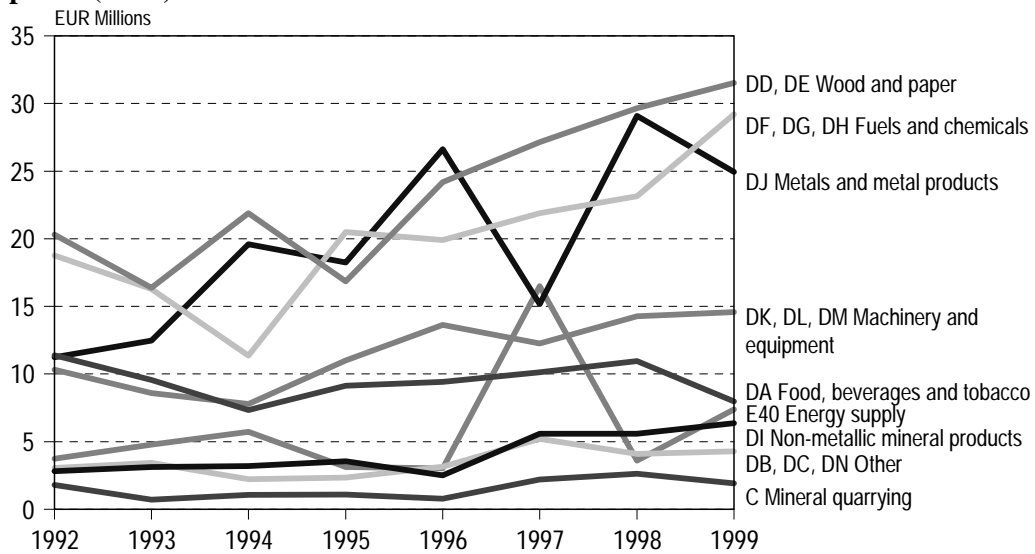
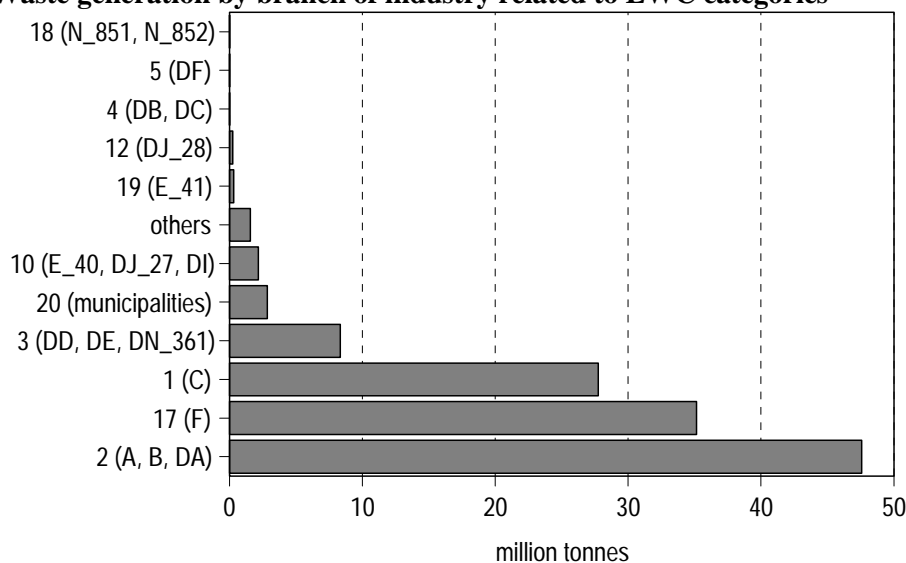


Figure 20 recapitulates the proportion of waste generated by branches of industry. It presents the annual generation of waste according to some EWC categories, also giving examples of the NACE classes. EWC categories presented in the figure are explained below the figure. The figure shows that the “primary production” (2) has the largest prevention potential, followed by construction and demolition (17), and mining (1).

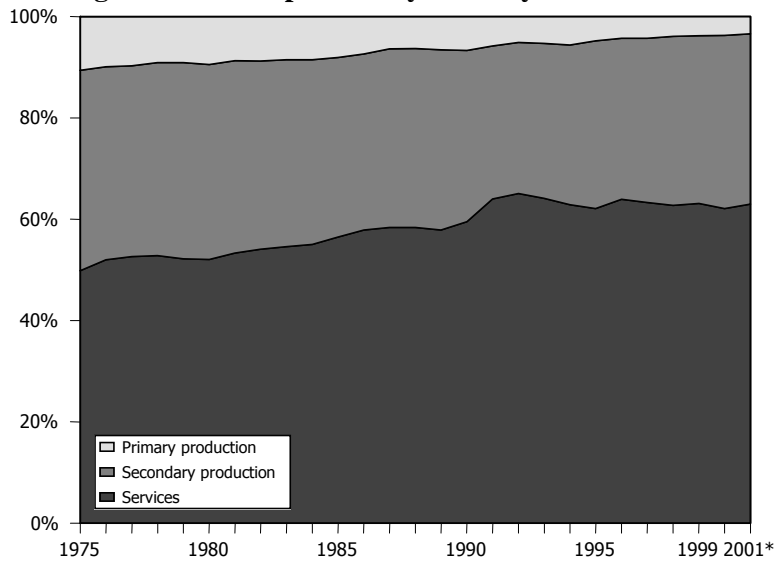
Figure 20. Waste generation by branch of industry related to EWC categories



- 18 Wastes from human or animal health care and/or related research (excluding kitchen and restaurant wastes which do not arise from immediate health care) / (851) Human health activities, (852) Veterinary activities
- 5 Wastes from petroleum refining, natural gas purification and pyrolytic treatment of coal / (DF) Manufacture of coke, refined petroleum products and nuclear fuel
- 4 Wastes from the leather and textile industries / (DB) Manufacture of textiles and textile products, (DC) Manufacture of leather and leather products
- 12 Wastes from shaping and surface treatment of metals and plastics / (DJ 28) Manufacture of fabricated metal products, except machinery and equipment
- 19 Waste from waste treatment facilities, off-site waste water treatment plants and the water industry / (E41) Collection, purification and distribution of water
- others Other branches of industry, including manufacture of electrical and optical equipment (DL)
- 10 Inorganic wastes from thermal processes / (E40) Electricity, gas, steam and hot water supply, (DJ 27) Manufacture of basic metals, (DI) Manufacture of other non-metallic mineral products
- 20 Household wastes and comparable waste from industrial, service or other operations (municipal wastes) including separately collected fractions
- 3 Wastes from the mechanical wood industry and the production of paper, cardboard, pulp, panels and furniture / (DD) Manufacture of wood and wood products, (DE) Manufacture of pulp, paper and paper products; publishing and printing, (DN 361) Manufacture of furniture
- 1 Waste resulting from exploration, mining, dressing and further treatment of minerals and quarry / (C) Mining and quarrying
- 17 Construction and demolition waste (including road construction) / (F) Construction
- 2 Waste from agricultural, horticultural, hunting, fishing and aquaculture primary production, food preparation and processing / (A) Agriculture, hunting and forestry, (B) Fishing, (DA) Manufacture of food products, beverages and tobacco

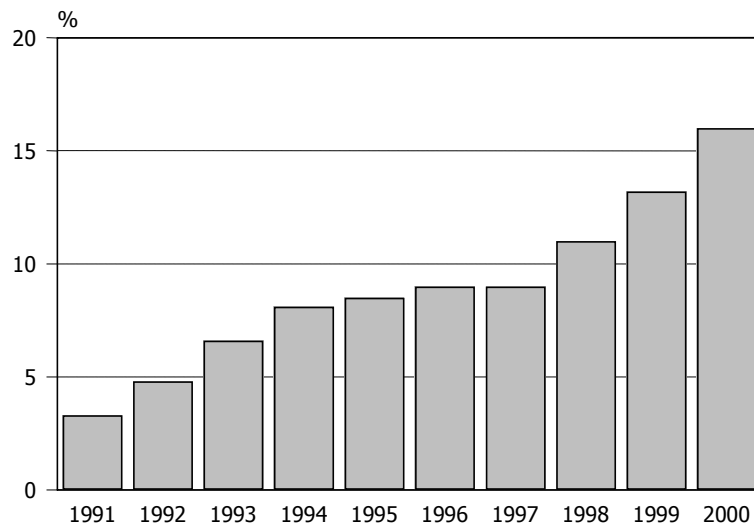
The structure of the Finnish economy has changed remarkably during the past 30 years, as presented in Figures 21 and 22. The proportion of services, such as trade, hotels and restaurants, traffic and public services has increased remarkably, and from the beginning of the 1990s both the absolute and proportional increase of ICT-production (included in the branch of “Manufacture of electrical and optical equipment”, NACE code DL) has been very intensive.

Figure 21. Proportion of gross domestic product by industry 1975-2001



Source: Economic Statistics: National Accounts

Figure 22. ICT production^{*)} as a proportion of total value of manufacturing industry, 1991–2000



Source: Statistics Finland, Business Structures

^{*)} telecommunications equipment, consumer electronics, computers, electronics components, office machines, instruments for measuring etc...

These observed changes in the service sector and in the manufacturing of machinery and equipment sectors have strongly influenced the relationship between the economic development and material requirement of the economy. **Consequently, one could argue that the main reason for the observed strong decoupling of the economy's material requirement (DMI) from the economic growth (GDP) in Finland is the relatively rapid growth of low waste sectors, such as ICT and services.**

After the violent economic recession in Finland in the beginning of 1990s, the trends of direct material inputs and domestic hidden flows have not followed the trend of GDP of the whole economy as closely as they did during the economic growth in 1980s, but rather are following closer the trend of GDP that excludes services and manufacturing of machinery and equipment, as shown in Figure 23. The decoupling started in 1980s, but greatly intensified after the recession period along with the rapid growth of the ICT sector.

One of the main results of this study is reflected in Figure 23. Decoupling of material use (and hidden flows) from economic growth at a national level is due to the development in the sectors manufacturing of machinery and equipment, and trade and services. These sectors produce relatively small amount of waste and do not require much hidden flows of imports. Without the rapid growth of these sectors, the strong decoupling between material use and GDP would not have occurred in Finland.

Figure 24 illustrates the same kind of phenomenon. The trend of total material input per GDP in Finland is quite similar to that of Ireland. Economic development in Finland and Ireland are rather similar and differs clearly from other EU countries. Although the trend of total material input is decreasing in most of the EU countries, decrease has been the steepest in Ireland and Finland.

Figure 23. **Gross domestic product and material requirement (1975=100)**

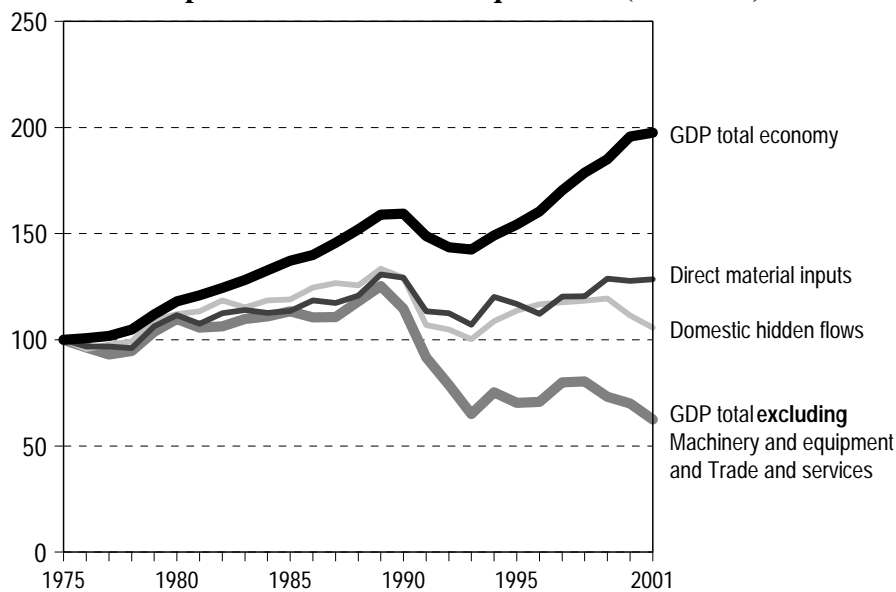
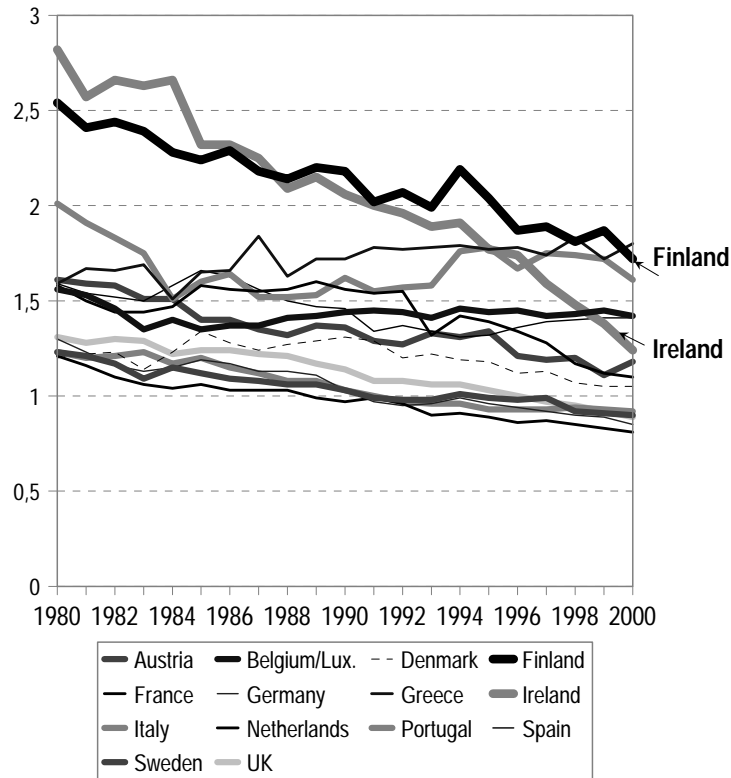


Figure 24. Total material input in tonnes per GDP in EU countries 1980-2000



Source: EC, 2002b.

Domestic hidden flows and hidden flows of imports in Finland are illustrated in Figures 25 and 26. A closer look demonstrates that hidden flows of construction, mainly civil engineering, and of mineral quarrying, are the main factors affecting the trend of total domestic hidden flows (Figure 25). Within those industrial branches the domestic hidden flows follow quite closely the economic development. The substantial increase in the hidden flows of imports of metallic ores, metal industry products and manufactured products indicates clearly the recent sharp change in the Finnish economy: more and more metal raw materials and components are imported, rather than extracted from the Finnish soil. Naturally this reduces the generation of domestic hidden flows and waste, but at the same time transfers the waste burden (pollution) beyond the Finnish borders. The overall hidden flows (waste burden) seem to be increasing, rather than decreasing and the similar trend is emerging across the European Union Member States (ETC/WMF, 2003).

Figure 25. Domestic hidden flows in 1970-2001

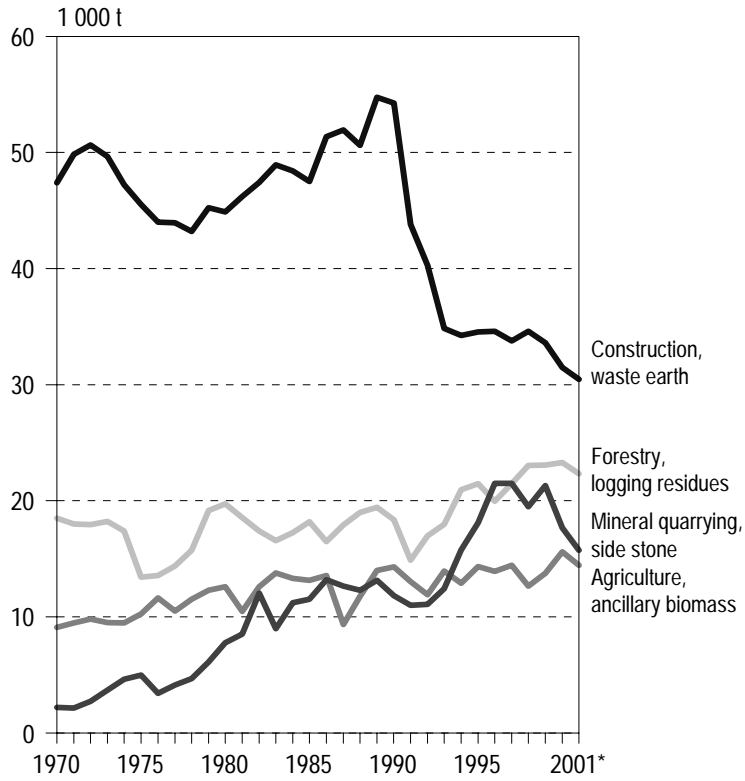
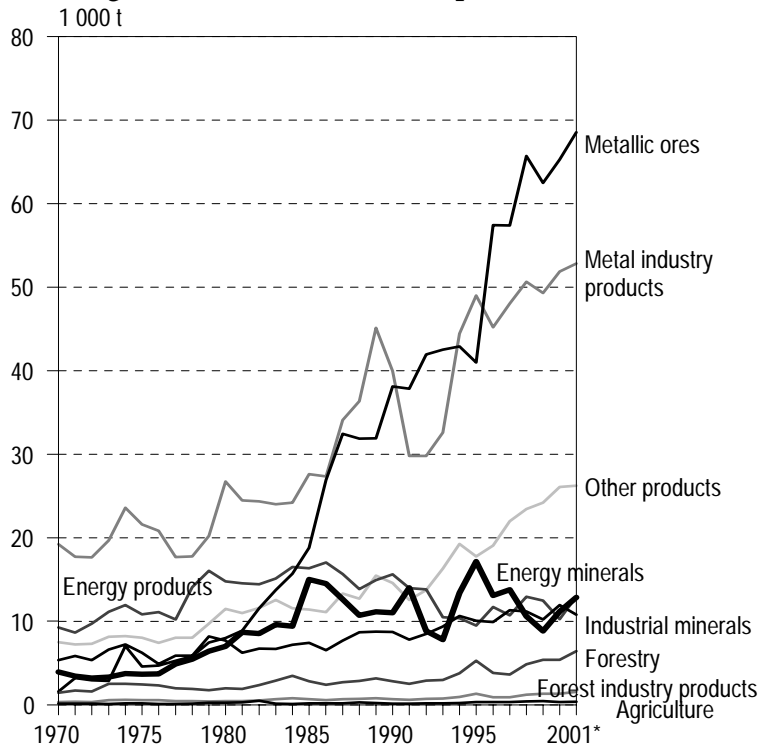


Figure 26. Hidden flows of imports in 1970-2001



17. TECHNICAL WASTE PREVENTION INDICATORS

17.1 Data and Classifications

Information on the economic development, material use and waste generation at the national level does not reveal the extent to which the individual factors, such as “recovery of waste”, “preventive measures” and “structural change of the economy”, affect material input and waste generation. In order to get a more detailed picture of interactions between economic development and material flows, the basic data on direct material inputs and hidden flows has to be presented according to same classification as the data on economic development.

To achieve a level where the data classified according to statistical classification of economic activities and the re-arranged TMR data on material requirement could be linked, the branches of industry were reorganised to form “aggregated branches”. These aggregates are presented in Table 8. The data on material flows and waste quantities are presented according to the Finnish version of the NACE classification, Standard Industrial Classification, TOL (Statistics Finland, 2002b). Consequently, material flows and waste data can be linked with economic data, especially with economic data on agriculture, forestry, manufacturing industries and mining and quarrying.

At the most detailed level, the basic data on TMR are available according to the statistical classification of products by activity, CPA (EC, 2002c). For each material or material group the CPA code gives the branch of industry or the activity where the material is typically used as a raw material or as a product. Hence, it is possible to link the TMR time series with branches of industry based on economic activity and NACE classification.

Table 8. Aggregation of industrial branches

| NACE code | Branches of industry / Kind of activity |
|------------|---|
| A01 | Agriculture and fishing |
| A02 | Forestry |
| CA, CB | Mineral quarrying |
| DA | Food, beverage and tobacco |
| DD, DE | Wood and paper |
| DF, DG, DH | Fuels and chemicals |
| DI | Non-metallic mineral products |
| DJ | Metals and metal products |
| DK, DL, DM | Machinery and equipment |
| DB, DC, DN | Other industries |
| ETC40 | Energy supply |
| F | Construction |
| G-Q | Trade and services |

It should be emphasized that “material requirement” by industrial branch may refer to either input or output, depending on the activity group concerned. For example, saw logs and pulp wood are outputs (products) of forestry (A02), but inputs (raw materials) of the wood and paper industry (DD, DE). Therefore, efficiency indicators, such as “material input/value added” and “material output/value added” that would be directly comparable between different activity groups, cannot be created. Still, the re-arrangement and re-grouping of the TMR data by aggregated branches developed in this study, is an applicable method for showing the trends of material requirement by aggregated branches. These

trends can be examined and analysed together with trends of waste generation and economic key figures.

Branches included in the activity group “trade and services” are heterogeneous in respect to their economic development, material requirement and generation of waste. In this study no attempt was made to closely examine the individual branches included in this group. In general, one could argue that this group exploits mainly manufactured products and that the material requirement of these products was already recorded when they were produced by another branch of industry. Most of the waste generated in trade and services is municipal waste, except the sector of traffic and transportation that converts a remarkable amount of material to air emissions.

An essential precondition for combining TMR with economic data is that TMR itself is calculated and compiled from actual annual data on material use and production, and is not derived or estimated on the basis of economic development. Unless calculated properly, the TMR time series combined with economic trends do not give much information on the actual development of the material requirement in relation to economic development at national level or within a branch of industry.

17.2 Aggregation and presentation of the data

Aggregation of both physical and monetary data was done according to the industrial branches presented in Table 8. The actual statistics are presented in Annex 2. Figures 1–14 of Annex 1 present only the time series (without units) on material requirement, waste and economic key figures. In order to be able to present material and economic time series in the same figure, each of the series was first scaled so that all the observations were divided by the smallest value of the series in question. This means that the smallest value of each series was scaled to be one.

As an example, Table 9 gives values for agriculture over four years. The smallest value of each series has been indicated in grey. After dividing the values of gross domestic product by 4 146, value added by 2 017, employees by 2 611, direct inputs by 9 591 and hidden flows by 10 238, the series agree with the ones presented in Table 10. Because tonnes were divided by tonnes etc., units disappeared. Similar procedure was applied to all industrial branches. Based on this modification of results, it became possible to present all the relevant time series in the same figure. Consequently, only the trends are relevant in Figures 1-22 of Annex 1. The order of the series is not significant.

Table 9. **Agriculture A01**

| Variable | Unit | Year | | | | |
|---------------------------|-----------------------------|--------|--------|--------|--------|--------|
| | | 1975 | 1976 | 1977 | 1978 | 1979 |
| Gross domestic product | million EUR, at 2000 prices | 4 146 | 4 369 | 4 188 | 4 382 | 4 608 |
| Value added in production | million EUR, at 2000 prices | 2 017 | 2 155 | 2 202 | 2 217 | 2 287 |
| Employees | 100 persons | 2 977 | 2 922 | 2 735 | 2 634 | 2 611 |
| Direct inputs | 1000 tonnes | 9 591 | 10 963 | 9 983 | 10 828 | 11 400 |
| Hidden flows | 1000 tonnes | 10 238 | 11 634 | 10 509 | 11 525 | 12 286 |

Table 10. **Agriculture A01**

| Variable | Year | | | | |
|---------------------------|------|------|------|------|------|
| | 1975 | 1976 | 1977 | 1978 | 1979 |
| Gross domestic product | 1.00 | 1.05 | 1.01 | 1.06 | 1.11 |
| Value added in production | 1.00 | 1.07 | 1.09 | 1.10 | 1.13 |
| Employees | 1.14 | 1.12 | 1.05 | 1.01 | 1.00 |
| Direct inputs | 1.00 | 1.14 | 1.04 | 1.13 | 1.19 |
| Hidden flows | 1.00 | 1.14 | 1.03 | 1.13 | 1.20 |

17.3 Results

In the previous section the development of waste generation and economic progress between branches of industry was examined. In this section the economy and eco-efficiency of each branch is explored. The results of these two sections are partly identical, or they go hand in hand and support each others.

The correlation, or relation, between material requirement and economic growth seems to be dependent on the branches of industry. Three different correlations can be found between material requirement and domestic hidden flows (amounts of waste) and economic growth. The correlations are reflecting the possibilities to prevent the increase of waste generation when the production volumes grow, processes change or the economy grows:

1. *Steady correlation:* The ratio of waste generation to material use and production is quite steady. Possibilities to decouple waste generation from the production growth are weak.
2. *Alterable correlation:* There are varying, but generally relatively wide possibilities to reuse or recycle materials within or between industrial branches and to reduce the use of virgin materials and subsequent waste generation thereof. Possibilities for decoupling are largely dependent on technical possibilities.
3. *Insignificant correlation:* Economic growth is achievable without enhanced material use, or it is not highly dependent on the material use. Decoupling is relatively easy to reach.

The first group includes the branches of industry that generate wastes like manure and silvicultural waste, *i.e.* along with the increase of production also the generation of waste will increase. In case of rising or decreasing prices, the correlation between material use and gross value of production will vary accordingly. Such branches of industry are primarily agriculture and forestry (see Figures 1 and 2 in Annex 1). **Possibilities to prevent waste generation and decouple it from the economic growth are limited.**

In general, the branches of industry included in the group of ‘alterable correlation’, have technological possibilities to improve their processes, to substitute the materials used or recycle the waste generated. Typically such branches of industry are the manufacturing of food products, wood and paper products, energy supply and construction (see Figures 4, 5, 11 and 12 in Annex 1). Household waste is typically included in this group. **Possibilities to decouple waste prevention from economic growth vary according to technical possibilities, but theoretical possibilities to prevent waste generation are relatively high** and the prevention would also influence the extraction of natural resources and primary production of materials.

Some industrial branches (Group 3) do not normally need much input material and do not necessarily generate more waste, while increasing their gross value of production. These are typically ‘high-tech’ industries, such as the manufacturing of electrical, medical, optical or communication equipment (see Figure 21). For the development of successful waste prevention policies and for the creation of waste prevention indicators, these branches should be addressed separately. **Within these hi-tech but low-waste sectors preventive measures should primarily be focused on the reduction of hazardous components and constituents, rather than the volume of waste generated. However, decoupling is relatively easy to reach.**

From a point of view of productivity (output per given unit of input), a brief look at the data shows that at the national level GDP per DMI has increased in Finland slower than the GDP per employees. As can be seen from Figures 15–22 in Annex 1, in material intensive branches the labour productivity has increased faster than the resource productivity. Especially in agriculture and forestry, where the amounts of hidden flows are relatively high, there has been no increase in the productivity of material use. In fact, the application of the “productivity”-approach to explore linkages between material use and waste generation would provide an interesting and informative extension of the waste prevention indicator work.

18. CONCLUSIONS

18.1 Applicability of the method in other OECD countries

A general conclusion is that time series on economic key figures by branch of industry are available in all EU countries and OECD countries. Summary data on physical material use and imports and exports are also available from all EU countries (EC, 2002b). In some countries, studies have been made and data have been compiled on resource flows into economies and outflows from the economies (WRI, 1997; WRI, 2000).

The applicability of this study to other OECD countries is to some extent dependent on the possibilities to present physical data and statistics on material requirement and material flows by material types and by branches of industry. The disaggregation of summary data is quite necessary, in particular in the manufacturing industry where material requirement and waste generation differ quite much between individual branches. The disaggregation of material use into biomass, construction minerals, industrial minerals and ores, and fossil fuels, as presented in the publication "Material use in the European Union 1980-2000: Indicators and analysis" (EC, 2002b), offers a useful starting point to study the volumes and trends in material use and waste generation, but it is not yet adequate for the studies concerning individual branches of industry.

Only a limited number of international data sources on waste were studied during this project, but it seems evident that complete and comparable time series on waste generation by industrial branches are not yet available. Comparable waste statistics by branches, even at several years' interval, would be very useful in examining the applicability of the developed method to other countries.

At the national level, a comparison between material use and economic development in the European Union countries is possible on the basis of existing data on Domestic Extraction, Imports, Direct Material Input and Direct Material Input per GDP (EC, 2002b). A common feature for almost all EU countries in 1980-2000 is that the Domestic Extraction of natural resources has only slightly increased or even decreased in some countries, but the Imports of raw materials and manufactured products have remarkably increased. Also, in almost all EU countries the material intensity of the economy, expressed as Direct Material Input (= Domestic Extraction + Imports) in tonnes per GDP has clearly decreased. The reduction of material intensity has been the most rapid in the countries that clearly had the highest material intensity in the beginning of the period. In countries with a relatively low original material intensity, the trend has been slower and more linear. In Finland it seems evident that the structural change of the economy due to the increased activity of the service sector and the information technology sector has been the main reason of the reduced material intensity of the economy.

18.2 Indicators for measuring the effectiveness of the waste policy

In many countries the most important goal of the waste policy is unambiguously the prevention of waste generation. Although prevention is the most difficult to measure and implement, it is clearly considered most important goal in the waste sector to pave the way towards sustainable development. Based on the data and trends examined in this study, it is difficult to imagine that we could achieve a decreasing trend in total waste generation or absolute decoupling of waste generation from the economic growth without a structural change of the economy towards less material intensive branches of industry.

Thus the most effective and most informative ways to measure the results of the waste policy and the material use policy may be to keep records of changes in the structures of the economy and to form indicators that describe these changes. In practice, this means that we should develop indicators that would reveal the proportional share and change of low waste industrial branches in the economy. This could be done on the basis of the data on gross production and its value added, or by using statistics on the development of material requirement of different industrial branches.

The existing statistics on environmental expenditure targeting waste management do not seem give a clear picture of the possible correlation between these expenditures, material requirement and industrial waste generation. Also, the results obtained in this study support this observation, although in theory expenditure should reflect rather well societal responses to waste related concerns. The main reason for this annoying observation may lie in the fact that environmental expenditures are not normally recorded and published in such a detailed level that they could be used to indicate changes in waste generation.

The increase of the proportion of imports of raw materials into a national economy decreases the domestic hidden flows and waste. This information can be achieved from and monitored through the foreign trade statistics that consists of both physical and monetary data on imported materials, and national accounts.

On the basis of this study it is proposed that the indicators based on material flow accounts that are developed to reflect waste prevention policies, instruments and the effects of applied instruments, should take into account:

- The structure of the economy;
- The proportion of material intensive branches vs. proportion of low material intensive branches; and
- Technical possibilities to reuse and recycle materials.

Further, it is proposed that such indicators also take into consideration the necessity to divide waste and closely related materials into three main categories as discussed in Chapter 15:

- Materials generated in the extraction of natural resources and soil excavation;
- Waste generated in production and consumption activities; and
- Dissipative flows of materials from animal husbandry.

When taking these considerations into account, it would be relatively easy to develop waste prevention indicators that would link material use with waste generation and economic development. The developed indicators would compare the amount of waste generated with the amount of material inputs or with the amount of accumulated material (stocks). In this respect it should be noted that changes in the material use *within* the economy, such as recycling, are included in the indicators because recycling has an impact on the effectiveness of material use. Recycling extends the life-cycle of materials in the economy, while decreases the extraction of virgin natural resources.

The following waste prevention indicators are proposed based on the present study on material flow accounts:

(1) Hidden flow index:

Domestic hidden flows / Total material input (TMI);

(2) Waste disposal index:

Waste disposed of / Net additions to stock; and

(3) Manure utilisation index:

Dissipative use of manure / Total generation of manure.

“**Hidden flow index**” describes the changes in material effectiveness especially in the branches of primary production and construction. In these branches, hidden flows reflect directly the changes in the relatively high amounts of waste generated. In addition to waste generation, the trend of hidden flows indicates the magnitude of primary production and construction in the total national economy. Hidden flow index can relatively easily be calculated separately for branches of agriculture, forestry, mining and quarrying and construction. Hidden flow index, or only hidden flows, can also be used together with economic figures, such as GDP, value added and environmental expenditures.

“**Waste disposal index**” reflects the efficiency of the use of materials in and recovery of the waste from the production and consumption processes. Waste disposal index brings together two quite opposite sides of the destination of materials: waste as materials that are no more usable for economic purposes (disposal) and materials that remain usable for the economy for a relatively long period of time (stock).

“**Manure utilisation index**” describes the magnitude and development of waste utilisation in agriculture leading to productive use of high amounts of waste. The use of this ratio together with hidden flow index and waste disposal index also makes sure, that the most important material types that can be regarded as waste are taken into account in waste prevention indicators, although unambiguous definition of waste and time series on waste generation are not available.

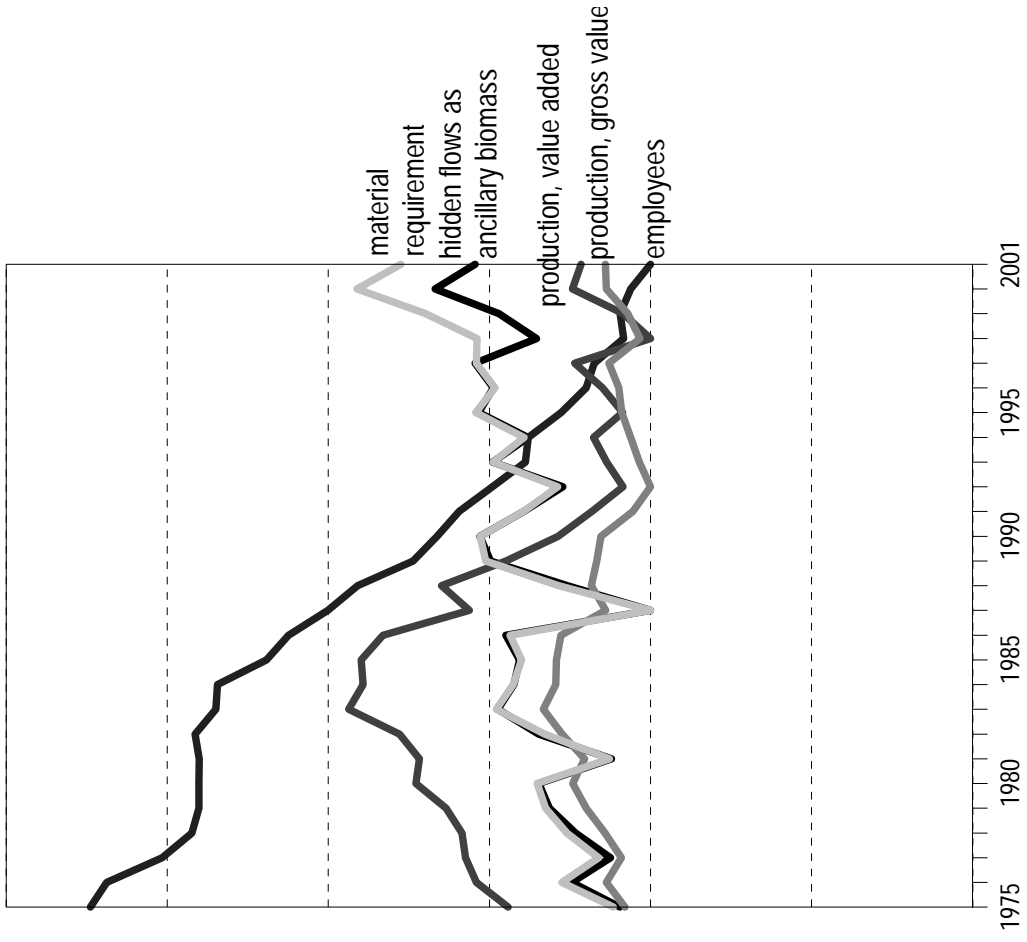
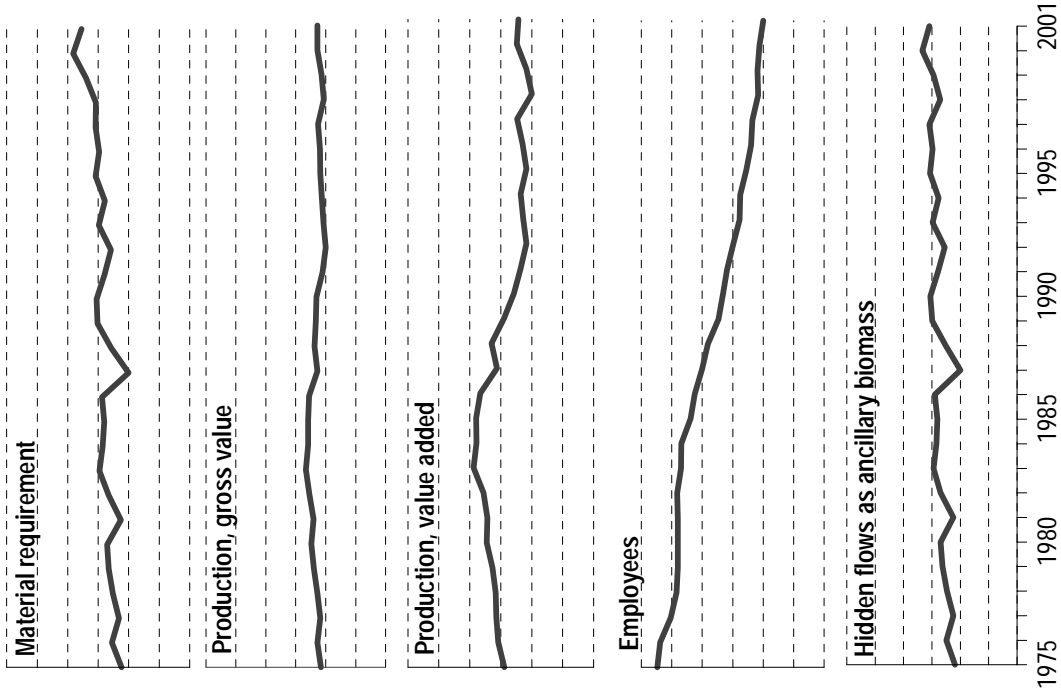
REFERENCES

- EC (European Commission) (2001), "Economy-wide Material Flow Accounts and Derived Indicators: A Methodological Guide", *Eurostat Theme 2 Economy and Finance*, Luxembourg.
- EC (2002a), Commission Regulation (EC) No 29/2002 of 19 December 2001 amending Council Regulation (EEC) No 3037/90 on the Statistical Classification of Economic Activities in the European Community, NACE, *Official Journal of the European Communities*, 10.1.2002 L 6/3-34, Luxembourg.
- EC (2002b), "Material Use in the European Union 1980-2000: Indicators and Analysis", *Eurostat Theme 2 Economy and Finance*, Luxembourg.
- EC (2002c), Commission Regulation (EC) No 204/2002 of 19 December 2001 Amending Council Regulation (EEC) No 3696/93 on the Statistical Classification of Products by Activity (CPA) in the European Economic Community, *Official Journal of the European Communities*, 6.2.2002 L 36/1-196, Luxembourg.
- ETC/WMF (European Topic Centre on Waste and Material Flows) (2003), "Zero Study: Resource Use in European Countries", ETC/WMF, Copenhagen.
- Isaksson, K. E. (1993), "Talonrakennustoiminnan jätteet" (Wastes from House Building), *Environment* 1993:7, Statistics Finland, Helsinki.
- Montgomery, R. & L. Sanches (2002), "Efficiency: The Sustainability Criterion that Provides Useful Guidance for Statistical Research", *Statistical Journal of the UNECE*, 19, pp. 29-40. Geneva.
- Muukkonen, J. (2000), *TMR, DMI and Material Balances, Finland 1980-1997*. Eurostat Working Papers 2/2000/B/1, Luxembourg.
- Mäenpää, I. *et al* (2000), "Luonnonvarojen kokonaiskäyttö Suomessa" (Natural Resource Use of Finland), *Suomen ympäristö*, 428, Ympäristöministeriö, Helsinki.
- Ollila, P. (1995), *Comparing Sampling Strategies with the Waste Statistics Data: Living Conditions/Statistical Methods*, Statistics Finland, Helsinki.
- Perälä, A. L. & E. Nippala (1998), "Rakentamisen jätteet ja niiden hyötykäyttö" (Construction Wastes and Their Utilization), Technical Research Centre of Finland, Research Notes 1936.
- Statistics Finland (1994), *Environment Statistics: Environment*, 1994:3, Statistics Finland, Helsinki.
- Statistics Finland (1995), *Wastes from Manufacturing and Related Industries 1992: Environment*, 1995:7, Statistics Finland, Helsinki.
- Statistics Finland (1998), "Rakennusjätetilastoinnin kehittäminen" (The Development of Statistics on Construction Waste: Reviews), 1998/10, Statistics Finland, Helsinki.

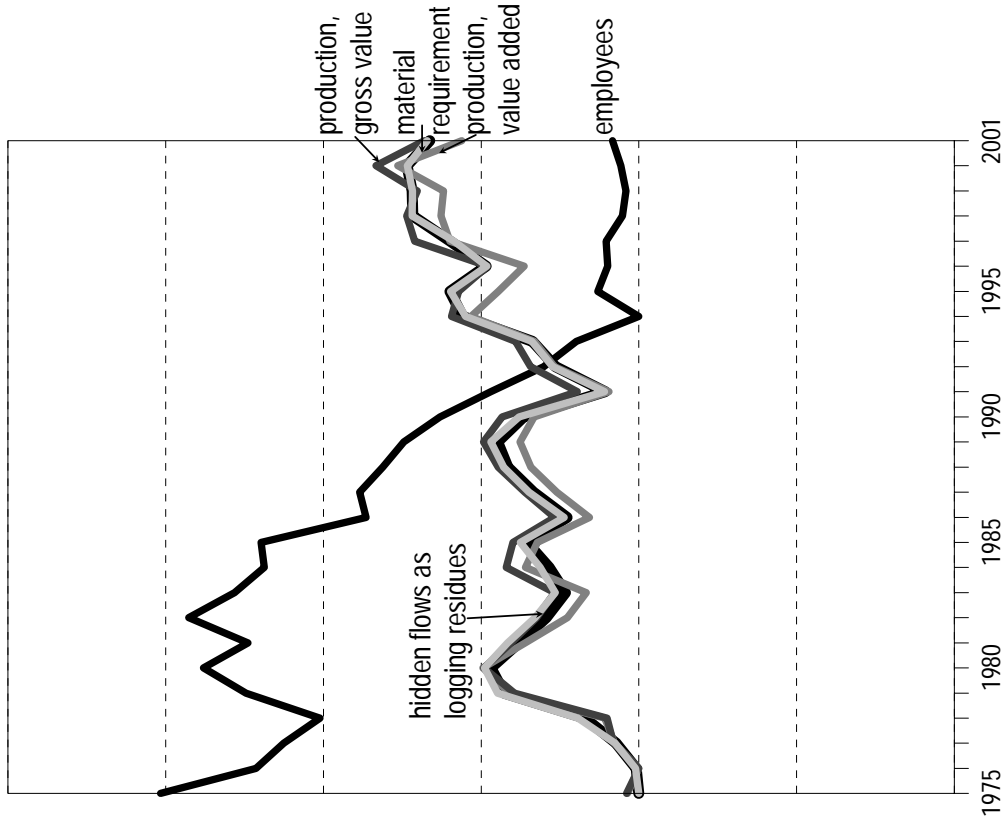
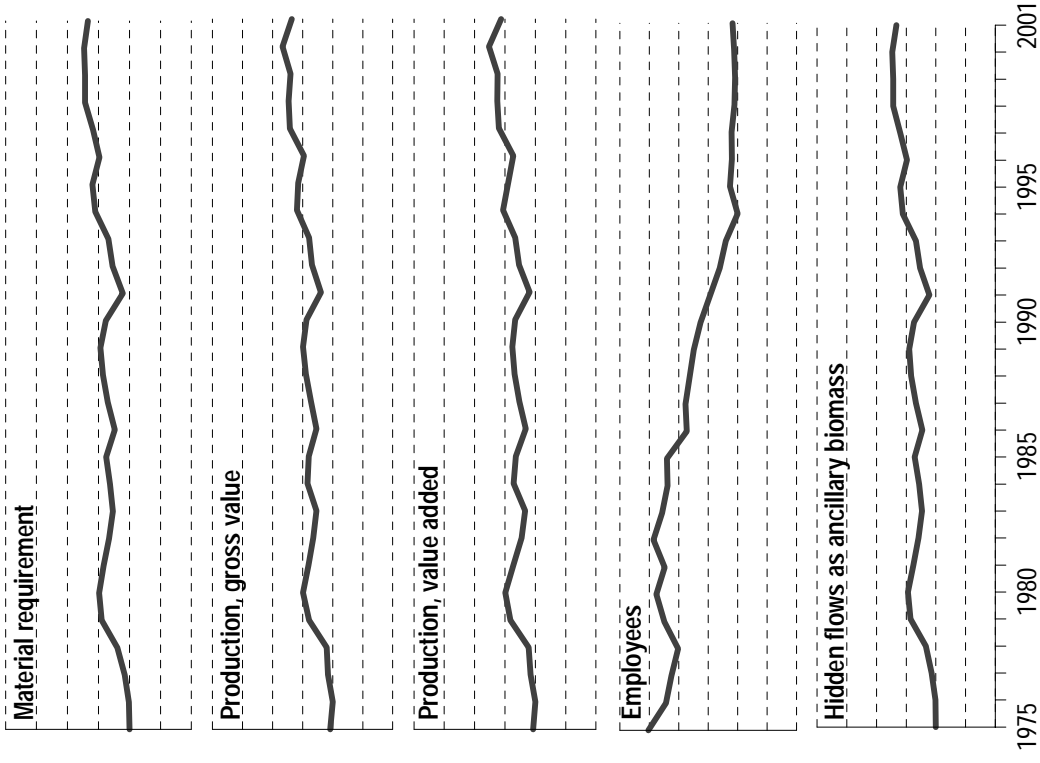
- Statistics Finland (2000), *Environment Statistics: Environment and Natural Resources*, 2000:1, Statistics Finland, Helsinki.
- Statistics Finland (2001), *Environment Statistics: Environment and Natural Resources*, 2001:2, Statistics Finland, Helsinki.
- Statistics Finland (2002a), *Environment Statistics: Environment and Natural Resources*, 2002:3, Statistics Finland, Helsinki.
- Statistics Finland (2002b), *Standard Industrial Classification TOL 2002: Handbooks 4, Annex 2 Summary*, Statistics Finland, Helsinki.
- Statistics Finland (2003), *Environment Statistics: Environment and Natural Resources*, 2003:2, Statistics Finland, Helsinki.
- Vahvelainen, S. (2002), "Industrial and Consumption Waste: How to Meet the Indicator Needs: Experiences from Finland", *Statistical Journal of the UNECE*, 19, pp. 65-78, Geneva.
- Vahvelainen, S. & K. E. Isaksson (1992), *Industrial Waste: Environment*, 1992:1, Statistics Finland, Helsinki.
- Vahvelainen, S. & Salomaa, E. (2000), *Wastes from Production and Consumption: Environment and Natural Resources 2000:5*, Statistics Finland, Helsinki.
- WRI (World Resources Institute) (1997), *Resource Flows: The Material Basis of Industrial Economies*, WRI, Washington DC.
- WRI (2000), *The Weight of Nations: Material Outflows from Industrial Economies*, WRI, Washington DC.

ANNEX 1

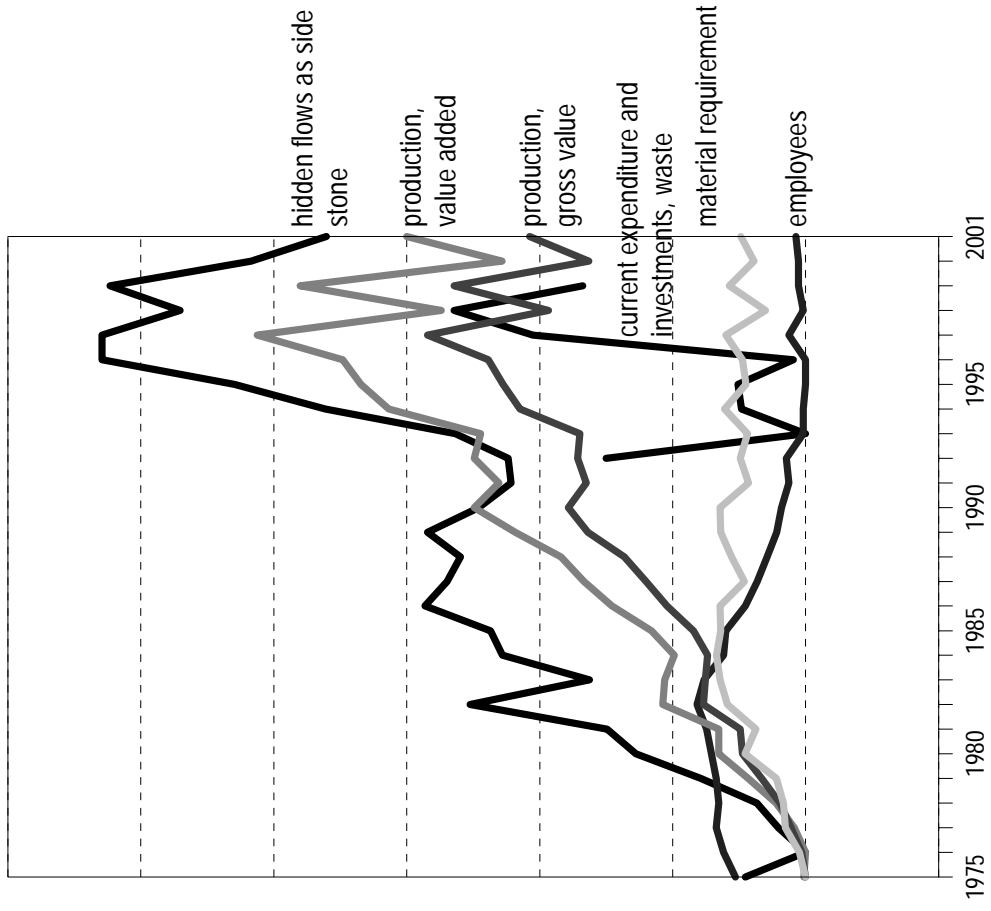
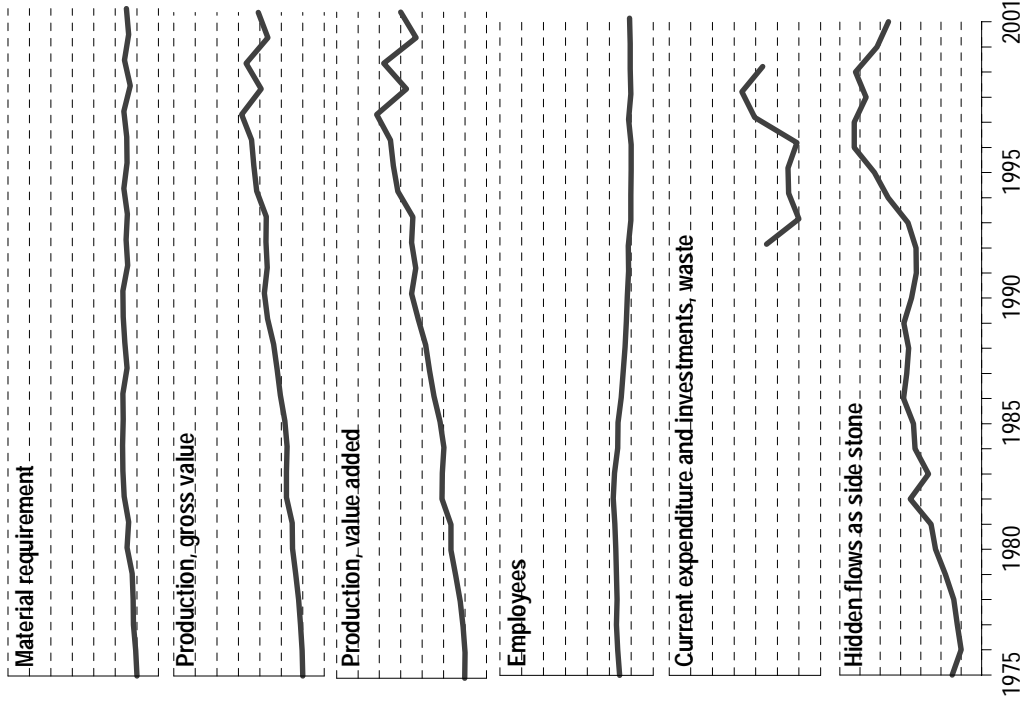
| Figures | Economic activities | Codes of NACE | Page |
|----------------------|---|----------------------|-------------|
| Figures 1a and 1b. | Agriculture | A01 | 34 |
| Figures 2a and 2b. | Forestry | A02 | 35 |
| Figures 3a and 3b | Mineral quarrying | CA, CB | 36 |
| Figures 4a and 4b. | Food, beverages and tobacco | DA | 37 |
| Figures 5a and 5b. | Wood and paper | DD, DE | 38 |
| Figures 6a and 6b. | Fuels and chemicals | DF, DG, DH | 39 |
| Figures 7a and 7b. | Non-metallic mineral products | DI | 40 |
| Figures 8a and 8b. | Metal and metal products | DJ | 41 |
| Figures 9a and 9b. | Machinery and equipment | DK, DL, DM | 42 |
| Figures 10a and 10b. | Other manufacture | DB, DC, DN | 43 |
| Figures 11a and 11b. | Energy supply | E40 | 44 |
| Figures 12a and 12b. | Construction | F | 45 |
| Figures 13a and 13b. | Trade and services | G-Q | 46 |
| Figure 14. | Household population, consumption and packaging waste | | 47 |
| Figures 15–22. | Productivity as GDP/employees and GDP/direct material inputs in 1975–2001 | | |
| Figure 15 | Total economy | A-Q | 48 |
| Figure 16. | Agriculture | A01 | 48 |
| Figure 17. | Forestry | A02 | 48 |
| Figure 18. | Mining and quarrying | C | 48 |
| Figure 19. | Industry | D | 49 |
| Figure 20. | Energy supply | E40 | 49 |
| Figure 21. | Construction | F | 49 |
| Figure 22. | Trade and services | G-Q | 49 |



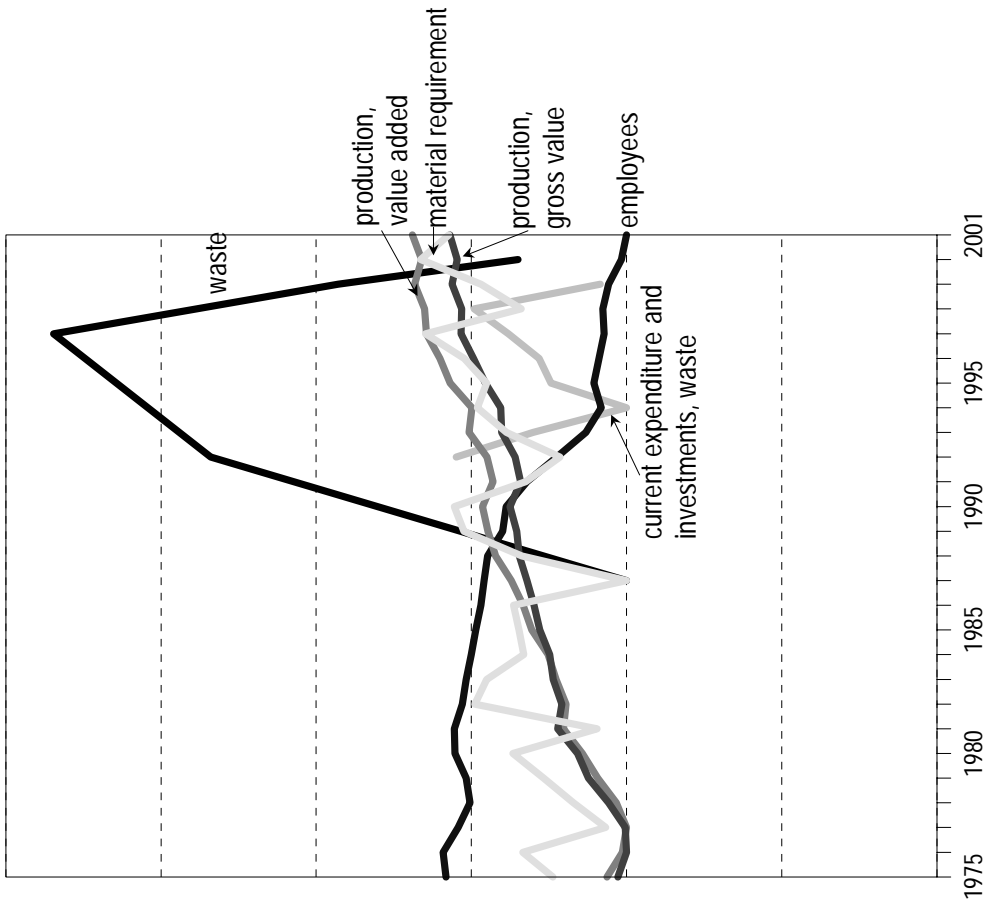
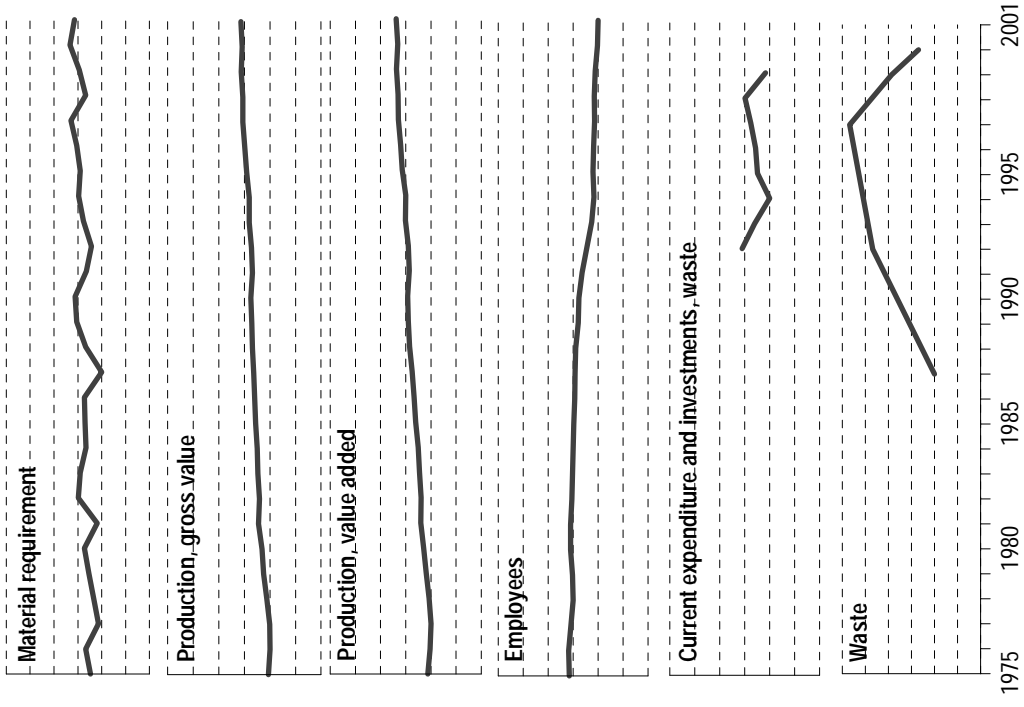
Figures 1a and 1b. Agriculture A01



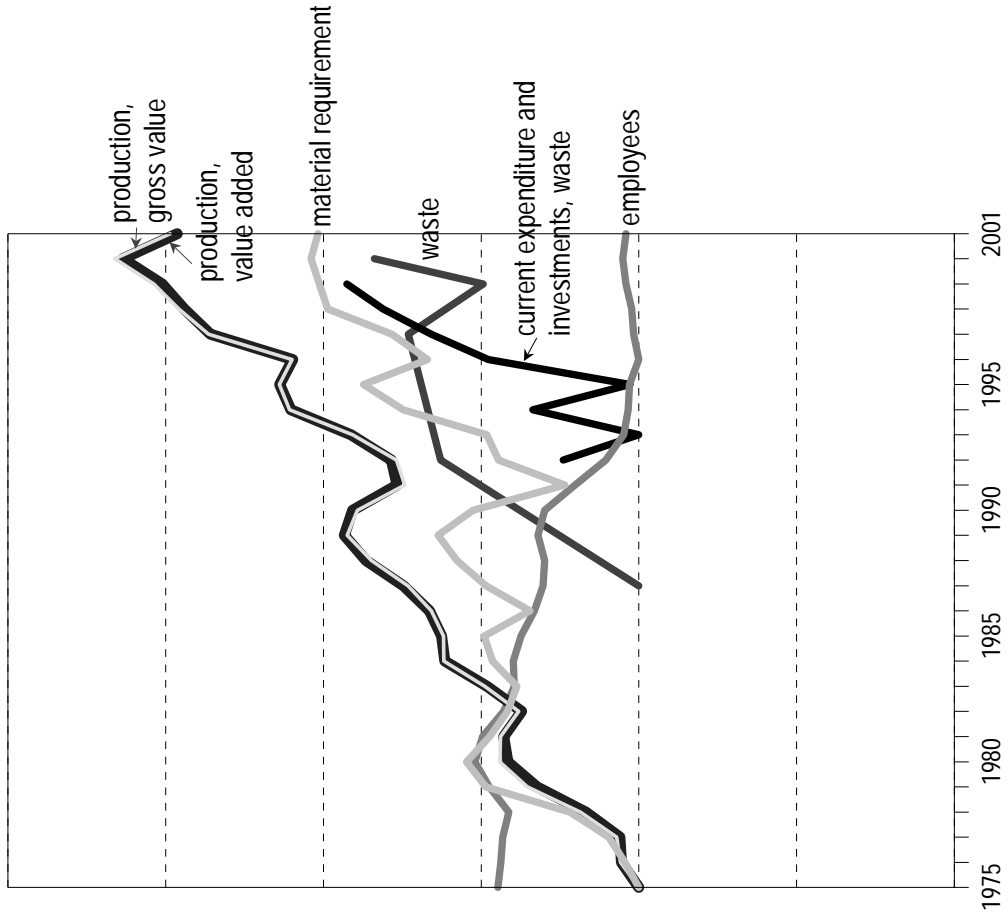
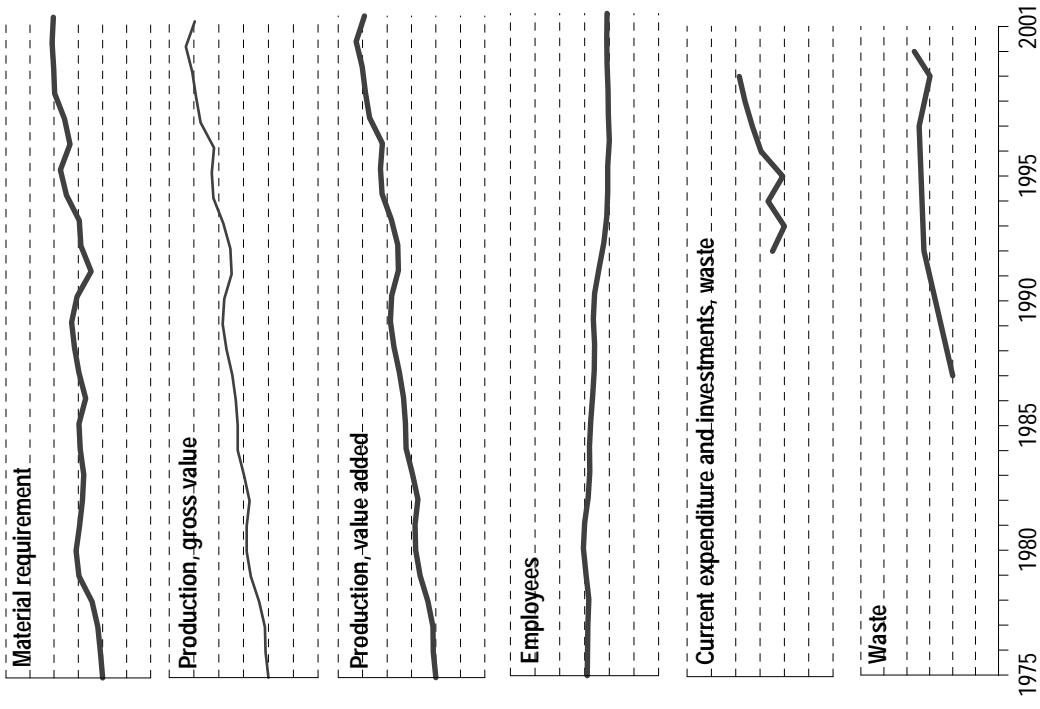
Figures 2a and 2b. Forestry A02



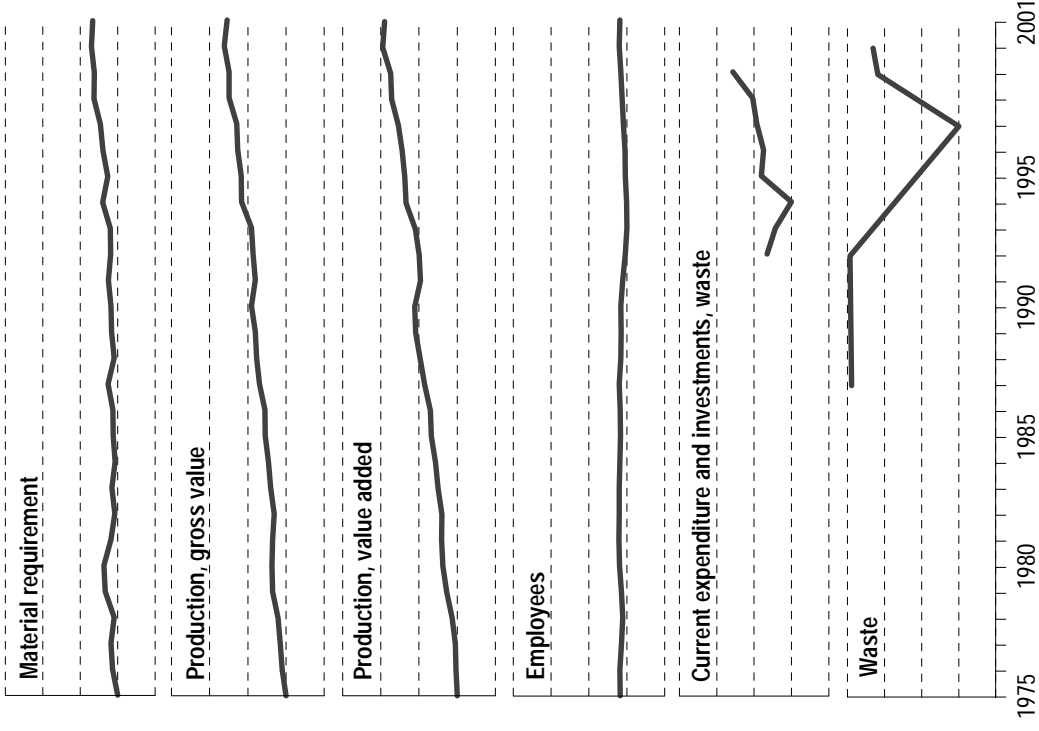
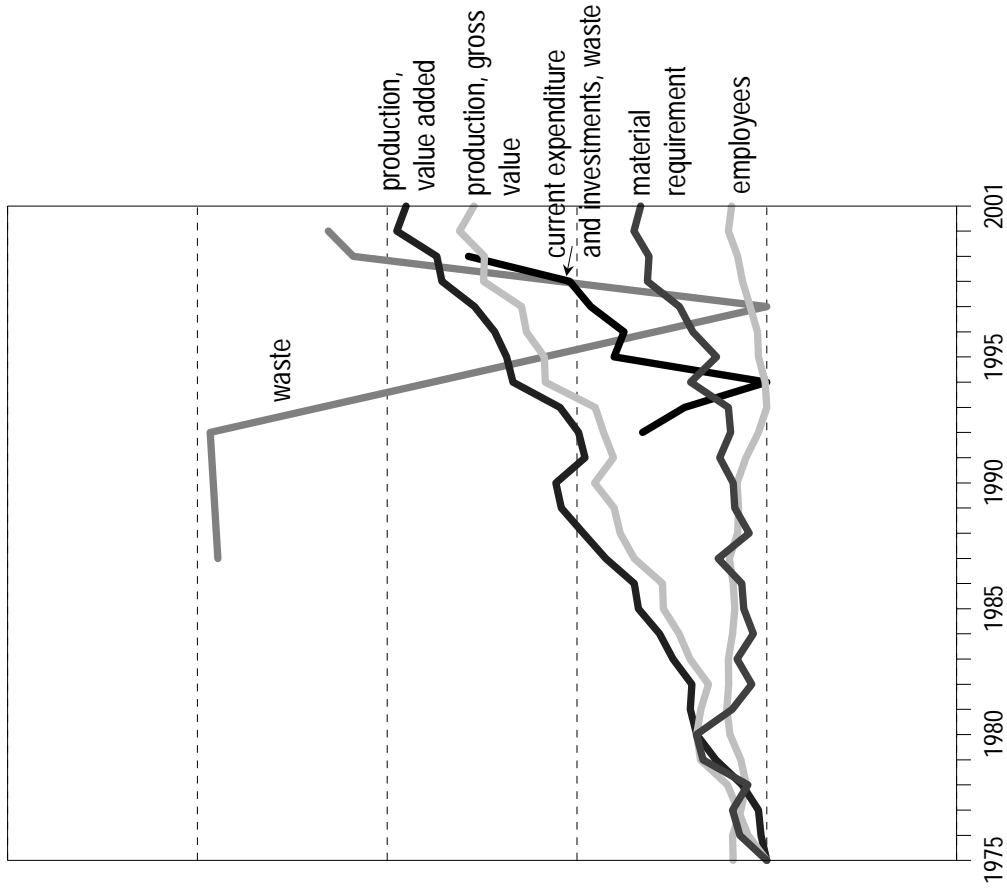
Figures 3a and 3b. Mineral quarrying CA, CB



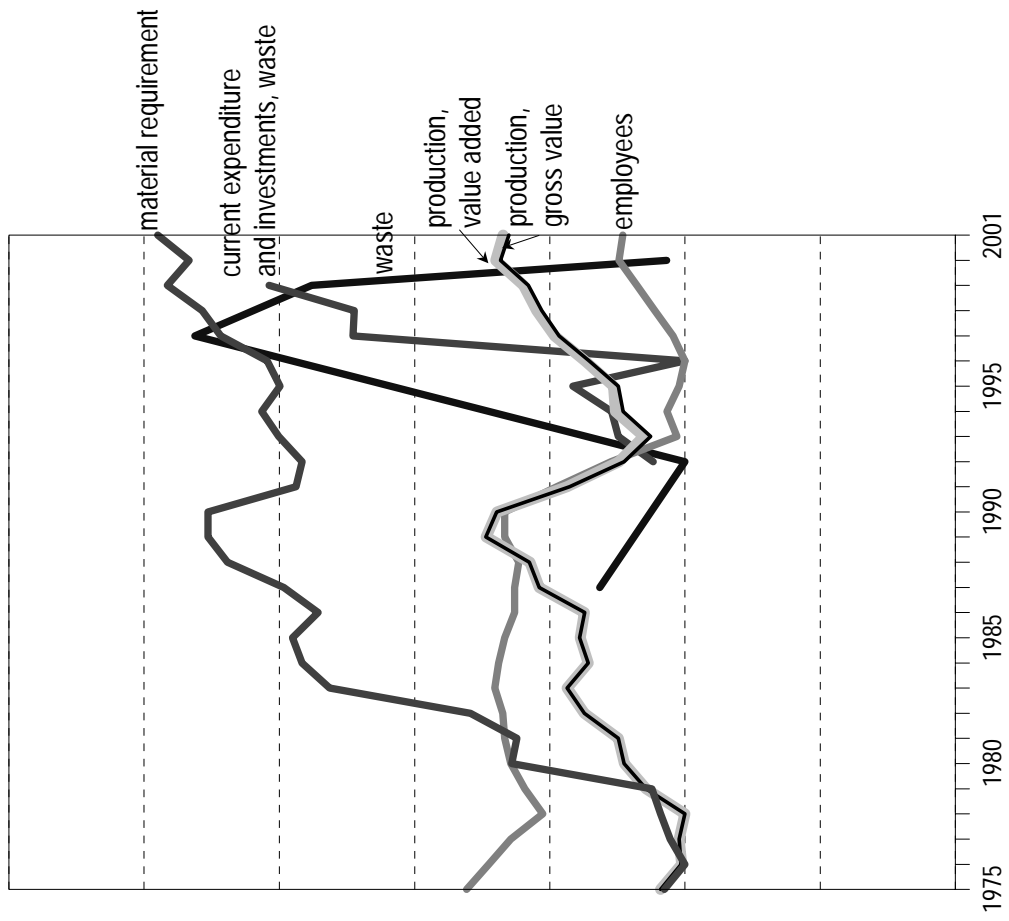
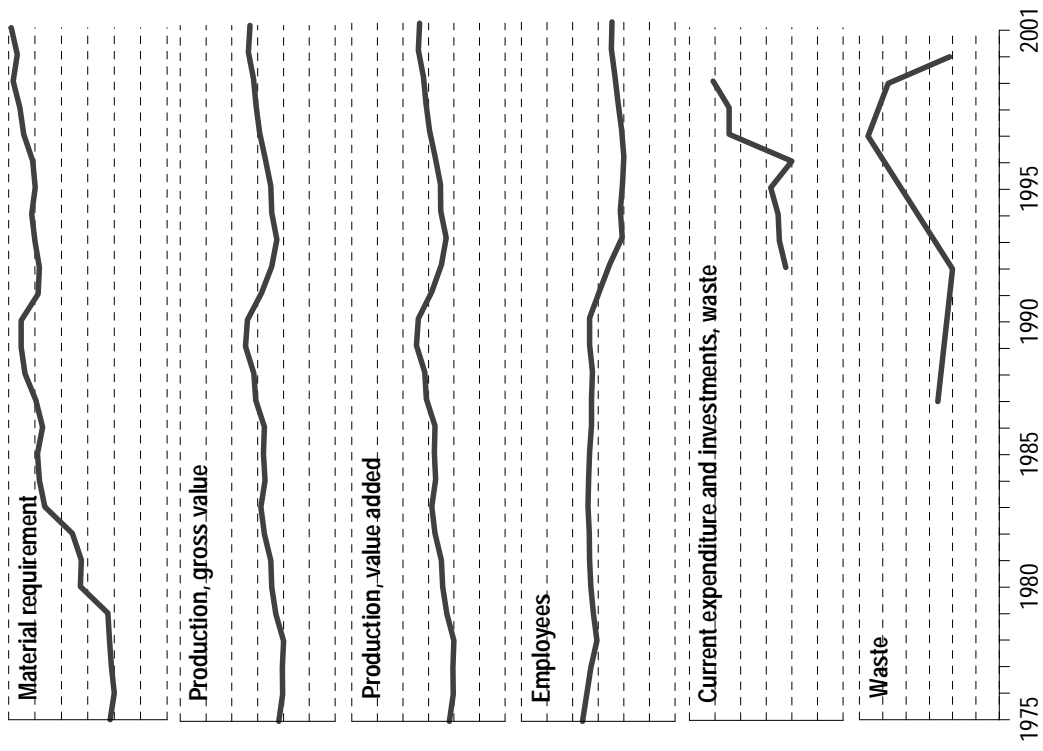
Figures 4a and 4b. Food, beverages and tobacco DA



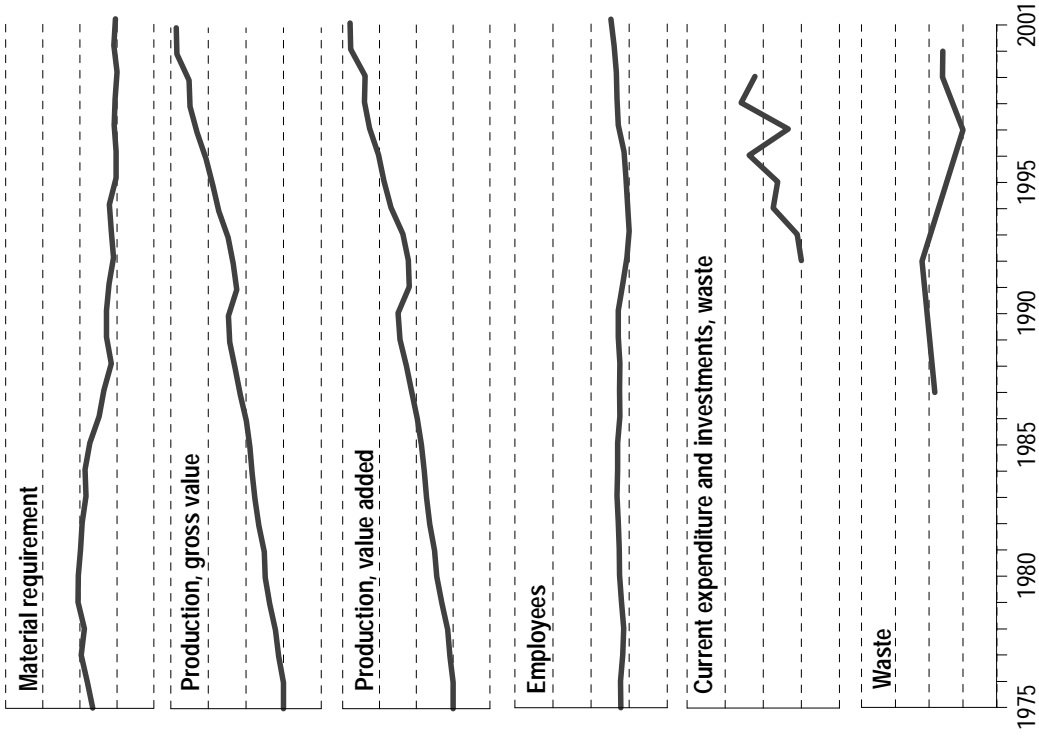
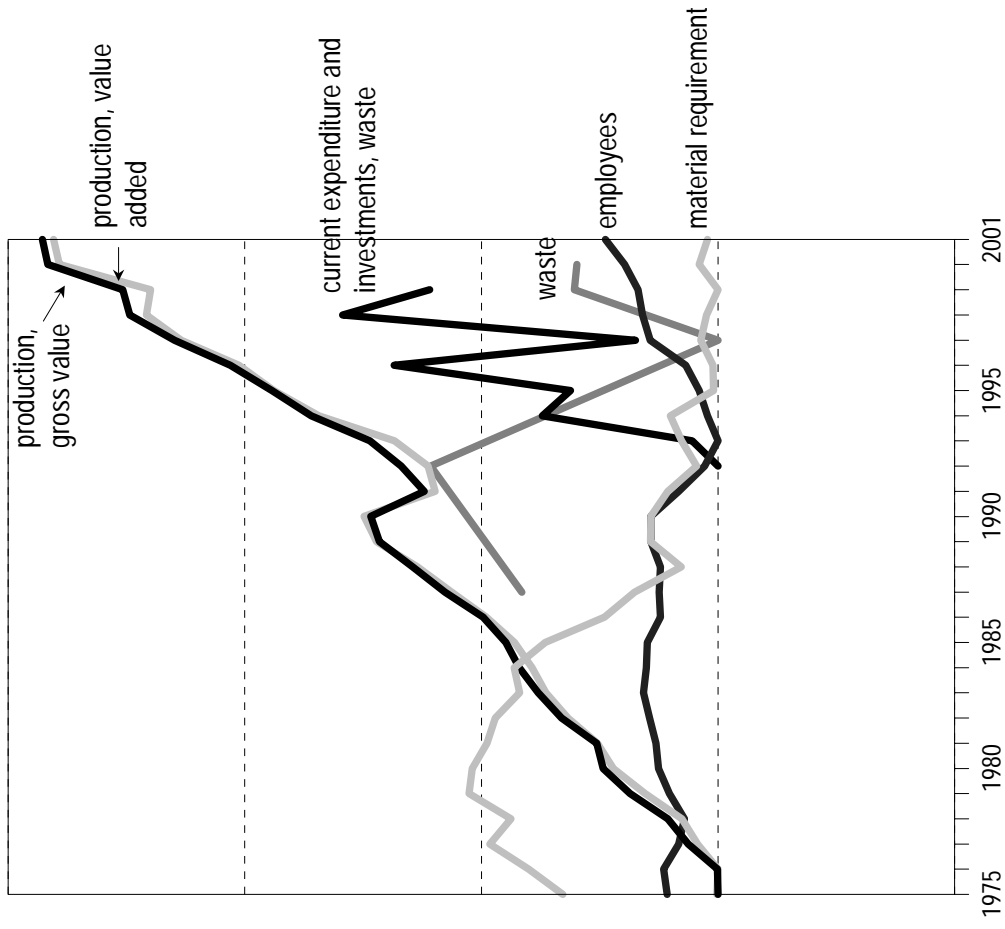
Figures 5a and 5b. Wood and paper DD, DE



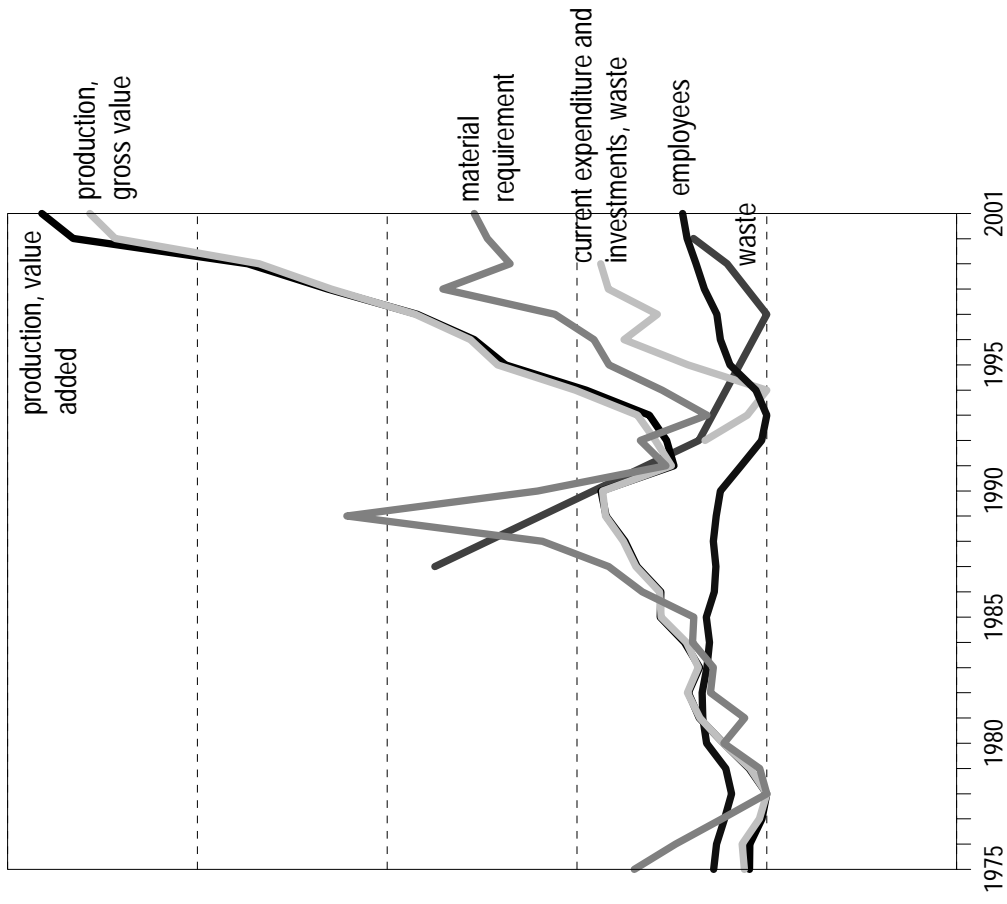
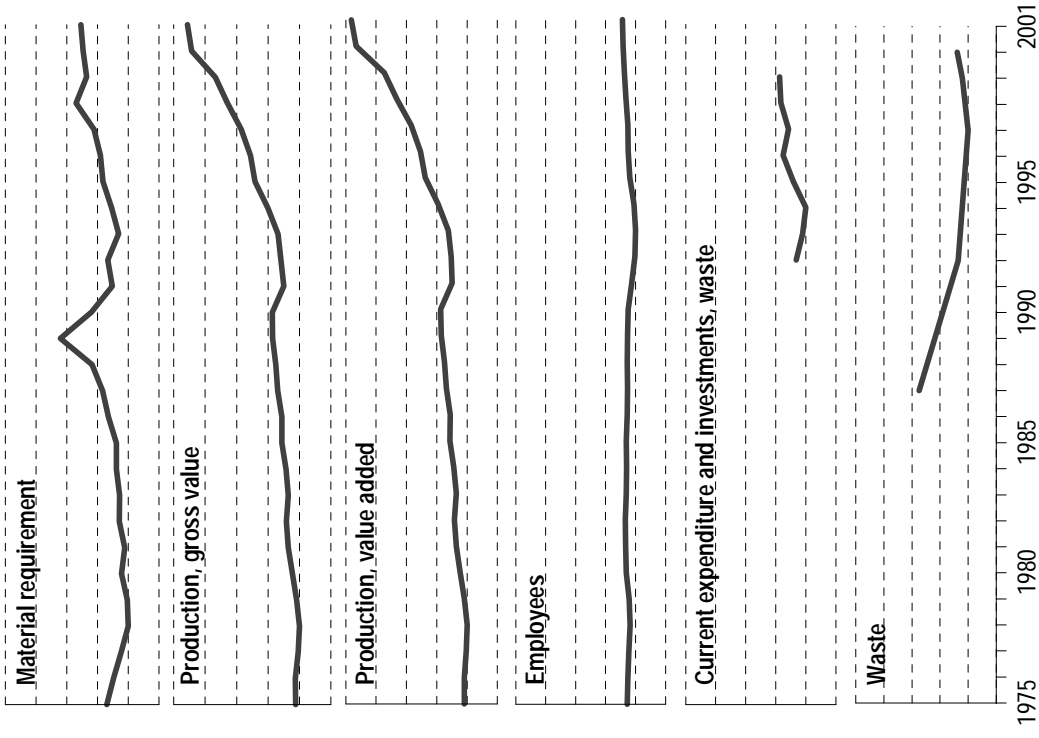
Figures 6a and 6b. Fuels and chemicals DF, DG, DH



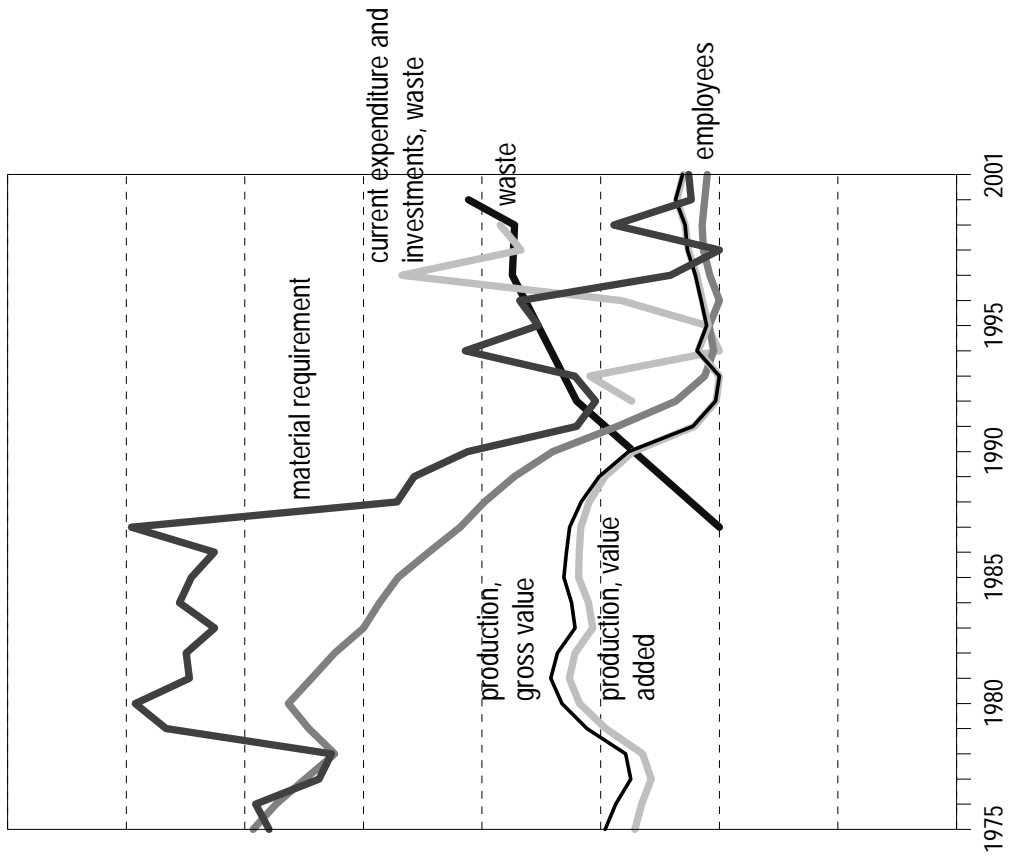
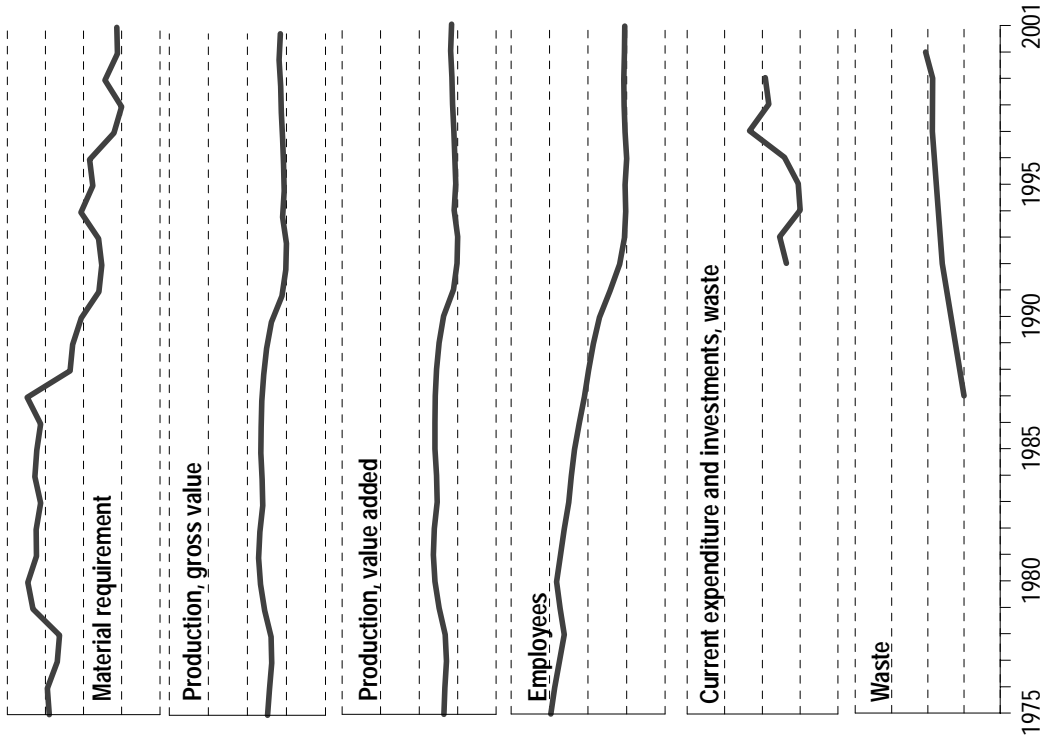
Figures 7a and 7b. Non-metallic mineral products DI



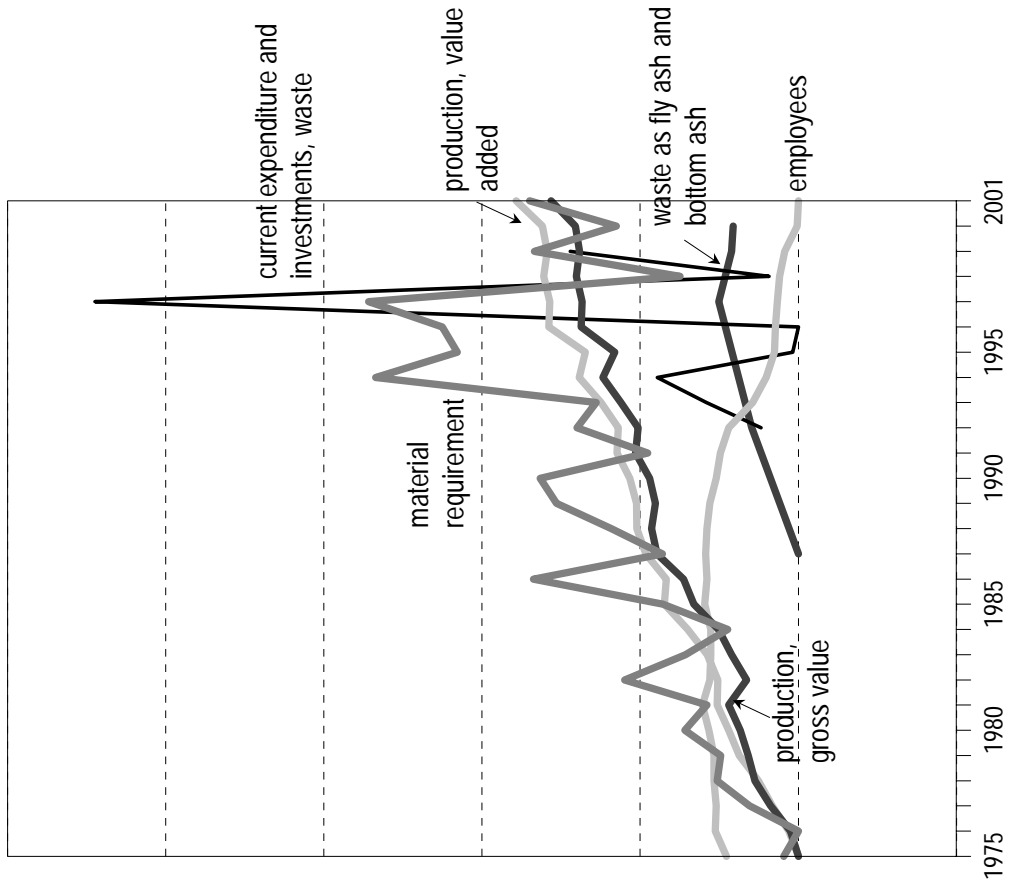
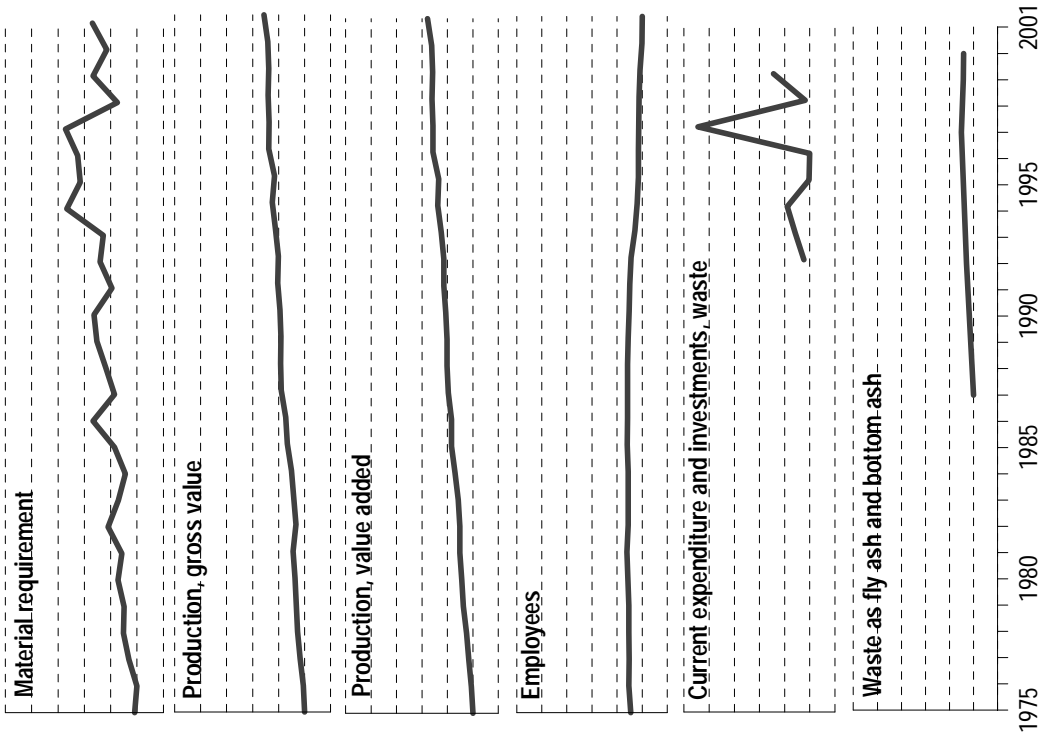
Figures 8a and 8b. Metal and metal products DJ



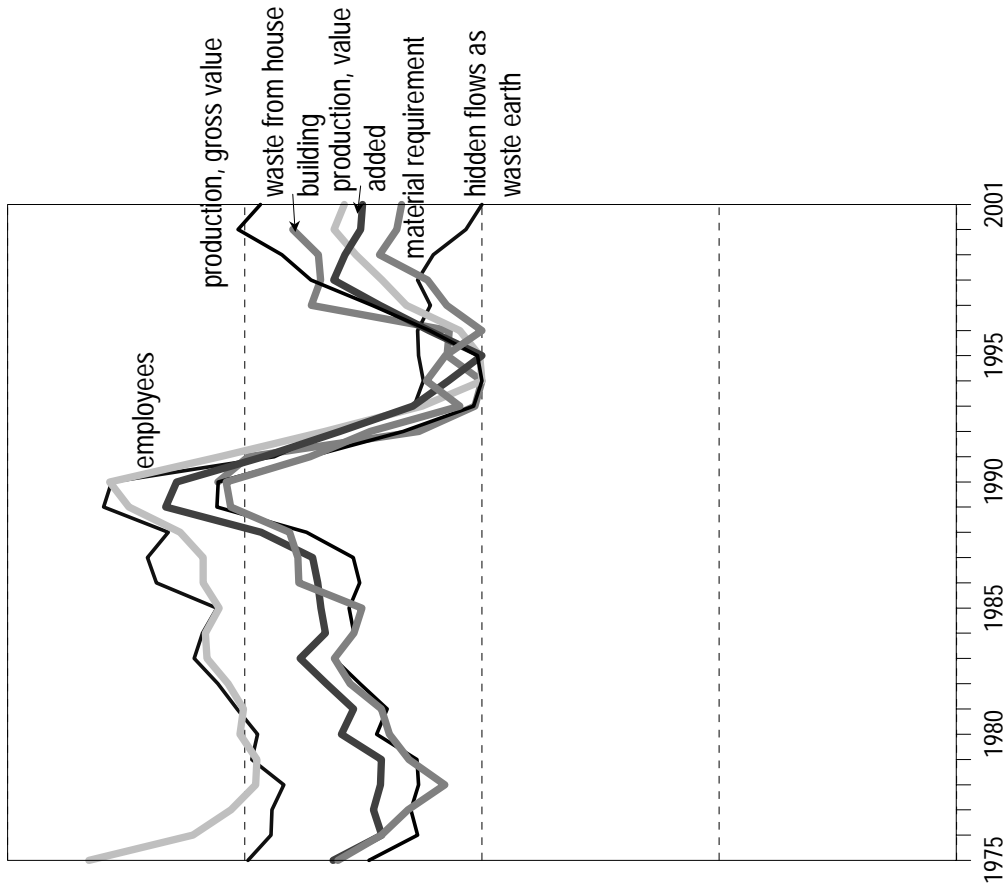
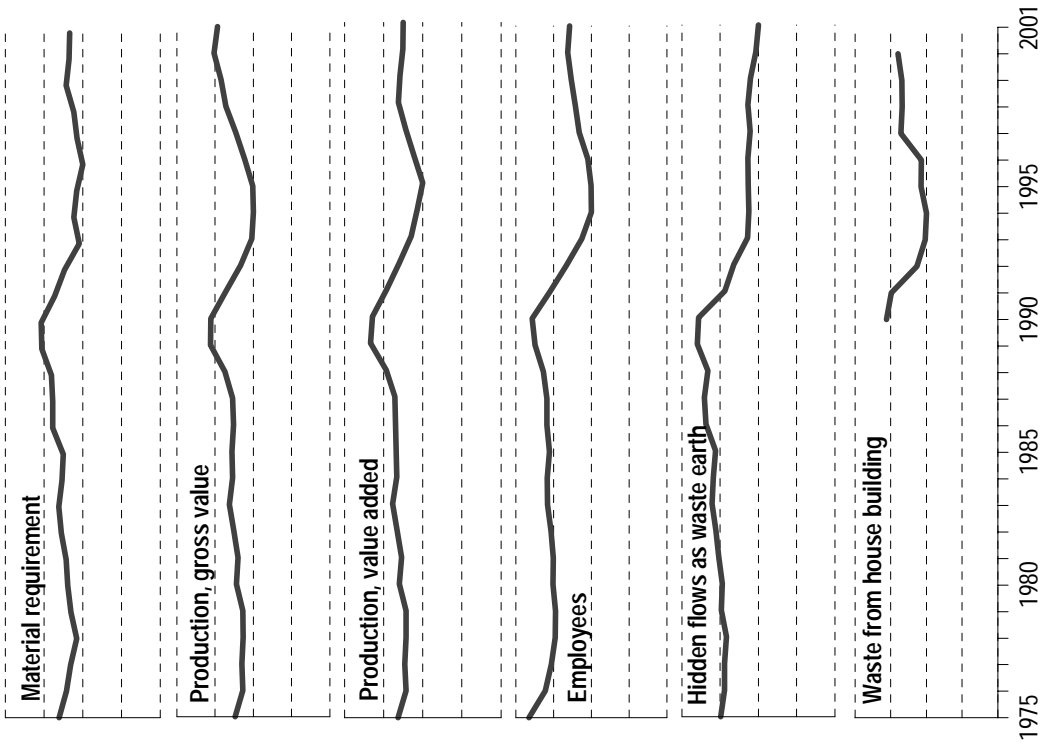
Figures 9a and 9b. Machinery and equipment DK, DL, DM



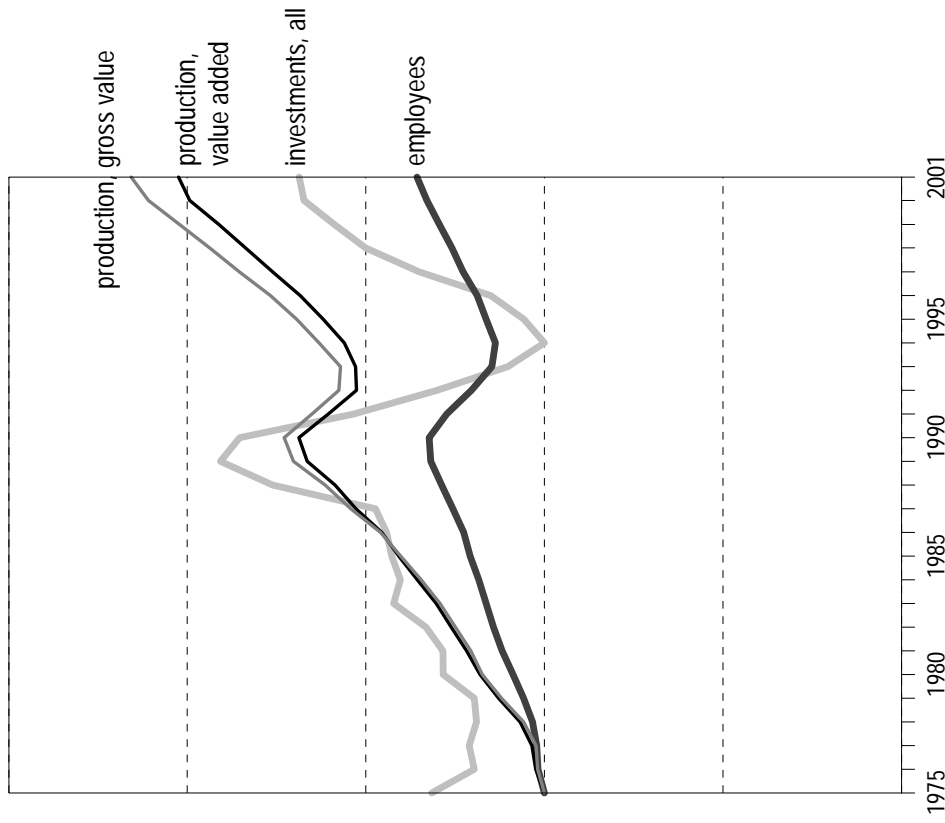
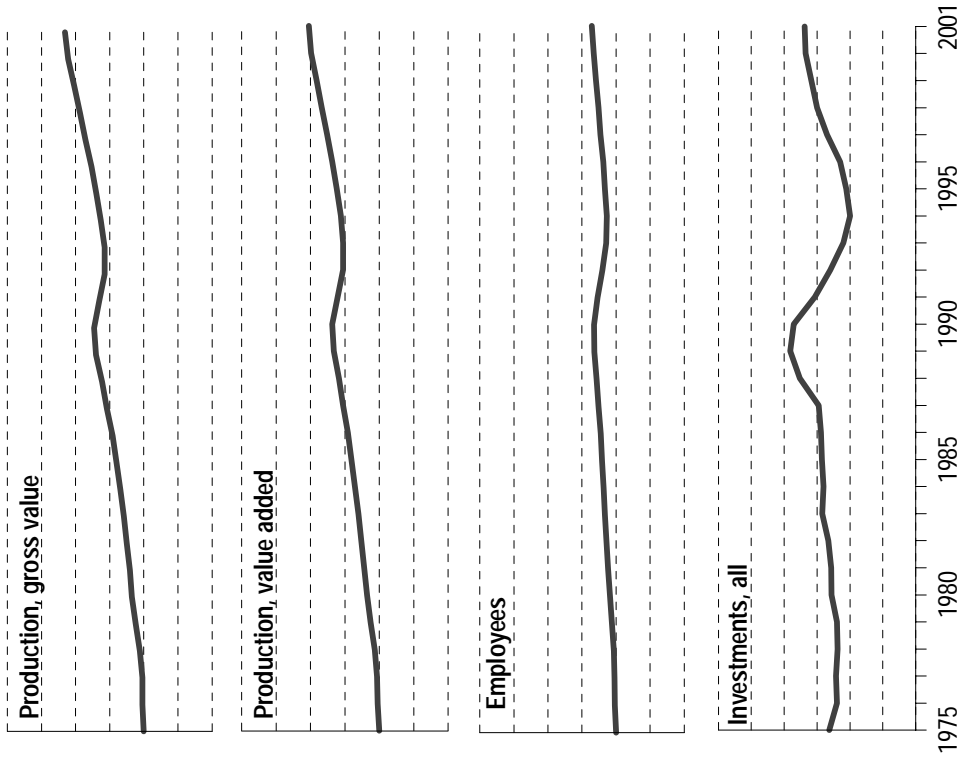
Figures 10a and 10b. Other manufacture DB, DC, DN



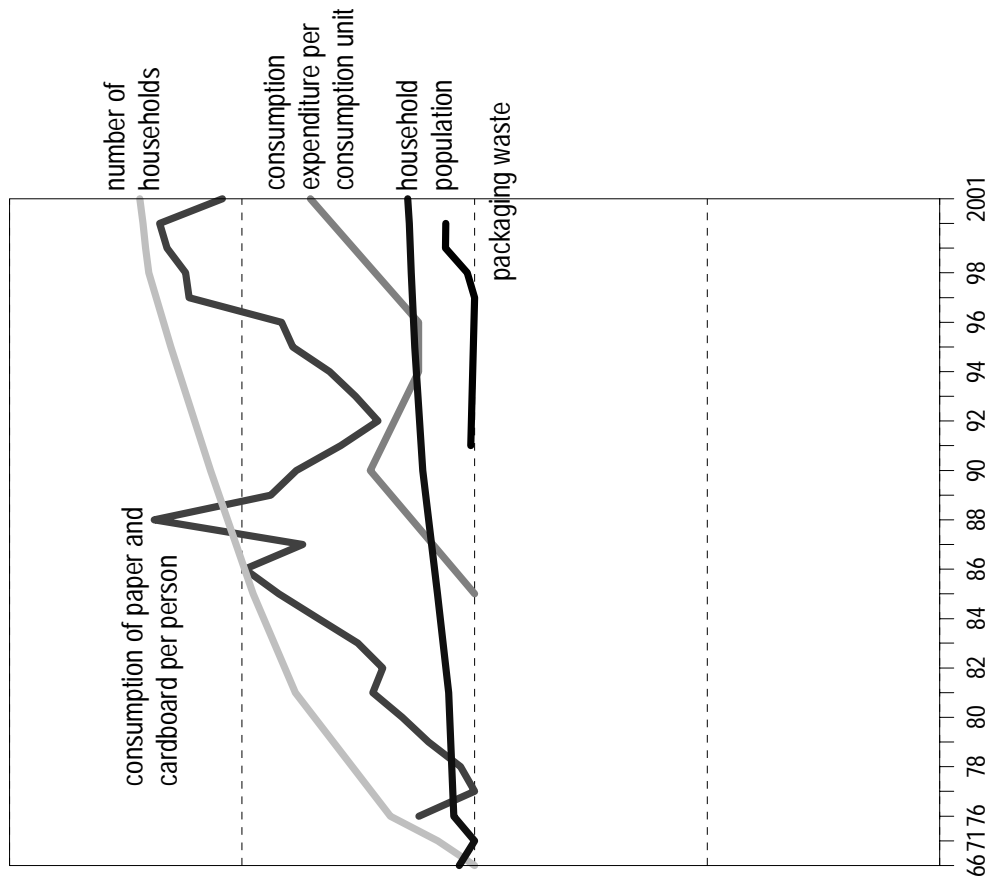
Figures 11a and 11b. Energy supply E40



Figures 12a and 12b. Construction F



Figures 13a and 13b. Trade and services G-Q



Figures 14. Household population, consumption and packaging waste

Figures 15–22. Productivity as GDP/employees and GDP/direct material input (1975=100)

Figure 15.
Total economy

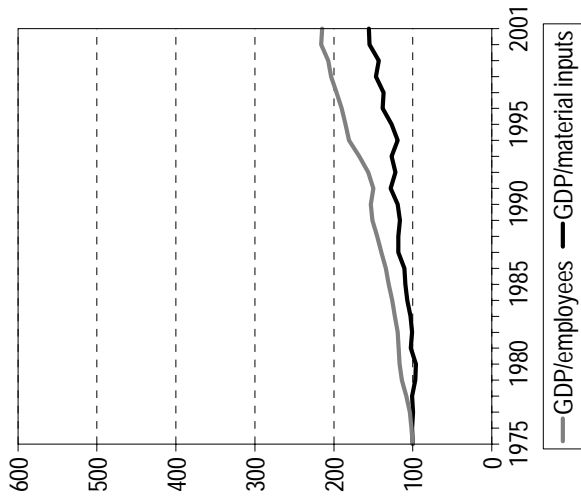


Figure 16.
Agriculture

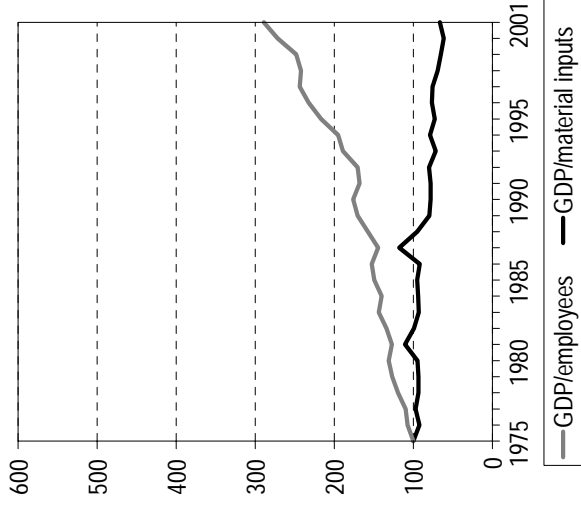


Figure 17.
Forestry

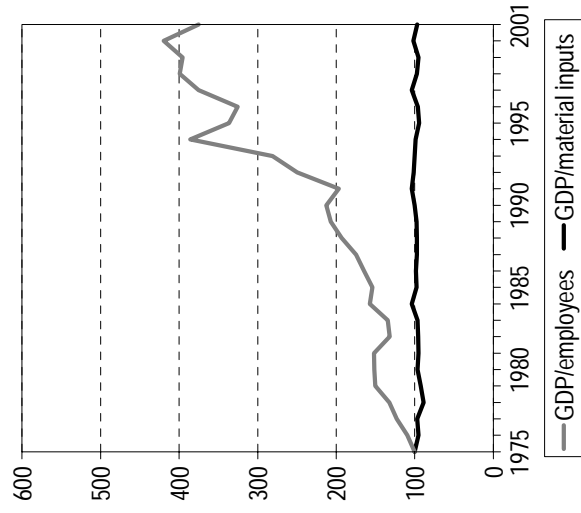


Figure 18.
Mining and quarrying

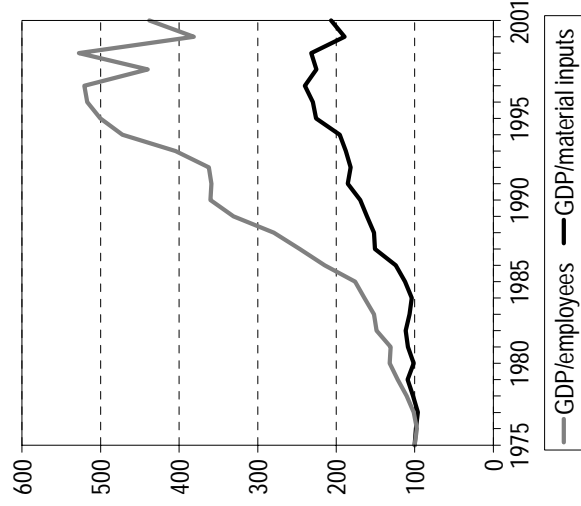


Figure 19.
Industry

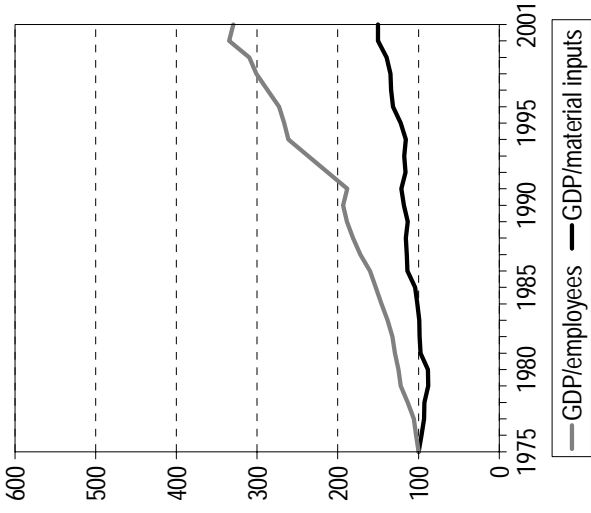


Figure 20.
Energy supply

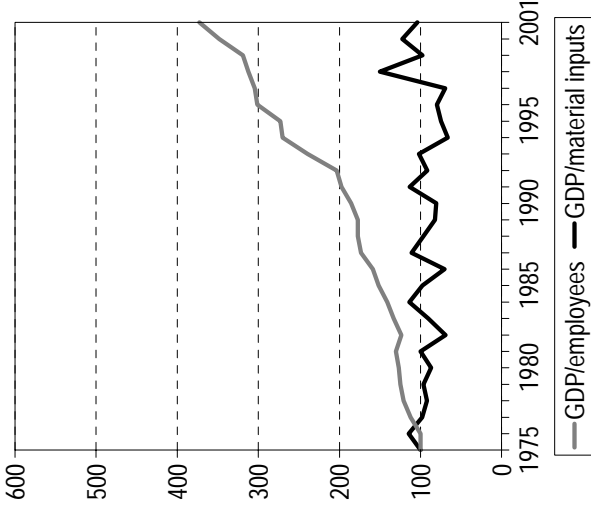


Figure 21.
Construction

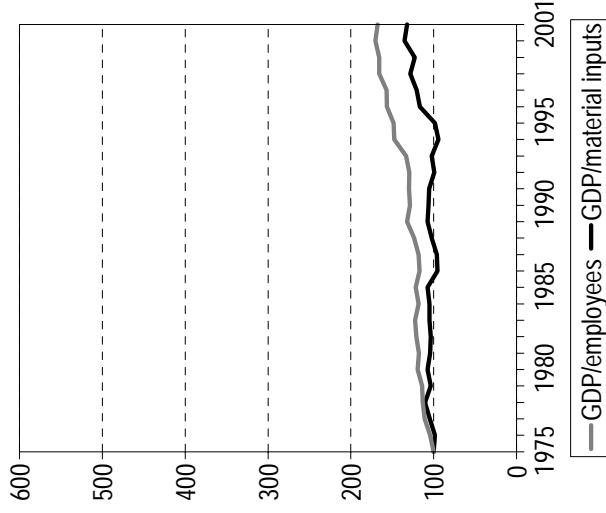
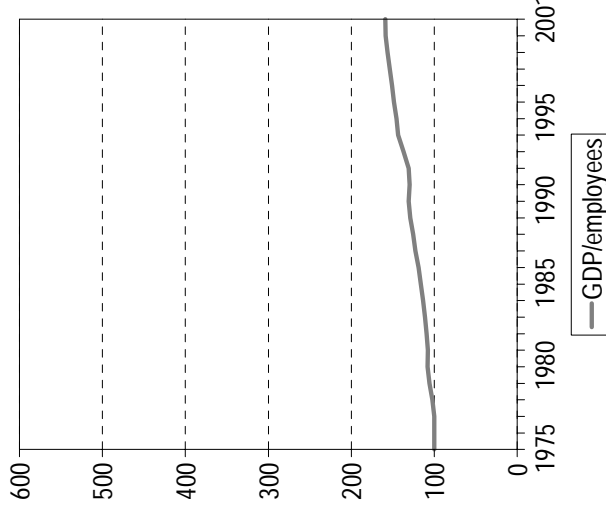


Figure 22.
Trade and services



ANNEX 2

Finnish statistical tables for the study on linkages between material use, waste generation, economic development and waste prevention policies in developing indicators for waste prevention*Contents*

| |
|--|
| Table A: Gross domestic product 1975-2001 |
| Table B: Value added of production 1975-2001 |
| Table C: Employment 1975-2001 |
| Table D: Total investments 1960-2001 |
| Table E: Material requirement 1970-2001 |
| Table F: Hidden flows 1970-2001 |
| Table G: Environmentally related taxes, fees and charges 1980-2001 |
| Table H: Investments in waste management 1992-1999 |
| Table I: Current expenditure of waste and protection of soil and groundwater 1992-1999 |
| Table J: Industrial waste 1987, 1992, 1997, 1999 and 2000 |
| Table K: Consumption expenditure of households |
| Table L: Household population |
| Table M: Allocation of investments in environmental protection 1992-1999 |
| Table N: Allocation of expenditure and maintenance costs of environmental protection 1992-1999 |
| Table O: Packaging waste 1991, 1997, 1998, 1999 and 2000 |
| Table P: Consumption and recovery of paper and cardboard 1976-2001 |

Table A: Gross domestic product 1975-2001

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | |
|--|-------------------------------|---------|---------|---------|---------|---------|---------|---------|---------|--|
| | 1 000 000 EUR, at 2000 prices | | | | | | | | | |
| 0 Total | 116 946 | 117 778 | 118 148 | 122 014 | 130 873 | 138 403 | 141 289 | 144 748 | 149 425 | |
| A Agriculture, hunting and forestry | 5 991 | 6 144 | 6 106 | 6 336 | 7 082 | 7 417 | 7 121 | 7 244 | 7 369 | |
| 01 Agriculture, hunting and related service act. | 4 146 | 4 369 | 4 188 | 4 382 | 4 608 | 4 769 | 4 627 | 4 894 | 5 120 | |
| 01MAA Agriculture and related service act. | 4 110 | 4 332 | 4 140 | 4 317 | 4 531 | 4 684 | 4 539 | 4 810 | 5 042 | |
| 0112 Horticulture | 287 | 308 | 313 | 361 | 363 | 350 | 392 | 424 | 427 | |
| 0125 Other farming of animals | 192 | 191 | 203 | 257 | 311 | 352 | 367 | 429 | 462 | |
| 013 Mixed farming | 3 574 | 3 774 | 3 563 | 3 634 | 3 791 | 3 915 | 3 712 | 3 888 | 4 083 | |
| 014 Agricultural service activities | 57 | 59 | 61 | 65 | 66 | 67 | 68 | 69 | 70 | |
| 015 Hunting and game husbandry | 36 | 37 | 48 | 65 | 77 | 85 | 88 | 84 | 78 | |
| 02 Forestry and related service activities | 1 845 | 1 775 | 1 918 | 1 954 | 2 474 | 2 648 | 2 494 | 2 350 | 2 249 | |
| 0211 Forest cultivation | 20 | 21 | 24 | 23 | 25 | 30 | 34 | 38 | 41 | |
| 0212 Timber harvesting | 1 751 | 1 680 | 1 813 | 1 850 | 2 346 | 2 493 | 2 320 | 2 168 | 2 068 | |
| 0219 Other forestry | | | | | | | | | | |
| 0202 Forestry related service activities | 74 | 74 | 81 | 81 | 103 | 125 | 140 | 144 | 140 | |
| B Fishing | 84 | 88 | 86 | 103 | 106 | 116 | 115 | 127 | 133 | |
| 05 Fishing and fish farming | 84 | 88 | 86 | 103 | 106 | 116 | 115 | 127 | 133 | |
| C Mining and quarrying | 331 | 341 | 367 | 395 | 441 | 488 | 494 | 586 | 581 | |
| 10 Mining of energy producing minerals | 40 | 33 | 31 | 52 | 73 | 106 | 94 | 173 | 140 | |
| 13 Mining of metal ores | 95 | 114 | 124 | 123 | 129 | 124 | 132 | 127 | 126 | |
| 14 Mining of other minerals | 196 | 194 | 212 | 220 | 239 | 258 | 268 | 286 | 315 | |
| D Manufacturing | 37 238 | 37 980 | 37 807 | 39 397 | 43 825 | 46 839 | 48 326 | 48 599 | 49 916 | |
| DA Food products, beverages and tobacco | 5 374 | 5 228 | 5 251 | 5 533 | 5 870 | 6 054 | 6 386 | 6 318 | 6 466 | |
| 15 Food products and beverages | 5 137 | 5 011 | 5 043 | 5 324 | 5 636 | 5 815 | 6 056 | 6 088 | 6 237 | |
| 151 Food supplies | 5 137 | 5 011 | 5 043 | 5 324 | 5 636 | 5 815 | 6 056 | 6 088 | 6 237 | |
| 159 Beverages | | | | | | | | | | |
| 16 Tobacco products | 237 | 217 | 208 | 209 | 234 | 239 | 330 | 230 | 229 | |
| DB Textiles and textile products | 2 628 | 2 586 | 2 446 | 2 398 | 2 652 | 2 769 | 2 820 | 2 746 | 2 601 | |
| 17 Textiles | 910 | 851 | 803 | 770 | 850 | 896 | 857 | 819 | 781 | |
| 18 Wearing apparel, dressing of fur | 1 718 | 1 735 | 1 643 | 1 628 | 1 802 | 1 873 | 1 963 | 1 927 | 1 820 | |
| DC Leather and leather products | 384 | 387 | 346 | 380 | 429 | 515 | 561 | 548 | 515 | |
| 19 Leather and leather products | 384 | 387 | 346 | 380 | 429 | 515 | 561 | 548 | 515 | |
| DD Wood and wood products | 1 987 | 2 247 | 2 395 | 2 666 | 3 209 | 3 473 | 3 113 | 2 905 | 3 194 | |
| 20 Wood and wood products | 1 987 | 2 247 | 2 395 | 2 666 | 3 209 | 3 473 | 3 113 | 2 905 | 3 194 | |
| DE Pulp, paper, publishing and printing | 7 579 | 7 880 | 7 849 | 8 676 | 9 741 | 10 308 | 10 646 | 10 304 | 11 042 | |
| 21 Pulp, paper and paper products | 5 423 | 5 753 | 5 734 | 6 431 | 7 344 | 7 787 | 7 958 | 7 535 | 8 082 | |
| 22 Publishing and printing | 2 156 | 2 127 | 2 115 | 2 245 | 2 397 | 2 521 | 2 688 | 2 769 | 2 960 | |
| DF Coke, petroleum products and nuclear fuel | 1 914 | 2 372 | 2 656 | 2 612 | 2 899 | 2 612 | 2 424 | 2 295 | 2 472 | |
| 23 Coke, petroleum products and nuclear fuel | 1 914 | 2 372 | 2 656 | 2 612 | 2 899 | 2 612 | 2 424 | 2 295 | 2 472 | |
| DG Chemicals and chemical products | 1 871 | 1 826 | 1 777 | 1 963 | 2 216 | 2 589 | 2 667 | 2 592 | 2 784 | |
| 24 Chemicals and chemical products | 1 871 | 1 826 | 1 777 | 1 963 | 2 216 | 2 589 | 2 667 | 2 592 | 2 784 | |
| DH Rubber and plastic products | 733 | 764 | 767 | 880 | 983 | 986 | 997 | 1 016 | 1 091 | |
| 25 Rubber and plastic products | 733 | 764 | 767 | 880 | 983 | 986 | 997 | 1 016 | 1 091 | |
| 251 Rubber products | 733 | 764 | 767 | 880 | 983 | 986 | 997 | 1 016 | 1 091 | |
| 252 Plastic products | | | | | | | | | | |
| DI Non-metallic mineral products | 1 463 | 1 361 | 1 371 | 1 342 | 1 534 | 1 644 | 1 673 | 1 841 | 1 927 | |
| 26 Non-metallic mineral products | 1 463 | 1 361 | 1 371 | 1 342 | 1 534 | 1 644 | 1 673 | 1 841 | 1 927 | |
| DJ Basic metals and fabricated metal products | 2 943 | 2 951 | 3 315 | 3 569 | 4 037 | 4 373 | 4 453 | 4 891 | 5 180 | |
| 27 Basic metals | 1 773 | 1 748 | 2 044 | 2 281 | 2 566 | 2 692 | 2 609 | 2 787 | 2 999 | |
| 28 Fabricated metal products | 1 170 | 1 203 | 1 271 | 1 288 | 1 471 | 1 681 | 1 844 | 2 104 | 2 181 | |
| DK Machinery and equipment | 4 562 | 4 560 | 4 600 | 4 540 | 5 031 | 5 709 | 6 437 | 6 533 | 6 015 | |
| 29 Machinery and equipment | 4 562 | 4 560 | 4 600 | 4 540 | 5 031 | 5 709 | 6 437 | 6 533 | 6 015 | |
| DL Electrical and optical equipment | 1 724 | 1 565 | 1 516 | 1 520 | 1 665 | 1 905 | 2 042 | 2 084 | 2 177 | |
| 30 Office machinery and computers | 60 | 65 | 61 | 65 | 76 | 112 | 144 | 171 | 191 | |
| 31 Other electrical machinery and apparatus | 1 127 | 983 | 960 | 928 | 993 | 1 154 | 1 194 | 1 145 | 1 154 | |
| 32 Radio, television and communication equipment | 259 | 275 | 253 | 245 | 271 | 285 | 286 | 320 | 369 | |
| 33 Medical and precision instruments, clocks | 278 | 242 | 242 | 282 | 325 | 354 | 418 | 448 | 463 | |
| DM Transport equipment | 3 078 | 3 336 | 2 591 | 2 320 | 2 421 | 2 682 | 2 858 | 3 266 | 3 214 | |
| 34 Motor vehicles and trailers | 527 | 519 | 465 | 477 | 569 | 595 | 602 | 657 | 686 | |
| 35 Other transport equipment | 2 551 | 2 817 | 2 126 | 1 843 | 1 852 | 2 087 | 2 256 | 2 609 | 2 528 | |
| 351 Ships and boats | 2 551 | 2 817 | 2 126 | 1 843 | 1 852 | 2 087 | 2 256 | 2 609 | 2 528 | |
| 352 Other transport equipment | | | | | | | | | | |
| DN Other manufacturing and recycling | 998 | 917 | 927 | 998 | 1 138 | 1 220 | 1 249 | 1 260 | 1 238 | |
| 36 Other manufacturing | 998 | 917 | 927 | 998 | 1 138 | 1 220 | 1 249 | 1 260 | 1 238 | |
| 361 Furniture | 998 | 917 | 927 | 998 | 1 138 | 1 220 | 1 249 | 1 260 | 1 238 | |
| 362 Other products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| E Electricity, gas and water supply | 2 023 | 2 001 | 2 181 | 2 329 | 2 378 | 2 467 | 2 583 | 2 400 | 2 561 | |
| 40 Electricity, gas, steam and hot water supply | 1 600 | 1 678 | 1 881 | 2 038 | 2 107 | 2 187 | 2 305 | 2 123 | 2 274 | |
| 41 Purification and distribution of water | 423 | 323 | 300 | 291 | 271 | 280 | 278 | 277 | 287 | |
| F Construction | 13 975 | 12 820 | 12 982 | 12 800 | 12 835 | 13 793 | 13 542 | 14 187 | 14 811 | |

Source: Statistics Finland, Business structures and economic accounts

Table A: Gross domestic product 1975-2001 (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0 Total | 154 454 | 160 115 | 163 804 | 171 843 | 180 009 | 189 405 | 190 962 | 176 766 | 171 300 |
| A Agriculture, hunting and forestry | 7 493 | 7 445 | 7 161 | 6 792 | 7 115 | 7 133 | 6 977 | 6 173 | 6 227 |
| 01 Agriculture, hunting and related service act. | 4 972 | 4 962 | 4 911 | 4 374 | 4 549 | 4 483 | 4 433 | 4 052 | 3 842 |
| 01MAA Agriculture and related service act. | 4 887 | 4 885 | 4 841 | 4 312 | 4 481 | 4 414 | 4 373 | 3 992 | 3 777 |
| 0112 Horticulture | 362 | 364 | 378 | 336 | 329 | 318 | 332 | 365 | 362 |
| 0125 Other farming of animals | 448 | 527 | 511 | 476 | 512 | 362 | 256 | 190 | 210 |
| 013 Mixed farming | 4 007 | 3 925 | 3 883 | 3 432 | 3 573 | 3 667 | 3 718 | 3 369 | 3 133 |
| 014 Agricultural service activities | 70 | 69 | 69 | 68 | 67 | 67 | 67 | 68 | 72 |
| 015 Hunting and game husbandry | 85 | 77 | 70 | 62 | 68 | 69 | 60 | 60 | 65 |
| 02 Forestry and related service activities | 2 521 | 2 483 | 2 250 | 2 418 | 2 566 | 2 650 | 2 544 | 2 121 | 2 385 |
| 0211 Forest cultivation | 43 | 46 | 50 | 50 | 54 | 60 | 67 | 70 | 69 |
| 0212 Timber harvesting | 2 319 | 2 267 | 2 045 | 2 202 | 2 324 | 2 384 | 2 271 | 1 845 | 2 110 |
| 0219 Other forestry | | | | | | | | | |
| 0202 Forestry related service activities | 159 | 170 | 155 | 166 | 188 | 206 | 206 | 206 | 206 |
| B Fishing | 135 | 135 | 135 | 134 | 163 | 147 | 147 | 148 | 175 |
| 05 Fishing and fish farming | 135 | 135 | 135 | 134 | 163 | 147 | 147 | 148 | 175 |
| C Mining and quarrying | 575 | 610 | 676 | 728 | 782 | 873 | 922 | 877 | 899 |
| 10 Mining of energy producing minerals | 110 | 123 | 173 | 200 | 196 | 229 | 296 | 292 | 362 |
| 13 Mining of metal ores | 131 | 126 | 119 | 129 | 142 | 155 | 142 | 138 | 123 |
| 14 Mining of other minerals | 334 | 361 | 384 | 399 | 444 | 489 | 484 | 447 | 414 |
| D Manufacturing | 52 165 | 54 141 | 54 926 | 58 114 | 60 562 | 62 710 | 62 824 | 55 963 | 57 010 |
| DA Food products, beverages and tobacco | 6 523 | 6 690 | 6 790 | 6 905 | 7 035 | 7 080 | 7 192 | 7 015 | 7 108 |
| 15 Food products and beverages | 6 295 | 6 466 | 6 556 | 6 663 | 6 774 | 6 837 | 6 943 | 6 792 | 6 886 |
| 151 Food supplies | 6 295 | 5 824 | 5 869 | 5 969 | 6 022 | 6 037 | 6 119 | 5 958 | 6 043 |
| 159 Beverages | | 642 | 687 | 694 | 752 | 800 | 824 | 834 | 843 |
| 16 Tobacco products | 228 | 224 | 234 | 242 | 261 | 243 | 249 | 223 | 222 |
| DB Textiles and textile products | 2 594 | 2 634 | 2 589 | 2 503 | 2 298 | 2 105 | 1 872 | 1 411 | 1 262 |
| 17 Textiles | 768 | 751 | 712 | 740 | 711 | 682 | 636 | 531 | 539 |
| 18 Wearing apparel, dressing of fur | 1 826 | 1 883 | 1 877 | 1 763 | 1 587 | 1 423 | 1 236 | 880 | 723 |
| DC Leather and leather products | 556 | 578 | 557 | 534 | 493 | 410 | 390 | 326 | 299 |
| 19 Leather and leather products | 556 | 578 | 557 | 534 | 493 | 410 | 390 | 326 | 299 |
| DD Wood and wood products | 3 283 | 3 205 | 3 245 | 3 427 | 3 643 | 3 978 | 3 715 | 2 848 | 2 958 |
| 20 Wood and wood products | 3 283 | 3 205 | 3 245 | 3 427 | 3 643 | 3 978 | 3 715 | 2 848 | 2 958 |
| DE Pulp, paper, publishing and printing | 12 195 | 12 289 | 12 618 | 13 138 | 14 031 | 14 430 | 14 389 | 13 812 | 13 959 |
| 21 Pulp, paper and paper products | 9 037 | 8 999 | 9 171 | 9 544 | 10 288 | 10 507 | 10 519 | 10 313 | 10 692 |
| 22 Publishing and printing | 3 158 | 3 290 | 3 447 | 3 594 | 3 743 | 3 923 | 3 870 | 3 499 | 3 267 |
| DF Coke, petroleum products and nuclear fuel | 2 512 | 2 598 | 2 516 | 2 849 | 2 849 | 2 630 | 3 108 | 3 240 | 3 325 |
| 23 Coke, petroleum products and nuclear fuel | 2 512 | 2 598 | 2 516 | 2 849 | 2 849 | 2 630 | 3 108 | 3 240 | 3 325 |
| DG Chemicals and chemical products | 2 999 | 3 068 | 3 063 | 3 233 | 3 481 | 3 742 | 3 724 | 3 423 | 3 553 |
| 24 Chemicals and chemical products | 2 999 | 3 068 | 3 063 | 3 233 | 3 481 | 3 742 | 3 724 | 3 423 | 3 553 |
| DH Rubber and plastic products | 1 091 | 1 313 | 1 424 | 1 588 | 1 678 | 1 781 | 1 787 | 1 506 | 1 524 |
| 25 Rubber and plastic products | 1 091 | 1 313 | 1 424 | 1 588 | 1 678 | 1 781 | 1 787 | 1 506 | 1 524 |
| 251 Rubber products | 1 091 | 232 | 239 | 216 | 210 | 210 | 211 | 175 | 196 |
| 252 Plastic products | | 1 081 | 1 185 | 1 372 | 1 468 | 1 571 | 1 576 | 1 331 | 1 328 |
| DI Non-metallic mineral products | 1 823 | 1 865 | 1 840 | 2 066 | 2 114 | 2 330 | 2 276 | 1 915 | 1 645 |
| 26 Non-metallic mineral products | 1 823 | 1 865 | 1 840 | 2 066 | 2 114 | 2 330 | 2 276 | 1 915 | 1 645 |
| DJ Basic metals and fabricated metal products | 5 417 | 5 581 | 5 866 | 6 339 | 6 739 | 7 153 | 7 263 | 6 600 | 6 884 |
| 27 Basic metals | 3 247 | 3 338 | 3 441 | 3 597 | 3 791 | 3 913 | 4 017 | 3 935 | 4 379 |
| 28 Fabricated metal products | 2 170 | 2 243 | 2 425 | 2 742 | 2 948 | 3 240 | 3 246 | 2 665 | 2 505 |
| DK Machinery and equipment | 6 446 | 7 125 | 6 806 | 7 494 | 7 914 | 8 444 | 8 622 | 6 310 | 6 125 |
| 29 Machinery and equipment | 6 446 | 7 125 | 6 806 | 7 494 | 7 914 | 8 444 | 8 622 | 6 310 | 6 125 |
| DL Electrical and optical equipment | 2 398 | 2 825 | 3 231 | 3 535 | 3 800 | 4 219 | 4 291 | 3 846 | 4 638 |
| 30 Office machinery and computers | 230 | 265 | 375 | 461 | 549 | 617 | 572 | 605 | 982 |
| 31 Other electrical machinery and apparatus | 1 171 | 1 372 | 1 484 | 1 481 | 1 536 | 1 684 | 1 701 | 1 541 | 1 639 |
| 32 Radio, television and communication equipment | 422 | 509 | 609 | 736 | 782 | 891 | 968 | 772 | 1 089 |
| 33 Medical and precision instruments, clocks | 575 | 679 | 763 | 857 | 933 | 1 027 | 1 050 | 928 | 928 |
| DM Transport equipment | 3 085 | 3 100 | 3 074 | 3 125 | 2 995 | 2 843 | 2 714 | 2 438 | 2 540 |
| 34 Motor vehicles and trailers | 685 | 767 | 887 | 1 013 | 963 | 942 | 851 | 656 | 647 |
| 35 Other transport equipment | 2 400 | 2 333 | 2 187 | 2 112 | 2 032 | 1 901 | 1 863 | 1 782 | 1 893 |
| 351 Ships and boats | 2 400 | 1 856 | 1 737 | 1 580 | 1 434 | 1 303 | 1 234 | 1 275 | 1 432 |
| 352 Other transport equipment | | 477 | 450 | 532 | 598 | 598 | 629 | 507 | 461 |
| DN Other manufacturing and recycling | 1 243 | 1 270 | 1 307 | 1 378 | 1 492 | 1 565 | 1 481 | 1 273 | 1 190 |
| 36 Other manufacturing | 1 243 | 1 269 | 1 306 | 1 376 | 1 490 | 1 563 | 1 477 | 1 269 | 1 186 |
| 361 Furniture | 1 243 | 906 | 920 | 999 | 1 076 | 1 140 | 1 057 | 867 | 794 |
| 362 Other products | 0 | 363 | 386 | 377 | 414 | 423 | 420 | 402 | 392 |
| 37 Recycling | 0 | 1 | 1 | 2 | 2 | 2 | 4 | 4 | 4 |
| E Electricity, gas and water supply | 2 696 | 2 960 | 3 073 | 3 352 | 3 416 | 3 381 | 3 444 | 3 582 | 3 553 |
| 40 Electricity, gas, steam and hot water supply | 2 409 | 2 659 | 2 760 | 3 028 | 3 084 | 3 046 | 3 106 | 3 248 | 3 222 |
| 41 Purification and distribution of water | 287 | 301 | 313 | 324 | 332 | 335 | 338 | 334 | 331 |
| F Construction | 14 332 | 14 447 | 14 195 | 14 349 | 15 462 | 17 596 | 17 562 | 15 395 | 13 158 |

Source: Statistics Finland, Business structures and economic accounts

Table A: Gross domestic product 1975-2001 (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| 0 Total | 172 545 | 183 519 | 191 674 | 199 428 | 212 674 | 224 533 | 234 612 | 250 018 | 251 581 |
| A Agriculture, hunting and forestry | 6 446 | 6 910 | 6 975 | 6 846 | 7 374 | 7 050 | 7 135 | 7 623 | 7 361 |
| 01 Agriculture, hunting and related service act. | 3 976 | 4 081 | 4 186 | 4 221 | 4 337 | 3 969 | 4 113 | 4 369 | 4 379 |
| 01MAA Agriculture and related service act. | 3 909 | 4 014 | 4 127 | 4 172 | 4 292 | 3 919 | 4 051 | 4 301 | 4 305 |
| 0112 Horticulture | 330 | 379 | 357 | 370 | 387 | 365 | 373 | 393 | 393 |
| 0125 Other farming of animals | 201 | 248 | 269 | 318 | 335 | 309 | 289 | 267 | 270 |
| 013 Mixed farming | 3 304 | 3 309 | 3 421 | 3 387 | 3 462 | 3 141 | 3 287 | 3 529 | 3 525 |
| 014 Agricultural service activities | 74 | 78 | 80 | 97 | 108 | 104 | 102 | 112 | 117 |
| 015 Hunting and game husbandry | 67 | 67 | 59 | 49 | 45 | 50 | 62 | 68 | 74 |
| 02 Forestry and related service activities | 2 470 | 2 829 | 2 789 | 2 625 | 3 037 | 3 081 | 3 022 | 3 254 | 2 982 |
| 0211 Forest cultivation | 69 | 67 | 72 | 71 | 70 | 52 | 63 | 71 | 71 |
| 0212 Timber harvesting | 2 209 | 2 563 | 2 478 | 2 312 | 2 717 | 2 772 | 2 701 | 2 907 | 2 633 |
| 0219 Other forestry | | 22 | 22 | 21 | 22 | 25 | 20 | 20 | 20 |
| 0202 Forestry related service activities | 192 | 177 | 217 | 221 | 228 | 232 | 238 | 256 | 258 |
| B Fishing | 175 | 165 | 184 | 190 | 187 | 157 | 144 | 135 | 143 |
| 05 Fishing and fish farming | 175 | 165 | 184 | 190 | 187 | 157 | 144 | 135 | 143 |
| C Mining and quarrying | 893 | 1 042 | 1 084 | 1 121 | 1 272 | 971 | 1 206 | 871 | 1 018 |
| 10 Mining of energy producing minerals | 358 | 477 | 504 | 521 | 596 | 294 | 506 | 210 | 362 |
| 13 Mining of metal ores | 114 | 116 | 112 | 116 | 113 | 106 | 111 | 104 | 96 |
| 14 Mining of other minerals | 421 | 449 | 468 | 484 | 563 | 571 | 589 | 557 | 560 |
| D Manufacturing | 59 764 | 66 728 | 71 162 | 73 331 | 79 529 | 85 781 | 90 031 | 99 269 | 98 421 |
| DA Food products, beverages and tobacco | 7 334 | 7 348 | 7 606 | 7 808 | 8 018 | 8 007 | 8 166 | 8 079 | 8 204 |
| 15 Food products and beverages | 7 126 | 7 144 | 7 418 | 7 633 | 7 862 | 7 849 | 8 062 | 7 984 | 8 105 |
| 151 Food supplies | 6 310 | 6 345 | 6 576 | 6 800 | 7 009 | 6 948 | 7 173 | 7 096 | 7 198 |
| 159 Beverages | 816 | 799 | 842 | 833 | 853 | 901 | 889 | 888 | 907 |
| 16 Tobacco products | 208 | 204 | 188 | 175 | 156 | 158 | 104 | 95 | 99 |
| DB Textiles and textile products | 1 268 | 1 386 | 1 250 | 1 286 | 1 266 | 1 253 | 1 249 | 1 221 | 1 185 |
| 17 Textiles | 570 | 620 | 610 | 653 | 643 | 647 | 648 | 662 | 687 |
| 18 Wearing apparel, dressing of fur | 698 | 766 | 640 | 633 | 623 | 606 | 601 | 559 | 498 |
| DC Leather and leather products | 277 | 293 | 271 | 266 | 266 | 273 | 244 | 237 | 223 |
| 19 Leather and leather products | 277 | 293 | 271 | 266 | 266 | 273 | 244 | 237 | 223 |
| DD Wood and wood products | 3 413 | 3 971 | 3 850 | 3 966 | 4 473 | 4 845 | 5 134 | 5 454 | 5 076 |
| 20 Wood and wood products | 3 413 | 3 971 | 3 850 | 3 966 | 4 473 | 4 845 | 5 134 | 5 454 | 5 076 |
| DE Pulp, paper, publishing and printing | 14 830 | 16 184 | 16 613 | 16 113 | 18 141 | 18 670 | 19 137 | 20 005 | 18 700 |
| 21 Pulp, paper and paper products | 11 636 | 12 870 | 13 112 | 12 527 | 14 370 | 14 794 | 15 268 | 15 889 | 14 742 |
| 22 Publishing and printing | 3 194 | 3 314 | 3 501 | 3 586 | 3 771 | 3 876 | 3 869 | 4 116 | 3 958 |
| DF Coke, petroleum products and nuclear fuel | 3 317 | 3 868 | 3 770 | 4 060 | 3 802 | 4 418 | 4 181 | 4 082 | 3 802 |
| 23 Coke, petroleum products and nuclear fuel | 3 317 | 3 868 | 3 770 | 4 060 | 3 802 | 4 418 | 4 181 | 4 082 | 3 802 |
| DG Chemicals and chemical products | 3 637 | 4 132 | 4 213 | 4 324 | 4 573 | 4 689 | 4 825 | 5 247 | 5 360 |
| 24 Chemicals and chemical products | 3 637 | 4 132 | 4 213 | 4 324 | 4 573 | 4 689 | 4 825 | 5 247 | 5 360 |
| DH Rubber and plastic products | 1 649 | 1 789 | 1 828 | 1 852 | 1 981 | 2 157 | 2 235 | 2 504 | 2 328 |
| 25 Rubber and plastic products | 1 649 | 1 789 | 1 828 | 1 852 | 1 981 | 2 157 | 2 235 | 2 504 | 2 328 |
| 251 Rubber products | 218 | 264 | 290 | 276 | 291 | 332 | 327 | 378 | 389 |
| 252 Plastic products | 1 431 | 1 525 | 1 538 | 1 576 | 1 690 | 1 825 | 1 908 | 2 126 | 1 939 |
| DI Non-metallic mineral products | 1 512 | 1 649 | 1 673 | 1 817 | 1 967 | 2 053 | 2 119 | 2 258 | 2 216 |
| 26 Non-metallic mineral products | 1 512 | 1 649 | 1 673 | 1 817 | 1 967 | 2 053 | 2 119 | 2 258 | 2 216 |
| DJ Basic metals and fabricated metal products | 7 274 | 8 001 | 8 492 | 9 011 | 9 701 | 10 259 | 10 347 | 11 281 | 11 345 |
| 27 Basic metals | 4 620 | 4 902 | 5 184 | 5 504 | 5 787 | 6 115 | 6 336 | 6 619 | 6 690 |
| 28 Fabricated metal products | 2 654 | 3 099 | 3 308 | 3 507 | 3 914 | 4 144 | 4 011 | 4 662 | 4 655 |
| DK Machinery and equipment | 6 345 | 7 457 | 9 101 | 9 497 | 10 145 | 10 159 | 10 009 | 10 472 | 11 050 |
| 29 Machinery and equipment | 6 345 | 7 457 | 9 101 | 9 497 | 10 145 | 10 159 | 10 009 | 10 472 | 11 050 |
| DL Electrical and optical equipment | 5 522 | 6 779 | 8 193 | 9 154 | 10 875 | 14 468 | 17 846 | 23 631 | 24 062 |
| 30 Office machinery and computers | 1 111 | 1 117 | 1 089 | 1 112 | 1 292 | 1 304 | 1 277 | 189 | 2 |
| 31 Other electrical machinery and apparatus | 1 618 | 1 859 | 1 981 | 2 119 | 2 270 | 2 517 | 2 593 | 2 862 | 2 956 |
| 32 Radio, television and communication equipment | 1 771 | 2 701 | 3 865 | 4 507 | 5 701 | 8 992 | 12 338 | 18 816 | 19 067 |
| 33 Medical and precision instruments, clocks | 1 022 | 1 102 | 1 258 | 1 416 | 1 612 | 1 655 | 1 638 | 1 764 | 2 037 |
| DM Transport equipment | 2 224 | 2 588 | 2 971 | 2 816 | 2 874 | 2 985 | 2 934 | 3 049 | 3 153 |
| 34 Motor vehicles and trailers | 470 | 542 | 625 | 678 | 779 | 841 | 848 | 921 | 914 |
| 35 Other transport equipment | 1 754 | 2 046 | 2 346 | 2 138 | 2 095 | 2 144 | 2 086 | 2 128 | 2 239 |
| 351 Ships and boats | 1 300 | 1 593 | 1 874 | 1 645 | 1 610 | 1 610 | 1 609 | 1 680 | 1 827 |
| 352 Other transport equipment | 454 | 453 | 472 | 493 | 485 | 534 | 477 | 448 | 412 |
| DN Other manufacturing and recycling | 1 162 | 1 283 | 1 331 | 1 361 | 1 447 | 1 545 | 1 605 | 1 749 | 1 717 |
| 36 Other manufacturing | 1 149 | 1 260 | 1 252 | 1 266 | 1 344 | 1 444 | 1 495 | 1 612 | 1 560 |
| 361 Furniture | 739 | 828 | 867 | 871 | 935 | 1 051 | 1 082 | 1 193 | 1 103 |
| 362 Other products | 410 | 432 | 385 | 395 | 409 | 393 | 413 | 419 | 457 |
| 37 Recycling | 13 | 23 | 79 | 95 | 103 | 101 | 110 | 137 | 157 |
| E Electricity, gas and water supply | 3 722 | 3 913 | 3 793 | 4 137 | 4 131 | 4 182 | 4 167 | 4 206 | 4 449 |
| 40 Electricity, gas, steam and hot water supply | 3 396 | 3 578 | 3 458 | 3 796 | 3 789 | 3 845 | 3 813 | 3 856 | 4 101 |
| 41 Purification and distribution of water | 326 | 335 | 335 | 341 | 342 | 337 | 354 | 350 | 348 |
| F Construction | 11 489 | 11 286 | 11 396 | 12 532 | 13 895 | 15 354 | 16 046 | 17 089 | 16 561 |

Table A: Gross domestic product 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|--|-------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1 000 000 EUR, at 2000 prices | | | | | | | | |
| 45 Construction | 13 975 | 12 820 | 12 982 | 12 800 | 12 835 | 13 793 | 13 542 | 14 187 | 14 811 |
| 4501 House building | 10 371 | 9 445 | 9 848 | 9 777 | 9 842 | 10 685 | 10 388 | 11 038 | 11 778 |
| 4502 Civil engineering | 3 604 | 3 375 | 3 134 | 3 023 | 2 993 | 3 108 | 3 154 | 3 149 | 3 033 |
| 4509 Construction related service activities | | | | | | | | | |
| G Wholesale and retail trade | 13 108 | 13 110 | 12 285 | 12 519 | 13 514 | 14 050 | 13 980 | 14 607 | 14 845 |
| 50 Sale and repair of motor vehicles | 1 883 | 1 893 | 1 754 | 1 782 | 1 903 | 1 968 | 2 026 | 2 192 | 2 168 |
| 501 Sale of motor vehicles | 1 883 | 1 893 | 1 754 | 1 782 | 1 903 | 1 968 | 2 026 | 2 192 | 2 168 |
| 502 Maintenance and repair of motor vehicles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 51 Wholesale trade and commission trade | 7 130 | 7 078 | 6 739 | 6 895 | 7 556 | 7 912 | 7 743 | 8 092 | 8 283 |
| 52 Retail trade, repair of household goods | 4 095 | 4 139 | 3 792 | 3 842 | 4 055 | 4 170 | 4 211 | 4 323 | 4 394 |
| 521 Retail sale | 4 095 | 4 139 | 3 792 | 3 842 | 4 055 | 4 170 | 4 211 | 4 323 | 4 394 |
| 527 Repair of personal and household goods | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H Hotels and restaurants | 3 004 | 2 971 | 2 827 | 2 891 | 3 071 | 3 178 | 3 203 | 3 250 | 3 268 |
| 55 Hotels and restaurants | 3 004 | 2 971 | 2 827 | 2 891 | 3 071 | 3 178 | 3 203 | 3 250 | 3 268 |
| 551 Provision of short term accommodation | 904 | 894 | 851 | 870 | 924 | 956 | 963 | 978 | 983 |
| 553 Restaurants and catering | 2 100 | 2 077 | 1 976 | 2 021 | 2 147 | 2 222 | 2 240 | 2 272 | 2 285 |
| I Transport, storage and communication | 8 008 | 7 905 | 7 927 | 8 177 | 8 932 | 9 344 | 9 598 | 9 625 | 9 828 |
| IA Transport and storage | 7 058 | 6 974 | 6 962 | 7 169 | 7 867 | 8 204 | 8 355 | 8 294 | 8 389 |
| 60 Land transport, transport via pipelines | 3 855 | 3 654 | 3 530 | 3 579 | 3 940 | 4 124 | 4 098 | 4 053 | 4 121 |
| 601 Transport via railways | 462 | 461 | 453 | 449 | 506 | 566 | 571 | 555 | 559 |
| 602 Other land transport | 3 375 | 3 173 | 3 052 | 3 096 | 3 398 | 3 508 | 3 488 | 3 459 | 3 526 |
| 6021 Scheduled passenger land transport | 1 312 | 1 236 | 1 143 | 1 178 | 1 241 | 1 241 | 1 242 | 1 233 | 1 210 |
| 6022 Taxi traffic | 427 | 403 | 375 | 363 | 380 | 401 | 405 | 386 | 378 |
| 6024 Freight transport by road | 1 636 | 1 534 | 1 534 | 1 555 | 1 777 | 1 866 | 1 841 | 1 840 | 1 938 |
| 603 Transport via pipelines | 18 | 20 | 25 | 34 | 36 | 50 | 39 | 39 | 36 |
| 61 Water transport | 971 | 973 | 1 067 | 1 134 | 1 259 | 1 317 | 1 328 | 1 242 | 1 179 |
| 62 Air transport | 268 | 282 | 288 | 325 | 377 | 387 | 431 | 453 | 468 |
| 63 Supporting transport act., travel agencies | 1 964 | 2 065 | 2 077 | 2 131 | 2 291 | 2 376 | 2 498 | 2 546 | 2 621 |
| 6301 Supporting rail transport activities | | | | | | | | | |
| 6302 Supporting road transport activities | 639 | 663 | 675 | 680 | 712 | 729 | 753 | 772 | 800 |
| 6303 Supporting air transport activities | 70 | 73 | 73 | 77 | 80 | 83 | 85 | 88 | 91 |
| 6309 Other supporting transport activities | 1 255 | 1 329 | 1 329 | 1 374 | 1 499 | 1 564 | 1 660 | 1 686 | 1 730 |
| IB Post and telecommunications | 950 | 931 | 965 | 1 008 | 1 065 | 1 140 | 1 243 | 1 331 | 1 439 |
| 64 Post and telecommunications | 950 | 931 | 965 | 1 008 | 1 065 | 1 140 | 1 243 | 1 331 | 1 439 |
| 641 Post and courier activities | 543 | 527 | 543 | 552 | 579 | 611 | 659 | 699 | 744 |
| 642 Telecommunications | 407 | 404 | 422 | 456 | 486 | 529 | 584 | 632 | 695 |
| J Financial intermediation | 2 638 | 2 692 | 2 788 | 2 880 | 2 967 | 3 244 | 3 560 | 3 547 | 3 868 |
| 65 Financial intermediation | 2 217 | 2 262 | 2 353 | 2 436 | 2 518 | 2 756 | 3 038 | 2 964 | 3 244 |
| 66 Insurance | 421 | 430 | 435 | 444 | 449 | 463 | 495 | 559 | 586 |
| 67 Activities auxiliary to financial intermediation | 0 | 0 | 0 | 0 | 0 | 25 | 27 | 24 | 38 |
| K Real estate, renting and business activities | 11 495 | 11 623 | 12 003 | 12 500 | 13 178 | 14 048 | 14 515 | 15 339 | 16 050 |
| KA Real estate activities | 7 790 | 8 036 | 8 420 | 8 759 | 9 072 | 9 424 | 9 677 | 10 074 | 10 506 |
| 70 Real estate activities | 7 790 | 8 036 | 8 420 | 8 759 | 9 072 | 9 424 | 9 677 | 10 074 | 10 506 |
| 701 Real estate activities with own property | 949 | 846 | 874 | 862 | 870 | 941 | 902 | 955 | 1 021 |
| 702 Letting of own property | 6 300 | 6 604 | 6 922 | 7 235 | 7 508 | 7 762 | 8 003 | 8 306 | 8 635 |
| 7021 Letting of dwellings | 5 784 | 6 058 | 6 349 | 6 645 | 6 897 | 7 133 | 7 366 | 7 665 | 7 981 |
| 7022 Operation of dwelling and residential real estate | 516 | 546 | 573 | 590 | 611 | 629 | 637 | 641 | 654 |
| 703 Real estate act. on a fee or contract basis | 541 | 586 | 624 | 662 | 694 | 721 | 772 | 813 | 850 |
| 7031 Real estate agencies | 108 | 117 | 128 | 144 | 161 | 176 | 190 | 201 | 209 |
| 7032 Management of real estate | 433 | 469 | 496 | 518 | 533 | 545 | 582 | 612 | 641 |
| KB Business activities | 3 705 | 3 587 | 3 583 | 3 741 | 4 106 | 4 624 | 4 838 | 5 265 | 5 544 |
| 71 Renting of machinery and equipment | 287 | 342 | 337 | 351 | 401 | 416 | 412 | 424 | 446 |
| 72 Computer and related activities | 453 | 462 | 470 | 536 | 589 | 665 | 682 | 840 | 885 |
| 73 Research and development | 262 | 273 | 294 | 314 | 325 | 352 | 378 | 405 | 434 |
| 74 Other business activities | 2 703 | 2 510 | 2 482 | 2 540 | 2 791 | 3 191 | 3 366 | 3 596 | 3 779 |
| 741 Legal, accounting, book-keeping activities etc. | 128 | 120 | 126 | 137 | 154 | 183 | 215 | 251 | 295 |
| 742 Technical consultancy, testing and analysis | 950 | 846 | 830 | 837 | 930 | 1 119 | 1 170 | 1 265 | 1 276 |
| 744 Advertising | 1 067 | 971 | 953 | 965 | 1 055 | 1 170 | 1 197 | 1 205 | 1 243 |
| 747 Industrial cleaning | 311 | 337 | 327 | 338 | 356 | 371 | 384 | 406 | 427 |
| 748 Miscellaneous business activities | 247 | 236 | 246 | 263 | 296 | 348 | 400 | 469 | 538 |
| L Administration, compulsory social security | 5 054 | 5 238 | 5 429 | 5 648 | 5 865 | 6 124 | 6 387 | 6 699 | 7 067 |
| 75 Administration, compulsory social security | 5 054 | 5 238 | 5 429 | 5 648 | 5 865 | 6 124 | 6 387 | 6 699 | 7 067 |
| 751 Administration of the State | 4 290 | 4 520 | 4 685 | 4 854 | 5 039 | 5 216 | 5 520 | 5 731 | 5 954 |
| 752 National defence and conscripts | 369 | 288 | 320 | 353 | 382 | 458 | 428 | 508 | 604 |
| 753 Compulsory social security activities | 395 | 430 | 424 | 441 | 444 | 450 | 439 | 460 | 509 |
| 7351 Employment pension insurance | 172 | 187 | 187 | 196 | 197 | 205 | 204 | 216 | 210 |
| 7539 Other compulsory social security activities | 223 | 243 | 237 | 245 | 247 | 245 | 235 | 244 | 299 |
| M Education | 4 517 | 4 736 | 4 856 | 4 983 | 5 150 | 5 273 | 5 381 | 5 429 | 5 533 |
| 80 Education | 4 517 | 4 736 | 4 856 | 4 983 | 5 150 | 5 273 | 5 381 | 5 429 | 5 533 |
| N Health and social work | 6 205 | 6 706 | 6 990 | 7 338 | 7 649 | 7 959 | 8 238 | 8 672 | 8 966 |

Source: Statistics Finland, Business structures and economic accounts

Table A: Gross domestic product 1975-2001 (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 45 Construction | 14 332 | 14 447 | 14 195 | 14 349 | 15 462 | 17 596 | 17 562 | 15 395 | 13 158 |
| 4501 House building | 11 307 | 11 288 | 10 932 | 11 176 | 12 322 | 14 238 | 14 134 | 12 249 | 10 215 |
| 4502 Civil engineering | 3 025 | 3 159 | 3 263 | 3 173 | 3 140 | 3 358 | 3 299 | 3 036 | 2 839 |
| 4509 Construction related service activities | | | | | | | 129 | 110 | 104 |
| G Wholesale and retail trade | 15 285 | 15 820 | 16 449 | 17 580 | 18 541 | 19 712 | 19 136 | 16 868 | 14 806 |
| 50 Sale and repair of motor vehicles | 2 267 | 2 400 | 2 511 | 2 664 | 2 878 | 3 094 | 2 927 | 2 406 | 2 003 |
| 501 Sale of motor vehicles | 2 267 | 2 400 | 2 511 | 2 664 | 2 878 | 3 094 | 1 748 | 1 389 | 1 153 |
| 502 Maintenance and repair of motor vehicles | 0 | 0 | 0 | 0 | 0 | 0 | 1 179 | 1 017 | 850 |
| 51 Wholesale trade and commission trade | 8 549 | 8 833 | 9 233 | 9 939 | 10 471 | 11 211 | 10 917 | 9 402 | 8 261 |
| 52 Retail trade, repair of household goods | 4 469 | 4 587 | 4 705 | 4 977 | 5 192 | 5 407 | 5 292 | 5 060 | 4 542 |
| 521 Retail sale | 4 469 | 4 587 | 4 705 | 4 977 | 5 192 | 5 407 | 5 138 | 4 915 | 4 397 |
| 527 Repair of personal and household goods | 0 | 0 | 0 | 0 | 0 | 0 | 154 | 145 | 145 |
| H Hotels and restaurants | 3 384 | 3 510 | 3 642 | 3 855 | 4 039 | 4 249 | 4 255 | 3 911 | 3 687 |
| 55 Hotels and restaurants | 3 384 | 3 510 | 3 642 | 3 855 | 4 039 | 4 249 | 4 255 | 3 911 | 3 687 |
| 551 Provision of short term accommodation | 1 018 | 1 055 | 1 095 | 1 146 | 1 196 | 1 267 | 1 270 | 1 165 | 1 096 |
| 553 Restaurants and catering | 2 366 | 2 455 | 2 547 | 2 709 | 2 843 | 2 982 | 2 985 | 2 746 | 2 591 |
| I Transport, storage and communication | 10 094 | 10 461 | 10 653 | 11 398 | 12 067 | 12 885 | 13 627 | 13 011 | 12 853 |
| IA Transport and storage | 8 590 | 8 872 | 8 997 | 9 553 | 10 044 | 10 699 | 11 306 | 10 647 | 10 421 |
| 60 Land transport, transport via pipelines | 4 213 | 4 403 | 4 422 | 4 666 | 4 815 | 5 099 | 5 278 | 4 871 | 4 711 |
| 601 Transport via railways | 551 | 553 | 472 | 514 | 539 | 549 | 572 | 537 | 536 |
| 602 Other land transport | 3 619 | 3 798 | 3 884 | 4 066 | 4 185 | 4 427 | 4 563 | 4 182 | 4 018 |
| 6021 Scheduled passenger land transport | 1 181 | 1 177 | 1 160 | 1 160 | 1 125 | 1 114 | 1 130 | 1 043 | 1 095 |
| 6022 Taxi traffic | 386 | 403 | 415 | 443 | 464 | 490 | 524 | 473 | 445 |
| 6024 Freight transport by road | 2 052 | 2 218 | 2 309 | 2 463 | 2 596 | 2 823 | 2 909 | 2 666 | 2 478 |
| 603 Transport via pipelines | 43 | 52 | 66 | 86 | 91 | 123 | 143 | 152 | 157 |
| 61 Water transport | 1 075 | 913 | 886 | 831 | 927 | 998 | 1 083 | 1 020 | 1 059 |
| 62 Air transport | 496 | 547 | 578 | 695 | 795 | 917 | 950 | 913 | 864 |
| 63 Supporting transport act., travel agencies | 2 806 | 3 009 | 3 111 | 3 361 | 3 507 | 3 685 | 3 995 | 3 843 | 3 787 |
| 6301 Supporting rail transport activities | | | | | | | 242 | 272 | 350 |
| 6302 Supporting road transport activities | 817 | 848 | 850 | 869 | 883 | 904 | 920 | 943 | 943 |
| 6303 Supporting air transport activities | 94 | 99 | 96 | 105 | 115 | 129 | 140 | 147 | 137 |
| 6309 Other supporting transport activities | 1 895 | 2 062 | 2 165 | 2 387 | 2 509 | 2 652 | 2 693 | 2 481 | 2 357 |
| IB Post and telecommunications | 1 504 | 1 589 | 1 656 | 1 845 | 2 023 | 2 186 | 2 321 | 2 364 | 2 432 |
| 64 Post and telecommunications | 1 504 | 1 589 | 1 656 | 1 845 | 2 023 | 2 186 | 2 321 | 2 364 | 2 432 |
| 641 Post and courier activities | 776 | 799 | 801 | 879 | 942 | 995 | 1 020 | 1 001 | 990 |
| 642 Telecommunications | 728 | 790 | 855 | 966 | 1 081 | 1 191 | 1 301 | 1 363 | 1 442 |
| J Financial intermediation | 4 384 | 4 869 | 5 267 | 5 743 | 5 954 | 6 435 | 6 432 | 5 379 | 4 426 |
| 65 Financial intermediation | 3 748 | 4 172 | 4 518 | 5 018 | 5 158 | 5 570 | 5 629 | 4 560 | 3 695 |
| 66 Insurance | 595 | 592 | 613 | 620 | 658 | 667 | 658 | 644 | 604 |
| 67 Activities auxiliary to financial intermediation | 41 | 105 | 136 | 105 | 138 | 198 | 145 | 175 | 127 |
| K Real estate, renting and business activities | 16 892 | 17 605 | 18 446 | 19 432 | 20 745 | 22 059 | 22 419 | 21 892 | 21 445 |
| KA Real estate activities | 10 849 | 11 234 | 11 574 | 12 007 | 12 603 | 13 202 | 13 568 | 13 913 | 14 113 |
| 70 Real estate activities | 10 849 | 11 234 | 11 574 | 12 007 | 12 603 | 13 202 | 13 568 | 13 913 | 14 113 |
| 701 Real estate activities with own property | 983 | 969 | 936 | 954 | 1 072 | 1 258 | 1 236 | 994 | 819 |
| 702 Letting of own property | 8 978 | 9 333 | 9 668 | 10 020 | 10 442 | 10 878 | 11 262 | 11 790 | 12 082 |
| 7021 Letting of dwellings | 8 296 | 8 613 | 8 918 | 9 237 | 9 567 | 9 902 | 10 226 | 10 681 | 11 033 |
| 7022 Operation of dwelling and residential real estate | 682 | 720 | 750 | 783 | 875 | 976 | 1 036 | 1 109 | 1 049 |
| 703 Real estate act. on a fee or contract basis | 888 | 932 | 970 | 1 033 | 1 089 | 1 066 | 1 070 | 1 129 | 1 212 |
| 7031 Real estate agencies | 215 | 222 | 236 | 265 | 289 | 229 | 192 | 204 | 264 |
| 7032 Management of real estate | 673 | 710 | 734 | 768 | 800 | 837 | 878 | 925 | 948 |
| KB Business activities | 6 043 | 6 371 | 6 872 | 7 425 | 8 142 | 8 857 | 8 851 | 7 979 | 7 332 |
| 71 Renting of machinery and equipment | 477 | 491 | 514 | 511 | 530 | 509 | 503 | 408 | 390 |
| 72 Computer and related activities | 1 053 | 1 081 | 1 235 | 1 339 | 1 482 | 1 552 | 1 510 | 1 478 | 1 510 |
| 73 Research and development | 455 | 484 | 508 | 558 | 589 | 625 | 656 | 676 | 697 |
| 74 Other business activities | 4 058 | 4 315 | 4 615 | 5 017 | 5 541 | 6 171 | 6 182 | 5 417 | 4 735 |
| 741 Legal, accounting, book-keeping activities etc. | 338 | 388 | 444 | 511 | 603 | 699 | 761 | 880 | 950 |
| 742 Technical consultancy, testing and analysis | 1 326 | 1 470 | 1 617 | 1 782 | 1 985 | 2 253 | 2 386 | 1 974 | 1 706 |
| 744 Advertising | 1 318 | 1 303 | 1 299 | 1 345 | 1 435 | 1 531 | 1 342 | 1 025 | 717 |
| 747 Industrial cleaning | 457 | 473 | 486 | 497 | 484 | 499 | 483 | 428 | 400 |
| 748 Miscellaneous business activities | 619 | 681 | 769 | 882 | 1 034 | 1 189 | 1 210 | 1 110 | 962 |
| L Administration, compulsory social security | 7 066 | 7 351 | 7 591 | 7 915 | 8 074 | 8 271 | 8 491 | 8 833 | 8 872 |
| 75 Administration, compulsory social security | 7 066 | 7 351 | 7 591 | 7 915 | 8 074 | 8 271 | 8 491 | 8 833 | 8 872 |
| 751 Administration of the State | 6 051 | 6 176 | 6 273 | 6 568 | 6 700 | 6 901 | 7 006 | 7 325 | 7 148 |
| 752 National defence and conscripts | 487 | 621 | 709 | 718 | 719 | 700 | 780 | 781 | 1 026 |
| 753 Compulsory social security activities | 528 | 554 | 609 | 629 | 655 | 670 | 705 | 727 | 698 |
| 7351 Employment pension insurance | 235 | 235 | 260 | 259 | 282 | 286 | 317 | 340 | 307 |
| 7539 Other compulsory social security activities | 293 | 319 | 349 | 370 | 373 | 384 | 388 | 387 | 391 |
| M Education | 5 538 | 5 691 | 5 891 | 6 120 | 6 283 | 6 509 | 6 683 | 6 791 | 6 672 |
| 80 Education | 5 538 | 5 691 | 5 891 | 6 120 | 6 283 | 6 509 | 6 683 | 6 791 | 6 672 |
| N Health and social work | 9 627 | 10 074 | 10 494 | 10 930 | 11 224 | 11 584 | 11 970 | 12 016 | 11 667 |

Table A: Gross domestic product 1975-2001 (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 45 Construction | 11 489 | 11 286 | 11 396 | 12 532 | 13 895 | 15 354 | 16 046 | 17 089 | 16 561 |
| 4501 House building | 8 720 | 8 504 | 8 297 | 9 296 | 10 398 | 11 561 | 12 040 | 13 142 | 12 543 |
| 4502 Civil engineering | 2 685 | 2 691 | 3 000 | 3 131 | 3 372 | 3 649 | 3 853 | 3 782 | 3 829 |
| 4509 Construction related service activities | 84 | 91 | 99 | 105 | 125 | 144 | 153 | 165 | 189 |
| G Wholesale and retail trade | 14 261 | 15 445 | 16 288 | 17 054 | 17 985 | 19 180 | 20 015 | 20 781 | 21 431 |
| 50 Sale and repair of motor vehicles | 1 942 | 2 096 | 2 377 | 2 539 | 2 652 | 2 907 | 3 051 | 3 075 | 3 041 |
| 501 Sale of motor vehicles | 1 245 | 1 341 | 1 500 | 1 552 | 1 731 | 1 978 | 2 104 | 2 116 | 2 031 |
| 502 Maintenance and repair of motor vehicles | 697 | 755 | 877 | 987 | 921 | 929 | 947 | 959 | 1 010 |
| 51 Wholesale trade and commission trade | 7 986 | 8 834 | 9 103 | 9 495 | 10 111 | 10 790 | 11 280 | 11 784 | 12 251 |
| 52 Retail trade, repair of household goods | 4 333 | 4 515 | 4 808 | 5 020 | 5 222 | 5 483 | 5 684 | 5 922 | 6 139 |
| 521 Retail sale | 4 197 | 4 370 | 4 663 | 4 868 | 5 067 | 5 330 | 5 535 | 5 775 | 5 992 |
| 527 Repair of personal and household goods | 136 | 145 | 145 | 152 | 155 | 153 | 149 | 147 | 147 |
| H Hotels and restaurants | 3 554 | 3 651 | 3 761 | 3 874 | 4 065 | 4 203 | 4 249 | 4 333 | 4 420 |
| 55 Hotels and restaurants | 3 554 | 3 651 | 3 761 | 3 874 | 4 065 | 4 203 | 4 249 | 4 333 | 4 420 |
| 551 Provision of short term accommodation | 1 075 | 1 089 | 1 122 | 1 168 | 1 228 | 1 288 | 1 304 | 1 335 | 1 343 |
| 553 Restaurants and catering | 2 479 | 2 562 | 2 639 | 2 706 | 2 837 | 2 915 | 2 945 | 2 998 | 3 077 |
| I Transport, storage and communication | 13 169 | 13 780 | 14 494 | 15 240 | 16 459 | 17 865 | 18 693 | 19 955 | 20 359 |
| IA Transport and storage | 10 694 | 11 213 | 11 721 | 12 148 | 12 898 | 13 627 | 13 830 | 14 228 | 14 246 |
| 60 Land transport, transport via pipelines | 4 774 | 4 854 | 5 037 | 5 306 | 5 541 | 5 779 | 5 903 | 6 237 | 6 058 |
| 601 Transport via railways | 594 | 617 | 625 | 615 | 667 | 658 | 658 | 672 | 659 |
| 602 Other land transport | 4 016 | 4 053 | 4 221 | 4 491 | 4 679 | 4 897 | 5 033 | 5 348 | 5 164 |
| 6021 Scheduled passenger land transport | 960 | 879 | 862 | 875 | 868 | 872 | 889 | 859 | 804 |
| 6022 Taxi traffic | 412 | 388 | 413 | 473 | 495 | 526 | 556 | 568 | 581 |
| 6024 Freight transport by road | 2 644 | 2 786 | 2 946 | 3 143 | 3 316 | 3 499 | 3 588 | 3 921 | 3 779 |
| 603 Transport via pipelines | 164 | 184 | 191 | 200 | 195 | 224 | 212 | 217 | 235 |
| 61 Water transport | 1 277 | 1 397 | 1 416 | 1 398 | 1 503 | 1 648 | 1 687 | 1 610 | 1 576 |
| 62 Air transport | 914 | 1 046 | 1 208 | 1 259 | 1 399 | 1 523 | 1 524 | 1 507 | 1 496 |
| 63 Supporting transport act., travel agencies | 3 729 | 3 916 | 4 060 | 4 185 | 4 455 | 4 677 | 4 716 | 4 874 | 5 116 |
| 6301 Supporting rail transport activities | 369 | 396 | 406 | 362 | 361 | 365 | 362 | 363 | 378 |
| 6302 Supporting road transport activities | 992 | 1 014 | 980 | 973 | 1 009 | 1 048 | 1 066 | 1 092 | 1 378 |
| 6303 Supporting air transport activities | 123 | 128 | 136 | 156 | 178 | 203 | 212 | 223 | 225 |
| 6309 Other supporting transport activities | 2 245 | 2 378 | 2 538 | 2 694 | 2 907 | 3 061 | 3 076 | 3 196 | 3 135 |
| IB Post and telecommunications | 2 475 | 2 567 | 2 773 | 3 092 | 3 561 | 4 238 | 4 863 | 5 727 | 6 113 |
| 64 Post and telecommunications | 2 475 | 2 567 | 2 773 | 3 092 | 3 561 | 4 238 | 4 863 | 5 727 | 6 113 |
| 641 Post and courier activities | 977 | 1 023 | 1 072 | 1 114 | 1 187 | 1 230 | 1 249 | 1 289 | 1 290 |
| 642 Telecommunications | 1 498 | 1 544 | 1 701 | 1 978 | 2 374 | 3 008 | 3 614 | 4 438 | 4 823 |
| J Financial intermediation | 5 344 | 5 183 | 4 998 | 5 285 | 5 393 | 5 432 | 6 174 | 6 715 | 6 133 |
| 65 Financial intermediation | 4 591 | 4 390 | 4 143 | 4 270 | 4 340 | 4 223 | 4 652 | 4 802 | 4 327 |
| 66 Insurance | 561 | 552 | 645 | 769 | 740 | 836 | 960 | 1 110 | 992 |
| 67 Activities auxiliary to financial intermediation | 192 | 241 | 210 | 246 | 313 | 373 | 562 | 803 | 814 |
| K Real estate, renting and business activities | 22 035 | 23 275 | 24 860 | 26 010 | 27 372 | 28 624 | 30 110 | 31 708 | 32 970 |
| KA Real estate activities | 14 518 | 14 970 | 15 637 | 16 192 | 16 720 | 17 104 | 17 724 | 18 376 | 18 734 |
| 70 Real estate activities | 14 518 | 14 970 | 15 637 | 16 192 | 16 720 | 17 104 | 17 724 | 18 376 | 18 734 |
| 701 Real estate activities with own property | 627 | 660 | 736 | 773 | 936 | 977 | 1 132 | 1 251 | 1 230 |
| 702 Letting of own property | 12 592 | 13 005 | 13 700 | 14 138 | 14 484 | 14 762 | 15 206 | 15 690 | 16 070 |
| 7021 Letting of dwellings | 11 576 | 11 974 | 12 289 | 12 576 | 12 929 | 13 148 | 13 573 | 13 879 | 14 209 |
| 7022 Operation of dwelling and residential real estate | 1 016 | 1 031 | 1 411 | 1 562 | 1 555 | 1 614 | 1 633 | 1 811 | 1 861 |
| 703 Real estate act. on a fee or contract basis | 1 299 | 1 305 | 1 201 | 1 281 | 1 300 | 1 365 | 1 386 | 1 435 | 1 434 |
| 7031 Real estate agencies | 334 | 329 | 320 | 372 | 369 | 398 | 411 | 389 | 409 |
| 7032 Management of real estate | 965 | 976 | 881 | 909 | 931 | 967 | 975 | 1 046 | 1 025 |
| KB Business activities | 7 517 | 8 305 | 9 223 | 9 818 | 10 652 | 11 520 | 12 386 | 13 332 | 14 236 |
| 71 Renting of machinery and equipment | 363 | 351 | 383 | 415 | 455 | 499 | 531 | 567 | 579 |
| 72 Computer and related activities | 1 536 | 1 580 | 1 607 | 1 734 | 1 984 | 2 445 | 2 690 | 3 151 | 3 763 |
| 73 Research and development | 658 | 688 | 755 | 782 | 870 | 837 | 864 | 887 | 903 |
| 74 Other business activities | 4 960 | 5 686 | 6 478 | 6 887 | 7 343 | 7 739 | 8 301 | 8 727 | 8 991 |
| 741 Legal, accounting, book-keeping activities etc. | 1 116 | 1 330 | 1 476 | 1 651 | 1 994 | 2 110 | 2 234 | 2 358 | 2 286 |
| 742 Technical consultancy, testing and analysis | 1 828 | 2 120 | 2 455 | 2 414 | 2 385 | 2 347 | 2 532 | 2 645 | 2 905 |
| 744 Advertising | 725 | 793 | 896 | 1 010 | 1 081 | 1 295 | 1 379 | 1 404 | 1 424 |
| 747 Industrial cleaning | 359 | 381 | 465 | 565 | 560 | 600 | 634 | 689 | 741 |
| 748 Miscellaneous business activities | 932 | 1 062 | 1 186 | 1 247 | 1 323 | 1 387 | 1 522 | 1 631 | 1 635 |
| L Administration, compulsory social security | 8 435 | 8 895 | 8 890 | 9 250 | 9 751 | 9 780 | 9 949 | 9 947 | 9 967 |
| 75 Administration, compulsory social security | 8 435 | 8 895 | 8 890 | 9 250 | 9 751 | 9 780 | 9 949 | 9 947 | 9 967 |
| 751 Administration of the State | 6 895 | 7 255 | 7 384 | 7 710 | 8 159 | 7 986 | 8 319 | 8 434 | 8 642 |
| 752 National defence and conscripts | 860 | 905 | 795 | 825 | 867 | 1 041 | 844 | 684 | 473 |
| 753 Compulsory social security activities | 680 | 735 | 711 | 715 | 725 | 753 | 786 | 829 | 852 |
| 7351 Employment pension insurance | 305 | 296 | 307 | 319 | 324 | 348 | 368 | 407 | 428 |
| 7539 Other compulsory social security activities | 375 | 439 | 404 | 396 | 401 | 405 | 418 | 422 | 424 |
| M Education | 6 558 | 6 709 | 6 969 | 7 048 | 7 137 | 7 384 | 7 577 | 7 666 | 7 779 |
| 80 Education | 6 558 | 6 709 | 6 969 | 7 048 | 7 137 | 7 384 | 7 577 | 7 666 | 7 779 |
| N Health and social work | 11 122 | 10 855 | 10 993 | 11 394 | 11 677 | 11 790 | 12 046 | 12 337 | 12 942 |

Source: Statistics Finland, Business structures and economic accounts

Table A: Gross domestic product 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 1 000 000 EUR, at 2000 prices | | | | | | | | | |
| 85 Health and social work | 6 205 | 6 706 | 6 990 | 7 338 | 7 649 | 7 959 | 8 238 | 8 672 | 8 966 |
| 851 Human health activities | 4 464 | 4 786 | 4 944 | 5 095 | 5 249 | 5 390 | 5 545 | 5 863 | 6 021 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 853 Social work activities | 1 741 | 1 920 | 2 046 | 2 243 | 2 400 | 2 569 | 2 693 | 2 809 | 2 945 |
| O Other community, social and personal service act. | 3 164 | 3 327 | 3 420 | 3 628 | 3 788 | 3 978 | 4 160 | 4 359 | 4 557 |
| 90 Environmental care | 356 | 385 | 364 | 379 | 376 | 388 | 417 | 446 | 461 |
| 91 Activities of membership organizations | 1 093 | 1 162 | 1 205 | 1 254 | 1 301 | 1 356 | 1 421 | 1 481 | 1 541 |
| 911 Activities of business and employers' org. | 372 | 386 | 401 | 412 | 428 | 450 | 476 | 504 | 528 |
| 913 Activities of religious and other organizations | 721 | 776 | 804 | 842 | 873 | 906 | 945 | 977 | 1 013 |
| 9131 Activities of religious organizations | 466 | 501 | 522 | 554 | 576 | 589 | 620 | 645 | 670 |
| 9139 Activities of other organizations | 255 | 275 | 282 | 288 | 297 | 317 | 325 | 332 | 343 |
| 92 Recreational, cultural and sporting activities | 1 347 | 1 411 | 1 479 | 1 612 | 1 714 | 1 827 | 1 903 | 2 003 | 2 113 |
| 93 Other service activities | 368 | 369 | 372 | 383 | 397 | 407 | 419 | 429 | 442 |
| 9301 Washing and dry cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9309 Other personal service activities | 368 | 369 | 372 | 383 | 397 | 407 | 419 | 429 | 442 |
| P Activites of hhs as employers of domestic staff | 111 | 96 | 94 | 90 | 92 | 85 | 86 | 78 | 72 |
| 95 Activities of hhs as employers of domestic staff | 111 | 96 | 94 | 90 | 92 | 85 | 86 | 78 | 72 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table A: (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|-------|--------|--------|--------|--------|--------|--------|--------|--------|
| 85 Health and social work | 9 627 | 10 074 | 10 494 | 10 930 | 11 224 | 11 584 | 11 970 | 12 016 | 11 667 |
| 851 Human health activities | 6 392 | 6 674 | 6 912 | 7 194 | 7 304 | 7 462 | 7 632 | 7 638 | 7 383 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 77 | 67 | 69 |
| 853 Social work activities | 3 235 | 3 400 | 3 582 | 3 736 | 3 920 | 4 122 | 4 261 | 4 311 | 4 215 |
| O Other community, social and personal service act. | 4 725 | 4 936 | 5 140 | 5 340 | 5 523 | 5 803 | 6 023 | 5 876 | 5 799 |
| 90 Environmental care | 491 | 539 | 557 | 607 | 632 | 696 | 726 | 691 | 694 |
| 91 Activities of membership organizations | 1 564 | 1 593 | 1 642 | 1 657 | 1 676 | 1 740 | 1 777 | 1 718 | 1 711 |
| 911 Activities of business and employers' org. | 552 | 576 | 601 | 602 | 611 | 644 | 658 | 653 | 625 |
| 913 Activities of religious and other organizations | 1 012 | 1 017 | 1 041 | 1 055 | 1 065 | 1 096 | 1 119 | 1 065 | 1 086 |
| 9131 Activities of religious organizations | 670 | 675 | 694 | 708 | 715 | 741 | 756 | 730 | 725 |
| 9139 Activities of other organizations | 342 | 342 | 347 | 347 | 350 | 355 | 363 | 335 | 361 |
| 92 Recreational, cultural and sporting activities | 2 211 | 2 324 | 2 442 | 2 558 | 2 676 | 2 805 | 2 935 | 2 878 | 2 858 |
| 93 Other service activities | 459 | 480 | 499 | 518 | 539 | 562 | 585 | 589 | 536 |
| 9301 Washing and dry cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 193 | 192 | 183 |
| 9309 Other personal service activities | 459 | 480 | 499 | 518 | 539 | 562 | 392 | 397 | 353 |
| P Activites of hhs as employers of domestic staff | 63 | 60 | 65 | 61 | 59 | 58 | 50 | 51 | 51 |
| 95 Activities of hhs as employers of domestic staff | 63 | 60 | 65 | 61 | 59 | 58 | 50 | 51 | 51 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table A: (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 85 Health and social work | 11 122 | 10 855 | 10 993 | 11 394 | 11 677 | 11 790 | 12 046 | 12 337 | 12 942 |
| 851 Human health activities | 7 103 | 6 881 | 6 914 | 7 117 | 7 237 | 7 304 | 7 428 | 7 585 | 7 940 |
| 852 Veterinary activities | 82 | 79 | 81 | 82 | 85 | 87 | 86 | 89 | 94 |
| 853 Social work activities | 3 937 | 3 895 | 3 998 | 4 195 | 4 355 | 4 399 | 4 532 | 4 663 | 4 908 |
| O Other community, social and personal service act. | 5 529 | 5 631 | 5 747 | 6 025 | 6 341 | 6 661 | 6 939 | 7 240 | 7 477 |
| 90 Environmental care | 642 | 706 | 724 | 730 | 832 | 865 | 880 | 956 | 973 |
| 91 Activities of membership organizations | 1 697 | 1 653 | 1 692 | 1 790 | 1 814 | 1 881 | 2 007 | 2 063 | 2 124 |
| 911 Activities of business and employers' org. | 614 | 587 | 602 | 604 | 599 | 627 | 641 | 658 | 664 |
| 913 Activities of religious and other organizations | 1 083 | 1 066 | 1 090 | 1 186 | 1 215 | 1 254 | 1 366 | 1 405 | 1 460 |
| 9131 Activities of religious organizations | 711 | 680 | 701 | 783 | 796 | 837 | 886 | 912 | 944 |
| 9139 Activities of other organizations | 372 | 386 | 389 | 403 | 419 | 417 | 480 | 493 | 516 |
| 92 Recreational, cultural and sporting activities | 2 700 | 2 712 | 2 786 | 2 930 | 3 090 | 3 283 | 3 401 | 3 555 | 3 706 |
| 93 Other service activities | 490 | 560 | 545 | 575 | 605 | 632 | 651 | 666 | 674 |
| 9301 Washing and dry cleaning | 168 | 159 | 164 | 184 | 192 | 196 | 204 | 215 | 213 |
| 9309 Other personal service activities | 322 | 401 | 381 | 391 | 413 | 436 | 447 | 451 | 461 |
| P Activites of hhs as employers of domestic staff | 49 | 51 | 80 | 91 | 106 | 119 | 131 | 143 | 150 |
| 95 Activities of hhs as employers of domestic staff | 49 | 51 | 80 | 91 | 106 | 119 | 131 | 143 | 150 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table B: Value added of production 1975-2001

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|--|-------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1 000 000 EUR, at 2000 prices | | | | | | | | |
| 0 Total | 57 749 | 58 227 | 58 834 | 60 606 | 64 669 | 68 212 | 69 875 | 71 846 | 74 107 |
| A Agriculture, hunting and forestry | 3 531 | 3 616 | 3 776 | 3 836 | 4 348 | 4 601 | 4 390 | 4 282 | 4 414 |
| 01 Agriculture, hunting and related service act. | 2 017 | 2 155 | 2 202 | 2 217 | 2 287 | 2 418 | 2 402 | 2 489 | 2 709 |
| 01MAA Agriculture and related service act. | 1 983 | 2 120 | 2 156 | 2 155 | 2 213 | 2 336 | 2 317 | 2 408 | 2 635 |
| 0112 Horticulture | 97 | 115 | 124 | 150 | 149 | 136 | 182 | 210 | 214 |
| 0125 Other farming of animals | 136 | 132 | 142 | 188 | 225 | 255 | 266 | 306 | 338 |
| 013 Mixed farming | 1 703 | 1 826 | 1 842 | 1 768 | 1 789 | 1 894 | 1 817 | 1 843 | 2 035 |
| 014 Agricultural service activities | 47 | 47 | 48 | 49 | 50 | 51 | 52 | 49 | 48 |
| 015 Hunting and game husbandry | 34 | 35 | 46 | 62 | 74 | 82 | 85 | 81 | 74 |
| 02 Forestry and related service activities | 1 514 | 1 461 | 1 574 | 1 619 | 2 061 | 2 183 | 1 988 | 1 793 | 1 705 |
| 0211 Forest cultivation | 12 | 13 | 15 | 14 | 15 | 18 | 21 | 24 | 25 |
| 0212 Timber harvesting | 1 486 | 1 427 | 1 536 | 1 582 | 2 013 | 2 116 | 1 921 | 1 736 | 1 651 |
| 0219 Other forestry | | | | | | | | | |
| 0202 Forestry related service activities | 16 | 21 | 23 | 23 | 33 | 49 | 46 | 33 | 29 |
| B Fishing | 64 | 66 | 64 | 77 | 75 | 79 | 77 | 85 | 88 |
| 05 Fishing and fish farming | 64 | 66 | 64 | 77 | 75 | 79 | 77 | 85 | 88 |
| C Mining and quarrying | 82 | 81 | 88 | 99 | 116 | 134 | 134 | 168 | 167 |
| 10 Mining of energy producing minerals | 14 | 12 | 12 | 20 | 29 | 41 | 36 | 64 | 54 |
| 13 Mining of metal ores | 12 | 15 | 16 | 17 | 18 | 16 | 17 | 16 | 17 |
| 14 Mining of other minerals | 56 | 54 | 60 | 62 | 69 | 77 | 81 | 88 | 96 |
| D Manufacturing | 10 915 | 10 989 | 10 877 | 11 355 | 12 658 | 13 712 | 14 289 | 14 383 | 14 750 |
| DA Food products, beverages and tobacco | 1 140 | 1 087 | 1 072 | 1 108 | 1 172 | 1 225 | 1 290 | 1 281 | 1 315 |
| 15 Food products and beverages | 1 090 | 1 041 | 1 027 | 1 063 | 1 122 | 1 173 | 1 220 | 1 231 | 1 266 |
| 151 Food supplies | 1 090 | 1 041 | 1 027 | 1 063 | 1 122 | 1 173 | 1 220 | 1 231 | 1 266 |
| 159 Beverages | | | | | | | | | |
| 16 Tobacco products | 50 | 46 | 45 | 45 | 50 | 52 | 70 | 50 | 49 |
| DB Textiles and textile products | 885 | 888 | 854 | 851 | 941 | 989 | 1 009 | 983 | 928 |
| 17 Textiles | 334 | 321 | 310 | 305 | 337 | 354 | 340 | 325 | 307 |
| 18 Wearing apparel, dressing of fur | 551 | 567 | 544 | 546 | 604 | 635 | 669 | 658 | 621 |
| DC Leather and leather products | 138 | 137 | 125 | 138 | 156 | 189 | 205 | 200 | 186 |
| 19 Leather and leather products | 138 | 137 | 125 | 138 | 156 | 189 | 205 | 200 | 186 |
| DD Wood and wood products | 520 | 589 | 617 | 680 | 811 | 879 | 799 | 756 | 827 |
| 20 Wood and wood products | 520 | 589 | 617 | 680 | 811 | 879 | 799 | 756 | 827 |
| DE Pulp, paper, publishing and printing | 2 663 | 2 771 | 2 758 | 3 038 | 3 402 | 3 626 | 3 748 | 3 611 | 3 888 |
| 21 Pulp, paper and paper products | 1 819 | 1 933 | 1 932 | 2 167 | 2 465 | 2 634 | 2 688 | 2 518 | 2 714 |
| 22 Publishing and printing | 844 | 838 | 826 | 871 | 937 | 992 | 1 060 | 1 093 | 1 174 |
| DF Coke, petroleum products and nuclear fuel | 153 | 176 | 197 | 192 | 212 | 203 | 193 | 201 | 214 |
| 23 Coke, petroleum products and nuclear fuel | 153 | 176 | 197 | 192 | 212 | 203 | 193 | 201 | 214 |
| DG Chemicals and chemical products | 537 | 534 | 524 | 567 | 642 | 749 | 785 | 763 | 818 |
| 24 Chemicals and chemical products | 537 | 534 | 524 | 567 | 642 | 749 | 785 | 763 | 818 |
| DH Rubber and plastic products | 299 | 309 | 312 | 358 | 400 | 402 | 409 | 416 | 446 |
| 25 Rubber and plastic products | 299 | 309 | 312 | 358 | 400 | 402 | 409 | 416 | 446 |
| 251 Rubber products | 299 | 309 | 312 | 358 | 400 | 402 | 409 | 416 | 446 |
| 252 Plastic products | | | | | | | | | |
| DI Non-metallic mineral products | 593 | 551 | 556 | 544 | 622 | 666 | 678 | 746 | 781 |
| 26 Non-metallic mineral products | 593 | 551 | 556 | 544 | 622 | 666 | 678 | 746 | 781 |
| DJ Basic metals and fabricated metal products | 830 | 826 | 898 | 952 | 1 081 | 1 191 | 1 247 | 1 350 | 1 427 |
| 27 Basic metals | 365 | 352 | 399 | 444 | 499 | 525 | 521 | 528 | 561 |
| 28 Fabricated metal products | 465 | 474 | 499 | 508 | 582 | 666 | 726 | 822 | 866 |
| DK Machinery and equipment | 1 378 | 1 383 | 1 408 | 1 401 | 1 552 | 1 762 | 2 004 | 2 021 | 1 850 |
| 29 Machinery and equipment | 1 378 | 1 383 | 1 408 | 1 401 | 1 552 | 1 762 | 2 004 | 2 021 | 1 850 |
| DL Electrical and optical equipment | 553 | 492 | 480 | 481 | 528 | 594 | 630 | 653 | 685 |
| 30 Office machinery and computers | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 3 |
| 31 Other electrical machinery and apparatus | 355 | 305 | 300 | 288 | 308 | 355 | 363 | 364 | 374 |
| 32 Radio, television and communication equipment | 84 | 87 | 81 | 77 | 87 | 92 | 93 | 103 | 119 |
| 33 Medical and precision instruments, clocks | 113 | 98 | 98 | 114 | 132 | 145 | 171 | 183 | 189 |
| DM Transport equipment | 831 | 882 | 709 | 650 | 689 | 753 | 798 | 903 | 895 |
| 34 Motor vehicles and trailers | 199 | 196 | 177 | 182 | 217 | 230 | 233 | 253 | 262 |
| 35 Other transport equipment | 632 | 686 | 532 | 468 | 472 | 523 | 565 | 650 | 633 |
| 351 Ships and boats | 632 | 686 | 532 | 468 | 472 | 523 | 565 | 650 | 633 |
| 352 Other transport equipment | | | | | | | | | |
| DN Other manufacturing and recycling | 395 | 364 | 367 | 395 | 450 | 484 | 494 | 499 | 490 |
| 36 Other manufacturing | 395 | 364 | 367 | 395 | 450 | 484 | 494 | 499 | 490 |
| 361 Furniture | 395 | 364 | 367 | 395 | 450 | 484 | 494 | 499 | 490 |
| 362 Other products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E Electricity, gas and water supply | 970 | 937 | 992 | 1 043 | 1 109 | 1 160 | 1 206 | 1 204 | 1 254 |
| 40 Electricity, gas, steam and hot water supply | 665 | 705 | 775 | 833 | 914 | 958 | 1 006 | 1 004 | 1 048 |
| 41 Purification and distribution of water | 305 | 232 | 217 | 210 | 195 | 202 | 200 | 200 | 206 |
| F Construction | 6 744 | 6 217 | 6 308 | 6 232 | 6 220 | 6 655 | 6 522 | 6 817 | 7 100 |

Source: Statistics Finland, Business structures and economic accounts

Table B: Value added of production 1975-2001 (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 Total | 76 635 | 79 285 | 80 861 | 84 134 | 87 768 | 91 848 | 92 084 | 86 005 | 82 935 |
| A Agriculture, hunting and forestry | 4 634 | 4 586 | 4 250 | 4 027 | 4 269 | 4 039 | 3 746 | 3 253 | 3 369 |
| 01 Agriculture, hunting and related service act. | 2 647 | 2 655 | 2 560 | 2 186 | 2 307 | 2 027 | 1 800 | 1 653 | 1 518 |
| 01MAA Agriculture and related service act. | 2 566 | 2 582 | 2 494 | 2 128 | 2 244 | 1 963 | 1 745 | 1 598 | 1 459 |
| 0112 Horticulture | 144 | 164 | 174 | 127 | 124 | 114 | 121 | 146 | 160 |
| 0125 Other farming of animals | 326 | 382 | 380 | 344 | 397 | 274 | 188 | 128 | 144 |
| 013 Mixed farming | 2 046 | 1 987 | 1 892 | 1 611 | 1 678 | 1 531 | 1 393 | 1 280 | 1 108 |
| 014 Agricultural service activities | 50 | 49 | 48 | 46 | 45 | 44 | 43 | 44 | 47 |
| 015 Hunting and game husbandry | 81 | 73 | 66 | 58 | 63 | 64 | 55 | 55 | 59 |
| 02 Forestry and related service activities | 1 987 | 1 931 | 1 690 | 1 841 | 1 962 | 2 012 | 1 946 | 1 600 | 1 851 |
| 0211 Forest cultivation | 27 | 28 | 31 | 31 | 33 | 37 | 41 | 44 | 43 |
| 0212 Timber harvesting | 1 924 | 1 862 | 1 633 | 1 778 | 1 881 | 1 921 | 1 851 | 1 502 | 1 754 |
| 0219 Other forestry | | | | | | | | | |
| 0202 Forestry related service activities | 36 | 41 | 26 | 32 | 48 | 54 | 54 | 54 | 54 |
| B Fishing | 88 | 89 | 88 | 86 | 105 | 88 | 84 | 85 | 101 |
| 05 Fishing and fish farming | 88 | 89 | 88 | 86 | 105 | 88 | 84 | 85 | 101 |
| C Mining and quarrying | 161 | 175 | 199 | 216 | 230 | 258 | 283 | 268 | 283 |
| 10 Mining of energy producing minerals | 40 | 46 | 64 | 75 | 73 | 85 | 113 | 111 | 137 |
| 13 Mining of metal ores | 17 | 17 | 16 | 18 | 19 | 21 | 19 | 18 | 17 |
| 14 Mining of other minerals | 104 | 112 | 119 | 123 | 138 | 152 | 151 | 139 | 129 |
| D Manufacturing | 15 499 | 16 140 | 16 394 | 17 365 | 18 180 | 18 955 | 18 879 | 16 614 | 16 647 |
| DA Food products, beverages and tobacco | 1 343 | 1 399 | 1 429 | 1 470 | 1 524 | 1 551 | 1 570 | 1 533 | 1 554 |
| 15 Food products and beverages | 1 294 | 1 352 | 1 379 | 1 419 | 1 467 | 1 499 | 1 517 | 1 485 | 1 505 |
| 151 Food supplies | 1 294 | 1 147 | 1 160 | 1 198 | 1 227 | 1 242 | 1 253 | 1 218 | 1 235 |
| 159 Beverages | | 205 | 219 | 221 | 240 | 257 | 264 | 267 | 270 |
| 16 Tobacco products | 49 | 47 | 50 | 51 | 57 | 52 | 53 | 48 | 49 |
| DB Textiles and textile products | 930 | 949 | 938 | 909 | 841 | 774 | 690 | 522 | 471 |
| 17 Textiles | 304 | 300 | 288 | 299 | 292 | 281 | 263 | 219 | 221 |
| 18 Wearing apparel, dressing of fur | 626 | 649 | 650 | 610 | 549 | 493 | 427 | 303 | 250 |
| DC Leather and leather products | 199 | 209 | 202 | 198 | 184 | 153 | 145 | 122 | 111 |
| 19 Leather and leather products | 199 | 209 | 202 | 198 | 184 | 153 | 145 | 122 | 111 |
| DD Wood and wood products | 853 | 840 | 842 | 890 | 946 | 1 033 | 964 | 735 | 749 |
| 20 Wood and wood products | 853 | 840 | 842 | 890 | 946 | 1 033 | 964 | 735 | 749 |
| DE Pulp, paper, publishing and printing | 4 288 | 4 332 | 4 454 | 4 668 | 4 990 | 5 123 | 5 106 | 4 888 | 4 930 |
| 21 Pulp, paper and paper products | 3 037 | 3 025 | 3 094 | 3 243 | 3 498 | 3 558 | 3 566 | 3 495 | 3 625 |
| 22 Publishing and printing | 1 251 | 1 307 | 1 360 | 1 425 | 1 492 | 1 565 | 1 540 | 1 393 | 1 305 |
| DF Coke, petroleum products and nuclear fuel | 217 | 222 | 212 | 241 | 239 | 237 | 268 | 298 | 304 |
| 23 Coke, petroleum products and nuclear fuel | 217 | 222 | 212 | 241 | 239 | 237 | 268 | 298 | 304 |
| DG Chemicals and chemical products | 884 | 919 | 908 | 963 | 1 048 | 1 127 | 1 122 | 1 050 | 1 070 |
| 24 Chemicals and chemical products | 884 | 919 | 908 | 963 | 1 048 | 1 127 | 1 122 | 1 050 | 1 070 |
| DH Rubber and plastic products | 447 | 517 | 560 | 623 | 657 | 696 | 698 | 588 | 595 |
| 25 Rubber and plastic products | 447 | 517 | 560 | 623 | 657 | 696 | 698 | 588 | 595 |
| 251 Rubber products | 447 | 106 | 109 | 99 | 96 | 96 | 96 | 80 | 89 |
| 252 Plastic products | | 411 | 451 | 524 | 561 | 600 | 602 | 508 | 506 |
| DI Non-metallic mineral products | 739 | 755 | 746 | 837 | 856 | 944 | 922 | 781 | 677 |
| 26 Non-metallic mineral products | 739 | 755 | 746 | 837 | 856 | 944 | 922 | 781 | 677 |
| DJ Basic metals and fabricated metal products | 1 475 | 1 537 | 1 635 | 1 756 | 1 875 | 2 018 | 2 062 | 1 814 | 1 838 |
| 27 Basic metals | 608 | 628 | 657 | 687 | 724 | 748 | 761 | 742 | 829 |
| 28 Fabricated metal products | 867 | 909 | 978 | 1 069 | 1 151 | 1 270 | 1 301 | 1 072 | 1 009 |
| DK Machinery and equipment | 2 002 | 2 197 | 2 073 | 2 284 | 2 411 | 2 573 | 2 627 | 1 932 | 1 871 |
| 29 Machinery and equipment | 2 002 | 2 197 | 2 073 | 2 284 | 2 411 | 2 573 | 2 627 | 1 932 | 1 871 |
| DL Electrical and optical equipment | 761 | 893 | 994 | 1 072 | 1 144 | 1 275 | 1 323 | 1 158 | 1 298 |
| 30 Office machinery and computers | 5 | 5 | 8 | 9 | 11 | 12 | 12 | 11 | 20 |
| 31 Other electrical machinery and apparatus | 383 | 446 | 475 | 474 | 498 | 553 | 567 | 514 | 545 |
| 32 Radio, television and communication equipment | 137 | 164 | 199 | 238 | 254 | 289 | 314 | 252 | 354 |
| 33 Medical and precision instruments, clocks | 236 | 278 | 312 | 351 | 381 | 421 | 430 | 381 | 379 |
| DM Transport equipment | 868 | 863 | 877 | 904 | 870 | 828 | 791 | 682 | 701 |
| 34 Motor vehicles and trailers | 262 | 292 | 336 | 381 | 362 | 353 | 320 | 246 | 243 |
| 35 Other transport equipment | 606 | 571 | 541 | 523 | 508 | 475 | 471 | 436 | 458 |
| 351 Ships and boats | 606 | 398 | 377 | 329 | 291 | 258 | 243 | 252 | 282 |
| 352 Other transport equipment | | 173 | 164 | 194 | 217 | 217 | 228 | 184 | 176 |
| DN Other manufacturing and recycling | 493 | 508 | 524 | 550 | 595 | 623 | 591 | 511 | 478 |
| 36 Other manufacturing | 493 | 508 | 524 | 549 | 595 | 623 | 590 | 510 | 477 |
| 361 Furniture | 493 | 353 | 359 | 389 | 419 | 444 | 411 | 338 | 309 |
| 362 Other products | 0 | 155 | 165 | 160 | 176 | 179 | 179 | 172 | 168 |
| 37 Recycling | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 |
| E Electricity, gas and water supply | 1 336 | 1 446 | 1 447 | 1 540 | 1 583 | 1 587 | 1 618 | 1 668 | 1 660 |
| 40 Electricity, gas, steam and hot water supply | 1 130 | 1 229 | 1 221 | 1 307 | 1 344 | 1 345 | 1 374 | 1 427 | 1 422 |
| 41 Purification and distribution of water | 206 | 217 | 226 | 233 | 239 | 242 | 244 | 241 | 238 |
| F Construction | 6 827 | 6 876 | 6 912 | 6 965 | 7 523 | 8 554 | 8 438 | 7 499 | 6 673 |

Table B: Value added of production 1975-2001 (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|--------|--------|--------|--------|--------|---------|---------|---------|---------|
| 0 Total | 82 330 | 86 170 | 89 087 | 92 674 | 98 449 | 103 196 | 106 859 | 113 055 | 114 052 |
| A Agriculture, hunting and forestry | 3 535 | 3 884 | 3 633 | 3 600 | 4 064 | 3 777 | 3 883 | 4 316 | 3 982 |
| 01 Agriculture, hunting and related service act. | 1 590 | 1 646 | 1 520 | 1 608 | 1 728 | 1 399 | 1 518 | 1 738 | 1 700 |
| 01MAA Agriculture and related service act. | 1 529 | 1 585 | 1 467 | 1 565 | 1 689 | 1 356 | 1 463 | 1 676 | 1 634 |
| 0112 Horticulture | 135 | 162 | 174 | 172 | 197 | 171 | 169 | 193 | 194 |
| 0125 Other farming of animals | 103 | 150 | 123 | 175 | 189 | 200 | 172 | 134 | 139 |
| 013 Mixed farming | 1 240 | 1 222 | 1 137 | 1 185 | 1 261 | 957 | 1 098 | 1 307 | 1 258 |
| 014 Agricultural service activities | 51 | 51 | 33 | 33 | 42 | 28 | 24 | 42 | 43 |
| 015 Hunting and game husbandry | 61 | 61 | 53 | 43 | 39 | 43 | 55 | 62 | 66 |
| 02 Forestry and related service activities | 1 945 | 2 238 | 2 113 | 1 992 | 2 336 | 2 378 | 2 365 | 2 578 | 2 282 |
| 0211 Forest cultivation | 43 | 41 | 45 | 44 | 44 | 32 | 39 | 44 | 44 |
| 0212 Timber harvesting | 1 856 | 2 154 | 2 018 | 1 898 | 2 240 | 2 291 | 2 273 | 2 478 | 2 183 |
| 0219 Other forestry | | 12 | 12 | 11 | 12 | 14 | 11 | 11 | 11 |
| 0202 Forestry related service activities | 46 | 31 | 38 | 39 | 40 | 41 | 42 | 45 | 44 |
| B Fishing | 102 | 96 | 116 | 120 | 120 | 101 | 93 | 83 | 86 |
| 05 Fishing and fish farming | 102 | 96 | 116 | 120 | 120 | 101 | 93 | 83 | 86 |
| C Mining and quarrying | 279 | 335 | 352 | 363 | 415 | 303 | 389 | 266 | 324 |
| 10 Mining of energy producing minerals | 135 | 180 | 191 | 197 | 225 | 111 | 191 | 79 | 137 |
| 13 Mining of metal ores | 14 | 16 | 15 | 15 | 14 | 14 | 15 | 14 | 13 |
| 14 Mining of other minerals | 130 | 139 | 146 | 151 | 176 | 178 | 183 | 173 | 174 |
| D Manufacturing | 17 501 | 19 598 | 21 012 | 21 596 | 23 623 | 25 458 | 26 835 | 30 154 | 29 984 |
| DA Food products, beverages and tobacco | 1 616 | 1 606 | 1 681 | 1 717 | 1 763 | 1 770 | 1 804 | 1 780 | 1 812 |
| 15 Food products and beverages | 1 572 | 1 562 | 1 640 | 1 678 | 1 728 | 1 735 | 1 781 | 1 759 | 1 790 |
| 151 Food supplies | 1 311 | 1 306 | 1 371 | 1 412 | 1 456 | 1 448 | 1 497 | 1 475 | 1 500 |
| 159 Beverages | 261 | 256 | 269 | 266 | 272 | 287 | 284 | 284 | 290 |
| 16 Tobacco products | 44 | 44 | 41 | 39 | 35 | 35 | 23 | 21 | 22 |
| DB Textiles and textile products | 473 | 516 | 470 | 486 | 478 | 474 | 473 | 462 | 450 |
| 17 Textiles | 232 | 251 | 248 | 266 | 262 | 263 | 264 | 267 | 277 |
| 18 Wearing apparel, dressing of fur | 241 | 265 | 222 | 220 | 216 | 211 | 209 | 195 | 173 |
| DC Leather and leather products | 103 | 110 | 103 | 101 | 101 | 105 | 96 | 92 | 88 |
| 19 Leather and leather products | 103 | 110 | 103 | 101 | 101 | 105 | 96 | 92 | 88 |
| DD Wood and wood products | 861 | 998 | 965 | 1 000 | 1 127 | 1 201 | 1 265 | 1 353 | 1 262 |
| 20 Wood and wood products | 861 | 998 | 965 | 1 000 | 1 127 | 1 201 | 1 265 | 1 353 | 1 262 |
| DE Pulp, paper, publishing and printing | 5 228 | 5 698 | 5 843 | 5 675 | 6 377 | 6 570 | 6 728 | 7 038 | 6 580 |
| 21 Pulp, paper and paper products | 3 951 | 4 369 | 4 442 | 4 240 | 4 868 | 5 015 | 5 180 | 5 392 | 4 998 |
| 22 Publishing and printing | 1 277 | 1 329 | 1 401 | 1 435 | 1 509 | 1 555 | 1 548 | 1 646 | 1 582 |
| DF Coke, petroleum products and nuclear fuel | 319 | 369 | 360 | 389 | 364 | 425 | 400 | 391 | 370 |
| 23 Coke, petroleum products and nuclear fuel | 319 | 369 | 360 | 389 | 364 | 425 | 400 | 391 | 370 |
| DG Chemicals and chemical products | 1 101 | 1 239 | 1 266 | 1 291 | 1 370 | 1 408 | 1 432 | 1 542 | 1 581 |
| 24 Chemicals and chemical products | 1 101 | 1 239 | 1 266 | 1 291 | 1 370 | 1 408 | 1 432 | 1 542 | 1 581 |
| DH Rubber and plastic products | 646 | 704 | 719 | 727 | 777 | 848 | 877 | 983 | 917 |
| 25 Rubber and plastic products | 646 | 704 | 719 | 727 | 777 | 848 | 877 | 983 | 917 |
| 251 Rubber products | 99 | 121 | 132 | 126 | 132 | 152 | 149 | 172 | 177 |
| 252 Plastic products | 547 | 583 | 587 | 601 | 645 | 696 | 728 | 811 | 740 |
| DI Non-metallic mineral products | 627 | 684 | 688 | 745 | 806 | 842 | 869 | 925 | 910 |
| 26 Non-metallic mineral products | 627 | 684 | 688 | 745 | 806 | 842 | 869 | 925 | 910 |
| DJ Basic metals and fabricated metal products | 1 956 | 2 219 | 2 377 | 2 499 | 2 699 | 2 821 | 2 807 | 3 125 | 3 145 |
| 27 Basic metals | 881 | 958 | 1 036 | 1 077 | 1 140 | 1 203 | 1 242 | 1 308 | 1 318 |
| 28 Fabricated metal products | 1 075 | 1 261 | 1 341 | 1 422 | 1 559 | 1 618 | 1 565 | 1 817 | 1 827 |
| DK Machinery and equipment | 1 938 | 2 279 | 2 777 | 2 881 | 3 067 | 3 076 | 3 043 | 3 195 | 3 383 |
| 29 Machinery and equipment | 1 938 | 2 279 | 2 777 | 2 881 | 3 067 | 3 076 | 3 043 | 3 195 | 3 383 |
| DL Electrical and optical equipment | 1 556 | 1 969 | 2 452 | 2 773 | 3 310 | 4 465 | 5 577 | 7 714 | 7 928 |
| 30 Office machinery and computers | 23 | 23 | 22 | 23 | 27 | 27 | 26 | 4 | 0 |
| 31 Other electrical machinery and apparatus | 538 | 617 | 657 | 702 | 750 | 831 | 856 | 947 | 975 |
| 32 Radio, television and communication equipment | 576 | 878 | 1 258 | 1 470 | 1 873 | 2 927 | 4 022 | 6 044 | 6 120 |
| 33 Medical and precision instruments, clocks | 419 | 451 | 515 | 578 | 660 | 680 | 673 | 719 | 833 |
| DM Transport equipment | 607 | 694 | 789 | 779 | 817 | 850 | 836 | 874 | 891 |
| 34 Motor vehicles and trailers | 177 | 204 | 235 | 255 | 293 | 316 | 319 | 347 | 347 |
| 35 Other transport equipment | 430 | 490 | 554 | 524 | 524 | 534 | 517 | 527 | 544 |
| 351 Ships and boats | 255 | 313 | 368 | 323 | 316 | 316 | 316 | 330 | 359 |
| 352 Other transport equipment | 175 | 177 | 186 | 201 | 208 | 218 | 201 | 197 | 185 |
| DN Other manufacturing and recycling | 470 | 513 | 522 | 533 | 567 | 603 | 628 | 680 | 667 |
| 36 Other manufacturing | 466 | 508 | 504 | 511 | 543 | 579 | 602 | 648 | 631 |
| 361 Furniture | 289 | 322 | 338 | 340 | 365 | 410 | 423 | 466 | 431 |
| 362 Other products | 177 | 186 | 166 | 171 | 178 | 169 | 179 | 182 | 200 |
| 37 Recycling | 4 | 5 | 18 | 22 | 24 | 24 | 26 | 32 | 36 |
| E Electricity, gas and water supply | 1 730 | 1 828 | 1 803 | 1 960 | 1 957 | 1 979 | 1 976 | 1 993 | 2 102 |
| 40 Electricity, gas, steam and hot water supply | 1 495 | 1 586 | 1 561 | 1 714 | 1 710 | 1 736 | 1 721 | 1 741 | 1 851 |
| 41 Purification and distribution of water | 235 | 242 | 242 | 246 | 247 | 243 | 255 | 252 | 251 |
| F Construction | 5 883 | 5 497 | 5 133 | 5 706 | 6 239 | 6 736 | 6 616 | 6 445 | 6 425 |

Source: Statistics Finland, Business structures and economic account

Table B: Value added of production 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|--|-------------------------------|-------|-------|-------|-------|-------|-------|--------|--------|
| | 1 000 000 EUR, at 2000 prices | | | | | | | | |
| 45 Construction | 6 744 | 6 217 | 6 308 | 6 232 | 6 220 | 6 655 | 6 522 | 6 817 | 7 100 |
| 4501 House building | 4 922 | 4 530 | 4 749 | 4 721 | 4 740 | 5 136 | 5 005 | 5 303 | 5 669 |
| 4502 Civil engineering | 1 822 | 1 687 | 1 559 | 1 511 | 1 480 | 1 519 | 1 517 | 1 514 | 1 431 |
| 4509 Construction related service activities | | | | | | | | | |
| G Wholesale and retail trade | 7 137 | 7 131 | 6 635 | 6 750 | 7 268 | 7 536 | 7 484 | 7 894 | 8 097 |
| 50 Sale and repair of motor vehicles | 1 009 | 1 014 | 924 | 937 | 990 | 1 015 | 1 048 | 1 140 | 1 095 |
| 501 Sale of motor vehicles | 1 009 | 1 014 | 924 | 937 | 990 | 1 015 | 1 048 | 1 140 | 1 095 |
| 502 Maintenance and repair of motor vehicles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 51 Wholesale trade and commission trade | 3 872 | 3 826 | 3 628 | 3 694 | 4 037 | 4 222 | 4 116 | 4 370 | 4 573 |
| 52 Retail trade, repair of household goods | 2 256 | 2 291 | 2 083 | 2 119 | 2 241 | 2 299 | 2 320 | 2 384 | 2 429 |
| 521 Retail sale | 2 256 | 2 291 | 2 083 | 2 119 | 2 241 | 2 299 | 2 320 | 2 384 | 2 429 |
| 527 Repair of personal and household goods | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H Hotels and restaurants | 998 | 995 | 946 | 966 | 1 024 | 1 055 | 1 064 | 1 086 | 1 092 |
| 55 Hotels and restaurants | 998 | 995 | 946 | 966 | 1 024 | 1 055 | 1 064 | 1 086 | 1 092 |
| 551 Provision of short term accommodation | 314 | 312 | 297 | 303 | 321 | 331 | 333 | 341 | 343 |
| 553 Restaurants and catering | 684 | 683 | 649 | 663 | 703 | 724 | 731 | 745 | 749 |
| I Transport, storage and communication | 4 826 | 4 736 | 4 745 | 4 881 | 5 307 | 5 552 | 5 681 | 5 704 | 5 835 |
| IA Transport and storage | 4 154 | 4 079 | 4 065 | 4 174 | 4 560 | 4 754 | 4 812 | 4 775 | 4 832 |
| 60 Land transport, transport via pipelines | 2 486 | 2 355 | 2 280 | 2 314 | 2 552 | 2 678 | 2 655 | 2 628 | 2 675 |
| 601 Transport via railways | 274 | 273 | 268 | 266 | 300 | 336 | 339 | 329 | 331 |
| 602 Other land transport | 2 194 | 2 062 | 1 987 | 2 014 | 2 216 | 2 292 | 2 277 | 2 260 | 2 308 |
| 6021 Scheduled passenger land transport | 766 | 722 | 666 | 687 | 725 | 725 | 725 | 720 | 707 |
| 6022 Taxi traffic | 304 | 286 | 267 | 258 | 270 | 285 | 288 | 275 | 269 |
| 6024 Freight transport by road | 1 124 | 1 054 | 1 054 | 1 069 | 1 221 | 1 282 | 1 264 | 1 265 | 1 332 |
| 603 Transport via pipelines | 18 | 20 | 25 | 34 | 36 | 50 | 39 | 39 | 36 |
| 61 Water transport | 450 | 451 | 495 | 526 | 584 | 611 | 616 | 575 | 547 |
| 62 Air transport | 123 | 129 | 132 | 147 | 172 | 176 | 196 | 206 | 212 |
| 63 Supporting transport act., travel agencies | 1 095 | 1 144 | 1 158 | 1 187 | 1 252 | 1 289 | 1 345 | 1 366 | 1 398 |
| 6301 Supporting rail transport activities | | | | | | | | | |
| 6302 Supporting road transport activities | 527 | 544 | 557 | 569 | 588 | 603 | 620 | 631 | 646 |
| 6303 Supporting air transport activities | 48 | 51 | 51 | 54 | 56 | 57 | 57 | 59 | 60 |
| 6309 Other supporting transport activities | 520 | 549 | 550 | 564 | 608 | 629 | 668 | 676 | 692 |
| IB Post and telecommunications | 672 | 657 | 680 | 707 | 747 | 798 | 869 | 929 | 1 003 |
| 64 Post and telecommunications | 672 | 657 | 680 | 707 | 747 | 798 | 869 | 929 | 1 003 |
| 641 Post and courier activities | 414 | 402 | 414 | 420 | 442 | 466 | 503 | 533 | 567 |
| 642 Telecommunications | 258 | 255 | 266 | 287 | 305 | 332 | 366 | 396 | 436 |
| J Financial intermediation | 1 900 | 2 015 | 2 091 | 2 115 | 2 145 | 2 377 | 2 644 | 2 534 | 2 762 |
| 65 Financial intermediation | 1 704 | 1 814 | 1 888 | 1 908 | 1 935 | 2 144 | 2 394 | 2 258 | 2 464 |
| 66 Insurance | 196 | 201 | 203 | 207 | 210 | 216 | 231 | 261 | 273 |
| 67 Activities auxiliary to financial intermediation | 0 | 0 | 0 | 0 | 0 | 17 | 19 | 15 | 25 |
| K Real estate, renting and business activities | 7 386 | 7 564 | 7 865 | 8 241 | 8 731 | 9 241 | 9 593 | 10 170 | 10 606 |
| KA Real estate activities | 4 983 | 5 218 | 5 520 | 5 781 | 6 042 | 6 228 | 6 459 | 6 761 | 7 062 |
| 70 Real estate activities | 4 983 | 5 218 | 5 520 | 5 781 | 6 042 | 6 228 | 6 459 | 6 761 | 7 062 |
| 701 Real estate activities with own property | 184 | 191 | 238 | 245 | 245 | 298 | 266 | 272 | 278 |
| 702 Letting of own property | 4 417 | 4 619 | 4 851 | 5 076 | 5 319 | 5 437 | 5 671 | 5 946 | 6 213 |
| 7021 Letting of dwellings | 4 142 | 4 328 | 4 545 | 4 761 | 4 992 | 5 102 | 5 334 | 5 613 | 5 879 |
| 7022 Operation of dwelling and residential real estate | 275 | 291 | 306 | 315 | 327 | 335 | 337 | 333 | 334 |
| 703 Real estate act. on a fee or contract basis | 382 | 408 | 431 | 460 | 478 | 493 | 522 | 543 | 571 |
| 7031 Real estate agencies | 66 | 73 | 80 | 93 | 102 | 113 | 122 | 122 | 133 |
| 7032 Management of real estate | 316 | 335 | 351 | 367 | 376 | 380 | 400 | 421 | 438 |
| KB Business activities | 2 403 | 2 346 | 2 345 | 2 460 | 2 689 | 3 013 | 3 134 | 3 409 | 3 544 |
| 71 Renting of machinery and equipment | 213 | 247 | 243 | 254 | 290 | 293 | 282 | 284 | 293 |
| 72 Computer and related activities | 338 | 345 | 350 | 399 | 442 | 503 | 509 | 626 | 650 |
| 73 Research and development | 194 | 207 | 227 | 241 | 251 | 268 | 292 | 311 | 324 |
| 74 Other business activities | 1 658 | 1 547 | 1 525 | 1 566 | 1 706 | 1 949 | 2 051 | 2 188 | 2 277 |
| 741 Legal, accounting, book-keeping activities etc. | 106 | 98 | 99 | 106 | 120 | 138 | 151 | 175 | 204 |
| 742 Technical consultancy, testing and analysis | 760 | 675 | 660 | 665 | 731 | 873 | 905 | 956 | 955 |
| 744 Advertising | 308 | 280 | 276 | 278 | 304 | 338 | 343 | 344 | 350 |
| 747 Industrial cleaning | 269 | 292 | 283 | 301 | 306 | 316 | 325 | 345 | 352 |
| 748 Miscellaneous business activities | 215 | 202 | 207 | 216 | 245 | 284 | 327 | 368 | 416 |
| L Administration, compulsory social security | 3 751 | 3 906 | 4 033 | 4 096 | 4 256 | 4 387 | 4 656 | 4 836 | 4 998 |
| 75 Administration, compulsory social security | 3 751 | 3 906 | 4 033 | 4 096 | 4 256 | 4 387 | 4 656 | 4 836 | 4 998 |
| 751 Administration of the State | 3 332 | 3 485 | 3 619 | 3 691 | 3 853 | 3 993 | 4 255 | 4 410 | 4 554 |
| 752 National defence and conscripts | 123 | 101 | 104 | 92 | 98 | 90 | 92 | 100 | 107 |
| 753 Compulsory social security activities | 296 | 320 | 310 | 313 | 305 | 304 | 309 | 326 | 337 |
| 7351 Employment pension insurance | 128 | 138 | 136 | 139 | 135 | 140 | 143 | 152 | 157 |
| 7539 Other compulsory social security activities | 168 | 182 | 174 | 174 | 170 | 164 | 166 | 174 | 180 |
| M Education | 3 627 | 3 717 | 3 831 | 3 907 | 4 049 | 4 169 | 4 256 | 4 275 | 4 367 |
| 80 Education | 3 627 | 3 717 | 3 831 | 3 907 | 4 049 | 4 169 | 4 256 | 4 275 | 4 367 |
| N Health and social work | 4 916 | 5 298 | 5 545 | 5 836 | 6 107 | 6 361 | 6 589 | 6 925 | 7 124 |

Table B: Value added of production 1975-2001 (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 45 Construction | 6 827 | 6 876 | 6 912 | 6 965 | 7 523 | 8 554 | 8 438 | 7 499 | 6 673 |
| 4501 House building | 5 421 | 5 422 | 5 433 | 5 536 | 6 116 | 7 063 | 6 936 | 6 142 | 5 419 |
| 4502 Civil engineering | 1 406 | 1 454 | 1 479 | 1 429 | 1 407 | 1 491 | 1 440 | 1 302 | 1 197 |
| 4509 Construction related service activities | | | | | | | 62 | 55 | 57 |
| G Wholesale and retail trade | 8 493 | 8 887 | 9 249 | 9 952 | 10 524 | 11 439 | 11 155 | 9 729 | 8 207 |
| 50 Sale and repair of motor vehicles | 1 153 | 1 232 | 1 286 | 1 360 | 1 470 | 1 579 | 1 483 | 1 204 | 987 |
| 501 Sale of motor vehicles | 1 153 | 1 232 | 1 286 | 1 360 | 1 470 | 1 579 | 1 147 | 938 | 771 |
| 502 Maintenance and repair of motor vehicles | 0 | 0 | 0 | 0 | 0 | 0 | 336 | 266 | 216 |
| 51 Wholesale trade and commission trade | 4 861 | 5 095 | 5 331 | 5 803 | 6 112 | 6 691 | 6 502 | 5 455 | 4 554 |
| 52 Retail trade, repair of household goods | 2 479 | 2 560 | 2 632 | 2 789 | 2 942 | 3 169 | 3 170 | 3 070 | 2 666 |
| 521 Retail sale | 2 479 | 2 560 | 2 632 | 2 789 | 2 942 | 3 169 | 3 105 | 3 017 | 2 606 |
| 527 Repair of personal and household goods | 0 | 0 | 0 | 0 | 0 | 0 | 65 | 53 | 60 |
| H Hotels and restaurants | 1 130 | 1 172 | 1 216 | 1 287 | 1 350 | 1 438 | 1 486 | 1 372 | 1 259 |
| 55 Hotels and restaurants | 1 130 | 1 172 | 1 216 | 1 287 | 1 350 | 1 438 | 1 486 | 1 372 | 1 259 |
| 551 Provision of short term accommodation | 355 | 367 | 381 | 399 | 417 | 447 | 461 | 427 | 390 |
| 553 Restaurants and catering | 775 | 805 | 835 | 888 | 933 | 991 | 1 025 | 945 | 869 |
| I Transport, storage and communication | 5 992 | 6 206 | 6 316 | 6 747 | 7 137 | 7 620 | 8 055 | 7 754 | 7 759 |
| IA Transport and storage | 4 944 | 5 103 | 5 173 | 5 476 | 5 746 | 6 122 | 6 473 | 6 147 | 6 113 |
| 60 Land transport, transport via pipelines | 2 745 | 2 878 | 2 904 | 3 076 | 3 181 | 3 386 | 3 514 | 3 248 | 3 133 |
| 601 Transport via railways | 327 | 328 | 280 | 305 | 320 | 325 | 339 | 319 | 318 |
| 602 Other land transport | 2 375 | 2 498 | 2 558 | 2 685 | 2 770 | 2 938 | 3 032 | 2 777 | 2 658 |
| 6021 Scheduled passenger land transport | 690 | 688 | 677 | 677 | 656 | 650 | 660 | 609 | 639 |
| 6022 Taxi traffic | 275 | 286 | 295 | 315 | 330 | 349 | 373 | 336 | 316 |
| 6024 Freight transport by road | 1 410 | 1 524 | 1 586 | 1 693 | 1 784 | 1 939 | 1 999 | 1 832 | 1 703 |
| 603 Transport via pipelines | 43 | 52 | 66 | 86 | 91 | 123 | 143 | 152 | 157 |
| 61 Water transport | 499 | 423 | 410 | 385 | 430 | 463 | 503 | 474 | 491 |
| 62 Air transport | 226 | 248 | 263 | 315 | 361 | 416 | 431 | 415 | 392 |
| 63 Supporting transport act., travel agencies | 1 474 | 1 554 | 1 596 | 1 700 | 1 774 | 1 857 | 2 025 | 2 010 | 2 097 |
| 6301 Supporting rail transport activities | | | | | | | 128 | 131 | 137 |
| 6302 Supporting road transport activities | 662 | 679 | 687 | 707 | 730 | 749 | 762 | 770 | 789 |
| 6303 Supporting air transport activities | 61 | 64 | 63 | 67 | 74 | 89 | 97 | 102 | 95 |
| 6309 Other supporting transport activities | 751 | 811 | 846 | 926 | 970 | 1 019 | 1 038 | 1 007 | 1 076 |
| IB Post and telecommunications | 1 048 | 1 103 | 1 143 | 1 271 | 1 391 | 1 498 | 1 582 | 1 607 | 1 646 |
| 64 Post and telecommunications | 1 048 | 1 103 | 1 143 | 1 271 | 1 391 | 1 498 | 1 582 | 1 607 | 1 646 |
| 641 Post and courier activities | 592 | 610 | 610 | 670 | 719 | 759 | 777 | 764 | 755 |
| 642 Telecommunications | 456 | 493 | 533 | 601 | 672 | 739 | 805 | 843 | 891 |
| J Financial intermediation | 3 156 | 3 512 | 3 843 | 4 101 | 4 116 | 4 410 | 4 459 | 3 430 | 2 639 |
| 65 Financial intermediation | 2 850 | 3 166 | 3 451 | 3 740 | 3 721 | 3 951 | 4 064 | 3 018 | 2 289 |
| 66 Insurance | 278 | 276 | 286 | 289 | 307 | 311 | 307 | 301 | 282 |
| 67 Activities auxiliary to financial intermediation | 28 | 70 | 106 | 72 | 88 | 148 | 88 | 111 | 68 |
| K Real estate, renting and business activities | 11 119 | 11 447 | 11 979 | 12 568 | 13 117 | 13 574 | 13 768 | 13 672 | 13 640 |
| KA Real estate activities | 7 297 | 7 453 | 7 757 | 8 068 | 8 296 | 8 424 | 8 626 | 9 096 | 9 430 |
| 70 Real estate activities | 7 297 | 7 453 | 7 757 | 8 068 | 8 296 | 8 424 | 8 626 | 9 096 | 9 430 |
| 701 Real estate activities with own property | 244 | 276 | 264 | 270 | 304 | 349 | 351 | 283 | 232 |
| 702 Letting of own property | 6 461 | 6 563 | 6 855 | 7 119 | 7 283 | 7 384 | 7 597 | 8 109 | 8 445 |
| 7021 Letting of dwellings | 6 130 | 6 223 | 6 513 | 6 773 | 6 929 | 7 017 | 7 204 | 7 636 | 7 997 |
| 7022 Operation of dwelling and residential real estate | 331 | 340 | 342 | 346 | 354 | 367 | 393 | 473 | 448 |
| 703 Real estate act. on a fee or contract basis | 592 | 614 | 638 | 679 | 709 | 691 | 678 | 704 | 753 |
| 7031 Real estate agencies | 137 | 142 | 151 | 173 | 191 | 153 | 129 | 136 | 176 |
| 7032 Management of real estate | 455 | 472 | 487 | 506 | 518 | 538 | 549 | 568 | 577 |
| KB Business activities | 3 822 | 3 994 | 4 222 | 4 500 | 4 821 | 5 150 | 5 142 | 4 576 | 4 210 |
| 71 Renting of machinery and equipment | 305 | 304 | 308 | 293 | 291 | 268 | 256 | 212 | 207 |
| 72 Computer and related activities | 760 | 765 | 840 | 882 | 940 | 951 | 915 | 873 | 861 |
| 73 Research and development | 336 | 351 | 354 | 381 | 397 | 420 | 434 | 442 | 431 |
| 74 Other business activities | 2 421 | 2 574 | 2 720 | 2 944 | 3 193 | 3 511 | 3 537 | 3 049 | 2 711 |
| 741 Legal, accounting, book-keeping activities etc. | 230 | 261 | 290 | 327 | 374 | 419 | 446 | 506 | 546 |
| 742 Technical consultancy, testing and analysis | 980 | 1 074 | 1 136 | 1 228 | 1 323 | 1 472 | 1 538 | 1 213 | 1 045 |
| 744 Advertising | 370 | 369 | 365 | 378 | 402 | 428 | 371 | 273 | 201 |
| 747 Industrial cleaning | 368 | 360 | 366 | 375 | 366 | 381 | 369 | 335 | 307 |
| 748 Miscellaneous business activities | 473 | 510 | 563 | 636 | 728 | 811 | 813 | 722 | 612 |
| L Administration, compulsory social security | 4 990 | 5 056 | 5 074 | 5 185 | 5 316 | 5 408 | 5 413 | 5 504 | 5 384 |
| 75 Administration, compulsory social security | 4 990 | 5 056 | 5 074 | 5 185 | 5 316 | 5 408 | 5 413 | 5 504 | 5 384 |
| 751 Administration of the State | 4 550 | 4 596 | 4 607 | 4 708 | 4 830 | 4 921 | 4 921 | 5 002 | 4 880 |
| 752 National defence and conscripts | 102 | 103 | 97 | 96 | 94 | 91 | 90 | 92 | 91 |
| 753 Compulsory social security activities | 338 | 357 | 370 | 381 | 392 | 396 | 402 | 410 | 413 |
| 7351 Employment pension insurance | 161 | 167 | 171 | 175 | 189 | 198 | 207 | 215 | 217 |
| 7539 Other compulsory social security activities | 177 | 190 | 199 | 206 | 203 | 198 | 195 | 195 | 196 |
| M Education | 4 364 | 4 447 | 4 532 | 4 673 | 4 765 | 4 876 | 4 945 | 4 964 | 4 887 |
| 80 Education | 4 364 | 4 447 | 4 532 | 4 673 | 4 765 | 4 876 | 4 945 | 4 964 | 4 887 |
| N Health and social work | 7 475 | 7 752 | 7 951 | 8 238 | 8 448 | 8 685 | 8 892 | 8 888 | 8 644 |

Source: Statistics Finland, Business structures and economic account

Table B: Value added of production 1975-2001 (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 45 Construction | 5 883 | 5 497 | 5 133 | 5 706 | 6 239 | 6 736 | 6 616 | 6 445 | 6 425 |
| 4501 House building | 4 722 | 4 381 | 3 926 | 4 493 | 4 913 | 5 256 | 5 141 | 4 996 | 4 947 |
| 4502 Civil engineering | 1 113 | 1 062 | 1 149 | 1 149 | 1 252 | 1 399 | 1 390 | 1 352 | 1 372 |
| 4509 Construction related service activities | 48 | 54 | 58 | 64 | 74 | 81 | 85 | 97 | 106 |
| G Wholesale and retail trade | 7 855 | 8 401 | 8 951 | 9 313 | 9 869 | 10 544 | 11 012 | 11 437 | 11 760 |
| 50 Sale and repair of motor vehicles | 1 023 | 1 104 | 1 280 | 1 348 | 1 436 | 1 595 | 1 681 | 1 693 | 1 658 |
| 501 Sale of motor vehicles | 832 | 893 | 947 | 976 | 1 088 | 1 244 | 1 323 | 1 331 | 1 276 |
| 502 Maintenance and repair of motor vehicles | 191 | 211 | 333 | 372 | 348 | 351 | 358 | 362 | 382 |
| 51 Wholesale trade and commission trade | 4 299 | 4 698 | 4 829 | 5 010 | 5 355 | 5 716 | 5 977 | 6 248 | 6 479 |
| 52 Retail trade, repair of household goods | 2 533 | 2 599 | 2 842 | 2 955 | 3 078 | 3 233 | 3 354 | 3 496 | 3 623 |
| 521 Retail sale | 2 473 | 2 532 | 2 772 | 2 887 | 3 017 | 3 172 | 3 295 | 3 438 | 3 565 |
| 527 Repair of personal and household goods | 60 | 67 | 70 | 68 | 61 | 61 | 59 | 58 | 58 |
| H Hotels and restaurants | 1 195 | 1 241 | 1 341 | 1 326 | 1 344 | 1 555 | 1 575 | 1 611 | 1 627 |
| 55 Hotels and restaurants | 1 195 | 1 241 | 1 341 | 1 326 | 1 344 | 1 555 | 1 575 | 1 611 | 1 627 |
| 551 Provision of short term accommodation | 377 | 388 | 401 | 400 | 421 | 509 | 518 | 533 | 529 |
| 553 Restaurants and catering | 818 | 853 | 940 | 926 | 923 | 1 046 | 1 057 | 1 078 | 1 098 |
| I Transport, storage and communication | 7 990 | 8 309 | 8 746 | 9 254 | 9 954 | 10 773 | 11 276 | 12 090 | 12 205 |
| IA Transport and storage | 6 320 | 6 575 | 6 877 | 7 182 | 7 581 | 7 976 | 8 090 | 8 364 | 8 244 |
| 60 Land transport, transport via pipelines | 3 186 | 3 254 | 3 382 | 3 572 | 3 728 | 3 901 | 3 981 | 4 215 | 4 158 |
| 601 Transport via railways | 352 | 366 | 370 | 365 | 395 | 390 | 389 | 399 | 390 |
| 602 Other land transport | 2 670 | 2 704 | 2 821 | 3 007 | 3 138 | 3 287 | 3 380 | 3 599 | 3 533 |
| 6021 Scheduled passenger land transport | 560 | 514 | 503 | 511 | 507 | 509 | 519 | 501 | 523 |
| 6022 Taxi traffic | 293 | 276 | 294 | 337 | 352 | 374 | 396 | 404 | 414 |
| 6024 Freight transport by road | 1 817 | 1 914 | 2 024 | 2 159 | 2 279 | 2 404 | 2 465 | 2 694 | 2 596 |
| 603 Transport via pipelines | 164 | 184 | 191 | 200 | 195 | 224 | 212 | 217 | 235 |
| 61 Water transport | 592 | 647 | 656 | 648 | 697 | 764 | 782 | 747 | 731 |
| 62 Air transport | 414 | 475 | 548 | 571 | 635 | 691 | 692 | 684 | 672 |
| 63 Supporting transport act., travel agencies | 2 128 | 2 199 | 2 291 | 2 391 | 2 521 | 2 620 | 2 635 | 2 718 | 2 683 |
| 6301 Supporting rail transport activities | 138 | 142 | 143 | 153 | 159 | 164 | 169 | 174 | 179 |
| 6302 Supporting road transport activities | 804 | 812 | 825 | 831 | 845 | 853 | 850 | 872 | 862 |
| 6303 Supporting air transport activities | 85 | 89 | 94 | 108 | 124 | 141 | 147 | 155 | 156 |
| 6309 Other supporting transport activities | 1 101 | 1 156 | 1 229 | 1 299 | 1 393 | 1 462 | 1 469 | 1 517 | 1 486 |
| IB Post and telecommunications | 1 670 | 1 734 | 1 869 | 2 072 | 2 373 | 2 797 | 3 186 | 3 726 | 3 961 |
| 64 Post and telecommunications | 1 670 | 1 734 | 1 869 | 2 072 | 2 373 | 2 797 | 3 186 | 3 726 | 3 961 |
| 641 Post and courier activities | 745 | 780 | 818 | 850 | 906 | 939 | 953 | 984 | 984 |
| 642 Telecommunications | 925 | 954 | 1 051 | 1 222 | 1 467 | 1 858 | 2 233 | 2 742 | 2 977 |
| J Financial intermediation | 3 488 | 3 088 | 3 148 | 3 465 | 3 662 | 3 770 | 4 263 | 4 475 | 3 764 |
| 65 Financial intermediation | 3 113 | 2 668 | 2 729 | 2 964 | 3 124 | 3 111 | 3 443 | 3 507 | 2 963 |
| 66 Insurance | 262 | 258 | 301 | 359 | 345 | 390 | 448 | 518 | 350 |
| 67 Activities auxiliary to financial intermediation | 113 | 162 | 118 | 142 | 193 | 269 | 372 | 450 | 451 |
| K Real estate, renting and business activities | 14 015 | 14 665 | 15 269 | 15 864 | 16 605 | 17 376 | 18 258 | 19 250 | 19 988 |
| KA Real estate activities | 9 712 | 9 970 | 10 279 | 10 573 | 10 866 | 11 092 | 11 504 | 11 936 | 12 233 |
| 70 Real estate activities | 9 712 | 9 970 | 10 279 | 10 573 | 10 866 | 11 092 | 11 504 | 11 936 | 12 233 |
| 701 Real estate activities with own property | 178 | 183 | 198 | 217 | 280 | 313 | 367 | 394 | 409 |
| 702 Letting of own property | 8 717 | 8 967 | 9 348 | 9 582 | 9 829 | 9 981 | 10 343 | 10 708 | 10 952 |
| 7021 Letting of dwellings | 8 287 | 8 467 | 8 550 | 8 645 | 8 902 | 9 026 | 9 427 | 9 689 | 9 912 |
| 7022 Operation of dwelling and residential real estate | 430 | 500 | 798 | 937 | 927 | 955 | 916 | 1 019 | 1 040 |
| 703 Real estate act. on a fee or contract basis | 817 | 820 | 733 | 774 | 757 | 798 | 794 | 834 | 872 |
| 7031 Real estate agencies | 228 | 219 | 211 | 250 | 228 | 247 | 241 | 226 | 252 |
| 7032 Management of real estate | 589 | 601 | 522 | 524 | 529 | 551 | 553 | 608 | 620 |
| KB Business activities | 4 303 | 4 695 | 4 990 | 5 291 | 5 739 | 6 284 | 6 754 | 7 314 | 7 755 |
| 71 Renting of machinery and equipment | 193 | 198 | 197 | 213 | 234 | 256 | 272 | 292 | 298 |
| 72 Computer and related activities | 857 | 884 | 857 | 917 | 1 058 | 1 406 | 1 544 | 1 821 | 2 132 |
| 73 Research and development | 393 | 401 | 425 | 465 | 514 | 530 | 547 | 551 | 522 |
| 74 Other business activities | 2 860 | 3 212 | 3 511 | 3 696 | 3 933 | 4 092 | 4 391 | 4 650 | 4 803 |
| 741 Legal, accounting, book-keeping activities etc. | 656 | 751 | 773 | 857 | 1 040 | 1 098 | 1 162 | 1 236 | 1 197 |
| 742 Technical consultancy, testing and analysis | 1 134 | 1 307 | 1 468 | 1 435 | 1 421 | 1 394 | 1 507 | 1 578 | 1 726 |
| 744 Advertising | 205 | 225 | 258 | 288 | 310 | 373 | 395 | 407 | 412 |
| 747 Industrial cleaning | 274 | 286 | 343 | 416 | 413 | 442 | 466 | 508 | 546 |
| 748 Miscellaneous business activities | 591 | 643 | 669 | 700 | 749 | 785 | 861 | 921 | 922 |
| L Administration, compulsory social security | 5 168 | 5 207 | 5 208 | 5 292 | 5 491 | 5 436 | 5 494 | 5 562 | 5 636 |
| 75 Administration, compulsory social security | 5 168 | 5 207 | 5 208 | 5 292 | 5 491 | 5 436 | 5 494 | 5 562 | 5 636 |
| 751 Administration of the State | 4 669 | 4 706 | 4 684 | 4 771 | 4 968 | 4 920 | 4 970 | 5 020 | 5 065 |
| 752 National defence and conscripts | 91 | 89 | 108 | 100 | 93 | 81 | 78 | 82 | 90 |
| 753 Compulsory social security activities | 408 | 412 | 416 | 421 | 430 | 435 | 446 | 460 | 481 |
| 7351 Employment pension insurance | 211 | 205 | 211 | 219 | 225 | 230 | 235 | 245 | 259 |
| 7539 Other compulsory social security activities | 197 | 207 | 205 | 202 | 205 | 205 | 211 | 215 | 222 |
| M Education | 4 824 | 4 842 | 4 988 | 5 084 | 5 178 | 5 332 | 5 444 | 5 505 | 5 554 |
| 80 Education | 4 824 | 4 842 | 4 988 | 5 084 | 5 178 | 5 332 | 5 444 | 5 505 | 5 554 |
| N Health and social work | 8 151 | 8 048 | 8 191 | 8 443 | 8 616 | 8 684 | 8 749 | 8 915 | 9 343 |

Table B: Value added of production 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1 000 000 EUR, at 2000 prices | | | | | | | | | |
| 85 Health and social work | 4 916 | 5 298 | 5 545 | 5 836 | 6 107 | 6 361 | 6 589 | 6 925 | 7 124 |
| 851 Human health activities | 3 506 | 3 740 | 3 871 | 4 002 | 4 129 | 4 240 | 4 365 | 4 604 | 4 692 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 853 Social work activities | 1 410 | 1 558 | 1 674 | 1 834 | 1 978 | 2 121 | 2 224 | 2 321 | 2 432 |
| O Other community, social and personal service act. | 1 954 | 2 046 | 2 100 | 2 236 | 2 325 | 2 438 | 2 545 | 2 653 | 2 765 |
| 90 Environmental care | 226 | 245 | 235 | 260 | 244 | 247 | 266 | 281 | 292 |
| 91 Activities of membership organizations | 674 | 722 | 749 | 777 | 803 | 835 | 874 | 904 | 938 |
| 911 Activities of business and employers' org. | 226 | 233 | 239 | 243 | 248 | 259 | 269 | 278 | 289 |
| 913 Activities of religious and other organizations | 448 | 489 | 510 | 534 | 555 | 576 | 605 | 626 | 649 |
| 9131 Activities of religious organizations | 358 | 392 | 412 | 434 | 451 | 466 | 492 | 511 | 532 |
| 9139 Activities of other organizations | 90 | 97 | 98 | 100 | 104 | 110 | 113 | 115 | 117 |
| 92 Recreational, cultural and sporting activities | 808 | 835 | 874 | 950 | 1 019 | 1 091 | 1 131 | 1 188 | 1 247 |
| 93 Other service activities | 246 | 244 | 242 | 249 | 259 | 265 | 274 | 280 | 288 |
| 9301 Washing and dry cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9309 Other personal service activities | 246 | 244 | 242 | 249 | 259 | 265 | 274 | 280 | 288 |
| P Activities of hhs as employers of domestic staff | 111 | 96 | 94 | 90 | 92 | 85 | 86 | 78 | 72 |
| 95 Activities of hhs as employers of domestic staff | 111 | 96 | 94 | 90 | 92 | 85 | 86 | 78 | 72 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | -1 163 | -1 183 | -1 156 | -1 154 | -1 161 | -1 330 | -1 341 | -1 248 | -1 384 |
| 991 Indirect financial services | -1 163 | -1 183 | -1 156 | -1 154 | -1 161 | -1 330 | -1 341 | -1 248 | -1 384 |
| 999 Industry unknown | | | | | | | | | |

Table B: (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 85 Health and social work | 7 475 | 7 752 | 7 951 | 8 238 | 8 448 | 8 685 | 8 892 | 8 888 | 8 644 |
| 851 Human health activities | 4 875 | 5 030 | 5 106 | 5 278 | 5 331 | 5 403 | 5 478 | 5 445 | 5 280 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 46 | 40 | 40 |
| 853 Social work activities | 2 600 | 2 722 | 2 845 | 2 960 | 3 117 | 3 282 | 3 368 | 3 403 | 3 324 |
| O Other community, social and personal service act. | 2 857 | 2 981 | 3 060 | 3 143 | 3 242 | 3 411 | 3 535 | 3 414 | 3 396 |
| 90 Environmental care | 314 | 346 | 357 | 385 | 401 | 444 | 451 | 432 | 426 |
| 91 Activities of membership organizations | 947 | 966 | 977 | 982 | 991 | 1 030 | 1 054 | 996 | 1 010 |
| 911 Activities of business and employers' org. | 297 | 302 | 309 | 311 | 311 | 330 | 338 | 323 | 317 |
| 913 Activities of religious and other organizations | 650 | 664 | 668 | 671 | 680 | 700 | 716 | 673 | 693 |
| 9131 Activities of religious organizations | 534 | 547 | 550 | 552 | 559 | 579 | 590 | 566 | 570 |
| 9139 Activities of other organizations | 116 | 117 | 118 | 119 | 121 | 121 | 126 | 107 | 123 |
| 92 Recreational, cultural and sporting activities | 1 297 | 1 355 | 1 407 | 1 449 | 1 515 | 1 586 | 1 670 | 1 631 | 1 636 |
| 93 Other service activities | 299 | 314 | 319 | 327 | 335 | 351 | 360 | 355 | 324 |
| 9301 Washing and dry cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 127 | 125 | 120 |
| 9309 Other personal service activities | 299 | 314 | 319 | 327 | 335 | 351 | 233 | 230 | 204 |
| P Activities of hhs as employers of domestic staff | 63 | 60 | 65 | 61 | 59 | 58 | 50 | 51 | 51 |
| 95 Activities of hhs as employers of domestic staff | 63 | 60 | 65 | 61 | 59 | 58 | 50 | 51 | 51 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | -1 549 | -1 547 | -1 714 | -2 020 | -2 196 | -2 552 | -2 722 | -2 160 | -1 664 |
| 991 Indirect financial services | -1 549 | -1 547 | -1 714 | -2 020 | -2 196 | -2 552 | -2 722 | -2 160 | -1 664 |
| 999 Industry unknown | | | | | | | | | |

Table B: (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 85 Health and social work | 8 151 | 8 048 | 8 191 | 8 443 | 8 616 | 8 684 | 8 749 | 8 915 | 9 343 |
| 851 Human health activities | 4 999 | 4 928 | 4 954 | 5 054 | 5 097 | 5 120 | 5 129 | 5 211 | 5 442 |
| 852 Veterinary activities | 42 | 40 | 42 | 40 | 42 | 44 | 42 | 45 | 48 |
| 853 Social work activities | 3 110 | 3 080 | 3 195 | 3 349 | 3 477 | 3 520 | 3 578 | 3 659 | 3 853 |
| O Other community, social and personal service act. | 3 227 | 3 271 | 3 363 | 3 517 | 3 645 | 3 664 | 3 786 | 3 977 | 4 085 |
| 90 Environmental care | 402 | 417 | 412 | 405 | 462 | 469 | 486 | 522 | 520 |
| 91 Activities of membership organizations | 997 | 950 | 979 | 1 036 | 1 071 | 1 088 | 1 137 | 1 157 | 1 174 |
| 911 Activities of business and employers' org. | 316 | 297 | 307 | 308 | 317 | 319 | 329 | 335 | 338 |
| 913 Activities of religious and other organizations | 681 | 653 | 672 | 728 | 754 | 769 | 808 | 822 | 836 |
| 9131 Activities of religious organizations | 548 | 514 | 528 | 575 | 595 | 600 | 612 | 620 | 627 |
| 9139 Activities of other organizations | 133 | 139 | 144 | 153 | 159 | 169 | 196 | 202 | 209 |
| 92 Recreational, cultural and sporting activities | 1 535 | 1 565 | 1 649 | 1 725 | 1 764 | 1 756 | 1 809 | 1 932 | 2 029 |
| 93 Other service activities | 293 | 339 | 323 | 351 | 348 | 351 | 354 | 366 | 362 |
| 9301 Washing and dry cleaning | 109 | 103 | 104 | 110 | 113 | 113 | 115 | 124 | 120 |
| 9309 Other personal service activities | 184 | 236 | 219 | 241 | 235 | 238 | 239 | 242 | 242 |
| P Activities of hhs as employers of domestic staff | 49 | 51 | 80 | 91 | 106 | 119 | 131 | 143 | 150 |
| 95 Activities of hhs as employers of domestic staff | 49 | 51 | 80 | 91 | 106 | 119 | 131 | 143 | 150 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | -2 662 | -2 191 | -2 247 | -2 320 | -2 439 | -2 411 | -2 921 | -3 167 | -2 963 |
| 991 Indirect financial services | -2 662 | -2 191 | -2 247 | -2 320 | -2 439 | -2 411 | -2 921 | -3 167 | -2 963 |
| 999 Industry unknown | | | | | | | | | |

Source: Statistics Finland, Business structures and economic account

Table B: Value added of production 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|--|-------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 100 persons | | | | | | | | |
| 0 Total | 23 242 | 23 028 | 22 611 | 22 402 | 22 890 | 23 556 | 23 852 | 24 120 | 24 211 |
| A Agriculture, hunting and forestry | 3 460 | 3 347 | 3 143 | 3 020 | 3 042 | 3 068 | 3 040 | 3 090 | 2 992 |
| 01 Agriculture, hunting and related service act. | 2 977 | 2 922 | 2 735 | 2 634 | 2 611 | 2 611 | 2 610 | 2 624 | 2 554 |
| 01MAA Agriculture and related service act. | 2 976 | 2 921 | 2 734 | 2 633 | 2 610 | 2 610 | 2 609 | 2 623 | 2 553 |
| 0112 Horticulture | | | | | | | | | |
| 0125 Other farming of animals | 13 | 13 | 13 | 13 | 18 | 23 | 26 | 27 | 28 |
| 013 Mixed farming | 2 940 | 2 886 | 2 699 | 2 597 | 2 569 | 2 563 | 2 559 | 2 572 | 2 501 |
| 014 Agricultural service activities | 23 | 22 | 22 | 23 | 23 | 24 | 24 | 24 | 24 |
| 015 Hunting and game husbandry | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 02 Forestry and related service activities | 483 | 425 | 408 | 386 | 431 | 457 | 430 | 466 | 438 |
| 0211 Forest cultivation | 12 | 12 | 12 | 11 | 12 | 11 | 13 | 10 | 11 |
| 0212 Timber harvesting | 423 | 360 | 346 | 332 | 378 | 402 | 363 | 414 | 387 |
| 0219 Other forestry | | | | | | | | | |
| 0202 Forestry related service activities | 48 | 53 | 50 | 43 | 41 | 44 | 54 | 42 | 40 |
| B Fishing | 35 | 34 | 34 | 33 | 31 | 31 | 29 | 27 | 27 |
| 05 Fishing and fish farming | 35 | 34 | 34 | 33 | 31 | 31 | 29 | 27 | 27 |
| C Mining and quarrying | 84 | 89 | 92 | 91 | 92 | 94 | 96 | 100 | 97 |
| 10 Mining of energy producing minerals | 7 | 7 | 10 | 13 | 14 | 16 | 17 | 24 | 23 |
| 13 Mining of metal ores | 40 | 45 | 46 | 41 | 41 | 40 | 40 | 37 | 36 |
| 14 Mining of other minerals | 37 | 37 | 36 | 37 | 37 | 38 | 39 | 39 | 38 |
| D Manufacturing | 5 772 | 5 710 | 5 540 | 5 382 | 5 569 | 5 819 | 5 794 | 5 693 | 5 597 |
| DA Food products, beverages and tobacco | 661 | 665 | 645 | 629 | 634 | 649 | 650 | 639 | 634 |
| 15 Food products and beverages | 645 | 651 | 631 | 615 | 619 | 634 | 633 | 625 | 621 |
| 151 Food supplies | 645 | 651 | 631 | 615 | 619 | 634 | 633 | 625 | 621 |
| 159 Beverages | | | | | | | | | |
| 16 Tobacco products | 16 | 14 | 14 | 14 | 15 | 15 | 17 | 14 | 13 |
| DB Textiles and textile products | 738 | 703 | 663 | 631 | 651 | 660 | 626 | 597 | 571 |
| 17 Textiles | 285 | 264 | 249 | 233 | 239 | 246 | 223 | 210 | 193 |
| 18 Wearing apparel, dressing of fur | 453 | 439 | 414 | 398 | 412 | 414 | 403 | 387 | 378 |
| DC Leather and leather products | 103 | 103 | 102 | 99 | 101 | 114 | 114 | 112 | 107 |
| 19 Leather and leather products | 103 | 103 | 102 | 99 | 101 | 114 | 114 | 112 | 107 |
| DD Wood and wood products | 490 | 486 | 491 | 492 | 539 | 557 | 530 | 474 | 463 |
| 20 Wood and wood products | 490 | 486 | 491 | 492 | 539 | 557 | 530 | 474 | 463 |
| DE Pulp, paper, publishing and printing | 958 | 953 | 942 | 922 | 937 | 965 | 967 | 956 | 934 |
| 21 Pulp, paper and paper products | 603 | 595 | 585 | 555 | 553 | 571 | 562 | 543 | 517 |
| 22 Publishing and printing | 355 | 358 | 357 | 367 | 384 | 394 | 405 | 413 | 417 |
| DF Coke, petroleum products and nuclear fuel | 31 | 33 | 32 | 32 | 34 | 41 | 39 | 40 | 39 |
| 23 Coke, petroleum products and nuclear fuel | 31 | 33 | 32 | 32 | 34 | 41 | 39 | 40 | 39 |
| DG Chemicals and chemical products | 185 | 188 | 182 | 175 | 179 | 199 | 204 | 202 | 205 |
| 24 Chemicals and chemical products | 185 | 188 | 182 | 175 | 179 | 199 | 204 | 202 | 205 |
| DH Rubber and plastic products | 190 | 186 | 178 | 175 | 179 | 172 | 175 | 172 | 171 |
| 25 Rubber and plastic products | 190 | 186 | 178 | 175 | 179 | 172 | 175 | 172 | 171 |
| 251 Rubber products | 190 | 186 | 178 | 175 | 179 | 172 | 175 | 172 | 171 |
| 252 Plastic products | | | | | | | | | |
| DI Non-metallic mineral products | 244 | 233 | 222 | 206 | 215 | 222 | 225 | 226 | 230 |
| 26 Non-metallic mineral products | 244 | 233 | 222 | 206 | 215 | 222 | 225 | 226 | 230 |
| DJ Basic metals and fabricated metal products | 513 | 519 | 492 | 482 | 509 | 528 | 533 | 544 | 555 |
| 27 Basic metals | 220 | 224 | 217 | 207 | 210 | 215 | 216 | 206 | 204 |
| 28 Fabricated metal products | 293 | 295 | 275 | 275 | 299 | 313 | 317 | 338 | 351 |
| DK Machinery and equipment | 664 | 646 | 636 | 606 | 623 | 684 | 691 | 692 | 662 |
| 29 Machinery and equipment | 664 | 646 | 636 | 606 | 623 | 684 | 691 | 692 | 662 |
| DL Electrical and optical equipment | 386 | 373 | 362 | 358 | 368 | 390 | 395 | 389 | 390 |
| 30 Office machinery and computers | 15 | 15 | 14 | 15 | 16 | 24 | 26 | 28 | 32 |
| 31 Other electrical machinery and apparatus | 205 | 201 | 199 | 193 | 193 | 209 | 217 | 210 | 207 |
| 32 Radio, television and communication equipment | 106 | 104 | 96 | 93 | 95 | 98 | 91 | 88 | 89 |
| 33 Medical and precision instruments, clocks | 60 | 53 | 53 | 57 | 64 | 59 | 61 | 63 | 62 |
| DM Transport equipment | 353 | 367 | 342 | 335 | 342 | 370 | 379 | 389 | 389 |
| 34 Motor vehicles and trailers | 82 | 79 | 78 | 79 | 83 | 94 | 94 | 95 | 92 |
| 35 Other transport equipment | 271 | 288 | 264 | 256 | 259 | 276 | 285 | 294 | 297 |
| 351 Ships and boats | 271 | 288 | 264 | 256 | 259 | 276 | 285 | 294 | 297 |
| 352 Other transport equipment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DN Other manufacturing and recycling | 256 | 255 | 251 | 240 | 258 | 268 | 266 | 261 | 247 |
| 36 Other manufacturing | 256 | 255 | 251 | 240 | 258 | 268 | 266 | 261 | 247 |
| 361 Furniture | 256 | 255 | 251 | 240 | 258 | 268 | 266 | 261 | 247 |
| 362 Other products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E Electricity, gas and water supply | 245 | 257 | 258 | 259 | 259 | 267 | 273 | 265 | 264 |
| 40 Electricity, gas, steam and hot water supply | 221 | 232 | 231 | 233 | 233 | 238 | 244 | 237 | 236 |
| 41 Purification and distribution of water | 24 | 25 | 27 | 26 | 26 | 29 | 29 | 28 | 28 |
| F Construction | 2 152 | 1 894 | 1 800 | 1 739 | 1 735 | 1 777 | 1 769 | 1 807 | 1 859 |

Table C: Employment 1975-2001 (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 Total | 24 360 | 24 394 | 24 317 | 24 453 | 24 699 | 24 930 | 24 815 | 23 419 | 21 767 |
| A Agriculture, hunting and forestry | 2 968 | 2 805 | 2 666 | 2 537 | 2 423 | 2 223 | 2 120 | 2 015 | 1 870 |
| 01 Agriculture, hunting and related service act. | 2 548 | 2 383 | 2 308 | 2 175 | 2 075 | 1 888 | 1 807 | 1 733 | 1 620 |
| 01MAA Agriculture and related service act. | 2 547 | 2 382 | 2 307 | 2 174 | 2 074 | 1 887 | 1 806 | 1 732 | 1 619 |
| 0112 Horticulture | | | | | | | 45 | 43 | 39 |
| 0125 Other farming of animals | 30 | 28 | 28 | 26 | 25 | 20 | 19 | 18 | 16 |
| 013 Mixed farming | 2 493 | 2 330 | 2 255 | 2 124 | 2 025 | 1 843 | 1 717 | 1 647 | 1 542 |
| 014 Agricultural service activities | 24 | 24 | 24 | 24 | 24 | 24 | 25 | 24 | 22 |
| 015 Hunting and game husbandry | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 02 Forestry and related service activities | 420 | 422 | 358 | 362 | 348 | 335 | 313 | 282 | 250 |
| 0211 Forest cultivation | 11 | 10 | 11 | 10 | 11 | 10 | 9 | 9 | 7 |
| 0212 Timber harvesting | 373 | 377 | 315 | 322 | 304 | 291 | 266 | 233 | 204 |
| 0219 Other forestry | | | | | | | | | |
| 0202 Forestry related service activities | 36 | 35 | 32 | 30 | 33 | 34 | 38 | 40 | 39 |
| B Fishing | 26 | 25 | 23 | 22 | 23 | 22 | 22 | 21 | 21 |
| 05 Fishing and fish farming | 26 | 25 | 23 | 22 | 23 | 22 | 22 | 21 | 21 |
| C Mining and quarrying | 89 | 88 | 80 | 75 | 71 | 67 | 65 | 62 | 63 |
| 10 Mining of energy producing minerals | 16 | 17 | 19 | 20 | 18 | 18 | 19 | 16 | 19 |
| 13 Mining of metal ores | 33 | 30 | 21 | 19 | 16 | 14 | 10 | 10 | 10 |
| 14 Mining of other minerals | 40 | 41 | 40 | 36 | 37 | 35 | 36 | 36 | 34 |
| D Manufacturing | 5 538 | 5 488 | 5 320 | 5 240 | 5 187 | 5 147 | 5 039 | 4 602 | 4 160 |
| DA Food products, beverages and tobacco | 627 | 621 | 614 | 610 | 605 | 585 | 580 | 552 | 512 |
| 15 Food products and beverages | 614 | 608 | 602 | 598 | 593 | 573 | 569 | 541 | 502 |
| 151 Food supplies | 614 | 553 | 547 | 544 | 540 | 519 | 514 | 487 | 453 |
| 159 Beverages | | 55 | 55 | 54 | 53 | 54 | 55 | 54 | 49 |
| 16 Tobacco products | 13 | 13 | 12 | 12 | 12 | 12 | 11 | 11 | 10 |
| DB Textiles and textile products | 555 | 530 | 502 | 464 | 418 | 388 | 341 | 269 | 218 |
| 17 Textiles | 180 | 169 | 159 | 152 | 144 | 134 | 125 | 102 | 88 |
| 18 Wearing apparel, dressing of fur | 375 | 361 | 343 | 312 | 274 | 254 | 216 | 167 | 130 |
| DC Leather and leather products | 103 | 107 | 93 | 88 | 86 | 70 | 66 | 55 | 42 |
| 19 Leather and leather products | 103 | 107 | 93 | 88 | 86 | 70 | 66 | 55 | 42 |
| DD Wood and wood products | 452 | 432 | 409 | 387 | 381 | 395 | 388 | 341 | 297 |
| 20 Wood and wood products | 452 | 432 | 409 | 387 | 381 | 395 | 388 | 341 | 297 |
| DE Pulp, paper, publishing and printing | 948 | 943 | 924 | 918 | 919 | 926 | 912 | 863 | 809 |
| 21 Pulp, paper and paper products | 514 | 504 | 485 | 473 | 470 | 472 | 462 | 437 | 411 |
| 22 Publishing and printing | 434 | 439 | 439 | 445 | 449 | 454 | 450 | 426 | 398 |
| DF Coke, petroleum products and nuclear fuel | 35 | 35 | 39 | 42 | 40 | 36 | 34 | 36 | 36 |
| 23 Coke, petroleum products and nuclear fuel | 35 | 35 | 39 | 42 | 40 | 36 | 34 | 36 | 36 |
| DG Chemicals and chemical products | 207 | 207 | 206 | 209 | 209 | 207 | 208 | 203 | 192 |
| 24 Chemicals and chemical products | 207 | 207 | 206 | 209 | 209 | 207 | 208 | 203 | 192 |
| DH Rubber and plastic products | 165 | 161 | 161 | 162 | 149 | 153 | 157 | 144 | 132 |
| 25 Rubber and plastic products | 165 | 161 | 161 | 162 | 149 | 153 | 157 | 144 | 132 |
| 251 Rubber products | 165 | 40 | 38 | 35 | 22 | 22 | 23 | 22 | 22 |
| 252 Plastic products | | 121 | 123 | 127 | 127 | 131 | 134 | 122 | 110 |
| DI Non-metallic mineral products | 228 | 225 | 220 | 220 | 218 | 225 | 225 | 199 | 172 |
| 26 Non-metallic mineral products | 228 | 225 | 220 | 220 | 218 | 225 | 225 | 199 | 172 |
| DJ Basic metals and fabricated metal products | 550 | 548 | 525 | 527 | 525 | 542 | 542 | 492 | 446 |
| 27 Basic metals | 204 | 205 | 201 | 190 | 185 | 180 | 182 | 173 | 165 |
| 28 Fabricated metal products | 346 | 343 | 324 | 337 | 340 | 362 | 360 | 319 | 281 |
| DK Machinery and equipment | 649 | 638 | 599 | 614 | 625 | 640 | 657 | 593 | 522 |
| 29 Machinery and equipment | 649 | 638 | 599 | 614 | 625 | 640 | 657 | 593 | 522 |
| DL Electrical and optical equipment | 402 | 432 | 435 | 435 | 450 | 435 | 421 | 385 | 364 |
| 30 Office machinery and computers | 33 | 34 | 34 | 31 | 31 | 30 | 26 | 26 | 29 |
| 31 Other electrical machinery and apparatus | 203 | 216 | 215 | 204 | 203 | 187 | 183 | 169 | 152 |
| 32 Radio, television and communication equipment | 100 | 108 | 113 | 127 | 139 | 142 | 135 | 117 | 117 |
| 33 Medical and precision instruments, clocks | 66 | 74 | 73 | 73 | 77 | 76 | 77 | 73 | 66 |
| DM Transport equipment | 375 | 375 | 365 | 342 | 330 | 313 | 285 | 265 | 240 |
| 34 Motor vehicles and trailers | 92 | 98 | 103 | 110 | 104 | 105 | 96 | 85 | 72 |
| 35 Other transport equipment | 283 | 277 | 262 | 232 | 226 | 208 | 189 | 180 | 168 |
| 351 Ships and boats | 283 | 199 | 181 | 163 | 159 | 137 | 117 | 107 | 99 |
| 352 Other transport equipment | 0 | 78 | 81 | 69 | 67 | 71 | 72 | 73 | 69 |
| DN Other manufacturing and recycling | 242 | 234 | 228 | 222 | 232 | 232 | 223 | 205 | 178 |
| 36 Other manufacturing | 242 | 234 | 228 | 222 | 232 | 232 | 223 | 205 | 178 |
| 361 Furniture | 242 | 170 | 165 | 159 | 172 | 175 | 166 | 151 | 129 |
| 362 Other products | 0 | 64 | 63 | 63 | 60 | 57 | 57 | 54 | 49 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E Electricity, gas and water supply | 266 | 272 | 271 | 270 | 269 | 265 | 260 | 255 | 245 |
| 40 Electricity, gas, steam and hot water supply | 236 | 242 | 240 | 241 | 240 | 237 | 231 | 227 | 219 |
| 41 Purification and distribution of water | 30 | 30 | 31 | 29 | 29 | 28 | 29 | 28 | 26 |
| F Construction | 1 863 | 1 829 | 1 869 | 1 869 | 1 926 | 2 053 | 2 101 | 1 828 | 1 567 |

Source: Statistics Finland, Business structures and economic account

ENV/EPOC/WGWPR/SE(2004)1/FINAL
Table C: Employment 1975-2001 (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 Total | 20 468 | 20 180 | 20 578 | 20 849 | 21 539 | 21 970 | 22 525 | 23 034 | 23 295 |
| A Agriculture, hunting and forestry | 1 739 | 1 692 | 1 605 | 1 515 | 1 489 | 1 379 | 1 390 | 1 357 | 1 295 |
| 01 Agriculture, hunting and related service act. | 1 509 | 1 500 | 1 388 | 1 304 | 1 277 | 1 177 | 1 190 | 1 154 | 1 087 |
| 01MAA Agriculture and related service act. | 1 508 | 1 499 | 1 387 | 1 303 | 1 276 | 1 176 | 1 189 | 1 153 | 1 086 |
| 0112 Horticulture | 35 | 31 | 32 | 31 | 31 | 31 | 31 | 31 | 31 |
| 0125 Other farming of animals | 15 | 15 | 22 | 20 | 20 | 20 | 20 | 20 | 20 |
| 013 Mixed farming | 1 436 | 1 434 | 1 313 | 1 233 | 1 206 | 1 106 | 1 119 | 1 083 | 1 016 |
| 014 Agricultural service activities | 22 | 19 | 20 | 19 | 19 | 19 | 19 | 19 | 19 |
| 015 Hunting and game husbandry | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 02 Forestry and related service activities | 230 | 192 | 217 | 211 | 212 | 202 | 200 | 203 | 208 |
| 0211 Forest cultivation | 7 | 7 | 8 | 9 | 9 | 9 | 12 | 13 | 11 |
| 0212 Timber harvesting | 183 | 144 | 164 | 155 | 156 | 143 | 141 | 144 | 147 |
| 0219 Other forestry | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 0 | 2 |
| 0202 Forestry related service activities | 39 | 40 | 44 | 45 | 46 | 49 | 46 | 46 | 48 |
| B Fishing | 21 | 19 | 20 | 20 | 18 | 18 | 16 | 18 | 18 |
| 05 Fishing and fish farming | 21 | 19 | 20 | 20 | 18 | 18 | 16 | 18 | 18 |
| C Mining and quarrying | 56 | 56 | 55 | 55 | 62 | 56 | 58 | 58 | 59 |
| 10 Mining of energy producing minerals | 17 | 20 | 20 | 21 | 25 | 20 | 20 | 19 | 19 |
| 13 Mining of metal ores | 8 | 7 | 6 | 6 | 6 | 6 | 7 | 7 | 8 |
| 14 Mining of other minerals | 31 | 29 | 29 | 28 | 31 | 30 | 31 | 32 | 32 |
| D Manufacturing | 3 917 | 3 958 | 4 141 | 4 167 | 4 294 | 4 421 | 4 508 | 4 599 | 4 629 |
| DA Food products, beverages and tobacco | 473 | 452 | 462 | 455 | 448 | 450 | 442 | 425 | 418 |
| 15 Food products and beverages | 464 | 443 | 453 | 447 | 441 | 443 | 438 | 421 | 414 |
| 151 Food supplies | 423 | 402 | 414 | 411 | 405 | 407 | 401 | 382 | 374 |
| 159 Beverages | 41 | 41 | 39 | 36 | 36 | 36 | 37 | 39 | 40 |
| 16 Tobacco products | 9 | 9 | 9 | 8 | 7 | 7 | 4 | 4 | 4 |
| DB Textiles and textile products | 189 | 180 | 178 | 170 | 173 | 176 | 176 | 168 | 166 |
| 17 Textiles | 78 | 76 | 77 | 79 | 81 | 81 | 81 | 78 | 78 |
| 18 Wearing apparel, dressing of fur | 111 | 104 | 101 | 91 | 92 | 95 | 95 | 90 | 88 |
| DC Leather and leather products | 38 | 39 | 39 | 35 | 32 | 33 | 33 | 31 | 30 |
| 19 Leather and leather products | 38 | 39 | 39 | 35 | 32 | 33 | 33 | 31 | 30 |
| DD Wood and wood products | 280 | 295 | 298 | 286 | 300 | 307 | 312 | 318 | 314 |
| 20 Wood and wood products | 280 | 295 | 298 | 286 | 300 | 307 | 312 | 318 | 314 |
| DE Pulp, paper, publishing and printing | 769 | 740 | 733 | 715 | 718 | 717 | 730 | 734 | 728 |
| 21 Pulp, paper and paper products | 399 | 396 | 393 | 386 | 389 | 384 | 388 | 384 | 385 |
| 22 Publishing and printing | 370 | 344 | 340 | 329 | 329 | 333 | 342 | 350 | 343 |
| DF Coke, petroleum products and nuclear fuel | 35 | 33 | 33 | 34 | 34 | 33 | 32 | 37 | 36 |
| 23 Coke, petroleum products and nuclear fuel | 35 | 33 | 33 | 34 | 34 | 33 | 32 | 37 | 36 |
| DG Chemicals and chemical products | 186 | 183 | 188 | 186 | 184 | 187 | 187 | 188 | 190 |
| 24 Chemicals and chemical products | 186 | 183 | 188 | 186 | 184 | 187 | 187 | 188 | 190 |
| DH Rubber and plastic products | 124 | 132 | 139 | 142 | 157 | 169 | 179 | 190 | 183 |
| 25 Rubber and plastic products | 124 | 132 | 139 | 142 | 157 | 169 | 179 | 190 | 183 |
| 251 Rubber products | 21 | 24 | 27 | 25 | 25 | 26 | 27 | 28 | 28 |
| 252 Plastic products | 103 | 108 | 112 | 117 | 132 | 143 | 152 | 162 | 155 |
| DI Non-metallic mineral products | 139 | 144 | 138 | 135 | 141 | 150 | 159 | 168 | 166 |
| 26 Non-metallic mineral products | 139 | 144 | 138 | 135 | 141 | 150 | 159 | 168 | 166 |
| DJ Basic metals and fabricated metal products | 422 | 441 | 456 | 480 | 543 | 557 | 565 | 589 | 623 |
| 27 Basic metals | 161 | 162 | 165 | 171 | 169 | 173 | 172 | 169 | 171 |
| 28 Fabricated metal products | 261 | 279 | 291 | 309 | 374 | 384 | 393 | 420 | 452 |
| DK Machinery and equipment | 501 | 511 | 557 | 589 | 593 | 613 | 600 | 619 | 635 |
| 29 Machinery and equipment | 501 | 511 | 557 | 589 | 593 | 613 | 600 | 619 | 635 |
| DL Electrical and optical equipment | 371 | 421 | 509 | 539 | 562 | 610 | 673 | 693 | 699 |
| 30 Office machinery and computers | 31 | 31 | 35 | 35 | 25 | 24 | 21 | 10 | 6 |
| 31 Other electrical machinery and apparatus | 142 | 148 | 160 | 164 | 169 | 167 | 166 | 170 | 174 |
| 32 Radio, television and communication equipment | 129 | 163 | 226 | 249 | 269 | 312 | 359 | 386 | 389 |
| 33 Medical and precision instruments, clocks | 69 | 79 | 88 | 91 | 99 | 107 | 127 | 127 | 130 |
| DM Transport equipment | 224 | 227 | 242 | 236 | 229 | 233 | 232 | 245 | 248 |
| 34 Motor vehicles and trailers | 62 | 64 | 68 | 68 | 73 | 77 | 75 | 77 | 76 |
| 35 Other transport equipment | 162 | 163 | 174 | 168 | 156 | 156 | 157 | 168 | 172 |
| 351 Ships and boats | 96 | 101 | 114 | 111 | 100 | 102 | 106 | 117 | 123 |
| 352 Other transport equipment | 66 | 62 | 60 | 57 | 56 | 54 | 51 | 51 | 49 |
| DN Other manufacturing and recycling | 166 | 160 | 169 | 165 | 180 | 186 | 188 | 194 | 193 |
| 36 Other manufacturing | 165 | 158 | 165 | 161 | 175 | 182 | 184 | 187 | 188 |
| 361 Furniture | 117 | 110 | 115 | 112 | 123 | 130 | 134 | 138 | 138 |
| 362 Other products | 48 | 48 | 50 | 49 | 52 | 52 | 50 | 49 | 50 |
| 37 Recycling | 1 | 2 | 4 | 4 | 5 | 4 | 4 | 7 | 5 |
| E Electricity, gas and water supply | 221 | 209 | 201 | 199 | 197 | 194 | 189 | 176 | 176 |
| 40 Electricity, gas, steam and hot water supply | 196 | 183 | 175 | 174 | 172 | 170 | 165 | 153 | 152 |
| 41 Purification and distribution of water | 25 | 26 | 26 | 25 | 25 | 24 | 24 | 23 | 24 |
| F Construction | 1 326 | 1 177 | 1 183 | 1 232 | 1 365 | 1 425 | 1 490 | 1 544 | 1 519 |

Table C: Employment 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|--|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 100 persons | | | | | | | | |
| 45 Construction | 2 152 | 1 894 | 1 800 | 1 739 | 1 735 | 1 777 | 1 769 | 1 807 | 1 859 |
| 4501 House building | 1 557 | 1 335 | 1 278 | 1 235 | 1 231 | 1 269 | 1 261 | 1 308 | 1 386 |
| 4502 Civil engineering | 595 | 559 | 522 | 504 | 504 | 508 | 508 | 499 | 473 |
| 4509 Construction related service activities | | | | | | | | | |
| G Wholesale and retail trade | 3 130 | 3 088 | 2 952 | 2 880 | 2 929 | 2 999 | 3 007 | 3 058 | 3 085 |
| 50 Sale and repair of motor vehicles | 405 | 398 | 376 | 372 | 376 | 387 | 395 | 437 | 428 |
| 501 Sale of motor vehicles | 405 | 398 | 376 | 372 | 376 | 387 | 395 | 437 | 428 |
| 502 Maintenance and repair of motor vehicles | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 51 Wholesale trade and commission trade | 997 | 991 | 965 | 923 | 943 | 963 | 977 | 959 | 973 |
| 52 Retail trade, repair of household goods | 1 728 | 1 699 | 1 611 | 1 585 | 1 610 | 1 649 | 1 635 | 1 662 | 1 684 |
| 521 Retail sale | 1 728 | 1 699 | 1 611 | 1 585 | 1 610 | 1 649 | 1 635 | 1 662 | 1 684 |
| 527 Repair of personal and household goods | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| H Hotels and restaurants | 667 | 649 | 675 | 681 | 648 | 662 | 665 | 671 | 676 |
| 55 Hotels and restaurants | 667 | 649 | 675 | 681 | 648 | 662 | 665 | 671 | 676 |
| 551 Provision of short term accommodation | 159 | 155 | 161 | 163 | 153 | 157 | 157 | 160 | 163 |
| 553 Restaurants and catering | 508 | 494 | 514 | 518 | 495 | 505 | 508 | 511 | 513 |
| I Transport, storage and communication | 1 592 | 1 612 | 1 610 | 1 631 | 1 660 | 1 690 | 1 734 | 1 735 | 1 735 |
| IA Transport and storage | 1 164 | 1 166 | 1 162 | 1 178 | 1 203 | 1 226 | 1 258 | 1 255 | 1 253 |
| 60 Land transport, transport via pipelines | 777 | 785 | 783 | 788 | 798 | 810 | 829 | 832 | 836 |
| 601 Transport via railways | 195 | 193 | 193 | 192 | 192 | 194 | 196 | 195 | 193 |
| 602 Other land transport | 582 | 592 | 590 | 596 | 606 | 616 | 633 | 637 | 643 |
| 6021 Scheduled passenger land transport | 161 | 162 | 160 | 158 | 157 | 158 | 157 | 158 | 156 |
| 6022 Taxi traffic | 71 | 73 | 70 | 69 | 70 | 70 | 72 | 73 | 76 |
| 6024 Freight transport by road | 350 | 357 | 360 | 369 | 379 | 388 | 404 | 406 | 411 |
| 603 Transport via pipelines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 61 Water transport | 137 | 129 | 125 | 133 | 139 | 144 | 149 | 146 | 137 |
| 62 Air transport | 34 | 34 | 33 | 34 | 35 | 37 | 38 | 38 | 39 |
| 63 Supporting transport act., travel agencies | 216 | 218 | 221 | 223 | 231 | 235 | 242 | 239 | 241 |
| 6301 Supporting rail transport activities | | | | | | | | | |
| 6302 Supporting road transport activities | 40 | 41 | 39 | 38 | 38 | 38 | 38 | 37 | 37 |
| 6303 Supporting air transport activities | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| 6309 Other supporting transport activities | 165 | 166 | 171 | 174 | 182 | 186 | 193 | 191 | 193 |
| IB Post and telecommunications | 428 | 446 | 448 | 453 | 457 | 464 | 476 | 480 | 482 |
| 64 Post and telecommunications | 428 | 446 | 448 | 453 | 457 | 464 | 476 | 480 | 482 |
| 641 Post and courier activities | 278 | 285 | 285 | 288 | 290 | 296 | 302 | 305 | 308 |
| 642 Telecommunications | 150 | 161 | 163 | 165 | 167 | 168 | 174 | 175 | 174 |
| J Financial intermediation | 501 | 511 | 518 | 522 | 522 | 546 | 558 | 566 | 578 |
| 65 Financial intermediation | 410 | 418 | 424 | 426 | 428 | 446 | 456 | 463 | 471 |
| 66 Insurance | 91 | 93 | 94 | 96 | 94 | 97 | 99 | 100 | 102 |
| 67 Activities auxiliary to financial intermediation | 0 | 0 | 0 | 0 | 0 | 3 | 3 | 3 | 5 |
| K Real estate, renting and business activities | 786 | 796 | 799 | 818 | 865 | 935 | 991 | 1 040 | 1 094 |
| KA Real estate activities | 262 | 269 | 278 | 284 | 294 | 300 | 309 | 317 | 321 |
| 70 Real estate activities | 262 | 269 | 278 | 284 | 294 | 300 | 309 | 317 | 321 |
| 701 Real estate activities with own property | 36 | 31 | 30 | 29 | 29 | 29 | 29 | 30 | 31 |
| 702 Letting of own property | 45 | 47 | 48 | 48 | 49 | 49 | 49 | 47 | 47 |
| 7021 Lettings of dwellings | 32 | 32 | 32 | 31 | 31 | 31 | 31 | 30 | 30 |
| 7022 Operation of dwelling and residential real estate | 13 | 15 | 16 | 17 | 18 | 18 | 18 | 17 | 17 |
| 703 Real estate act. on a fee or contract basis | 181 | 191 | 200 | 207 | 216 | 222 | 231 | 240 | 243 |
| 7031 Real estate agencies | 13 | 14 | 15 | 17 | 19 | 21 | 23 | 25 | 27 |
| 7032 Management of real estate | 168 | 177 | 185 | 190 | 197 | 201 | 208 | 215 | 216 |
| KB Business activities | 524 | 527 | 521 | 534 | 571 | 635 | 682 | 723 | 773 |
| 71 Renting of machinery and equipment | 28 | 28 | 29 | 30 | 31 | 32 | 32 | 32 | 33 |
| 72 Computer and related activities | 47 | 50 | 55 | 59 | 65 | 81 | 89 | 93 | 106 |
| 73 Research and development | 61 | 62 | 61 | 64 | 66 | 70 | 73 | 76 | 80 |
| 74 Other business activities | 388 | 387 | 376 | 381 | 409 | 452 | 488 | 522 | 554 |
| 741 Legal, accounting, book-keeping activities etc. | 31 | 32 | 32 | 35 | 38 | 40 | 50 | 53 | 60 |
| 742 Technical consultancy, testing and analysis | 157 | 147 | 137 | 134 | 144 | 169 | 178 | 189 | 192 |
| 744 Advertising | 46 | 45 | 44 | 45 | 45 | 50 | 52 | 53 | 54 |
| 747 Industrial cleaning | 99 | 107 | 105 | 104 | 114 | 119 | 123 | 130 | 138 |
| 748 Miscellaneous business activities | 55 | 56 | 58 | 63 | 68 | 74 | 85 | 97 | 110 |
| L Administration, compulsory social security | 1 257 | 1 295 | 1 350 | 1 375 | 1 404 | 1 443 | 1 509 | 1 571 | 1 594 |
| 75 Administration, compulsory social security | 1 257 | 1 295 | 1 350 | 1 375 | 1 404 | 1 443 | 1 509 | 1 571 | 1 594 |
| 751 Administration of the State | 882 | 914 | 977 | 998 | 1 054 | 1 095 | 1 158 | 1 202 | 1 231 |
| 752 National defence and conscripts | 300 | 307 | 300 | 303 | 276 | 273 | 275 | 290 | 283 |
| 753 Compulsory social security activities | 75 | 74 | 73 | 74 | 74 | 75 | 76 | 79 | 80 |
| 7351 Employment pension insurance | 22 | 22 | 22 | 23 | 23 | 24 | 24 | 26 | 26 |
| 7539 Other compulsory social security activities | 53 | 52 | 51 | 51 | 51 | 51 | 52 | 53 | 54 |
| M Education | 1 025 | 1 046 | 1 072 | 1 073 | 1 107 | 1 132 | 1 167 | 1 178 | 1 202 |
| 80 Education | 1 025 | 1 046 | 1 072 | 1 073 | 1 107 | 1 132 | 1 167 | 1 178 | 1 202 |
| N Health and social work | 1 874 | 2 021 | 2 075 | 2 180 | 2 280 | 2 333 | 2 426 | 2 509 | 2 573 |

Source: Statistics Finland, Business structures and economic account

ENV/EPOC/WGWPR/SE(2004)1/FINAL
Table C: Employment 1975-2001 (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 45 Construction | 1 863 | 1 829 | 1 869 | 1 869 | 1 926 | 2 053 | 2 101 | 1 828 | 1 567 |
| 4501 House building | 1 400 | 1 364 | 1 411 | 1 431 | 1 488 | 1 617 | 1 673 | 1 417 | 1 192 |
| 4502 Civil engineering | 463 | 465 | 458 | 438 | 438 | 436 | 412 | 397 | 362 |
| 4509 Construction related service activities | | | | | | | 16 | 14 | 13 |
| G Wholesale and retail trade | 3 119 | 3 156 | 3 141 | 3 200 | 3 258 | 3 307 | 3 275 | 2 972 | 2 635 |
| 50 Sale and repair of motor vehicles | 442 | 455 | 461 | 495 | 517 | 541 | 526 | 461 | 405 |
| 501 Sale of motor vehicles | 442 | 455 | 461 | 495 | 517 | 541 | 316 | 297 | 257 |
| 502 Maintenance and repair of motor vehicles | 0 | 0 | 0 | 0 | 0 | 0 | 210 | 164 | 148 |
| 51 Wholesale trade and commission trade | 977 | 980 | 961 | 964 | 981 | 1 005 | 979 | 902 | 798 |
| 52 Retail trade, repair of household goods | 1 700 | 1 721 | 1 719 | 1 741 | 1 760 | 1 761 | 1 770 | 1 609 | 1 432 |
| 521 Retail sale | 1 700 | 1 721 | 1 719 | 1 741 | 1 760 | 1 761 | 1 743 | 1 572 | 1 400 |
| 527 Repair of personal and household goods | 0 | 0 | 0 | 0 | 0 | 0 | 27 | 37 | 32 |
| H Hotels and restaurants | 692 | 697 | 703 | 719 | 737 | 772 | 775 | 698 | 639 |
| 55 Hotels and restaurants | 692 | 697 | 703 | 719 | 737 | 772 | 775 | 698 | 639 |
| 551 Provision of short term accomodation | 165 | 167 | 168 | 168 | 175 | 181 | 182 | 164 | 146 |
| 553 Restaurants and catering | 527 | 530 | 535 | 551 | 562 | 591 | 593 | 534 | 493 |
| I Transport, storage and communication | 1 740 | 1 745 | 1 745 | 1 773 | 1 811 | 1 836 | 1 838 | 1 726 | 1 646 |
| IA Transport and storage | 1 246 | 1 239 | 1 243 | 1 263 | 1 294 | 1 307 | 1 314 | 1 219 | 1 168 |
| 60 Land transport, transport via pipelines | 830 | 825 | 836 | 860 | 890 | 882 | 878 | 810 | 762 |
| 601 Transport via railways | 188 | 185 | 181 | 179 | 168 | 160 | 156 | 145 | 140 |
| 602 Other land transport | 642 | 640 | 655 | 681 | 722 | 722 | 722 | 665 | 622 |
| 6021 Scheduled passenger land transport | 153 | 152 | 152 | 151 | 154 | 155 | 154 | 149 | 137 |
| 6022 Taxi traffic | 75 | 77 | 77 | 84 | 90 | 93 | 94 | 85 | 87 |
| 6024 Freight transport by road | 414 | 411 | 426 | 446 | 478 | 474 | 474 | 431 | 398 |
| 603 Transport via pipelines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 61 Water transport | 136 | 127 | 119 | 109 | 103 | 105 | 108 | 107 | 106 |
| 62 Air transport | 40 | 42 | 43 | 44 | 48 | 53 | 56 | 52 | 51 |
| 63 Supporting transport act., travel agencies | 240 | 245 | 245 | 250 | 253 | 267 | 272 | 250 | 249 |
| 6301 Supporting rail transport activities | | | | | | | | | |
| 6302 Supporting road transport activities | 37 | 37 | 37 | 37 | 37 | 37 | 35 | 33 | 33 |
| 6303 Supporting air transport activities | 11 | 11 | 11 | 12 | 13 | 16 | 16 | 17 | 17 |
| 6309 Other supporting transport activities | 192 | 197 | 197 | 201 | 203 | 214 | 221 | 200 | 199 |
| IB Post and telecommunications | 494 | 506 | 502 | 510 | 517 | 529 | 524 | 507 | 478 |
| 64 Post and telecommunications | 494 | 506 | 502 | 510 | 517 | 529 | 524 | 507 | 478 |
| 641 Post and courier activities | 315 | 321 | 320 | 325 | 330 | 341 | 341 | 327 | 303 |
| 642 Telecommunications | 179 | 185 | 182 | 185 | 187 | 188 | 183 | 180 | 175 |
| J Financial intermediation | 591 | 629 | 642 | 676 | 687 | 700 | 661 | 620 | 572 |
| 65 Financial intermediation | 482 | 516 | 526 | 558 | 569 | 577 | 540 | 500 | 454 |
| 66 Insurance | 104 | 101 | 104 | 106 | 107 | 109 | 106 | 103 | 102 |
| 67 Activities auxiliary to financial intermediation | 5 | 12 | 12 | 12 | 11 | 14 | 15 | 17 | 16 |
| K Real estate, renting and business activities | 1 149 | 1 199 | 1 266 | 1 339 | 1 434 | 1 547 | 1 608 | 1 548 | 1 436 |
| KA Real estate activities | 327 | 326 | 330 | 331 | 335 | 346 | 344 | 337 | 329 |
| 70 Real estate activities | 327 | 326 | 330 | 331 | 335 | 346 | 344 | 337 | 329 |
| 701 Real estate activities with own property | 33 | 32 | 32 | 32 | 33 | 35 | 36 | 29 | 20 |
| 702 Letting of own property | 48 | 48 | 50 | 50 | 52 | 53 | 54 | 54 | 55 |
| 7021 Letting of dwellings | 30 | 30 | 30 | 30 | 29 | 29 | 29 | 29 | 28 |
| 7022 Operation of dwelling and residential real estate | 18 | 18 | 20 | 20 | 23 | 24 | 25 | 25 | 27 |
| 703 Real estate act. on a fee or contract basis | 246 | 246 | 248 | 249 | 250 | 258 | 254 | 254 | 254 |
| 7031 Real estate agencies | 29 | 30 | 31 | 32 | 34 | 36 | 38 | 34 | 31 |
| 7032 Management of real estate | 217 | 216 | 217 | 217 | 216 | 222 | 216 | 220 | 223 |
| KB Business activities | 822 | 873 | 936 | 1 008 | 1 099 | 1 201 | 1 264 | 1 211 | 1 107 |
| 71 Renting of machinery and equipment | 33 | 33 | 33 | 35 | 35 | 36 | 40 | 36 | 33 |
| 72 Computer and related activities | 124 | 139 | 154 | 162 | 174 | 176 | 177 | 172 | 159 |
| 73 Research and development | 83 | 88 | 91 | 92 | 97 | 99 | 103 | 104 | 101 |
| 74 Other business activities | 582 | 613 | 658 | 719 | 793 | 890 | 944 | 899 | 814 |
| 741 Legal, accounting, book-keeping activities etc. | 68 | 76 | 85 | 96 | 114 | 130 | 151 | 178 | 174 |
| 742 Technical consultancy, testing and analysis | 195 | 210 | 231 | 252 | 281 | 320 | 341 | 308 | 254 |
| 744 Advertising | 56 | 56 | 56 | 56 | 56 | 58 | 57 | 57 | 55 |
| 747 Industrial cleaning | 143 | 140 | 141 | 150 | 151 | 163 | 164 | 162 | 158 |
| 748 Miscellaneous business activities | 120 | 131 | 145 | 165 | 191 | 219 | 231 | 194 | 173 |
| L Administration, compulsory social security | 1 567 | 1 580 | 1 595 | 1 612 | 1 639 | 1 638 | 1 636 | 1 676 | 1 635 |
| 75 Administration, compulsory social security | 1 567 | 1 580 | 1 595 | 1 612 | 1 639 | 1 638 | 1 636 | 1 676 | 1 635 |
| 751 Administration of the State | 1 225 | 1 232 | 1 252 | 1 276 | 1 307 | 1 327 | 1 326 | 1 343 | 1 304 |
| 752 National defence and conscripts | 262 | 265 | 259 | 252 | 244 | 223 | 222 | 245 | 243 |
| 753 Compulsory social security activities | 80 | 83 | 84 | 84 | 88 | 88 | 88 | 88 | 88 |
| 7351 Employment pension insurance | 26 | 26 | 26 | 25 | 28 | 28 | 28 | 28 | 28 |
| 7539 Other compulsory social security activities | 54 | 57 | 58 | 59 | 60 | 60 | 60 | 60 | 60 |
| M Education | 1 204 | 1 227 | 1 249 | 1 282 | 1 303 | 1 330 | 1 349 | 1 343 | 1 318 |
| 80 Education | 1 204 | 1 227 | 1 249 | 1 282 | 1 303 | 1 330 | 1 349 | 1 343 | 1 318 |
| N Health and social work | 2 693 | 2 781 | 2 849 | 2 918 | 2 986 | 3 051 | 3 079 | 3 076 | 2 990 |

Table C: Employment 1975-2001 (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 45 Construction | 1 326 | 1 177 | 1 183 | 1 232 | 1 365 | 1 425 | 1 490 | 1 544 | 1 519 |
| 4501 House building | 982 | 872 | 888 | 914 | 1 032 | 1 078 | 1 139 | 1 186 | 1 140 |
| 4502 Civil engineering | 333 | 294 | 283 | 305 | 319 | 331 | 334 | 339 | 356 |
| 4509 Construction related service activities | 11 | 11 | 12 | 13 | 14 | 16 | 17 | 19 | 23 |
| G Wholesale and retail trade | 2 502 | 2 433 | 2 478 | 2 555 | 2 667 | 2 739 | 2 828 | 2 874 | 2 900 |
| 50 Sale and repair of motor vehicles | 361 | 351 | 369 | 411 | 432 | 453 | 464 | 473 | 471 |
| 501 Sale of motor vehicles | 220 | 204 | 216 | 258 | 273 | 278 | 287 | 291 | 286 |
| 502 Maintenance and repair of motor vehicles | 141 | 147 | 153 | 153 | 159 | 175 | 177 | 182 | 185 |
| 51 Wholesale trade and commission trade | 774 | 790 | 828 | 863 | 903 | 917 | 946 | 962 | 974 |
| 52 Retail trade, repair of household goods | 1 367 | 1 292 | 1 281 | 1 281 | 1 332 | 1 369 | 1 418 | 1 439 | 1 455 |
| 521 Retail sale | 1 339 | 1 264 | 1 255 | 1 254 | 1 299 | 1 335 | 1 381 | 1 402 | 1 419 |
| 527 Repair of personal and household goods | 28 | 28 | 26 | 27 | 33 | 34 | 37 | 37 | 36 |
| H Hotels and restaurants | 600 | 584 | 597 | 619 | 658 | 681 | 715 | 737 | 756 |
| 55 Hotels and restaurants | 600 | 584 | 597 | 619 | 658 | 681 | 715 | 737 | 756 |
| 551 Provision of short term accommodation | 141 | 142 | 139 | 141 | 158 | 162 | 170 | 174 | 174 |
| 553 Restaurants and catering | 459 | 442 | 458 | 478 | 500 | 519 | 545 | 563 | 582 |
| I Transport, storage and communication | 1 578 | 1 559 | 1 580 | 1 598 | 1 649 | 1 703 | 1 704 | 1 706 | 1 688 |
| IA Transport and storage | 1 126 | 1 121 | 1 132 | 1 147 | 1 192 | 1 230 | 1 243 | 1 242 | 1 226 |
| 60 Land transport, transport via pipelines | 729 | 718 | 718 | 735 | 762 | 793 | 809 | 805 | 802 |
| 601 Transport via railways | 138 | 123 | 118 | 104 | 103 | 102 | 100 | 96 | 96 |
| 602 Other land transport | 591 | 595 | 600 | 631 | 659 | 691 | 709 | 709 | 706 |
| 6021 Scheduled passenger land transport | 131 | 126 | 129 | 128 | 128 | 130 | 129 | 127 | 124 |
| 6022 Taxi traffic | 78 | 78 | 82 | 88 | 91 | 97 | 101 | 104 | 98 |
| 6024 Freight transport by road | 382 | 391 | 389 | 415 | 440 | 464 | 479 | 478 | 484 |
| 603 Transport via pipelines | 0 | 0 | | | | | | | |
| 61 Water transport | 106 | 104 | 112 | 107 | 109 | 112 | 112 | 109 | 106 |
| 62 Air transport | 50 | 51 | 52 | 54 | 58 | 61 | 63 | 61 | 58 |
| 63 Supporting transport act., travel agencies | 241 | 248 | 250 | 251 | 263 | 264 | 259 | 267 | 260 |
| 6301 Supporting rail transport activities | | | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 6302 Supporting road transport activities | 33 | 31 | 30 | 29 | 29 | 26 | 19 | 20 | 11 |
| 6303 Supporting air transport activities | 17 | 18 | 18 | 18 | 19 | 20 | 21 | 22 | 22 |
| 6309 Other supporting transport activities | 191 | 199 | 201 | 203 | 214 | 217 | 218 | 224 | 226 |
| IB Post and telecommunications | 452 | 438 | 448 | 451 | 457 | 473 | 461 | 464 | 462 |
| 64 Post and telecommunications | 452 | 438 | 448 | 451 | 457 | 473 | 461 | 464 | 462 |
| 641 Post and courier activities | 286 | 277 | 284 | 284 | 283 | 287 | 265 | 262 | 248 |
| 642 Telecommunications | 166 | 161 | 164 | 167 | 174 | 186 | 196 | 202 | 214 |
| J Financial intermediation | 528 | 515 | 482 | 446 | 428 | 410 | 395 | 413 | 412 |
| 65 Financial intermediation | 413 | 401 | 362 | 327 | 306 | 290 | 272 | 280 | 280 |
| 66 Insurance | 99 | 101 | 106 | 103 | 102 | 99 | 94 | 95 | 92 |
| 67 Activities auxiliary to financial intermediation | 16 | 13 | 14 | 16 | 20 | 21 | 29 | 38 | 40 |
| K Real estate, renting and business activities | 1 382 | 1 401 | 1 528 | 1 578 | 1 660 | 1 790 | 1 942 | 2 095 | 2 212 |
| KA Real estate activities | 323 | 311 | 311 | 308 | 313 | 315 | 330 | 348 | 355 |
| 70 Real estate activities | 323 | 311 | 311 | 308 | 313 | 315 | 330 | 348 | 355 |
| 701 Real estate activities with own property | 19 | 18 | 20 | 20 | 21 | 22 | 24 | 25 | 25 |
| 702 Letting of own property | 55 | 57 | 71 | 62 | 61 | 59 | 64 | 69 | 72 |
| 7021 Lettings of dwellings | 28 | 28 | 28 | 27 | 26 | 25 | 27 | 29 | 30 |
| 7022 Operation of dwelling and residential real estate | 27 | 29 | 43 | 35 | 35 | 34 | 37 | 40 | 42 |
| 703 Real estate act. on a fee or contract basis | 249 | 236 | 220 | 226 | 231 | 234 | 242 | 254 | 258 |
| 7031 Real estate agencies | 31 | 33 | 30 | 34 | 37 | 40 | 42 | 43 | 43 |
| 7032 Management of real estate | 218 | 203 | 190 | 192 | 194 | 194 | 200 | 211 | 215 |
| KB Business activities | 1 059 | 1 090 | 1 217 | 1 270 | 1 347 | 1 475 | 1 612 | 1 747 | 1 857 |
| 71 Renting of machinery and equipment | 31 | 28 | 30 | 30 | 32 | 31 | 34 | 42 | 41 |
| 72 Computer and related activities | 167 | 163 | 175 | 194 | 208 | 255 | 307 | 372 | 434 |
| 73 Research and development | 93 | 94 | 100 | 109 | 121 | 122 | 129 | 131 | 125 |
| 74 Other business activities | 768 | 805 | 912 | 937 | 986 | 1 067 | 1 142 | 1 202 | 1 257 |
| 741 Legal, accounting, book-keeping activities etc. | 179 | 199 | 210 | 202 | 215 | 237 | 235 | 252 | 256 |
| 742 Technical consultancy, testing and analysis | 231 | 238 | 274 | 285 | 290 | 305 | 330 | 344 | 370 |
| 744 Advertising | 54 | 60 | 73 | 79 | 83 | 92 | 106 | 108 | 111 |
| 747 Industrial cleaning | 145 | 154 | 186 | 189 | 197 | 209 | 230 | 240 | 247 |
| 748 Miscellaneous business activities | 159 | 154 | 169 | 182 | 201 | 224 | 241 | 258 | 273 |
| L Administration, compulsory social security | 1 575 | 1 565 | 1 558 | 1 568 | 1 624 | 1 598 | 1 620 | 1 649 | 1 656 |
| 75 Administration, compulsory social security | 1 575 | 1 565 | 1 558 | 1 568 | 1 624 | 1 598 | 1 620 | 1 649 | 1 656 |
| 751 Administration of the State | 1 245 | 1 237 | 1 227 | 1 254 | 1 314 | 1 302 | 1 318 | 1 332 | 1 327 |
| 752 National defence and conscripts | 243 | 240 | 240 | 224 | 220 | 206 | 210 | 222 | 230 |
| 753 Compulsory social security activities | 87 | 88 | 91 | 90 | 90 | 90 | 92 | 95 | 99 |
| 7351 Employment pension insurance | 27 | 25 | 25 | 26 | 26 | 26 | 27 | 29 | 31 |
| 7539 Other compulsory social security activities | 60 | 63 | 66 | 64 | 64 | 64 | 65 | 66 | 68 |
| M Education | 1 291 | 1 300 | 1 359 | 1 396 | 1 429 | 1 475 | 1 505 | 1 522 | 1 566 |
| 80 Education | 1 291 | 1 300 | 1 359 | 1 396 | 1 429 | 1 475 | 1 505 | 1 522 | 1 566 |
| N Health and social work | 2 812 | 2 792 | 2 831 | 2 896 | 2 949 | 2 990 | 3 030 | 3 114 | 3 223 |

Source: Statistics Finland, Business structures and economic account

Table C: Employment 1975-2001 (Cont.)

| | 1975 | 1976 | 1977 | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 |
|---|-------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 100 persons | | | | | | | | |
| 85 Health and social work | 1 874 | 2 021 | 2 075 | 2 180 | 2 280 | 2 333 | 2 426 | 2 509 | 2 573 |
| 851 Human health activities | 967 | 1 053 | 1 076 | 1 136 | 1 180 | 1 217 | 1 262 | 1 321 | 1 353 |
| 852 Veterinary activities | | | | | | | | | |
| 853 Social work activities | 907 | 968 | 999 | 1 044 | 1 100 | 1 116 | 1 164 | 1 188 | 1 220 |
| O Other community, social and personal service act. | 575 | 603 | 620 | 647 | 675 | 693 | 725 | 748 | 781 |
| 90 Environmental care | 33 | 35 | 34 | 34 | 32 | 33 | 36 | 36 | 38 |
| 91 Activities of membership organizations | 195 | 211 | 220 | 229 | 237 | 247 | 262 | 270 | 282 |
| 911 Activities of business and employers' org. | 49 | 50 | 51 | 51 | 52 | 54 | 57 | 58 | 61 |
| 913 Activities of religious and other organizations | 146 | 161 | 169 | 178 | 185 | 193 | 205 | 212 | 221 |
| 9131 Activities of religious organizations | 111 | 123 | 130 | 138 | 144 | 150 | 160 | 166 | 174 |
| 9139 Activities of other organizations | 35 | 38 | 39 | 40 | 41 | 43 | 45 | 46 | 47 |
| 92 Recreational, cultural and sporting activities | 247 | 258 | 269 | 287 | 308 | 315 | 328 | 342 | 361 |
| 93 Other service activities | 100 | 99 | 97 | 97 | 98 | 98 | 99 | 100 | 100 |
| 9301 Washing and dry cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 9309 Other personal service activities | 100 | 99 | 97 | 97 | 98 | 98 | 99 | 100 | 100 |
| P Activites of hhs as employers of domestic staff | 87 | 76 | 73 | 71 | 72 | 67 | 69 | 62 | 57 |
| 95 Activities of hhs as employers of domestic staff | 87 | 76 | 73 | 71 | 72 | 67 | 69 | 62 | 57 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table C: (Cont.)

| | 1984 | 1985 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 85 Health and social work | 2 693 | 2 781 | 2 849 | 2 918 | 2 986 | 3 051 | 3 079 | 3 076 | 2 990 |
| 851 Human health activities | 1 413 | 1 459 | 1 490 | 1 532 | 1 563 | 1 582 | 1 597 | 1 596 | 1 554 |
| 852 Veterinary activities | | | | | | | 9 | 9 | 9 |
| 853 Social work activities | 1 280 | 1 322 | 1 359 | 1 386 | 1 423 | 1 469 | 1 473 | 1 471 | 1 427 |
| O Other community, social and personal service act. | 804 | 825 | 845 | 871 | 897 | 925 | 945 | 935 | 928 |
| 90 Environmental care | 40 | 42 | 44 | 46 | 47 | 52 | 52 | 52 | 53 |
| 91 Activities of membership organizations | 285 | 288 | 291 | 294 | 300 | 310 | 317 | 310 | 314 |
| 911 Activities of business and employers' org. | 64 | 65 | 67 | 70 | 72 | 76 | 80 | 79 | 79 |
| 913 Activities of religious and other organizations | 221 | 223 | 224 | 224 | 228 | 234 | 237 | 231 | 235 |
| 9131 Activities of religious organizations | 174 | 176 | 176 | 176 | 179 | 185 | 187 | 189 | 186 |
| 9139 Activities of other organizations | 47 | 47 | 48 | 48 | 49 | 49 | 50 | 42 | 49 |
| 92 Recreational, cultural and sporting activities | 377 | 392 | 406 | 425 | 441 | 452 | 461 | 456 | 451 |
| 93 Other service activities | 102 | 103 | 104 | 106 | 109 | 111 | 115 | 117 | 110 |
| 9301 Washing and dry cleaning | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 32 | 30 |
| 9309 Other personal service activities | 102 | 103 | 104 | 106 | 109 | 111 | 84 | 85 | 80 |
| P Activites of hhs as employers of domestic staff | 51 | 48 | 53 | 50 | 48 | 47 | 42 | 42 | 42 |
| 95 Activities of hhs as employers of domestic staff | 51 | 48 | 53 | 50 | 48 | 47 | 42 | 42 | 42 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table C: (Cont.)

| | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 85 Health and social work | 2 812 | 2 792 | 2 831 | 2 896 | 2 949 | 2 990 | 3 030 | 3 114 | 3 223 |
| 851 Human health activities | 1 458 | 1 456 | 1 476 | 1 503 | 1 515 | 1 521 | 1 524 | 1 558 | 1 598 |
| 852 Veterinary activities | 10 | 10 | 11 | 12 | 12 | 12 | 12 | 12 | 12 |
| 853 Social work activities | 1 344 | 1 326 | 1 344 | 1 381 | 1 422 | 1 457 | 1 494 | 1 544 | 1 613 |
| O Other community, social and personal service act. | 881 | 879 | 895 | 932 | 965 | 995 | 1 029 | 1 057 | 1 066 |
| 90 Environmental care | 51 | 55 | 56 | 58 | 60 | 64 | 67 | 70 | 67 |
| 91 Activities of membership organizations | 310 | 302 | 304 | 316 | 327 | 335 | 352 | 356 | 361 |
| 911 Activities of business and employers' org. | 76 | 69 | 67 | 68 | 69 | 71 | 74 | 74 | 74 |
| 913 Activities of religious and other organizations | 234 | 233 | 237 | 248 | 258 | 264 | 278 | 282 | 287 |
| 9131 Activities of religious organizations | 181 | 177 | 179 | 187 | 193 | 195 | 198 | 199 | 201 |
| 9139 Activities of other organizations | 53 | 56 | 58 | 61 | 65 | 69 | 80 | 83 | 86 |
| 92 Recreational, cultural and sporting activities | 415 | 415 | 427 | 442 | 457 | 469 | 481 | 498 | 509 |
| 93 Other service activities | 105 | 107 | 108 | 116 | 121 | 127 | 129 | 133 | 129 |
| 9301 Washing and dry cleaning | 28 | 28 | 29 | 31 | 31 | 32 | 34 | 35 | 33 |
| 9309 Other personal service activities | 77 | 79 | 79 | 85 | 90 | 95 | 95 | 98 | 96 |
| P Activites of hhs as employers of domestic staff | 39 | 41 | 65 | 73 | 85 | 96 | 106 | 115 | 120 |
| 95 Activities of hhs as employers of domestic staff | 39 | 41 | 65 | 73 | 85 | 96 | 106 | 115 | 120 |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table D: Total investments 1960-2001

| | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 |
|--|-------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| | 1 000 000 EUR, at 2000 prices | | | | | | | | |
| 0 Total | 10 760 | 11 744 | 11 772 | 11 434 | 12 192 | 13 317 | 13 756 | 13 598 | 13 269 |
| A Agriculture, hunting and forestry | 1 035 | 1 009 | 974 | 1 072 | 1 038 | 1 116 | 1 192 | 1 085 | 1 038 |
| 01 Agriculture, hunting and related service act. | 736 | 772 | 723 | 784 | 735 | 762 | 806 | 687 | 623 |
| 01MAA Agriculture and related service act. | 736 | 772 | 723 | 784 | 735 | 762 | 806 | 687 | 623 |
| 0112 Horticulture | | | | | | | | | |
| 0125 Other farming of animals | | | | | | | | | |
| 013 Mixed farming | 736 | 772 | 723 | 784 | 735 | 762 | 806 | 687 | 623 |
| 014 Agricultural service activities | | | | | | | | | |
| 015 Hunting and game husbandry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02 Forestry and related service activities | 299 | 237 | 251 | 288 | 303 | 354 | 386 | 398 | 415 |
| 0211 Forest cultivation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0212 Timber harvesting | 299 | 237 | 251 | 288 | 303 | 354 | 386 | 398 | 415 |
| 0219 Other forestry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0202 Forestry related service activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| B Fishing | 18 | 22 | 19 | 19 | 14 | 19 | 23 | 29 | 33 |
| 05 Fishing and fish farming | 18 | 22 | 19 | 19 | 14 | 19 | 23 | 29 | 33 |
| C Mining and quarrying | 47 | 40 | 40 | 24 | 34 | 43 | 68 | 49 | 82 |
| 10 Mining of energy producing minerals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 13 Mining of metal ores | 47 | 40 | 40 | 24 | 34 | 43 | 68 | 49 | 82 |
| 14 Mining of other minerals | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| D Manufacturing | 1 830 | 2 402 | 2 207 | 1 852 | 2 109 | 2 175 | 2 259 | 1 903 | 1 970 |
| DA Food products, beverages and tobacco | 196 | 249 | 307 | 241 | 284 | 297 | 264 | 253 | 248 |
| 15 Food products and beverages | 192 | 241 | 299 | 234 | 276 | 289 | 256 | 246 | 241 |
| 151 Food supplies | 192 | 241 | 299 | 234 | 276 | 289 | 256 | 246 | 241 |
| 159 Beverages | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 Tobacco products | 4 | 8 | 8 | 7 | 8 | 8 | 8 | 7 | 7 |
| DB Textiles and textile products | 47 | 52 | 52 | 50 | 59 | 61 | 48 | 64 | 61 |
| 17 Textiles | 32 | 36 | 36 | 35 | 42 | 44 | 33 | 45 | 42 |
| 18 Wearing apparel, dressing of fur | 15 | 16 | 16 | 15 | 17 | 17 | 15 | 19 | 19 |
| DC Leather and leather products | 20 | 24 | 22 | 21 | 32 | 30 | 29 | 22 | 20 |
| 19 Leather and leather products | 20 | 24 | 22 | 21 | 32 | 30 | 29 | 22 | 20 |
| DD Wood and wood products | 79 | 89 | 98 | 106 | 75 | 77 | 94 | 95 | 100 |
| 20 Wood and wood products | 79 | 89 | 98 | 106 | 75 | 77 | 94 | 95 | 100 |
| DE Pulp, paper, publishing and printing | 1 072 | 1 385 | 1 193 | 760 | 966 | 803 | 767 | 539 | 626 |
| 21 Pulp, paper and paper products | 1 040 | 1 337 | 1 136 | 717 | 908 | 731 | 700 | 451 | 580 |
| 22 Publishing and printing | 32 | 48 | 57 | 43 | 58 | 72 | 67 | 88 | 46 |
| DF Coke, petroleum products and nuclear fuel | 5 | 20 | 42 | 58 | 38 | 145 | 81 | 70 | 70 |
| 23 Coke, petroleum products and nuclear fuel | 5 | 20 | 42 | 58 | 38 | 145 | 81 | 70 | 70 |
| DG Chemicals and chemical products | 37 | 114 | 117 | 54 | 83 | 168 | 114 | 99 | 154 |
| 24 Chemicals and chemical products | 37 | 114 | 117 | 54 | 83 | 168 | 114 | 99 | 154 |
| DH Rubber and plastic products | 15 | 18 | 28 | 36 | 34 | 50 | 60 | 53 | 63 |
| 25 Rubber and plastic products | 15 | 18 | 28 | 36 | 34 | 50 | 60 | 53 | 63 |
| 251 Rubber products | 15 | 18 | 28 | 36 | 34 | 50 | 60 | 53 | 63 |
| 252 Plastic products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DI Non-metallic mineral products | 43 | 61 | 71 | 79 | 90 | 91 | 103 | 98 | 73 |
| 26 Non-metallic mineral products | 43 | 61 | 71 | 79 | 90 | 91 | 103 | 98 | 73 |
| DJ Basic metals and fabricated metal products | 137 | 174 | 106 | 260 | 224 | 209 | 426 | 351 | 158 |
| 27 Basic metals | 95 | 126 | 61 | 199 | 164 | 147 | 350 | 283 | 87 |
| 28 Fabricated metal products | 42 | 48 | 45 | 61 | 60 | 62 | 76 | 68 | 71 |
| DK Machinery and equipment | 81 | 91 | 89 | 116 | 117 | 119 | 143 | 130 | 137 |
| 29 Machinery and equipment | 81 | 91 | 89 | 116 | 117 | 119 | 143 | 130 | 137 |
| DL Electrical and optical equipment | 18 | 38 | 28 | 21 | 31 | 42 | 41 | 27 | 23 |
| 30 Office machinery and computers | 1 | 3 | 2 | 1 | 2 | 3 | 3 | 2 | 2 |
| 31 Other electrical machinery and apparatus | 7 | 14 | 11 | 8 | 12 | 17 | 16 | 11 | 10 |
| 32 Radio, television and communication equipment | 7 | 15 | 11 | 9 | 13 | 16 | 17 | 11 | 8 |
| 33 Medical and precision instruments, clocks | 3 | 6 | 4 | 3 | 4 | 6 | 5 | 3 | 3 |
| DM Transport equipment | 56 | 63 | 30 | 23 | 35 | 40 | 47 | 69 | 90 |
| 34 Motor vehicles and trailers | 15 | 19 | 9 | 7 | 10 | 10 | 13 | 20 | 14 |
| 35 Other transport equipment | 41 | 44 | 21 | 16 | 25 | 30 | 34 | 49 | 76 |
| 351 Ships and boats | 41 | 44 | 21 | 16 | 25 | 30 | 34 | 49 | 76 |
| 352 Other transport equipment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DN Other manufacturing and recycling | 24 | 24 | 24 | 27 | 41 | 43 | 42 | 33 | 147 |
| 36 Other manufacturing | 24 | 24 | 24 | 27 | 41 | 43 | 42 | 33 | 147 |
| 361 Furniture | 24 | 24 | 24 | 27 | 41 | 43 | 42 | 33 | 147 |
| 362 Other products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E Electricity, gas and water supply | 620 | 584 | 584 | 545 | 483 | 552 | 519 | 476 | 440 |
| 40 Electricity, gas, steam and hot water supply | 556 | 499 | 500 | 488 | 405 | 466 | 445 | 424 | 352 |
| 41 Purification and distribution of water | 64 | 85 | 84 | 57 | 78 | 86 | 74 | 52 | 88 |
| F Construction | 228 | 234 | 254 | 235 | 237 | 284 | 382 | 305 | 250 |

Source: Statistics Finland, Business structures and economic accounts

Table D: Total investments 1960-2001 (Cont.)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 Total | 14 861 | 16 494 | 17 026 | 18 191 | 19 690 | 20 374 | 22 887 | 21 023 | 20 329 |
| A Agriculture, hunting and forestry | 1 186 | 1 113 | 1 214 | 1 159 | 1 274 | 1 231 | 1 606 | 1 591 | 1 497 |
| 01 Agriculture, hunting and related service act. | 745 | 671 | 739 | 705 | 790 | 761 | 959 | 960 | 889 |
| 01MAA Agriculture and related service act. | 745 | 671 | 739 | 705 | 790 | 761 | 959 | 960 | 889 |
| 0112 Horticulture | | | | | | | | | |
| 0125 Other farming of animals | | | | | | | | | |
| 013 Mixed farming | 745 | 671 | 739 | 705 | 790 | 761 | 959 | 960 | 889 |
| 014 Agricultural service activities | | | | | | | | | |
| 015 Hunting and game husbandry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02 Forestry and related service activities | 441 | 442 | 475 | 454 | 484 | 470 | 647 | 631 | 608 |
| 0211 Forest cultivation | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 20 | 18 |
| 0212 Timber harvesting | 441 | 442 | 475 | 454 | 484 | 470 | 615 | 599 | 579 |
| 0219 Other forestry | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 6 | 6 |
| 0202 Forestry related service activities | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 6 | 5 |
| B Fishing | 37 | 41 | 45 | 47 | 50 | 41 | 19 | 16 | 19 |
| 05 Fishing and fish farming | 37 | 41 | 45 | 47 | 50 | 41 | 19 | 16 | 19 |
| C Mining and quarrying | 63 | 54 | 95 | 102 | 64 | 109 | 136 | 97 | 78 |
| 10 Mining of energy producing minerals | 0 | 1 | 2 | 3 | 6 | 12 | 17 | 12 | 11 |
| 13 Mining of metal ores | 63 | 43 | 82 | 81 | 38 | 73 | 94 | 67 | 25 |
| 14 Mining of other minerals | 0 | 10 | 11 | 18 | 20 | 24 | 25 | 18 | 42 |
| D Manufacturing | 2 339 | 3 091 | 3 418 | 3 056 | 2 790 | 3 640 | 3 801 | 3 437 | 2 901 |
| DA Food products, beverages and tobacco | 356 | 365 | 323 | 343 | 421 | 402 | 335 | 302 | 427 |
| 15 Food products and beverages | 346 | 353 | 313 | 333 | 409 | 390 | 332 | 298 | 424 |
| 151 Food supplies | 346 | 353 | 313 | 333 | 409 | 390 | 332 | 298 | 424 |
| 159 Beverages | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 16 Tobacco products | 10 | 12 | 10 | 10 | 12 | 12 | 3 | 4 | 3 |
| DB Textiles and textile products | 95 | 130 | 106 | 92 | 135 | 165 | 115 | 100 | 83 |
| 17 Textiles | 68 | 93 | 75 | 64 | 95 | 117 | 75 | 65 | 48 |
| 18 Wearing apparel, dressing of fur | 27 | 37 | 31 | 28 | 40 | 48 | 40 | 35 | 35 |
| DC Leather and leather products | 37 | 13 | 12 | 17 | 16 | 15 | 16 | 16 | 13 |
| 19 Leather and leather products | 37 | 13 | 12 | 17 | 16 | 15 | 16 | 16 | 13 |
| DD Wood and wood products | 165 | 225 | 132 | 148 | 218 | 278 | 271 | 247 | 142 |
| 20 Wood and wood products | 165 | 225 | 132 | 148 | 218 | 278 | 271 | 247 | 142 |
| DE Pulp, paper, publishing and printing | 762 | 1 004 | 1 341 | 1 020 | 752 | 831 | 1 191 | 1 285 | 1 342 |
| 21 Pulp, paper and paper products | 711 | 945 | 1 269 | 937 | 646 | 697 | 1 123 | 1 162 | 1 218 |
| 22 Publishing and printing | 51 | 59 | 72 | 83 | 106 | 134 | 68 | 123 | 124 |
| DF Coke, petroleum products and nuclear fuel | 40 | 106 | 161 | 98 | 78 | 146 | 156 | 40 | 27 |
| 23 Coke, petroleum products and nuclear fuel | 40 | 106 | 161 | 98 | 78 | 146 | 156 | 40 | 27 |
| DG Chemicals and chemical products | 146 | 188 | 276 | 372 | 147 | 244 | 131 | 91 | 60 |
| 24 Chemicals and chemical products | 146 | 188 | 276 | 372 | 147 | 244 | 131 | 91 | 60 |
| DH Rubber and plastic products | 62 | 65 | 59 | 71 | 75 | 78 | 79 | 53 | 56 |
| 25 Rubber and plastic products | 62 | 65 | 59 | 71 | 75 | 78 | 79 | 53 | 56 |
| 251 Rubber products | 62 | 65 | 59 | 71 | 75 | 78 | 79 | 53 | 56 |
| 252 Plastic products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DI Non-metallic mineral products | 142 | 129 | 120 | 107 | 186 | 207 | 153 | 84 | 71 |
| 26 Non-metallic mineral products | 142 | 129 | 120 | 107 | 186 | 207 | 153 | 84 | 71 |
| DJ Basic metals and fabricated metal products | 199 | 400 | 453 | 302 | 267 | 478 | 674 | 634 | 272 |
| 27 Basic metals | 119 | 276 | 327 | 173 | 145 | 327 | 539 | 547 | 192 |
| 28 Fabricated metal products | 80 | 124 | 126 | 129 | 122 | 151 | 135 | 87 | 80 |
| DK Machinery and equipment | 150 | 229 | 237 | 249 | 232 | 281 | 301 | 217 | 171 |
| 29 Machinery and equipment | 150 | 229 | 237 | 249 | 232 | 281 | 301 | 217 | 171 |
| DL Electrical and optical equipment | 44 | 64 | 77 | 111 | 99 | 114 | 88 | 88 | 134 |
| 30 Office machinery and computers | 3 | 4 | 4 | 5 | 5 | 6 | 6 | 6 | 7 |
| 31 Other electrical machinery and apparatus | 17 | 24 | 30 | 45 | 39 | 46 | 51 | 58 | 51 |
| 32 Radio, television and communication equipment | 18 | 25 | 30 | 45 | 39 | 45 | 21 | 19 | 71 |
| 33 Medical and precision instruments, clocks | 6 | 11 | 13 | 16 | 16 | 17 | 10 | 5 | 5 |
| DM Transport equipment | 84 | 115 | 78 | 66 | 91 | 312 | 232 | 234 | 60 |
| 34 Motor vehicles and trailers | 24 | 31 | 23 | 20 | 27 | 75 | 22 | 16 | 11 |
| 35 Other transport equipment | 60 | 84 | 55 | 46 | 64 | 237 | 210 | 218 | 49 |
| 351 Ships and boats | 60 | 84 | 55 | 46 | 64 | 237 | 210 | 218 | 49 |
| 352 Other transport equipment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| DN Other manufacturing and recycling | 57 | 58 | 43 | 60 | 73 | 89 | 59 | 46 | 43 |
| 36 Other manufacturing | 57 | 58 | 43 | 60 | 73 | 89 | 59 | 46 | 43 |
| 361 Furniture | 57 | 58 | 43 | 60 | 73 | 89 | 59 | 46 | 43 |
| 362 Other products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E Electricity, gas and water supply | 531 | 675 | 951 | 920 | 1 240 | 1 396 | 1 799 | 1 866 | 1 564 |
| 40 Electricity, gas, steam and hot water supply | 428 | 543 | 790 | 758 | 1 087 | 1 248 | 1 611 | 1 680 | 1 320 |
| 41 Purification and distribution of water | 103 | 132 | 161 | 162 | 153 | 148 | 188 | 186 | 244 |
| F Construction | 292 | 368 | 361 | 372 | 394 | 466 | 370 | 232 | 319 |

Table D: Total investments 1960-2001 (Cont.)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 Total | 18 713 | 19 297 | 21 183 | 21 516 | 22 632 | 23 306 | 22 850 | 23 461 | 23 648 |
| A Agriculture, hunting and forestry | 1 434 | 1 538 | 1 701 | 1 709 | 1 823 | 1 723 | 1 637 | 1 687 | 1 576 |
| 01 Agriculture, hunting and related service act. | 875 | 972 | 1 097 | 1 049 | 1 188 | 1 154 | 1 102 | 1 076 | 980 |
| 01MAA Agriculture and related service act. | 875 | 972 | 1 097 | 1 049 | 1 188 | 1 154 | 1 102 | 1 076 | 980 |
| 0112 Horticulture | | | | | | | | | |
| 0125 Other farming of animals | | | | | | | | | |
| 013 Mixed farming | 875 | 972 | 1 097 | 1 049 | 1 188 | 1 154 | 1 102 | 1 076 | 980 |
| 014 Agricultural service activities | | | | | | | | | |
| 015 Hunting and game husbandry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02 Forestry and related service activities | 559 | 566 | 604 | 660 | 635 | 569 | 535 | 611 | 596 |
| 0211 Forest cultivation | 16 | 20 | 23 | 26 | 25 | 22 | 20 | 26 | 25 |
| 0212 Timber harvesting | 532 | 531 | 564 | 618 | 596 | 535 | 502 | 569 | 555 |
| 0219 Other forestry | 6 | 7 | 10 | 9 | 7 | 7 | 9 | 9 | 9 |
| 0202 Forestry related service activities | 5 | 8 | 7 | 7 | 7 | 5 | 4 | 7 | 7 |
| B Fishing | 18 | 17 | 19 | 15 | 16 | 16 | 15 | 15 | 14 |
| 05 Fishing and fish farming | 18 | 17 | 19 | 15 | 16 | 16 | 15 | 15 | 14 |
| C Mining and quarrying | 81 | 139 | 89 | 102 | 141 | 94 | 66 | 114 | 105 |
| 10 Mining of energy producing minerals | 16 | 25 | 21 | 18 | 30 | 24 | 7 | 9 | 15 |
| 13 Mining of metal ores | 31 | 31 | 28 | 28 | 37 | 25 | 29 | 59 | 48 |
| 14 Mining of other minerals | 34 | 83 | 40 | 56 | 74 | 45 | 30 | 46 | 42 |
| D Manufacturing | 2 230 | 2 512 | 3 380 | 3 597 | 3 748 | 3 558 | 3 549 | 3 809 | 3 928 |
| DA Food products, beverages and tobacco | 400 | 456 | 447 | 412 | 514 | 477 | 389 | 391 | 404 |
| 15 Food products and beverages | 397 | 451 | 440 | 402 | 504 | 467 | 384 | 385 | 398 |
| 151 Food supplies | 397 | 451 | 440 | 402 | 504 | 467 | 384 | 343 | 350 |
| 159 Beverages | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 42 | 48 |
| 16 Tobacco products | 3 | 5 | 7 | 10 | 10 | 10 | 5 | 6 | 6 |
| DB Textiles and textile products | 136 | 125 | 138 | 129 | 149 | 113 | 93 | 82 | 96 |
| 17 Textiles | 85 | 79 | 91 | 93 | 103 | 63 | 51 | 68 | 55 |
| 18 Wearing apparel, dressing of fur | 51 | 46 | 47 | 36 | 46 | 50 | 42 | 14 | 41 |
| DC Leather and leather products | 13 | 12 | 17 | 27 | 28 | 17 | 21 | 13 | 13 |
| 19 Leather and leather products | 13 | 12 | 17 | 27 | 28 | 17 | 21 | 13 | 13 |
| DD Wood and wood products | 187 | 196 | 254 | 244 | 166 | 175 | 146 | 161 | 167 |
| 20 Wood and wood products | 187 | 196 | 254 | 244 | 166 | 175 | 146 | 161 | 167 |
| DE Pulp, paper, publishing and printing | 649 | 825 | 1 167 | 1 303 | 1 335 | 1 264 | 1 366 | 1 544 | 1 505 |
| 21 Pulp, paper and paper products | 475 | 655 | 958 | 1 100 | 1 139 | 944 | 1 050 | 1 223 | 1 163 |
| 22 Publishing and printing | 174 | 170 | 209 | 203 | 196 | 320 | 316 | 321 | 342 |
| DF Coke, petroleum products and nuclear fuel | 57 | 41 | 38 | 54 | 65 | 38 | 60 | 70 | 72 |
| 23 Coke, petroleum products and nuclear fuel | 57 | 41 | 38 | 54 | 65 | 38 | 60 | 70 | 72 |
| DG Chemicals and chemical products | 87 | 90 | 159 | 224 | 206 | 223 | 192 | 184 | 214 |
| 24 Chemicals and chemical products | 87 | 90 | 159 | 224 | 206 | 223 | 192 | 184 | 214 |
| DH Rubber and plastic products | 54 | 88 | 113 | 97 | 92 | 98 | 106 | 84 | 111 |
| 25 Rubber and plastic products | 54 | 88 | 113 | 97 | 92 | 98 | 106 | 84 | 111 |
| 251 Rubber products | 54 | 88 | 113 | 97 | 92 | 98 | 106 | 7 | 11 |
| 252 Plastic products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 77 | 100 |
| DI Non-metallic mineral products | 104 | 110 | 162 | 187 | 209 | 188 | 203 | 169 | 213 |
| 26 Non-metallic mineral products | 104 | 110 | 162 | 187 | 209 | 188 | 203 | 169 | 213 |
| DJ Basic metals and fabricated metal products | 163 | 165 | 304 | 363 | 330 | 301 | 299 | 349 | 453 |
| 27 Basic metals | 108 | 92 | 202 | 243 | 181 | 150 | 152 | 227 | 338 |
| 28 Fabricated metal products | 55 | 73 | 102 | 120 | 149 | 151 | 147 | 122 | 115 |
| DK Machinery and equipment | 144 | 171 | 269 | 286 | 322 | 289 | 265 | 301 | 304 |
| 29 Machinery and equipment | 144 | 171 | 269 | 286 | 322 | 289 | 265 | 301 | 304 |
| DL Electrical and optical equipment | 121 | 75 | 139 | 125 | 129 | 147 | 185 | 188 | 161 |
| 30 Office machinery and computers | 9 | 9 | 10 | 13 | 14 | 20 | 28 | 31 | 23 |
| 31 Other electrical machinery and apparatus | 45 | 45 | 58 | 75 | 70 | 66 | 69 | 67 | 52 |
| 32 Radio, television and communication equipment | 61 | 12 | 53 | 22 | 23 | 43 | 69 | 63 | 59 |
| 33 Medical and precision instruments, clocks | 6 | 9 | 18 | 15 | 22 | 18 | 19 | 27 | 27 |
| DM Transport equipment | 76 | 112 | 114 | 88 | 126 | 145 | 134 | 193 | 150 |
| 34 Motor vehicles and trailers | 14 | 21 | 28 | 23 | 23 | 29 | 20 | 35 | 55 |
| 35 Other transport equipment | 62 | 91 | 86 | 65 | 103 | 116 | 114 | 158 | 95 |
| 351 Ships and boats | 62 | 91 | 86 | 65 | 103 | 116 | 114 | 102 | 76 |
| 352 Other transport equipment | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 56 | 19 |
| DN Other manufacturing and recycling | 39 | 46 | 59 | 58 | 77 | 83 | 90 | 80 | 65 |
| 36 Other manufacturing | 39 | 46 | 59 | 58 | 77 | 83 | 90 | 80 | 65 |
| 361 Furniture | 39 | 46 | 59 | 58 | 77 | 83 | 90 | 65 | 53 |
| 362 Other products | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 12 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| E Electricity, gas and water supply | 981 | 1 041 | 871 | 937 | 1 201 | 1 040 | 989 | 1 117 | 1 107 |
| 40 Electricity, gas, steam and hot water supply | 822 | 892 | 716 | 794 | 1 056 | 917 | 863 | 985 | 971 |
| 41 Purification and distribution of water | 159 | 149 | 155 | 143 | 145 | 123 | 126 | 132 | 136 |
| F Construction | 256 | 267 | 338 | 353 | 357 | 484 | 410 | 253 | 274 |

Source: Statistics Finland, Business structures and economic account

Table D: Total investments 1960-2001 (Cont.)

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| 0 Total | 24 718 | 27 609 | 31 073 | 29 635 | 24 138 | 20 191 | 17 123 | 16 500 | 18 342 |
| A Agriculture, hunting and forestry | 1 465 | 1 538 | 1 678 | 1 548 | 1 170 | 929 | 837 | 873 | 1 000 |
| 01 Agriculture, hunting and related service act. | 857 | 886 | 998 | 951 | 714 | 487 | 456 | 447 | 548 |
| 01MAA Agriculture and related service act. | 857 | 886 | 998 | 951 | 714 | 487 | 456 | 447 | 548 |
| 0112 Horticulture | | | | | | | | | 0 |
| 0125 Other farming of animals | | | | | | | | | |
| 013 Mixed farming | 857 | 886 | 998 | 951 | 714 | 487 | 456 | 447 | 548 |
| 014 Agricultural service activities | | | | | | | | | |
| 015 Hunting and game husbandry | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 02 Forestry and related service activities | 608 | 652 | 680 | 597 | 456 | 442 | 381 | 426 | 452 |
| 0211 Forest cultivation | 27 | 31 | 30 | 25 | 17 | 14 | 12 | 17 | 18 |
| 0212 Timber harvesting | 564 | 602 | 627 | 552 | 426 | 415 | 358 | 397 | 420 |
| 0219 Other forestry | 10 | 11 | 14 | 11 | 7 | 6 | 4 | 6 | 7 |
| 0202 Forestry related service activities | 7 | 8 | 9 | 9 | 6 | 7 | 7 | 6 | 7 |
| B Fishing | 14 | 16 | 13 | 14 | 13 | 9 | 8 | 9 | 8 |
| 05 Fishing and fish farming | 14 | 16 | 13 | 14 | 13 | 9 | 8 | 9 | 8 |
| C Mining and quarrying | 91 | 95 | 126 | 109 | 70 | 65 | 60 | 74 | 100 |
| 10 Mining of energy producing minerals | 16 | 18 | 15 | 16 | 13 | 19 | 16 | 20 | 36 |
| 13 Mining of metal ores | 31 | 36 | 50 | 41 | 33 | 28 | 34 | 35 | 40 |
| 14 Mining of other minerals | 44 | 41 | 61 | 52 | 24 | 18 | 10 | 19 | 24 |
| D Manufacturing | 4 752 | 4 115 | 5 473 | 5 011 | 3 710 | 3 189 | 2 667 | 2 865 | 3 882 |
| DA Food products, beverages and tobacco | 516 | 413 | 515 | 507 | 440 | 592 | 339 | 319 | 391 |
| 15 Food products and beverages | 469 | 399 | 488 | 497 | 430 | 576 | 332 | 314 | 402 |
| 151 Food supplies | 360 | 325 | 410 | 405 | 331 | 417 | 247 | 251 | 332 |
| 159 Beverages | 109 | 74 | 78 | 92 | 99 | 159 | 85 | 63 | 70 |
| 16 Tobacco products | 47 | 14 | 27 | 10 | 10 | 16 | 7 | 5 | -11 |
| DB Textiles and textile products | 116 | 25 | 90 | 82 | 37 | 28 | 41 | 30 | 59 |
| 17 Textiles | 70 | 30 | 52 | 53 | 27 | 18 | 35 | 24 | 48 |
| 18 Wearing apparel, dressing of fur | 46 | -5 | 38 | 29 | 10 | 10 | 6 | 6 | 11 |
| DC Leather and leather products | 13 | 10 | 16 | 13 | 6 | 5 | 4 | 5 | 8 |
| 19 Leather and leather products | 13 | 10 | 16 | 13 | 6 | 5 | 4 | 5 | 8 |
| DD Wood and wood products | 167 | 187 | 324 | 302 | 226 | 160 | 162 | 179 | 217 |
| 20 Wood and wood products | 167 | 187 | 324 | 302 | 226 | 160 | 162 | 179 | 217 |
| DE Pulp, paper, publishing and printing | 1 825 | 1 761 | 2 177 | 1 995 | 1 542 | 1 238 | 968 | 914 | 1 070 |
| 21 Pulp, paper and paper products | 1 508 | 1 503 | 1 822 | 1 609 | 1 251 | 968 | 795 | 695 | 865 |
| 22 Publishing and printing | 317 | 258 | 355 | 386 | 291 | 270 | 173 | 219 | 205 |
| DF Coke, petroleum products and nuclear fuel | 84 | 42 | 104 | 49 | 103 | 110 | 81 | 23 | 40 |
| 23 Coke, petroleum products and nuclear fuel | 84 | 42 | 104 | 49 | 103 | 110 | 81 | 23 | 40 |
| DG Chemicals and chemical products | 362 | 282 | 318 | 268 | 167 | 178 | 194 | 205 | 345 |
| 24 Chemicals and chemical products | 362 | 282 | 318 | 268 | 167 | 178 | 194 | 205 | 345 |
| DH Rubber and plastic products | 130 | 129 | 137 | 146 | 96 | 64 | 80 | 119 | 137 |
| 25 Rubber and plastic products | 130 | 129 | 137 | 146 | 96 | 64 | 80 | 119 | 137 |
| 251 Rubber products | 20 | 30 | 20 | 22 | 10 | 15 | 8 | 25 | 18 |
| 252 Plastic products | 110 | 99 | 117 | 124 | 86 | 49 | 72 | 94 | 119 |
| DI Non-metallic mineral products | 210 | 185 | 236 | 280 | 115 | 78 | 78 | 115 | 109 |
| 26 Non-metallic mineral products | 210 | 185 | 236 | 280 | 115 | 78 | 78 | 115 | 109 |
| DJ Basic metals and fabricated metal products | 595 | 499 | 688 | 541 | 410 | 249 | 226 | 268 | 633 |
| 27 Basic metals | 444 | 318 | 399 | 295 | 255 | 164 | 159 | 185 | 480 |
| 28 Fabricated metal products | 151 | 181 | 289 | 246 | 155 | 85 | 67 | 83 | 153 |
| DK Machinery and equipment | 376 | 335 | 467 | 448 | 303 | 208 | 172 | 221 | 347 |
| 29 Machinery and equipment | 376 | 335 | 467 | 448 | 303 | 208 | 172 | 221 | 347 |
| DL Electrical and optical equipment | 180 | 153 | 191 | 198 | 123 | 168 | 197 | 308 | 386 |
| 30 Office machinery and computers | 23 | 13 | 27 | 27 | 24 | 24 | 27 | 25 | 20 |
| 31 Other electrical machinery and apparatus | 53 | 48 | 61 | 76 | 43 | 65 | 67 | 73 | 78 |
| 32 Radio, television and communication equipment | 83 | 82 | 75 | 64 | 35 | 60 | 75 | 180 | 262 |
| 33 Medical and precision instruments, clocks | 21 | 10 | 28 | 31 | 21 | 19 | 28 | 30 | 26 |
| DM Transport equipment | 112 | 78 | 105 | 110 | 95 | 56 | 104 | 124 | 92 |
| 34 Motor vehicles and trailers | 42 | 51 | 52 | 44 | 47 | 16 | 12 | 8 | 32 |
| 35 Other transport equipment | 70 | 27 | 53 | 66 | 48 | 40 | 92 | 116 | 60 |
| 351 Ships and boats | 55 | 11 | 34 | 37 | 19 | 24 | 69 | 95 | 34 |
| 352 Other transport equipment | 15 | 16 | 19 | 29 | 29 | 16 | 23 | 21 | 26 |
| DN Other manufacturing and recycling | 66 | 16 | 105 | 72 | 47 | 55 | 21 | 35 | 48 |
| 36 Other manufacturing | 66 | 16 | 105 | 72 | 47 | 55 | 21 | 34 | 44 |
| 361 Furniture | 53 | -1 | 91 | 53 | 35 | 42 | 13 | 22 | 31 |
| 362 Other products | 13 | 17 | 14 | 19 | 12 | 13 | 8 | 12 | 13 |
| 37 Recycling | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 4 |
| E Electricity, gas and water supply | 1 032 | 990 | 1 174 | 1 002 | 1 074 | 870 | 771 | 949 | 850 |
| 40 Electricity, gas, steam and hot water supply | 898 | 870 | 1 054 | 883 | 925 | 759 | 664 | 834 | 739 |
| 41 Purification and distribution of water | 134 | 120 | 120 | 119 | 149 | 111 | 107 | 115 | 111 |
| F Construction | 360 | 507 | 604 | 577 | 423 | 137 | 58 | 181 | 289 |

Table D: Total investments 1960-2001 (Cont.)

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|--------|--------|--------|--------|--------|--------|
| 0 Total | 19 571 | 22 268 | 24 148 | 24 744 | 25 753 | 26 829 |
| A Agriculture, hunting and forestry | 942 | 1 151 | 1 266 | 1 255 | 1 218 | 1 197 |
| 01 Agriculture, hunting and related service act. | 595 | 737 | 895 | 896 | 851 | 852 |
| 01MAA Agriculture and related service act. | 595 | 737 | 895 | 896 | 851 | 852 |
| 0112 Horticulture | 0 | 0 | 0 | 0 | 0 | 0 |
| 0125 Other farming of animals | | | | | | |
| 013 Mixed farming | 595 | 737 | 895 | 896 | 851 | 852 |
| 014 Agricultural service activities | | | | | | |
| 015 Hunting and game husbandry | 0 | 0 | 0 | 0 | 0 | 0 |
| 02 Forestry and related service activities | 347 | 414 | 371 | 359 | 367 | 345 |
| 0211 Forest cultivation | 13 | 5 | 5 | 14 | 9 | 6 |
| 0212 Timber harvesting | 320 | 394 | 347 | 329 | 339 | 321 |
| 0219 Other forestry | 8 | 8 | 11 | 9 | 11 | 9 |
| 0202 Forestry related service activities | 6 | 7 | 8 | 7 | 8 | 9 |
| B Fishing | 5 | 5 | 3 | 4 | 4 | 3 |
| 05 Fishing and fish farming | 5 | 5 | 3 | 4 | 4 | 3 |
| C Mining and quarrying | 99 | 81 | 95 | 115 | 124 | 127 |
| 10 Mining of energy producing minerals | 28 | 10 | 20 | 21 | 10 | 17 |
| 13 Mining of metal ores | 48 | 43 | 39 | 51 | 76 | 58 |
| 14 Mining of other minerals | 23 | 28 | 36 | 43 | 38 | 52 |
| D Manufacturing | 4 114 | 4 095 | 4 312 | 3 857 | 3 754 | 4 689 |
| DA Food products, beverages and tobacco | 404 | 363 | 387 | 364 | 348 | 446 |
| 15 Food products and beverages | 394 | 360 | 398 | 362 | 347 | 443 |
| 151 Food supplies | 311 | 275 | 284 | 258 | 261 | 287 |
| 159 Beverages | 83 | 85 | 114 | 104 | 86 | 156 |
| 16 Tobacco products | 10 | 3 | -11 | 2 | 1 | 3 |
| DB Textiles and textile products | 33 | 55 | 54 | 34 | 38 | 50 |
| 17 Textiles | 16 | 36 | 41 | 23 | 28 | 38 |
| 18 Wearing apparel, dressing of fur | 17 | 19 | 13 | 11 | 10 | 12 |
| DC Leather and leather products | 9 | 9 | 8 | 7 | 6 | 5 |
| 19 Leather and leather products | 9 | 9 | 8 | 7 | 6 | 5 |
| DD Wood and wood products | 141 | 213 | 282 | 279 | 279 | 276 |
| 20 Wood and wood products | 141 | 213 | 282 | 279 | 279 | 276 |
| DE Pulp, paper, publishing and printing | 1 682 | 1 203 | 1 264 | 931 | 870 | 1 476 |
| 21 Pulp, paper and paper products | 1 505 | 962 | 1 017 | 714 | 686 | 1 277 |
| 22 Publishing and printing | 177 | 241 | 247 | 217 | 184 | 199 |
| DF Coke, petroleum products and nuclear fuel | 44 | 137 | 43 | 101 | 63 | 135 |
| 23 Coke, petroleum products and nuclear fuel | 44 | 137 | 43 | 101 | 63 | 135 |
| DG Chemicals and chemical products | 193 | 308 | 309 | 299 | 211 | 227 |
| 24 Chemicals and chemical products | 193 | 308 | 309 | 299 | 211 | 227 |
| DH Rubber and plastic products | 125 | 131 | 197 | 173 | 131 | 163 |
| 25 Rubber and plastic products | 125 | 131 | 197 | 173 | 131 | 163 |
| 251 Rubber products | 27 | 25 | 59 | 39 | 36 | 57 |
| 252 Plastic products | 98 | 106 | 138 | 134 | 95 | 106 |
| DI Non-metallic mineral products | 72 | 101 | 134 | 145 | 130 | 119 |
| 26 Non-metallic mineral products | 72 | 101 | 134 | 145 | 130 | 119 |
| DJ Basic metals and fabricated metal products | 602 | 702 | 597 | 407 | 518 | 522 |
| 27 Basic metals | 462 | 493 | 336 | 192 | 287 | 248 |
| 28 Fabricated metal products | 140 | 209 | 261 | 215 | 231 | 274 |
| DK Machinery and equipment | 317 | 323 | 291 | 248 | 246 | 274 |
| 29 Machinery and equipment | 317 | 323 | 291 | 248 | 246 | 274 |
| DL Electrical and optical equipment | 362 | 390 | 533 | 695 | 744 | 811 |
| 30 Office machinery and computers | 2 | 7 | 6 | 2 | -4 | 1 |
| 31 Other electrical machinery and apparatus | 86 | 100 | 109 | 90 | 84 | 117 |
| 32 Radio, television and communication equipment | 245 | 223 | 360 | 526 | 595 | 655 |
| 33 Medical and precision instruments, clocks | 29 | 60 | 58 | 77 | 69 | 38 |
| DM Transport equipment | 88 | 94 | 141 | 112 | 99 | 121 |
| 34 Motor vehicles and trailers | 28 | 32 | 34 | 35 | 24 | 38 |
| 35 Other transport equipment | 60 | 62 | 107 | 77 | 75 | 83 |
| 351 Ships and boats | 28 | 22 | 54 | 23 | 27 | 35 |
| 352 Other transport equipment | 32 | 40 | 53 | 54 | 48 | 48 |
| DN Other manufacturing and recycling | 42 | 66 | 72 | 62 | 71 | 64 |
| 36 Other manufacturing | 36 | 57 | 67 | 58 | 66 | 58 |
| 361 Furniture | 27 | 43 | 53 | 46 | 50 | 42 |
| 362 Other products | 9 | 14 | 14 | 12 | 16 | 16 |
| 37 Recycling | 6 | 9 | 5 | 4 | 5 | 6 |
| E Electricity, gas and water supply | 830 | 989 | 810 | 745 | 862 | 915 |
| 40 Electricity, gas, steam and hot water supply | 714 | 859 | 684 | 605 | 713 | 745 |
| 41 Purification and distribution of water | 116 | 130 | 126 | 140 | 149 | 170 |
| F Construction | 296 | 363 | 352 | 465 | 501 | 462 |

Source: Statistics Finland, Business structures and economic account

Table D: Total investments 1960-2001 (Cont.)

| | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 |
|--|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| | 1 000 000 EUR, at 2000 prices | | | | | | | | |
| 45 Construction | 228 | 234 | 254 | 235 | 237 | 284 | 382 | 305 | 250 |
| 4501 House building | 96 | 81 | 80 | 82 | 67 | 76 | 132 | 101 | 69 |
| 4502 Civil engineering | 122 | 144 | 165 | 144 | 163 | 201 | 237 | 196 | 176 |
| 4509 Construction related service activities | 10 | 9 | 9 | 9 | 7 | 7 | 13 | 8 | 5 |
| G Wholesale and retail trade | 850 | 816 | 659 | 444 | 631 | 849 | 973 | 909 | 603 |
| 50 Sale and repair of motor vehicles | 164 | 161 | 126 | 85 | 121 | 161 | 189 | 176 | 112 |
| 501 Sale of motor vehicles | 149 | 146 | 114 | 77 | 110 | 147 | 172 | 159 | 101 |
| 502 Maintenance and repair of motor vehicles | 15 | 15 | 12 | 8 | 11 | 14 | 17 | 17 | 11 |
| 51 Wholesale trade and commission trade | 434 | 414 | 330 | 229 | 326 | 452 | 497 | 467 | 317 |
| 52 Retail trade, repair of household goods | 252 | 241 | 203 | 130 | 184 | 236 | 287 | 266 | 174 |
| 521 Retail sale | 251 | 240 | 202 | 129 | 183 | 235 | 286 | 265 | 173 |
| 527 Repair of personal and household goods | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| H Hotels and restaurants | 57 | 50 | 36 | 23 | 33 | 47 | 43 | 50 | 43 |
| 55 Hotels and restaurants | 57 | 50 | 36 | 23 | 33 | 47 | 43 | 50 | 43 |
| 551 Provision of short term accommodation | 38 | 33 | 17 | 12 | 19 | 27 | 26 | 31 | 26 |
| 553 Restaurants and catering | 19 | 17 | 19 | 11 | 14 | 20 | 17 | 19 | 17 |
| I Transport, storage and communication | 1 862 | 1 834 | 1 900 | 1 927 | 2 357 | 2 515 | 2 418 | 2 528 | 2 554 |
| IA Transport and storage | 1 735 | 1 709 | 1 751 | 1 777 | 2 197 | 2 378 | 2 260 | 2 376 | 2 395 |
| 60 Land transport, transport via pipelines | 512 | 569 | 606 | 615 | 553 | 600 | 629 | 847 | 527 |
| 601 Transport via railways | 239 | 309 | 337 | 347 | 312 | 308 | 258 | 516 | 263 |
| 602 Other land transport | 273 | 260 | 269 | 268 | 241 | 292 | 371 | 331 | 264 |
| 6021 Scheduled passenger land transport | 70 | 70 | 74 | 81 | 68 | 81 | 71 | 77 | 75 |
| 6022 Taxi traffic | 108 | 103 | 109 | 92 | 94 | 110 | 32 | 42 | 15 |
| 6024 Freight transport by road | 95 | 87 | 86 | 95 | 79 | 101 | 268 | 212 | 174 |
| 603 Transport via pipelines | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 61 Water transport | 230 | 222 | 219 | 194 | 329 | 313 | 241 | 315 | 329 |
| 62 Air transport | 32 | 37 | 41 | 25 | 122 | 90 | 98 | 13 | 231 |
| 63 Supporting transport act., travel agencies | 961 | 881 | 885 | 943 | 1 193 | 1 375 | 1 292 | 1 201 | 1 308 |
| 6301 Supporting rail transport activities | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 6302 Supporting road transport activities | 832 | 747 | 745 | 765 | 972 | 1 113 | 1 024 | 945 | 1 017 |
| 6303 Supporting air transport activities | 43 | 33 | 26 | 47 | 45 | 47 | 55 | 43 | 42 |
| 6309 Other supporting transport activities | 85 | 100 | 112 | 129 | 174 | 213 | 211 | 211 | 247 |
| IB Post and telecommunications | 127 | 125 | 149 | 150 | 160 | 137 | 158 | 152 | 159 |
| 64 Post and telecommunications | 127 | 125 | 149 | 150 | 160 | 137 | 158 | 152 | 159 |
| 641 Post and courier activities | 14 | 9 | 13 | 13 | 16 | 11 | 15 | 14 | 11 |
| 642 Telecommunications | 113 | 116 | 136 | 137 | 144 | 126 | 143 | 138 | 148 |
| J Financial intermediation | 107 | 107 | 136 | 145 | 137 | 160 | 195 | 195 | 166 |
| 65 Financial intermediation | 88 | 81 | 104 | 118 | 115 | 131 | 161 | 167 | 126 |
| 66 Insurance | 19 | 26 | 32 | 27 | 22 | 29 | 34 | 28 | 40 |
| 67 Activities auxiliary to financial intermediation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| K Real estate, renting and business activities | 2 944 | 3 447 | 3 748 | 3 825 | 3 608 | 3 902 | 4 043 | 4 267 | 4 276 |
| KA Real estate activities | 2 894 | 3 400 | 3 718 | 3 809 | 3 572 | 3 844 | 3 994 | 4 217 | 4 214 |
| 70 Real estate activities | 2 894 | 3 400 | 3 718 | 3 809 | 3 572 | 3 844 | 3 994 | 4 217 | 4 214 |
| 701 Real estate activities with own property | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 702 Letting of own property | 2 830 | 3 331 | 3 633 | 3 721 | 3 467 | 3 746 | 3 919 | 4 110 | 4 124 |
| 7021 Letting of dwellings | 2 585 | 3 039 | 3 350 | 3 436 | 3 187 | 3 441 | 3 646 | 3 794 | 3 715 |
| 7022 Operation of dwelling and residential real estate | 245 | 292 | 283 | 285 | 280 | 305 | 273 | 316 | 409 |
| 703 Real estate act. on a fee or contract basis | 64 | 69 | 85 | 88 | 105 | 98 | 75 | 107 | 90 |
| 7031 Real estate agencies | 4 | 4 | 3 | 3 | 3 | 3 | 4 | 3 | 4 |
| 7032 Management of real estate | 60 | 65 | 82 | 85 | 102 | 95 | 71 | 104 | 86 |
| KB Business activities | 50 | 47 | 30 | 16 | 36 | 58 | 49 | 50 | 62 |
| 71 Renting of machinery and equipment | 2 | 3 | 3 | 2 | 4 | 6 | 6 | 7 | 10 |
| 72 Computer and related activities | 1 | 4 | 4 | 2 | 3 | 6 | 7 | 7 | 8 |
| 73 Research and development | 13 | 16 | 9 | 6 | 16 | 13 | 11 | 14 | 15 |
| 74 Other business activities | 34 | 24 | 14 | 6 | 13 | 33 | 25 | 22 | 29 |
| 741 Legal, accounting, book-keeping activities etc. | 16 | 15 | 4 | 2 | 4 | 16 | 11 | 9 | 12 |
| 742 Technical consultancy, testing and analysis | 7 | 1 | 5 | 2 | 5 | 3 | 3 | 3 | 4 |
| 744 Advertising | 4 | 2 | 3 | 1 | 2 | 4 | 4 | 4 | 4 |
| 747 Industrial cleaning | 5 | 4 | 2 | 1 | 2 | 7 | 5 | 4 | 5 |
| 748 Miscellaneous business activities | 2 | 2 | 0 | 0 | 0 | 3 | 2 | 2 | 4 |
| L Administration, compulsory social security | 309 | 318 | 355 | 364 | 390 | 404 | 427 | 463 | 457 |
| 75 Administration, compulsory social security | 309 | 318 | 355 | 364 | 390 | 404 | 427 | 463 | 457 |
| 751 Administration of the State | 290 | 293 | 324 | 339 | 371 | 378 | 396 | 437 | 422 |
| 752 National defence and conscripts | | | | | | | | | |
| 753 Compulsory social security activities | 19 | 25 | 31 | 25 | 19 | 26 | 31 | 26 | 35 |
| 7351 Employment pension insurance | 16 | 22 | 27 | 23 | 16 | 23 | 28 | 23 | 31 |
| 7539 Other compulsory social security activities | 3 | 3 | 4 | 2 | 3 | 3 | 3 | 3 | 4 |
| M Education | 316 | 317 | 323 | 396 | 432 | 481 | 424 | 473 | 436 |
| 80 Education | 316 | 317 | 323 | 396 | 432 | 481 | 424 | 473 | 436 |
| N Health and social work | 207 | 249 | 254 | 257 | 304 | 329 | 331 | 403 | 427 |

Table D: Total investments 1960-2001 (Cont.)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 45 Construction | 292 | 368 | 361 | 372 | 394 | 466 | 370 | 232 | 319 |
| 4501 House building | 112 | 157 | 152 | 165 | 181 | 235 | 130 | 70 | 114 |
| 4502 Civil engineering | 170 | 197 | 195 | 193 | 197 | 208 | 232 | 157 | 198 |
| 4509 Construction related service activities | 10 | 14 | 14 | 14 | 16 | 23 | 8 | 5 | 7 |
| G Wholesale and retail trade | 883 | 1 102 | 1 039 | 1 018 | 1 311 | 927 | 1 086 | 884 | 786 |
| 50 Sale and repair of motor vehicles | 162 | 210 | 195 | 188 | 240 | 166 | 207 | 169 | 147 |
| 501 Sale of motor vehicles | 146 | 190 | 177 | 170 | 216 | 149 | 189 | 153 | 134 |
| 502 Maintenance and repair of motor vehicles | 16 | 20 | 18 | 18 | 24 | 17 | 18 | 16 | 13 |
| 51 Wholesale trade and commission trade | 467 | 571 | 540 | 529 | 682 | 490 | 573 | 465 | 416 |
| 52 Retail trade, repair of household goods | 254 | 321 | 304 | 301 | 389 | 271 | 306 | 250 | 223 |
| 521 Retail sale | 253 | 319 | 302 | 299 | 385 | 268 | 304 | 248 | 221 |
| 527 Repair of personal and household goods | 1 | 2 | 2 | 2 | 4 | 3 | 2 | 2 | 2 |
| H Hotels and restaurants | 47 | 124 | 103 | 130 | 199 | 139 | 139 | 117 | 101 |
| 55 Hotels and restaurants | 47 | 124 | 103 | 130 | 199 | 139 | 139 | 117 | 101 |
| 551 Provision of short term accommodation | 28 | 65 | 54 | 68 | 103 | 70 | 72 | 60 | 52 |
| 553 Restaurants and catering | 19 | 59 | 49 | 62 | 96 | 69 | 67 | 57 | 49 |
| I Transport, storage and communication | 2 736 | 2 573 | 2 577 | 3 126 | 2 912 | 2 986 | 3 347 | 2 999 | 2 818 |
| IA Transport and storage | 2 573 | 2 362 | 2 322 | 2 832 | 2 602 | 2 619 | 2 908 | 2 553 | 2 384 |
| 60 Land transport, transport via pipelines | 634 | 765 | 749 | 852 | 979 | 1 007 | 1 009 | 914 | 864 |
| 601 Transport via railways | 246 | 281 | 273 | 289 | 274 | 302 | 387 | 373 | 335 |
| 602 Other land transport | 388 | 484 | 476 | 563 | 640 | 682 | 616 | 541 | 529 |
| 6021 Scheduled passenger land transport | 54 | 70 | 94 | 112 | 138 | 147 | 135 | 150 | 128 |
| 6022 Taxi traffic | 27 | 45 | 38 | 54 | 54 | 59 | 56 | 48 | 47 |
| 6024 Freight transport by road | 307 | 369 | 344 | 397 | 448 | 476 | 425 | 343 | 354 |
| 603 Transport via pipelines | 0 | 0 | 0 | 0 | 65 | 23 | 6 | 0 | 0 |
| 61 Water transport | 518 | 336 | 289 | 517 | 206 | 251 | 540 | 501 | 586 |
| 62 Air transport | 218 | 182 | 183 | 208 | 162 | 272 | 364 | 236 | 81 |
| 63 Supporting transport act., travel agencies | 1 203 | 1 079 | 1 101 | 1 255 | 1 255 | 1 089 | 995 | 902 | 853 |
| 6301 Supporting rail transport activities | 2 | 2 | 2 | 3 | 3 | 3 | 0 | 4 | 4 |
| 6302 Supporting road transport activities | 1 003 | 897 | 952 | 1 019 | 1 015 | 886 | 829 | 732 | 717 |
| 6303 Supporting air transport activities | 58 | 18 | 17 | 17 | 14 | 8 | 24 | 33 | 27 |
| 6309 Other supporting transport activities | 140 | 162 | 130 | 216 | 223 | 192 | 142 | 133 | 105 |
| IB Post and telecommunications | 163 | 211 | 255 | 294 | 310 | 367 | 439 | 446 | 434 |
| 64 Post and telecommunications | 163 | 211 | 255 | 294 | 310 | 367 | 439 | 446 | 434 |
| 641 Post and courier activities | 11 | 32 | 28 | 34 | 27 | 34 | 29 | 27 | 44 |
| 642 Telecommunications | 152 | 179 | 227 | 260 | 283 | 333 | 410 | 419 | 390 |
| J Financial intermediation | 222 | 202 | 265 | 211 | 255 | 257 | 400 | 395 | 413 |
| 65 Financial intermediation | 181 | 173 | 232 | 165 | 178 | 188 | 294 | 275 | 310 |
| 66 Insurance | 41 | 29 | 33 | 46 | 77 | 69 | 106 | 120 | 103 |
| 67 Activities auxiliary to financial intermediation | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| K Real estate, renting and business activities | 4 676 | 5 434 | 5 387 | 6 175 | 7 028 | 7 012 | 7 586 | 6 936 | 7 321 |
| KA Real estate activities | 4 606 | 5 355 | 5 316 | 6 111 | 6 929 | 6 922 | 7 487 | 6 829 | 7 210 |
| 70 Real estate activities | 4 606 | 5 355 | 5 316 | 6 111 | 6 929 | 6 922 | 7 487 | 6 829 | 7 210 |
| 701 Real estate activities with own property | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 1 | 1 |
| 702 Letting of own property | 4 532 | 5 298 | 5 265 | 6 041 | 6 858 | 6 851 | 7 413 | 6 753 | 7 133 |
| 7021 Lettings of dwellings | 4 160 | 4 842 | 4 880 | 5 527 | 6 021 | 6 367 | 6 813 | 6 246 | 6 477 |
| 7022 Operation of dwelling and residential real estate | 372 | 456 | 385 | 514 | 837 | 484 | 600 | 507 | 656 |
| 703 Real estate act. on a fee or contract basis | 74 | 57 | 51 | 70 | 71 | 71 | 72 | 75 | 76 |
| 7031 Real estate agencies | 4 | 4 | 5 | 5 | 5 | 5 | 7 | 7 | 6 |
| 7032 Management of real estate | 70 | 53 | 46 | 65 | 66 | 66 | 65 | 68 | 70 |
| KB Business activities | 70 | 79 | 71 | 64 | 99 | 90 | 99 | 107 | 111 |
| 71 Renting of machinery and equipment | 10 | 12 | 14 | 14 | 16 | 16 | 15 | 21 | 23 |
| 72 Computer and related activities | 9 | 10 | 15 | 12 | 18 | 18 | 19 | 18 | 18 |
| 73 Research and development | 22 | 19 | 13 | 10 | 17 | 18 | 25 | 31 | 27 |
| 74 Other business activities | 29 | 38 | 29 | 28 | 48 | 38 | 40 | 37 | 43 |
| 741 Legal, accounting, book-keeping activities etc. | 10 | 16 | 10 | 8 | 21 | 9 | 14 | 6 | 9 |
| 742 Technical consultancy, testing and analysis | 7 | 6 | 7 | 8 | 9 | 11 | 10 | 7 | 10 |
| 744 Advertising | 4 | 8 | 4 | 3 | 6 | 5 | 2 | 3 | 3 |
| 747 Industrial cleaning | 5 | 4 | 5 | 6 | 7 | 9 | 13 | 15 | 15 |
| 748 Miscellaneous business activities | 3 | 4 | 3 | 3 | 5 | 4 | 1 | 6 | 6 |
| L Administration, compulsory social security | 469 | 486 | 441 | 624 | 589 | 600 | 676 | 689 | 650 |
| 75 Administration, compulsory social security | 469 | 486 | 441 | 624 | 589 | 600 | 676 | 689 | 650 |
| 751 Administration of the State | 437 | 460 | 410 | 580 | 524 | 549 | 545 | 542 | 550 |
| 752 National defence and conscripts | | | | | | | | | |
| 753 Compulsory social security activities | 32 | 26 | 31 | 44 | 65 | 51 | 131 | 147 | 100 |
| 7351 Employment pension insurance | 28 | 23 | 26 | 38 | 58 | 44 | 118 | 134 | 90 |
| 7539 Other compulsory social security activities | 4 | 3 | 5 | 6 | 7 | 7 | 13 | 13 | 10 |
| M Education | 435 | 374 | 383 | 405 | 497 | 507 | 597 | 579 | 608 |
| 80 Education | 435 | 374 | 383 | 405 | 497 | 507 | 597 | 579 | 608 |
| N Health and social work | 463 | 401 | 331 | 371 | 385 | 389 | 558 | 475 | 505 |

Source: Statistics Finland, Business structures and economic account

Table D: Total investments 1960-2001 (Cont.)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 45 Construction | 256 | 267 | 338 | 353 | 357 | 484 | 410 | 253 | 274 |
| 4501 House building | 97 | 87 | 130 | 146 | 175 | 259 | 232 | 58 | 63 |
| 4502 Civil engineering | 153 | 174 | 199 | 196 | 169 | 208 | 163 | 186 | 203 |
| 4509 Construction related service activities | 6 | 6 | 9 | 11 | 13 | 17 | 15 | 9 | 8 |
| G Wholesale and retail trade | 748 | 967 | 1 048 | 1 114 | 1 175 | 1 462 | 1 467 | 1 539 | 1 578 |
| 50 Sale and repair of motor vehicles | 134 | 182 | 171 | 185 | 192 | 251 | 267 | 282 | 253 |
| 501 Sale of motor vehicles | 121 | 165 | 154 | 167 | 172 | 226 | 241 | 254 | 227 |
| 502 Maintenance and repair of motor vehicles | 13 | 17 | 17 | 18 | 20 | 25 | 26 | 28 | 26 |
| 51 Wholesale trade and commission trade | 395 | 509 | 571 | 617 | 640 | 807 | 774 | 801 | 920 |
| 52 Retail trade, repair of household goods | 219 | 276 | 306 | 312 | 343 | 404 | 426 | 456 | 405 |
| 521 Retail sale | 217 | 275 | 304 | 309 | 340 | 400 | 422 | 452 | 401 |
| 527 Repair of personal and household goods | 2 | 1 | 2 | 3 | 3 | 4 | 4 | 4 | 4 |
| H Hotels and restaurants | 107 | 129 | 130 | 118 | 98 | 116 | 125 | 121 | 128 |
| 55 Hotels and restaurants | 107 | 129 | 130 | 118 | 98 | 116 | 125 | 121 | 128 |
| 551 Provision of short term accomodation | 55 | 67 | 66 | 60 | 57 | 67 | 73 | 70 | 76 |
| 553 Restaurants and catering | 52 | 62 | 64 | 58 | 41 | 49 | 52 | 51 | 52 |
| I Transport, storage and communication | 2 450 | 2 443 | 2 646 | 2 848 | 2 654 | 2 653 | 2 441 | 2 340 | 2 630 |
| IA Transport and storage | 2 019 | 2 070 | 2 317 | 2 485 | 2 255 | 2 243 | 2 061 | 1 891 | 2 152 |
| 60 Land transport, transport via pipelines | 851 | 901 | 826 | 819 | 718 | 755 | 718 | 771 | 788 |
| 601 Transport via railways | 318 | 291 | 282 | 280 | 246 | 233 | 210 | 201 | 205 |
| 602 Other land transport | 533 | 609 | 543 | 539 | 471 | 521 | 499 | 493 | 480 |
| 6021 Scheduled passenger land transport | 131 | 137 | 138 | 152 | 148 | 157 | 136 | 129 | 108 |
| 6022 Taxi traffic | 56 | 64 | 51 | 46 | 48 | 44 | 42 | 43 | 48 |
| 6024 Freight transport by road | 346 | 408 | 354 | 341 | 275 | 320 | 321 | 321 | 324 |
| 603 Transport via pipelines | 0 | 1 | 1 | 0 | 1 | 1 | 9 | 77 | 103 |
| 61 Water transport | 247 | 152 | 362 | 495 | 393 | 384 | 310 | 53 | 205 |
| 62 Air transport | 75 | 75 | 153 | 211 | 142 | 129 | 44 | 98 | 108 |
| 63 Supporting transport act., travel agencies | 846 | 942 | 976 | 960 | 1 002 | 975 | 989 | 969 | 1 051 |
| 6301 Supporting rail transport activities | 4 | 3 | 3 | 3 | 2 | 2 | 0 | 0 | 0 |
| 6302 Supporting road transport activities | 728 | 811 | 797 | 777 | 808 | 803 | 801 | 795 | 882 |
| 6303 Supporting air transport activities | 28 | 25 | 26 | 26 | 33 | 24 | 21 | 19 | 22 |
| 6309 Other supporting transport activities | 86 | 103 | 150 | 154 | 159 | 146 | 167 | 155 | 147 |
| IB Post and telecommunications | 431 | 373 | 329 | 363 | 399 | 410 | 380 | 449 | 478 |
| 64 Post and telecommunications | 431 | 373 | 329 | 363 | 399 | 410 | 380 | 449 | 478 |
| 641 Post and courier activities | 68 | 44 | 21 | 35 | 38 | 34 | 22 | 33 | 37 |
| 642 Telecommunications | 363 | 329 | 308 | 328 | 361 | 376 | 358 | 416 | 441 |
| J Financial intermediation | 374 | 403 | 446 | 473 | 460 | 491 | 607 | 427 | 820 |
| 65 Financial intermediation | 240 | 270 | 279 | 295 | 277 | 359 | 403 | 367 | 643 |
| 66 Insurance | 134 | 133 | 166 | 176 | 181 | 126 | 195 | 45 | 169 |
| 67 Activities auxiliary to financial intermediation | 0 | 0 | 1 | 2 | 2 | 6 | 9 | 15 | 8 |
| K Real estate, renting and business activities | 7 437 | 7 265 | 7 714 | 7 471 | 7 961 | 8 574 | 8 533 | 8 883 | 8 388 |
| KA Real estate activities | 7 322 | 7 108 | 7 545 | 7 304 | 7 758 | 8 348 | 8 260 | 8 530 | 7 954 |
| 70 Real estate activities | 7 322 | 7 108 | 7 545 | 7 304 | 7 758 | 8 348 | 8 260 | 8 530 | 7 954 |
| 701 Real estate activities with own property | 1 | 1 | 2 | 2 | 2 | 3 | 2 | 0 | 1 |
| 702 Letting of own property | 7 231 | 7 022 | 7 457 | 7 216 | 7 669 | 8 258 | 8 152 | 8 403 | 7 826 |
| 7021 Letting of dwellings | 6 488 | 6 424 | 6 746 | 6 551 | 6 953 | 6 966 | 6 911 | 6 645 | 6 186 |
| 7022 Operation of dwelling and residential real estate | 743 | 598 | 711 | 665 | 716 | 1 292 | 1 241 | 1 758 | 1 640 |
| 703 Real estate act. on a fee or contract basis | 90 | 85 | 86 | 86 | 87 | 87 | 106 | 127 | 127 |
| 7031 Real estate agencies | 4 | 6 | 7 | 10 | 11 | 9 | 13 | 21 | 12 |
| 7032 Management of real estate | 86 | 79 | 79 | 76 | 76 | 78 | 93 | 106 | 115 |
| KB Business activities | 115 | 157 | 169 | 167 | 203 | 226 | 273 | 353 | 434 |
| 71 Renting of machinery and equipment | 22 | 29 | 43 | 38 | 33 | 38 | 55 | 87 | 131 |
| 72 Computer and related activities | 21 | 34 | 42 | 32 | 35 | 34 | 45 | 61 | 69 |
| 73 Research and development | 30 | 34 | 27 | 26 | 43 | 40 | 49 | 58 | 67 |
| 74 Other business activities | 42 | 60 | 57 | 71 | 92 | 114 | 124 | 147 | 167 |
| 741 Legal, accounting, book-keeping activities etc. | 9 | 14 | 17 | 15 | 22 | 26 | 26 | 38 | 39 |
| 742 Technical consultancy, testing and analysis | 9 | 15 | 16 | 24 | 31 | 39 | 44 | 49 | 57 |
| 744 Advertising | 5 | 6 | 6 | 5 | 8 | 9 | 12 | 14 | 17 |
| 747 Industrial cleaning | 13 | 15 | 13 | 18 | 16 | 26 | 27 | 24 | 22 |
| 748 Miscellaneous business activities | 6 | 10 | 5 | 9 | 15 | 14 | 15 | 22 | 32 |
| L Administration, compulsory social security | 797 | 839 | 897 | 847 | 875 | 950 | 833 | 856 | 722 |
| 75 Administration, compulsory social security | 797 | 839 | 897 | 847 | 875 | 950 | 833 | 856 | 722 |
| 751 Administration of the State | 646 | 696 | 719 | 729 | 740 | 809 | 711 | 698 | 639 |
| 752 National defence and conscripts | | | | | | | | | |
| 753 Compulsory social security activities | 151 | 143 | 178 | 118 | 135 | 141 | 122 | 158 | 83 |
| 7351 Employment pension insurance | 138 | 130 | 170 | 111 | 119 | 113 | 102 | 145 | 60 |
| 7539 Other compulsory social security activities | 13 | 13 | 8 | 7 | 16 | 28 | 20 | 13 | 23 |
| M Education | 468 | 475 | 493 | 441 | 530 | 526 | 548 | 626 | 676 |
| 80 Education | 468 | 475 | 493 | 441 | 530 | 526 | 548 | 626 | 676 |
| N Health and social work | 530 | 451 | 485 | 564 | 603 | 616 | 605 | 612 | 607 |

Table D: Total investments 1960-2001 (Cont.)

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|--|-------|--------|--------|--------|-------|-------|-------|-------|-------|
| 45 Construction | 360 | 507 | 604 | 577 | 423 | 137 | 58 | 181 | 289 |
| 4501 House building | 134 | 226 | 286 | 301 | 200 | 23 | -9 | 82 | 144 |
| 4502 Civil engineering | 215 | 262 | 293 | 250 | 218 | 120 | 69 | 91 | 131 |
| 4509 Construction related service activities | 11 | 19 | 25 | 26 | 5 | -6 | -2 | 8 | 14 |
| G Wholesale and retail trade | 1 752 | 1 598 | 2 284 | 2 146 | 1 681 | 1 381 | 1 034 | 574 | 833 |
| 50 Sale and repair of motor vehicles | 305 | 343 | 400 | 377 | 279 | 209 | 142 | 113 | 118 |
| 501 Sale of motor vehicles | 274 | 308 | 358 | 343 | 257 | 190 | 130 | 101 | 101 |
| 502 Maintenance and repair of motor vehicles | 31 | 35 | 42 | 34 | 22 | 19 | 12 | 12 | 17 |
| 51 Wholesale trade and commission trade | 915 | 628 | 1 201 | 1 131 | 906 | 732 | 522 | 305 | 359 |
| 52 Retail trade, repair of household goods | 532 | 627 | 683 | 638 | 496 | 440 | 370 | 156 | 356 |
| 521 Retail sale | 527 | 621 | 677 | 634 | 493 | 437 | 368 | 154 | 354 |
| 527 Repair of personal and household goods | 5 | 6 | 6 | 4 | 3 | 3 | 2 | 2 | 2 |
| H Hotels and restaurants | 131 | 122 | 333 | 278 | 239 | 124 | 73 | 84 | 95 |
| 55 Hotels and restaurants | 131 | 122 | 333 | 278 | 239 | 124 | 73 | 84 | 95 |
| 551 Provision of short term accommodation | 72 | 59 | 223 | 173 | 135 | 70 | 41 | 44 | 31 |
| 553 Restaurants and catering | 59 | 63 | 110 | 105 | 104 | 54 | 32 | 40 | 64 |
| I Transport, storage and communication | 2 644 | 2 921 | 3 439 | 3 428 | 2 625 | 2 786 | 2 549 | 2 461 | 2 655 |
| IA Transport and storage | 2 129 | 2 376 | 2 840 | 2 825 | 2 093 | 2 319 | 2 096 | 1 981 | 2 044 |
| 60 Land transport, transport via pipelines | 762 | 764 | 898 | 633 | 419 | 335 | 287 | 396 | 627 |
| 601 Transport via railways | 205 | 204 | 252 | 65 | 51 | 64 | 46 | 48 | 96 |
| 602 Other land transport | 549 | 545 | 630 | 548 | 365 | 259 | 226 | 346 | 530 |
| 6021 Scheduled passenger land transport | 151 | 123 | 129 | 108 | 95 | 77 | 73 | 90 | 112 |
| 6022 Taxi traffic | 52 | 48 | 59 | 50 | 40 | 35 | 35 | 23 | 29 |
| 6024 Freight transport by road | 346 | 374 | 442 | 390 | 230 | 147 | 118 | 233 | 389 |
| 603 Transport via pipelines | 8 | 15 | 16 | 20 | 3 | 12 | 15 | 2 | 1 |
| 61 Water transport | 65 | 401 | 548 | 450 | 67 | 516 | 392 | 86 | -6 |
| 62 Air transport | 164 | 135 | 225 | 339 | 230 | 69 | 181 | 183 | 91 |
| 63 Supporting transport act., travel agencies | 1 138 | 1 076 | 1 169 | 1 403 | 1 377 | 1 399 | 1 236 | 1 316 | 1 332 |
| 6301 Supporting rail transport activities | 0 | 0 | 0 | 159 | 166 | 127 | 139 | 162 | 182 |
| 6302 Supporting road transport activities | 925 | 901 | 949 | 1 042 | 1 044 | 1 051 | 910 | 928 | 836 |
| 6303 Supporting air transport activities | 27 | 31 | 34 | 48 | 58 | 62 | 49 | 37 | 56 |
| 6309 Other supporting transport activities | 186 | 144 | 186 | 154 | 109 | 159 | 138 | 189 | 258 |
| IB Post and telecommunications | 515 | 545 | 599 | 603 | 532 | 467 | 453 | 480 | 611 |
| 64 Post and telecommunications | 515 | 545 | 599 | 603 | 532 | 467 | 453 | 480 | 611 |
| 641 Post and courier activities | 46 | 57 | 66 | 74 | 53 | 33 | 53 | 45 | 42 |
| 642 Telecommunications | 469 | 488 | 533 | 529 | 479 | 434 | 400 | 435 | 569 |
| J Financial intermediation | 605 | 209 | 730 | 601 | 566 | 501 | -63 | 509 | 69 |
| 65 Financial intermediation | 525 | -23 | 581 | 353 | 380 | 221 | -101 | 388 | -109 |
| 66 Insurance | 71 | 217 | 139 | 236 | 177 | 271 | 33 | 122 | 169 |
| 67 Activities auxiliary to financial intermediation | 9 | 15 | 10 | 12 | 9 | 9 | 5 | -1 | 9 |
| K Real estate, renting and business activities | 8 486 | 11 854 | 11 903 | 11 224 | 8 911 | 6 834 | 6 308 | 5 132 | 5 881 |
| KA Real estate activities | 8 028 | 11 298 | 11 348 | 10 720 | 8 519 | 6 468 | 6 020 | 4 804 | 5 435 |
| 70 Real estate activities | 8 028 | 11 298 | 11 348 | 10 720 | 8 519 | 6 468 | 6 020 | 4 804 | 5 435 |
| 701 Real estate activities with own property | 2 | 3 | 3 | 4 | 5 | 0 | 0 | 4 | -10 |
| 702 Letting of own property | 7 874 | 11 095 | 11 067 | 10 372 | 8 379 | 6 326 | 5 894 | 4 666 | 5 360 |
| 7021 Letting of dwellings | 6 244 | 7 371 | 8 440 | 7 922 | 6 556 | 5 451 | 4 956 | 4 624 | 4 502 |
| 7022 Operation of dwelling and residential real estate | 1 630 | 3 724 | 2 627 | 2 450 | 1 823 | 875 | 938 | 42 | 858 |
| 703 Real estate act. on a fee or contract basis | 152 | 200 | 278 | 344 | 135 | 142 | 126 | 134 | 85 |
| 7031 Real estate agencies | 14 | 21 | 29 | 19 | 16 | 14 | 8 | 6 | 8 |
| 7032 Management of real estate | 138 | 179 | 249 | 325 | 119 | 128 | 118 | 128 | 77 |
| KB Business activities | 458 | 556 | 555 | 504 | 392 | 366 | 288 | 328 | 446 |
| 71 Renting of machinery and equipment | 126 | 149 | 151 | 134 | 85 | 72 | 50 | 50 | 93 |
| 72 Computer and related activities | 72 | 91 | 90 | 80 | 62 | 86 | 82 | 67 | 111 |
| 73 Research and development | 81 | 95 | 84 | 66 | 73 | 74 | 61 | 55 | 64 |
| 74 Other business activities | 179 | 221 | 230 | 224 | 172 | 134 | 95 | 156 | 178 |
| 741 Legal, accounting, book-keeping activities etc. | 41 | 59 | 57 | 52 | 48 | 45 | 36 | 48 | 10 |
| 742 Technical consultancy, testing and analysis | 66 | 79 | 87 | 91 | 69 | 53 | 31 | 56 | 98 |
| 744 Advertising | 16 | 20 | 21 | 17 | 10 | 7 | 5 | 9 | 16 |
| 747 Industrial cleaning | 23 | 24 | 25 | 26 | 10 | 1 | 4 | 8 | 11 |
| 748 Miscellaneous business activities | 33 | 39 | 40 | 38 | 35 | 28 | 19 | 35 | 43 |
| L Administration, compulsory social security | 805 | 1 037 | 639 | 743 | 768 | 743 | 627 | 772 | 585 |
| 75 Administration, compulsory social security | 805 | 1 037 | 639 | 743 | 768 | 743 | 627 | 772 | 585 |
| 751 Administration of the State | 665 | 667 | 599 | 669 | 700 | 613 | 495 | 586 | 531 |
| 752 National defence and conscripts | | | | | | | | | |
| 753 Compulsory social security activities | 140 | 370 | 40 | 74 | 68 | 130 | 132 | 186 | 54 |
| 7351 Employment pension insurance | 130 | 359 | 26 | 61 | 57 | 120 | 124 | 171 | 41 |
| 7539 Other compulsory social security activities | 10 | 11 | 14 | 13 | 11 | 10 | 8 | 15 | 13 |
| M Education | 734 | 727 | 708 | 795 | 779 | 721 | 680 | 642 | 641 |
| 80 Education | 734 | 727 | 708 | 795 | 779 | 721 | 680 | 642 | 641 |
| N Health and social work | 709 | 702 | 736 | 818 | 791 | 788 | 591 | 537 | 561 |

Source: Statistics Finland, Business structures and economic account

Table D: Total investments 1960-2001 (Cont.)

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|-------|-------|-------|-------|--------|--------|
| 45 Construction | 296 | 363 | 352 | 465 | 501 | 462 |
| 4501 House building | 146 | 194 | 158 | 236 | 254 | 226 |
| 4502 Civil engineering | 141 | 153 | 174 | 201 | 218 | 197 |
| 4509 Construction related service activities | 9 | 16 | 20 | 28 | 29 | 39 |
| G Wholesale and retail trade | 1 014 | 1 201 | 1 228 | 1 294 | 1 214 | 1 153 |
| 50 Sale and repair of motor vehicles | 123 | 179 | 192 | 209 | 159 | 166 |
| 501 Sale of motor vehicles | 105 | 159 | 161 | 177 | 137 | 135 |
| 502 Maintenance and repair of motor vehicles | 18 | 20 | 31 | 32 | 22 | 31 |
| 51 Wholesale trade and commission trade | 588 | 642 | 632 | 626 | 619 | 568 |
| 52 Retail trade, repair of household goods | 303 | 380 | 404 | 459 | 436 | 419 |
| 521 Retail sale | 301 | 375 | 400 | 455 | 433 | 416 |
| 527 Repair of personal and household goods | 2 | 5 | 4 | 4 | 3 | 3 |
| H Hotels and restaurants | 113 | 144 | 157 | 151 | 130 | 113 |
| 55 Hotels and restaurants | 113 | 144 | 157 | 151 | 130 | 113 |
| 551 Provision of short term accommodation | 47 | 63 | 79 | 67 | 50 | 40 |
| 553 Restaurants and catering | 66 | 81 | 78 | 84 | 80 | 73 |
| I Transport, storage and communication | 2 666 | 3 072 | 3 440 | 3 497 | 3 047 | 3 181 |
| IA Transport and storage | 1 989 | 2 342 | 2 672 | 2 570 | 2 079 | 2 223 |
| 60 Land transport, transport via pipelines | 627 | 675 | 761 | 741 | 669 | 693 |
| 601 Transport via railways | 67 | 95 | 104 | 181 | 125 | 152 |
| 602 Other land transport | 506 | 541 | 642 | 544 | 518 | 508 |
| 6021 Scheduled passenger land transport | 115 | 137 | 147 | 121 | 109 | 103 |
| 6022 Taxi traffic | 40 | 29 | 34 | 37 | 35 | 34 |
| 6024 Freight transport by road | 351 | 375 | 461 | 386 | 374 | 371 |
| 603 Transport via pipelines | 54 | 39 | 15 | 16 | 26 | 33 |
| 61 Water transport | -16 | 226 | 197 | 125 | 24 | 134 |
| 62 Air transport | 128 | 78 | 140 | 301 | 141 | 208 |
| 63 Supporting transport act., travel agencies | 1 250 | 1 363 | 1 574 | 1 403 | 1 245 | 1 188 |
| 6301 Supporting rail transport activities | 268 | 308 | 313 | 326 | 274 | 232 |
| 6302 Supporting road transport activities | 720 | 761 | 818 | 786 | 691 | 705 |
| 6303 Supporting air transport activities | 54 | 44 | 84 | 100 | 80 | 73 |
| 6309 Other supporting transport activities | 208 | 250 | 359 | 191 | 200 | 178 |
| IB Post and telecommunications | 677 | 730 | 768 | 927 | 968 | 958 |
| 64 Post and telecommunications | 677 | 730 | 768 | 927 | 968 | 958 |
| 641 Post and courier activities | 41 | 62 | 87 | 72 | 80 | 50 |
| 642 Telecommunications | 636 | 668 | 681 | 855 | 888 | 908 |
| J Financial intermediation | 199 | 88 | 365 | 414 | 545 | 499 |
| 65 Financial intermediation | 76 | 8 | 210 | 237 | 320 | 353 |
| 66 Insurance | 114 | 69 | 146 | 167 | 203 | 145 |
| 67 Activities auxiliary to financial intermediation | 9 | 11 | 9 | 10 | 22 | 1 |
| K Real estate, renting and business activities | 6 296 | 7 593 | 8 837 | 9 642 | 10 932 | 10 948 |
| KA Real estate activities | 5 729 | 6 979 | 8 120 | 8 827 | 10 040 | 10 037 |
| 70 Real estate activities | 5 729 | 6 979 | 8 120 | 8 827 | 10 040 | 10 037 |
| 701 Real estate activities with own property | 10 | -2 | 6 | 10 | 2 | 5 |
| 702 Letting of own property | 5 604 | 6 924 | 8 021 | 8 723 | 9 927 | 9 922 |
| 7021 Letting of dwellings | 4 815 | 5 891 | 6 374 | 6 875 | 7 101 | 6 428 |
| 7022 Operation of dwelling and residential real estate | 789 | 1 033 | 1 647 | 1 848 | 2 826 | 3 494 |
| 703 Real estate act. on a fee or contract basis | 115 | 57 | 93 | 94 | 111 | 110 |
| 7031 Real estate agencies | 10 | 6 | 14 | 15 | 13 | 8 |
| 7032 Management of real estate | 105 | 51 | 79 | 79 | 98 | 102 |
| KB Business activities | 567 | 614 | 717 | 815 | 892 | 911 |
| 71 Renting of machinery and equipment | 162 | 119 | 155 | 144 | 200 | 165 |
| 72 Computer and related activities | 122 | 143 | 179 | 237 | 247 | 314 |
| 73 Research and development | 77 | 63 | 62 | 88 | 68 | 65 |
| 74 Other business activities | 206 | 289 | 321 | 346 | 377 | 367 |
| 741 Legal, accounting, book-keeping activities etc. | 63 | 76 | 97 | 99 | 102 | 102 |
| 742 Technical consultancy, testing and analysis | 37 | 89 | 98 | 96 | 114 | 112 |
| 744 Advertising | 23 | 30 | 32 | 38 | 39 | 41 |
| 747 Industrial cleaning | 14 | 23 | 27 | 34 | 28 | 37 |
| 748 Miscellaneous business activities | 69 | 71 | 67 | 79 | 94 | 75 |
| L Administration, compulsory social security | 663 | 883 | 773 | 992 | 959 | 1 014 |
| 75 Administration, compulsory social security | 663 | 883 | 773 | 992 | 959 | 1 014 |
| 751 Administration of the State | 578 | 760 | 693 | 818 | 844 | 859 |
| 752 National defence and conscripts | | | | | | |
| 753 Compulsory social security activities | 85 | 123 | 80 | 174 | 115 | 155 |
| 7351 Employment pension insurance | 72 | 111 | 68 | 163 | 107 | 145 |
| 7539 Other compulsory social security activities | 13 | 12 | 12 | 11 | 8 | 10 |
| M Education | 673 | 771 | 763 | 702 | 694 | 772 |
| 80 Education | 673 | 771 | 763 | 702 | 694 | 772 |
| N Health and social work | 624 | 664 | 615 | 649 | 705 | 768 |

Table D: Total investments 1960-2001 (Cont.)

| | 1960 | 1961 | 1962 | 1963 | 1964 | 1965 | 1966 | 1967 | 1968 |
|---|------|------|------|------|------|------|------|------|------|
| 1 000 000 EUR, at 2000 prices | | | | | | | | | |
| 85 Health and social work | 207 | 249 | 254 | 257 | 304 | 329 | 331 | 403 | 427 |
| 851 Human health activities | 165 | 178 | 156 | 170 | 190 | 229 | 197 | 291 | 287 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 853 Social work activities | 42 | 71 | 98 | 87 | 114 | 100 | 134 | 112 | 140 |
| O Other community, social and personal service act. | 330 | 315 | 283 | 306 | 385 | 441 | 459 | 463 | 494 |
| 90 Environmental care | 97 | 87 | 82 | 87 | 147 | 119 | 137 | 143 | 167 |
| 91 Activities of membership organizations | 62 | 55 | 33 | 39 | 35 | 73 | 62 | 57 | 69 |
| 911 Activities of business and employers' org. | 13 | 12 | 8 | 7 | 6 | 16 | 14 | 11 | 17 |
| 913 Activities of religious and other organizations | 49 | 43 | 25 | 32 | 29 | 57 | 48 | 46 | 52 |
| 9131 Activities of religious organizations | 38 | 33 | 19 | 24 | 22 | 44 | 36 | 35 | 40 |
| 9139 Activities of other organizations | 11 | 10 | 6 | 8 | 7 | 13 | 12 | 11 | 12 |
| 92 Recreational, cultural and sporting activities | 166 | 167 | 163 | 175 | 198 | 243 | 253 | 256 | 250 |
| 93 Other service activities | 5 | 6 | 5 | 5 | 5 | 6 | 7 | 7 | 8 |
| 9301 Washing and dry cleaning | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 |
| 9309 Other personal service activities | 3 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 5 |
| P Activities of hhs as employers of domestic staff | | | | | | | | | |
| 95 Activities of hhs as employers of domestic staff | | | | | | | | | |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | | | |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | | | |

Table D: (Cont.)

| | 1969 | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|---|------|------|------|------|------|------|------|------|------|
| 85 Health and social work | 463 | 401 | 331 | 371 | 385 | 389 | 558 | 475 | 505 |
| 851 Human health activities | 305 | 312 | 236 | 257 | 282 | 274 | 378 | 325 | 348 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 853 Social work activities | 158 | 89 | 95 | 114 | 103 | 115 | 180 | 150 | 157 |
| O Other community, social and personal service act. | 482 | 456 | 416 | 475 | 702 | 674 | 758 | 699 | 739 |
| 90 Environmental care | 154 | 111 | 140 | 159 | 206 | 223 | 246 | 222 | 204 |
| 91 Activities of membership organizations | 72 | 88 | 28 | 34 | 147 | 110 | 133 | 112 | 151 |
| 911 Activities of business and employers' org. | 17 | 19 | 8 | 8 | 31 | 22 | 23 | 26 | 26 |
| 913 Activities of religious and other organizations | 55 | 69 | 20 | 26 | 116 | 88 | 110 | 86 | 125 |
| 9131 Activities of religious organizations | 42 | 53 | 15 | 20 | 91 | 68 | 94 | 70 | 110 |
| 9139 Activities of other organizations | 13 | 16 | 5 | 6 | 25 | 20 | 16 | 16 | 15 |
| 92 Recreational, cultural and sporting activities | 248 | 249 | 240 | 273 | 337 | 329 | 364 | 347 | 363 |
| 93 Other service activities | 8 | 8 | 8 | 9 | 12 | 12 | 15 | 18 | 21 |
| 9301 Washing and dry cleaning | 3 | 3 | 3 | 4 | 5 | 5 | 6 | 8 | 9 |
| 9309 Other personal service activities | 5 | 5 | 5 | 5 | 7 | 7 | 9 | 10 | 12 |
| P Activities of hhs as employers of domestic staff | | | | | | | | | |
| 95 Activities of hhs as employers of domestic staff | | | | | | | | | |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | | | | | | | 9 | 11 | 10 |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | | | | | | | 9 | 11 | 10 |

Table D: (Cont.)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|---|------|------|------|------|------|------|------|-------|-------|
| 85 Health and social work | 530 | 451 | 485 | 564 | 603 | 616 | 605 | 612 | 607 |
| 851 Human health activities | 350 | 286 | 304 | 341 | 373 | 401 | 401 | 394 | 374 |
| 852 Veterinary activities | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 853 Social work activities | 180 | 165 | 181 | 223 | 230 | 215 | 204 | 218 | 233 |
| O Other community, social and personal service act. | 791 | 798 | 912 | 911 | 971 | 981 | 998 | 1 030 | 1 054 |
| 90 Environmental care | 209 | 201 | 227 | 211 | 215 | 217 | 209 | 214 | 230 |
| 91 Activities of membership organizations | 147 | 153 | 167 | 164 | 165 | 153 | 152 | 153 | 160 |
| 911 Activities of business and employers' org. | 23 | 23 | 29 | 26 | 28 | 25 | 25 | 27 | 29 |
| 913 Activities of religious and other organizations | 124 | 130 | 138 | 138 | 137 | 128 | 127 | 126 | 131 |
| 9131 Activities of religious organizations | 110 | 116 | 107 | 116 | 115 | 105 | 105 | 103 | 111 |
| 9139 Activities of other organizations | 14 | 14 | 31 | 22 | 22 | 23 | 22 | 23 | 20 |
| 92 Recreational, cultural and sporting activities | 413 | 423 | 506 | 523 | 578 | 598 | 620 | 645 | 645 |
| 93 Other service activities | 22 | 21 | 12 | 13 | 13 | 13 | 17 | 18 | 19 |
| 9301 Washing and dry cleaning | 10 | 9 | 5 | 5 | 5 | 5 | 7 | 6 | 7 |
| 9309 Other personal service activities | 12 | 12 | 7 | 8 | 8 | 8 | 10 | 12 | 12 |
| P Activities of hhs as employers of domestic staff | | | | | | | | | |
| 95 Activities of hhs as employers of domestic staff | | | | | | | | | |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | 11 | 13 | 14 | 16 | 19 | 22 | 27 | 32 | 41 |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | 11 | 13 | 14 | 16 | 19 | 22 | 27 | 32 | 41 |

Source: Statistics Finland, Business structures and economic account

Table D: Total investments 1960-2001 (Cont.)

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 | 1994 | 1995 |
|---|-------|-------|-------|-------|-------|-------|------|------|------|
| 85 Health and social work | 709 | 702 | 736 | 818 | 791 | 788 | 591 | 537 | 561 |
| 851 Human health activities | 415 | 412 | 447 | 503 | 483 | 453 | 342 | 325 | 341 |
| 852 Veterinary activities | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 2 | 2 |
| 853 Social work activities | 294 | 290 | 289 | 314 | 307 | 334 | 249 | 210 | 218 |
| O Other community, social and personal service act. | 1 094 | 1 102 | 1 188 | 1 305 | 1 288 | 1 089 | 891 | 800 | 857 |
| 90 Environmental care | 217 | 210 | 236 | 271 | 269 | 234 | 205 | 190 | 187 |
| 91 Activities of membership organizations | 165 | 173 | 178 | 186 | 193 | 166 | 124 | 103 | 120 |
| 911 Activities of business and employers' org. | 30 | 36 | 39 | 42 | 38 | 38 | 34 | 32 | 31 |
| 913 Activities of religious and other organizations | 135 | 137 | 139 | 144 | 155 | 128 | 90 | 71 | 89 |
| 9131 Activities of religious organizations | 109 | 110 | 110 | 114 | 121 | 95 | 69 | 55 | 73 |
| 9139 Activities of other organizations | 26 | 27 | 29 | 30 | 34 | 33 | 21 | 16 | 16 |
| 92 Recreational, cultural and sporting activities | 693 | 695 | 744 | 819 | 793 | 665 | 542 | 487 | 531 |
| 93 Other service activities | 19 | 24 | 30 | 29 | 33 | 24 | 20 | 20 | 19 |
| 9301 Washing and dry cleaning | 7 | 10 | 12 | 12 | 14 | 10 | 8 | 8 | 6 |
| 9309 Other personal service activities | 12 | 14 | 18 | 17 | 19 | 14 | 12 | 12 | 13 |
| P Activites of hhs as employers of domestic staff | | | | | | | | | |
| 95 Activities of hhs as employers of domestic staff | | | | | | | | | |
| Q Extra-territorial organizations and bodies | | | | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | | | | |
| X Field of activity not specified | 44 | 76 | 45 | 36 | 30 | 25 | 32 | 38 | 36 |
| 991 Indirect financial services | | | | | | | | | |
| 999 Industry unknown | 44 | 76 | 45 | 36 | 30 | 25 | 32 | 38 | 36 |

Table D: (Cont.)

| | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|---|-------|-------|-------|------|-------|------|
| 85 Health and social work | 624 | 664 | 615 | 649 | 705 | 768 |
| 851 Human health activities | 356 | 411 | 380 | 394 | 433 | 474 |
| 852 Veterinary activities | 2 | 4 | 3 | 3 | 4 | 4 |
| 853 Social work activities | 266 | 249 | 232 | 252 | 268 | 290 |
| O Other community, social and personal service act. | 1 001 | 1 130 | 1 099 | 937 | 1 040 | 969 |
| 90 Environmental care | 197 | 208 | 212 | 219 | 209 | 174 |
| 91 Activities of membership organizations | 155 | 177 | 179 | 188 | 155 | 157 |
| 911 Activities of business and employers' org. | 33 | 35 | 36 | 35 | 37 | 36 |
| 913 Activities of religious and other organizations | 122 | 142 | 143 | 153 | 118 | 121 |
| 9131 Activities of religious organizations | 107 | 124 | 126 | 132 | 97 | 98 |
| 9139 Activities of other organizations | 15 | 18 | 17 | 21 | 21 | 23 |
| 92 Recreational, cultural and sporting activities | 636 | 727 | 683 | 501 | 650 | 631 |
| 93 Other service activities | 13 | 18 | 25 | 29 | 26 | 7 |
| 9301 Washing and dry cleaning | 6 | 9 | 12 | 17 | 14 | -5 |
| 9309 Other personal service activities | 7 | 9 | 13 | 12 | 12 | 12 |
| P Activites of hhs as employers of domestic staff | | | | | | |
| 95 Activities of hhs as employers of domestic staff | | | | | | |
| Q Extra-territorial organizations and bodies | | | | | | |
| 97 Extra-territorial organizations and bodies | | | | | | |
| X Field of activity not specified | 36 | 38 | 33 | 25 | 24 | 19 |
| 991 Indirect financial services | | | | | | |
| 999 Industry unknown | 36 | 38 | 33 | 25 | 24 | 19 |

Table E: Material requirement 1970-2001

| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|--|-------------|---------|---------|---------|--------|--------|--------|--------|
| | 1000 tonnes | | | | | | | |
| DIRECT INPUTS | | | | | | | | |
| A01 Agriculture | 9 347 | 9 275 | 9 501 | 9 172 | 8 920 | 9 591 | 10 963 | 9 983 |
| A02 Forestry | 49 023 | 47 521 | 47 501 | 47 923 | 45 439 | 35 092 | 35 476 | 37 731 |
| C Mining and quarrying | 22 830 | 21 978 | 25 392 | 28 064 | 29 302 | 27 981 | 29 305 | 32 278 |
| DA Food, beverages, tobacco | 5 599 | 5 502 | 5 579 | 5 322 | 5 432 | 6 308 | 6 803 | 5 442 |
| DB, DC Textile and leather etc. industries | 85 | 88 | 93 | 100 | 107 | 92 | 94 | 85 |
| DD, DE Wood and paper | 45 828 | 43 766 | 43 665 | 46 280 | 44 588 | 34 198 | 35 719 | 37 495 |
| DF, DG, DH Fuels and chemicals | 11 088 | 10 224 | 10 515 | 10 877 | 11 238 | 11 449 | 13 075 | 13 511 |
| DI Mineral products | 5 404 | 5 275 | 5 200 | 5 641 | 6 297 | 5 793 | 5 384 | 5 677 |
| DJ Metals and metal products | 7 289 | 6 653 | 8 444 | 9 493 | 9 685 | 9 007 | 9 789 | 10 680 |
| DK, DL, DM Machinery and equipment | 245 | 201 | 217 | 234 | 289 | 380 | 331 | 276 |
| E40 Energy supply | 4 539 | 4 231 | 4 421 | 5 550 | 6 546 | 6 316 | 5 778 | 7 561 |
| F Construction | 95 391 | 101 552 | 113 118 | 107 834 | 95 835 | 95 490 | 88 777 | 84 688 |
| HIDDEN FLOWS | | | | | | | | |
| A01 Agriculture, as ancillary biomass | 9 104 | 9 466 | 9 818 | 9 521 | 9 470 | 10 238 | 11 634 | 10 509 |
| A02 Forestry, as logging residues | 18 497 | 18 008 | 17 937 | 18 220 | 17 399 | 13 430 | 13 551 | 14 402 |
| C Mining and quarrying, as side stone | 2 202 | 2 151 | 2 728 | 3 686 | 4 640 | 4 971 | 3 418 | 4 120 |
| F Construction as waste earth | 47 394 | 49 840 | 50 656 | 49 653 | 47 231 | 45 508 | 44 012 | 43 954 |

Table E: (Cont.)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|--|--------|--------|--------|--------|--------|--------|--------|--------|
| DIRECT INPUTS | | | | | | | | |
| A01 Agriculture | 10 828 | 11 400 | 11 617 | 9 689 | 11 414 | 12 709 | 12 264 | 12 039 |
| A02 Forestry | 41 874 | 50 824 | 52 276 | 49 707 | 46 659 | 44 410 | 46 084 | 48 293 |
| C Mining and quarrying | 32 655 | 34 136 | 40 758 | 38 494 | 44 430 | 45 984 | 46 755 | 45 879 |
| DA Food, beverages, tobacco | 5 971 | 6 460 | 6 964 | 5 583 | 7 591 | 7 397 | 6 785 | 6 865 |
| DB, DC Textile and leather etc. industries | 84 | 106 | 110 | 103 | 103 | 99 | 104 | 102 |
| DD, DE Wood and paper | 41 667 | 50 808 | 52 879 | 50 367 | 48 445 | 47 441 | 50 065 | 50 963 |
| DF, DG, DH Fuels and chemicals | 12 590 | 15 283 | 15 694 | 13 537 | 12 356 | 13 239 | 12 258 | 12 838 |
| DI Mineral products | 5 873 | 6 042 | 8 833 | 8 736 | 9 654 | 12 458 | 13 010 | 13 200 |
| DJ Metals and metal products | 10 201 | 11 160 | 11 083 | 10 747 | 10 557 | 10 000 | 10 123 | 9 413 |
| DK, DL, DM Machinery and equipment | 224 | 232 | 274 | 250 | 290 | 287 | 311 | 310 |
| E40 Energy supply | 8 750 | 8 618 | 9 926 | 9 112 | 12 128 | 9 900 | 8 358 | 10 735 |
| F Construction | 79 007 | 84 531 | 87 539 | 88 804 | 93 616 | 96 062 | 93 024 | 91 784 |
| HIDDEN FLOWS | | | | | | | | |
| A01 Agriculture, as ancillary biomass | 11 525 | 12 286 | 12 587 | 10 482 | 12 589 | 13 779 | 13 309 | 13 146 |
| A02 Forestry, as logging residues | 15 732 | 19 164 | 19 728 | 18 549 | 17 378 | 16 565 | 17 244 | 18 196 |
| C Mining and quarrying, as side stone | 4 671 | 6 109 | 7 781 | 8 518 | 12 040 | 8 978 | 11 215 | 11 521 |
| F Construction as waste earth | 43 190 | 45 257 | 44 875 | 46 202 | 47 421 | 48 952 | 48 410 | 47 504 |

Sources: University of Oulu, Thule Institute. Statistics Finland, Environment and energy

Table D: Total investments 1960-2001 (Cont.)

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|--|---------|---------|---------|---------|---------|--------|--------|--------|
| DIRECT INPUTS | | | | | | | | |
| A01 Agriculture | 12 340 | 8 596 | 11 044 | 12 994 | 13 137 | 11 985 | 11 071 | 12 802 |
| A02 Forestry | 43 414 | 47 326 | 50 132 | 51 560 | 48 413 | 38 917 | 44 689 | 47 023 |
| C Mining and quarrying | 45 988 | 40 877 | 43 564 | 45 867 | 45 976 | 40 029 | 41 794 | 40 211 |
| DA Food, beverages, tobacco | 6 953 | 5 097 | 6 815 | 7 769 | 7 926 | 6 756 | 6 190 | 7 069 |
| DB, DC Textile and leather etc. industries | 99 | 110 | 75 | 73 | 65 | 51 | 48 | 51 |
| DD, DE Wood and paper | 46 002 | 50 751 | 53 931 | 55 973 | 52 191 | 42 230 | 49 422 | 50 704 |
| DF, DG, DH Fuels and chemicals | 12 952 | 14 387 | 12 519 | 13 374 | 13 485 | 14 292 | 13 626 | 13 759 |
| DI Mineral products | 12 686 | 13 371 | 14 494 | 14 880 | 14 882 | 13 132 | 13 008 | 13 473 |
| DJ Metals and metal products | 8 048 | 7 355 | 6 287 | 6 988 | 6 982 | 6 593 | 5 931 | 6 280 |
| DK, DL, DM Machinery and equipment | 370 | 410 | 488 | 718 | 493 | 342 | 372 | 294 |
| E40 Energy supply | 15 460 | 10 748 | 12 618 | 14 608 | 15 209 | 11 283 | 13 863 | 13 165 |
| F Construction | 101 540 | 101 675 | 102 953 | 112 064 | 112 720 | 99 792 | 90 494 | 76 657 |
| HIDDEN FLOWS | | | | | | | | |
| A01 Agriculture, as ancillary biomass | 13 546 | 9 349 | 11 763 | 13 990 | 14 300 | 13 027 | 11 894 | 13 930 |
| A02 Forestry, as logging residues | 16 491 | 17 921 | 19 003 | 19 444 | 18 348 | 14 874 | 16 985 | 17 964 |
| C Mining and quarrying, as side stone | 13 202 | 12 638 | 12 287 | 13 142 | 11 822 | 10 991 | 11 067 | 12 422 |
| F Construction as waste earth | 51 377 | 51 956 | 50 623 | 54 770 | 54 266 | 43 813 | 40 266 | 34 835 |

Table E: (Cont.)

| | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 |
|--|--------|--------|--------|--------|--------|----------|----------|----------|
| DIRECT INPUTS | | | | | | | | |
| A01 Agriculture | 11 969 | 13 256 | 12 749 | 13 242 | 13 226 | 14 597 | 16 432 | 15 260 |
| A02 Forestry | 54 363 | 56 054 | 52 029 | 55 647 | 60 301 | 60 282 | 60 849 | 58 641 |
| C Mining and quarrying | 45 062 | 40 574 | 41 265 | 44 815 | 36 452 | 44 016 | 38 849 | 41 657 |
| DA Food, beverages, tobacco | 7 547 | 7 395 | 7 763 | 8 398 | 6 830 | 7 492 | 8 476 | 8 017 |
| DB, DC Textile and leather etc. industries | 66 | 56 | 58 | 38 | 32 | 46 | 36 | 36 |
| DD, DE Wood and paper | 59 759 | 64 058 | 57 125 | 60 972 | 67 939 | 68 824 | 69 747 | 68 987 |
| DF, DG, DH Fuels and chemicals | 16 042 | 14 490 | 15 909 | 16 712 | 18 648 | 18 562 | 19 457 | 19 058 |
| DI Mineral products | 13 809 | 13 446 | 13 703 | 14 627 | 14 996 | 15 690 | 15 258 | 15 882 |
| DJ Metals and metal products | 6 537 | 5 538 | 5 558 | 5 833 | 5 706 | 5 437 | 5 875 | 5 681 |
| DK, DL, DM Machinery and equipment | 347 | 409 | 427 | 473 | 605 | 526 | 553 | 568 |
| E40 Energy supply | 21 219 | 18 237 | 18 785 | 21 482 | 10 103 | 15 423 | 12 425 | 15 596 |
| F Construction | 81 813 | 78 930 | 73 249 | 78 722 | 81 656 | 89 084 | 86 394 | 85 661 |
| HIDDEN FLOWS | | | | | | | | |
| A01 Agriculture, as ancillary biomass | 12 903 | 14 334 | 13 911 | 14 442 | 12 655 | 13754.53 | 15600.37 | 14434.91 |
| A02 Forestry, as logging residues | 20 935 | 21 473 | 19 944 | 21 460 | 23 052 | 23078.09 | 23298.7 | 22331.53 |
| C Mining and quarrying, as side stone | 15 760 | 18 099 | 21 502 | 21 501 | 19 498 | 21293.78 | 17667.92 | 15732.85 |
| F Construction as waste earth | 34 239 | 34 545 | 34 602 | 33 780 | 34 603 | 33593.14 | 31494.02 | 30468 |

Sources: University of Oulu, Thule Institute. Statistics Finland, Environment and energy

Table F: Hidden flows 1970-2001

| | 1970 | 1971 | 1972 | 1973 | 1974 | 1975 | 1976 | 1977 |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| 1000 tonnes | | | | | | | | |
| DOMESTIC HIDDEN FLOWS | | | | | | | | |
| Forestry, logging residues | 18 497 | 18 008 | 17 937 | 18 220 | 17 399 | 13 430 | 13 551 | 14 402 |
| Agriculture, ancillary biomass | 9 104 | 9 466 | 9 818 | 9 521 | 9 470 | 10 238 | 11 634 | 10 509 |
| Mineral quarrying, side stone | 2 202 | 2 151 | 2 728 | 3 686 | 4 640 | 4 971 | 3 418 | 4 120 |
| Construction, waste earth | 47 394 | 49 840 | 50 656 | 49 653 | 47 231 | 45 508 | 44 012 | 43 954 |
| HIDDEN FLOWS OF IMPORT | | | | | | | | |
| Agriculture | 130 | 126 | 127 | 116 | 171 | 177 | 109 | 90 |
| Biotic | 8 | 7 | 10 | 8 | 10 | 11 | 13 | 5 |
| Abiotic | 122 | 119 | 117 | 108 | 161 | 167 | 96 | 86 |
| Forestry | 1 426 | 1 717 | 1 584 | 2 517 | 2 515 | 2 434 | 2 316 | 1 994 |
| Biotic | 1 099 | 1 334 | 1 242 | 1 954 | 1 927 | 1 867 | 1 772 | 1 532 |
| Abiotic | 326 | 383 | 342 | 563 | 588 | 567 | 544 | 462 |
| Mineral quarrying | 10 852 | 12 505 | 11 509 | 12 786 | 18 028 | 14 480 | 13 281 | 16 003 |
| Energy minerals | 3 911 | 3 428 | 3 205 | 3 314 | 3 755 | 3 654 | 3 682 | 4 875 |
| Metallic ores | 1 611 | 3 218 | 2 954 | 2 870 | 7 048 | 4 590 | 4 717 | 5 258 |
| Industrial minerals | 5 329 | 5 858 | 5 349 | 6 601 | 7 223 | 6 236 | 4 882 | 5 870 |
| Dimension stones | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| Gravel and crushed stones | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 |
| Manufactured products | 36 291 | 33 972 | 35 042 | 39 550 | 44 318 | 41 023 | 39 866 | 36 371 |
| Energy products | 9 253 | 8 643 | 9 724 | 11 126 | 11 931 | 10 844 | 11 081 | 10 202 |
| Forest industry products | 326 | 383 | 342 | 563 | 588 | 567 | 544 | 462 |
| Metal industry products | 19 218 | 17 723 | 17 661 | 19 697 | 23 577 | 21 585 | 20 832 | 17 692 |
| Other products | 7 494 | 7 223 | 7 315 | 8 164 | 8 222 | 8 027 | 7 409 | 8 015 |
| (of which biotic) | 1 449 | 1 417 | 1 461 | 1 662 | 1 184 | 1 564 | 1 135 | 1 347 |

Table F: (Cont.)

| | 1978 | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DOMESTIC HIDDEN FLOWS | | | | | | | | |
| Forestry, logging residues | 15 732 | 19 164 | 19 728 | 18 549 | 17 378 | 16 565 | 17 244 | 18 196 |
| Agriculture, ancillary biomass | 11 525 | 12 286 | 12 587 | 10 482 | 12 589 | 13 779 | 13 309 | 13 146 |
| Mineral quarrying, side stone | 4 671 | 6 109 | 7 781 | 8 518 | 12 040 | 8 978 | 11 215 | 11 521 |
| Construction, waste earth | 43 190 | 45 257 | 44 875 | 46 202 | 47 421 | 48 952 | 48 410 | 47 504 |
| HIDDEN FLOWS OF IMPORT | | | | | | | | |
| Agriculture | 151 | 262 | 253 | 306 | 496 | 140 | 96 | 168 |
| Biotic | 7 | 12 | 14 | 16 | 17 | 15 | 14 | 16 |
| Abiotic | 144 | 249 | 239 | 290 | 479 | 125 | 82 | 152 |
| Forestry | 1 894 | 1 767 | 1 963 | 1 896 | 2 361 | 2 905 | 3 459 | 2 819 |
| Biotic | 1 459 | 1 351 | 1 502 | 1 448 | 1 823 | 2 242 | 2 665 | 2 164 |
| Abiotic | 434 | 417 | 460 | 448 | 538 | 663 | 794 | 655 |
| Mineral quarrying | 17 159 | 22 071 | 22 722 | 23 801 | 26 853 | 30 069 | 32 304 | 41 258 |
| Energy minerals | 5 475 | 6 434 | 7 006 | 8 677 | 8 537 | 9 623 | 9 407 | 15 016 |
| Metallic ores | 5 817 | 7 470 | 8 012 | 8 886 | 11 574 | 13 756 | 15 702 | 18 800 |
| Industrial minerals | 5 866 | 8 167 | 7 704 | 6 237 | 6 742 | 6 688 | 7 195 | 7 442 |
| Dimension stones | 1 | 1 | 1 | 1 | 0 | 2 | 1 | 1 |
| Gravel and crushed stones | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Manufactured products | 40 284 | 46 412 | 53 420 | 50 456 | 50 891 | 52 316 | 53 065 | 56 022 |
| Energy products | 14 071 | 16 030 | 14 764 | 14 546 | 14 416 | 15 110 | 16 500 | 16 337 |
| Forest industry products | 434 | 417 | 460 | 448 | 538 | 663 | 794 | 655 |
| Metal industry products | 17 748 | 20 231 | 26 718 | 24 479 | 24 348 | 24 000 | 24 194 | 27 625 |
| Other products | 8 030 | 9 735 | 11 478 | 10 983 | 11 588 | 12 543 | 11 577 | 11 405 |
| (of which biotic) | 1 247 | 1 123 | 1 604 | 1 132 | 1 757 | 1 465 | 806 | 784 |

Source: University of Oulu, Thule Institute

Table D: Total investments 1960-2001 (Cont.)

| | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DOMESTIC HIDDEN FLOWS | | | | | | | | |
| Forestry, logging residues | 16 491 | 17 921 | 19 003 | 19 444 | 18 348 | 14 874 | 16 985 | 17 964 |
| Agriculture, ancillary biomass | 13 546 | 9 349 | 11 763 | 13 990 | 14 300 | 13 027 | 11 894 | 13 930 |
| Mineral quarrying, side stone | 13 202 | 12 638 | 12 287 | 13 142 | 11 822 | 10 991 | 11 067 | 12 422 |
| Construction, waste earth | 51 377 | 51 956 | 50 623 | 54 770 | 54 266 | 43 813 | 40 266 | 34 835 |
| HIDDEN FLOWS OF IMPORT | | | | | | | | |
| Agriculture | 168 | 189 | 273 | 232 | 142 | 146 | 187 | 185 |
| Biotic | 14 | 15 | 23 | 23 | 17 | 18 | 16 | 33 |
| Abiotic | 154 | 174 | 250 | 209 | 125 | 128 | 171 | 153 |
| Forestry | 2 395 | 2 726 | 2 837 | 3 146 | 2 814 | 2 514 | 2 890 | 2 964 |
| Biotic | 1 826 | 2 063 | 2 133 | 2 364 | 2 121 | 1 902 | 2 168 | 2 197 |
| Abiotic | 569 | 663 | 705 | 781 | 693 | 612 | 722 | 768 |
| Mineral quarrying | 47 988 | 52 765 | 51 293 | 51 823 | 57 883 | 59 711 | 59 315 | 59 724 |
| Energy minerals | 14 509 | 12 626 | 10 719 | 11 133 | 11 006 | 14 025 | 8 822 | 7 802 |
| Metallic ores | 26 927 | 32 461 | 31 874 | 31 921 | 38 109 | 37 832 | 41 956 | 42 527 |
| Industrial minerals | 6 551 | 7 676 | 8 690 | 8 759 | 8 737 | 7 826 | 8 497 | 9 357 |
| Dimension stones | 1 | 1 | 3 | 2 | 1 | 1 | 5 | 7 |
| Gravel and crushed stones | 0 | 0 | 7 | 9 | 30 | 26 | 36 | 31 |
| Manufactured products | 56 073 | 63 713 | 63 631 | 76 284 | 70 859 | 56 923 | 58 068 | 60 153 |
| Energy products | 17 040 | 15 651 | 13 865 | 14 925 | 15 639 | 13 982 | 13 810 | 10 499 |
| Forest industry products | 569 | 663 | 705 | 781 | 693 | 612 | 722 | 768 |
| Metal industry products | 27 358 | 34 097 | 36 351 | 45 125 | 39 949 | 29 786 | 29 792 | 32 577 |
| Other products | 11 107 | 13 302 | 12 710 | 15 453 | 14 578 | 12 542 | 13 744 | 16 310 |
| (of which biotic) | 889 | 1 200 | 1 036 | 1 106 | 858 | 974 | 1 002 | 1 201 |

Table F: (Cont.)

| | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001* |
|--------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| DOMESTIC HIDDEN FLOWS | | | | | | | | |
| Forestry, logging residues | 20 935 | 21 473 | 19 944 | 21 460 | 23 052 | 23 078 | 23 299 | 22 332 |
| Agriculture, ancillary biomass | 12 903 | 14 334 | 13 911 | 14 442 | 12 655 | 13 755 | 15 600 | 14 435 |
| Mineral quarrying, side stone | 15 760 | 18 099 | 21 502 | 21 501 | 19 498 | 21 294 | 17 668 | 15 733 |
| Construction, waste earth | 34 239 | 34 545 | 34 602 | 33 780 | 34 603 | 33 593 | 31 494 | 30 468 |
| HIDDEN FLOWS OF IMPORT | | | | | | | | |
| Agriculture | 203 | 319 | 324 | 328 | 397 | 428 | 342 | 348 |
| Biotic | 54 | 63 | 55 | 53 | 47 | 69 | 53 | 57 |
| Abiotic | 150 | 256 | 269 | 275 | 349 | 359 | 289 | 291 |
| Forestry | 3 766 | 5 262 | 3 801 | 3 636 | 4 849 | 5 378 | 5 381 | 6 423 |
| Biotic | 2 814 | 3 920 | 2 876 | 2 747 | 3 641 | 4 054 | 4 066 | 4 864 |
| Abiotic | 952 | 1 342 | 925 | 889 | 1 208 | 1 324 | 1 314 | 1 559 |
| Mineral quarrying | 66 978 | 68 227 | 80 451 | 82 506 | 87 509 | 81 560 | 88 396 | 92 194 |
| Energy minerals | 13 409 | 17 161 | 13 081 | 13 782 | 10 600 | 8 840 | 11 161 | 12 852 |
| Metallic ores | 42 906 | 40 996 | 57 445 | 57 379 | 65 724 | 62 476 | 65 286 | 68 541 |
| Industrial minerals | 10 639 | 10 045 | 9 897 | 11 337 | 11 174 | 10 229 | 11 927 | 10 780 |
| Dimension stones | 3 | 3 | 11 | 2 | 4 | 2 | 5 | 3 |
| Gravel and crushed stones | 21 | 23 | 18 | 6 | 7 | 13 | 17 | 19 |
| Manufactured products | 75 005 | 77 594 | 76 895 | 81 655 | 88 215 | 87 311 | 89 527 | 93 619 |
| Energy products | 10 366 | 9 480 | 11 695 | 10 714 | 12 931 | 12 496 | 10 260 | 12 974 |
| Forest industry products | 952 | 1 342 | 925 | 889 | 1 208 | 1 324 | 1 314 | 1 559 |
| Metal industry products | 44 446 | 49 012 | 45 209 | 48 054 | 50 635 | 49 297 | 51 884 | 52 834 |
| Other products | 19 241 | 17 760 | 19 067 | 21 998 | 23 440 | 24 194 | 26 068 | 26 252 |
| (of which biotic) | 1 470 | 1 592 | 1 840 | 1 768 | 2 023 | 2 213 | 2 180 | 2 301 |

Source: University of Oulu, Thule Institute

Table G: Environmentally related taxes, fees and charges 1980-2001

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 1986 |
|--|----------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | 1 000 000 EUR, at current prices | | | | | | |
| 1. MOTOR FUELS, total | 461.38 | 471.27 | 534.53 | 527.87 | 571.01 | 654.09 | 657.90 |
| Leaded petrol | 334.48 | 328.73 | 370.57 | 363.52 | 391.50 | 449.98 | 457.51 |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Unleaded petrol | | | | | | | |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Diesel oil | 126.90 | 142.55 | 163.96 | 164.36 | 179.51 | 204.11 | 200.40 |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| 2. OTHER ENERGY PRODUCTS, total | 107.29 | 150.41 | 176.22 | 174.65 | 241.71 | 264.77 | 164.62 |
| Light fuel oil | 25.55 | 41.41 | 50.96 | 44.65 | 46.62 | 54.58 | 49.12 |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Heavy fuel oil | 16.65 | 24.24 | 29.89 | 32.10 | 32.86 | 38.17 | 23.05 |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Coal | | | | 12.79 | 29.47 | 2.02 | |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Peat | | | | | | | |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Natural gas | | | | 2.70 | 1.57 | 2.14 | 1.29 |
| Basic tax | | | | | | | |
| Surtax | | | | | | | |
| Electricity production | 65.09 | 84.77 | 95.36 | 82.41 | 131.19 | 167.85 | 91.16 |
| Electricity consumption | | | | | | | |
| 3. VEHICLE-RELATED TAXATION, total | 272.46 | 325.11 | 387.17 | 468.40 | 525.92 | 564.10 | 672.58 |
| 3.1 Car sales tax | 238.49 | 279.02 | 338.06 | 407.52 | 450.41 | 481.69 | 580.58 |
| 3.2 Vehicle tax ("sticker tax") | | | | | | | |
| 3.3 Motor vehicle tax ("diesel tax") | 33.97 | 46.08 | 49.11 | 60.88 | 75.52 | 82.41 | 92.00 |
| 4. AGRICULTURAL INPUT, total | 21.19 | 20.69 | 13.29 | 15.98 | 21.86 | 31.60 | 44.38 |
| 4.1 Fertilisers | 21.19 | 20.69 | 13.29 | 15.98 | 21.86 | 31.45 | 44.23 |
| 4.2 Pesticides | | | | | | 0.15 | 0.15 |
| 5. OTHER GOODS, total | 0.34 | 0.34 | 0.50 | 0.50 | 2.67 | 3.04 | 5.53 |
| 5.1a Beer surtax | | | | | | | |
| 5.1b Soft drink surtax | | | | | 0.49 | 0.35 | 0.82 |
| 5.2 Oil waste tax | | | | | | | |
| 5.3 Oil pollution control fee | 0.34 | 0.34 | 0.50 | 0.50 | 2.19 | 2.69 | 4.71 |
| 5.4 Charter flight tax | | | | | | | |
| 6. WATER AND WASTEWATER CHARGES, total | 216.52 | 229.33 | 224.03 | 255.18 | 284.65 | 312.91 | 330.83 |
| 6.1 Water charges | 114.14 | 120.89 | 118.10 | 132.61 | 143.71 | 156.37 | 162.03 |
| 6.2 Wastewater charges | 102.22 | 108.27 | 105.76 | 122.41 | 140.61 | 156.37 | 168.64 |
| 6.3 Water protection fee | 0.17 | 0.17 | 0.17 | 0.17 | 0.34 | 0.17 | 0.17 |
| 7. WASTE DISPOSAL AND MANAGEMENT CHARGES, total | 0.00 | 0.00 | 11.96 | 18.84 | 23.71 | 25.94 | 27.77 |
| 7.1 Waste tax | | | | | | | |
| 7.2 Municipal Waste Charges | | | 11.96 | 18.84 | 23.71 | 25.94 | 27.77 |
| TOTAL | 1079.19 | 1197.15 | 1347.70 | 1461.43 | 1671.55 | 1856.46 | 1903.63 |
| Charges | 216.36 | 229.16 | 235.82 | 273.86 | 308.03 | 338.68 | 358.44 |
| TOTAL, TAXES AND FEES | 862.84 | 967.99 | 1111.87 | 1187.57 | 1363.52 | 1517.78 | 1545.19 |
| Total tax revenue (OECD) | 11883.15 | 14168.99 | 15499.36 | 17171.99 | 20074.24 | 22749.94 | 25304.38 |
| - Central Government | 6568.24 | 7789.46 | 8583.98 | 9639.69 | 11356.22 | 12686.58 | 14178.75 |
| - Local Government | 2574.12 | 3157.56 | 3545.40 | 3959.31 | 4562.10 | 5094.75 | 5648.26 |
| - Social Security Funds | 2740.79 | 3221.98 | 3369.98 | 3572.98 | 4155.92 | 4968.61 | 5477.38 |
| - Supra-national Authorities (EU) | | | | | | | |
| Total tax revenue (OECD)* | 11883.15 | 14168.99 | 15499.36 | 17171.99 | 20074.24 | 22749.94 | 25304.38 |
| Share of the environmental taxes and fees (%) | 9.1 | 8.4 | 8.7 | 8.5 | 8.3 | 8.2 | 7.5 |
| *Does not include social security contributions. | 7.3 | 6.8 | 7.2 | 6.9 | 6.8 | 6.7 | 6.1 |

Source: Statistics Finland, Environment and energy

Table G: Environmentally related taxes, fees and charges 1980-2001 (Cont.)

| | 1987 | 1988 | 1989 | 1990 | 1991 | 1992 | 1993 |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| 1. MOTOR FUELS, total | 536.97 | 701.39 | 767.41 | 927.76 | 1054.11 | 1137.07 | 1332.39 |
| Leaded petrol | | | | | | | |
| Basic tax | 385.25 | 488.08 | 437.34 | 267.42 | 294.46 | 233.37 | 128.53 |
| Surtax | | | | 56.41 | 55.91 | 59.56 | 15.04 |
| Unleaded petrol | 0.77 | 3.36 | 86.04 | 295.80 | 402.39 | 553.68 | 847.64 |
| Basic tax | | | | | | | 9.02 |
| Surtax | | | | | | | |
| Diesel oil | 150.96 | 209.95 | 244.04 | 224.93 | 223.11 | 215.06 | 253.49 |
| Basic tax | | | | 83.20 | 78.23 | 75.41 | 78.67 |
| Surtax | | | | | | | |
| 2. OTHER ENERGY PRODUCTS, total | 0.00 | 0.00 | 0.00 | 36.65 | 36.92 | 40.82 | 191.34 |
| Light fuel oil | | | | | | | |
| Basic tax | | | | | | | 13.57 |
| Surtax | | | | 9.53 | 9.75 | 9.31 | 13.48 |
| Heavy fuel oil | | | | | | | 2.08 |
| Basic tax | | | | 4.72 | 3.99 | 2.78 | 3.47 |
| Surtax | | | | | | | |
| Coal | | | | | | | |
| Basic tax | | | | 15.16 | 14.06 | 19.61 | 27.79 |
| Surtax | | | | | | | |
| Peat | | | | | | | |
| Basic tax | | | | 3.70 | 4.88 | 4.71 | 10.09 |
| Surtax | | | | | | | |
| Natural gas | | | | | | | |
| Basic tax | | | | 3.53 | 4.24 | 4.40 | 10.54 |
| Surtax | | | | | | | |
| Electricity production | | | | | | | 110.33 |
| Electricity consumption | | | | | | | |
| 3. VEHICLE-RELATED TAXATION, total | 746.92 | 925.54 | 1036.21 | 836.90 | 545.43 | 471.60 | 419.46 |
| 3.1 Car sales tax | 642.65 | 836.06 | 915.78 | 696.80 | 400.29 | 334.19 | 270.61 |
| 3.2 Vehicle tax ("sticker tax") | | | | | | | |
| 3.3 Motor vehicle tax ("diesel tax") | 104.28 | 89.48 | 120.42 | 140.10 | 145.15 | 137.41 | 148.85 |
| 4. AGRICULTURAL INPUT, total | 24.39 | 7.74 | 11.79 | 29.08 | 58.04 | 82.97 | 87.79 |
| 4.1 Fertilisers | 24.22 | 6.90 | 10.76 | 27.92 | 57.02 | 81.91 | 86.78 |
| 4.2 Pesticides | 0.17 | 0.84 | 1.03 | 1.16 | 1.03 | 1.06 | 1.01 |
| 5. OTHER GOODS, total | 8.02 | 7.23 | 10.38 | 14.94 | 14.23 | 50.83 | 33.81 |
| 5.1a Beer surtax | | | | | | 3.87 | 2.69 |
| 5.1b Soft drink surtax | 1.13 | 0.00 | 2.81 | 3.83 | 2.96 | 3.57 | 3.20 |
| 5.2 Oil waste tax | 2.19 | 2.35 | 2.69 | 4.37 | 4.04 | 2.52 | 3.53 |
| 5.3 Oil pollution control fee | 4.71 | 4.88 | 4.88 | 6.73 | 7.23 | 5.72 | 5.72 |
| 5.4 Charter flight tax | | | | | | 35.15 | 18.67 |
| 6. WATER AND WASTEWATER CHARGES, total | 358.38 | 391.57 | 418.43 | 464.26 | 496.44 | 544.08 | 553.85 |
| 6.1 Water charges | 172.29 | 188.25 | 201.17 | 223.92 | 238.61 | 261.52 | 265.26 |
| 6.2 Wastewater charges | 185.93 | 203.15 | 217.10 | 240.18 | 257.50 | 282.22 | 288.26 |
| 6.3 Water protection fee | 0.17 | 0.17 | 0.17 | 0.17 | 0.34 | 0.34 | 0.34 |
| 7. WASTE DISPOSAL AND MANAGEMENT CHARGES, total | 32.63 | 38.73 | 44.43 | 52.42 | 59.60 | 64.65 | 63.27 |
| 7.1 Waste tax | 32.63 | 38.73 | 44.43 | 52.42 | 59.60 | 64.65 | 63.27 |
| 7.2 Municipal Waste Charges | | | | | | | |
| TOTAL | 1707.32 | 2072.20 | 2288.65 | 2362.01 | 2264.78 | 2392.01 | 2681.91 |
| Charges | 390.85 | 430.13 | 462.70 | 516.52 | 555.70 | 608.40 | 616.78 |
| TOTAL, TAXES AND FEES | 1316.47 | 1642.07 | 1825.96 | 1845.49 | 1709.08 | 1783.62 | 2065.13 |
| Total tax revenue (OECD) | 26123.12 | 31594.94 | 35527.51 | 39332.09 | 38732.00 | 37614.39 | 36921.96 |
| - Central Government | 14476.10 | 17610.12 | 19949.95 | 21001.29 | 21024.84 | 19845.84 | 18279.84 |
| - Local Government | 5754.89 | 6691.19 | 7314.83 | 8581.28 | 8089.50 | 7753.80 | 7923.17 |
| - Social Security Funds | 5892.13 | 7293.64 | 8262.74 | 9749.52 | 9617.66 | 10014.75 | 10718.95 |
| - Supra-national Authorities (EU) | | | | | | | |
| Total tax revenue (OECD)* | 26123.12 | 31594.94 | 35527.51 | 39332.09 | 38732.00 | 37614.39 | 36921.96 |
| Share of the environmental taxes and fees (%) | 6.5 | 6.6 | 6.4 | 6.0 | 5.8 | 6.4 | 7.3 |
| *Does not include social security contributions. | 5.0 | 5.2 | 5.1 | 4.7 | 4.4 | 4.7 | 5.6 |

Source: Statistics Finland, Environment and energy

Table G: Environmentally related taxes, fees and charges 1980-2001 (Cont.)

| | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000* | 2001* |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 1. MOTOR FUELS, total | 1472.04 | 1650.76 | 1769.34 | 1812.90 | 1939.88 | 1968.68 | 1939.48 | 1959.76 |
| Leaded petrol | 1.71 | | | | | | | |
| Basic tax | 0.05 | | | | | | | |
| Surtax | | | | | | | | |
| Unleaded petrol | 1035.62 | 1100.45 | 1224.74 | 1221.38 | 1265.11 | 1253.64 | 1211.96 | 1223.16 |
| Basic tax | 31.16 | 52.31 | 50.96 | 68.62 | 85.10 | 98.35 | 95.14 | 96.02 |
| Surtax | | | | | | | | |
| Diesel oil | 376.79 | 458.65 | 452.93 | 463.36 | 511.96 | 523.82 | 537.11 | 544.07 |
| Basic tax | 26.72 | 39.36 | 40.70 | 59.54 | 77.70 | 92.87 | 95.28 | 96.50 |
| Surtax | | | | | | | | |
| 2. OTHER ENERGY PRODUCTS, total | 188.19 | 304.92 | 369.00 | 524.24 | 634.40 | 682.81 | 656.57 | 692.56 |
| Light fuel oil | 19.60 | 19.85 | 21.02 | 48.44 | 52.81 | 50.34 | 44.48 | 48.64 |
| Basic tax | 37.33 | 63.74 | 67.11 | 86.62 | 113.70 | 124.60 | 110.19 | 120.48 |
| Surtax | | | | | | | | |
| Heavy fuel oil | 4.06 | 5.21 | 5.89 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Basic tax | 15.08 | 32.80 | 37.51 | 45.75 | 58.70 | 52.33 | 44.11 | 47.63 |
| Surtax | | | | | | | | |
| Coal | 60.02 | 60.04 | 109.49 | 53.99 | 46.92 | 46.68 | 49.21 | 57.96 |
| Basic tax | | | | | | | | |
| Surtax | | | | | | | | |
| Peat | 11.77 | 12.11 | 13.62 | 7.90 | 10.60 | 14.62 | 13.32 | 14.84 |
| Basic tax | | | | | | | | |
| Surtax | | | | | | | | |
| Natural gas | 30.91 | 22.20 | 27.08 | 20.18 | 28.76 | 24.75 | 24.71 | 23.91 |
| Basic tax | 9.42 | 88.97 | 87.29 | | | | | |
| Surtax | | | | | | | | |
| Electricity production | | | | 261.36 | 322.92 | 369.48 | 370.54 | 379.08 |
| Electricity consumption | | | | | | | | |
| 3. VEHICLE-RELATED TAXATION, total | 591.35 | 739.86 | 950.26 | 1062.61 | 1261.24 | 1423.04 | 1459.03 | 1357.45 |
| 3.1 Car sales tax | 345.46 | 451.58 | 607.33 | 708.07 | 884.50 | 1028.47 | 1058.66 | 922.21 |
| 3.2 Vehicle tax ("sticker tax") | 103.94 | 175.92 | 186.69 | 189.88 | 201.49 | 209.39 | 219.66 | 226.77 |
| 3.3 Motor vehicle tax ("diesel tax") | 141.95 | 112.35 | 156.25 | 164.66 | 175.25 | 185.17 | 180.70 | 208.47 |
| 4. AGRICULTURAL INPUT, total | 45.93 | 1.01 | 1.01 | 1.01 | 1.51 | 1.68 | 1.78 | 1.67 |
| 4.1 Fertilisers | 44.91 | | | | | | | |
| 4.2 Pesticides | 1.03 | 1.01 | 1.01 | 1.01 | 1.51 | 1.68 | 1.78 | 1.67 |
| 5. OTHER GOODS, total | 32.63 | 26.57 | 18.50 | 19.85 | 20.52 | 22.54 | 22.13 | 24.41 |
| 5.1a Beer surtax | 8.07 | 14.80 | 8.75 | 9.25 | 10.09 | 12.28 | 12.37 | 14.78 |
| 5.1b Soft drink surtax | 2.69 | 2.52 | 1.51 | 1.68 | 1.51 | 1.18 | 1.10 | 1.12 |
| 5.2 Oil waste tax | 3.20 | 3.53 | 3.36 | 3.36 | 3.36 | 3.20 | 3.26 | 3.12 |
| 5.3 Oil pollution control fee | 5.21 | 5.72 | 4.88 | 5.55 | 5.55 | 5.89 | 5.41 | 5.39 |
| 5.4 Charter flight tax | 13.46 | | | | | | | |
| 6. WATER AND WASTEWATER CHARGES, total | 573.12 | 561.92 | 627.34 | 612.20 | 614.73 | 636.42 | 674.69 | 705.87 |
| 6.1 Water charges | 265.16 | 250.77 | 280.71 | 273.98 | 264.56 | 275.32 | 293.55 | 299.27 |
| 6.2 Wastewater charges | 307.62 | 310.64 | 346.13 | 337.72 | 349.66 | 360.59 | 380.75 | 406.54 |
| 6.3 Water protection fee | 0.34 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.39 | 0.07 |
| 7. WASTE DISPOSAL AND MANAGEMENT CHARGES, total | 69.84 | 68.60 | 92.59 | 114.07 | 134.61 | 140.93 | 150.17 | 158.75 |
| 7.1 Waste tax | | | 6.90 | 21.36 | 30.61 | 33.97 | 33.28 | 31.34 |
| 7.2 Municipal Waste Charges | 69.84 | 68.60 | 85.70 | 92.71 | 104.00 | 106.96 | 116.89 | 127.41 |
| TOTAL | 2973.10 | 3353.65 | 3828.05 | 4146.88 | 4606.90 | 4876.10 | 4903.85 | 4900.46 |
| Charges | 642.62 | 630.01 | 712.53 | 704.41 | 718.23 | 742.88 | 791.19 | 833.21 |
| TOTAL, TAXES AND FEES | 2330.48 | 2723.64 | 3115.51 | 3442.47 | 3888.67 | 4133.22 | 4112.66 | 4067.24 |
| Total tax revenue (OECD) | 40929.71 | 42681.05 | 46563.50 | 49313.04 | 53354.26 | 56220.68 | 61430.98 | 62422.28 |
| - Central Government | 19758.04 | 20711.67 | 23393.43 | 25389.31 | 27951.15 | 29720.32 | 33832.85 | 32788.57 |
| - Local Government | 9128.57 | 9333.42 | 10520.66 | 11006.55 | 11783.58 | 12139.97 | 12997.23 | 14044.36 |
| - Social Security Funds | 12043.10 | 12462.89 | 12483.92 | 12752.34 | 13466.47 | 14218.10 | 14462.31 | 15462.53 |
| - Supra-national Authorities (EU) | | 173.07 | 165.50 | 164.82 | 153.05 | 142.29 | 138.59 | 126.81 |
| Total tax revenue (OECD)* | 40929.71 | 42681.05 | 46563.50 | 49313.04 | 53354.26 | 56220.68 | 61430.98 | 62422.28 |
| Share of the environmental taxes and fees (%) | 7.3 | 7.9 | 8.2 | 8.4 | 8.6 | 8.7 | 8.0 | 7.9 |
| *Does not include social security contributions. | 5.7 | 6.4 | 6.7 | 7.0 | 7.3 | 7.4 | 6.7 | 6.5 |

Source: Statistics Finland, Environment and energy

Table H: Investments in waste management 1992-1999

| | | | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|-------|--------|---------------------------------------|---------------------|-----------|-----------|-----------|-----------|------------|-----------|-----------|
| | | | EUR, at 2000 prices | | | | | | | |
| 10-14 | CA, CB | Mining and quarrying | 359 445 | 405 444 | 48 934 | 0 | 353 873 | 1 010 281 | 1 468 245 | 947 689 |
| 15-16 | DA | Food, beverages and tobacco | 495 559 | 370 425 | 69 578 | 698 622 | 921 774 | 583 068 | 2 348 171 | 565 390 |
| 17 | DB | Textiles | 21 954 | 15 564 | 0 | 24 344 | 264 872 | 25 055 | 250 009 | 37 312 |
| 18-19 | DB, DC | Leather, textile and leather products | 41 513 | 0 | 24 652 | 7 441 | 8 930 | 22 117 | 4 637 | 0 |
| 20 | DD | Wood and wood products | 67 857 | 37 548 | 231 991 | 375 979 | 69 605 | 34 227 | 57 778 | 333 359 |
| 21 | DE | Pulp, paper and paper products | 3 508 428 | 2 541 029 | 4 183 201 | 1 278 950 | 8 021 317 | 5 145 579 | 7 666 142 | 5 617 873 |
| 22 | DE | Publishing and printing | 1 374 911 | 111 478 | 168 508 | 731 334 | 286 244 | 82 839 | 94 402 | 0 |
| 23 | DF | Fuels | 45 305 | 227 041 | 0 | 349 192 | 11 319 | 34 887 | 0 | 0 |
| 24 | DG | Chemicals | 3 418 417 | 975 283 | 795 131 | 3 019 224 | 2 338 515 | 1 953 621 | 528 401 | 1 952 256 |
| 25 | DH | Rubber and plastic products | 565 412 | 419 257 | 34 306 | 4 114 299 | 253 364 | 528 147 | 864 676 | 570 977 |
| 26 | DI | Non-metallic mineral products | 311 146 | 16 731 | 394 942 | 519 797 | 27 579 | 172 644 | 456 378 | 1 545 171 |
| 27 | DJ | Basic metals | 1 441 172 | 587 933 | 420 475 | 3 461 237 | 5 371 479 | 586 562 | 2 130 246 | 2 978 077 |
| 28 | DJ | Metal products | 7 983 | 56 225 | 2 750 351 | 8 503 | 3 221 471 | 429 390 | 8 343 405 | 1 103 759 |
| 29 | DK | Machinery and equipment | 70 252 | 122 567 | 204 838 | 78 869 | 77 427 | 172 866 | 651 878 | 61 771 |
| 30-33 | DL | Electrical and optical equipment | 70 053 | 94 552 | 178 824 | 657 162 | 308 138 | 245 345 | 511 138 | 252 960 |
| 34-35 | DM | Transport equipment | 2 398 959 | 68 287 | 10 463 | 358 415 | 1 792 714 | 99 372 | 171 056 | 33 450 |
| 36 | DN | Other manufacture | 0 | 0 | 37 429 | 31 966 | 172 820 | 1 222 310 | 295 117 | 273 073 |
| 40 | E | Energy supply | 72 448 | 1 182 675 | 909 374 | 0 | 788 036 | 11 525 392 | 999 522 | 296 104 |
| 41 | E | Water supply | .. | .. | .. | .. | 62 243 | 56 280 | 0 | 0 |

Source: Statistics Finland, Environment and energy

Table I: Current expenditure of waste and protection of soil and groundwater 1992-1999

| | | | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|-------|--------|---------------------------------------|---------------------|------------|------------|------------|------------|------------|------------|------------|
| | | | EUR, at 2000 prices | | | | | | | |
| 10-14 | CA, CB | Mining and quarrying | 1 443 598 | 315 161 | 1 019 352 | 1 088 116 | 433 161 | 1 188 589 | 1 157 305 | 981 573 |
| 15-16 | DA | Food, beverages and tobacco | 10 876 282 | 9 188 405 | 7 274 877 | 8 437 583 | 8 489 808 | 9 557 846 | 8 602 485 | 7 400 149 |
| 17 | DB | Textiles | 642 541 | 1 254 925 | 369 007 | 312 651 | 600 111 | 875 654 | 846 588 | 728 023 |
| 18-19 | DB, DC | Leather, textile and leather products | 482 406 | 553 567 | 698 257 | 645 445 | 872 407 | 845 864 | 785 059 | 1 167 787 |
| 20 | DD | Wood and wood products | 1 931 654 | 2 951 458 | 2 888 045 | 2 197 031 | 2 422 846 | 3 399 879 | 5 085 490 | 4 174 981 |
| 21 | DE | Pulp, paper and paper products | 11 025 724 | 8 936 420 | 12 037 279 | 10 272 626 | 11 324 698 | 15 831 959 | 14 140 965 | 14 711 095 |
| 22 | DE | Publishing and printing | 2 397 510 | 1 795 659 | 2 376 353 | 1 984 130 | 2 063 287 | 2 654 452 | 2 615 681 | 6 689 133 |
| 23 | DF | Fuels | 1 278 756 | 906 866 | 874 914 | 980 510 | 2 097 850 | 1 539 709 | 5 925 446 | 3 418 323 |
| 24 | DG | Chemicals | 12 365 119 | 11 850 707 | 8 009 296 | 9 733 375 | 13 238 784 | 13 928 061 | 12 191 343 | 18 695 350 |
| 25 | DH | Rubber and plastic products | 1 100 088 | 1 893 004 | 1 642 420 | 2 291 219 | 1 956 311 | 3 898 703 | 3 642 006 | 4 569 971 |
| 26 | DI | Non-metallic mineral products | 2 494 483 | 3 112 807 | 2 796 793 | 3 032 521 | 2 483 381 | 5 419 980 | 5 127 087 | 4 828 553 |
| 27 | DJ | Basic metals | 7 877 855 | 8 138 941 | 14 648 879 | 13 108 348 | 15 337 749 | 10 773 432 | 9 894 012 | 15 724 253 |
| 28 | DJ | Metal products | 1 914 975 | 3 696 510 | 1 770 490 | 1 670 122 | 2 699 451 | 3 371 050 | 8 706 314 | 5 130 175 |
| 29 | DK | Machinery and equipment | 2 603 718 | 2 755 467 | 3 101 917 | 4 263 724 | 4 493 028 | 4 713 296 | 4 945 900 | 6 188 628 |
| 30-33 | DL | Electrical and optical equipment | 2 384 268 | 2 543 473 | 1 731 987 | 2 949 564 | 2 989 567 | 3 664 501 | 4 703 631 | 4 906 822 |
| 34-35 | DM | Transport equipment | 2 777 220 | 2 991 301 | 2 544 475 | 2 696 713 | 3 959 794 | 3 354 687 | 3 274 628 | 3 127 635 |
| 36 | DN | Other manufacture | 1 857 625 | 1 614 573 | 1 094 945 | 1 318 564 | 1 223 170 | 2 209 005 | 1 901 375 | 2 072 132 |
| 40 | E | Energy supply | 3 669 231 | 3 603 419 | 4 812 983 | 3 132 134 | 2 237 907 | 4 956 324 | 2 587 039 | 7 091 585 |
| 41 | E | Water supply | .. | .. | .. | .. | 861 344 | 818 313 | 43 204 | 43 560 |

Source: Statistics Finland, Environment and energy

Table J: Industrial waste

| | | 1987 | 1992 | 1997 | 1999 | 2000 |
|------------|---|-----------|-----------|-----------|-----------|-----------|
| | | tonnes | | | | |
| DA | Food, beverages and tobacco | 737 189 | 1 725 262 | 2 098 469 | 1 422 433 | 995 100 |
| DB, DC | Textiles and leather, textile and leather products | 152 419 | 150 712 | 18 349 | 12 035 | 22 900 |
| DD | Wood and wood products | 2 521 146 | 4 227 995 | 3 905 789 | 3 512 153 | 3 021 600 |
| DE | Pulp, paper and paper products, publishing and printing | 2 907 536 | 4 615 159 | 5 493 225 | 4 594 823 | 6 960 500 |
| DF, DG, DH | Fuels and chemicals, rubber and plastic products | 2 726 876 | 2 754 436 | 700 556 | 2 226 194 | 2 319 400 |
| DI | Non-metallic mineral products | 846 038 | 642 999 | 1 808 519 | 1 530 450 | 686 900 |
| DJ | Metals and metal products | 2 302 155 | 2 788 489 | 1 258 773 | 2 023 809 | 2 009 100 |
| DK, DL, DM | Machinery and equipment | 940 621 | 464 656 | 342 272 | 413 951 | 474 100 |
| DN | Other manufacture and recycling | 9 882 | 109 221 | 285 506 | 290 235 | 310 900 |

Source: Vahvelainen & Isaksson (1992), Wastes from Manufacturing and Related Industries 1992 (1995), Vahvelainen & Salomaa (2000), Environment Statistics (2002), Environment Statistics (2003)

Table K: Consumption expenditure of households

| | 1985 | 1990 | 1994-96 | 1998 | 2001-02 |
|---|---|--------|---------|--------|---------|
| | EUR / year per consumption unit*), at 2001 prices | | | | |
| Food and non-alcoholic beverages | 1 650 | 1 728 | 1 829 | 1 853 | 1 987 |
| Alcoholic beverages and tobacco | 366 | 449 | 401 | 391 | 427 |
| Clothing and footwear | 633 | 736 | 499 | 592 | 515 |
| Housing and energy | 2 532 | 3 543 | 3 731 | 3 872 | 4 321 |
| Furnishing, hh appliances and equipment | 637 | 667 | 534 | 612 | 743 |
| Health | 487 | 552 | 492 | 510 | 535 |
| Transport | 1 712 | 2 036 | 1 598 | 1 889 | 2 213 |
| Communication | 106 | 162 | 233 | 370 | 551 |
| Recreation and culture | 1 169 | 1 479 | 1 261 | 1 397 | 1 487 |
| Education | 17 | 24 | 21 | 24 | 27 |
| Restaurants and hotels | 655 | 652 | 549 | 555 | 685 |
| Other goods and services | 1 171 | 1 603 | 1 327 | 1 452 | 1 573 |
| Total | 11 135 | 13 631 | 12 475 | 13 517 | 15 064 |

*) OECD scale: First adult of a household receives value 1, other adults value 0.7 and children value 0.5

Source: Statistics Finland, Household Budget Survey

Table L: Household population

| | Number of | Number of | Average size of |
|------|------------|----------------|-----------------|
| | households | persons in hhs | households |
| | 1000 hhs | 1000 persons | persons |
| 1966 | 1 385 | 4 626 | 3.34 |
| 1971 | 1 495 | 4 476 | 2.99 |
| 1976 | 1 636 | 4 676 | 2.86 |
| 1981 | 1 919 | 4 727 | 2.46 |
| 1985 | 2 045 | 4 833 | 2.36 |
| 1990 | 2 171 | 4 974 | 2.29 |
| 1995 | 2 290 | 5 053 | 2.21 |
| 1998 | 2 355 | 5 086 | 2.16 |
| 1999 | 2 365 | 5 097 | 2.15 |
| 2000 | 2 373 | 5 105 | 2.15 |
| 2001 | 2 382 | 5 120 | 2.15 |

*) Persons who reside permanently in institutions or live abroad are excluded from household population. A household consists of persons who mainly live and either have their meals together or otherwise use their income together.

Source: Statistics Finland, Household Budget Survey, Income Distribution Survey

Table M: Allocation of investments in environmental protection 1992-1999

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|-------|--------------------------|---------|--------|---------|---------|---------|--------|--------|
| | 1000 EUR, at 2000 prices | | | | | | | |
| air | 237 137 | 198 900 | 98 653 | 81 915 | 128 198 | 156 562 | 68 991 | 43 345 |
| water | 109 561 | 102 517 | 80 732 | 168 096 | 150 842 | 59 485 | 77 991 | 70 370 |
| waste | 18 905 | 10 998 | 12 402 | 25 928 | 28 895 | 31 366 | 42 160 | 25 371 |
| other | 1 798 | 1 615 | 3 525 | 4 453 | 5 865 | 2 963 | 3 946 | 5 677 |

Source: Statistics Finland, Environment and energy

Table N: Allocation of expenditure and maintenance costs of environmental protection 1992-1999

| | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 |
|--------------------------|---------|---------|---------|---------|---------|---------|---------|---------|
| 1000 EUR, at 2000 prices | | | | | | | | |
| air | 43 735 | 64 440 | 51 516 | 56 201 | 64 324 | 71 136 | 56 907 | 65 779 |
| water | 118 999 | 119 126 | 118 007 | 118 879 | 131 211 | 144 852 | 144 199 | 134 668 |
| waste | 69 124 | 68 102 | 69 692 | 70 115 | 79 785 | 93 002 | 96 176 | 107 532 |
| other | 2 348 | 917 | 5 132 | 5 380 | 4 418 | 4 190 | 11 067 | 9 609 |

Source: Statistics Finland, Environment and energy

Table O: Packaging waste

| | 1991 | | | 1997 | | | 1998 | | |
|----------------------|---------|-----------------|----------------|---------|-----------------|----------------|---------|-----------------|----------------|
| | Total | Total recycling | Total recovery | Total | Total recycling | Total recovery | Total | Total recycling | Total recovery |
| | tonnes | % | % | tonnes | % | % | tonnes | % | % |
| Paper and fibreboard | 211 200 | 33 | 42 | 243 500 | 57 | 73 | 246 000 | 57 | 72 |
| Plastics | 99 200 | 9 | 10 | 90 000 | 10 | 22 | 89 400 | 10 | 20 |
| Metals | 25 600 | - | - | 31 000 | 8 | 8 | 32 000 | 16 | 16 |
| Glass | 51 900 | 29 | 29 | 52 000 | 48 | 57 | 55 700 | 62 | 62 |

Table O: (Cont.)

| | 1999 | | | 2000 | | |
|----------------------|---------|-----------------|----------------|---------|-----------------|----------------|
| | Total | Total recycling | Total recovery | Total | Total recycling | Total recovery |
| | tonnes | % | % | tonnes | % | % |
| Paper and fibreboard | 255 600 | 61 | 72 | 257 400 | 62 | 72 |
| Plastics | 92 000 | 13 | 30 | 87 400 | 14 | 36 |
| Metals | 36 600 | 19 | 19 | 39 400 | 25 | 25 |
| Glass | 58 400 | 78 | 78 | 58 300 | 64 | 64 |

Source: Environment Statistics (1994), Environment Statistics (2000), Environment Statistics (2001), Environment Statistics (2002), Environment Statistics (2003)

Table P: Consumption and recovery of paper and cardboard 1976-2001

| Year | Consumption per capita | | Recovery per capita | |
|------|------------------------|--|---------------------|------|
| | kg | | kg | % |
| 1976 | 140.9 | | 22.0 | 15.6 |
| 1977 | 125.8 | | 36.0 | 28.6 |
| 1978 | 129.6 | | 41.0 | 31.6 |
| 1979 | 138.3 | | 45.0 | 32.5 |
| 1980 | 145.4 | | 51.0 | 35.1 |
| 1981 | 153.3 | | 56.0 | 36.5 |
| 1982 | 150.7 | | 58.0 | 38.5 |
| 1983 | 157.4 | | 59.0 | 37.5 |
| 1984 | 168.1 | | 63.0 | 37.5 |
| 1985 | 178.8 | | 70.0 | 39.1 |
| 1986 | 188.0 | | 74.0 | 39.4 |
| 1987 | 172.3 | | 60.0 | 34.8 |
| 1988 | 212.5 | | 78.0 | 36.7 |
| 1989 | 181.0 | | 87.0 | 48.1 |
| 1990 | 174.0 | | 91.0 | 52.3 |
| 1991 | 162.0 | | 91.0 | 56.2 |
| 1992 | 152.0 | | 89.0 | 58.6 |
| 1993 | 158.0 | | 90.0 | 57.0 |
| 1994 | 165.0 | | 93.0 | 56.4 |
| 1995 | 175.0 | | 99.0 | 56.6 |
| 1996 | 178.0 | | 110.0 | 61.8 |
| 1997 | 203.0 | | 124.0 | 61.1 |
| 1998 | 204.0 | | 129.0 | 63.2 |
| 1999 | 209.0 | | 135.0 | 64.6 |
| 2000 | 211.0 | | 142.0 | 67.3 |
| 2001 | 194.0 | | 143.0 | 73.7 |

Source: Environment Statistics (1994), Environment Statistics (2003)