# The analytical usefulness of a system of environmental accounts

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**Abstract:** Economic activities lead to pressures on environmental systems because of emissions of pollutants and extraction of natural resources. This paper will argue and illustrate that the environmental accounting framework (SEEA, 2003) is particularly useful to assess the interrelationships between economy and environment. The primary reason for this is that the environmental accounts are entirely consistent with the system of national accounts. The environmental data can therefore be coupled to the framework of supply and use tables and input-output tables, giving ample opportunities for in-depth environmental-economic analyses. In this paper, we will provide some concrete examples from practice using data for $CO_2$-emissions for the period 1990-2005 in the Netherlands: structural decomposition analysis, the 'environmental balance of trade', the attribution of $CO_2$ to final demand categories, etc. The paper will conclude with a plea for increased international co-ordination and standardisation in the field of environmental accounting.

## 1. Introduction

The economy is a complex system of which production, consumption, technology and investment are just a few of the many different interrelated dimensions. All these different aspects of the economy may have detrimental or beneficial effects on environmental pressures. The relationship is further complicated by the fact that transboundary aspects (such as international trade and technological transfers) are becoming more and more important for economic and environmental analysis. As a consequence, the link between the economy and the environment is not straightforward. In this paper, we will argue that this complex relationship is best tackled using a statistical system which produce economic and environmental statistics in an integrated statistical framework. The environmental portion of this framework is usually referred to as the "environmental accounts" (SEEA, 2003). To illustrate the analytical usefulness of these accounts, we will use data on $CO_2$-emissions for the period 1990-2005 in the Netherlands. A number of analyses such as structural decomposition analysis, the 'environmental balance of trade', and the attribution of $CO_2$ to final demand categories are provided. We will also shortly discuss further opportunities for modelling applications, and the need for further statistical co-ordination.

This paper is structured as follows. After a short, more general discussion of the relationship between the economy and the environment in section 2, section 3 addresses the basics of environmental accounting. In section 4, a number of applications are illustrated using data for $CO_2$-emissions for the Netherlands. Finally, in section 5, we will put forward some recommendations which, in our opinion, are needed to take the environment into account.

## 2. Economic growth and the environment: A primer

The relationship between economic growth and the resulting environmental pressures has been one of the most important questions in environmental economics for a long time (think for example of Malthus, 1798; Meadows et al., 1972, WCED, 1987). In this 'growth debate', the main question is whether economic growth can continue indefinitely given the constraints set by the natural environment. Whereas some argue that this is possible (Beckerman, 1999), others are more pessimistic (Daly, 1999). Growth optimists expect that the positive correlation between economic growth and environmental pressure will, and already is, reversing. Growth pessimists believe that, in the long run, this will turn out to be impossible.

A line of empirical research that has led to significant debate is the Environmental Kuznets Curve (EKC). These studies are based on cross-sectional or time series data, which show an inverted U-shape relationship between economic variables and environmental pressures. The implication is that the environment is a luxury good, which receives more attention beyond a certain threshold of income or wealth. Grossman and Krueger (1995), for example, find that for the pollutants they investigate the turning point is below $8000 per capita. However, the results do not hold for all pollutants and furthermore the EKC is a black-box approach which does not explain the mechanisms that achieve this outcome. Doubts have, therefore, been raised over the robustness and generality of the EKC. Moreover, it has been suggested that relinking occurred in the late 1980s (de Bruijn and Opschoor, 1997; de Bruijn and Heintz, 1999). For an overview, see Dinda (2004).

Figure 1 shows the relationship between GDP-growth and $CO_2$-emissions for the Netherlands for the period 1990-2005. Conceptually, the figures for $CO_2$-emission and GDP can be compared, as both are derived from the same consistent system of environmental accounts. Figure 1 shows that for the period 1990-2005 *relative decoupling* took place in the Netherlands, i.e. the growth rate of $CO_2$ is lower than the growth rate of GDP. Note however that relative decoupling still leads to a net *increase* in environmental pressure. Only *absolute decoupling*, whereby environmental emissions decrease can lead to reduced pressure. As the figure shows, in the years 1996-97 and 1998-99 and more recently 2004-05 absolute decoupling occurred.

If the trend towards absolute decoupling is sustained after 2004, is this a good thing? The answer, perhaps surprisingly, is not a straightforward “yes”. A lot of the complexity of this question is caused by globalisation, in particular because of the re-distribution of production and consumption patterns. If figure 1 would represent global GDP and $CO_2$-emissions, it would be a positive development when the $CO_2$-emissions drop. For the sake of completeness, however, we should note that even a decrease in emissions could still be too slow to prevent a dramatic climate change and ecosystem collapse in the case of critical limits already being exceeded. In this paper, we will not dwell on this point.

Figure 1 only represents developments on a national scale, so we need to be careful of its interpretation. From the Dutch perspective, figure 1 represents a positive development, but this does not automatically translate into absolute decoupling on a global scale. The contrary could be the case - absolute decoupling for the Netherlands could actually go hand in hand with global increases in emissions, for example when ‘dirty’ industries move abroad.

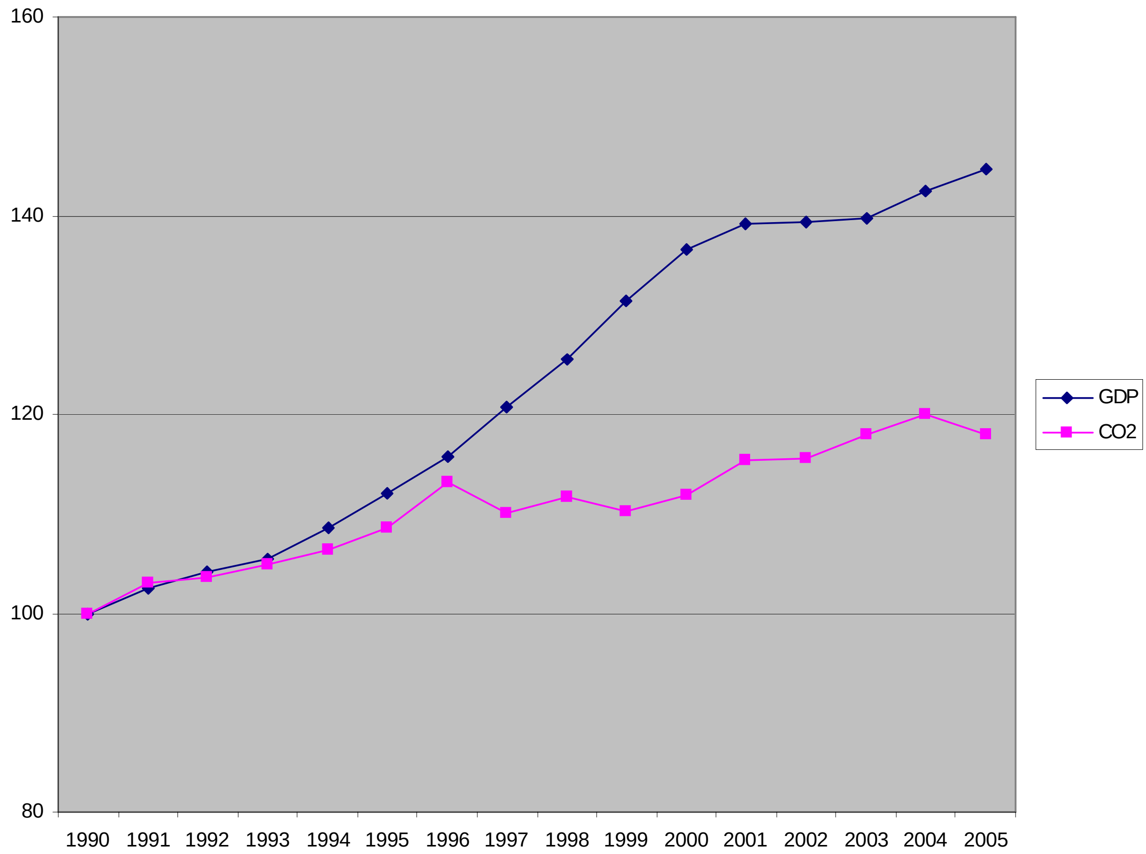


*Figure 1. The development of $CO_2$-emissions and GDP in the Netherlands (1990=100)*

Since economies are open systems, environmental pressures can be 'exported'. Industries that produce $CO_2$ intensive products may go abroad because of environmental regulations or other reasons. These products are then simply imported. This mechanism will lead to decreases in the national $CO_2$-figures, because the $CO_2$ emitted in production processes abroad to produce our imports are not taken into account. This process is sometimes referred to as "carbon leakage" or the "pollution haven hypothesis" (PHH). Basically the hypothesis is that developed countries specialise in clean production and start to import the 'dirty' products from other (developing) countries. We will return to this point in our discussion of the 'environmental balance of trade'.

# 3. Environmental Accounting

## 3.1 International Setting

Environmental accounts have been developed to link environmental and economic statistics. An important characteristic of environmental accounting is that the data are consistent with the national accounts. As such they are commonly referred to as ‘satellite accounts’. The environmental data can be directly compared to macro-economic indicators such as GDP. Specific accounts cover natural resources such oil and gas, material flows, air emissions, water, waste, and environmental expenditure. The environmental accounts provide a tool to analyse to what extent our current production and consumption patterns are depleting natural resources or are polluting the environment. In addition, the system includes information about policy measures such as environmentally related taxes or subsidies.

International co-ordination of accounting practices culminated in the System of Integrated Environmental and Economic Accounting, commonly referred to as the SEEA 2003 (UN, 2003). The SEEA provides an overview of the different environmental accounts. Recently, the UN Committee of Experts on Environmental-Economic Accounting (UNCEEA) was established. Its main objective is the elevation of the system of environmental accounts to an international statistical standard and the implementation of SEEA in all countries. In Europe, Eurostat has also indicated that the development of the environmental accounts should be given high priority (Eurostat, 2003). On the national level, there is also much interest in the environmental accounts. Environmental policy institutes and ministries use this data for environmental-economic analyses and policy development.

## 3.2 Dutch Environmental Accounts

Statistics Netherlands has a long history in environmental accounting at the national accounts department (de Haan, 2004). In 1991, an illustrative NAMEA (National Accounting Matrix including Environmental Accounts) was presented for the first time (de Boo, Bosch, Gorter and Keuning, 1993), based on the conceptual design by Keuning (1993). The original design contained a complete system of national flow accounts, including a full set of income distribution and use accounts, accumulation accounts and changes in balance sheet accounts.

At present, a wide variety of different elements are produced on a regular basis by Statistics Netherlands. The air emissions accounts cover environmental information on climate change (emission of greenhouse gasses), ozone layer depletion, acidification, and local air pollution. In the energy accounts, the supply and use of energy products is shown both in physical and monetary terms. The waste accounts record the production and treatment of 70 different kinds of solid waste. The water accounts (NAMWA, National Accounting Matrix including Water Accounts) include both the production and consumption of water (tap water, groundwater, surface water), and the emission of hazardous substances to water (heavy metals, nutrients, pesticides etc.). The Dutch environmental accounts also include some monetary accounts related to environmental subjects, such as the environmental expenditure accounts and the environmental tax accounts.

The range of Dutch environmental accounts will be further expanded in the next few years. New work will be undertaken with regard to material flow accounts (MFA), asset accounts in monetary and physical terms for oil, natural gas, and land. The monetary accounts will be extended with the inclusion of environmental subsidies and the environmental goods and services sector.

## 4. The analytical usefulness of environmental accounts: some concrete examples

### 4.1 Introductory remarks

The environmental accounts have two primary features which make them very useful to investigate the relationship between the economy and the environment. First of all, environmental accounts are fully consistent with the system of national accounts. This means that the national accounting aggregates such as GDP, labour force, production, exports, imports, etc. can be linked to environmental indicators. Secondly, and related to the previous point, environmental accounts can be linked to the framework of input-output tables. The input-output tables are part of the national accounts system and can be used, among other things, for input-output modelling. This work was pioneered by Nobel laureate Wassily Leontief and provides a good basis for in-depth environmental-economic analyses. These two advantages will be illustrated below where we investigate a number of trends using data from the Dutch environmental accounts. The examples will mainly relate to the trade-offs between the economy and the $CO_2$-emissions in the Netherlands for the period 1990-2005.

### 4.2 Key indicators

One of the most important applications of the environmental accounts is the set of consistent indicators that can be derived from this integrated system. The environmental accounts provide key indicators which are consistent with economic figures. Table 1 illustrates the key figures published in the annual Dutch publication on environmental accounts (Statistics Netherlands, 2007a). The table provides an overview of both economic aggregates (GDP, final consumption of households, labour force, etc.) and environmental aggregates (emissions of greenhouse gasses, emissions of acidifying gasses, production of solid waste etc.). In addition, data is provided on environmentally related transactions (green taxes, environmental expenditure) and resource use of the economy (water use, energy use). Finally, the physical and monetary asset accounts for oil and gas are included in the table.

*Table 1. Key indicators of the Dutch environmental accounts*

| | Unit | 1990 | 1995 | 2000 | 2003 | 2004 | 2005 | 2006* |
|---|---|---|---|---|---|---|---|---|
| Domestic Product (gross, market prices) | mln euro | 243652 | 305261 | 417960 | 476945 | 491184 | 508964 | 534324 |
| Domestic Product (gross, market prices, price level 2000) | mln euro | 306034 | 342776 | 417960 | 427765 | 437332 | 443937 | 457278 |
| Value added (gross, basic prices) | mln euro | 223832 | 275686 | 373415 | 425256 | 436874 | 451886 | 473610 |
| Value added (gross, basic prices, price level 2000) | mln euro | 276842 | 308196 | 373415 | 382985 | 391896 | 397663 | 409625 |
| Final consumption expenditure households | mln euro | 121102 | 151058 | 210823 | 238103 | 242781 | 249735 | 253482 |
| Final consumption expenditure households (price level 2000) | mln euro | 155860 | 170120 | 210823 | 216269 | 218390 | 220003 | 218182 |
| Investments in fixed assets (gross) | mln euro | 55328 | 63500 | 91652 | 92848 | 92426 | 96494 | 105283 |
| Labour input of employed persons | 1000 fte | 5536 | 5774 | 6534 | 6547 | 6480 | 6463 | 6579 |
| Population | 1000 | 14947 | 15460 | 15922 | 16223 | 16276 | 16317 | 16341 |
| Environmental costs 1) | mln euro | 861 | 1209 | 1531 | 1615 | 1573 | 1548 | . |
| Environmental investments1) | mln euro | 556 | 418 | 417 | 295 | 382 | 338 | . |
| Taxes | mln euro | 62197 | 70835 | 99060 | 110177 | 113661 | 124039 | 132393 |
| Green taxes | mln euro | 5824 | 9249 | 13973 | 14975 | 16064 | 17270 | 18702 |
| Environmental fees | mln euro | 1619 | 2367 | 2906 | 3408 | 3583 | 3710 | 3956 |
| Greenhouse effect | mln $CO_2$ -eq. | 229448 | 245311 | 242117 | 245162 | 248654 | 244107 | 238801 |
| Ozone layer depletion | 1000 CFK11-eq. | 4852 | 678 | 215 | 184 | 178 | 173 | 169 |
| Acidification | mln ac-eq. | 38 | 31 | 27 | 26 | 26 | 26 | 24 |
| Fine dust | mln kg | 86 | 67 | 59 | 53 | 52 | 52 | 47 |
| Eutrophication 2) | mln eutr-eq. | 223 | 213 | 173 | 162 | 143 | 146 | . |
| Solid waste production | mln kg | 52450 | 53983 | 64013 | 62748 | 62744 | 61213 | . |
| Land filled waste | mln kg | 14982 | 9209 | 4907 | 2756 | 1836 | 2137 | . |
| Heavy metals to water 2) | 1000 eq. | . | 198 | 158 | 124 | 130 | 132 | . |
| Nutrients to water2) | 1000 eq. | . | 29395 | 26699 | 25851 | 25783 | 25890 | . |
| Net domestic energy consumption | petajoules | 2899 | 3195 | 3357 | 3531 | 3602 | 3611 | 3527 |
| Water use, groundwater extraction | mln $m^3$ | . | . | . | 1153 | 1044 | 1025 | . |
| Mineral reserves gas | 1000 mln $Sm^3$ | 2113 | 1952 | 1777 | 1615 | 1572 | 1510 | 1439 |
| Valuation mineral reserves gas | 1000 mln euro | 70,4 | 74,4 | 72,5 | 100,8 | 103,0 | 100,0 | 109,0 |
| Mineral reserves oil | mln $Sm^3$ | 64,0 | 50,0 | 30,0 | 38,0 | 34,0 | 35,9 | 38,1 |
| Valuation mineral reserves oil | 1000 mln euro | 4,2 | 3,1 | 2,3 | 4,3 | 4,9 | 4,3 | 5,2 |

As stated, the above table is derived from the annual publication on environmental accounts, a publication that is entirely dedicated to environmental accounting issues. In addition, data on important environmental issues are also included in the annual publication on national accounts. The latter publication starts with a table containing core indicators for the Dutch economy. This set of indicators also includes several key indicators on environmental developments, right below economic growth and other more traditional key indicators for the economy. In the annex to this paper, the upper part of this table is shown.

Furthermore, the national accounts publication also contains a special section on environmental accounting. In this section, several summary tables are presented showing, for example, the link between production and consumption on the one hand, and environmental pollution on the other. Two of the relevant tables have also been annexed to this paper.

### 4.3 Transport efficiency

Although the key indicators are the summary statistics of the environmental accounting system, more detailed figures can also be produced. An example is the calculation of the transport efficiency of different transport activities. By combining data on transport performance (passenger kilometres, ton kilometre) with $CO_2$-emissions from the environmental accounts, the transport efficiency ($CO_2$ per passenger kilometre or ton kilometre) can be calculated. The environmental accounts are particularly suitable for this kind of analyses, because emissions abroad caused by residents are taken into account. Figure 2 shows the results for the different Dutch transport modes for passenger travel. Cars produce most $CO_2$-emissions per passenger kilometre while trains are most $CO_2$ efficient. A similar analysis has been made for the transportation of goods. Here, it shows that transport by train is most $CO_2$-efficient, followed by transport over water. Transport over land by trucks produces most $CO_2$ per ton kilometre.

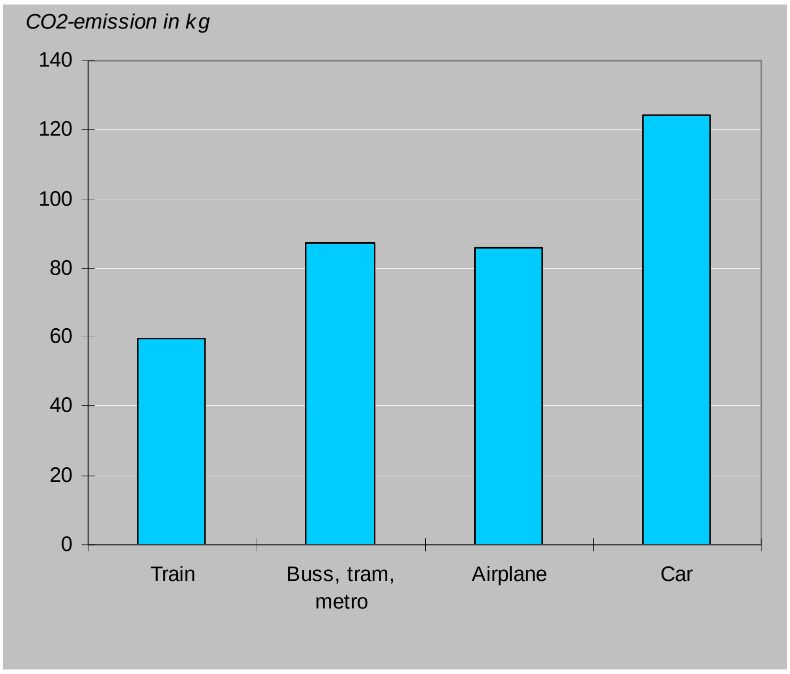


*Figure 2. $CO_2$-emissions per passenger kilometre, 2003*

## 4.4 The environmental balance of trade

The environmental accounts provide an excellent opportunity to test the Pollution Haven Hypothesis (PHH) which was discussed in section 2. By calculating the 'environmental balance of trade' for a country, insight is gained about the extent to which countries have shifted the environmental burden abroad (see amongst others Wyckoff and Roop, 1994; Antweiler, 1998; de Haan, 2001 and 2004; Machado et al., 2001; and Suh et al., 2002; Ahmad and Wyckoff, 2003; Peters and Hertwich, 2006; Peters, 2008). In this method, the embodied emissions (the direct and indirect emissions from the production process) of imports and exports are calculated using an input-output model. The model attributes emissions to exports and imports irrespective of the location where the emissions take place. The environmental balance of trade is equal to the embodied emissions in exports minus those in imports. If the PHH holds, one would expect the environmental balance to decrease in developed countries and to increase in developing countries.

Figure 3 suggests that the PHH does not hold for $CO_2$-emissions in the Netherlands. In the period 1990-2005, the environmental balance of trade is increasing slightly. The first results indicate that, on aggregate, the Netherlands is not shifting its environmental burden abroad in the case of $CO_2$-emissions. In fact, the opposite is true – our surplus for $CO_2$-emissions is increasing.

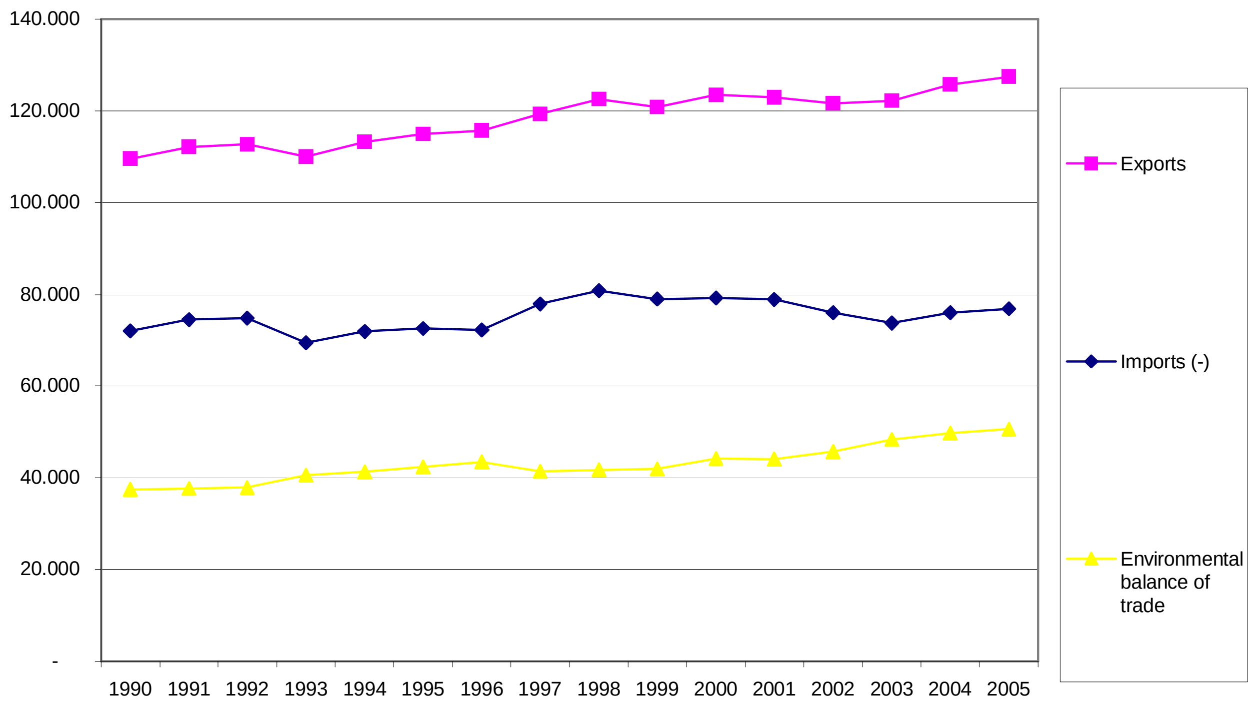


*Figure 3. The embodied $CO_2$-emissions of imports and exports and the environmental balance of trade (million Kg)*

These results for the Netherlands are not atypical. Empirical studies into the PHH show a mixed bag of results. Articles which support the PHH, such as Machado et al. (2001) and Wyckoff and Roop (1994), are contrary to others such as Jacobsen (2000) and Munksgaard and Pedersen (2001) which show results which counter the hypothesis. The results reflect the fact that the mechanisms at work are far more subtle than the simple statement “developed countries become clean at the expense of developing countries”.

The environmental balance of trade may become a very important indicator for the analysis of the interrelationships between globalisation and environmental issues. It also addresses distributional issues in relation to environmental pollution among countries. Further enhancements of the methodology, however, are possible and necessary. Note, for example, that we could only conclusively falsify the PHH, if the origin and destination of imports and exports were also included in the calculation (see also de Haan, 2004). Furthermore, the standard assumptions of the input-output model apply and in addition it is assumed that the imported goods are produced using the same production (and emissions) structure as the Dutch economy. This latter assumption may have a significant impact on the embodied emissions of imports in particular.

### 4.5 Structural decomposition analysis

A widely used analysis is the so-called structural decomposition analysis (SDA); see Rose and Casler (1996), Rose (1999), Hoekstra and van den Bergh (2002), de Haan (2004) and Hoekstra (2005) for overviews of the literature, and de Haan (2001, 2004), Wilting *et al.* (2006) and Statistics Netherlands (2007a) for applications in the case of the Netherlands. The method uses the input-output model to decompose changes in the target variable (in this case, $CO_2$-emissions). In figure 4, the development of the $CO_2$-emissions have been decomposed into an efficiency effect (the effect of the improvement of the emissions per unit output), a structural effect (the effect of shifts in the structure of the economy) and the final demand effect (the effect of economic growth). As the figure shows, the effects of economic growth are the largest driving forces of emissions which are only partially negated by an increase in the efficiency. The figure basically shows that emissions would have been about 35% higher, if there had been no changes in efficiency and structure. Note that far more detailed SDA-specifications can be produced in which final demand and technological effects are decomposed into sub-components.

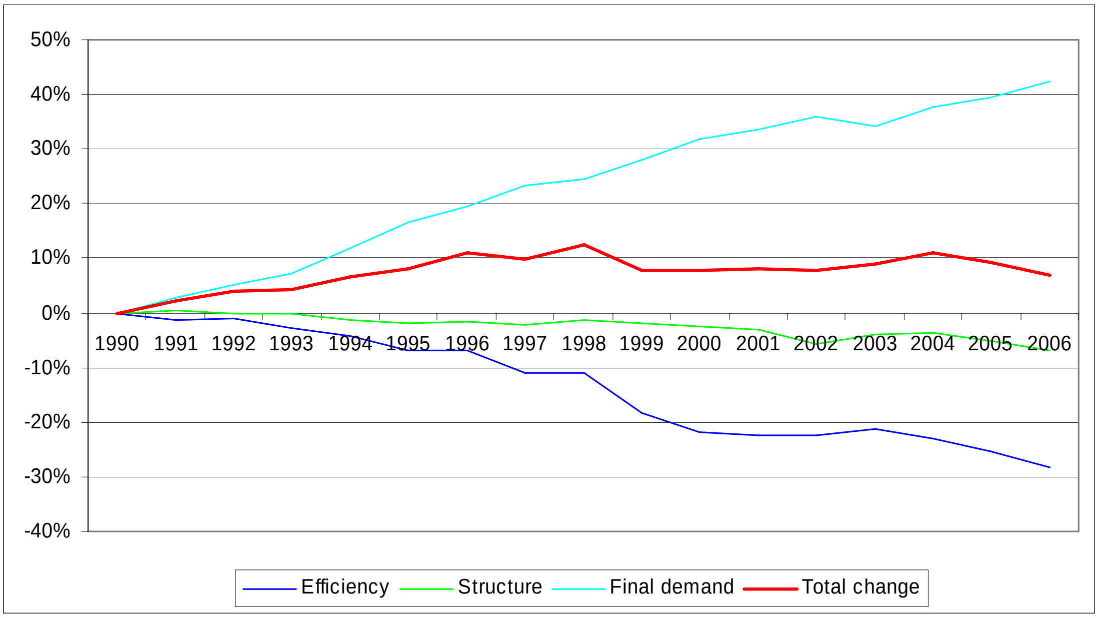


*Figure 4. Structural decomposition analysis for greenhouse gasses ($CO_2$, $CH_4$, $N_2O$).*

### 4.6 Attribution of $CO_2$-emissions to final demand categories

Using input-output kind of analyses, the $CO_2$-emissions caused by the production of goods and services can be attributed to the different final demand categories, such as exports, final consumption of households, final consumption of government and investments. The calculations are fairly similar to the calculations for the environmental balance of trade. More than half of the total $CO_2$-emissions caused by the Dutch economy is related to exports. One third of the emissions can be attributed to final consumption of households, and respectively 8 and 6 percent to final consumption of government and investments. $CO_2$-emissions caused by Dutch agriculture and transport are mainly related to export activities. Financial services emit $CO_2$ mainly for the benefit of household consumption.

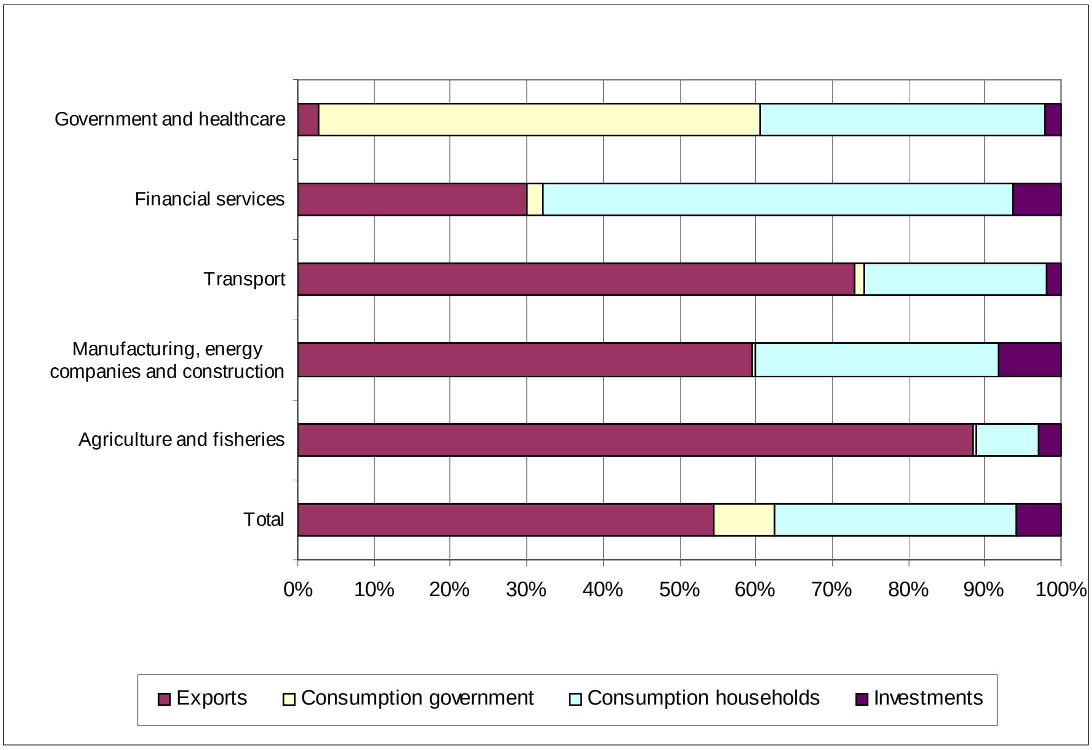


*Figure 5. $CO_2$ emissions attributed to final demand categories, 2005*

## 4.7 Other modelling applications

Most of the above applications are variations of the input-output model which are used to analyse historical developments. However, the environmental accounts can also be used to feed more complex macro-economic models, such as Computable General Equilibrium (CGE) models or dynamic input-output models. Figures 6 and 7 show scenario analyses which were produced by the Netherlands Environmental Assessment Agency using data from the environmental accounts[1]. In figure 6, the emissions of greenhouse gasses (GHG) by residents are projected to 2040. Four different scenarios have been distinguished: Global Economy (in which international co-operation on trade liberalisation increases, but less so on political and environmental issues), Strong Europe (in which further European integration is achieved), Transatlantic markets (in which European integration falters, but economic co-operation between Europe and the United States is enhanced) and Regional Communities (in which countries value their own sovereignty which causes economic and political integration to falter). Figure 7 shows the development of $CO_2$ emissions for one of the scenarios.

[1] We were kindly granted permission to reproduce these results from the publication ‘Welvaart and leefomgeving’ (CPB/MNP/RPB, 2006).

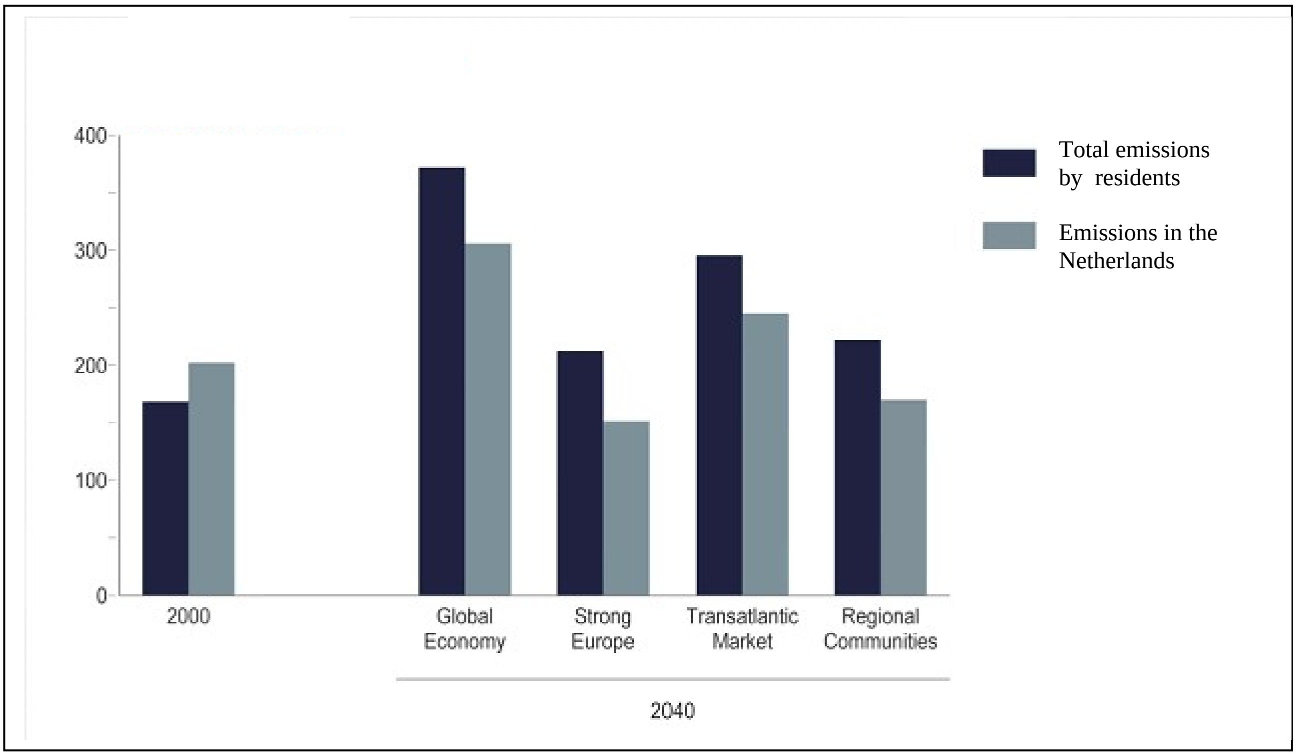


*Figure 6. GHG-emissions of residents and emissions in the Netherlands for four scenarios*

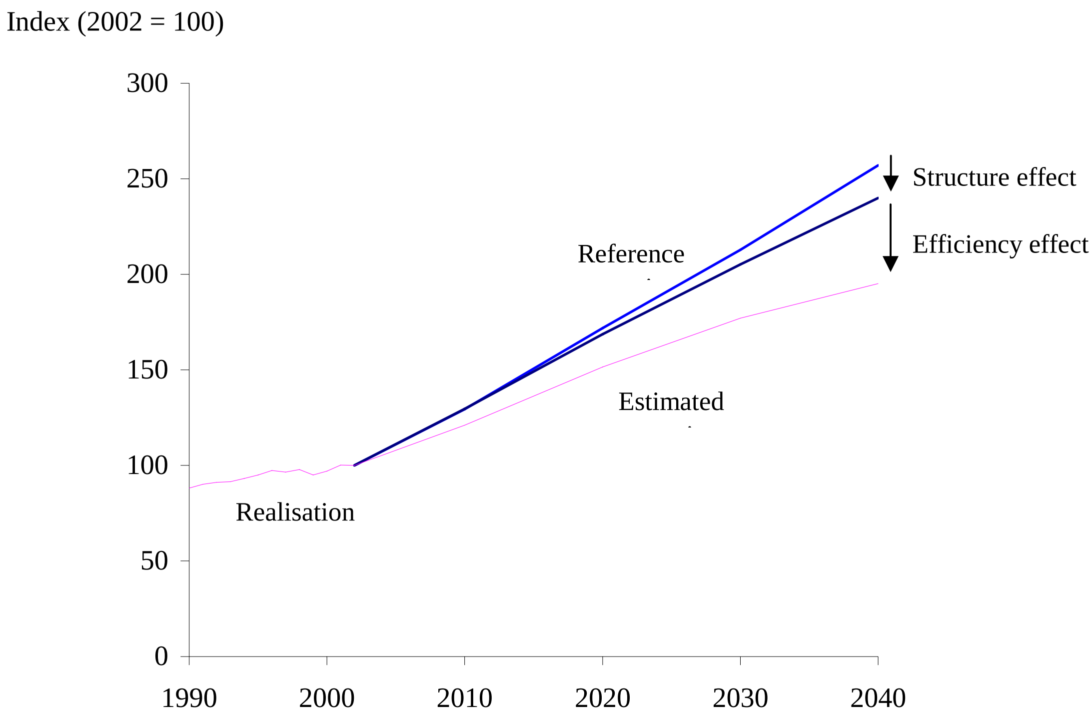


*Figure 7. $CO_2$-emissions for the Global Economy scenario*

Furthermore, in the Netherlands, the environmental accounts are also used for the calculation of the Sustainable National Income (SNI) (Gerlagh et al, 2002) at the Institute for Environmental Studies.

A further benefit of the environmental accounts is that they can also be coupled to other satellite accounts such as Tourism Satellite Accounts (TSA). By combining these two accounts one can calculate the environmental (direct and indirect) impacts of different types of tourists (daytrips, overnights stays, foreign visitors etc). Similarly, the environmental accounts could be integrated into growth accounts (which have just been published by the CBS for the first time). Natural resources already have been added to the growth accounting model, and perhaps emissions could at some stage be analysed as well.

A final point is that the possibilities for analysis have been enhanced by the fact that Eurostat now publish several environmental accounts, including air emissions, for many countries of the EU. By coupling these to the supply and use framework, the analyses mentioned in this section can be repeated for all countries. The data can also be used to further refine the analysis of the environmental balance of trade.

## 5. S.O.S – A Standard for Official Statistics

In section 4, we have shown that environmental accounts can provide very valuable and powerful tools to analyse the relationship between the economy and the environment. Note that none of the applications have valued the losses from environmental degradation. Our examples show that these valuations techniques are not necessary to provide policy makers, politicians and the general public with the information needed to make explicit choices between economic growth and environmental issues.

However, despite the abundance of information, economic growth is often put on a par with the development of societal progress at large. As a result, economic growth is nearly always given priority above other political objectives. In cases that growth of income can be combined with environmental issues, e.g. technological development to arrive at a decoupling of economy and environmental degradation, everyone is pleased. However, when a choice has to be made between less economic growth or less environmental pollution, income is the preferred option in most cases.

Environmentalists sometimes blame statistics for the above political choices, because issues such as environmental degradation are not properly reflected in GDP and economic growth. We think that this is a bit harsh and unjustified view on statisticians. It is for example important to realise that the System of National Accounts (SNA) 1993 explicitly states that GDP is a measure of economic activity and rejects the use of GDP as a measure of social welfare. In our opinion, however, macro-economic statisticians cannot completely ignore these allegations. Where economic statistics based on observable monetary transactions have developed to a very high standard, where international guidelines for the compilation of national accounts have been laid out in great detail, where the present-day system of national accounts is well respected by all people involved in macro-economics, the more ambitious goals of the origins of (welfare) economics seem to have been lost down the road. Where great emphasis is put on the compilation and publication of economic indicators, non-monetary issues affecting people's welfare are not given the same priority and attention.

The above reasoning does make statistics responsible, at least partially. It underscores the necessity to increase the statistical portfolio with accounts which address sustainability and welfare issues. By doing so, we will be able to provide a more balanced overview of societal developments and illustrate the deficiencies of economic growth as an overall indicator for societal progress. We should try to provide information about other important indicators for the development of a broader concept of welfare, in addition to and on an equal footing with GDP.

In the Netherlands, for example, plans are now in its final stages to develop and publish a 'Sustainability Monitor'. This monitor, initiated by government, will be a co-operative project between Statistics Netherlands (project leader), the Netherlands Bureau for Economic Policy Analysis, the Netherlands Environmental Assessment Agency, the Social and Cultural Planning Office of the Netherlands, and the Netherlands Bureaus for Spatial Research. The goal of the monitor is to provide a much broader picture of societal developments, with sustainability as the common denominator.

On the international level, a very promising development in relation to environmental issues is the creation of the United Nations Committee of Experts on Environmental Accounting (UNCEEA). It has been established with the approval of its terms of reference by the Bureau of the United Nations Statistical Commission in November 2005 (United Nations, 2005). In our opinion, two of the goals of the UN Committee should be given absolute priority. Both goals are more or less copied from the experiences, from the international "success story" of national accounts.

The first (short term) goal should be the definition of an internationally accepted core set of accounts and embedded indicators on the most urgent environmental issues. These tables should preferably be defined in such a way that the relevant data can directly be related to the core set of economic data, by using the same classifications and the same conceptual starting points. Doing so, the analytical usefulness, and as a consequence also the "attractiveness" of the relevant data will be enhanced significantly. Subsequently, it is important that the key tables are completed by as many countries as possible. For sure, one of the main advantages of national accounts is the international comparability of its main indicators, including the underlying frameworks. To achieve this goal in a reasonably short period, it is imperative to be as concrete and as focussed as possible.

The second important goal is the elevation of SEEA, the international guidelines for environmental-economic accounting, to an international statistical standard. Of course, it would be unrealistic to assume that this new standard will directly gain the same (long standing) status and reputation as the international guidelines for the national accounts, the SNA 1993 and its European equivalent, the European System of National and Regional Accounts (ESA) 1995. On the other hand, it is imperative to finalise the project of elevating the SEEA to an international standard as soon as possible. This will further enhance the implementation of standardised tables. It will also provide a clear benchmark for environmental accounting.

Therefore, our strong plea: S.O.S., a <u>S</u>tandard for <u>O</u>fficial <u>S</u>tatistics!

**References**


1. Ahmad, N. and A. Wyckoff, 2003. Carbon dioxide emissions embodied in international trade in goods. *OECD science, technology and industry working papes.* 2003/15, OECD publishing.

2. Antweiler, W., 1998. The Pollution Terms of Trade. *Economic Systems Research*. Vol. 8, No. 4 .

3. Antweiler, W., B.R. Copeland, M.S. Taylor, 2001. Is Free Trade Good for the Environment? *American Economic Review*, 91, pp. 877-908.

4. Beckerman, W., 1999. A pro-growth perspective, in J.C.J.M. van den Bergh (ed.), *Handbook of Environmental and Resource Economics*, Edward Elgar, Cheltenham, pp. 867–94.

5. Boo, A.J. de, Bosch, P.R., Gorter, C.N., and Keuning, S.J., 1993. An Environmental module and the complete system of national accounts, in: A. Franz and C. Stahmer (eds.), *Approaches to environmental accounting*, Physica-Verlag, Heidelberg.

6. Bruijn, S.M. de and J.B. Opschoor, 1997. Developments in the throughput-income relationship: theoretical and empirical observations', *Ecological Economics*, 20, 255–68.

7. Bruijn, S.M. de and R.J. Heintz, 1999. The environmental Kuznets curve hypothesis, in J.C.J.M. van den Bergh (ed.), *Handbook of Environmental and Resource Economics*, Edward Elgar, Cheltenham, pp. 656–77.

8. CPB/MNP/RPB, 2006. *Welvaart en Leefomgeving: een scenariostudie voor Nederland in 2040.*

9. Daly, H.E., 1999, Steady-state Economics: avoiding uneconomic growth, in J.C.J.M. van den Bergh (ed.), *Handbook of Environmental and Resource Economics*, Edward Elgar, Cheltenham, pp. 635–42.

10. Dinda, S., 2004. Environmental Kuznets Curve Hypothesis: A Survey, *Ecological Economics*, 49, pp. 431-455.

11. Eurostat (2003), *Environmental Accounts 2003 – Present state and future development*, Doc. ENV/072/8, Joint Meeting of the Working Groups "Environmental Statistics" and "Environmental Accounts" Joint Eurostat/EFTA group, 10-12 September 2003, Eurostat (Luxemburg).

12. Gerlagh R., Dellink, R.B., Hofkes, M.W. and Verbruggen, H., 2002. 'A Measure of Sustainable National Income for the Netherlands'. *Ecological Economics*, 41, pp. 157-174

13. Grossman, G.M. and A.B. Krueger, 1995. Economic growth and the environment, *Quarterly Journal of Economics*, 110, 353–77.

14. Haan, M. de, 2001. 'A structural decomposition analysis of pollution in the Netherlands', *Economic System Research*, 13 (2), 181–96.

15. Haan, M. de, 2004. *Accounting for goods and for bads. Measuring environmental pressure in a national accounts framework*, PhD thesis, Statistics Netherlands (CBS), Voorburg, The Netherlands.

16. Hoekstra, R. and J.C.J.M van den Bergh, 2002. Structural decomposition analysis of physical flows in the economy. *Environmental and resource economics*, 23, 357-78.

17. Hoekstra, R., 2005. *Economic Growth, Material Flows and the Environment: New Applications of Structural Decomposition Analysis and Physical Input-Output Tables*. Edward Elgar Scientific Publishers.

18. Jacobsen, H.K., 2000. Energy demand, structural change and trade: a decomposition analysis of the Danish manufacturing industry, *Economic Systems Research*, 12 (3), 319–43.

19. Keuning, S.J., 1993. An information system for environmental indicators in relation to the national accounts in: W.F.M. de Vries, G.P. den Bakker, M.B.G. Gircour, S.J. Keuning and A. Lenson (eds.), *The value added of national accounting*, Statistics Netherlands, Voorburg/Heerlen.

20. Machado, G., R. Schaeffer and E. Worrell, 2001. Energy and carbon embodied in the international trade of Brazil: an input–output analysis. *Ecological Economics*, 39 (3), 409–24.

21. Malthus, T. 1798. *An Essay on the Principle of Population*, 1st edition.

22. Meadows, D.H., D.L. Meadows, J. Randers and W.W. Behrens II, 1972. *The Limits to Growth*, Universe Books, New York.

23. Munksgaard J.1 and K.A.Pedersen, 2001. $CO_2$ accounts for open economies: producer or consumer responsibility? *Energy Policy*, Volume 29, Number 4, March 2001 , pp. 327-334(8)

24. Peters, G.P. and E.G. Hertwich, 2006. Structural analysis of international trade: environmental impacts of Norway. *Economic Systems Research*, Vol. 18, No. 2, 155-181, June 2006.

25. Peters, G.P., 2008. From production-based to consumption-based national emission inventories. *Ecological Economics*, Vol. 65, 13-23.

26. Rose, A., 1999. Input–output decomposition analysis of energy and the environment, in J.C.J.M. van den Bergh (ed.), *Handbook of Environmental and Resource Economics,* Edward Elgar, Cheltenham. pp. 1164–79.

27. Rose, A. and S.D. Casler, 1996. Input–output structural decomposition analysis: a critical appraisal, *Economic Systems Research*, 8 (1), 33–62.

28. Statistics Netherlands, 2007a. Milieurekeningen 2006. Heerlen/Voorburg

29. Statistics Netherlands, 2007b. National accounts 2006. Heerlen/Voorburg

30. Suh, S., G. Huppes and H. Udo de Haes, 2002. *Environmental impacts of domestic and imported commodities in the U.S. economy*, 14th International Conference on Input–Output Techniques, Montreal, Canada.

31. UN (United Nations), 2003. *System of integrated environmental and economic accounting 2003*, Commission of the European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations & World Bank (2003). Final draft circulated for information prior to official editing, United Nations, New York.

32. WCED (World Commission on Environment and Development), 1987. *Our Common Future*, Oxford University Press, Oxford/New York.

33. Wilting, H., R. Hoekstra and S. Schenau, 2006. *Emissions and Trade; a Structural Decomposition Analysis for the Netherlands* Intermediate Input-Output Conference, 2006, Sendai, Japan

34. Wyckoff, A.W. and J.M. Roop, 1994. The embodiment of carbon in imports of manufactured products: implications for international greenhouse gas emissions, *Energy Policy*, (March), 187–94.

## Annex. Some examples of tables in relation to environmental accounting, as presented in the national accounts publication (Statistics Netherlands, 2007b)

**Economic key figures**

| | Unit | 1990 | 1995 | 2000 | 2003 | 2004 | 2005* | 2006* |
|---|---|---|---|---|---|---|---|---|
| **Total economy** | | | | | | | | |
| Domestic product (GDP) | mln euro | 243 652 | 305 261 | 417 960 | 476 945 | 491 184 | 508 964 | 534 324 |
| Domestic product (GDP) | % volume changes | 4,2 | 3,1 | 3,9 | 0,3 | 2,2 | 1,5 | 3,0 |
| Burden of taxation and social security contributions | % GDP | 41,7 | 40,0 | 39,7 | 37,2 | 37,3 | 37,6 | 39,1 |
| National saving (net) | mln euro | 26 729 | 37 791 | 57 368 | 49 831 | 61 913 | 57 285 | 67 896 |
| National net lending/ net borrowing | mln euro | 5 535 | 17 742 | 25 380 | 28 181 | 40 847 | 34 148 | 39 208 |
| Change in financial net worth | mln euro | 6 464 | 17 415 | 22 918 | 29 875 | 40 443 | 33 030 | 36 269 |
| **Environmental indicators** | | | | | | | | |
| Greenhouse effect (CO2-equivalents) | mln kg | 229 448 | 245 311 | 242 117 | 244 903 | 248 393 | 243 862 | 238 801 |
| Ozonelayer depletion (CFK11-equivalents) | 1 000 kg | 4 852 | 678 | 215 | 184 | 178 | 173 | 169 |
| Acidification (AEQ) | mln kg | 38 | 31 | 27 | 26 | 26 | 26 | 24 |
| Eutrophication (EEQ) | mln kg | 167 | 139 | 115 | 115 | 101 | 99 | . |
| Waste (kg) | mln kg | 14 982 | 9 209 | 4 907 | 2 750 | 1 836 | . | . |

**Integrated physical Environmental accounts, 2004**

| | Green-house effect | CFKs and halons | Acidifi-cation | Fine dust ($PM_{10}$) | Eutrophi-cation total | Eutrophi-cation to water | Heavy metal to water | Waste water | Danger-ous waste | Non-dan-gerous waste |
|---|---|---|---|---|---|---|---|---|---|---|
| | *mln kg $CO_2$ eq.* | *1 000 kg* | *mln kg acid eq.* | *mln kg* | *mln kg manure eq.* | | *heavy metal eq. (x 1000)* | *1 000 i.e.* | *mln kg* | |
| **ORIGIN OF SUBSTANCES** | | | | | | | | | | |
| BY PRODUCERS | 200 622 | 93,5 | 23,4 | 41,7 | 115 | 17 | 69,6 | 9 673 | 1 375 | 41 932 |
| Agriculture, forestry and fishing | 28 134 | – | 8,4 | 10,6 | 66 | 9 | 13,0 | 159 | 5 | 2 259 |
| Mining and quarrying | 3 322 | – | 0,1 | 0,1 | 0 | 0 | 0,2 | 9 | 14 | 274 |
| Manufacturing | 55 576 | 81,0 | 2,9 | 11,8 | 13 | 3 | 14,4 | 2 865 | 515 | 8 037 |
| Manufacture of food products, beverages and tobacco | 4 877 | 0,0 | 0,1 | 2,6 | 5 | 2 | 1,5 | 1 691 | 2 | 2 415 |
| Manufacture of textile and leather products | 301 | – | 0,0 | 0,1 | 0 | 0 | 0,8 | 103 | 8 | 56 |
| Manufacture of paper and paper products | 1 342 | – | 0,0 | 0,4 | 1 | 0 | 0,4 | 125 | 6 | 456 |
| Publishing and printing | 354 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | 26 | 6 | 193 |
| Manufacture of petroleum products | 12 977 | – | 1,3 | 2,4 | 1 | 0 | 0,8 | 70 | 69 | 114 |
| Manufacture of basic chemicals and man-made fibres | 22 281 | 0,1 | 0,6 | 1,2 | 3 | 0 | 3,9 | 97 | 137 | 544 |
| Manufacture of chemical products | 715 | – | 0,0 | 0,4 | 1 | 0 | 0,5 | 440 | 78 | 285 |
| Manufacture of rubber and plastic products | 271 | – | 0,0 | 0,1 | 0 | 0 | 0,0 | 19 | 3 | 91 |
| Manufacture of basic metals | 7 437 | 0,0 | 0,4 | 2,2 | 0 | 0 | 0,8 | 40 | 129 | 2 272 |
| Manufacture of fabricated metal products | 781 | – | 0,0 | 0,6 | 0 | 0 | 0,8 | 48 | 30 | 120 |
| Manufacture of machinery and equipment n.e.c. | 382 | – | 0,0 | 0,0 | 0 | – | 0,1 | 43 | 9 | 76 |
| Manufacture of electrical and optical equipment | 500 | – | 0,0 | 0,1 | 0 | 0 | 1,5 | 41 | 15 | 62 |
| Manufacture of transport equipment | 278 | 0,0 | 0,0 | 0,0 | 0 | 0 | 2,7 | 35 | 11 | 97 |
| Other manufacturing | 3 082 | 80,9 | 0,3 | 1,7 | 1 | 0 | 0,2 | 87 | 13 | 1 257 |
| Electricity, gas and water supply | 56 804 | – | 1,3 | 0,4 | 1 | 0 | 0,2 | 28 | 11 | 1 406 |
| Construction | 2 073 | 12,5 | 0,4 | 2,1 | 4 | 0 | 0,8 | 60 | 56 | 23 694 |
| Construction of buildings | 550 | – | 0,1 | 0,6 | 4 | 0 | 0,3 | . | . | . |
| Civil engineering | 686 | – | 0,1 | 0,5 | – | 0 | 0,1 | . | . | . |
| Building installation and completion | 838 | 12,5 | 0,2 | 0,9 | – | 0 | 0,4 | . | . | . |
| Trade, hotels, restaurants and repair | 5 165 | – | 0,3 | 0,4 | 0 | 0 | 1,6 | 1 425 | 136 | 1 543 |
| Trade and repair of motor vehicles/cycles | 861 | – | 0,0 | 0,1 | 0 | 0 | 0,2 | 124 | 49 | 85 |
| Wholesale trade (excl. motor vehicles/cycles) | 1 703 | – | 0,1 | 0,2 | 0 | 0 | 0,6 | 218 | 84 | 404 |
| Retail trade and repair (excl. motor vehicles/cycles) | 982 | – | 0,0 | 0,1 | 0 | – | 0,6 | 298 | 3 | 706 |
| Hotels and restaurants | 1 619 | – | 0,0 | 0,0 | – | 0 | 0,2 | 786 | 0 | 348 |
| Transport, storage and communication | 29 399 | – | 8,9 | 13,7 | 9 | 0 | 5,4 | 198 | 157 | 333 |
| Land transport | 8 869 | – | 1,3 | 4,3 | 2 | 0 | 3,1 | 64 | . | . |
| Water transport | 7 435 | – | 6,1 | 7,9 | 5 | – | 1,7 | 6 | . | . |
| Air transport | 12 495 | – | 1,4 | 0,4 | 2 | – | 0,1 | 6 | . | . |
| Supporting transport activities | 355 | – | 0,0 | 1,1 | 0 | 0 | 0,4 | 101 | . | . |
| Post and telecommunications | 245 | – | 0,0 | 0,1 | – | – | 0,2 | 20 | . | . |
| Financial and business activities | 4 740 | – | 0,5 | 1,5 | 1 | 0 | 2,1 | 445 | 62 | 524 |
| Banking | 399 | – | 0,0 | 0,1 | 0 | 0 | 0,2 | 51 | 5 | 58 |
| Insurance and pension funding | 173 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | 11 | 2 | 22 |
| Activities auxiliary to financial intermediation | 96 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | 18 | 2 | 21 |
| Real estate activities | 229 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | 171 | 2 | 27 |
| Renting of movables | 1 834 | – | 0,2 | 0,8 | 0 | 0 | 0,4 | 13 | 3 | 9 |
| Computer and related activities | 293 | – | 0,0 | 0,1 | 0 | 0 | 0,2 | 9 | 4 | 47 |
| Research and development | 232 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | 9 | 2 | 12 |
| Legal and economic activities | 661 | – | 0,0 | 0,1 | 0 | 0 | 0,3 | 162 | 8 | 99 |
| Architectural and engineering activities | 189 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | – | 3 | 38 |
| Advertising | 106 | – | 0,0 | 0,0 | 0 | 0 | 0,1 | – | 2 | 20 |
| Activities of employment agencies | 206 | – | 0,0 | 0,1 | 0 | 0 | 0,3 | – | 8 | 100 |
| Other business activities | 321 | – | 0,0 | 0,1 | 0 | 0 | 0,2 | – | 20 | 72 |
| General government | 3 381 | – | 0,4 | 0,6 | 0 | 0 | 2,6 | 308 | 35 | 330 |
| Public administration and social security | 1 495 | – | 0,1 | 0,2 | 0 | – | 2,1 | 118 | 13 | 166 |
| Defence activities | 815 | – | 0,2 | 0,4 | – | 0 | 0,1 | 8 | 11 | 28 |
| Subsidized education | 1 070 | – | 0,0 | 0,0 | 0 | – | 0,4 | 183 | 11 | 136 |
| Care and other service activities | 12 028 | – | 0,3 | 0,4 | 20 | 6 | 29,3 | 4 176 | 383 | 3 532 |
| Health and social work activities | 2 280 | – | 0,1 | 0,0 | 0 | 0 | 13,4 | 654 | 36 | 338 |
| Sewage and refuse disposal services | 7 898 | – | 0,1 | 0,2 | 20 | 5 | 15,5 | 3 024 | 333 | 3 051 |
| Recreational, cultural and sporting activities | 1 148 | – | 0,0 | 0,1 | 0 | – | 0,2 | 306 | 4 | 50 |
| Private households with employed persons | – | – | – | – | – | – | 0,1 | 2 | 2 | 31 |
| Other service activities n.e.c. | 703 | – | 0,0 | 0,1 | – | 0 | 0,2 | 190 | 8 | 63 |
| BY CONSUMERS | 39 922 | 61,7 | 2,1 | 10,5 | 26 | 16 | 76,7 | 16 282 | 292 | 8 607 |
| OTHER DOMESTIC ORIGIN | 7 559 | 23,0 | 0,0 | 0,0 | 5 | 6 | 6,1 | 4 460 | . | . |
| **Total residents** | 248 393 | 178,2 | 25,6 | 52,2 | 145 | 39 | 152,4 | 30 415 | 1 667 | 50 540 |
| FROM THE REST OF THE WORLD | | | 9,3 | . | 51 | 44 | 352,4 | . | 490 | 130 |
| **Total origin of substances** | 248 393 | 178,2 | 34,9 | 52,2 | 196 | 83 | 504,8 | 30 415 | 2 157 | 50 669 |
| **DESTINATION OF SUBSTANCES** | | | | | | | | | | |
| ABSORPTION BY PRODUCERS | | | | | 33 | 23 | 90,2 | 26 837 | 1 452 | 44 932 |
| TO THE REST OF THE WORLD | | | 20,8 | . | 59 | 42 | 220,9 | . | 322 | 4 285 |
| CONTRIBUTION TO ENVIRONMENTAL THEMES | | | | | | | | | | |
| Greenhouse effect | 248 393 | | | | | | | | | |
| Ozonelayer depletion | | 178,2 | | | | | | | | |
| Acidification | | | 14,1 | | | | | | | |
| Air pollution | | | | 52,2 | | | | | | |
| Eutrophication | | | | | 103 | | | | | |
| Water pollution | | | | | | 18 | 193,7 | 3 578 | | |
| Waste | | | | | | | | | 384 | 1 452 |
| **Total destination of substances** | 248 393 | 178,2 | 34,9 | 52,2 | 196 | 83 | 504,8 | 30 415 | 2 157 | 50 669 |

**Integrated monetary Environmental accounts, 2004**

| | Output (basic prices) | Value added (gross, basic prices) | Environ-mental costs | Green taxes | Environ-mental taxes | Labour input of employed persons |
|---|---|---|---|---|---|---|
| | *mln euro* | | | | | *1 000 full-time equivalent jobs* |
| BY PRODUCERS | 913 856 | 436 874 | . | 5 938 | 890 | 6 480 |
| Agriculture, forestry and fishing | 23 248 | 9 399 | 740 | 207 | 48 | 216 |
| Mining and quarrying | 14 835 | 11 324 | 122 | 28 | 3 | 9 |
| Manufacturing | 223 873 | 62 594 | 1 300 | 740 | 258 | 865 |
| Manufacture of food products, beverages and tobacco | 47 633 | 11 571 | 180 | 116 | 117 | 123 |
| Manufacture of textile and leather products | 3 781 | 1 092 | x | 11 | 14 | 21 |
| Manufacture of paper and paper products | 5 579 | 1 664 | 39 | 17 | 13 | 23 |
| Publishing and printing | 12 674 | 5 647 | 23 | 27 | 7 | 80 |
| Manufacture of petroleum products | 18 763 | 2 641 | 277 | 222 | 5 | 6 |
| Manufacture of basic chemicals and man-made fibres | 29 086 | 7 257 | 358 | 89 | 19 | 30 |
| Manufacture of chemical products | 12 134 | 3 162 | 89 | 28 | 22 | 35 |
| Manufacture of rubber and plastic products | 6 103 | 1 898 | 15 | 17 | 3 | 32 |
| Manufacture of basic metals | 7 042 | 2 306 | 100 | 30 | 11 | 21 |
| Manufacture of fabricated metal products | 14 478 | 4 769 | 41 | 38 | 8 | 93 |
| Manufacture of machinery and equipment n.e.c. | 17 168 | 5 597 | 33 | 35 | 6 | 84 |
| Manufacture of electrical and optical equipment | 18 595 | 3 869 | 39 | 22 | 9 | 82 |
| Manufacture of transport equipment | 13 970 | 3 410 | 22 | 18 | 3 | 50 |
| Other manufacturing | 16 867 | 7 711 | x | 71 | 21 | 185 |
| Electricity, gas and water supply | 24 985 | 6 757 | 200 | 83 | 15 | 29 |
| Construction | 63 675 | 23 501 | . | 199 | 29 | 450 |
| Construction of buildings | 31 303 | 10 031 | . | 60 | 7 | 172 |
| Civil engineering | 12 285 | 4 108 | . | 33 | 5 | 76 |
| Building installation and completion | 20 087 | 9 362 | . | 107 | 17 | 202 |
| Trade, hotels, restaurants and repair | 116 523 | 65 832 | . | 672 | 130 | 1 238 |
| Trade and repair of motor vehicles/cycles | 14 875 | 7 416 | . | 196 | 11 | 133 |
| Wholesale trade (excl. motor vehicles/cycles) | 58 467 | 33 851 | . | 301 | 37 | 428 |
| Retail trade and repair (excl. motor vehicles/cycles) | 26 985 | 16 294 | . | 118 | 29 | 484 |
| Hotels and restaurants | 16 196 | 8 271 | . | 58 | 53 | 193 |
| Transport, storage and communication | 68 685 | 32 303 | 149 | 1 067 | 62 | 410 |
| Land transport | 17 377 | 9 865 | . | 896 | 8 | 180 |
| Water transport | 5 683 | 1 828 | . | 45 | 1 | 20 |
| Air transport | 7 514 | 1 958 | . | 20 | 33 | 28 |
| Supporting transport activities | 13 957 | 6 408 | . | 58 | 13 | 87 |
| Post and telecommunications | 24 154 | 12 244 | . | 48 | 7 | 94 |
| Financial and business activities | 209 440 | 117 839 | . | 2 244 | 87 | 1 282 |
| Banking | 35 721 | 19 025 | . | 75 | 8 | 139 |
| Insurance and pension funding | 17 674 | 8 957 | . | 42 | 4 | 52 |
| Activities auxiliary to financial intermediation | 5 990 | 4 239 | . | 24 | 2 | 54 |
| Real estate activities | 53 307 | 32 608 | . | 33 | 24 | 68 |
| Renting of movables | 7 652 | 4 243 | . | 1 775 | 6 | 23 |
| Computer and related activities | 14 110 | 8 062 | . | 39 | 6 | 114 |
| Research and development | 3 714 | 1 941 | . | 25 | 2 | 30 |
| Legal and economic activities | 28 999 | 15 215 | . | 105 | 12 | 243 |
| Architectural and engineering activities | 9 963 | 4 845 | . | 26 | 5 | 93 |
| Advertising | 6 583 | 2 022 | . | 17 | 2 | 50 |
| Activities of employment agencies | 11 535 | 9 361 | . | 21 | 3 | 243 |
| Other business activities | 14 192 | 7 321 | . | 61 | 13 | 172 |
| General government | 79 809 | 51 436 | . | 347 | 69 | 800 |
| Public administration and social security | 48 759 | 27 824 | . | 257 | 48 | 404 |
| Defence activities | 6 480 | 4 200 | . | 29 | 0 | 65 |
| Subsidized education | 24 570 | 19 412 | . | 61 | 21 | 332 |
| Care and other service activities | 87 558 | 55 889 | . | 352 | 189 | 1 180 |
| Health and social work activities | 52 435 | 38 722 | . | 105 | 85 | 805 |
| Sewage and refuse disposal services | 7 749 | 2 866 | 2 318 | 128 | 59 | 27 |
| Recreational, cultural and sporting activities | 15 642 | 6 245 | . | 76 | 30 | 121 |
| Private households with employed persons | 1 921 | 1 921 | . | 0 | 0 | 75 |
| Other service activities n.e.c. | 9 811 | 6 135 | . | 43 | 15 | 153 |
| BY CONSUMERS | | | 307 | 10 126 | 2 693 | |
| **Total** | 913 856 | 436 874 | . | 16 064 | 3 583 | 6 480 |