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WHAT'S IN A NAMEA?

Recent results of the NAMEA-approach to environmental accounting

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*) This paper has been presented at the international symposium on integrated environmental and economic accounting in theory and practice, Tokyo, March 5-8, 1996. The results shown in this paper are based on a NAMEA time-series that has been compiled jointly by staff of the Environment Statistics and the National Accounts Department.

Nr. NA-080
Kengetal: P-30/1996-3
ISSN: 1385-1845

Abstract

The National Accounting Matrix including Environmental Accounts (NAMEA) shows environmental pressures in physical units that are consistent with the monetary figures in the national accounts. Based on the expected contribution of each polluting substance to five major environmental problems, emissions are converted into theme equivalents per problem. This results in five summary environmental indicators that are directly comparable to the conventional economic aggregates. In addition, this meso-level information system is increasingly used for integrated analyses and forecasts of economic and environmental changes.

This paper introduces the NAMEA-concept, provides some illustrative analyses of the recently completed NAMEA time-series, and demonstrates that social accounts and social indicators can easily be integrated. This results in a fairly broad, multi-purpose statistical information system.

Contents

1. Introduction

At present, integrated environmental and economic accounts are available for the years 1986-1992 in the Netherlands. These accounts are casted into a National Accounting Matrix including Environmental Accounts (NAMEA). In view of the favourable reaction by our users, it is the intention of Statistics Netherlands to continue the annual compilation of these NAMEAs, and as well their presentation as an integral part of the national accounts. For a review of the present status of the NAMEA-approach and of its actual and potential uses, and for a comparison with the System for integrated Environmental and Economic Accounting (SEEA), it is referred to Keuning (1996).

This paper provides a description of the NAMEA-framework as it is applied in practice (section 2), analyzes some results from a recently completed time-series of NAMEAs (section 3), and demonstrates that social accounts and social indicators can easily be integrated into this framework (section 4). The paper winds up with a summary and conclusions.

2. The NAMEA-approach

At the 1991 special IARIW-conference on environmental accounting, an illustrative NAMEA was presented for the first time (de Boo, Bosch, Gorter and Keuning, 1993), according to the conceptual design by Keuning (1993). That design contains 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 a conceptual level, not only emissions of pollutants and extraction of natural resources are represented, but also their effects. A distinction is made between effects of current emissions that are absorbed in the current period (noise, stench, etc.), current effects of emissions in the past (e.g. leakage from a garbage dump), net capital losses due to natural causes (e.g. a severe drought), referable damage -to economic assets and to other, natural assets - due to environmental effects, and finally non-referable degradation to non-economic, natural assets. All these transactions were summarized in additional balancing items, culminating in a new total for the changes in net worth.

Soon, it became clear that insufficient data were available for an immediate operationalization of this conceptual framework. For that reason, it was decided to compile a more modest pilot-NAMEA, making use of the work done at the Dutch Ministry of Housing, Spatial planning and the Environment (1989). This Ministry had developed a so-called national environment policy plan, in which a number of environmental themes were distinguished. For each of these themes a single indicator had been designed, by weighing together the emissions that contributed to each theme; refer to Adriaanse (1993). The conversion of emissions into theme equivalents was based on the expected contribution of each polluting substance to a particular environmental problem. Finally, target values for each theme in the year 2000 were formulated. By the time the first NAMEA was compiled, this environment policy plan had been approved by Dutch Parliament. In 1993, the first NAMEA became available (De Haan, Keuning and Bosch, 1994), and the present NAMEAs largely maintained this format; see e.g. De Haan and Keuning (1996). The 1994 NAMEA-paper also contains an annex on compilation issues, while this year a more extended

methodological publication has appeared (CBS, 1996).

Table 1 presents an aggregate NAMEA for 1992.[1] It consists of a conventional National Accounting Matrix extended with three accounts on the environment: a substances account (account 11), an account for global environmental themes (account 12) and an account for national environmental themes (account 13). These accounts do not express transactions in money terms but include information on the environment as it is observed in reality: that is, in physical units. In order to emphasize that currency units and physical units cannot be added up, the physical units are positioned higher in the rows, and more to the left in the columns of accounts 2, 3, 6 and 9.

The rest of the NAMEA presents the regular national accounts flows in a matrix format (cf. Keuning and de Gijt, 1992). Some transactions that are relevant to an environmental concern are single out (cf. account 1a). As usual in a matrix presentation, receipts are shown in the rows and outlays in the columns. Most of the accounts contain a balancing item in the column (the doubly framed cells in Table 1), defined as the difference between total receipts, in the row, and the (other) outlays, in the column. In this way, row and column totals are equal for each account, which guarantees the consistency of the complete system.

The first account presents intermediate and final uses of goods and services in the row, and domestic and foreign supply in the column. Supply at market prices consists of output at basic prices plus trade and transport margins plus taxes on products. Supply and use of environmental cleansing services are shown separately. In order to provide a complete picture of the industries' expenses on behalf of the environment in the NAMEA, these services are inclusive of the so-called internal environmental cleansing. Internal environmental cleansing services are produced by the same establishment that uses them within its own production process (cf. also De Boo, 1995). As intra-establishment deliveries are not considered output in the standard

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1. Readers who are already familiar with the NAMEA-framework may want to skip the rest of this section, as it resembles earlier explanations (e.g. in De Haan et al., 1994).

TABLE 1
A NATIONAL ACCOUNTING MATRIX INCLUDING ENVIRONMENTAL ACCOUNTS (NAMEA) FOR THE NETHERLANDS, 1991
(ACCOUNT 1-10 IN MILLION GUILDERS)

ACCOUNT (classification)		Goods and services (product-groups)	Consumption of households (Purposes) Environ ment / other purposes	Production (Branches of industries)	Income generation (primary input categories)	Income distribution and use (Sectors)	Capital	Taxes (Taxes categ.) Environmental / other taxes	Rest of the world Current
		1a 1b	2a 2b	3	4	5	6	8a 8b	9
Goods and services (Product groups)		Trade and transport margins	Consumption of households	Intermediate consumption		Consumption government	Gross capital formation		Exports (fob)
Environmental cleansing services	1a	- -	24 -	6305		1410			
Other goods and services	1b		710 321727	501763		76837	114818		293086
Consumption of households (Purposes)						Consumption households			
Environment	2a					734			
Other purposes	2b					321727			
Production (Branches of industry)	3	Production, basic prices							
		7627 994861							
Income generation (Primary input categories)	4			Net Domestic Product, factor costs 429118				Vat not handed over to the government 1880	Wages to the rest of the world 820
Income distribution and use (Sectors)	5				Net National Generated Income, factor costs 430650	Property income and current transfers 573920		Taxes 3982 137518	Income and other transfers from the rest of the world 60190
Capital	6			Consumption of fixed capital 61560		Net saving 72960			
Financial balance	7						Net lending to the rest of the world 17340		
Taxes (Tax categories)		Taxes less subsidies on products		Other taxes less subsidies on production		Taxes on income and wealth	VAT on land and taxes on investment		Taxes from the rest of the world
Environmental taxes	8a	907		855		2220			
Other taxes	8b	112 45787		2887		88730	992		1050
Rest of the world Current	9	Imports (cif) 267386			Wages to the rest of the world 1170	Income and other transfers to the rest of the world 67720		Taxes to the rest of the world 160	
Rest of the world Capital	10						Capital transfers to the rest of the world 2350		Balance of payments of the rest of the world -18710
Substances (CFCs en halons in 1000 kg, gas in pj, oil in tj and other substances in million kg)				Absorption of substances in production					Trans border pollution to the rest of the world
CO2	11a								488
N2O	11b								159
CH4	11c								113
CFCs en halons	11d								24
NOx	11e								581
SO2	11f								
NH3	11g								
P	11h								
N	11i								
Waste	11j			2645					
Gas	11k			2595					
Oil	11l			138					
Global environmental themes							Environmental indicators		
Greenhouse effects (GWP)	12a						188890		
Ozone layer depletion (ODP)	12b						3816		
National environmental themes									
Acidification (AEQ)	13a						156		
Eutrophication (EEQ)	13b						287		
Waste (KG)	13c						23761		
Natural resource depletion (PJ)	13d						-759		
TOTAL		Supply, market prices	Consumption of households	Costs, basic prices	Allocation of generated income	Current outlay	Capital outlays	Tax receipts	Current receipts from the rest of the world
		7739 1308941	734 321727	1002488	431820	1206258	135500	3982 139558	336436

	Rest of the world Capital	Substances (CFCs en halons in 1000 kg, gas in pj, oil in tj and other substances in million kg)												Global environmental themes		National environmental themes				TOTAL
		CO2	N2	CH4	CFCs & halons	NOx	SO2	NH3	P	N	Waste	Gas	Oil	Greenhouse effect	Depletion ozone layer	Acidi-fication	Eutro-phication	Waste	Depletion of Natural resources	
	10	11a	11	11c	11d	11e	11f	11g	11h	11i	11j	11k	11l	12a	12b	13a	13b	13c	13d	
1a																				Commodity use
1b																				7739 1308941
2a		Emission of pollutants from households																		Consumption of households
2b		36372	2	4	656	156	5	-	15	115	6663									734 321727
3		Emission of pollutants from industries																		Production, basic prices
		128040	59	724	4375	397	191	220	155	1257	19742									1002468
4																				Generated income 431820
5																				Current receipts 1206258
6	Capital transfers fro the rest ofthe world 980	Other changes in natural resources										1836	138							Capital receipts 135500
7	Net lending from the rest of the world -17340																			-
8a																				Tax payments
8b																				3982 139558
9		Trans border pollution from the rest o.t. world																		Current payments to the rest of the world
						93	99	27	20	415										336436
10																				Capital payments to the rest of the world -16360
1a														Allocation to global environmental themes 164412		Allocation to national environmental themes (immission of substances)				Destination of substances 164412
1b														61						61
1c														728						728
1d															5031					5031
1e																158				646
1f																136				295
1g																134				247
1h																	166			190
1i																	1206			1787
1j																		23760		26405
1k																			-759	1836
1l																			-	138
2a																				Theme-equivalent global 188890
2b																				3816
3a																				Theme-equivalent national 156
3b																				287
3c																				23760
3d																				-759
	Capital receipts from the rest of the world -16360	Origin of substances 164412	61	728	5031	646	295	247	190	1787	26405	1836	138	Theme-equivalents, Global 188890	3816	Theme-equivalents, national 156	287	23760	-759	

statistics, both production and intermediate consumption are higher in the NAMEA than in the conventional national accounts. Evidently, this affects neither Net Domestic Product (NDP) nor any other balancing item.

The second account is a specific consumption account, which re-allocates consumption expenditures (matrix 1,2) to consumption purposes (vector 2,5). The latter are connected to specific pollution patterns (2,11). Consumer goods that are purchased in order to protect the environment are presented separately (cell 2a,5). This concerns, for example, the extra costs of cars fitted with catalytic converters. Pollution generated by the government is connected to government production and not to government consumption in the NAMEA.

The third account shows in the row the production of goods and services, and in the column intermediate use and value added. 'Other taxes on production' are recorded on a separate tax account (cell 8,3) and consumption of fixed capital is directly put on the capital account (cell 6,3), so that the balancing item in cell (4,3) equals Net Domestic Product (NDP) at factor cost. In row 3, the production of goods and services is expanded with the concomitant emissions of pollutants (row-vector 3,11). Vector (11,3) shows the amounts for several inputs which have not been explicitly paid for. In fact, their depletion may not even be incorporated in the output price, and thus also not be contained in regular NDP. This concerns, for instance, natural resources and the waste that is re-processed in incineration plants. Note that the emissions of waste incineration plants are in fact taken into account, namely in row-vector (3,11). In principle, re-cycling of materials should also be shown here, but at present insufficient data are available.

The fourth row shows the components of NDP (wages and salaries, employers' social contributions and operating surplus) as well as wages and salaries from abroad. Cell (4,3) reflects value added tax invoiced by sellers, but not handed over to the government, for various reasons. In the column of account 4, primary income is allocated to the institutional sectors (corporations, households, government, etc.) and

to the rest of the world. In the fifth account, income is (re-) distributed and used for consumption and saving.

In account 6, gross saving is allocated to gross capital formation and to net lending and capital transfers to the rest of the world. In the present NAMEAs, accounts 6 and 7 are not subdivided by institutional sector, so that inter-institutional capital transfers and financial flows cancel out. Account 7 presents the financial balances (net lending) of the total economy and the rest of the world, respectively. These balances add up to zero by definition. Therefore, the (empty) column of this account has been deleted.

Account 8 of the NAMEA is a separate tax account, in which a variety of taxes are presented: taxes (less subsidies) on products in sub-matrix (8,1), other taxes on production in sub-matrix (8,3), taxes on income and wealth in sub-matrix (8,5), and so forth. In the detailed NAMEA, all kinds of environmental taxes such as energy levies, levies on pollution of surface waters and levies on waste water drain-offs are presented separately. The column of this account shows the collection of these taxes by the government (row-vector 5,8) and the rest of the world (cell 9,8b).

Accounts 9 and 10 represent all transactions with the rest of the world. The row of the current account (9) presents imports, not only of goods and services, but also of less wanted substances. For the time being, data are only available for the entry of pollutants via the rivers or through the air. The column contains exports, including the outflow of pollutants to other countries. Cell (10,9) reflects the current external balance of the rest of the world with the Netherlands. The figures show that the Netherlands managed to create a surplus for goods and services as well as for pollutants. Of course, this 'pollution trade balance' only refers to 'direct' flows of pollutants. However, estimates on pollutants embodied in imported products, or invoked by foreign demand, can easily be made with the help of a NAMEA-based analysis (see the next section of this paper).

Account 11 registers in the column the origin of ten types of pollutants. This pollution is caused by producers (vector 3,11), consumers (vector 2,11) and the rest of the world (vector 9,11). Besides, this column registers additions to proven reserves and other changes in natural resources (vector 6,11). The row of this account shows in vector (11,3) the extraction of natural resources (crude oil, natural gas and wood) as well as the re-absorption of pollutants into the economic process. This concerns, for instance, part of solid waste that is incinerated. The rest of the pollutants is exported to other countries (vector 11,9), or is re-allocated to five environmental themes (sub-matrices 11,12 and 11,13). The use of natural resources is allocated to a sixth theme: loss of natural resources. Account 11 is expressed in kilograms or in petajoules. Of course, the row and column totals of account 11 are equal.

Table 2: Environmental themes and their corresponding substances (in parentheses, the weigths used to convert substance units into theme-equivalents)

Environmental themes	Substances	Theme-equivalents
Greenhouse effect	CO_2 (1), N_2O (270) and CH_4 (11)	global warming potentials
Depletion of the ozone layer	CFCs 11, 12, 13, 112 (1), CFC 113 (0.8), CFCs 114, 115 (0.6), Trichloroethane (0.1) Tetrachloride (1) and Halon 1301 (10)	ozone depletion potentials
Acidification	NO_x (0.22), SO_2 (0.31) and NH_3 (0.59)	acid-equivalents
Eutrophication	P (1) and N (0.1)	eutrophication-equivalents
Accumulation of waste	Waste	million kilograms
Waste water	Waste water	million kilograms
Natural resources	Gas (1) and Oil (1)	petajoules

The so-called 'environmental themes' as presented in account 12 and 13 are adopted from the second Netherlands' National Environmental Policy Plan (Netherlands Ministry of Housing, Spatial Planning and the Environment, 1993). Environmental themes are used as an inventory framework of current environmental problems in the Netherlands. The column totals of account 12 and 13 reflect a weighted aggregation

procedure. The weights reflect for each theme the potential relative stress on the environment of each substance. These aggregation methods have been accepted by Dutch Parliament and are for the major part based on international research on the effects of different substances on environmental quality (cf. also Adriaanse, 1993). The conversion from the substance units, as given in the heading of account 11, into the corresponding theme-related stress equivalents is shown in Table 2; refer to De Haan, Keuning and Bosch (1994) for a more detailed exposition of each theme.

This method yields a limited number of physical environmental indicators, shown in vector (12-13, 6). Account 12 monitors two global environmental problems: the greenhouse effect and the depletion of the ozone layer. The corresponding indicators reflect the Netherlands' contribution to these global problems. If however the environmental damage within the country is at stake (cf. the themes in account 13), summary indicators on the national accumulation of pollutants are directly comparable with the economic indicators from the national accounts. For these themes, domestic pollution is augmented with the import, and reduced by the export of pollutants.

The aggregate NAMEA in Table 1 presents the interrelation between macro-indicators for the economy (NDP, Net Saving, external balance) and the environment (environmental theme indicators). However, underlying this table a much more detailed information system is available. This is illustrated in the next section.

3. A preliminary analysis of the 1986-1992 NAMEAs

Thus far, NAMEAs have been compiled for 1986 through 1992; cf. CBS (1996) for a detailed review of results and compilation methods. This section presents a selection of these results.

Table 3: Contribution of each industry to GDP and to five major environmental problems in the Netherlands, 1992

Industry	Gross Domestic Product (factor cost)	Green-house Effect	Ozone Layer Deple-tion	Acidi-fi-cation	Eutro-phi-cation	Waste
	column %					
Agriculture and fishery	4	15	2	46	82	6
Crude petroleum & natural gas production and exploration	3	2	0	1	0	0
Other mining and quarrying	0	0	0	0	0	0
Food, beverages and tobacco industry	3	4	5	1	3	11
Textiles, clothing, leather and leatherware industry	1	0	0	0	0	0
Wood and furniture industry	1	0	0	0	0	1
Paper, paperware, printing and related industries	2	1	1	0	1	3
Petroleum industry	1	7	0	11	0	0
Chemical industry	2	15	26	7	2	14
Rubber and plastic-processing industry	1	1	12	0	0	0
Manufacture of building materials, earthenware and glass	1	2	0	2	0	3
Basic metal industry	1	3	0	3	0	1
Manufacture of metal products and machinery	3	2	9	0	0	2
Other manufacturing	4	1	4	0	0	1
Electricity generation	1	24	0	10	1	2
Other public utilities	1	1	0	0	0	0
Construction and installation on construction projects	6	2	6	1	0	28
Transport and storage	6	8	5	12	1	2
Environmental cleaning services	0	2	5	4	5	6
Other services	61	9	24	1	3	19
Total	100	100	100	100	100	100

Table 3 gives the 1992 contribution of each industry to GDP and to five major environmental problems in the Netherlands. As expected, the share of services in GDP largely surpasses its share in each of the environmental problems. It strikes that the contribution of manufacturing excluding food processing, chemicals and related industries to Gross Domestic Product exceeds its contribution to all environmental problems except one (ozone layer depletion). The environment intensity of construction is also relatively low, apart from waste generation.

On the contrary, the contribution of agriculture to most of the problems concerned is significantly higher than its share in GDP. The same applies to electricity generation, the chemical industry, and, somewhat surprisingly, to the food, beverages and tobacco industry. In all cases, more than half the pollution is generated by two or at most three of the twenty industries. More than half the greenhouse effect, the acidification and the eutrophication is caused by industries that generate less than 10% of GDP.

Table 4: Annual volume change of economic and environmental indicators in the Netherlands, 1986-1992

	Economic indicators		Environmental indicators				
	GDP at factor cost	Household Consumption	Green-house effect	Ozone layer depletion	Acidi-fi-cation	Eutro-phi-cation	Waste
	% volume change						
TOTAL	2.9	2.8	0.1	-8.7	-3.1	-1.7	1.8
CONSUMPTION OF HOUSEHOLDS		2.8	-0.8	-3.3	-1.0	-2.3	0.6
own transport		0.7	1.4	–	-0.7	-0.6	-7.8
other purposes		3.0	-1.9	-3.3	-2.8	-2.7	0.8
PRODUCTION	2.9		0.2	-8.8	-3.4	-1.7	2.3
Agriculture and fisheries	4.2		2.0	-2.8	-4.0	-1.8	-
Manufacturing industries	1.9		0.0	-9.7	-4.1	-1.3	1.5
Services	3.3		0.1	-7.5	0.9	-0.8	2.9

Table 4 presents an overview of the annual changes in economic and environmental indicators for the period 1986 to 1992. It is quite remarkable that all environmental indicators decrease, or increase considerably less than the GDP and consumption volume. So, at least for the problems covered here, the pollution per unit of production and consumption has fallen. The same applies to virtually every consumption category and major industry distinguished in this table.

Not surprisingly, the results are most impressive for the ozone layer depletion problem. In manufacturing, for instance, the emissions that cause this problem have been reduced by almost 10% per year, on average, despite an annual value-added volume growth of almost 2%. In addition, the reduction of acidifying emissions by agriculture is worth mentioning: -4% per year, despite an annual value-added change of +4%. In general, the relatively less harmful services industry has been somewhat less succesful in reducing the pollution. Finally, the waste

problem appears to have been most difficult to tackle in this period: all categories, except the waste caused by own transport (car wrecks and such), still showed an absolute increase in environmental pressure.

Table 5: Average annual volume change of value added and of emissions contributing to five major environmental problems in the Netherlands, by industry, 1986-1992

Industry	Gross Value Added (factor cost)	Green-house Effect	Ozone Layer Deple-tion	Acidi-fi-cation	Eutro-phi-cation	Waste
	% volume change					
Agriculture and fishery	4.2	2.0	-2.8	-4.0	-1.8	-
Crude petroleum & natural gas production and exploration	1.3	6.0	-	-6.9	-	-
Other mining and quarrying	2.1	-	-	-	-	-
Food, beverages and tobacco industry	2.8	2.6	-2.5	0.0	1.6	18.2
Textiles, clothing, leather and leatherware industry	0.6	-	-	-	-	-
Wood and furniture industry	3.1	-	-	-	-	-
Paper, paperware, printing and related industries	2.8	-	-	-	4.4	4.9
Petroleum industry	2.8	2.6	-	-2.9	-	-
Chemical industry	2.1	1.2	-6.2	-6.1	-6.1	-2.7
Rubber and plastic-processing industry	4.7	-	-8.9	-	-	-
Manufacture of building materials, earthenware and glass	0.1	6.5	-	5.0	-	-1.8
Basic metal industry	0.1	-1.8	-	0.5	-	-
Manufacture of metal products and machinery	2.3	-10.6	-13.3	-	-	7.9
Other manufacturing	2.0	-	-13.4	-	-	-
Electricity generation	2.6	1.7	-	-6.6	-3.1	-2.9
Other public utilities	1.1	-	-	-	-	-
Construction and installation on construction projects	1.8	4.5	0.7	0.0	-	0.3
Transport and storage	4.8	1.9	-3.4	1.6	2.0	-10.5
Environmental cleaning services	2.5	1.4	0.0	4.9	-2.8	-1.1
Other services	3.0	-1.5	-8.8	-2.2	3.5	10.2
Total	2.9	0.2	-8.8	-3.4	-1.7	2.3

Note: In this table, rates of change are not given if the contribution of an industry to the theme concerned is very small (<1% for acidification and eutrophication and <2% for the other themes).

More detailed results are presented in Table 5. In general, it appears that the most polluting industries have been most succesful in abating emissions, perhaps under the influence of (anticipated) government measures. For instance, the chemical industry has realized a substantial annual reduction in the emission of substances that cause the ozone layer depletion, acidification, eutrophication and the waste problem. Yet, the volume growth of value added in this industry amounted to 2.1% in this period. Only the emission of gases that caused the greenhouse effect still increased. A similar picture emerges in electricity

generation. On the other hand, the score was somewhat less positive in, for instance, the paper, paperware, printing and related industries. In any case, the results in this table may be of use in the continuing dialogue between the government and representatives of the industries concerned.

So far, the discussion has been limited to the direct contributions of production activities to environmental indicators. This, though, does not provide a complete picture, as some production processes generate a relatively modest pollution but use more harmful intermediate inputs. These backward linkages can be taken into account when computing the pollution intensities of final products. For instance, the demand for food products generates pollution not only in food processing but also in agriculture.

This 'total' environmental pressure caused by the final demand for all kinds of products can also be analyzed with the help of the NAMEA-framework. The NAMEA is a square matrix, with identical row and column totals, and, more importantly, the NAMEA has been structured so as to make it suitable for Leontiev-type analyses; cf. sections XV.F.2 and XX.G.2 of the 1993 System of National Accounts (United Nations et al., 1993).

First, Table 6 shows the 'total' pollution caused by one unit of final demand for three major product categories, relative to the average 'total' pollution caused by one unit of final demand. Obviously, one guilder of final demand for services generates not even half the pollution of an average guilder of final demand for Dutch products. The opposite applies to a guilder of final demand for agricultural and manufacturing products.

An impression of the 'direct' relative pollution per guilder is obtained by dividing the last five columns in Table 3 by the first one. For instance, the direct contribution of agriculture to the eutrophication problem is more than 20 times its GDP contribution. If all backward linkages are taken into account, this ratio drops to almost

14 (cf. Table 6). In general, the relatively large direct contribution of agriculture to the environmental problems concerned is just mitigated somewhat if indirect effects are incorporated. All in all, a guilder of demand for food contributes most to the greenhouse effect, acidification and eutrophication, while a guilder of demand for manufactured products generates most waste and ozone layer depletion. However, when drawing policy conclusions from these figures, it should also be kept in mind that foreign substitutes for domestic products are not necessarily less harmful to the environment. In this regard, the theory of comparative advantage may also be of use in assessing the policy implications of the negative side-effects of production and international trade.

Table 6: Cumulative pollution per unit of final demand in each industry relative to the aggregate cumulative pollution per unit of final demand (1987).

	Environmental indicators				
	Green-house effect	Ozone layer depletion	Acidi-fi-cation	Eutro-phi-cation	Waste
ratio					
PRODUCTION					
Agriculture and fisheries	3.08	1.29	8.26	13.91	1.51
Manufacturing industries	1.70	1.71	1.59	1.46	1.71
Services	0.45	0.50	0.33	0.22	0.49
TOTAL	1	1	1	1	1

Table 7 compares the 'total' pollution per final demand unit in 1992 with that in 1987. Clearly, all products generate less pollution per guilder in 1992. The total reduction varies from 7% for waste to not less than 48% for the ozone layer depleting gases. A comparison of the results in this table with those in table 6 yields the interesting conclusion that, for all five problems, pollution has been reduced most in the production of the most harmful products (agricultural products in the case of eutrophication, acidification and the greenhouse effect, and manufactured products in the case of the ozone layer depletion and waste generation). Analogously, the smallest decrease in pollution has been achieved in services, with the exception of the ozone depleting emissions. Finally, even the spread of the pollution reduction is positively correlated with the original spread of pollution intensities. For example, the biggest difference in pollution reduction between

agricultural products on the one hand and services on the other hand occurs with respect to the themes acidification and eutrophication.

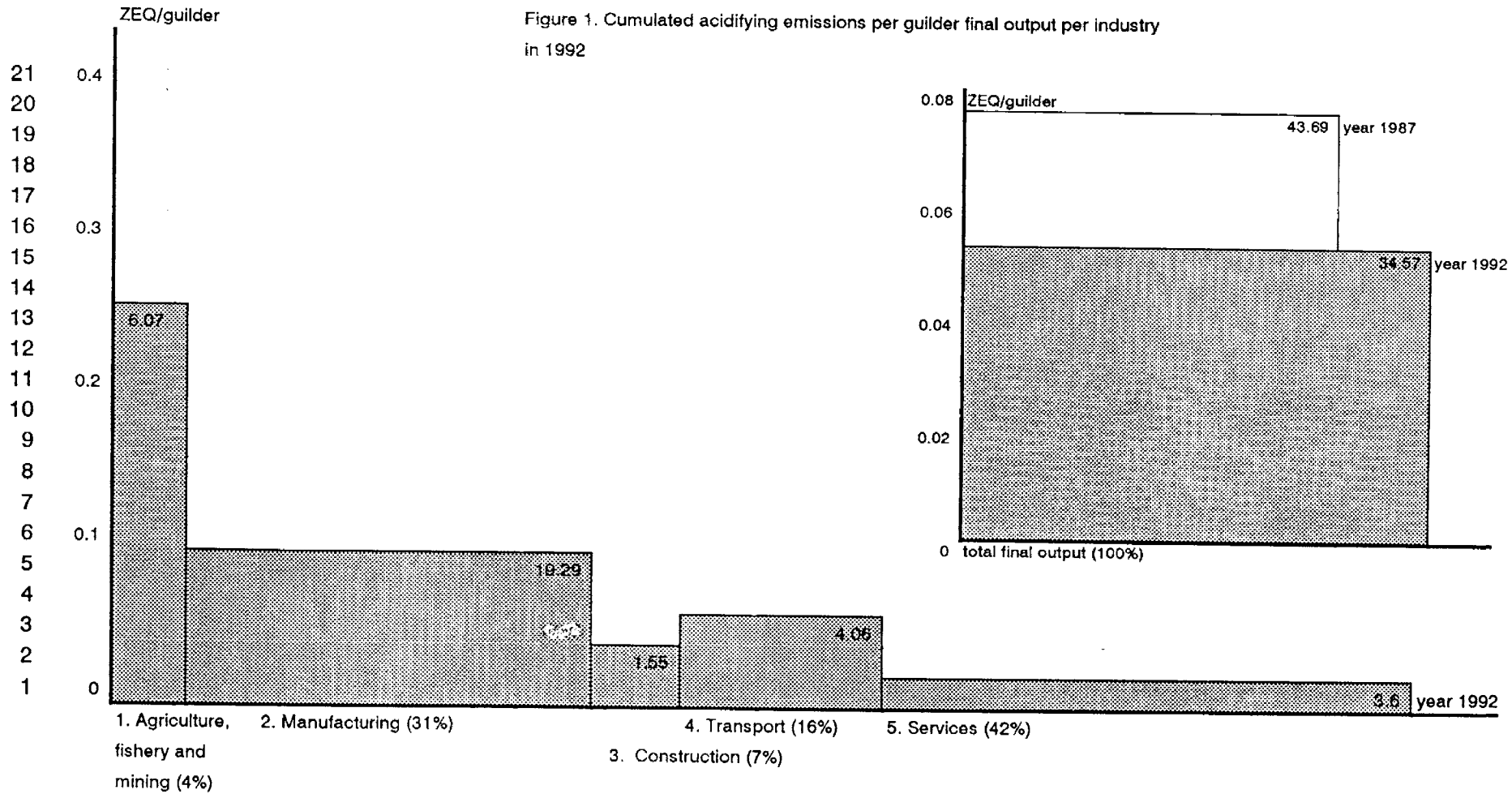
Table 7: Cumulative pollution per final demand unit in 1992 relative to 1987

	Environmental indicators				
	Green-house effect	Ozone layer depletion	Acidi-fi-cation	Eutro-phi-cation	Waste
ratio					
PRODUCTION					
Agriculture and fisheries	0.77	0.57	0.58	0.67	0.97
Manufacturing industries	0.85	0.51	0.66	0.73	0.91
Services	0.87	0.54	0.79	0.82	0.98
TOTAL	0.86	0.52	0.68	0.75	0.93

The above analyses have also been made at a more detailed level. It appeared, for instance, that not only the 'direct' pollution by the chemical industry, but also the 'total' environment intensity of the final demand for chemical products was still substantially above average - with the exception of their contribution to the eutrophication problem. However, the 'distance' to the average was reduced by about half when pollution embodied in intermediate inputs was taken into account as well. A similar result was found for electricity. On the contrary, the position of the food, beverage and tobacco industry worsened considerably when backward linkages were incorporated, in view of their reliance on environment-intensive agricultural inputs. Besides, the very favourable score of services was shaded a bit in an analysis including indirect effects.

The resulting cumulative pollution per guilder final demand in 1992 is depicted in Figure 1 for the case of acidification. This figure should be read as follows. The horizontal ax is subdivided in accordance with the share of each industry in final demand. The vertical ax gives the cumulative pollution per guilder final demand. As a consequence, the surface of each block represents the relative 'total' pollution by each industry. That 'total' amount is also written inside each block. This presentation shows, for instance, that 'total' acidification generated by the final demand for agricultural output is one and a half times as large as that generated by the final transport services demand, although

Figure 1. Cumulated acidifying emissions per guilder final output per industry in 1992

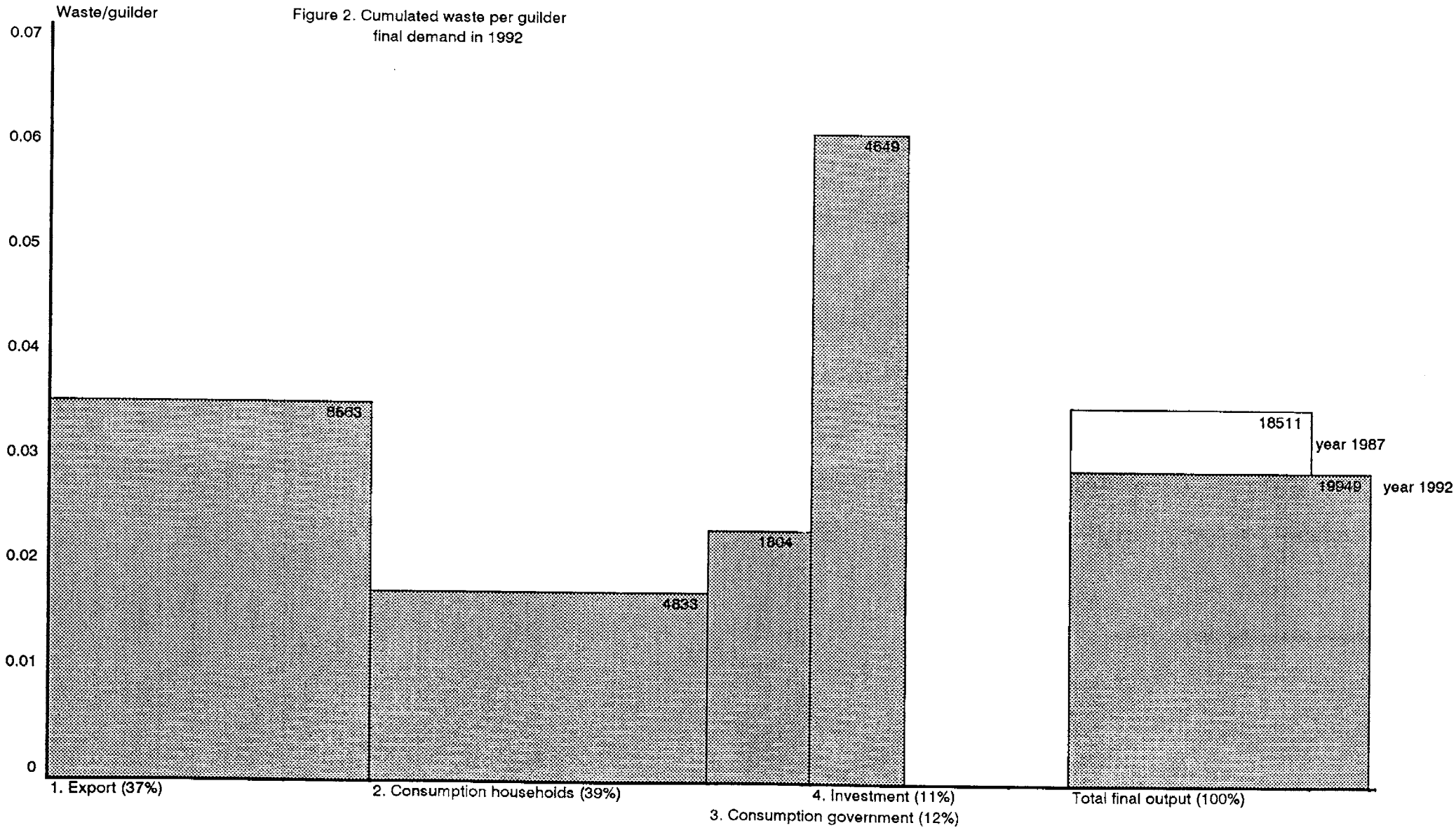


the final demand for transport services is four times as big as the final demand for agricultural products. On the other hand, the final demand for services generates more than twice the acidification of the final demand for construction output, despite the fact that per guilder the former industry is much less polluting.

The same analysis can also be done for each of the final demand categories, as is shown in Figure 2. Evidently, most waste is generated by exports, although per guilder final demand capital formation is the greater culprit. From the right-hand side of this table, it may be clear at a glance that the increase in waste emission between 1987 and 1992 is entirely due to the growth of final demand; for, per guilder final demand the 'total' waste production declined substantially. All in all, the purpose of such figures is to demonstrate that the same problem can be viewed from different perspectives.

Summarizing, the NAMEA can be used for several Leontiev-type analyses. Clearly, the usefulness of such analyses is enhanced if the social dimension is incorporated as well. This is shown in the next section of this paper.

Figure 2. Cumulated waste per guilder final demand in 1992



4. Integrating social accounts and indicators into the NAMEA[2]

The 1993 System of National Accounts (SNA) contains a chapter on Social Accounting Matrices (SAM); see United Nations et al. (1993: Chapter XX). That chapter indicates that a further extension, in the direction of a so-called System of Economic and Social Accounting Matrices and Extensions (SESAME), is both useful and feasible. In this context, it states: "This approach could equally well be followed when dealing with environmental issues" (para. 20.33).

At present, both a 1990 SAM and a 1990 NAMEA are available for the Netherlands; refer to Timmerman and Van de Ven (1994), and De Haan and Keuning (1995), respectively. These two frameworks have been integrated into a so-called Social Accounting Matrix including Environmental Accounts (SAMEA). At the aggregate level, the only difference of a SAMEA with the NAMEA shown in Table 1 concerns a breakdown of the Distribution and Use of Income Account into three subaccounts. This serves to provide a better insight into the income distribution and use by household subsector. Such subsectors are not distinguished in the NAMEA.

The additional information contained in the SAMEA, in comparison with the NAMEA, is only revealed in the detailed tables. For instance, wages and salaries by branch of industry, as shown in the Generation of Income Account, are broken down by sex and by seven educational levels. Concomitantly, full-time equivalent employment by branch of industry has also been subdivided by these labour categories. This enables an analysis of the relationship between the remuneration of each labour category and the pollution that is caused by the economic activities in which they are employed. By way of illustration, Table 8 shows the contribution of each labour category to total employment, the wage bill and five major environmental problems. The latter proportions have been computed by allocating, first, the pollution equivalents per environmental problem to the substances that cause these problems, secondly, the pollution equivalents by substance to the economic activities that emit these substances, and finally, the pollution

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2. Refer to Keuning and Timmerman (1995) for a more extensive presentation of these results.

equivalents by economic activity to the primary input categories that generate the value added in these activities.

Table 8 provides an indication for the type of labour that might benefit or suffer from a shift in economic structure towards less polluting activities. For instance, it appears that women are typically working in industries that burden the environment less. They make up 24% of the wage bill and 31% of employment, but account for only 11-14% of the environmental stress equivalents. To some extent, the same applies to men with lower secondary, vocational or general, education (accounting for 7% of wages and employment, and 5-7% of the pollution) and men with a university degree (accounting for 8% of the wage bill, 5% of total employment and 4-7% of the problems). On the other hand, a relatively large share of the environmental problems is caused by activities that employ relatively many men with middle-level education (higher general secondary, and middle vocational education). Their share in the wage bill equals 40%, in employment 41%, and in the stress equivalents by theme 50-59%). Evidently, these differences are closely related to the representation of each labour category in services, which contribute relatively much to GDP and relatively little to the environmental themes incorporated in the SAMEA.

The bottom of this table shows that the contribution of operating surplus and mixed income to GDP is lower than their contribution to most of the environmental problems. In particular, this applies to eutrophication, which is predominantly caused by an activity with many self-employed, namely agriculture. An exception to this rule is ozone layer depletion, which is associated with two manufacturing industries with a comparatively high share of compensation of employees in value added.

The SAMEA also contains the allocation of these value added categories to institutional subsectors, including ten household groups. This means that the above allocation of pollution units to primary input categories can be taken one step further, so that the contribution of

Table 8: Contribution to GDP, employment and environmental themes per primary input category, based on the 1990 SAMEA for the Netherlands

PRIMARY INPUT CATEGORIES	Gross Domestic Product (factor cost)	Total employ-ment (full-time equivalents)	ENVIRONMENTAL THEMES: Greenhouse effect (GWP)	Ozone layer depletion (ODP)	Acidifi-cation (AEQ)	Eutrophi-cation (EEQ)	Accumulation of waste (mln KG)
	in % of total employed persons						
Male with basic education	7	8	9	10	10	12	12
Male with lower general secondary education	4	4	3	4	4	4	4
Male with higher general secondary education	12	14	16	17	19	24	19
Male with lower vocational education	3	3	2	3	2	2	2
Male with middle vocational education	28	27	36	33	36	35	33
Male with higher vocational education	13	9	13	14	11	7	10
Male with university training	8	5	5	7	4	4	5
Female with basic education	2	3	2	1	1	2	2
Female with lower general secondary education	2	3	1	1	1	1	1
Female with higher general secondary education	3	5	3	2	3	3	2
Female with lower vocational education	1	2	1	1	1	1	1
Female with middle vocational education	9	11	5	4	5	4	5
Female with higher vocational education	5	5	2	2	2	1	2
Female with university training	2	1	1	1	1	-	1
Male with low education	27	28	31	34	36	42	38
Male with high education	49	41	55	55	51	45	48
Female with low education	8	13	6	5	6	7	6
Female with high education	16	18	8	6	7	5	8
Total	100	100	100	100	100	100	100
	in % of total primary input categories						
Total wages and salaries	49	100	38	52	27	19	47
Employers' social contributions	8	-	6	8	4	3	8
Operating surplus/mixed income (gross)	43	-	57	40	68	78	45
Total	100	100	100	100	100	100	100

each subsector is revealed, at least as far as their supply of production factors is concerned.

At the other hand, households also directly generate pollution, namely through their consumption. This is illustrated in Table 9. This table shows, for instance, that the contribution of the old-aged to all environmental problems surpasses their population share. The opposite applies to the households that mainly depend on other transfer income (unemployment benefits and such). In both sub-groups, the pollution caused per guilder of consumption is below average, except for the ozone layer depletion and the waste problem. It may be noted that the SAMEA can as well be used for an analysis of the 'total', cumulative pollution generated by the consumption pattern of each household group; cf. the previous section of this paper. Analogously, the 'total' employment, of each skill level and sex, involved in one unit of pollution might be computed for all environmental problems concerned.

Table 9: Contribution to consumption expenditure, population and environmental themes per household group, based on the 1990 SAMEA

			Total population	Household consumption	ENVIRONMENTAL THEMES				
					Greenhouse effect (GWP)	Ozone layer depletion (ODP)	Acidification (AEQ)	Eutrophication (EEQ)	Accumulation of waste (mln KG)
			in % of total households						
HOUSEHOLDS	Wages and salaries	Single-person	4.6	7.4	7.6	7.3	7.9	7.4	7.3
		Multi-person without children	22.1	28.1	30.3	27.5	32.8	28.5	27.6
		Multi-person with children	36.9	27.9	28.9	27.7	30.0	28.2	27.7
	Mixed income	Agriculture	1.9	1.7	1.6	1.7	1.5	1.6	1.7
		Trade, restaurants, repair	1.9	1.8	1.6	1.8	1.4	1.8	1.8
		Business and pers. serv.	2.3	2.9	2.8	3.0	2.6	2.9	3.0
		Other and property income	2.0	1.9	1.7	1.9	1.5	1.8	1.9
	Transfer income	Age	14.5	16.9	15.9	17.2	14.8	16.7	17.1
		Other	11.9	9.5	8.4	9.8	7.2	9.3	9.8
	Persons in institutions		1.8	1.9	1.1	2.1	0.3	1.8	2.1
	Total		100	100	100	100	100	100	100

5. Summary and conclusions

At present, the conceptual and statistical development of the NAMEA is continued. For instance, the number of environmental themes will be expanded when new information becomes available. This relates to e.g. other themes from the Netherlands' Environmental Policy Plan (the dispersion of toxic substances, stench and noise nuisance and excessive use of ground water). Another expansion of the system refers to a decomposition of supply and use data in the NAMEA into physical units and average prices. A direct connection can then be made between the use of natural resources and the emissions of pollutants (Konijn et al., 1995). In turn, the research on material flows, for instance on energy balances, may lead to more detailed emission estimates in the future.

In order to identify the incidence of environmental pressure, the present NAMEAs already distinguish between global and national environmental themes. For the former themes it may be assumed that each citizen is equally affected, so that the benefits of any reduction in environmental pressure would be distributed in the same way. For the other themes, it is necessary, and perhaps also sufficient, to subdivide the environmental theme equivalents and the labour and household groups by region. The classification of regions should be such that they are fairly homogeneous qua environmental burden. Any subsequent analysis will then show both the immediate costs, in terms of less income or higher unemployment, and the benefits, in terms of less environmental pressure, of all kinds of environmental policies. For an analysis of the likely longer-term economic benefits of more stringent environmental policies, the NAMEA should provide more details on the origin and destination of capital formation. This can be done by merging it with the National Accounting Matrix that is already available for the Netherlands (CBS, 1995; Keuning and de Gijt, 1992).

Finally, research is going on to integrate national accounts, environmental accounts and socio-demographic accounts in a single information system that also yields the core economic, social and environmental indicators for monitoring human development (Keuning,

1995). This SESAME-system allows for an extension of regular macro-analyses, that are now based on purely monetary national accounts. In turn, that would mean that the social and environmental consequences of all intended (monetary and fiscal) policies are automatically taken into account. This can only be achieved if the summary indicators that result from economic analysis are: 1) derived from an underlying analytical framework (SESAME), and 2) not themselves based on a large number of modelling assumptions ('greened economic aggregates'). In fact, a sustainable national income could very well be the result of a very important policy scenario that can be calculated with a SESAME-based model, namely the scenario in which all emissions and depletion have been reduced to acceptable norms.

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Timmerman, J.G. and P. van de Ven, "A SAM for the Netherlands, concepts and results", National accounts occasional paper series No. 68, Voorburg, 1994.

Statistics Netherlands
National Accounts Occasional Papers

NA/01 Flexibility in the system of National Accounts, Van Eck, R., C.N. Gorter and H.K. van Tuinen (1983).
This paper sets out some of the main ideas of what gradually developed into the Dutch view on the fourth revision of the SNA. In particular it focuses on the validity and even desirability of the inclusion of a number of carefully chosen alternative definitions in the "Blue Book", and the organization of a flexible system starting from a core that is easier to understand than the 1968 SNA.

NA/02 The unobserved economy and the National Accounts in the Netherlands, a sensitivity analysis, Broesterhuizen, G.A.A.M. (1983).
This paper studies the influence of fraud on macro-economic statistics, especially GDP. The term "fraud" is used as meaning unreporting or underreporting income (e.g. to the tax authorities). The conclusion of the analysis of growth figures is that a bias in the growth of GDP of more than 0.5% is very unlikely.

NA/03 Secondary activities and the National Accounts: Aspects of the Dutch measurement practice and its effects on the unofficial economy, Van Eck, R. (1985).
In the process of estimating national product and other variables in the National Accounts a number of methods is used to obtain initial estimates for each economic activity. These methods are described and for each method various possibilities for distortion are considered.

NA/04 Comparability of input-output tables in time, Al, P.G. and G.A.A.M. Broesterhuizen (1985).
It is argued that the comparability in time of statistics, and input-output tables in particular, can be filled in in various ways. The way in which it is filled depends on the structure and object of the statistics concerned. In this respect it is important to differentiate between coordinated input-output tables, in which groups of units (industries) are divided into rows and columns, and analytical input-output tables, in which the rows and columns refer to homogeneous activities.

NA/05 The use of chain indices for deflating the National Accounts, Al, P.G., B.M. Balk, S. de Boer and G.P. den Bakker (1985).
This paper is devoted to the problem of deflating National Accounts and input-output tables. This problem is approached from the theoretical as well as from the practical side. Although the theoretical argument favors the use of chained Vartia-I indices, the current practice of compilating National Accounts restricts to using chained Paasche and Laspeyres indices. Various possible objections to the use of chained indices are discussed and rejected.

NA/06 Revision of the system of National Accounts: the case for flexibility, Van Bochove, C.A. and H.K. van Tuinen (1985).
It is argued that the structure of the SNA should be made more flexible. This can be achieved by means of a system of a general purpose core supplemented with special modules. This core is a fully fledged, detailed system of National Accounts with a greater institutional content than the present SNA and a more elaborate description of the economy at the meso-level. The modules are more analytic and reflect special purposes and specific theoretical views.

NA/07 Integration of input-output tables and sector accounts; a possible solution, Van den Bos, C. (1985).
The establishment-enterprise problem is tackled by taking the institutional sectors to which the establishments belong into account during the construction of input-output tables. The extra burden on the construction of input-output tables resulting from this approach is examined for the Dutch situation. An adapted sectoring of institutional units is proposed for the construction of input-output tables.

NA/08 A note on Dutch National Accounting data 1900-1984, Van Bochove, C.A. (1985).
This note provides a brief survey of Dutch national accounting data for 1900-1984, concentrating on national income. It indicates where these data can be found and what the major discontinuities are. The note concludes that estimates of the level of national income may contain inaccuracies; that its growth rate is measured accurately for the period since 1948; and that the real income growth rate series for 1900-1984 may contain a systematic bias.

NA/09 **The structure of the next SNA: review of the basic options**, Van Bochove, C.A. and A.M. Bloem (1985).
There are two basic issues with respect to the structure of the next version of the UN System of National Accounts. The first is its 'size': reviewing this issue, it can be concluded that the next SNA should contain an integrated meso-economic statistical system. It is essential that the next SNA contains an institutional system without the imputations and attributions that pollute the present SNA. This can be achieved by distinguishing, in the central system of the next SNA, a core (the institutional system), a standard module for non-market production and a standard module describing attributed income and consumption of the household sector.

NA/10 **Dual sectoring in National Accounts**, Al, P.G. (1985).
Following a conceptual explanation of dual sectoring, an outline is given of a statistical system with complete dual sectoring in which the linkages are also defined and worked out. It is shown that the SNA 1968 is incomplete and obscure with respect to the links between the two sub-processes.

NA/11 **Backward and forward linkages with an application to the Dutch agro-industrial complex**, Harthoorn, R. (1985).
Some industries induce production in other industries. An elegant method is developed for calculating forward and backward linkages avoiding double counting. For 1981 these methods have been applied to determine the influence of Dutch agriculture in the Dutch economy in terms of value added and labour force.

NA/12 **Production chains**, Harthoorn, R. (1986).
This paper introduces the notion of production chains as a measure of the hierarchy of industries in the production process. Production chains are sequences of transformation of products by successive industries. It is possible to calculate forward transformations as well as backward ones.

NA/13 **The simultaneous compilation of current price and deflated input-output tables**, De Boer, S. and G.A.A.M. Broesterhuizen (1986).
A few years ago the method of compiling input-output tables underwent in the Netherlands an essential revision. The most significant improvement is that during the entire statistical process, from the processing and analysis of the basic data up to and including the phase of balancing the tables, data in current prices and deflated data are obtained simultaneously and in consistency with each other.

NA/14 **A proposal for the synoptic structure of the next SNA**, Al, P.G. and C.A. van Bochove (1986).

NA/15 **Features of the hidden economy in the Netherlands**, Van Eck, R. and B. Kazemier (1986).
This paper presents survey results on the size and structure of the hidden labour market in the Netherlands.

NA/16 **Uncovering hidden income distributions: the Dutch approach**, Van Bochove, C.A. (1987).

NA/17 **Main national accounting series 1900-1986**, Van Bochove, C.A. and T.A. Huitker (1987).
The main national accounting series for the Netherlands, 1900-1986, are provided, along with a brief explanation.

NA/18 **The Dutch economy, 1921-1939 and 1969-1985. A comparison based on revised macro-economic data for the interwar period**, Den Bakker, G.P., T.A. Huitker and C.A. van Bochove (1987).
A set of macro-economic time series for the Netherlands 1921-1939 is presented. The new series differ considerably from the data that had been published before. They are also more comprehensive, more detailed, and conceptually consistent with the modern National Accounts. The macro-economic developments that are shown by the new series are discussed. It turns out that the traditional economic-historical view of the Dutch economy has to be reversed.

NA/19 **Constant wealth national income: accounting for war damage with an application to the Netherlands, 1940-1945**, Van Bochove, C.A. and W. van Sorge (1987).

NA/20 **The micro-meso-macro linkage for business in an SNA-compatible system of economic statistics**, Van Bochove, C.A. (1987).

NA/21 **Micro-macro link for government**, Bloem, A.M. (1987).
This paper describes the way the link between the statistics on government finance and national accounts is provided for in the Dutch government finance statistics.

NA/22 **Some extensions of the static open Leontief model**, Harthoorn, R.(1987).
The results of input-output analysis are invariant for a transformation of the system of units. Such transformation can be used to derive the Leontief price model, for forecasting input-output tables and for the calculation of cumulative factor costs. Finally the series expansion of the Leontief inverse is used to describe how certain economic processes are spread out over time.

NA/23 **Compilation of household sector accounts in the Netherlands National Accounts**, Van der Laan, P. (1987).
This paper provides a concise description of the way in which household sector accounts are compiled within the Netherlands National Accounts. Special attention is paid to differences with the recommendations in the United Nations System of National Accounts (SNA).

NA/24 **On the adjustment of tables with Lagrange multipliers**, Harthoorn, R. and J. van Dalen (1987).
An efficient variant of the Lagrange method is given, which uses no more computer time and central memory then the widely used RAS method. Also some special cases are discussed: the adjustment of row sums and column sums, additional restraints, mutual connections between tables and three dimensional tables.

NA/25 **The methodology of the Dutch system of quarterly accounts**, Janssen, R.J.A. and S.B. Algera (1988).
In this paper a description is given of the Dutch system of quarterly national accounts. The backbone of the method is the compilation of a quarterly input-output table by integrating short-term economic statistics.

NA/26 **Imputations and re-routeings in the National Accounts**, Gorter, Cor N. (1988).
Starting out from a definition of 'actual' transactions an inventory of all imputations and re-routeings in the SNA is made. It is discussed which of those should be retained in the core of a flexible system of National Accounts. Conceptual and practical questions of presentation are brought up. Numerical examples are given.

NA/27 **Registration of trade in services and market valuation of imports and exports in the National Accounts**, Bos, Frits (1988).
The registration of external trade transactions in the main tables of the National Accounts should be based on invoice value; this is not only conceptually very attractive, but also suitable for data collection purposes.

NA/28 **The institutional sector classification**, Van den Bos, C. (1988).
A background paper on the conceptual side of the grouping of financing units. A limited number of criteria are formulated.

NA/29 **The concept of (transactor-)units in the National Accounts and in the basic system of economic statistics**, Bloem, Adriaan M. (1989).
Units in legal-administrative reality are often not suitable as statistical units in describing economic processes. Some transformation of legal-administrative units into economic statistical units is needed. This paper examines this transformation and furnishes definitions of economic statistical units. Proper definitions are especially important because of the forthcoming revision of the SNA.

NA/30 **Regional income concepts**, Bloem, Adriaan M. and Bas De Vet (1989).
In this paper, the conceptual and statistical problems involved in the regionalization of national accounting variables are discussed. Examples are the regionalization of Gross Domestic Product, Gross National Income, Disposable National Income and Total Income of the Population.

NA/31 The use of tendency surveys in extrapolating National Accounts, Oudde-ken, Frank and Gerrit Zijlmans (1989).
This paper discusses the feasibility of the use of tendency survey data in the compilation of very timely Quarterly Accounts. Some preliminary estimates of relations between tendency survey data and regular Quarterly Accounts-indicators are also presented.

NA/32 An economic core system and the socio-economic accounts module for the Netherlands, Gorter, Cor N. and Paul van der Laan (1989).
A discussion of the core and various types of modules in an overall system of economy related statistics. Special attention is paid to the Dutch Socio-economic Accounts. Tables and figures for the Netherlands are added.

NA/33 A systems view on concepts of income in the National Accounts, Bos, Frits (1989).
In this paper, concepts of income are explicitly linked to the purposes of use and to actual circumstances. Main choices in defining income are presented in a general system. The National Accounts is a multi-purpose framework. It should therefore contain several concepts of income, e.g. differing with respect to the production boundary. Furthermore, concepts of national income do not necessarily constitute an aggregation of income at a micro-level.

NA/34 How to treat borrowing and leasing in the next SNA, Keuning, Steven J. (1990).
The use of services related to borrowing money, leasing capital goods, and renting land should not be considered as intermediate inputs into specific production processes. It is argued that the way of recording the use of financial services in the present SNA should remain largely intact.

NA/35 A summary description of sources and methods used in compiling the final estimates of Dutch National Income 1986, Gorter, Cor N. and others (1990).
Translation of the inventory report submitted to the GNP Management Committee of the European Communities.

NA/36 The registration of processing in supply and use tables and input-output tables, Bloem, Adriaan M., Sake De Boer and Pieter Wind (1993).
The registration of processing is discussed primarily with regard to its effects on input-output-type tables and input-output quotes. Links between National Accounts and basic statistics, user demands and international guidelines are examined. Net recording is in general to be preferred. An exception has to be made when processing amounts to a complete production process, e.g. oil refineries in the Netherlands.

NA/37 A proposal for a SAM which fits into the next System of National Accounts, Keuning, Steven J. (1990).
This paper shows that all flow accounts which may become part of the next System of National Accounts can be embedded easily in a Social Accounting Matrix (SAM). In fact, for many purposes a SAM format may be preferred to the traditional T-accounts for the institutional sectors, since it allows for more flexibility in selecting relevant classifications and valuation principles.

NA/38 Net versus gross National Income, Bos, Frits (1990).
In practice, gross figures of Domestic Product, National Product and National Income are most often preferred to net figures. In this paper, this practice is challenged. Conceptual issues and the reliability of capital consumption estimates are discussed.

NA/39 Concealed interest income of households in the Netherlands; 1977, 1979 and 1981, Kazemier, Brugt (1990).
The major problem in estimating the size of hidden income is that total income, reported plus unreported, is unknown. However, this is not the case with total interest income of households in the Netherlands. This makes it possible to estimate at least the order of magnitude of this part of hidden income. In this paper it will be shown that in 1977, 1979 and 1981 almost 50% of total interest received by households was concealed.

NA/40 Who came off worst: Structural change of Dutch value added and employ-- ment during the interwar period, Den Bakker, Gert P. and Jan de Gijt (1990).
In this paper new data for the interwar period are presented. The distribution of value added over industries and a break-down of value added into components is given. Employment by industry is estimated as well. Moreover, structural changes during the interwar years and in the more recent past are juxtaposed.

NA/41 The supply of hidden labour in the Netherlands: a model, Kazemier, Brugt and Rob van Eck (1990).
This paper presents a model of the supply of hidden labour in the Netherlands. Model simulations show that the supply of hidden labour is not very sensitive to cyclical fluctuations. A tax exempt of 1500 guilders for second jobs and a higher probability of detection, however, may substantially decrease the magnitude of the hidden labour market.

NA/42 Benefits from productivity growth and the distribution of income, Keuning, Steven J. (1990).
This paper contains a discussion on the measurement of multifactor productivity and sketches a framework for analyzing the relation between productivity changes and changes in the average factor remuneration rate by industry. Subsequently, the effects on the average wage rate by labour category and the household primary income distribution are studied.

NA/43 Valuation principles in supply and use tables and in the sectoral accounts, Keuning, Steven J. (1991).
In many instances, the valuation of transactions in goods and services in the national accounts poses a problem. The main reason is that the price paid by the purchaser deviates from the price received by the producers. The paper discusses these problems and demonstrates that different valuations should be used in the supply and use tables and in the sectoral accounts.

NA/44 The choice of index number formulae and weights in the National Accounts. A sensitivity analysis based on macro-economic data for the interwar period, Bakker, Gert P. den (1991).
The sensitivity of growth estimates to variations in index number formulae and weighting procedures is discussed. The calculations concern the macro-economic variables for the interwar period in the Netherlands. It appears, that the use of different formulae and weights yields large differences in growth rates. Comparisons of Gross Domestic Product growth rates among countries are presently obscured by the use of different deflation methods. There exists an urgent need for standardization of deflation methods at the international level.

NA/45 Volume measurement of government output in the Netherlands; some alternatives, Kazemier, Brugt (1991).
This paper discusses three alternative methods for the measurement of the production volume of government. All methods yield almost similar results: the average annual increase in the last two decades of government labour productivity is about 0.7 percent per full-time worker equivalent. The implementation of either one of these methods would have led to circa 0.1 percentage points higher estimates of economic growth in the Netherlands.

NA/46 An environmental module and the complete system of national accounts, Boo, Abram J. De, Peter R. Bosch, Cor N. Gorter and Steven J. Keuning (1991).
A linkage between environmental data and the National Accounts is often limited to the production accounts. This paper argues that the consequences of economic actions on ecosystems and vice versa should be considered in terms of the complete System of National Accounts (SNA). One should begin with relating volume flows of environmental matter to the standard economic accounts. For this purpose, a so-called National Accounting Matrix including Environmental Accounts (NAMEA) is proposed. This is illustrated with an example.

NA/47 Deregulation and economic statistics: Europe 1992, Bos, Frits (1992).
The consequences of deregulation for economic statistics are discussed with a view to Europe 1992. In particular, the effects of the introduction of the Intrastat-system for statistics on international trade are investigated. It is argued that if the Statistical Offices of the EC-countries do not respond adequately, Europe 1992 will lead to a deterioration of economic statistics: they will become less reliable, less cost effective and less balanced.

NA/48 The history of national accounting, Bos, Frits (1992).
At present, the national accounts in most countries are compiled on the basis of concepts and classifications recommended in the 1968-United Nations guidelines. In this paper, we trace the historical roots of these guidelines (e.g. the work by King, Petty, Kuznets, Keynes, Leontief, Frisch, Tinbergen and Stone), compare the subsequent guidelines and discuss also alternative accounting systems like extended accounts and SAMs.

NA/49 Quality assessment of macroeconomic figures: The Dutch Quarterly Flash, Reininga, Ted, Gerrit Zijlmans and Ron Janssen (1992).
Since 1989-IV, the Dutch Central Bureau of Statistics has made preliminary estimates of quarterly macroeconomic figures at about 8 weeks after the end of the reference quarter. Since 1991-II, a preliminary or "Flash" estimate of GDP has been published. The decision to do so was based on a study comparing the Flash estimates and the regular Quarterly Accounts figures, which have a 17-week delay. This paper reports on a similar study with figures through 1991-III.

NA/50 Quality improvement of the Dutch Quarterly Flash: A Time Series Analysis of some Service Industries, Reininga, Ted and Gerrit Zijlmans (1992).
The Dutch Quarterly Flash (QF) is, just like the regular Quarterly Accounts (QA), a fully integrated statistic based on a quarterly updated input-output table. Not all short term statistics used to update the QA's IO-table are timely enough to be of use for the QF, so other sources have to be found or forecasts have to be made. In large parts of the service industry the latter is the only possibility. This paper reports on the use of econometric techniques (viz. series decomposition and ARIMA modelling) to improve the quality of the forecasts in five parts of the service industry.

NA/51 A Research and Development Module supplementing the National Accounts, Bos, Frits, Hugo Hollanders and Steven Keuning (1992).
This paper presents a national accounts framework fully tailored to a description of the role of Research and Development (R&D) in the national economy. The framework facilitates to draw macro-economic conclusions from all kinds of data on R&D (also micro-data and qualitative information). Figures presented in this way can serve as a data base for modelling the role of R&D in the national economy.

NA/52 The allocation of time in the Netherlands in the context of the SNA; a module, Kazemier, Brugt and Jeanet Exel (1992).
This paper presents a module on informal production, supplementing the National Accounts. Its purpose is to incorporate informal production into the concepts of the SNA. The relation between formal and informal production is shown in the framework of a Social Accounting Matrix (SAM). To avoid a controversial valuation of informal production, the module constists of two SAMs. One expressed in actual prices with informal labour valued zero, and one which expresses the embedded informal labour input measured in terms of hours worked.

NA/53 National Accounts and the environment: the case for a system's approach, Keuning, Steven J. (1992).
The present set of main economic indicators should be extended with one or a few indicators on the state of the environment. This paper lists various reasons why a so-called Green Domestic Product is not suitable for this purpose. Instead, a system's approach should be followed. A National Accounting Matrix including Environmental Accounts (NAMEA) is presented and the way to derive one or more separate indicators on the environment from this information system is outlined.

NA/54 How to treat multi-regional units and the extra-territorial region in the Regional Accounts?, De Vet, Bas (1992).
This paper discusses the regionalization of production and capital formation by multi-regional kind-of-activity units. It also examines the circumstances in which a unit may be said to have a local kind-of-activity unit in the extra-territorial region and what should be attributed to this "region".

NA/55 A historical Social Accounting Matrix for the Netherlands (1938), Den Bakker, Gert P., Jan de Gijt and Steven J. Keuning (1992).
This paper presents a Social Accounting Matrix (SAM) for the Netherlands in 1938, including related, non-monetary tables on demographic characteristics, employment, etc. The distribution of income and expenditure among household subgroups in the 1938 SAM is compared with concomittant data for 1987.

NA/56 Origin and development of the Dutch National Accounts, Den Bakker, Gert P. (1992).
This paper describes the history of national accounting in the Netherlands. After two early estimates in the beginning of the nineteenth century, modern national accounting started in the 1930s on behalf of the Tinbergen model for the Dutch economy. The development spurred up after World War II to provide data to the government for economic planning purposes. In the 1980s, the development was towards a flexible and institutional approach.

NA/57 Compiling Dutch Gross National Product (GNP); summary report on the final estimates after the revision in 1992, Bos, Frits (1992).
This summary report describes the sources and methods used for compiling the final estimate of Dutch Gross National Product after the revision of the Dutch National Accounts in 1992. Attention is focused on the estimation procedures for 1988. A more extensive report is also available (**NA/57_Ext.**).

NA/57_Ext. Compiling Dutch Gross National Product (GNP); full report on the final estimates after the revision in 1992, Bos, Frits and Cor N. Gorter (1993).
This report describes the compilation of the final estimate of Dutch Gross National Product after the revision of the Dutch National Accounts in 1992. Attention is focused on the estimation procedures for 1988. The description covers i.a. data sources, sampling features of the surveys, grossing up procedures, adjustments for underreporting and the integration process.

NA/58 The 1987 revision of the Netherlands' National Accounts, Van den Bos, C and P.G. Al (1994).
The 1987 revision that was completed in 1992 has improved the Dutch National Accounts in three ways. First, new and other data sources have been used, like Production statistics of service industries, the Budget Survey and Statistics on fixed capital formation. Secondly, the integration process has been improved by the use of detailed make- and use-tables instead of more aggregate input-output tables. Thirdly, several changes in bookkeeping conventions have been introduced, like a net instead of a gross registration of processing to order.

NA/59 A National Accounting Matrix for the Netherlands, Keuning, Steven and Jan de Gijt (1992).
Currently, the national accounts typically use two formats for presentation: matrices for the Input-Output tables and T-accounts for the transactions of institutional sectors. This paper demonstrates that presently available national accounts can easily be transformed into a National Accounting Matrix (NAM). This may improve both the transparency and analytic usefulness of the complete set of accounts.

NA/60 Integrated indicators in a National Accounting Matrix including environmental accounts (NAMEA); an application to the Netherlands, De Haan, Mark, Steven Keuning and Peter Bosch (1993).
In this paper, environmental indicators are integrated into a National Accounting Matrix including Environmental Accounts (NAMEA) and are put on a par with the major aggregates in the national accounts, like National Income. The environmental indicators reflect the goals of the environmental policy of the Dutch government. Concrete figures are presented for 1989. The NAMEA is optimally suited as a data base for modelling the interaction between the national economy and the environment.

NA/61 **Standard national accounting concepts, economic theory and data compilation issues; on constancy and change in the United Nations-Manuals on national accounting (1947, 1953, 1968 and 1993)**, Bos, Frits (1993).
In this paper, the four successive guidelines of the United Nations on national accounting are discussed in view of economic theory (Keynesian analysis, welfare, Hicksian income, input-output analysis, etc.) and data compilation issues (e.g. the link with concepts in administrative data sources). The new guidelines of the EC should complement those of the UN and be simpler and more cost-efficient. It should define a balanced set of operational concepts and tables that is attainable for most EC countries within 5 years.

NA/62 **Revision of the 1987 Dutch agricultural accounts,** Pauli, Peter and Nico van Stokrom (1994).
During the recent revision of the Dutch national accounts, new agricultural accounts have been compiled for the Netherlands. This paper presents the major methodological and practical improvements and results for 1987, the base year for this revision. In addition, this paper demonstrates that a linkage can be established between the E.C. agricultural accounting system and the agricultural part of the standard national accounts.

NA/63 **Implementing the revised SNA in the Dutch National Accounts,** Bos, Frits (1993).
This paper discusses the implementation of the new United Nations guidelines on national accounting (SNA) in the Netherlands. The changes in basic concepts and classifications in the SNA will be implemented during the forthcoming revision. The changes in scope will be introduced gradually. Important changes scheduled for the near future are the incorporation of balance sheets, an environmental module and a Social Accounting Matrix.

NA/64 **Damage and insurance compensations in the SNA, the business accounts and the Dutch national accounts,** Baris, Willem (1993).
This paper describes the recording of damages to inventories and produced fixed assets in general, including damages as a result of legal product liability and of the liability for damage to the environment. In this regard, the 1993 System of National Accounts and the practice of business accounting are compared with the Dutch national accounts.

NA/65 **Analyzing economic growth: a description of the basic data available for the Netherlands and an application,** Van Leeuwen, George, Hendrie van der Hoeven and Gerrit Zijlmans (1994).
This paper describes the STAN project of the OECD and the Dutch national accounts data supplied to the STAN database, which is designed for a structural analysis of the role of technology in economic performance. Following an OECD analysis for other industrial countries, the importance of international trade for a small open economy such as the Netherlands is investigated. The STAN database is also available on floppy disk at the costs of DFL. 25, an can be ordered by returning the order form below (Please mention: STAN floppy disk).

NA/66 **Comparability of the sector General Government in the National Accounts, a case study for the Netherlands and Germany**, Streppel, Irene and Dick Van Tongeren (1994).
This paper questions the international comparability of data concerning the sector General Government in the National Accounts. Two differences are distinguished: differences due to lack of compliance with international guidelines and institutional differences. Adjustments to National Accounts data are reflected in a separate module which comparises Germany versus The Netherlands. The module shows that total General Government resources as well as uses are substantially higher in the Netherlands.

NA/67 **What would Net Domestic Product have been in an environmentally sustainable economy?, Preliminary views and results**, De Boer, Bart, Mark de Haan and Monique Voogt (1994).
Sustainable use of the environment is a pattern of use that can last forever, at least in theory. This pattern is likely to render a lower net domestic product than the present economy. The coherence between reductions in pressure on the environment and changes in net domestic product is investigated with the help of a simple multiplier model. This model is based on a National Accounting Matrix including Environmental Accounts (NAMEA).

NA/68 A Social Accounting Matrix for the Netherlands, concepts and results, Timmerman, Jolanda G. and Peter J.M. van de Ven (1994).
In this paper a Social Accounting Matrix (SAM) for the Netherlands is presented. Two years are covered: 1988 and 1990. The SAM is an integrated data framework based on national accounts extended with information on distribution of income, consumption and wealth among household. Furthermore, labour income and employment are subdivided into several labour categories. The tables of the SAMs of both 1988 and 1990 are available on separate floppy disks at the costs of DFL. 65 each.

NA/69 Analyzing relative factor inputs of Dutch exports: An application of the 1990 Social Accounting Matrix for the Netherlands (forthcoming), Reininga, Ted (1995).
In this paper the validity of neoclassical trade theory for explaining Dutch international trade patterns is studied. The analysis is carried out with the use of a Social Accounting Matrix for The Netherlands. This study corroborates the outcome of other recent analysis in this field: classical trade theory offers a better starting-point to understand Dutch trade patterns than neoclassical trade theory. Moreover, these recent studies point to the increasing relevance of insights derived from modern trade theory. The results presented here seem to support this point of view.

NA/70 SESAME for the evaluation of economic development and social change, Keuning, Steven J. (1994).
This paper elaborates on the concept of a System of Economic and Social Accounting Matrices and Extensions, or SESAME for short. The SESAME-concept serves to meet the criticism that conventional national accounts take a too limited view at social, environmental and economic development. SESAME details the monetary accounts and couples non-monetary information in an integral system approach. SESAME is meant as a synthesis of national accounts and the social indicators approach.

NA/71 New revision policies for the Dutch National Accounts, Den Bakker, Gert P., Jan de Gijt and Robert A.M. van Rooijen (1994).
This paper presents the (new) revision policy for the Dutch National Accounts. In the past, several major revisions of national accounting data have been carried out in the Netherlands. In the course of time, the policy has changed several times. Recently, the aim has become to publish relatively long time-series shortly after the publication of the revised benchmark year data.

NA/72 Labour force data in a National Accounting framework, Den Bakker, Gert P. and Jan de Gijt (1994).
This paper deals with the Dutch interwar labour force data. Starting with census data the estimation of the working and non-working labour force by industry and by occupational type is described and the results are discussed. The data have been estimated within the national accounts framework. It is the first time that labour market figures at a meso-level have been estimated which are linked to other national accounting figures.

NA/73 Integrated estimates of productivity and terms-of-trade changes from a Social Accounting Matrix at constant prices, Keuning, Steven J.(1994).
This paper demonstrates that measures of real income change for the total economy can best be derived from real income changes per subsector. For this purpose a Social Accounting Matrix (SAM) at constant prices has been compiled. By breaking down value added at constant prices into constant price estimates for each primary input category, productivity changes by industry can be estimated as an integral part of the regular national accounts compilation. The national total trading gain or loss from a change in the terms of trade is as well allocated to subsectors, thus embedding the estimation of this macro-measure into a meso-consistency framework. These ideas have been applied in a case-study for Indonesia.

NA/74 Taking the environment into account: The Netherlands NAMEA's for 1989, 1990 and 1991, De Haan, Mark and Steven Keuning (1995).
The National Accounting Matrix including Environmental Accounts (NAMEA) contains figures on environmental burdens in relation to economic developments as reflected in the National accounts. NAMEA's for the Netherlands in 1989, 1990 and 1991 have now been completed. They include a more detailed industrial classification and a series of environment taxes and levies, plus environmental protection expenditures by industry and households. Further, the depletion of two important mineral resources in the Netherlands is now incorporated in the NAMEA's.

NA/75 Economic theory and national accounting, Bos, Frits (1995).
This paper describes the relationship between economic theory and national accounting. This relationship is often misunderstood, by economic theorists and national accountants alike. Attention is drawn to the consistency required in a national accounting system, to national accounts figures as a transformation of primary data and to the fundamentally different valuation principles employed in economic theory and national accounting (forward looking and analytic versus backward looking and descriptive). The gap between economic theory and national accounting can only be bridged by satellite accounts, as in these accounts consistency with the overall system and valuation at current exchange value are not strictly required.

NA/76 An information-system for economic, environmental and social statistics, Keuning, Steven J. and Jolanda G. Timmerman (1995).
The 1993 SNA mentions that a SAM can also be extended to deal with environmental issues. This entails the integration of a SAM and a NAMEA into a SAMEA (Social Accounting Matrix including Environmental Accounts), a further extension into the direction of a so-called SESAME (System of Economic and Social Accounting Matrices and Extensions). This paper shows how environmental data and environmental indicators can be integrated into such a system. A Dutch case-study shows the interrelations between e.g. the employment of various types of workers (by sex/educational level) and the environmental problems caused by the activities in which they are employed. Moreover, this pollution is also allocated to the subsectors that receive value added. This enables a comparison with the consumption-based pollution by subsector. The SAMEA yields a framework for an integrated analysis and modelling of social, economic and environmental issues.

NA/77 Material flows, energy use and the structure of the economy, Konijn, Paul J.A., Sake de Boer and Jan van Dalen (1995).
Many environmental problems are connected to production and use of materials and energy. It would therefore be desirable to have an information system that gives consistent, complete and detailed information on material and energy flows. Such a system would even be more useful if it could be connected directly to economic data. This paper presents such a system. Based on the foundation laid by the national accounts the authors construct a system for the analysis of flows of materials and energy through the economy. In this paper the proposed system is illustrated with an application to the flows of iron/steel and energy. An input-output table is presented that describes the production processes in the ferrous metal branch entirely in physical units. Subsequently, steel contents of final products are calculated, and an analysis is made of the consequences of a new technology in the basic steel industry on total energy use in the economy.

NA/78 Calendar effects on quarterly GDP-growth rates, Reininga, Ted K. and Brugt Kazemier (1996).
Since 1986 Statistics Netherlands publishes Quarterly National Accounts. The earliest estimates of quarterly GDP, the so-called flash estimates, are published some seven weeks after the reference quarter. In this paper we examine a new, faster flash estimate, some three to four weeks earlier than its original counterpart. The gain is made by using a simple regression technique and incomplete data. To compensate for the lack of data, information on the number of working-days and shopping-days was added to the regression. It turns out that these calendar-aspects significantly affect GDP-growth: 0.30%-points extra GDP-growth for one extra working-day. One extra shopping-day accounts for about 0.17%-points extra GDP-growth.

NA/79 The NAMEA experience. An interim evaluation of the Netherlands' integrated accounts and indicators for the environment and the economy, Keuning, Steven J. (1996).
The national accounts publication in the Netherlands contains not only the conventional economic accounts and indicators, but also an integrated system of environmental and economic accounts, the NAMEA (National Accounting Matrix including Environmental Accounts). This paper reports on the present status of the NAMEA-approach and gives a concise summary of this approach. It reviews the present applications of this framework in the Netherlands and, finally, a comparison with the SEEA is made and various common misunderstandings regarding Green National Income are set out.

NA/80 What's in a NAMEA? Recent results of the NAMEA-approach to environmental accounting, Keuning, Steven J. and Mark de Haan (1996).
The National Accounting Matrix including Environmental Accounts (NAMEA) shows environmental pressures in physical units that are consistent with the monetary figures in the national accounts. This paper introduces the NAMEA-concept, provides some illustrative analyses of the recently cpmpleted NAMEA time-series, and demonstrates that social accounts and social indicators can easily be intgrated. This results in a fairly broad, multi-purpose statistical information system.

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