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Environment-related Employment in the Netherlands, 1997

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Preface

As part of work to develop environmental accounting and environmental statistics, Eurostat is currently looking at measuring environmental employment. The basic framework for the work was developed by Eurostat together with OECD's Directorate for Science, Technology and Industry and published as OECD/Eurostat 1999: The Environmental Goods and Services Industry – Manual for Data Collection and Analysis. Copies of this manual (in English or French) can be obtained from OECD sales points or from the OECD on-line book-shop at <http://www.oecd.org/bookshop/>.

This Working Paper presents the results of work on environment-related employment by Statistics Netherlands and is the first of a series of 4 Eurostat Working Papers released in 2000 presenting the outcomes of pilot exercises undertaken by French, Dutch, Portuguese and Swedish statistical agencies in 1999.

The pilot exercises benefited from financial support provided by the European Commission's Directorate General for the Environment.

The reports on the pilot exercises provide useful and recent information on environmental employment, thus directly responding to political demand for better information on employment opportunities generated by environmental protection.

The reports also describe the methods developed for estimating environmental employment based on existing statistics and other information and provide indications for improvement of the primary statistics needed for measuring environmental employment.

Whereas each of the pilot exercises used a specific approach, all pilot exercises taken together offer a very comprehensive and helpful exploration of statistical approaches towards measuring environmental employment. It is thus recommended to consult all pilot applications together with the OECD/Eurostat environment industry manual when designing systems to measure environmental employment based on existing information.

In this Working Paper the approach by Statistics Netherlands is presented which makes extensive use of existing data. Results are on direct employment covering Pollution Management as well as Cleaner Technologies and Products (groups A and B in environment industry classification of the OECD/Eurostat manual). Results comprehensively cover environment-related employment in the public sector.

Eurostat distributes this report hoping that others wishing to undertake estimates of environmental employment can benefit from the Dutch experience.

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Summary

In the second half of 1999 Statistics Netherlands carried out an ad hoc project on environment-related employment in the Netherlands. The European Commission co-financed this project under the Community programme Environmental protection and employment. Direct environment-related employment in the Netherlands is estimated at least at 92,000 (end of 1997), which is about 1.3% of total employment. Some 34,000 of these jobs were in local and central government.

1. Introduction

Policymakers are showing an increasing interest in the consequences of environmental policy and environmental concerns for the economy. On the one hand this interest focuses on the financial burden on the polluting sectors which have to invest in pollution abatement control. On the other hand they want information on the new growth sector consisting of enterprises specialising in cleaning up environmental pollution on behalf of others. These two aspects are often referred to as the *demand side* and *supply side* of the 'environmental market'. The growing political interest has resulted in a new field of statistics at international as well as national level. At the international level Eurostat and the OECD are developing harmonised and comparable statistics on these subjects.

The need for *demand side* data is reflected in among other things Eurostat's structural business statistics regulation, which includes variables on environmental expenditure by industries since statistical year 1995. The interest in the *supply side* of the environmental market seems to be more recent. Data are needed on the size (in terms of employment and sales), the structure and the competitiveness of the so-called *eco-industries* (also called *specialised producers, environment industry* etc.). In the space of only a few years, many data collection activities and studies have been carried out by individual countries and international institutions.

In the period 1994-1997 OECD and Eurostat developed a handbook on the *environment industry* (in full: environmental goods and services industry), which offers a common framework to support and harmonise studies and surveys on this subject. The environment industry is defined as activities which produce goods and services to measure, prevent, limit, minimise or correct environmental damage to water, air and soil, as well as problems related to waste, noise and eco-systems. The handbook also gives an overview ('toolbox') of possible methodologies (demand side surveys, supply side surveys, national accounting techniques, etc.). This was necessary because problems in terms of definition, demarcation and measurement of the environment industry meant that standard – i.e. institutional-statistics based on standard classifications can only be partially useful. A combination of tools from the box is needed.

2. Project carried out by Statistics Netherlands

2.1 Goal

At the request of Eurostat and with financial support from the European Commission under the Community programme Environmental protection and employment, in the last quarter of 1999 Statistics Netherlands carried out an *ad hoc* project on environment-related employment in the Netherlands.

The term 'ad hoc' is used because the regular work programme of Statistics Netherlands does not include the full statistical description of environment-related employment (or the environment industry). In spite of this, we felt that it would be very useful to carry out a practical exercise and bring together all the existing data to see what is and is not possible and with this information.

Given the limited duration of the project and the impossibility of conducting extensive written surveys the following steps were formulated:

- 1) To explore the directly available data on environment-related employment (internal or external).
- 2) To arrive at estimates for environment-related employment in the Netherlands.
- 3) To draw conclusions on future steps.

Therefore the goal of the present project was to gather data on environment-related employment; however, the learning process was perceived as just as important.

2.2 Method

The OECD/Eurostat manual on the Environmental goods and services industry devotes a lot of attention to evaluation of methods of data collection and analysis. It also gives a detailed classification of this industry. The manual was used as a point of reference, but the work of Statistics Netherlands concentrated on tapping sources of information, and less on the question of whether these sources would fit one-to-one in the definition and classification. Another important background document is NACE Rev.1, often referred to in this paper. For practical reasons, the relevant parts of these two publications are not repeated here.

We decided to collect information on environment-related jobs in general, not paying much attention to the question of whether the jobs were created on the demand or the supply side of the environmental market. Where necessary these terms are used in the text. It is important to note that environment-related employment in the public sector was dealt with in its entirety. Many studies neglect the public sector, at least partly. Of course, it is debatable which government employees working for the environment should be considered as belonging to the environmental goods and services industries, but in this project they were all taken into consideration.

The information gathered consists mainly of direct employment related to goods and services for the protection of ambient air and climate, waste water and waste management, protection of soil and ground water, noise and vibration abatement, protection of bio-diversity and the natural landscape. These goods and services refer to both end-of-pipe and cleaner technologies. In terms of the OECD/Eurostat manual, these are mainly group A of the classification, 'Pollution management group' and group B 'Cleaner technologies and products group'.

So-called indirect employment effects or second order effects (for example to apportion part of the employment of a public utility plant that generates electricity used by an eco-industry) were not part of this project.

The method used consists of six main parts.

1) Creating an indicative database

An intensive (literature) study was carried out in order to create a database in a relatively short period with (possible) environment industry firms. This consisted of exploring the technical literature for names and addresses of enterprises in articles or advertisements and using the Internet for information on environment-related employment. This led to a first experimental database with a few hundred potential enterprises. Last but not least, an electronic database was received from a commercial publisher who issues a directory of enterprises operating on the environmental market. Initially this database contained about 800 potential environment enterprises. It should be mentioned that -as there were no plans to conduct a survey- the databases were indicative and not further developed. Lists of members of relevant industry organisations and associations were also collected.

The idea was to match all these sources with register information on employment (see below).

2) Using existing statistics and classifications

Environmental expenditure statistics

One of the main starting points was to use existing statistics within the office as much as possible. The use of the environmental expenditure statistics was a logical step in this respect. Statistics Netherlands has a lot of experience with such statistics. The statistics on the costs and financing of environmental control consist of an overview of environmental expenditure by nine economic sectors (central government, provinces, district water boards, municipalities, joint municipal arrangements, agriculture, industries, traffic/transport and households) and seven domains (water, air, soil, waste, noise, landscape, unallocated). These statistics do not produce direct data on employment, but they produce information on the current costs, including staffing costs. In principle, this information should make it possible to estimate employment based on assumptions of average wages.

Specialised producers

For several reasons Statistics Netherlands also developed some statistics on the supply-side of the environmental market. During the nineties production statistics were set up for NACE 37 (recycling) and 90 (collection and treatment of waste). These NACE classes (and also NACE 5157, wholesale in waste and scrap) which carry out characteristic activities as their main activity, are often indicated as *specialised producers*. These production statistics are of course an ideal source of information for this project because they supply direct information on employment.

5-digit level

Other existing statistics were also examined as a possible source of information on environment-related employment. Apart from the classes described above, NACE does not distinguish other activities separately that can be described fully as environmentally related.

However, the Dutch standard industrial classification distinguishes several relevant groups of activities at the *fifth digit* level:

- 74303 Environmental monitoring and analysis
- 92532 Management of natural areas
- 91336 Environmental and ecological movements

Unfortunately the relevant production statistics did not give information on this level of detail, but the business register did prove helpful as an indirect source (see below). In the rest of this paper for practical reasons 5 digit codes will be indicated as ‘NACE’ although in fact it refers to the (subdivided) Dutch classification only.

Product classifications

In the national and international literature on the environmental goods and services industries it is often mentioned that the central product classification/Prodcom or trade statistics may constitute a possible source of information. However, several studies have already pointed out the problems with this classification: the limited coverage of the list, multi-purpose goods, etc. The present project also attempted to use the available information on environmental products in some way to locate environment industries. But the availability of useful information was so poor that this approach was abandoned.

R&D

Other relevant statistics were those on Research and development. R&D statistics are an interesting source of information. The survey among research institutions collects data on their employment and their expenditure on each domain of research.

3) Using the business register

The general business register of Statistics Netherlands proved to be a very important source of information on employment. In principle, it gives the number of employees for statistical, legal and local units. The information is not always accurate and up-to-date, but it is useful enough for this type

of exercise. For some parts of the standard industrial classification (the 5-digit classes mentioned under 2)) the register served as the primary source.

Another interesting experiment was linking the business register with the electronic external database mentioned under 1).

4) Using annual accounts or budgets of governments

For its government finance statistics, Statistics Netherlands collects annual accounts or budgets for all government sectors. These often contain an annex with staffing information (number of employees, salaries). Although these were not always detailed enough, they did prove to be useful input for estimates of environment-related employment in government sectors.

5) Contacts with industry organisations and ministries

In addition to the knowledge within the Bureau, many external sources were used on an *ad hoc* basis to gather data on environment-related employment. They were able to provide more than we expected, particularly the industry organisations and associations. In the course of the project we contacted various environment-oriented organisations several times and in most cases they were able to provide us with employment estimates. For central government several informants were available at ministries.

6) Confronting sources

Where possible or necessary, different sources were consulted for the same item. Confrontation of these sources served as a reliability check and gave an idea what the maximum error would be while making estimates.

2.3 Quality of the data

As in this type of research all kinds of internal and external information sources are combined to make estimates on environment-related employment, the data used are not all of the same quality. Making (rough) estimates is justifiable to a certain extent, bearing in mind the goal of this project. But it is very important to be clear about the assumed reliability of the data and not to suggest that the reliability is greater than it really is. The present paper addresses this problem by using some qualitative 'quality indicators' for each figure used in the project. Although not perfect, it should give an idea of the degree of reliability of the figures.

In this paper three provisional quality indicators are distinguished:

A: normal statistical approach, direct data collection from survey, accuracy high and error margins known. *Example: production statistics based on questionnaires.*

B: no survey available, but data indirectly derived (often by calculation) from existing sources, error margins roughly known, a few assumptions necessary. *Example: using the staffing costs in environmental expenditure of a sector to calculate number of employees by using average wages per employee.*

C: estimates based on the best available information or combination of information, hardly any insight into error margin, several assumptions necessary. *Example: a rough estimate from an external expert of an industry organisation during a telephone conversation.*

Furthermore some other warnings should be made. The original idea was to choose 31 December 1997 as the date for which data were to be collected (most recent year of available production statistics), but as the method looked for all possible sources of information this could not always be realised. For example, the information gathered from external experts in general referred to the present situation. Although this is acceptable for the purpose of this exercise, it would be a handicap if the project were to be repeated from time to time. Also, while employment is in principle given in persons employed, irrespective of whether employment is full-time or part-time, not all sources allowed for the same approach in this.

3. Results

3.1 Private enterprises

3.1.1 Sewage and refuse disposal, sanitation and similar activities

Employment figures for private specialised producers in NACE classes 37, 5157 and 90 were the easiest to access. Table 1 shows results for the period 1995-1997. In 1997 these private units accounted for more than 24,000 employees. The rapid increase of employment in this period was caused by new companies on the waste and recycling market, statistical reasons (improving the population) and – perhaps most importantly - ongoing privatisation which causes a shift in employment from specialised government units to private ones. It should be mentioned that these figures also include enterprises whose shares are still owned by the government.

Table 1 - Private specialised producers: employment (actually working, incl temporary workers, 31 December)

NACE	1995		1997		Growth rate employment
	Number of enterprises	Employees	Number of enterprises	Employees	1997 compared to 1995, in %
3710 recycling of metal waste	23	340	21	447	31
3720 idem, non metal waste	91	1276	113	2176	71
5157 wholesale in waste and scrap	1100	5900	1298	7242	23
90001 cleaning of sewers	28	773	29	972	26
90002 collection of waste	228	6473	216	7829	21
90003 treatment of waste	145	3451	156	4373	27
90004 clean-up of soil pollution, removal of asbestos	101	1133	148	1304	15
Total	1716	19346	1981	24343	26

Source: Statistics Netherlands, production statistics.

A remark should be made with regard to a possible underestimation of these numbers. These activities may also be carried out as secondary activities of enterprises classified in other NACE classes. This effect is probably not large because the nineties showed that waste collection and treatment requires a high degree of speciality. Many firms with such activities as secondary activity disposed of these units, which then became 100% specialised producers, a development which was reflected in the register.

But there are still examples where employment is underestimated if it were assumed that activities in NACE 37, 5157 and 90 are found in these classes only. In a few -but not all- cases corrections were made. For example some soil cleansing (*in situ* or in special treatment installations) activities (in principle NACE 90) are found in the register as part of large construction enterprises (NACE 45). The (correction of) employment related to soil cleansing was estimated on the basis of a combination of branch and register information (plus about 300 employees). Likewise 'NACE 90 employment' was 'discovered' within Industrial cleaning (NACE 7470), about 1,600 employees. Enterprises in NACE 60 which transport waste were deliberately not considered, because these activities are considered as transport of goods and not as environmental services. This reasoning also applies to for example cleaning of green composting containers (NACE 74).

Furthermore, NACE 52503 (retail trade in second hand goods), NACE 3660 (social employment projects) and local government include not-profit organisations (in some cases sheltered workshops) which are subsidised by municipalities to collect, repair and resell large household appliances, furniture and so on. It is interesting to note that these shops, which specialise in recycling goods, are a booming business because of the policy incentives towards separate waste collection and high taxes on

landfills. It was not easy to make estimates for employment because these shops are scattered throughout the register. NACE 52503 showed about 300 employees.

But it appeared that there is a (new) branch-organisation for this typical kind of non-profitable organisations. A crucial characteristic of this association is that its members –in contrast with retail sale of second hand goods- do not pay for collecting the goods. Their goals are protection of the environment and generating employment. According to their first inventory the number of this kind of recycling shops/centres is about 150 with 3,100 employees in 1997. The association expects that 1998 will show a considerable higher employment, mainly because of higher quality of the data.

3.1.2 Technology, installations, constructions and equipment (excluding engineering and consulting)

The suppliers of the 'goods' (technology, equipment etc.) are much more difficult to describe for statisticians. One important reason for this is that they are scattered over many NACE classes in the business register. For many enterprises the supply of environmental technology is not a main activity. Therefore, especially as there were no plans to conduct a real survey, the only option was to make the best estimates possible.

For *engineering and consulting* a separate strategy could be developed based on an external report and register information. This is dealt with in the next section (3.1.3). For the remainder, mainly the manufacturers and constructors (including importers and exporters) three sources could be used:

1) Central government studies on the costs of construction of anti-noise walls. This in combination with contacts with the Association of contractors of noise abatement projects led to the conclusion that about 150 employees were involved in these projects. Noise insulation of buildings and homes is not included in this figure.

2) Information gathered from the sewer branch shows a rough estimate of 1,500 employees in the sewer (re)construction sector.

3) The two-yearly survey of the Dutch Association of Suppliers of Environmental Equipment and Technology (VLM). This association has 42 members specialised in environmental technology. However, these enterprises cover only a limited part of the environment market. Because market information is needed, the VLM conducts a written survey every two years among enterprises on the environmental market. Selection of relevant enterprises is done on basis of a commercial catalogue of environmental enterprises (more or less the same as mentioned in 2.2.). Suppliers in the areas of 'sewers', 'waste disposal', 'noise abatement' and 'energy saving' are explicitly excluded from their survey, as these topics are not part of their core business.

For the 1996-1998 survey, 635 enterprises were selected of which 108 responded. As the figures were not raised to the whole population, the results refer only to companies which responded. Although their report shows interesting features of the environmental market, the most important information for our purposes was employment. The reported environment-related employment was 3,000 employees in 1996, and was expected to grow to 3,500 in 1998. See table 2 below. Furthermore, the report shows that the responding manufacturers and importers have a total employment of 1,193 and 368 employees so that environmental part is 63% and 32% respectively.

Table 2 - Results VLM-survey: environmental employment

	1996	1997	1998
Producers (28)			
<50 employees	246	284	309
50 and more	461	471	495
Total	707	755	804
Importers (18)			
<50 employees	64	79	94
50 and more	37	37	42
Total	101	116	136
Services (62)			
<50 employees	350	392	428
50 and more	1910	2032	2111
Total	2260	2424	2539
Total (108)	3068	3295	3479

():number of respondents

Source: VLM (1998).

4) The matching of *ad hoc* databases of environmental enterprises with the business register. In the project we tried to match and link the information from the VLM member list, the catalogue list and our own literature list as much as possible to the employment information of the legal units in the business register. The key variable for this linking was the *postcode*, and in the second instance the *name* of the enterprise. To avoid double counting, enterprises for which information had been gathered from other sources were deleted from the lists. A list of about 500 enterprises remained which were subsequently linked to the register. This meant that enterprises whose eco-business is only ancillary were included as a whole (as a first step).

This exercise led to the following notes:

- In 20-30% of the cases no clear link could be found between catalogue and the register.
- In 5-10% of the cases there was a link but the register gave '0' employment.
- In several cases there was a link but it was not clear whether the catalogue and the register referred to exactly the same unit.
- There were several enterprises on the catalogue list for which it is uncertain whether environment-related activities were structural annual activities.
- There are several enterprises that are only small business offices of large foreign companies.
- With some exceptions, environment enterprises are mostly small or medium-sized enterprises with between 20 and 100 employees.
- The matching of VLM members with the register showed an employment of roughly 2,500 to 3,000 employees.

The enterprises that somehow linked up with the register accounted for about 14,000-15,000 employees. This is a maximum because no correction was made for main/secondary activity. The large enterprises in particular can distort the figures. For example: about 10% of the enterprises accounted for 60% of this total. On the other hand, the total could be an underestimation because for several existing (catalogue) enterprises no register information was found.

Looking at all available information a reasonable, but rough estimate for this part of the market (excluding noise and sewers) is a number of 300 enterprises with an average of 30 environmental employees, 9,000 employees in total.

3.1.3 Environmental engineering and consulting

A difficult aspect of activities in the sector environmental engineering and related technical consultants (in accordance with NACE 742) is that the largest enterprises are, as a whole not specialised in the environment alone. The purpose of their assignments can fluctuate from year to year. It turned out that an industry organisation of consulting engineers (ONRI) holds a regular survey among the large firms on this market, resulting in, among other things, information on environment-related employment among consulting engineers. Their information showed that in 1997, 22 of the largest 37 firms in the Netherlands accounted for 3,411 (1998: 3,591) employees on environment projects. We raised this figure based on register information to arrive at estimates for the 37 firms (about 3800).

In addition, there are many smaller actors on the market, mainly environmental consultants. Based on the considerations that most of these environmental consultants specialise in the environment, and in many cases small firms can be traced by name, all firms in NACE 742 with the components 'eco', 'enviro' 'environment', 'pollution', 'waste', 'waste water', etc. in their names were selected from the register. This exercise gave us another 250 consultants with about 1,000 employees.

This is an underestimate for the consultants not identified by these sources, but it is hardly imaginable that it is a large one. We arrived at an overall estimate for the employment of environmental engineering and consulting of 6,000. This includes about 100 employees of environmental service agencies (that come under the competence of the regional chambers of commerce) that advise enterprises on environmental issues.

3.1.4 Demand side: industries (operating equipment, environmental co-ordination)

Environmental policy and regulations make it compulsory for polluting enterprises to invest in the environment. The operation of environmental facilities, including their repair, maintenance, generates direct employment effects ('indirect' effects are ignored in this project). Activities like applying for a permit, setting up an environmental care system and doing research also require human resources. The statistics on environmental expenditure by enterprises (NACE 10-41, excluding NACE 37) constitute direct and indirect sources for employment figures. One of the variables in this survey is the number of man-years devoted to environmental co-ordination activities such as planning, applying for permits, setting up environmental care systems, etc. (see table 3). In 1997 the industry sector spent 1,365 man-years on these activities.

Table 3 - Environmental expenditure by enterprises, environmental co-ordination

NACE		1995		1997	
		Costs million HFL	Man years	Costs million HFL	Man years
10-14	Mining and quarrying	14.1	137.0	18.8	162.3
15-36	Manufacturing	124.6	1047.4	130.1	1118.4
	of which:				
15/16	Food products; beverages and tobacco	16.1	147.0	16.8	152.8
17	Textiles	3.0	27.3	3.2	27.5
19	Leather and leather products	0.2	3.7	0.2	2.1
21	Pulp, paper and paper products	4.1	37.5	5.0	48.4
23	Coke, refined petroleum products, nuclear fuel	4.9	23.0	4.8	27.4
24	Chemicals and chemical products	43.8	324.4	41.5	313.5
26	Other non-metallic mineral products	4.9	38.5	6.1	48.5
27	Basic metals	8.9	69.3	9.4	72.5
28-35	Fabricated metal products, machinery, equipment, manufacturing n.e.c.	28.7	275.7	31.2	303.8
18,20,22,25,36	Various	10.1	101.1	11.8	121.9
40/41	Public utilities	19.0	154.6	10.7	84.0
10-41	Total 1)	157.7	1338.9	159.6	1364.7

1) Enterprises with 20 or employees, ex. NACE 36631 and 37.

It is much more difficult to make reliable estimates for employment related to operational current costs. For this, information from the calculation model –only partly fed by information from enterprises- for current costs was used. The estimated personnel costs were subsequently translated into employment, based on the average wage sum for industries. This resulted in an estimated employment of 5,450 (incl. own research). It should be mentioned that the coverage of these figures is for NACE 10 to 41 (excluding NACE 37) only, so there is an unknown but probably not dramatic underestimation here for other business sectors like agriculture and some other NACE classes.

3.2 Government sectors

3.2.1 Waste disposal

Although nowadays many actors on the waste market operate under private law, a large proportion of waste disposal is carried out by government authorities. Large municipalities, in particular, sometimes because of employment reasons, often choose to keep their own cleansing departments. Furthermore, there are a lot of so called co-operative arrangements between smaller municipalities, for example a collective waste collection service. These arrangements are part of the public sector.

Statistics on waste collected by or on behalf of municipalities, are compiled by the environment department of Statistics Netherlands (waste quantities and costs), but they do not contain an employment variable. To a certain extent the register could supply employment information. But only the waste disposal activities by large municipalities or joint municipal arrangements are separately identified in the register as NACE 90 units. Many municipalities are too small to have a separate waste collection unit, so their activities are hidden in NACE 75 (public administration).

The strategy to determine employment for these activities as a whole was to use register information on employment of the largest statistical units and make estimates for the rest. This is done by looking at:

- the composition of the costs of waste disposal of municipalities or joint municipal arrangements.
- the number of municipalities that perform own activities; if there is evidence that all waste collection is contracted out to a private enterprise, no own employment was assigned to this activity.
- the number of inhabitants as a grossing up factor.

This resulted in an employment estimate of 12,000 employees for municipalities and 3,000 for inter municipal co-operative arrangements.

3.2.2 Collection and treatment of waste water (sewers and sewage)

In the Netherlands municipalities are responsible for the collection of wastewater, and district water boards for its treatment. The collection of wastewater means construction, maintenance, inspection and repair of the sewers. With a few exceptions, municipalities do not have separate sewer departments. If municipalities carry out activities themselves, they are mostly done by the municipal works department. Employment related to sewers is integrated within such a department and therefore difficult to estimate. Construction activities are mostly carried out by building contractors. Maintenance of sewers is often contracted out to private enterprises. These enterprises are already included in the employment figures for NACE 90 (see above).

To estimate the sewer-related employment for the Netherlands, two indirect sources were used and combined:

- information on the costs (including staff) of sewer management by municipalities, which is included in the statistics on costs and financing of environmental control, and
- information from an association of all (mainly public) bodies and organisations that have (some) responsibility with regard to the state of the sewer system in the Netherlands.

The rough estimate of employment is about 1,500 in municipalities (inspection, maintenance) of which 400 in the largest ten municipalities.

The treatment of waste water by district water boards consists not only of the operation of about 400 sewage treatment plants, but also of monitoring surface water quality and restoration activities. In principle there is a lot of statistical information at district water boards, but it does not give a full picture with regard to employment. The problem is that district water boards normally combine quantitative and qualitative water control. Quantitative water control is the traditional protection of the country against the water: the construction and maintenance of dikes, canals and so on.

Although this employment is not regarded as environment-related, a special analysis of their 1997 annual accounts was necessary to arrive at employment figures. This resulted in 4,500 employees for water quality control, including sewage treatment, of whom a small number for nature conservation.

3.2.3 Policymaking, law enforcement, control, co-ordination, permits, nature protection

In addition to employment in local and government authorities at an executive level, there is a whole range of environmental activities by government authorities at a more indirect level: environmental policy making, law enforcement, control, co-ordination, research, granting environmental permits, etc. These activities are found at all government levels, central and local. Based on methods described in section 2, information was gathered from many sources.

Using analysis of annual accounts or budgets and costing, figures were derived for provinces (2,200) and municipalities/inter-municipal co-operative arrangements (3,650).

Surprisingly, at the level of central government several relevant ministries had someone who had an overview of environment-related employment in his or her ministry.

For central government, including institutions such as RIVM (institute for health and environmental planning) and Statistics Netherlands itself, the environment-related employment is calculated to be 6,445. This includes the Ministry of Home Affairs or the Public Prosecutor's Office for environmental law enforcement activities, specialised units such as inspection flights to detect illegal discharges at sea, but also administrative work in environmental law suits. Moreover, detailed information was also available on the activities of regional police forces with regard to environment law enforcement (520 employees).

Furthermore the number of employees includes nature protection activities of central government bodies. Although these activities are at least partly on a more executive level, for practical reasons the employment numbers are included in this section.

3.3 Environmental education en information, research and development

This section deals with institutions, organisations, foundations and other non-profit associations working in the field of the environment. Information was gathered on environment-related employment at:

- vocational institutions and universities,
- technological institutions,
- laboratories,
- interest groups, pressure groups, public information foundations,
- management of natural areas

Based on existing reports and contacts with informants, employment at vocational institutions and universities related to scientific research and environmental education programmes is estimated at 1,500.

For environmental research and development our own R&D statistics could be used. The two-yearly survey among research institutions showed an employment in 1997 of 1,310 for the field of environment-related technology, including safety. Direct register information could be used for environmental laboratories as this activity is classified separately at a 5-digit level (NACE 74303: environmental monitoring and analysis). Based on register information employment for this activity is

estimated at 600. For the last category, too, there is a separate 5-digit level activity: NACE 91336 (associations/organisations on nature and environment) is estimated at 1250 employees. Likewise NACE 92532 shows an employment of 870 for organisations on management of natural areas.

4. Conclusions

In table 4 all the pieces of the puzzle are put together. This overview shows that total direct environment-related employment at the end of 1997 was at least 92,000, that is about 1.3 % of total employment in the Netherlands. The actual number may be somewhat higher, given some underestimates.

Table 4 - Data collection on environmental employment (31 December 1997), overview

Description	NACE	Sector	Employment	Data quality1)	Availability2)
Sewage and refuse disposal, sanitation and similar activities	90	Private	14478	A	Yearly
Wholesale of waste and scrap	5157	Private	7242	A	Yearly
Recycling	37	Private	2623	A	Yearly
Counted in: soil and industrial cleaning		Private	1900	B	Yearly
Waste disposal, municipalities	90	Public	12000	B	Two-yearly
Waste disposal, joint municipal arrangement	90	Public	3000	B	Yearly
Sewer management, municipalities	75	Public	1500	B	Unregular
Water quality control, district water boards	75 and 90	Public	4500	A/B	Yearly
Shops specialised in recycled goods	Various	Private	3100	B	Yearly
Anti-noise walls	45	Private	150	B	Unregular
Sewers (construction)	45	Private	1500	C	Unregular
Technology and equipment	Various	Private	9000	A/C	Two-yearly
Engineering and consulting	742	Private	6000	A/C	Yearly
Monitoring and analysis	74303	Private	600	B	Yearly
Operation of environmental facilities	10 to 41	Private	5450	B	Yearly
Environmental co-ordination	10 to 41	Private	1365	A	Yearly
Management of natural areas	92532	Institutions	870	B	Yearly
Interest groups (environment)	91336	Institutions	1250	B	Yearly
Environmental research and development	73	Institutions	1310	A	Two-yearly
Environmental education	80	Universities	1500	B	Unregular
Permits, enforcement, monitoring etc. (Central government)	75	Public	6445	B	Yearly
Permits, enforcement, monitoring etc. (Provinces)	75	Public	2200	A/B	Yearly
Permits, enforcement, monitoring etc. (Municipalities, joint municipal arrangements)	75	Public	3650	B	Two-yearly
Control and enforcement (regional police)	75	Public	520	B	Unregular
Total			92153		

1) A: surveys; B: calculation derived from existing data; C: (rough) estimate (see text for further explanation).

2) Regularity of data - directly or indirectly usable - produced on environmental employment.

More than 34,000 employees are found in the public sector. Although it was not possible to give a specification of environment-related employment into domains, the predominance of the waste domain is striking: at least 50% of all environment-related employment can be apportioned to the field of 'waste'. This can be explained by the labour demanding and labour intensive character of waste disposal activities.

This project shows that it is possible within a limited time schedule to produce general figures on environment-related employment purely based on bringing together existing data sources within the statistical office (expenditure statistics, production statistics, business register) and outside information (branches, associations, ministries). It is possible to provide a substantial part of the information by setting up regular production statistics for specialised producers and by processing demand side data

on environmental expenditure. In some NACE classes introduction of a 5th digit appeared to be useful because the business register could give employment figures on this level. This paper also shows that the government sector should not be neglected when discussing employment effects of environmental policy. Quite surprisingly, information was even available on environmental education and environmental law enforcement.

Of course, this approach has its limitations and weaknesses:

- several estimates had to be made;
- only aggregate information is available;
- the sources refer to different years;
- the overall result is an aggregate of sources with a wide variety in error margins;
- although many sources were used in a short time, it is still quite possible that not all sources of information were discovered.

There are not many sources to confront the overall results with. The most interesting one seems to be the DGXI/Eurostat report *Estimate of Eco-industries in the European Union 1994* which is based on a combination of methods including macro-economic modelling. This report shows an estimated direct employment of 88,800 for the Netherlands, which – in spite of referring to 1994 and being based on at least partly another approach - is surprisingly near the result of the present project.

In principle the only really detailed information on eco-enterprises would come from a questionnaire-based survey. Nevertheless this project has revealed a lot of information on which data are available. The exercise could be repeated in the future. As many of the sources of information are known after this first experiment, a renewed exercise would take less time, roughly spoken about 2-2,5 man-months. Efficiency could be improved a little bit by taking employment into account during the regular environmental expenditure surveys, for example the financial analysis of the annual accounts of joint municipal co-operations. The last column of table 4 shows the regularity of the data that were collected. Because of the fact that some sources are based on biennial statistics or on ad hoc estimates not explicitly referring to a statistical year, it seems the best solution to repeat this exercise every two or three years.

Finally, the results and understandings of this project could be used in combination with input/output modelling based on national accounting techniques to investigate further the economic consequences of environmental policy, including indirect effects.

References

Publications:

- Explanatory notes to NACE REV. 1* (version 3), Eurostat, 1992.
- Environment goods and services industry, manual for data collection and analysis*, OECD, 1999.
- Production and employment in the environment industry*, D. Drouet, rDi/OECD, 1996.
- An Estimate of Eco-industries in the European Union 1994* (Eurostat Working Paper Nr. 2/1997/B/1), Ecotec, BIPE and IFO, 1997.
- The Dutch environmental production sector, 1996-1998*, Association of Suppliers of Environmental Equipment and Technology, The Netherlands, (VLM), Zoetermeer.
- Higher environmental education and the labour market in the Netherlands*, Dröge/Van Hall institute, Schoot Uiterkamp/ IVEM, 1999 (DRAFT).
- The demand for graduates with environmental knowledge in the mid term*, VSNU, Utrecht, 1996.
- Environment and construction production, Economic institute for the construction industry EIB, 1999.
- Milieumarktwijzer*, VNU Business publications, Amsterdam, 1998.
- State of affairs municipal environmental policy 1998*, Report 1999/6, Ministry of the Environment, Zoetermeer.
- Maintenance and inspection of anti-noise walls*, Ministry of Transport and communications, 1991.
- Zeven gemeenten starten samen kringloopbedrijf het Warenhuis*, in: Gemeentereiniging en afvalmanagement 02/99.
- Gouden afvalbergen*, in Haagse Courant, pag. 5, 24 July 1999.

Statistics:

- Production statistics Environmental service industries and (preparation for) recycling, CBS.
- Waste collected by or on behalf of municipalities, CBS.
- Costs and financing of environmental control, CBS.
- Environmental costs of enterprises, CBS.
- Statistics on water quality control, part B: Sewage treatment, CBS.
- Statistics on Public Finance, CBS.
- Statistics on Research and Development, CBS.

Associations or branch-organisations:

- Dutch Association of Soil Cleansing Companies (NVPG), Rijswijk.
- Association of Noise Abatement enterprises (VOG), Zeist.
- Association contractors Noise Abatement Projects (AGHP), Utrecht.
- Association of Suppliers of Environmental Equipment and Technology, The Netherlands, (VLM), Zoetermeer.
- Association of firms of consulting engineers (ONRI), Den Haag.
- Association of the sewer branch (RIONED), Arnhem.
- Dutch Industrial Cleaners Association (DICA), Rotterdam.
- Technical and Vocational training Council (HBO-Raad), Den Haag