Eurostat
Working Papers

eurostat

The Environment Industry
in Sweden

Report prepared for DGXI and Eurostat by:
L. Tängdén, M. Nyman and U. Johansson
Statistics Sweden

The Environment Industry in Sweden

Prepared for DGXI and Eurostat by:
L. Tängdén, M. Nyman and U. Johansson
Statistics Sweden

Foreword

Statistics Sweden has developed physical environmental accounts since 1993. To begin with, the focus has been on developing the environmental accounts for energy and certain emissions. This report is a result of developmental work on incorporating descriptions of the environment industry into the Swedish environmental accounts.

The report includes an estimation of the total environment industry in Sweden in terms of employment and turnover. It describes register-based information on the core environment industry. The report also includes the first attempts to compile a list of environment enterprises outside the core environment industry.

SUMMARY

This report is based on three main sections; Framework, Description of the core industries[1] and a compiled List of environmental enterprises outside the core industries.

The core industries

Data for the core industries is a result of compiling and delimiting data from statistical registers and surveys.

The total number of employees in the core industries are over 9 000 if enterprises under these headings are included. If all establishments (local KAUs) in the core industries are included (even establishments where the enterprise is listed under another heading), the number of employees is 13 500 according to the Business Register. In some parts of the report we have chosen to work with enterprises because the VAT-register where we collect data about turnover is based on enterprises. In other parts when data linked from other registers (The register of education for example) are used, it has been necessary to use establishment as principle of selection. The turnover for the core industries based on enterprises was 16 203 million SEK in 1997.

Hopes are set on the environment industry to create new jobs; this is why data about the employees in the core industries are presented. Analysis of the employees gives a description of the branches and could give an indication of what kind of labour that will be needed in the future.

About 60 percent of the employees work in the private sector. The educational level is low. The share of employees with Maximum 9-year compulsory school is 43 percent in the core industries compared to 23 percent on the total labour market. Only 5 percent have University (tertiary, post secondary) education compared to 27 percent on the whole labour market. The employees are spread by age mainly like on the total labour market. This is interesting since the environment industry is rather new and was created in the 60´s and 70´s like the computer business. Compared to Computer software making enterprises, the core industries have more old and very young people employed. Almost 9 out of 10 employees in the core industries are men.

The list of environmental industry enterprises outside the core industries

A selection of enterprises from different sources has resulted in a first list of environment industry enterprises outside the core industries. The list was compiled from enterprises in the Business Register with "environment" or "ecology" in the enterprise name, environmental headings in the telephone directory, searches on the Internet, list of environmental consultants, enterprises in the EU report[2] and enterprises with product codes considered to be 100 percent environmental. Enterprises that obviously not equals the definition of environment industry have been sorted out and are not part of this study.

---

[1] The core industries are considered to contain 100 % environmental industry, mainly waste treatment, wastewater and recycling. The core industries are NACE code headings 25.12, 37, 51.57, and 90. Where possible we use an even more detailed level of these headings which is the Swedish SNI-code. The SNI-code is the same as NACE, but with a last digit added. See Annex.

[2] Ecotec, BIPE and IFO (1996). The Swedish Eco-Industry: Country Summary

The selection resulted in a list of identification codes of enterprises with data connected to each code. This list could be a starting point for further work to delimit the environmental industry. There is a great need for further improvement; the list needs to be completed with enterprises that have not yet been identified. It is also important to delimit the list, as it now most certainly contains enterprises or parts of enterprises that are not included under the definition of environmental industry. Data presented in this report must be seen only as a first attempt to estimate the total environmental industry in Sweden, however the work so far indicates that the list of enterprises will grow as more work will be done. Future work should try to ascertain the environmental share of the non-core enterprises, improve the coverage of governmental activities, add important parts missing today such as construction etc.

According to the list the number of employees from branches outside the core industries is nearly 30 000. The largest share, 25 percent or 6 400 employees were found in the branch Electricity, gas and water supply (SNI 40). Many of the enterprises in this group were producers of renewable energy. Many employees in other branches were found in enterprises producing environmental consultants services, environmental testing and analysis, industrial cleaning and producers of equipment for wastewater treatment and waste treatment.

When the core industries and the other listed enterprises are included, they represent nearly 39 000 employees or one percent of the Swedish labour force. This could be compared with the Swedish police force, 26 000 employees or employees at insurance companies, 41 000. The employees are spread on nearly 3 500 enterprises, which implies that the environmental industry includes a lot of small enterprises. The turnover for the core industries and the listed enterprises sums up to 89 700 million SEK.

Estimation of the total environmental industry, core industries and other branches 1997

SNI-code	Enterprises in the Business register	Enterprises in the VAT register	Number of employees in the Business register 1996	Share of employees at environmental establishments, %	Total turnover from the VAT register, Million SEK
Core industries	1 910	1 494	9 228	100	16 203
Non core industries					
21	7	10	3 330	7	5 991
26	10	11	1 214	7	2 198
29	43	52	3 943	4	7 195
40	31	37	6 363	25	41 711
74	547	549	4 928	2	4 351
80	15	16	4 058	3	1 372
Other SNI	919	904	5 605	0-2	10 657
Total excl. core industries	1 572	1 579	29 441	1	73 476
Total incl. core industries	3 482	3 073	38 669	1	89 679

TABLE OF CONTENTS

1. INTRODUCTION AND BACKGROUND

1.1 Background

There is a growing trend that environment policy and concerns are more and more integrated with other policy fields. More and more people realise that environmental problems, and policies of abatement, cannot be seen as isolated events. Instead, efficient measures of abatement make it necessary to integrate environmental concerns into all other policy fields. Another related tendency is that environment concerns are not only seen as extra costs inflicted on enterprises and other actors in the economy, but also as new business opportunities. This shift in perspectives has been strengthened during the last recession, when the environment sector has come to the focus of attention. Environment and employment policies especially have been more and more integrated. The hopes are that this integration will make it possible both to reduce environmental pressures and increase employment at the same time. For example it is suggested that:

- (parts of) the environment sector will be more labour intensive than traditional business activities and that a shift from traditional business activities to the green sector (maybe supported by green taxes) will increase employment,
- it is possible for Sweden to become a leading nation in the development of new green(high)technology, which will increase exports and domestic employment,
- and that the environment sector will be one of the few sectors which might provide future job opportunities for low-skilled workers.

In Sweden, implementation of the government policy of building a sustainable society has resulted in action plans involving all policy fields. There are also policies explicitly directed at the environment sector such as government grants for the creation of green jobs[3], and most recently, suggestions of supporting the internationalisation of the environment driven enterprises[4]. The same trends can be seen also in other countries and in the EU.[5]

However, it is not clear what is meant by the "environment sector". There seems to be a tendency to include all sorts of activities under this new heading, depending on point of view. There is also a conspicuous shortage of data on the green sector, and most of the existing information tend to be some kind of expert assessments of the size of different segments of the environment sector, which vary considerable in terms of activities covered. But work is now developing in international agencies and individual countries. OECD and Eurostat have worked on developing harmonised definitions and theoretical framework for assessing different aspects of the environment industry, and several countries are doing pilot work in this field. This report summarises the first pilot work done by Statistics Sweden on assessing the importance of the environment industry, and this will hopefully supply a basis for more systematic data production for this important sector in the future.

---

[3] Ministry of the Environment (1998).
[4] Ministry of Industry and Trade (1998).
[5] European Commission (1997).

1

1.2 Objectives and Methodology

The main objectives of this project are:

- to investigate possibilities of supplying information on the environment industry in the future
- to supply existing information on the core industries[6] of the environment industry: SNI 25.120, 37, 51.57 and 90
- to try to estimate the size of other segments of the environment industry

This will be done through the use of existing registers, surveys and other kinds of information, and by new combinations of these existing sources of information.

1.3 Structure of the report

Section 2 gives the necessary theoretical framework for work in this area. It includes recommendations on classifications of environment activities and environment producers, and suggestions of data collection methods.

Section 3 presents the results of an analysis of existing registers and surveys including a description of the source of information, presentation of existing data, and an analysis of possible use for future data production. The first part focuses on existing registers and surveys and presents data already available for the core industries of the environment industry. The second part presents work on identifying individual producers of environmental products and services.

Section 4 summarises the results of estimations of the employment and turnover for both core industries and other environmental enterprises.

Section 5 presents additional sources of information and data useful in this context but which have not been used in the overall estimates in this project.

Section 6 concludes with suggestions for future follow-up work in this field and subjects for further analysis.

---

[6] The core industries are considered to contain 100 % environmental industry, mainly waste treatment, wastewater and recycling. The core industries are NACE code headings 25.12, 37, 51.57, and 90. Where possible we use an even more detailed level of these headings which is the Swedish SNI-code. The SNI-code is the same as NACE, but with a last digit added. See Annex.

2

2. THEORETHICAL FRAMEWORK

Theoretical work on definitions and classifications has been done by an informal OECD/EUROSTAT Working Group on the Environment Industry consisting of members active in this field of work. This section is based on the draft Final version of their environment industry manual[7].

2.1 General Definition

The general definition agreed upon by the OECD/EUROSTAT working group is that:

"The environmental goods and services industry consists of 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. This includes cleaner technologies, products and services which reduce environmental risk and minimise pollution and resource use."[8]

This general definition is based on the purpose of the use of the products and services. Excluded from this definition are activities and products where the production is in some way less damaging for the environment. This project adheres to the definition above, although the first estimates presented here do not cover all parts of the environment industry. We also include some additional information on environment and economy e.g. environmentally certified enterprises and employees with environmental education. These are not included in the estimations on the size of the environment industry, but are described separately in section 5.

In Sweden the concept of environment driven enterprises has been used as a comparison to pure environment-technology enterprises.[9]

- *Pure environment-technology enterprises* supply products and services linked to cleaning-techniques, recycling, waste management, measurement of emissions, and energy production.
- The main purpose of the *environment driven enterprises* is not environment, but environment is a major force behind process- and product development as well as marketing.

These concepts are complemented by a distinction between pure environment techniques and environmentally adapted techniques:

- The main purpose of the *pure environment technique* is to treat emissions, pollution and waste. This is equivalent to the concept of end-of-pipe technology.
- The term *environmentally adapted technique* corresponds more or less to the term integrated or clean technologies. It includes techniques, services and methods of reducing the risk of negative effects of the environment: i.e. minimising resource and energy consumption, reduce the generation of waste, use of cleaner production resources and environmentally adapted products.

---

[7] OECD/Eurostat (1998).
[8] ibid. page 8.
[9] Ministry of Industry and Trade (1998).

The general definition of the OECD/EUROSTAT working group includes both the pure environment-technology enterprises and the production of environmentally adapted techniques. It does however exclude some of the environment driven enterprises as this concept also includes enterprises with environmentally friendly production. The links between production of environmental goods and services and environmentally friendly production (supply and demand sides of the environmental industry) will be further developed in section 2.4, but first we shall look more closely at classifications of environmental activities and producers.

2.2 Classification of the Environment Industry: activities

What kind of "environmental" activities are then included under the definition given above by the OECD/EUROSTAT working group? The group has provided a list of different activities divided into three groups: Pollution management, Cleaner Technologies and Products, and Resource Management. The table below summarises identified segments of the environment industry and gives examples of activities included under these segments.

Segments of the environment industry	Products, services and construction linked to for example:
Pollution Management	
Air pollution control	Treatment and/or removal of exhaust gases
Waste water management	Emission to water. Collection, treatment and transport of wastewater. Wastewater reuse systems
Waste management	Collection, treatment, management, storage and recovery of waste. Excludes manufacture of new products from recovered material
Soil and groundwater	Emission to soil and groundwater. Soil sanitation.
Noise and vibration	Reduction of (mainly outdoor) noise
Monitoring, control etc. including	
• *Environmental R&D*	R&D linked to development of cleaner products, processes and technologies as well as general research on the environment
• *Education, training, information*	Environmental education, training and information by specialised institutions or as workplace activities. Excluded are activities of the general education system
• *Other*	Environmental engineering, analytical services and the like
Cleaner Technologies and Products	
Cleaner/resource-efficient technologies	Reduced impact from production e.g.: decrease material inputs, reduce energy consumption, recover valuable by-products, reduce emissions, minimise waste disposal problems.
Cleaner/resource-efficient products	Reduced impact from use of products e.g.: decrease material inputs, improve product quality, reduce energy consumption, reduce emissions, minimise waste disposal problems.
Resource Management	
Indoor air pollution control	Treatment and renewal of indoor air to remove pollutants. Excludes air-conditioning
Water supply	Collect, purify and distribute potable water
Recycled materials	Manufacturing new materials or products from recovered waste or scrap
Renewable energy plant	Generation, collection and transmission of energy from renewable sources, including biomass, solar, wind, tidal or geothermal
Heat/energy saving and management	Reduce heat and energy use or minimise loss
Sustainable agriculture and fisheries	Reduce environmental impact of agriculture and fishery.
Sustainable forestry	Programmes and projects for reforestation and forest management on a long-term sustainable basis
Natural risk management	Prevent or reduce the impact of natural disasters
Eco-tourism	Tourism that involves protection of natural and cultural heritage etc.
Other	Including nature conservation, habitats and biodiversity

The definition and classification is to some degree flexible as it allows inclusion of extra categories that are viewed as important in individual countries. But as stressed by the OECD/EUROSTAT working group "To ensure international comparability it is most important to collect and present data in a way which allows identification of individual parts of the industry, especially with respect to borderlines between Pollution management, Cleaner Technologies and products and Resource management".[10]

There remains a few unsolved problems for part of the defined environment activities, in particular concerning the category Clean Technologies. These are difficult to define and it is not clear to what extent they should be included in environment industry estimates. The main functions of these categories are non-environmental, but they incorporate improved environmental performance. One of the issues is whether they should only be incorporated for the environmental part[11]. There are also the so-called multipurpose products where a possible environmental use may not be known even by the producer.

In this study we cover most of the environmental activities listed above in principle, except for Indoor air pollution control, Water supply, and Cleaner Technologies and Products. Waste management is well covered through existing statistics on the core industries of environment industry. The classification above has been the basis for the compilation of a list of environment enterprises, so in principle the other environment activities are in some way included in the study. In reality some environment activities are easier to get information on than others, this means that the coverage most likely varies considerably in this first list of enterprises. Some environment activities are described in separate sections because of the availability of more detailed information. These include Environmental R&D, Renewable energy, Sustainable Agriculture, Sustainable forestry, and Eco tourism.

2.3 Classification of the Environment Industry: producers

There are different ways of grouping the producers/production of the various environmental products and services listed above. In order to be compatible with other statistics, the grouping of the environment industry should in principle follow the same line as those for other economic activities. The latter is based on the concepts of units and activities. Units can be enterprises, establishments (local kind-of-activity unit), or even units of homogenous production. In this project we are dependent on existing sources of information and we shall give examples using both the enterprise and the establishment level.

Units execute an activity. Most units are engaged in a number of activities at the same time. The most important in terms of the size of the gross value added is called the *principal* activity; the other are called *secondary activities*. The principal activity is the basis for classification of activities into industries. In addition to this there may be a number of *ancillary* activities with the purpose of supporting the primary and secondary activities. If we translate all this into an environment industry context we will find:

---

[10] OECD/Eurostat (1998), page 11.

[11] There are substantial difficulties on measuring such an environmental part. This is attempted on the demand side in surveys of environmental protection expenditure (see section 5.7) One method suggested is to study the extra costs of the producers of this cleaner techniques and products. R&D and follow-up investments of this kind was included in the Swedish industry survey for 1997. The results will be to uncertain for statistical purposes, but could be used as an indicative list of such measures and extra costs.

Principal activity

These are producers specialised in the production of the environmental goods and services listed above. The existing classification of industries is not based on the possible use of the product or service produced. This means that only a part of the environment industry might be identified by using the existing classifications. These are mainly producers of services in waste water management, waste management and recycling activities: NACE 25.120, 37, 51.57 and 90. For these activities data from a number of sources are readily available and will be presented in section 3.1.

The identification of other specialised producers will have to be based on additional information e.g. from special branch organisations or special lists of environment producers. In this project we have built up a first tentative list of other specialised producers and this is the topic of section 3.2.

If one wishes to construct a new "environment industry", this would involve grouping together all these specialised producers. It should be noted that specialised producers might be involved in secondary activities not classified as environmental.

Secondary activity

It is probable that much of the production of environmental products and services takes place in the form of secondary activities. This makes it important to include these in estimates of the size of the environment industry. Secondary activities in the core domains of the environment industry, by enterprises with a non-environmental principal activity are not included in the estimates presented in this report. This is mainly due to the fact that the figures are based on enterprise statistics. This means that this is an understatement, which excludes mainly some important local government activities. [12] The list of enterprises in the non-core environment industry presented here might however include enterprises where the environment activities are of secondary nature.

Ancillary activity

This could be translated as environmental products and services produced and used within the same producer unit. This so-called *internal* production involves the use of materials and own personnel for environment protection purposes. These are the topics of separate surveys of environmental protection activities and will be described in more detail in section 5.7. Estimates of ancillary activities have not been included in the overall estimates of this study, due to lack of data. Data from other countries suggest that such activities are important especially in the air domain.

From this it is clear that there is a difference between measuring the activities of the environment industry and measuring environment industry activities. The former is limited to the specialised producers whose principal activity is production of environmental goods and services. The latter includes all kinds of environmental production, whether principal, secondary or ancillary.

---

[12] The reason for this is that information on turnover are only available on the enterprise level. Information on number of employees are however also available on the enterprise level. See also section 3.1.2.

6

It is also common to group activities according to the owner of the unit into sectors: e.g. private enterprises, public enterprises, and public sector. There is always the possibility of shifts between the different types of environment protection e.g.:

- Producers have a choice between ancillary production and buying the same service from specialised producers.
- Secondary activities might grow and become primary over the years, or be transferred into a separate producer unit and by this way become primary
- Private enterprises might take over activities in the public sector as has happened in particular in the waste domain in the last decades.

These shifts between different forms of production and producers are also the reason why the informal working group states that: "... the information should be presented in such a way that allows a breakdown into principal, secondary and ancillary, and private and public activities where possible and practical"[13]. It is clear that this is necessary for international comparisons and for studies of the growth of this sector over time. This would also suggest measuring as many activities and producers as possible, and not limit the study to specialised producers. The main focus of this project has been on measuring the environment industry through identification of enterprises where the environmental production is the principal activity, rather than measuring the total environment production, and this means that e.g. government activities are underestimated and ancillary activities are excluded in the overall estimates.

2.4 Supply and demand of environmental products and services

Regardless of the definition of producers and activities used, statistics on different aspects of an industry is based on measurements of transactions. Each transaction has two sides: e.g. selling and buying of products and services, payments of and receipt of salaries etc. These transactions can be incorporated into an accounting framework such as the national accounts. This means that you can measure both the supply and demand sides of the environmental activities: i.e. producers of environment products and services, and the buyers of the same goods.

The schedule below describes some of the links between supply and demand in the waste domain. The environment industry (supply side) involves production of goods, services, and internal activities. The demand side involves capital and current expenditure of non-environment industry and expenditure made by private households.
- Production of environment goods includes making rubbish containers. The producers sell these to the non-environment industry, where this will be recorded as (end-of-pipe) investments in the waste domain. They also sell the containers to enterprises specialised in waste management and treatment, both private and public. This would be recorded as capital expenditure by these producers of environment services classified under SNI 90.
- The waste management industry charges (households and) enterprises in the non-environment industry, for collection and treatment of their waste. The waste charges make up part of the turnover of the producers of environment services, and are part of the current expenditure of the non-environment industry (intermediate consumption) and of the final consumption expenditure of households.

---

[13] OECD/Eurostat (1998), page 8.

- The third part of the environment industry consists of internal ancillary activities in ordinary industry. This includes collection, sorting, and treatment of own produced waste. By definition own production for own use means that for this specific item supply and demand is the same. The value of the production equals the expenditure incurred.
- The schedule also indicates production affected by activities in the environment sector, but not part of this industry. These suppliers of previous stages are however dependent on the environment industry for sale of their goods and services, and an increase in the environment production would result in increased production by these suppliers. These kinds of *indirect effects* can be estimated e.g. by using input-output analysis.

Through the interactions described in the schedule we see that suppliers of the environment service producers are included under the concept of environment industry, but not the suppliers of the producers of environmental goods. The knowledge of interrelations between different actors of both the supply and demand side of the environment sector, could be used for data collection. It seems e.g. that investments in the waste-management industry would be a counterpart of environment industry sales e.g. equipment and vehicles for waste collection and treatment.

Environment Industry (supply side)		
Producers of environmental goods	Producers of environmental services	Internal or ancillary environmental activities
Producers of rubbish containers and other goods used in waste management	Waste management industry	In house waste management in non-environmental industry
Environmental Protection investments in the waste domain including rubbish containers	Current Expenditure on Environmental Protection: payments of waste charges by industry and households	Current Expenditure on Environmental Protection: internal
Non-Environment Industry and households		**(demand side)**

Other producers supplying goods and services used in the environment industry, e.g. metals, plastic, electricity to produce rubbish containers

Enterprises buying environmental goods do this in order to reduce the influence on the environment from their activities. Of course, adding environmentally friendly producers and producers of environmental products and services would mean adding parts of the demand side to the supply side: e.g. an enterprise that produces sewage treatment equipment and the enterprise that invests in the same equipment! The two companies might be said to be environment driven but in calculations of a new environment industry the two should be kept apart. The environmentally friendly production most likely results in some kind of internal/ancillary environmental activities which should be included in estimates of environmental production, together with the value of the production of the sewage treatment equipment. Demand side estimates might of course be used for estimating the production of environmental goods. This means that the supply and demand framework might be used for improving data collection as will be seen in the next section.

2.5 Methods of data collection and Work done so far

Despite the interest in this new "green" sector, there is a serious shortage of data available. Furthermore the existing information varies considerably in terms of coverage, definition and quality. A summary of the work done up to 1995 has been done by rDI.[14] This report includes an estimate of the Swedish environment industry made by The Royal Swedish Academy of Engineering Sciences (IVA).

IVA estimated the size of the pure environment-technology sector in Sweden in 1995.[15] This corresponds more or less to the production of products and services within the Pollution Management group (principal and secondary production with the exclusion of internal/ancillary and public sector activities). The estimate was based on analysis of relevant SNI codes and discussions with branch representatives and statisticians. Total employment was estimated to around 15000 employees, and total turnover to around 15 000 Million SEK. 80 percent of employment and 70 percent of turnover consisted of activities in branches defined as pure environment: SNI 25.12, 37, 51.57 and 90. The rest consisted of estimates of production of air pollution prevention equipment, equipment for wastewater treatment, and instruments for measurement and control, soil sanitation activities, and performance of measurement and other consultant services.

Apart from this kind of expert assessments, it is possible to distinguish three main methods of data collection for the environment industry. Each method has different implications as regards e.g. level of detail of information possible to supply, strengths and weaknesses of measuring different parts of the environment industry, and of course relative costs in terms of resources and time needed to collect the data.

1. Supply-side approach

This is the traditional form of data collection on other types of economic activities. Only recently supply side information has been collected on the environment industry. It is recommended by the informal working group that supply side information be collected mainly for the producers whose principal activity is within the boundaries of the defined environment industry. It is also suggested that supply side estimates include producers where the environment activity is significant although not the principal product (secondary

---

[14] Recherche Development International (rDI), (1996).
[15] IVA (1996).

production). It is possible to distinguish between three ways of obtaining supply side information.

i) Collection of data through new directed surveys of the environmental producers.
Specific surveys are needed in order to get detailed data. New directed surveys of the environment producers have been done in e.g. USA[16] and surveys are currently being done in Germany and France. Statistical Agencies in many countries work to limit the number of surveys inflicted on the respondents; especially small and medium sized enterprises. Sweden is no exception. This implies that any introduction of new surveys will be difficult to motivate. The information supplied must be highly demanded, and it has to bee impossible to use existing information and surveys to supply the information required. There may also be problems to get response rates high enough to secure reasonably good quality of data. This project is limited to using existing sources of information only, although the results of the work done could be used as a basis for a future survey.

ii) Collection of supply-side data through the use and combination of existing sources of information.
Existing registers and classifications of producers or production have not been built up for identifying environmental aspects. Instead, environment is typically a part of many categories in different classifications. Although much work has been done on revising classifications so that environmental aspects could be identified separately[17], it is hard to see that this will change the situation dramatically in the near future. At the moment it is only possible to get good supply side information mainly for the waste water, waste and recycling industries. Several countries have investigated the possibilities of supplying register based supply side information.[18] This has also been done in this project and the results of this is described in section 3.1 along with a presentation of existing data already available. It seems possible to get much more information through the use of existing sources of information, but that requires identification of individual producers.

iii) Database of environmental producers.
It would be desirable to build up a database of the producers of various environmental goods and services. When the producers are identified, it is possible to collect all the existing information on these producers already available through different registers and surveys. It is also possible to link and match different registers in order to get new data from the existing sources of information, and to improve the list of environmental enterprises. As shown in section 3.2. part of the work in this pilot project has focused on identifying individual producers, and using existing information to provide estimates on number of employees and turnover for these. A similar method has also been tested by Statistics Finland.[19] This estimate should be seen as a first indication, which suffers from some important limitations in terms of quality and coverage. Future work should try to ascertain the environmental share of the non-core enterprises, improve the coverage of governmental activities, add important parts missing today such as construction etc. This list of producers could also be the basis for new specific environment industry surveys, total or directed at specific segments of the environment industry. It would also be desirable to include information on main environmental activity in this database. A detailed specification of environmental activities seems to require a survey of the producers. It seems possible, though, to use other available

---

[16] Bureau of the Census, U.S. Department of Commerce (1998).
[17] e.g. Consumption of Functions of Government (COFOG) or classifications of education.
[18] Statistics Denmark (1998).
[19] Statistics Finland (1997).

information in order to get a first indicative classification of enterprises according to main environment activity All in all, the improvements and extensions mentioned here seems possible although this has not been possible in the line of this project.

2. Demand-side approach

It is possible to use information on the demand for environment products and services as a basis for estimating supply side data on an aggregated level. It might be possible also to convert data on expenditure into estimates of employment. Existing information for the demand side is restricted to statistics on Environment Protection Expenditures. This involves measuring extra costs associated with demand for environment products and services, which basically corresponds to the demand side of the Pollution Management group as defined by the OECD/EUROSTAT working group[20]. Expenditure surveys cover total national demand in selected industries for these products and services. This approach seems less promising for supplying data on the environment industry, not the least because demand side information in Sweden is very limited, although it is likely to increase somewhat in the future. But demand side surveys can be used to complement supply side information with data for some specific parts, such as internal/ancillary activities, or for reconciliation of the supply of environmental construction activities with investments e.g. in sewage networks.

An estimate of the size of the environment industry in the European Union and the member countries has been done based primarily on demand-side information.[21] Since the amount of demand side information varies considerably between countries, and the expenditure data is very limited, the results of these kinds of demand side estimations are very uncertain at least on the detailed (country) level.

3. Combining supply- and demand-side approaches

If data are gathered and incorporated into a consistent framework, it is possible to combine available information on both the supply and demand sides and attempt to reconcile this information within an accounting framework. This would allow improving existing data through checks of consistency, identification of data gaps, and allow the use of demand side information to cover such gaps in the supply side data. This makes it important for the data to be consistent with the national accounts framework for economic analysis, and also the environment accounts for connections with physical data. Through the use of this (input/output) accounting framework it is also possible to estimate indirect employment effects by activities in the environment sector: i.e. incorporating effects on the suppliers of previous stages of the production process.

The choice of methods of data collection influences what kind of variables are possible to estimate. There are several interesting variables describing different aspects of the environment industry. The choice of variables naturally depends on the aims of the investigation. The table below summarises some of the most important information needs and possible choices of variables.

---

[20] The Pollution Management group seems to be a rather more broad concept than environment protection especially as regards recycling and R&D activities.
[21] Ecotec, BIPE and IFO (1996).

11

Information needs	Choice of variables
Estimate size of the environment industry	Number of enterprises, employees, turnover
International competitiveness	Size of export and import
Leading in developments of new environmental technology	Size of environmental R&D, level of high-skilled workers (educational levels)
Job opportunities for low-skilled workers	Educational levels
Developments of the size of the environment sector	Relative yearly growth in turnover, value-added, employment etc.
Role of the government	State aid for industry promotion and exports, government grants to environment measures and for the creation of green jobs.

The OECD/EUROSTAT working group has identified the following variables as a minimum in order to enable basic analysis of the environment industry (broken down on environmental activity and business activity if possible):

- turnover
- employment (if possible by skill level or occupational classification)
- investment
- exports
- and R&D.

In this pilot project we will focus mainly on estimating the size of the environment industry and thus concentrate on number of enterprises, employees, and turnover. Possibilities of supplying also other information of interest will be described in the analysis of existing registers and surveys.

3. SOURCES OF INFORMATION

3.1 Describing the core industries from existing registers and surveys

This section presents the results of an analysis of different existing registers and surveys. It includes a description of the sources of information, presentation of existing data, and an analysis of possible use for future data production. The basis for many of these sources of information is the SNI[22] classification of activities in different branches of industry. As already pointed out, there are only a few branches of industries that could be identified as pure environment industry branches: i.e. SNI classes 25.12, 37, 51.57 and 90. Data for these industries are available in a number of registers and surveys, and will be presented below. A more in depth study of the waste and recycling industry will be the topic of a separate project. This will focus on problems with classifications, analysis of existing surveys e.g. as regards relevance from an environment industry and environmental accounting point of view. The project will also analyse borderlines between public and private activities in the waste domain. It is foreseen that this work will provide a basis for further understanding and improvement of data for these activities.

This means that the largest part of the environment industry is hidden under other SNI classes. Despite this, it is possible to get much more information from the existing registers, if it is possible to identify individual enterprises. The data presented for the core industries then indicate also the data that can be presented for other parts of the environment industry when such lists of enterprises are compiled.

3.1.1 Statistics Sweden's Business Register

The Business Register includes all legal units or individuals that run an activity, large or small. The main source is the National Taxation Authority from which Statistics Sweden gets up-to-date information twice a month.

· The enterprises and establishments each have a unique identification code, which is used in all registers and surveys dealing with enterprise statistics. They also have an activity code according to the SNI classification. This means that information on the core industries of the environment industry is already available and that identification of individual producers and their identification codes could be the basis for supplying information also on the non core enterprises or establishments of the environment industry. Examples of other information that are included in the Business Register are the enterprise size in terms of number of employees, geographic code, legal form and number of establishments.

Information from the Business Register that we are interested in include the following variables:

- Enterprises with the SNI codes 25.12, 37, 51.57 and 90
- Number of employees
- Establishments
- Address (for geographical purposes)
- Identification code

---

[22] NACE classification and the Swedish SNI classification is the same down to the four digit level, the last digit in the SNI five digit level is a Swedish addition. See Annex.

Enterprises and establishments in the Business Register 1997

SNI-code	Number of enterprises	Number of employees [1]	Number of establishments	Number of employees [2]
25120	112	632	118	700
37100	78	441	87	431
37200	46	184	51	210
51570	913	2 373	1 012	2 443
90001	52	409	608	2039
90002	285	3 879	517	5 388
90003	11	8	11	8
90004	10	28	21	113
90005	20	497	56	451
90006	12	66	13	70
90007	56	152	66	173
90008	315	559	336	1 482
Total	1 910	9 228	2 896	13 508

1) Number of employees in the enterprises 1996
2) Number of employees in the establishments 1996

The table summarises information on number of enterprises/establishments and number of employees in the core industries. The figures on the number of employees differ depending on the unit chosen. When enterprises is the principle of selection all employees at enterprises within the selected SNI code are counted, even those working on an establishment that is listed under another first SNI code. When establishment is the principle of selection all employees at the establishments with the selected SNI code are counted, even if the establishment belongs to an enterprise listed under another heading. The total number of employees based on establishments are 13 508, of which 9 044 employees are in enterprises with the principal activity in the core industries, and 4 464 are in enterprises with another principal activity (secondary environmental production). The latter are mainly local government units active in the waste management and wastewater domain, where the activity is directly run by the government unit and non-organised in a public enterprise, or contracted out to private enterprises. The total number of employees based on enterprises are 9 228. As we have seen, 9 044 of these are working in establishments with a principal activity in the core industries. The remaining 184 are working in establishments with other main activities (secondary non-environmental production). In statistics for employment, the number of employees based on establishments is the most commonly used figures, since these are a "purer" statistical unit. We are working mainly with the enterprise level here since information on turnover from the Register for value added tax is based on enterprises and no information on establishments is available.

3.1.2 Register for value added tax (VAT)

The survey includes all enterprises liable for VAT at the Swedish National Tax Board and with a turnover over 200 000 SEK (over 1 000 000 SEK from 1996). Tax liability exists on taxable sales of goods or services that take place within Sweden in the course of a commercial activity. This is the main rule for determining when tax liability exists. Tax liability also exist on:

- taxable intra-Community acquisition of goods that constitute chattels, i.e. movable tangible property
- taxable import of goods
- taxable purchases of certain services from foreign entrepreneurs (import of services).

In the register for VAT, the following variables are of interest:

- Enterprises with the SNI codes 25.12, 37, 51.57 and 90
- Turnover within Sweden liable to VAT
- Turnover of goods and services to foreign countries
- Identification code

There are differences between the Business Register and the VAT register as can be seen in the table below. This depends on the fact that in the Register for value added tax, small enterprises with a low turnover, are not included. Whereas in the Business Register all legal units or individuals who run an activity are included. The difference can also be explained by reorganization and expired or new enterprises.

**Enterprises in the Register for VAT 1997
versus in the Business Register 1997**

SNI-code	Number of enterprises in the VAT Register	Number of enterprises in the Business Register
25120	129	112
37100	70	78
37200	43	46
51570	641	913
90001	43	52
90002	273	285
90003	10	11
90004	9	10
90005	18	20
90006	16	12
90007	52	56
90008	190	315
Total	**1 494**	**1 910**

Data presented in the table below covers the years 1993 until 1997. However, some of the data for small enterprises, for the years 1996 and 1997, are calculated from the figures for 1995, where all enterprises with a turnover over 200 000 SEK are included.

Total turnover in million SEK excluding VAT and the share of turnover of goods and services to foreign countries

SNI-code	1993 Total	1993 Export	1994 Total	1994 Export	1995 Total	1995 Export	1996[1] Total	1996[1] Export	1997[1] Total	1997[1] Export
25120	987	3,3%	1 041	4,2%	908	5,2%	815	5,3%	853	5,2%
37100	528	43,6%	684	43,5%	1 017	27,1%	1 243	30,8%	1 258	32,2%
37200	116	26,1%	318	13,2%	891	3,5%	1 117	3,4%	1 255	4,2%
51570	4 273	16,3%	5 055	17,5%	6 652	19,1%	5 814	19,0%	6 076	17,1%
90001	1 355	0,1%	568	2,0%	697	9,4%	768	7,2%	781	1,3%
90002	3 458	0,2%	3 692	0,5%	4 101	0,7%	4 134	0,7%	4 291	0,4%
90003	2	0,0%	2	5,0%	4	2,9%	9	2,9%	15	0,0%
90004	55	0,0%	59	0,0%	60	0,0%	78	0,0%	76	0,0%
90005	399	0,2%	450	3,0%	428	4,3%	663	3,2%	723	3,6%
90006	93	24,0%	150	48,0%	123	28,1%	143	28,3%	98	13,0%
90007	143	0,3%	167	0,8%	245	2,1%	200	2,9%	267	2,8%
90008	367	0,1%	471	0,1%	507	0,3%	484	0,3%	511	0,0%
Total	11 776		12 656		15 631		15 467		16 203	

1) Partly projective, see description above

The total turnover has increased for the total of the core industries.

The market for the environmental goods and services to foreign countries are mainly in the SNI-codes 51.57 and 37.1. In all other core environmental SNI-codes there are hardly any export at all. Therefore it is difficult to analyse the export share of the total turnover. However in 1997 the share was also highest in SNI-code 37.1.

The turnover within Sweden (total turnover excluding export) follows the trend for the total turnover. The turnover has increased for the total of the core industries.

3.1.3 Financial statistics in the service sector

Financial statistics for the enterprises in the service sector covers mainly the SNI codes 50 - 74, 80-93.

The statistics is based on a stratified sample survey for enterprises with less then 50 employees. All enterprises over 50 employees are studied. The main source is the Business Register.

This means that financial statistics include information on the core industries:

* 51.57   Wholesale of waste and scrap
* 90   Sewage and refuse disposal, sanitation and similar activities

For these branches we are mainly interested in the variables:

- Financial Account (i.e. income, cost)
- Investment
- R&D
- Identification code

The table below summarises information from Financial statistics 1996.

Financial statistics in the service sector 1996
Million SEK

SNI-code	Number of enterprises	Number of enter-prises in the Bus-iness Reg. 1997	Turnover	Turnover in the VAT register	Operating expenses	of which: wages and salaries
25120	119	112	811	815	744	170
37100	45	78	694	1 243	617	124
37200	27	46	1 113	1 117	1 023	32
51570	484	913	5 904	5 814	5 478	650
90001	43	52	567	768	376	110
90002	237	285	4 156	4 134	3 598	1 320
90003	8	11	9	9	6	1
90004	7	10	72	78	57	4
90005	11	20	506	663	379	112
90006	14	12	137	143	110	35
90007	46	56	293	200	253	59
90008	145	315	518	484	460	143
Total	**1 186**	**1 910**	**14 781**	**15 467**	**13 101**	**2 760**

3.1.4 Manufacturing statistics

Manufacturing statistics cover all enterprises with more than 10 employees within the SNI codes 10 - 37. That means the extraction and manufacturing industry. This means that from manufacturing statistics we can get detailed information on the core industries:
- 25.12   Retreading and rebuilding of rubber tyres
- 37.1   Recycling of metal waste and scrap
- 37.2   Recycling of non-metal waste and scrap

For these branches we have selected the variables:
- Establishments
- Income
- Cost
- Employment

Selection of available manufacturing statistics
Million SEK

Income/Costs etc.	SNI-code 25.12				SNI-code 37.1				SNI-code 37.2			
	1993	1994	1995	1996	1993	1994	1995	1996	1993	1994	1995	1996
Establishments	10	14	14	15	11	13	12	14	..	..	6	7
Value added	73	135	145	147	168	243	265	208	..	..	41	87
Operating income	230	398	417	438	428	636	728	772	..	..	141	228
Market value	204	321	352	389	420	622	677	712	..	..	98	128
Total costs	208	342	361	391	333	510	573	685	..	..	126	176
Employees	213	327	347	365	248	416	341	358	..	..	100	127

We can summarise that there are only a few establishments in these branches, but the number of employees and the market value has increased for all branches during 1993-1997. Please note that the SNI code 37 was split into 37.1 and 37.2 from 1995.

It is also possible to get information about the following variables:
- Working hours
- Consumed bought energy
- Income of non-industrial activity
- Salary to wage-earners, salaried employees, other
- Social security expenses
- Raw material, not outer packing
- Outer packing
- Bought electrical energy
- Bought fuel
- Hired transportation
- Bought maintenance and repairing work
- Purchase of commodities
- Employed wage-earners, salaried employees, other

Product codes

An analysis of the activities of the environment industry includes looking at what kind of products this industry produces. An alternative way of identifying enterprises in the environment industry can be to study manufacturing statistics and product classifications more closely. If we can identify individual product groups in the classification that are mainly used for environmental purposes, it is possible to identify the main producers/enterprises of these products, and these producers/enterprises should be a part of the environment industry.

In this project we have made a first analysis of the product classifications. It is difficult to single out individual codes that are purely environmental. The majority of the environmental products are grouped together with non-environmental products. For example we have the product code for filters. In that code there are filters used for purification and filters for other industrial purposes. If we had the knowledge about the shares of environmental products in each code, this approach could be used for further analysis. Future work should include looking more closely at the product codes and analyse in which branches of industry and individual enterprises these products are produced.

In the line of this project we have chosen four product groups which will illustrate this method. The product groups based on HS codes are the following:

1) 2521000 - 6   Lime for lake liming
2) 4707100-900   Waste and consumed paper and paper board goods
3) 7001000   Waste of scrap and glass; melted glass
4) 9027   Instrument and equipment for physical and chemical analysis

The first three product groups above are examples of codes, which could be classified as purely environmental products. The fourth product group is not entirely environmental and we do not know how large the environmental share is. However, the product group Instrument and equipment for physical and chemical analysis most likely include many important environment products and was therefore included in this study. Through manufacturing statistics it was possible to identify enterprises that had a large share of production of these product groups. A total of 23 enterprises were identified by this exercise and these were included in the list of environmental enterprises presented in section 3.2.

3.1.5 The Employment Register System linked with the register of Education

Employees by establishments in the core industries

In Sweden, as well as in other European countries there are some hopes set on the environmental industry to create new jobs and somewhat lower the unemployment ratio. From an unemployment level below 2 percent, the unemployment increased in Sweden during the early nineties to about 8 percent in the mid nineties.

The level of education is an important variable to study in order to describe the development of a branch. Does the job require long education? Employers tend to ask for persons with long education even if it is not necessary to handle the assignment. Is it a young industry, with young employees? The younger generation has a longer average education. Is it dominated by men or women? Is this a future coming branch that can afford to hire people with high education? Are the employers private or run by government? In this section we will try to describe the core industries according to some of these questions.

The linked Register was originally made to analyse and make forecasts and projections in the area of education and labour market. It contains data about establishments on the SNI level aggregated from the identification code. The Register also contains data about the population aggregated from the social security code. The information is linked in order to combine persons with the SNI code under which their establishment is listed. The register is currently updated to year 1995, but 1996 will be available in the beginning of 1999. When the list of enterprises/establishments outside the core industries is thoroughly compiled it will be possible to describe the education levels and other data specifically for these enterprises/establishments.

According to the linked Register there were 14 242 persons employed within the core industries in 1995. This was an increase of 2 percent compared to 13 958 employed in 1992. This may not be much, but the total number of employees in Sweden decreased with 5 percent during the same period of time. The core industries managed to increase under a period of recession on the labour market as a whole.

Private and governmental sector

The environmental industry employers are not homogeneously spread by sector. In some of the branches like Retreading and Recovery of waste there are no governmental employers. In deposit on landfills on the other hand, most companies are publicly run. Between 1992 and 1995 there has been only a small change towards the private sector. Some of the changes on a more detailed level shown in the table above are not statistically sound. This could be a result of the new code system SNI-92 (NACE rev 1 with a Swedish digit added) which was implemented in 1992. The figures from 1992 are shown mainly to indicate that time series can be done in the future.

Employees in the core industries

| SNI-code	Governmental 1995	Private 1995	Total	% private 1995	% private 1992
25120	0	832	832	100	100
37100	0	468	468	100	99
37200	0	116	116	100	100
51570	45	2 808	2 853	98	100
90001	2 034	160	2 194	7	5
90002	2 728	3 194	5 922	54	50
90003	0	4	4	100	100
90004	91	16	107	15	17
90005	22	246	268	92	24
90006	0	127	127	100	100
90007	66	107	173	62	98
90008	608	570	1 178	48	98
total	5 594	8 648	14 242	61	60

Level of education

The level of education is lower in the core industries then on the labour market as a whole. Deposit on landfills of non-hazardous waste has the lowest level of education, as much as 64 percent of the employees has only Maximum 9-year compulsory school, to compare with 23 percent on the whole labour market. Only 5 percent have Post secondary or postgraduate education (mainly university education) which is 27 percent for the whole labour market in Sweden. The average for the core industries is also very low, as much as 43 percent only has Maximum 9-year compulsory school and only 8 percent has Post secondary education or more.

In some ways it is possible to compare the environmental industry with the computer industry. Both branches have a rather small amount of employees in the core industries. Beside the branches dealing especially with computers, computers are implemented in almost every other branch, and almost everybody on the labour market and in society has to have some knowledge about how to use them. The core environmental industry branches are not very large today, but the implementation of environmental concern increases. With this development the impact on labour market and education in general increases. However there are also large disparities between Computers and the development of the "IT-society" and the development of environmental industry and concern. One important disparity is the level of education, as shown below. The SNI-heading 72.002, Computer software making is used to illustrate this. The education level is very high. Contrary to the core environment industry branches, the education demands and lack of educated employees are often brought up as a delay of growth.

Level of education 1995 (after the lowest level) Core industries - Total labour market-Data software
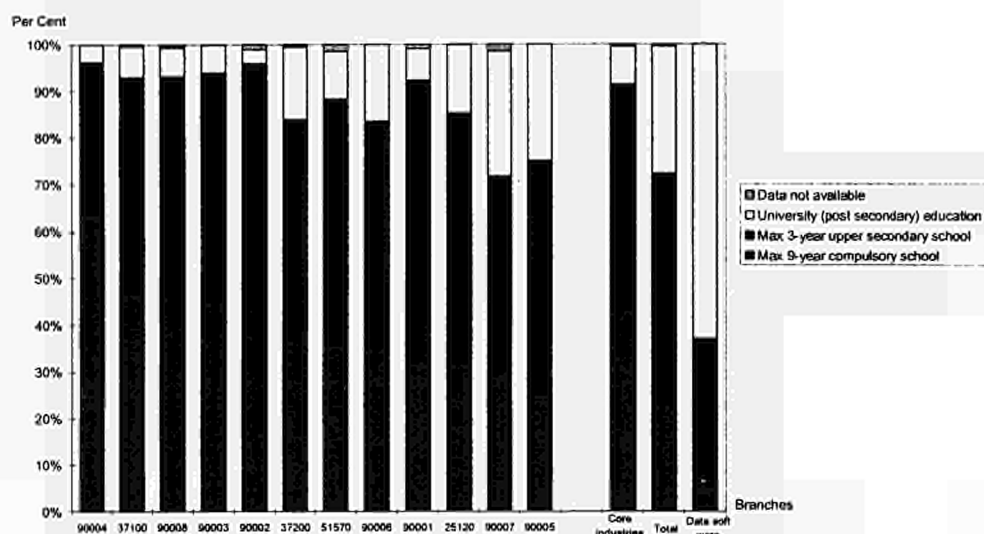
In order to see whether the core environmental branches have some special education demands, the employees have been ranked after the most common education.

Most common education groups, 1995, Core industries - Total labour market

Education	Core industries	%	Total labour market %
Max 9-year compulsory school	6110	43	23
Upper secondary school for industry	972	7	3
Other industry or crafts education(upper secondary)	687	5	3
Upper secondary school commercial programmes	681	5	7
Upper secondary school, Vehicle programme	665	5	1
Upper secondary school, natural science or technical	552	4	3
Upper secondary school, Transport programme	470	3	1
Other education programmes	4105	29	60
Total	14242	100	100

Not surprisingly, the most common education group among the employees was Maximum 9-year compulsory school, 43 percent as shown above. After that came Upper secondary school for industry, 7 percent and Other industry or crafts education at the same level, 5 percent. For the labour market as a whole, Maximum 9-year compulsory school was the most common education with 23 percent of the labour force. Upper secondary school, commercial programmes was the second most common education, 7 percent.
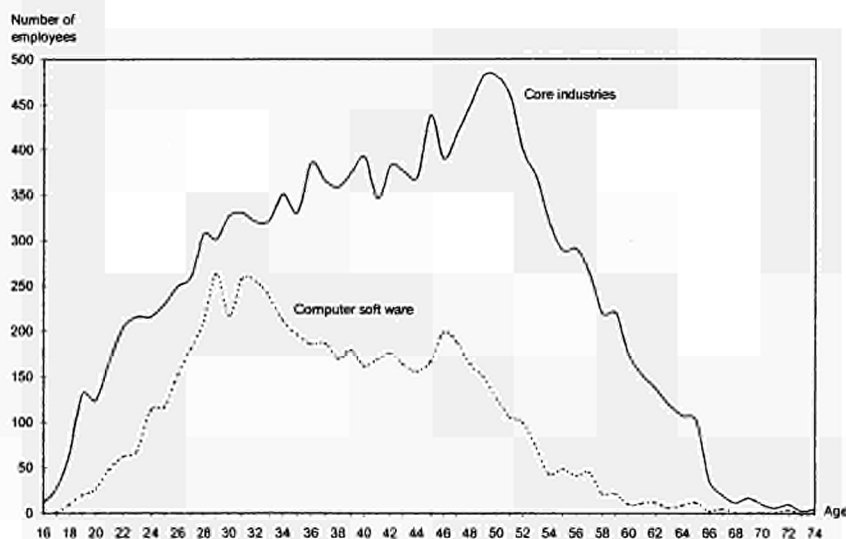
The employees by age

Along with the level of education, age is of great importance, explaining individuals possibilities to get a job. The youngest and the oldest have high unemployment ratios. However, the division of the employees in age groups indicates that the distribution of age groups in the core industries is very much the same as on the labour market as a whole.

The employees in the core industries by age, 1995.

SNI-code	Total	16-25 years	%	26-45 years	%	46-74 years	%
25120	832	170	20	396	48	266	32
37100	468	54	12	221	47	193	41
37200	116	18	16	61	53	37	32
51570	2 853	412	14	1 400	49	1 041	36
90001	2 194	122	6	899	41	1 173	53
90002	5 922	466	8	3 034	51	2 422	41
90003	4	1	25	3	75	0	0
90004	107	7	7	42	39	58	54
90005	268	21	8	153	57	94	35
90006	127	9	7	46	36	72	57
90007	173	17	10	88	51	68	39
90008	1 178	91	8	547	46	540	46
Total core industries	14 242	1 388	10	6 890	48	5 964	42
Total labour market	3 842 026	438 331	11	1 873 159	49	1 530 536	40

In order to illustrate the age curve for the core environment industry, computer software is used for comparison. While soft ware has mainly young people employed, the core industries have a lot of elderly employees as well as a great deal of very young people who has not (yet) been able to graduate from longer education programmes. The very young and the elderly have high unemployment ratios in Sweden. The high share of employees approaching retirement age in the core industries indicates a lot of new appointments in coming years just to maintain the present level of employees.

The employees in the core industries and in the computer software industry by age, 1995.


The employees by sex

Almost nine out of ten employees in the core industries are men. There are only small differences between the private and governmental sector. The whole labour market in Sweden is nearly equally shared among men and women. However, women represent a greater proportion in the governmental sector and men in the private sector.

Private (non-governmental) sector, 1995
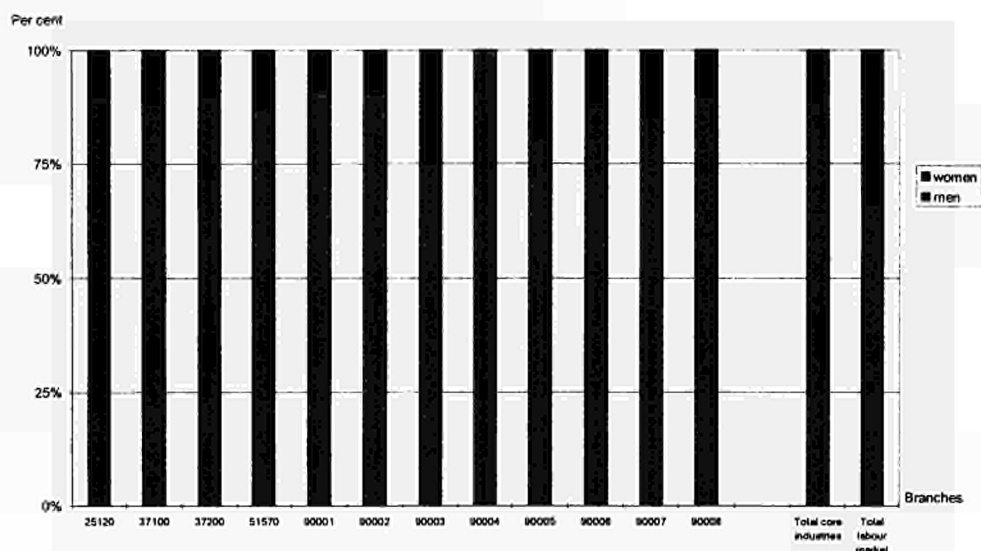
Governmental sector (municipal or run by state)[23], 1995
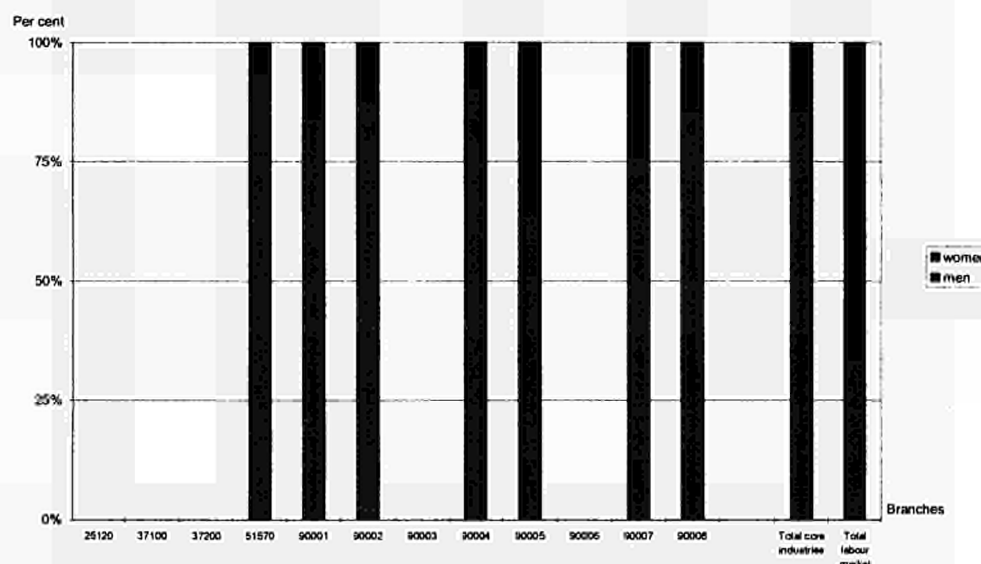
Employees by income

The average income is somewhat lower in the core environmental branches then on the labour market as a whole. This could be a result of the relatively high share of employees with short education.

In order to make a more specific description the employees have been divided by sex and sector. In Sweden, men have higher mean income then women, partially due to the fact that women often work part time. In the core industries, the difference in mean income between men and women is less then on the total labour market. This is sometimes the case in branches with a high share of men employed.

---

[23] There were no enterprises represented in the governmental sector for some of the core industries, that is why these bars are missing.

Employees by core industry and yearly income, 100 SEK 1995

SNI-code	Women Governmental (State and municipal)	Women Private (and other non-governmental)	Men Governmental (State and municipal)	Men Private (and other non-governmental)
25120	0	1 327	0	1 767
37100	0	1 679	0	2 233
37200	0	2 071	0	2 207
51570	2 004	1 431	1 535	1 711
90001	1 435	1 613	2 043	1 854
90002	1 599	1 698	1 969	2 032
90003	0	1 181	0	1 606
90004	1 796	0	1 777	1 601
90005	1 575	1 700	2 497	2 412
90006	0	2 115	0	1 995
90007	1 506	1 709	2 230	1 872
90008	1 603	1 278	1 627	1 783
Total core industries	1 645	1 618	2 008	1 923
Total labour market	1 597	· 1 473	2 151	2 028

The data covers income, which is not the same as wages. Income could pertain from more than one employer.

3.2 Identifying other environmental enterprises

An important task for development of statistics on environment industry is to identify individual environmental enterprises. The objective is to build up a database of these environment enterprises. This could be the basis for providing already existing information through different registers and surveys. It can also be the basis for future surveys in this area. In this project we have made first attempts of compiling such a list. This work is not complete and future work need to focus on complementing this first list. Future work also needs to concentrate on trying to ascertain how large the environment activities of these enterprises are. The first step would be to divide enterprises in three categories: principal, secondary but substantial, and environment activity of minor importance.

The list of enterprises (outside the core industries) related to the environmental industry has been compiled from different sources of data. The enterprises have been selected according to the definition of the OECD/EUROSTAT group. The sources of data were the telephone directory, enterprises in the Business Register where the name of the enterprise included ecology or environment, list of environmental consultants[24], enterprises in the EU-report[25], environmental consultants found by searching on the Internet and enterprises producing the environmental product codes[26].

The enterprises from the different sources have been compared and duplicate enterprises have been erased. The next step was to find the identification code in the Business register for the about 2 700 enterprises. Almost every enterprise was identified by searching in the Business Register. Only about 50 enterprises were not found and are therefore not included in the total estimation.

Thereafter the completed list with identification codes was sent to the Business Register and the VAT Register, to get the total employment and turnover estimation for the environment industry. About 1 570 enterprises had information in these two registers. The rest of the

---

[24] The Swedish Environmental Protection Agency (1998).

[25] Ecotec, BIPE and IFO (1996). The Swedish Eco-Industry: Country Summary.

[26] See section 3.1.4 for more detailed information.

enterprises were not active. The number of employees for the total list have been based on the enterprises and not on the establishments for practical purposes. In a future analysis it would be interesting to look more closely on environmental establishments.

Although efforts have been made to include mainly enterprises with a substantial amount of environment production this list should be interpreted as a first preliminary assessment. In the future the list could be extended with for example membership lists of branch associations, lists of producers of renewable energy, producers of selected environment products business guides complemented by producers known to be active in this field of work, and additional information from the establishment and enterprise register.

3.2.1 Telephone directory

In order to find companies in SNI headings outside the core industries one of the methods has been to list companies from the telephone directory on CD-ROM. The point of using this register is that it contains "all" enterprises and that they are structured in a different way from the traditional statistical registers. Under the "yellow pages", the companies are listed according to business. Examples of useful headings that traditional registers lack are "Environment, analysis-laboratories", "Environmental care", Environmental consultants" and so on. One company can be listed under several headings and some of the headings in the system are very similar. It is the company itself that decides under which heading/headings it chooses to be listed. The Swedish Telephone Company charges about 2000 SEK per heading. In order to delimit the environmental industry businesses we have chosen the headings that are within the definition of environmental industry. Headings directly corresponding to the core industries have not been chosen. Only the companies, where the company name indicates that the company is within the definition has been listed. Some cleaning companies and large construction companies for instance, has chosen environmental headings. They have been sorted out and are not part of the study.

This search resulted in nearly 2500 hits that could be reduced to about 750 enterprises due to the fact that many enterprises are listed under more than one heading. In future work it would be of interest to use this list and the headings to try and sort the enterprises more carefully by environmental activity such as water, air, biodiversity and so on.

The result of compiling the first list of enterprises outside the core industries is described in the next section.

4. ESTIMATION OF THE ENVIRONMENT INDUSTRY

An important output from this study is a first estimation of the environment industry in Sweden. Different methods have been used in order to accomplish this.

For the core industries we have compiled data from different registers, and the quality of these data are as good as the registers used. These are mainly total registers of very good quality. When the data differs according to which register they are selected from, this is mainly due to different delimitation because of different purposes for the registers.

In order to estimate the environment industry outside the core industries a list of enterprises from various sources has been compiled. This is the first attempt in this line of work in Sweden and the list needs improvement as described above.

Number of employees

The total estimation for both core industries and other environmental industry resulted in nearly 39 000 employees. This is about 1 percent of the total labour force in Sweden. Earlier estimations of the Swedish environment industry resulted in 15 000-20 000 employees[27]. It is possible that the estimation in this report will be reduced after further studies, but so far there are strong indications that the list rather will grow as more work will be done.

In most SNI headings the share of employees in what has been classified as environmental industry in this report is less than one percent.

The largest share, 25 percent or 6 400 employees, was found under SNI 40, Electricity, gas and water supply. Environmental enterprises under this heading mainly produce energy from renewable sources, often wood fuels. The percentage about equals the renewable energy part of the Swedish gross supply of energy (see section 5.3).

Nearly 5 000 employees were found under SNI 74, Other business activities. Environmental consultants, environmental technical testing and analysis and industrial cleaning were the main headings for the enterprises chosen.

More then 4 000 employees were found under SNI heading 80, education. The main employer under this heading was the Swedish Labour Market Board, who deals with vocational training. Many unemployment projects in Sweden are carried out within the environmental sector, but there is a great need for further studies to delimit the environmental industry part under this heading, which is probably overestimated here.

Nearly 4 000 employees were found under SNI 29, Manufacture of machinery and equipment. Producers of equipment for wastewater treatment and waste treatment were dominating in this group.

The SNI heading 21, Manufacture of pulp, paper and paper products; publishing and printing, included over 3 300 employees. The enterprises were mainly producers of Environmental packing - packing products made from waste paper. Many of the enterprises were found through the product code Waste and consumed paper.

---

[27] IVA (1996).

The branches/headings mentioned above had the largest amounts of environmental industry employees besides the core industries. The largest share after Electricity, gas and water supply (25 %) was found in SNI 21, (see above) and 26, Manufacture of other non-metallic mineral products, 7 percent (1 200 employees). Producers of cement composting tanks and lime for lake liming were found here. Future work should try to ascertain the environmental share of the non-core enterprises, improve the coverage of governmental activities, add important parts missing today such as construction etc.

Turnover

The total turnover for both core industries and other environment industry was over 89 700 million SEK. The list of enterprises in this study is (as pointed out above) not final and further work might reduce or increase the estimated turnover. However, this study represents a new approach as it is not only based on expert assessments, but also include a first attempt to create a total list of environmental enterprises.

The largest turnover was in the SNI 40 Electricity, gas and water supply, with nearly half of the grand total turnover for the environment industry. Other branches of industry with large turnover from environment industry was SNI 74: Other business activities, 29: Manufacture of machinery and equipment and 21: Manufacture of pulp, paper and paper products; publishing and printing. The branches of industry with large turnover within the environment industry are mainly the same as those with many employees.

Total estimation of the environmental industry in 1997

SNI-code	Enterprises in the Business register	Enterprises in the VAT register	Number of employees in the Business register 1996	Share of employees in environmental establishments	Total turnover from the VAT register, 1 000 SEK
Core industries	1 910	1 494	9 228	100%	16 203 000
0	114	104	0	0%	14 829
01	59	58	150	1%	132 253
02	20	21	25	0%	36 565
05	1	1	1	0%	420
10	3	3	4	1%	25 206
14	3	4	44	2%	78 602
15	5	5	8	0%	13 832
17	2	2	67	1%	74 494
20	21	21	243	1%	609 580
21	7	10	3 330	7%	5 991 471
22	14	17	1 518	3%	2 524 724
23	4	4	16	1%	81 320
24	11	11	82	0%	115 438
25	11	12	123	1%	281 149
26	10	11	1 214	7%	2 198 365
27	1	1	22	0%	76 340
28	14	14	134	0%	87 137
29	43	52	3 943	4%	7 194 536
30	1	1	0	0%	283
31	3	3	12	0%	11 915
33	5	6	303	1%	331 961
34	4	4	178	0%	242 922
35	1	1	0	0%	1 019
36	4	4	8	0%	3 002
40	31	37	6 363	25%	41 711 012
41	0	1	0	0%	0
45	108	110	607	0%	996 000
50	9	11	14	0%	25 177
51	252	246	896	1%	2 699 936
52	78	72	255	0%	518 873
55	7	8	7	0%	8 456
60	33	35	253	0%	550 358
61	1	1	3	0%	5 180
63	18	19	122	0%	725 592
65	2	1	1	0%	1 095
67	2	0	0	0%	0
70	24	24	16	0%	23 460
71	4	7	24	0%	69 257
72	18	18	17	0%	16 770
73	25	26	122	0%	150 877
74	547	549	4 928	2%	4 350 841
75	2	3	228	0%	96 247
80	15	16	4 058	3%	1 372 321
91	12	4	66	0%	8 729
92	15	13	10	0%	8 291
93	8	8	26	0%	9 698
Total excl. core industries	1 572	1 579	29 441	1%	73 475 534
Total incl. core industries	3 482	3 073	38 669	1%	89 678 534

5. ADDITIONAL INFORMATION

In this study we have collected additional information that needs further studies and analysis before they can bee used to complete the list of environment industry enterprises and establishments. This information could still be of value for the reader because it broadens the view of the green sector in Sweden.

5.1 Research and Development

There are three different surveys about research and development (R&D) at Statistics Sweden, covering the following sectors:

1. Business Enterprise Sector
2. General Government Sector
3. Higher Education Sector

It is only possible to separate environmental R&D in the first two sectors.

Business Enterprise Sector

The survey includes business enterprises with more than 50 employees 1995.

We have looked at the current costs for R&D activities distributed by the objectives:
- energy- and water supply
- physical environment and nature conservation

Improvement of energy- and water supply
R&D which objective is to improve the production and distribution of heat, electricity and water. R&D regarding future energy needs, energy savings and energy sources - incl. nuclear energy - are included.

Improvement of physical environment and nature conservation
R&D which aims to an undestroyed physical environment. The field includes R&D about pollution (air-, water and soil pollution etc.), their purpose, origin and effects, circulation, spreading and general influence on the people and the physical environment. R&D about general nature conservation is included. Questions about natural resources are only included if it's about general environmental studies, without concern to prospecting and mapping.

There were 50 enterprises that had the R&D objective either improvement of energy- and water supply or improvement of physical environment and nature conservation. The total current costs for these enterprises were for; Energy- and water supply, 32 Million SEK. Physical environment and nature conservation, 89 Million SEK.

R&D with environmental purpose also exists with other objectives than these two. The main objective in industry is improvement of production processes and products. This category does include environmental R&D linked with reducing e.g. emissions from the production process, new and cleaner production inputs and products with improved environmental characteristics. However, it is impossible to say how large the environmental part is from the R&D surveys. This is instead included in specific surveys of environmental protection expenditures in industry (se section 5.7.) Therefore we have no figures about the current cost for the total R&D with environmental purpose. The total current cost for R&D (regardless of objective) in the business sector is however around 40 000 Million SEK.

The enterprises with environmental R&D were in the following SNI codes (number of enterprises within the brackets):

DESCRIPTION	SNI-code
Manufacture of pulp, paper and paper products:	21122 (2), 21123 (2), 21129 (3), 21211 (1), 21219 (1), 21240 (3), 21250 (2)
Manufacture of chemicals and chemical products:	24110 (1)
Recycling:	37100 (1)
Electricity, gas, steam and hot water supply:	40100 (2), 40200 (1), 40300 (1)
Research and development:	73101 (1) , 73102 (6), 73104 (1), 73105 (1), 73202 (1)
Other business activities	74140 (1), 74150 (5), 74202 (4), 74300 (3), 74402 (2), 74403 (1), 74600 (1), 74844 (2)
Recreational, cultural and sporting activities:	92520 (1)

General Government Sector

The survey covers all governmental authorities in Sweden who has to give an annual report to The Swedish National Audit Office.

We have looked at the current costs for intramural R&D activities distributed by the objectives:
- energy- and water supply
- physical environment and nature conservation

Information about the sources of finance for extramural R&D, the recipients of the extramural R&D and the extramural expenditure by the objectives above, are also included.

Current costs for intramural R&D 1997 distributed according to objective Million SEK

Carrying out units	Energy- and water supply	Physical environment and nature conservation
The National Land Survey of Sweden	0	6
Swedish Radiation Protection Institute	0	5
Swedish Geotechnical Institute	1	2
Geological Survey of Sweden	0	3
Defence	5	3
Other	0	1
Total	**6**	**20**

Extramural R&D expenditure by objective 1997. Million SEK

Outlay units	Energy- and water supply	Physical environment and nature conservation
The Swedish Council for Building Research	15	48
Swedish National Board for Industrial and Technical Development	368	19
Swedish Council for Forestry and Agricultural Research	0	10
The Foundation for Strategic Environmental Research	0	99
Swedish Radiation Protection Institute	1	3
Swedish Environmental Protection Agency	0	132
Swedish Nuclear Power Inspectorate	71	
Defence	0	1
Total	**455**	**312**

The unit with the largest outlay with the objective energy- and water supply is the Swedish National Board for Industrial and Technical Development. They give 368 Million SEK to R&D in that area. The unit with the largest outlay in the other environmental objective; physical environment and nature conservation is the Swedish Environmental Protection Agency. They give 132 Million SEK to R&D in that area.

Sources of finance for the total extramural R&D 1997

Source	Million SEK	%
Direct government funds	7 638	87
Self-financed R&D foundation	795	9
Research Foundations	162	2
Other	185	2
Total	**8 780**	

This table gives us information about the sources of finance for all types of objectives. As the table shows, the direct government funds are the main sources of finance, 87 percent.

Recipients of the total extramural R&D 1997

Source	Million SEK	%
The Universities	3 937	45
Swedish Enterprises	2 509	29
International organisations	1 135	13
Trade Associations	517	6
General Government Sector	380	4
Private institutions, Researcher	290	3
Government-owned enterprises and public utilities	12	0
Total	**8 780**	

The Universities receive most of the outlays aimed for R&D for all types of objectives.

5.2 Education

In the work of delimiting and estimating the environmental industry we have tried a number of ways to find data from registers. One of these efforts has been to go backwards and try to find the companies within the environmental industry by their employees. In order to do so we have identified eight different codes that contain environmental education programmes within the Swedish standard of classification of education (SUN-code). It is not possible to delimit shorter courses within education programmes outside the environmental sector today, see below. Then we have searched for the chosen codes in a linked register that contains data from the Swedish Register of Education and the Swedish employment register system.

With this method it is possible to see under which SNI - headings persons with environmental education work. The Swedish SUN-code is not directly comparable with the ISCED (The international Standard Classification of Education) today, but ISCED has been revised, and the SUN system is also under revision. The aim is to make the SUN system comparable to ISCED. In the new system, environment will be classified as a separate field of study. This will make it easier to delimit environmental education in the future. The Swedish revision is planned to be implemented in year 2000.

SUN-code	Chosen education programmes in this study:
04022	Upper secondary school, 3years, natural science program, environmental technical alignment.
45200	Post secondary education shorter than three years, environmental health officer
46220	University (tertiary, post secondary) education, three years or longer, Environmental health and protection programme.
46228	University (tertiary education), Other higher environmental education
46231	University (tertiary education), study programme Biology, branch ecology
46235	University (tertiary education), study programme Ecotoxicology
46288	University (tertiary education), study programme Environmental- and Natural recourses
77611	Postgraduate education, Forestry doctors degree, Ecology and environmental protection

Number of employees with environmental education, 1995

SNI-code			(SUN-code)								
			4022	45200	46220	46228	46231	46235	46288	77611	Total
Ranking[1]		Total	285	355	644	116	119	28	83	2	1632
1	75125	Public administration of programmes for cultural services, environment and housing	0	156	265	31	14	0	17	0	483
2	75111	Executive and legislative administration of central, regional and local bodies.	2	74	178	18	10	2	12	0	296
3	75112	Administration and supervision of fiscal affairs	1	9	15	13	15	10	9	0	72
4	00000	Non specified	13	17	21	5	1	0	1	0	58
5	74202	Building design and drafting,supervision of construction	4	3	8	9	3	4	6	0	37
6	45230	Construction of highways, roads, airfields and sport facilities	0	5	12	1	2	1	1	0	22
7	85323	Care of aged and disabled	4	4	10	2	1	0	0	0	21
8	80100	Primary education	2	3	9	0	0	0	4	0	18
9	80302	Higher education for administration, economy and social professions	1	0	8	0	9	0	0	0	18
33	90002	Collection of garbage, trash, rubbish and waste	0	1	3	1	0	0	1	0	6
65	90001	Treatment of liquid waste, wastewater	0	1	0	2	1	0	0	0	4
132	90008	Snow-and icecleaning, salting, sweeping streets,highways etc.	0	2	0	0	0	0	0	0	
234	90005	Receving, reloading, intermediate storage of hazardous waste	0	0	1	0	0	0	0	0	1
235	90007	Other waste management	0	1	0	0	0	0	0	0	1

The NACE-headings 25.12, 37.1,37.2, 51.57, and 90.003, 90.004,90.006 did not have employees with any of our chosen programmes for environmental education.

1) Ranked after number of employees with environmental education

In 1995 there were a total of 1 632 persons employed in Sweden who had environmental education according to the delimitation used. As shown in the table above the most common branch was Public administration of programmes for cultural services, environment and housing. In order to do completing studies in future work it would be of great interest to withdraw a list of enterprises - employers in this, and other branches outside the core industries with many employees who has environmental education.

The core industries did not have many employees with environmental education, in fact several did not have any at all. However, this is not very surprising. The Swedish labour force has a high average education level, but a great deal of the academics work in the public sector. In the industry sector the academics are quite few, except in some knowledge intensive technological and pharmaceutical companies which are of great importance for the Swedish export. In future work we hope to be able to identify this sort of companies within the environmental industry as well, but they are not part of the identified core industries.

5.3 Energy statistics

Energy statistics covers the Swedish energy supply and its development. One interesting view is to look at the gross supply of energy for different years. The gross supply of energy is calculated from: national supply, import, export and an item covering changes in stocks, statistical differences etc. The energy sources that are included are: coal/coke, biofuel, peat etc., crude oil/petroleum products, natural gas, district heating (by heat pumps), hydro-electric power, nuclear fuel/nuclear power, net import of electric energy. Biofuel, peat etc. include wood-fuels, sulphate and sulphite lyes, peat, garbage and other.

The population for energy statistics is for *fuel statistics* the same as for manufacture statistics i.e. all enterprises with more than 10 employees with the SNI codes 10 - 37. The survey also includes all enterprises with the following activities:

- Transport and distribution of electricity
- Electric sales
- Electric production. The source of power has to be at least 100 kW. For private usage at least 400 kW.
- Heat production
- District heat production
- City gas production and distribution, natural gas distribution.

Power plants, independent thermal power plants for combined generation of electric energy and heat and thermal power plants that are included in the above mentioned enterprises.

Renewable energy as defined by the OECD/EUROSTAT working group includes energy from biomass, solar, wind, tidal or geothermal energy sources. Parts of the gross supply of energy identified as renewable sources are wood-fuels, sulphate and sulphite lyes, garbage, district heating and hydro-electric power. In 1997 this environmental energy supply was about 26 - 34 percent of the total gross supply of energy. The lower figure is calculated when nuclear energy has been calculated by nuclear fuel used in nuclear reactors and the higher figure when nuclear energy has been calculated by produced electric energy in nuclear power stations.

One explanation to the yearly changes is the weather changes. It is impossible to say anything about the trends but as Sweden is going to reduce the nuclear power plants, the environmental energy is probably going to increase.

Gross supply of energy. PJ

	1993	1994	1995	1996	1997
Coal/Coke	96,6	99,3	97,8	110,3	90,0
Biofuel, Peat etc.:					
Wood-fuels	**128,5**	**134,2**	**142,6**	**150,1**	**161,4**
Sulphate and sulphite lyes	**114,1**	**116,3**	**121,7**	**120,7**	**127,0**
Peat	12,5	11,1	14,7	14,1	12,2
Garbage	**15,6**	**16,0**	**16,6**	**16,7**	**17,4**
Other	2,6	5,3	7,1	10,3	6,3
Crude oil/Petroleum products	666,1	740,2	737,8	781,6	740,7
Natural gas	31,4	31,6	31,7	33,1	32,1
District heating (by heat pumps)	**25,4**	**24,5**	**24,6**	**24,4**	**25,3**
Hydro-electric power	**303,0**	**240,3**	**275,8**	**185,5**	**247,8**
Nuclear fuel/Nuclear power[1] Alt 1	642,7	769,7	734,1	797,9	734,7
Nuclear fuel/Nuclear power[2] Alt 2	222,4	265,0	251,9	269,6	252,9
Net import of electricity energy	**-2,0**	**0,9**	**-6,1**	**22,2**	**-9,3**
Gross supply of energy Alt 1	*2 036,3*	*2 189,3*	*2 198,4*	*2 266,8*	*2 185,5*
% environment	**28,8%**	**24,3%**	**26,4%**	**21,9%**	**26,5%**
Gross supply of energy Alt 2	*1 616,0*	*1 684,6*	*1 716,2*	*1 738,5*	*1 703,7*
% environment	**36,3%**	**31,5%**	**33,9%**	**28,6%**	**34,0%**

1) Alternative 1: As gross supply used neclear fuel in nuclear reactors
has been mentioned

2) Alternative 2: As gross supply produced electric energy in nuclear powe
stations has been mentioned

It is possible to identify the individual enterprises producing this renewable energy through
information within energy statistics. Through the use of information on types of energy and
energy content for each source of energy, it is possible to calculate the share of renewable
energy sources for each energy producer. In the first tests of this method we have selected out
enterprises with more than 50 percent renewable energy content as enterprises with
environment production as the principal activity. The results from these tests have to be
further analysed before published.

5.4 Branch associations

Branch associations are often mentioned as an important source of information for the
environment industry. Sometimes there exist these associations for particular segments of the
environment industry. They may have general information that may be used either as a basis
for an estimation of the size of this particular environmental activity, or give valuable
background information. Often these associations keep record of their members and/or
enterprises active in this field. These membership lists may be very useful in the work of
building up a list of environmental enterprises.

In the line of this project we have identified a number of special branch associations and
other institutes. In addition to the two presented in this section there are a number of other
associations identified especially in the energy and waste management sector, which could be
useful in future studies.

Ecotourism

In Sweden there is an organisation called The Swedish Ecotourism Association. This association has 158 members, where 84 of them are enterprises, associations or authorities. The other members (74) are private persons.

The association was established in 1996 to support ecotourism in Sweden and internationally and to support an increased environmental travel thinking. The Swedish Ecotourism Association has kindly provided us with information on the individual members which could be matched with their individual identification code from the Business Register. In this project ecotourism enterprises are only included through the search on the telephone directory. It would be interesting in a future work to match and compare enterprises from these two sources.

The Ecotourism Society in USA has defined ecotourism as follows:
"Responsible travelling, where the natural environment is protected and maintains the local populations well being."[28]

The Swedish Ecotourism Associations has decided on 10 commandment defining ecotourism:

1. The ecological and social bearing capacity shall be governing.
2. All travel agencies shall appoint a person responsible for environmental issues and set up an environmental plan.
3. The environmental actions are also intended for the subcontractors.
4. Choose environmentally adapted housing
5. High knowledge of guides
6. Support the local economy
7. Influence the travellers to a respectful attitude
8. Don't buy their life! (things made of threatened animals and plants).
9. Ecotourism demands good information to the tourists.
10. Ecotourism shall contribute to nature conservation and local development.

KRAV

The KRAV logo is an eco-labelling system handled by KRAV, an association with 22 member organisations having nation-wide coverage. The objective of KRAV is to stimulate the development of organic production. KRAV is a member of IFOAM, the International Federation of Organic Agriculture Movements.

The KRAV logo certifies that a production is done without any chemical pesticides or fertilisers, that animals are well taken care of and have free out-door access, and that the entire production is free from genetically modified organisms, GMO.

KRAV inspectors carry out regular inspection visits on location at the farms, shops, processors, restaurants, etc. Besides crop production and animal husbandry, KRAV certifies processing, distribution and handling, fish, apiculture, wild berries and mushroom, import, shops, restaurants, textile and production input.

---

[28] The Swedish Ecotourism Association (1998), page 19.

In October 1998 the amount of certification were:
2 750 farmers
550 groceries
550 shops
170 restaurants
Over 2 200 products had the KRAV logo

In 1997 a total of 3 932 enterprises were KRAV certified. The same year 96 810 hectare or 3,4 % of the total area under cultivation was certified as ecological production. The share of certified ecological production has increased over the last years. For example in 1991 the share was only 1,1 %.

KRAV is the largest eco label for ecological cultivation. In comparison 200 000 hectare in Sweden received environmental support for ecological cultivation in 1997. That is about 7 percent of the total area under cultivation. Applied areas for environmental support in 1998 is about 241 000 hectare.

5.5 Environmental certification system

We have two major different environmental certification systems in Sweden:
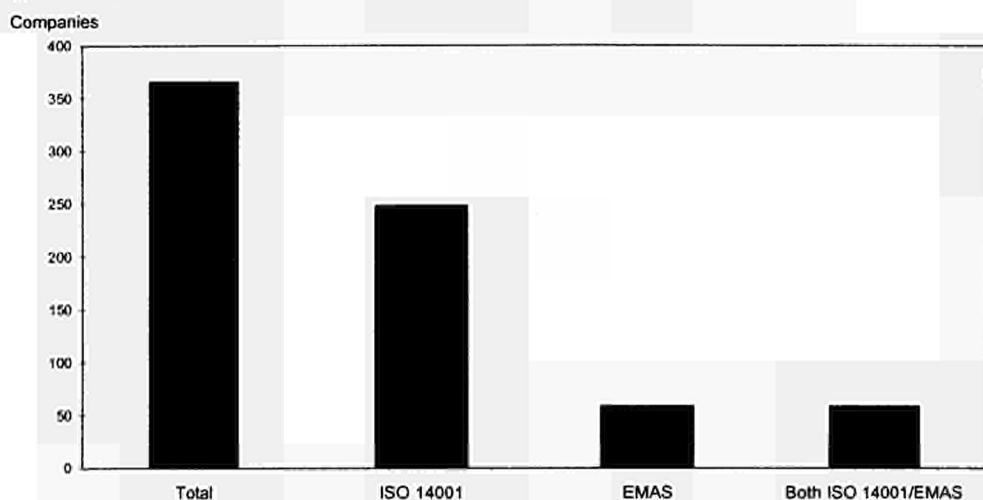
- EMAS (Eco Management and Audit Scheme)
- ISO 14001

Then there is also a certification system for forestry; FSC-Sweden.

The environmental certification of enterprises has increased during the last couple of years and is likely to increase a lot more in the near future. This is clear from the experience of the survey on environment protection expenditure in industry made this year. In that survey many enterprises included expenditure associated with environment certification procedures in 1997 or mentioned that they were in process or planned to be certified in the next few years.

Organisations responsible for these environment certificates have been contacted in the line of this project and information on individual enterprises are available and could be used in future work on environment and industry. Although the certified enterprises are not automatically a part of the definition of environmental industry enterprises given by the OECD/EUROSTAT working group it might be interesting to single these out in existing statistics.

Environmental certified companies in Sweden october 1998
(EMAS and ISO 14001)

Companies

Source: SIS Forum AB

EMAS

EMAS, the Eco-Management and Audit Scheme, is an EC standard of environmental certification. The main demand for this standard is that the production plant shall fulfil the national environmental legislation. Another demand is that the enterprise that wish to be certified must have an environmental policy where the main environmental commitments of the enterprise are written. *"Commitments aimed at the reasonable continuous improvement of environmental performance, with a view to reducing environmental impacts to levels not exceeding those corresponding to economically viable application of best available technology."*[29]

An external accountant controls that the enterprise lives up to the company policy.

It is voluntary to apply for certification. There is no comparable measurement for the different achievements of the environmental work for the different enterprises. The main reason for this certification is that enterprises with environmental commitments get an acknowledgement that can be used and understood in all European countries.

EMAS certification is handled by the Swedish EMAS Council.

ISO 14001

ISO 14 001 is an International standard for environmental managing systems. The standard consists of requirements on environmental managing systems. It shall make it easier for enterprises to work efficiently and structured with environmental work with the help of a well-documented environmental managing system. ISO 14001 has demands for further improvement of the environmental managing system. It is voluntary to apply for a certification.

Information about certified enterprises in Sweden is given by the Swedish Standards Institution.

---

[29] Swedish Society for Nature Conservation (1998), page 12.

FSC-Sweden

FSC (Forest Stewardship Council -Sweden) is a certificate standard for forestry. The standard is voluntary and similar to EMAS and ISO14001. FSC put specific ecological, social and economic demands on the forestry. FSC covers the environmental goals for forestry within the frame for environmental managing system. When the forestry has been certified the products from the forestry can be labelled with the FSC-symbol.

There are at the moment (December 1998), 5 651 300 hectare FSC-certified productive forest in Sweden. That is about 25 % of the total forest area. All the landowners are listed and available on FSC-Sweden's web site. This list could be used in future studies.

5.6 Eco - labelling

There are a number of Eco-labelling systems for products. The basis for these eco-labelling systems is demands set forth as regards environmental impact. This sometimes is limited only to the environmental function of the products but mostly the demands are based on a life-cycle perspective including the production phase. Organisations for the different eco-labelling systems have registers of products and manufacturers of these products with an eco-label. This could be used in future work on environment industry. This information has not been included in the list of environmental producers.

In this project we have concentrated on the three most common Eco-labelling systems:

- Bra Miljöval - Falken (Good environmental choice - The Falcon)
- Svanen (The Swan)
- KRAV (see section 5.4 Branch associations)

Other eco-labelling systems that exists in Sweden are: EC Flower, Ecology - Energy - Ergonomics - Emissions, Eloff Strömsnålt (Eloff Power Saving).

Bra Miljöval - Falken (Good environmental choice - The Falcon)

The Falcon eco-labelling system is handled by the Swedish Society for Nature Conservation.

A product must fulfil certain environmental demands, which are decided by experts from the Swedish society for nature conservation, to receive the Falcon. The demands are strong but reasonable to fulfil. When the majority of the enterprises can fulfil the demands, they are strengthened. Therefore a product can loose its Falcon eco-label.

The environmental demands are not only demands for the environmental influence when we use the product. There are also demands for the products total environmental influence, i.e. the whole life cycle of the product. For example environmental aspects of production and waste treatment are included.

It is voluntary to apply for the Falcon eco-label. When an enterprise has been approved to label a product with the Falcon, the enterprise must pay a license fee for using it on the product. It is also possible to receive the Falcon on transportation and electricity.
In the beginning of 1998 there were 176 enterprises with the Falcon labelling on chemical-technical products, 31 enterprises on paper products and 18 on textile.

Svanen (The Swan)

The Swan eco-labelling system is handled by the Swedish Standards Institution Eco-Labelling.

Products with the Swan must fulfil certain demands that ensure that these products imply less environmental problems than other products with the same purpose. The whole life cycle for the product is studied. Different from other eco-labels is that the Swan has demands for quality and function. The Swan labelled products shall at least have the same quality as other products. The standards have a time limit and changes gradually.

It is voluntary to apply for the eco-label the Swan. When an enterprise has been approved to label a product with the Swan, the enterprise must pay a license fee for using it on the product.

There are around 350 licences and around 2 000 products have the Swan eco-label. Total turnover for licence-holders are around 8 thousand Million SEK.

5.7 Survey of Environmental Protection Expenditure

Surveys of the demand for environment products and services have been conducted for several years in a number of countries covering both the private and public sector. Here we will focus on the private sector only. Surveys of environmental protection expenditure industry in Sweden have been made for 1981, 1985, 1988, and 1991 and are currently under way for 1997. We have seen that data from these surveys can be important in an environment industry context e.g. for identifying internal/ancillary activities or for consistency checks of supply side information.

The 1997 survey covered mining, manufacture and electricity (SNI classes 10-40 excluding 37). The survey included questions on capital expenditure on end-of-pipe and integrated equipment, current expenditure and additional sections related to resources and products lying outside the international definition of environment protection. The table below summarises the variables included and the links to supply side environment activities.

Expenditure survey 1997	Environment industry equivalent
1. Environment Protection Expenditure	
1a) End-of-pipe investments	Pollution Management: demand for products
1b) Integrated investments	Cleaner Technologies and Products: demand for products, extra cost only
1c) Current expenditure	Pollution Management: demand for services both external and internal
• Payments and charges	demand for external Pollution Management services
• Internal expenditure	demand=production of Internal/ancillary activities
2. Natural resources: Investments and R&D	Resource Management: demand for products and internal R&D
3. Adaptation of products: Investment and R&D	Environment Industry (supply side) activities

The result of the industry survey is currently being evaluated. Unfortunately the response rate is too low on average to enable reliable results. The response rate is also quite low for some specific variables. It is predicted that results of reasonable quality will only be produced for a selection of individual industries with particular good response rates.

42

One important variable in the survey is labour input. The survey included questions on environmental protection expenditure for own personnel, and the full-time equivalent of this labour input. This would provide information on internal environmental employment. It is easy to understand the importance of internal employment as compared with external environmental industry employment. Let us assume that internal environment employment at least equals one percent of total employment on average in mining, manufacturing, and electricity, which seems reasonable from the first analysis of the results of the industry survey. The internal employment then would be equal to about 20 percent of the total estimated external employment given in section 4. In addition to this there is most certainly internal activities in other industries although not of the same magnitude. The evaluation of this variable will continue and more detailed results are expected in early 1999.

6. FUTURE WORK

This pilot work on environment industry in Sweden has included analysis of existing sources of information that might be used in order to get different types of data on this economic sector in the future. We have also presented various existing data on the core industries of the environment industry and made first attempts of compiling a list of non-core enterprises and estimations of the size of the non-core environment industry. This project has supplied a good basis for future work on setting up a more regular data production system on the green sector.

Core industries

- Much information on the core industries already exists and part of the future work would involve extending the time series presented in this report. Time series would also increase the possibilities in analysing shifts and trends within these branches of industry.

- Given the importance of these core industries from an environment industry point of view it is important to analyse the quality of existing data, classification of enterprises and surveys. It is clear for example that there are actors within this industry that are not classified in these branches today. A separate project dealing with these issues has started and will be finished in the early 1999. The results of that project will increase the understanding of the core industries and existing data and their limitations. A possible outcome is also suggestions for changes in classifications and existing surveys in order to supply better information in the future.

- Cooperation with waste statistics has started in the above-mentioned project. One objective of this cooperation is to analyse the possibilities of connecting economic information with physical flows in the waste domain.

- Information on the core industries could also be used in an input-output framework in order to make estimations e.g. indirect employment associated with environmental industry activities.

Non-core industries

A list of individual environment producers/enterprises is vital for information on the non-core parts of the environment industry. Through this list it is possible to get much useful information from combinations of existing registers and surveys without actually introducing new surveys. In this project a first list of producers has been compiled and used for estimations of the size of the non-core part. This list will be the natural starting point for future work.

- Information from the telephone directory about types of environmental activity linked to individual producers, which have not been used in this project. Future work could involve analysing this information and attempt a classification of enterprises and establishments according to main environmental activity.

- The list presented in this report is not complete and needs to be further analysed. A starting point could be to analyse and compare enterprises within the list with the other existing sources presented in this report but not used for compiling the list of enterprises. Renewable energy is one example. It would be useful to study the enterprises producing renewable energy identified for example in Energy Statistics and compare them with the energy producing enterprises included in the list, and with additional information from branch associations.

- Future work should also analyse the possibilities of using information on the establishment level for estimates of the environment industry. Today, an establishment with a principal activity in the environment industry where the principal activity of the enterprise is non-environmental is excluded from the list of producers. This may be especially important for the public sector where activities in the local government known to be environmental have had to be excluded because the environmental part of the local government was so small that it would have been misleading to incorporate it in the list. We also saw in the section about core industries that the total number of employees in the core industries was considerably higher if the establishment level was used for basis of selection.

- In order to test the validity of the list of enterprises it would also be of interest to contact a selection of individual enterprises and check the classification of activities.

- In principle it is possible to get much more information for the non-core part than number of employees and turnover which was presented in this report. Future work could provide additional information on the non-core enterprises through the use and combination of existing registers. It would be especially interesting to analyse the educational levels in the non-core part as compared with the core industries to see if there are high-tech enterprises or environmental activities. Export and geographic variables would also be of interest for further studies in this context.

- There are a lot of material in the section of additional information such as eco labelling that could be used in the work of improving and completing the list.

- We could study the Environmental Funds that invest in environmental concerned enterprises. The Funds are handled by banks that have strong environmental demands on the enterprises that they want to invest in.

- A list of individual enterprises could also be the basis for a new survey supplying more detailed information on this industry. The first step in the process of producing a new survey could be to direct attention to a smaller part of the environment industry of special importance such as environmental consultants.

- Another possibility is to study, for example the projects that are supported by MISTRA (The Foundation for Strategic Environmental Research), an organisation supporting environmental research.

In order to summarise the possibilities for future work the authors of this report are unanimous that there are great opportunities and a lot of loose ends to work with in order to make a closer description of the environment industry in Sweden.

LITERATURE

Bureau of the Census, U.S. Department of Commerce (1998). Doc Eco-Ind/98/8. Survey of Environmental Products and Services: Results and survey forms.

Ecotec, BIPE and IFO (1996). Doc Eco-Ind/96/2. Data Collection on Eco-Industries in the EU + separate document The Swedish Eco-Industry - Country Summary.

Environmental Business International Inc, (1996a). Comments on the OECD Country Numbers Provided by Environmental Business International, Inc

Environmental Business International Inc, (1996b). Environmental Industry Research Methods of EBI Inc.

European Commission (1997). COM (97) 592 FINAL. Communication from the Commission on environment and employment (Building a sustainable Europe).

IVA (1996). Development of environment driven technology: A study by IVA about environmental considerations as a driving force for developments of technology in the Swedish economy. (In Swedish)

Ministry of the Environment (1998). Green Jobs: Environment-, Economic- and Labour Policy in Cooperation (In Swedish). Ds 1998:13.

Ministry of Industry and Trade (1998). Sustainable Sweden a SUCCESS story: Possibilities and obstacles for an internationalisation of an environmentally adapted Swedish trade and industry. SOU 1998:118. (In Swedish)

OECD/Eurostat (1998). Doc Eco-Ind/98/1. The Environment Industry Manual: Draft Final Version.

Recherche Development International (rDI), (1996). Production and employment in the environment industry: analysis of available supply-side data in OECD European countries.

Statistics Denmark (1998). Doc Eco-Ind/98/9. The Eco-Industry in Denmark: An investigation of the possibilities of an assessment through administrative registers.

Statistics Finland (1997). Doc Eco-Ind/98/13. Identifying the environment industry from register data: Finland.

The Swedish Ecotourism Association (1998). An information package about ecotourism from the Swedish Ecotourism Association (In Swedish).

The Swedish Environmental Protection Agency (1998). List of environmental enterprises, authorities, associations, etc.

Swedish Society for Nature Conservation (1998). Good Environmental Choice Magazine 1/98 (In Swedish).

ANNEX

SNI-code	DESCRIPTION
01	Agriculture, hunting and related service activities
02	Forestry, logging and related service activities
05	Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing
10	Mining of coal and lignite; extraction of peat
11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
12	Mining of uranium and thorium ores
13	Mining of metal ores
14	Other mining and quarrying
15	Manufacture of food products and beverages
16	Manufacture of tobacco products
17	Manufacture of textiles
18	Manufacture of wearing apparel; dressing and dyeing of fur
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
21	Manufacture of pulp, paper and paper products
22	Publishing, printing and reproduction of recorded media
23	Manufacture of coke, refined petroleum products and nuclear fuel
24	Manufacture of chemicals and chemical products
25	Manufacture of rubber and plastic products
25120	Retreading
26	Manufacture of other non-metallic mineral products
27	Manufacture of basic metals
28	Manufacture of fabricated metal products, except machinery and equipment
29	Manufacture of machinery and equipment n.e.c.
30	Manufacture of office machinery and computers
31	Manufacture of electrical machinery and apparatus n.e.c.
32	Manufacture of radio, television and communication equipment and apparatus
33	Manufacture of medical, precision and optical instruments, watches and clocks
34	Manufacture of motor vehicles, trailers and semi-trailers
35	Manufacture of other transport equipment
36	Manufacture of furniture; manufacturing n.e.c.
37	Recycling
37100	Recycling of metal waste and scrap
37200	Recycling of non-metal waste and scrap
40	Electricity, gas, steam and hot water supply
41	Collection, purification and distribution of water
45	Construction
50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel

continuation...

SNI-code	DESCRIPTION
51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
51570	Wholesale of waste and scrap
52	Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods
55	Hotels and restaurants
60	Land transport; transport via pipelines
61	Water transport
62	Air transport
63	Supporting auxiliary transport activities; activities of travel agencies
64	Post and telecommunications
65	Financial intermediation, except insurance and pension funding
66	Insurance and pension funding, except compulsory social security
67	Activities auxiliary to financial intermediation
70	Real estate activities
71	Renting of machinery and equipment without operator and of personal and household goods
72	Computer and related activities
73	Research and development
74	Other business activities
75	Public administration and defence; compulsory social security
80	Education
85	Health and social work
90	Sewage and refuse disposal, sanitation and similar activities
90001	Waste water treatment
90002	Collection, sorting and reloading of non-hazardous waste
90003	Composting and digestion of non-hazardous waste
90004	Deposit on landfills of non- hazardous waste
90005	Receiving, reloading and intermediate storage of hazardous waste
90006	Treatment and permanent storage of hazardous waste
90007	Other waste management
90008	Street cleansing, other sanitary management
91	Activities of membership organizations n.e.c.
92	Recreational, cultural and sporting activities
93	Other service activities
95	Private households with employed persons
99	Extra-territorial organizations and bodies