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Environmental Protection Expenditure: Methodological work for the Oil and Gas Extraction Industry (NACE 11) and preliminary figures for 2002 for the manufacturing, mining, quarrying and steam and hot water supply industries in Norway

Report to Eurostat

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Abstract:
A new approach for establishing environmental protection expenditure statistics for the Norwegian oil and gas extraction industry (NACE 11) is being developed. Instead of using a survey methodology, a calculation model is being built using a step-wise approach. Initially a survey approach was implemented for reporting end-of-pipe investment in the oil and gas extraction industry, but after an evaluation of this survey approach, combined with the mapping of data available for the petroleum industry from the Ministry of Petroleum and Energy, it was decided to try to develop a calculation model rather than scale up the survey methodology. The plans for the development of this calculation methodology are presented. Statistics for the manufacturing, mining and quarrying industries (NACE 10, 12-37) and the steam and hot water supply industry (NACE 40.3) have been developed using a survey-based methodology and figures for 2002 are presented. These statistics were developed by industry division and six environmental domains. The six environmental domains include: air/climate, wastewater/cooling water, waste, soil and groundwater, biodiversity and landscape, and other (which includes noise, R&D, management systems, etc.). The Structural Business Statistics regulation (58/97 as amended) provides the framework for establishing these statistics.

Keywords:
Environmental protection investment and expenditure in industry, petroleum industry, end-of-pipe investment, integrated technology investment, pollution prevention, miljøvernkostnader, miljøvern

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Executive summary

The development of the environmental protection investment and current expenditures variables as specified in the Structural Business Statistics (SBS) regulation is proceeding in a stepwise fashion at Statistics Norway. The following table provides a brief overview of the environmental protection expenditure statistics developed for 2002. This table also provides the status of development regarding the implementation of the necessary systems for complying with the SBS regulation with respect to the environmental protection expenditure variables. Details regarding the development of these figures are provided in the report and more detailed statistics are provided in the appendices.

Table 1 Summary table for environmental protection investment and current expenditures in Norway with respect to the SBS regulation. 2002. 1000 NOK

NACE Industry classification	Description	Investment		Current expenditures
		Pollution Treatment (End-of-pipe)	Pollution Prevention (Integrated technology)	
NACE 10, 12-14	Mining and quarrying	11 734	1 140	100 399
NACE 11	Oil and gas extraction	484 609*	.[a]	.[a]
NACE 15-37	Manufacturing	413 981	436 520	1 221 257
NACE 40.3	Steam and hot water supply	97 097	.	.
NACE 40.1-40.2	Production of electricity, distribution of gaseous fuels	.	.	.
NACE 41	Water supply	.	.	.

*Preliminary figures.
[a] Major focus for development work in the near future.

Statistics for the manufacturing, mining and quarrying industries (excluding NACE 11) were the first to be developed and for 2002, statistics for all three environmental protection variables were produced and published. Further development work is warranted with respect to the techniques and methodology used for grossing up the figures. There is also a need to make improvements regarding the editing of the data. Although there needs to be some further development and improvements, this sample survey has now been reasonably well established as an integral part of the annual industrial statistics survey and editing work conducted by the Division for Energy and industrial production statistics. The publication of this data is done in cooperation with the Division for Environmental statistics.

A similar stepwise approach to that used for the manufacturing industry has been started for the Steam and hot water supply industry (NACE 40.3). In the 2002 census survey of this industry a question regarding end-of-pipe investment was added to the general investment portion of the standard industry questionnaire. In 2002 there were only 44 enterprises in this industry but there is an increase in district heating in Norway so including this industry in the statistics is desirable. Environmental protection expenditure for the other parts of NACE 40, i.e. the production and distribution of electricity and the manufacture of gas and distribution of gaseous fuels through mains, will be very low in Norway for the three environmental domains, air/climate, wastewater and waste since nearly all of the electricity produced in Norway comes from hydroelectric power plants and there is nearly no commercial distribution of gaseous fuels in Norway. The expenditure related to biodiversity and landscape by hydropower enterprises is expected to be significant but since this environmental domain is only in the pilot phase in the SBS regulation, this work will not be of major focus in the near future but in the long run it will be desirable to expand our work to include these expenditures.

If the situation in Norway changes with regards to electricity production, for example if a natural gas power plant is built or if an infrastructure to use natural gas is developed in Norway, then these evaluations will need to be reconsidered. Expanding the survey to include these other portions of NACE 40 (40.1 and 40.2) in order to capture the expenditures related to biodiversity and landscape or

to include all three environmental protection variables for NACE 40.3 may be considered in the future but due to limited resources this will not be where our efforts will be focused in the near future. When examining which industries are not covered by the main manufacturing, mining and quarrying survey the most important industry excluded, which is also expected to have high levels of environmental protection expenditure, is the oil and natural gas extraction industry (NACE 11). This is an extremely important and large industry in Norway. For these reasons a special focus on this industry was taken in this project. Initially a purely survey-based approach was envisioned and started for this industry and it was believed to simply be a question of how to best implement this type of survey. Therefore, in the 2002 census survey of this industry, a question regarding end-of-pipe investment was added to the general investment portion of the standard industry questionnaires.

This evaluation has been revised due to the information obtained from contact with the industry and with the Ministry of Petroleum and Energy. At this time it is planned to develop a calculation model based on the investment plans and the operating plans that are provided by the operators on the Norwegian Continental Shelf to the Ministry. A stepwise development of the calculation model is planned focusing first on air emissions in 2005. Once all parties involved evaluate this approach and preliminary results, a second development phase focusing on discharges to sea will be planned. Until this calculation model is sufficiently developed, end-of-pipe investment will continue to be included in the annual survey of the petroleum industry. In this way statistics for end-of-pipe will be available and can be used to evaluate the calculation model until the model can become fully operational.

And finally, the only industry where work concerning environmental protection expenditure has not progressed to any large extent is NACE 41 Water supply. The main reason for this is the fact that there are currently no statistics covering the private water supply industry in the national accounts. The only data available regarding water supply is the public water supply, which is located in NACE 75 Public Administration. This gap in the national accounts will now be the focus of a specific project in 2005. Development of the environmental protection variables will have to be done after the main industrial variables are developed.

Although there are still some gaps in the environmental protection expenditure statistics for Norway, major portions of these statistics are already fairly well established and only need some refining. In the near future establishing statistics for the oil and natural gas extraction industry (NACE 11) will be given priority in terms of development work. A close cooperation between the Norwegian Oil Directorate, the Ministry of Petroleum and Energy and the Division for Environmental Statistics in Statistics Norway is currently being established with the purpose of developing a calculation model for environmental protection expenditure in the Norwegian oil and gas extraction industry.

The implementation of the SBS regulation is primarily the responsibility of the Division for Energy and industrial production statistics. However, in relation to the environmental protection expenditure variables, the Division for Environmental statistics is providing support in the development of these statistics.

1 Introduction

There are three main parts to this report. The first part, chapter 2, presents a short description of the work being done in the manufacturing, mining and quarrying industries, NACE 10, 12-37. Results from the environmental protection expenditure survey are presented in summary tables with detailed industry level data provided in the appendix. The second part of the report briefly describes the work in the steam in hot water supply industry (NACE 40.3) and the results are also presented.

The third part of this report, chapters 4 and 5, describes the work in the petroleum and natural gas extraction industry (NACE 11). In this portion of the report an overview of the types of environmental challenges facing the petroleum industry on the Norwegian Continental Shelf are described thematically (emissions to air, discharges to sea and solid waste). Preliminary results for end-of-pipe investments from the 2002 census survey are presented. An evaluation of the survey methodology with respect to the Norwegian petroleum industry is presented. Due to the availability of information regarding the petroleum industry from the Ministry of Petroleum and Energy and because of the high costs that this type of survey would require, an alternative model-based approach is presented as the focus for future development work.

1.1 Overview of approach taken to developing environmental protection expenditure statistics

The development of the environmental protection investment and current expenditures variables according to the SBS regulation is proceeding in a stepwise fashion at Statistics Norway. The implementation of and reporting to the SBS regulation is primarily the responsibility of the Division for Energy and industrial production statistics. However, in relation to the environmental protection expenditure variables, the Division for Environmental statistics is providing development support and is responsible for publishing the statistics.

There are three surveys that have needed to be modified to include the new environmental protection expenditure variables. One survey focuses on the manufacturing, mining and quarrying industries (NACE 10, 12-37). The second survey is specific for the steam and hot water supply industry (NACE 40.3). This third survey is the annual survey of the oil and gas extraction industry (NACE 11). Modifying these surveys has been made using a step-wise approach.

The first step has been to include a question regarding end-of-pipe or pollution treatment investment as part of the section of the standard survey instrument that requests information about total investments. Since this information is the least difficult to identify it was felt that by requesting this extra specification regarding the type of investment this was the most cost effective way for information to be collected. This also allows the reported environmental protection investment to be controlled and edited against the reported total investment (i.e., checking that end-of-pipe investment is less than total investment). This approach allows us to at least identify major decimal errors in the reporting from the enterprises and to increase the consistency between environmental investment and total investment. In 2000 and 2001 this was the approach taken in the manufacturing, mining and quarrying industries (NACE 11). In 2002 this approach was used for the steam and hot water supply industry (NACE 40.3) and the oil and gas extraction industry (NACE 11), while the manufacturing industry survey moved on to step two in the development process.

The second step has been to develop a separate survey instrument that requests all three environmental protection expenditure variables for the manufacturing, mining and quarrying industries (excluding NACE 11). In 2002, a sample survey that requested all three environmental protection expenditure variables was coordinated with the annual survey of the manufacturing, mining and quarrying industries. This type of survey will be continued in the future with improvements to the methodology being planned.

Due to the small size of the steam and hot water supply industry (NACE 40.3) in Norway it was decided to wait for further development in this industry and to concentrate our efforts on the much larger and more important petroleum industry (NACE 11).

Based on the feedback from the petroleum industry and on the potential availability of investment and operating costs which are already reported to the Ministry of Petroleum and Energy for approval, it was decided not to expand the survey-based collection of data beyond the variable for end-of-pipe investment. Instead, in cooperation with the Ministry of Petroleum and Energy and the Norwegian Petroleum Directorate, a calculation model will be developed and tested. If this approach is approved, based on preliminary results, a step-wise development for this model will be made. The environmental domains will be developed in the following order: emissions to air, discharges to sea (production water and wastewater) and waste.

Originally it was envisioned that a survey-based approach would also be implemented for NACE 11. But based on the results and feedback obtained when we started to implement this plan, it was decided to re-evaluate this strategy. Based on this evaluation, a new approach was formulated. This means that the original plan for this project has been slightly altered and only end-of-pipe investment has been estimated for NACE 11 in 2002 at this time. Once the calculation model has been developed it is hoped that it will be possible to make estimates for all three environmental variables for a number of years perhaps starting with 2000.

1.2 Environmental protection expenditure variables in the SBS regulation

There are three environmental protection expenditure variables included under the SBS regulation 58/97 as amended.

In the regulation these variables are identified as the following:

- Investments in end-of-pipe equipment (21 11 0)
- Investments in integrated technologies (21 12 0)
- Total current expenditure for environmental protection (21 14 0)

According to the regulation the variables shall also be broken down by four environmental domains:

- Ambient air and climate
- Wastewater management
- Waste management
- Other environmental protection activities

And the information is to be reported according to the following industry categories:

NACE Category to be reported according to SBS regulation	**Name of category**	**NACE Division**
Section C	Mining and Quarrying	10-13
Subsection DA	Food products, beverages, tobacco	15-16
Subsections DB and DC	Textiles, wearing apparel, leather	17-18 and 19
Subsection DD	Wood products	20
Subsection DE	Pulp and paper	21-22
Subsection DF	Refined petroleum products	23
Subsection DG and DH	Chemicals and rubber, plastic products	24 and 25
Subsection DI	Other non-metallic mineral products	26
Division 27	Basic metals	27
Division 28	Metal products	28
Subsections DK and DL and DM and DN	Machinery, electrical and optical equipment, transport equipment, furniture, other	29 and 30-33 and 34-35 and 36-37
Division 40	Electricity, gas, steam and hot water supply	40
Division 41	Collection, purification and distribution of water	41

The three main variables are also to be reported according to the following three size categories based on the number of employees:

- 0-49
- 50-249
- 250 +

A Eurostat task force has provided definitions and guidelines to help countries in the implementation of the environmental protection expenditure variables (Eurostat 2001). This work and earlier definitions for the variables were used to develop the specific questions in the questionnaires and in the examples and instructions provided to fill out the information.

Investments in end-of-pipe equipment (21 11 0) are also called investments in "pollution treatment" or known as "process external" equipment.

These are described as:

> "44. Pollution treatment investment is defined as capital expenditures for methods, technologies, processes or equipment designed to collect and remove pollution and pollutants (e.g. air emissions, effluents or solid waste) from the environment after their creation, prevent the spread of and measure the level of the pollution, and treat and dispose of pollutants generated by the operating activity of the company.
>
> 45. Pollution treatment investments include distinct, identifiable components supplementing existing equipment, which are implemented at the end of or completely outside the production line ("end-of-pipe" equipment).
>
> 46. Pollution treatment include investments in equipment (e.g. filters or separate cleaning steps) which compose or extract pollutants within the production line, when the removal of this equipment would not affect the functioning of the production line."
> (Eurostat 2001: 12)

Investments in integrated technologies (21 12 0) are also called investments in "pollution prevention" or known as "process internal" equipment.

These are described as:

> "48. Pollution prevention investment is defined as capital expenditures for new or adaptation of existing methods, technologies, processes, equipment (or parts thereof) designed to reduce or eliminate the creation of pollution, or change the composition of pollutants (e.g. toxicity), at the source, thereby reducing the environmental impacts associated with the release of pollutants and/or with polluting activities.
>
> 49. Included are investments needed when switching to new production inputs with lower environmental impacts….
>
> *Integrated*
> 53. Pollution prevention also include capital expenditures for methods, processes, technologies and equipment that are integrated with the overall operating activity (production process/installation) in a way that may make it difficult to identify separately the pollution prevention component.
>
> In these cases ("integrated measures"), only the environmental protection fraction of the total investment should be reported as an environmental protection expenditure.
>
> This fraction corresponds to the incremental expenditure of the selected investment vis-à-vis the capital expenditure that would have been incurred were it not for the environmental

protection considerations."
(Eurostat 2001: 13)

Total current expenditure for environmental protection (21 14 0) is described as follows:

> "59. Current expenditure on environmental protection includes compensation of employees, payments of rents, use of energy and other material goods and purchases of services, where the main purpose is to prevent, reduce, treat or eliminate pollutants and pollution or any other degradation of the environment resulting from the operating activity of the company….
>
> 63. Current expenditure on environmental protection often occurs as a result of previous investment in environmental protection equipment, it includes the compensation of employees, the payment of rents, consumption of goods and services necessary to run, repair and maintain the environmental protection facilities and equipment.
>
> 64. Current expenditure also occur when activities are undertaken which aim at the provision of environmental services such as environmental co-ordination, certification, training, information and research.
>
> 65. Current expenditure may also include the purchase of goods used for environmental protection purposes which are not used to run an environmental protection equipment (e.g. lime used to reduce air emissions), and any identifiable substantial incremental costs resulting from a switch to new production inputs or practices with lower environmental impacts.
>
> 66. Current expenditure includes the full cost of purchasing environmental protection services (fees, charges), which finance an environmental protection activity which is related to the environmental impacts of the operating activity of the company."
> (Eurostat 2001: 15-16)

Due to national interest, the OECD/Eurostat joint questionnaire and the defined pilot variables in the SBS regulation, more detailed environmental domains were included in the surveys in 2002. In 2002 the following six environmental domains were requested in the surveys to the manufacturing industry and the steam and hot water supply industry (NACE 40.3): air/climate, wastewater, waste, soil and groundwater, biodiversity and landscape, and other. For NACE 11 (gas and oil extraction) the following five environmental domains were requested: air/climate; soil and groundwater; cooling/production water and waste water; waste; and other. It was decided that the category "biodiversity and landscape" did not apply to any large degree to the North Sea petroleum industry which did not first have to do with waste water/discharges to sea.

For reporting to Eurostat for the SBS regulation these additional categories will simply be added to the category "other." For reporting to the OECD/Eurostat joint questionnaire for environmental protection expenditure and revenues, these categories will be reported separately as requested in that reporting system.

2 Environmental protection expenditure for Manufacturing, Mining and Quarrying Industry, NACE 10, 12-37

A survey methodology is used for obtaining environmental protection expenditure for these industries. In 2002 all three environmental variables were included as a separate survey instrument in the annual manufacturing, mining and quarrying survey.

2.1 2002 Data collection methodology for NACE 10, 12-37

The 2002 manufacturing, mining and quarrying survey was a sample survey, which is described in more detail below. First a brief description of the general industry survey is provided.

2.1.1 General industry survey

Coverage
The annual manufacturing statistics cover local kind-of-activity units (LKAUs) in manufacturing, mining and quarrying, as defined by the Norwegian Standard Industrial Classification (SIC). Information on oil and gas extraction is not included. Enterprises with individual proprietorship where the owner is working alone (one-man enterprises), are not included in this survey. Furthermore, local KAUs with employment less than half a man-year worked are not included in the annual manufacturing statistics.

Data sources and data collection
The manufacturing statistics are prepared based on information from questionnaires and data from administrative registers. The manufacturing statistics' sample is based on a so-called cut-off sample where all local KAUs with at least ten employees at the time of sampling are included. In addition all local KAUs in multi-enterprises with at least one manufacturing local KAU with ten or more employees are included. A form and a copy of the standard financial report that the tax authorities collect from the enterprises (the Standard Industry Form) are therefore collected from all enterprises with manufacturing activity with at least ten employees. The Standard Industry Form covers the income statement and the balance sheet which enterprises are required to report to the tax authorities.

The following table provides some basic information regarding the coverage of the manufacturing, mining and quarrying survey for the 2002 survey.

Table 2 Local kind-of-activity units (Local KAUs). Manufacturing Statistics. 2002

	Number of local KAUs	Production value in bill. NOK	Employment
Population	11 134	498.3	272 884
Sample	3 915	451.0	234 511
Small local KAUs	7 219	47.3	38 373

In 2002, the population consisted of 11 134 local KAUs classified in manufacturing, mining and quarrying, and the tables are produced based on data from these local KAU. The local KAUs in the population from which Statistics Norway has collected data, make up the net sample and came to 3915 in 2001. These 3 915 KAUs made up 90.5 per cent of total production value and 85.9 per cent of total employment in manufacturing, mining and quarrying.

2.1.2 Environmental protection expenditure survey

The environmental protection investment and current expenditure survey was conducted as a sample survey in 2002. The sample survey was a subset of the main industry survey. The separate questionnaire was included together with the other questionnaires that were a part of the manufacturing mining and quarrying 2002 survey. The establishments that were included in the

sample were sent all of the surveys administered by the Division for Energy and industrial production statistics that were needed to be reported that year in one mailing from Statistics Norway. This mailing was sent to the individual listed as being responsible for the enterprise (or establishment) in the business register. It was then necessary for the individual in each enterprise or establishment to forward the different questionnaires to the specific person(s) who had the responsibility and knowledge for responding to the various questionnaires.

For the Environmental protection expenditure survey, the sample was chosen according to the following criteria:

1. The enterprise (or establishment) was included in the general industry survey for 2002.
2. All enterprises with at least one establishment with 200 employees at the time the sample was drawn were automatically included.
3. The rest of the sample was selected as a stratified sample where the stratification was at the 3-digit NACE level with a higher probably of being included in the sample if that NACE group had a high reporting frequency of end-of-pipe investment in the 2001 census survey.

Although the SBS directive 58/97 as amended states that the entity to be included in the survey is at the enterprise-level, since industry statistics is surveyed at the establishment level it was decided to develop the environmental variables at the establishment level. There were many advantages for doing this since the controlling and editing procedures, databases and other systems that are set up for implementing the other parts of the SBS directive 58/97 can be simply be expanded to include these new variables. In the future we would like to be able to connect emissions data together with the expenditure data. Air emissions and water emissions data are collected at the establishment level so it is important that the units of analysis be consistent throughout all of these statistics.

The total number in the sample was 592 enterprises, which included 1173 establishments/LKAUs. The number of the enterprises responding was 540 enterprises, which included 1030 establishments/LKAUs. This is a response rate of 91.2 per cent at the enterprise level and 87.7 per cent at the establishment/LKAU level. Since it was obligatory to respond to the survey a high response rate is expected since there can be a fine imposed for not returning the questionnaire. Of the 1030 establishments returning the questionnaire, 990 reported figures. See appendix for a copy of the survey instrument.

These 990 establishments included 49 per cent of total production value, 37 per cent of total employment and 59 per cent of total gross investments in manufacturing, mining and quarrying in 2002.

The Division for Energy and industrial production statistics conducted the control and editing of the reported data. Since all of the establishments included in the environmental protection expenditure sample survey were also covered by the industrial production survey, environmental investment and current expenditure totals could be compared with the totals reported for gross investments and for current expenditures (defined as: costs of goods and services consumed and compensation of employees). In this way it was possible to check for values that would be unreasonable when taken into the context of the establishments' general level of investment and current expenditure. In this way decimal errors could be particularly identified and since the values were requested in 1000 NOK a number of decimal errors were identified in this way (i.e. figures reported were in NOK and not 1000 NOK). These types of decimal errors are very important to identify and correct since they greatly influence the values. This also allowed for a basic check of consistency between the statistics developed using the industrial production questionnaire and those developed using the environmental protection expenditure questionnaire. This consistency is also an important factor when developing the survey and the statistics.

Although the 2002 survey has been a sample survey rather than a census, it has been decided to not gross up the values at this time. It was determined that further work and experience with this survey

data are needed before a reliable grossing a methodology can be established. From experience the values reported in a survey conducted for the first year are not the most reliable. Typically data quality improves as respondents become accustomed to reporting the requested data. The respondents often need to set up or change some of their accounting systems in order to be able to provide the requested information regarding environmental protection expenditure.

As the survey becomes more established, relationships between the variables that need to be grossed up and the standard variables that are available (such as gross investment, employment and turnover) need to be investigated. Some preliminary work has been done using the pilot survey data from 1997 (Hass, et al. 2000). From this work no variables were clearly identified as reliable for grossing up the variables. Grossing up investment is particularly difficult and the uncertainty is high. Further discussion regarding grossing up can be found in Hass (2004).

2.2 Main figures for environmental investment and current costs by environmental domains

The main figures for environmental protection investment and current costs are presented in the following three tables. The detailed breakdowns by industry division are included in the Appendices 9.1 and 9.2. Please note that these figures are not grossed up. Future plans include work to focus on establishing grossing up methodologies for this survey. Further discussion regarding grossing up can be found in Hass (2004).

Table 3 End-of-pipe investments in the Norwegian manufacturing industry, 2002. NOK 1000

Industry division (SIC 94)	*Number of Local kind of activity units*	*Total*	*Air/climate*	*Wastewater*	*Solid waste*	*Soil and groundwater*	*Biodiversity and landscape*	*Other*
NACE 10, 12-37 MANUFACTURING, MINING AND QUARRYING	**990**	**425 715**	**190 391**	**109 184**	**105 171**	**2 099**	**3 635**	**15 235**
NACE C, 10, 12-14 Mining and quarrying	45	11 734	2 838	4 491	2 264	193	860	1 088
NACE D, 15-37 Industry	945	413 981	187 553	104 693	102 907	1 906	2 775	14 147

Table 4 Integrated investments in the Norwegian manufacturing industry, 2002. NOK 1000

Industry division (SIC 94)	*Number of Local kind of activity units*	*Total*	*Air/climate*	*Wastewater*	*Solid waste*	*Soil and groundwater*	*Biodiversity and landscape*	*Other*
NACE 10, 12-37 MANUFACTURING, MINING AND QUARRYING	**990**	**437 660**	**75 657**	**35 302**	**9 648**	**3 710**	**180**	**313 164**
NACE C, 10, 12-14 Mining and quarrying	45	1 140	100	-	-	40	-	1000
NACE D, 15-37 Industry	945	436 520	75 557	35 302	9 648	3 670	180	312 164

End-of-pipe investments are an important part of environmental protection investments and Norwegian establishments reported NOK 426 million in costs related to this type of investment in 2002. Investments in measures focusing on air emissions continue to be important. These investments accounted for 45 per cent of all end-of-pipe investment while end-of-pipe investments in solid waste measures accounted for about 25 per cent.

A large proportion of integrated technology investment (72 per cent) is not specified according to environmental domain. One reason for this can be that it is often difficult for establishments to divide up a large investment according to environmental domains if more than one domain is covered by the investment. Of the integrated technology investments that have been reported according to environmental domain, just about 61 per cent of the investment went to measures focused on air/climate emissions and 28 per cent of the investment went to treatment of wastewater/production water.

Table 5 Current costs in the Norwegian manufacturing industry, 2002. NOK 1000

Industry division (SIC 94)	*Number of Local kind of activity units*	*Total*	*Air/climate*	*Wastewater*	*Solid waste*	*Soil and groundwater*	*Biodiversity and landscape*	*Other*
NACE 10, 12-37 MANUFACTURING, MINING AND QUARRYING	**990**	**1 321 656**	**265 551**	**491 250**	**459 149**	**26 578**	**15 252**	**63 876**
NACE C, 10, 12-14 Mining and quarrying	45	100 399	50 503	26 095	18 452	285	350	4 714
NACE D, 15-37 Industry	945	1 221 257	215 048	465 155	440 697	26 293	14 902	59 162

NOK 950 million or about 72 per cent of current costs for environmental protection were related to wastewater and waste. These costs included municipal fees and other wastewater and solid waste fees. At the same time, costs for reducing air emissions were NOK 265 million or approximately 20 per cent of environmental protection current costs. Costs for CO_2 taxes and other environmental taxes are not included.

2.3 Data table according to industry division and enterprise size

Please note that these figures are not grossed up. Future plans include work to focus on establishing grossing up methodologies for this survey. Further discussion regarding grossing up can be found in Hass (2004).

Table 6 Size breakdown of establishments in industrial statistics, survey information. 2002

Size groupings after number of employed persons	Total Number of establish-ments	Total Number of employed persons	Total Production Value Mill. NOK	Survey information: Number of establish-ments reporting values in the environ-mental protection expenditure survey	Number of employees in the establish-ments reporting values in the environ-mental protection expenditure survey	Production Value in the establish-ments included in the environ-mental protection expenditure survey Mill. NOK	Per cent of establish-ments reporting values in the environ-mental protection expenditure survey	Per cent of employed persons in establish-ments reporting values in the environ-mental protection expenditure survey	Per cent of production value in establish-ments reporting values in the environ-mental protection expenditure survey
Total	**11 134**	**272 884**	**498 319**	**995**	**100 174**	**242 788**	**100**	**100**	**100**
1-49	10 048	103 207	144 987	565	10 841	23 162	57	11	10
50-249	998	99 582	177 199	323	38 157	77 364	32	38	32
250+	148	70 095	176 133	107	51 176	142 262	11	51	59

Table 7 Size breakdown of establishments in industrial statistics, with regards to environmental protection investments and current costs. 2002. 1000 NOK

Size groupings after number of employed persons	Investments and current cost					
	Number of establishments reporting values in the environ-mental protection expenditure survey	End-of-pipe investments	Integrated investment	Current costs	Average total investment per establishment	Average current cost per employee
Total	**995**	**425 715**	**437 660**	**1 321 656**	**8.62**	**13.19**
1-49	565	22 553	13 368	316 644	3.31	29.21
50-249	323	67 723	39 345	364 685	2.81	9.56
250+	107	335 439	384 947	640 327	14.08	12.51

The medium sized establishments had the least amount per employee in terms of current costs and also the lowest level of investment per establishment. On the other hand, it was the largest establishments that had the highest level of investment per establishment and the smallest establishments that had the highest current costs per employee. These figures tend to indicate that using number of employees as a grossing up factor may not be the best choice since there are such large variations.

3 Environmental protection expenditure for Steam and Hot Water Supply Industry (NACE 40.3)

NACE 40 in Norway differs from other European countries because of the very high level of hydropower used for producing electricity. This also means that the levels of environmental protection expenditure will also be much lower. Identifying the appropriate portion of this industry for establishing environmental protection expenditure statistics is important.

Production and distribution of electricity (NACE 40.1) in Norway is almost exclusively based on hydroelectric power, where potentially harmful air and water emissions are almost non-existent. Therefore, end-of-pipe investments in this sector are expected to be very small, and it has been decided to exclude NACE 40.1 from the survey for this reason. On the other hand, distribution of natural gas through mains (NACE 40.2) is more likely to induce such investments, but such distribution is not done on a commercial basis in Norway, and is therefore also excluded from the survey. Thus, only NACE 40.3 is currently being included in the work for environmental protection expenditure.

An annual industrial production survey for NACE 40.3 is conducted separately from the standard manufacturing industry survey. Therefore to collect data for this industry it was necessary to modify the standard questionnaire for this industry and include questions regarding end-of-pipe investment.

3.1 Data collection methodology for NACE 40.3

3.1.1 Survey instrument

The same approach was used for collecting data on pollution treatment (end-of-pipe) investments in the steam and hot water supply industry as was used in the manufacturing industry in 2000 and 2001. This simply means that a new section asking about pollution treatment (end-of-pipe) investments was included in the standard survey questionnaire for the steam and hot water supply industry in the section that requests data regarding all investment activity.

3.1.2 Survey information

There is an annual census survey taken of the steam in hot water supply industry. In the 2002 survey, the entire population of 44 establishments was included in the survey. Of these, 4 reported end-of-pipe investments, or 9 per cent of the population.

Two establishments reported end-of-pipe investment in both 2001 and 2002 years. This tends to indicate that the establishments are able to report this type of information since it was not the same 4 establishments in both years. This also shows that investments of this type are not made annually for many establishments so this makes it difficult to determine the non-response level for this reporting.

The reported environmental protection investment data was controlled by comparing the total end-of-pipe investment amount (sum of post 1305) against the amount for total investments reported on the same section of the questionnaire (post 1304 Acquisitions). See appendix for an example of the survey questions. The control was that total environmental protection investment amount could not be greater than the total of the acquisitions reported as investments in section 13 of the questionnaire [(sum of post 1305) < (post 1304 Acquisitions)].

Control and editing any type of investment reporting is difficult since these types of investments may not be done every year. There is also no expectation that all enterprises would have this type of investment every year. Exactly how many establishments would have this kind of investment is currently difficult to know and this will only be obtained through experience and with a longer time series of data. Currently it is difficult to know whether the establishments not reporting any of this

type of environmental protection investment actually did not have any or simply did not fill out the areas of the questionnaire. This potential non-response to this question will need to be considered in the future.

3.2 Survey results for 2002 for investment in Pollution Treatment equipment (end-of-pipe) for NACE 40.3 Steam and Hot Water Supply

The following table presents the 2002 results for the steam and hot water supply industry (NACE 40.3) according to environmental domain.

Table 8 Investment in Pollution Treatment equipment (end-of-pipe) for NACE 40.3 Steam and Hot Water Supply according to environmental domain. 2002.

Year	Number of Local kind of activity units	Investment in pollution treatment equipment (end-of-pipe). 1000 NOK							Gross investment (Acquisitions less disposals of fixed assets)	End of pipe investment as per cent of Gross investment
		Air/ climate	Waste-water	Solid waste	Soil and Ground-water	Biodiversity and Landscape	Other	Total	1000 NOK	Per cent
2002	44	84 036	-	-	3 465	-	9 596	97 097	626 369	15.5

Table 9 Investment in Pollution Treatment equipment (end-of-pipe) for NACE 40.3 Steam and Hot Water Supply according to size groups. 2002.

Year	Number of Local kind of activity units	Investment in pollution treatment equipment (end-of-pipe). 1000 NOK According to 3 size groups, number of employees				Gross investment (Acquisitions less disposals of fixed assets)	End of pipe investment as per cent of Gross investment
		0-49	50-249	250+	Total	1000 NOK	Per cent
2002	44	.	.	.	97 097	626 369	15.5

As indicated in the table, these values cannot be provided due to problems of confidentiality that arises because of the low number of reporting LKAUs.

Due to the types of environmental consequences of the production in this industry it would be expected that investment in air emissions treatment equipment would be high. The figures from 2002 correspond with this expectation since about 87 per cent of end-of-pipe investment was for the environmental domain for air and climate.

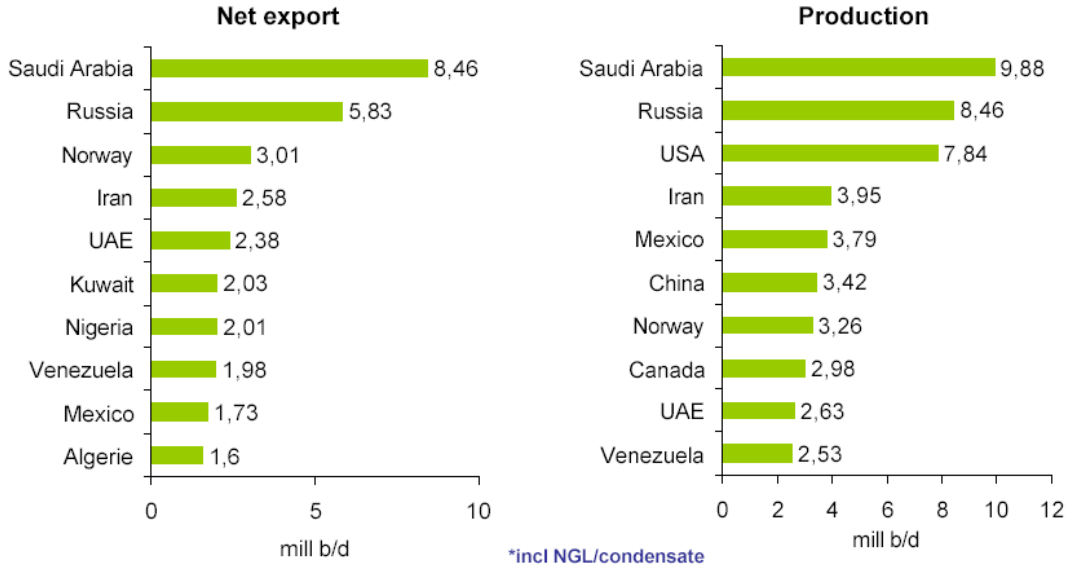
4 Environmental protection expenditure for Extraction of crude petroleum and natural gas - NACE 11

The oil and gas extraction industry in Norway is important both to the national economy and to supplying oil and natural gas to the rest of the world. A brief overview of the importance of this industry, internationally and nationally is provided in the next two sections. A description of some of the environmental consequences and challenges facing operations on the Norwegian Continental Shelf is provided in the third section. Section 4.4 provides the results for NACE 11 from the 2002 survey including end-of-pipe investment preliminary figures. The remaining portions of this chapter provide an analysis of survey methods and the proposal of a model-based system for determining investment and current costs for environmental protection expenditure.

4.1 Norwegian oil industry in relation to the world

The following figure shows net exports and production of crude oil from a selected number of countries in the world. In terms of net exports in 2003 Norway was third following after only Saudi Arabia and Russia. In terms of production Norway was seventh. This shows the importance of Norwegian oil in a global context. Due to this size of the Norwegian oil industry, the environmental impacts and the environmental protection expenditure to mitigate these effects can also be substantial.

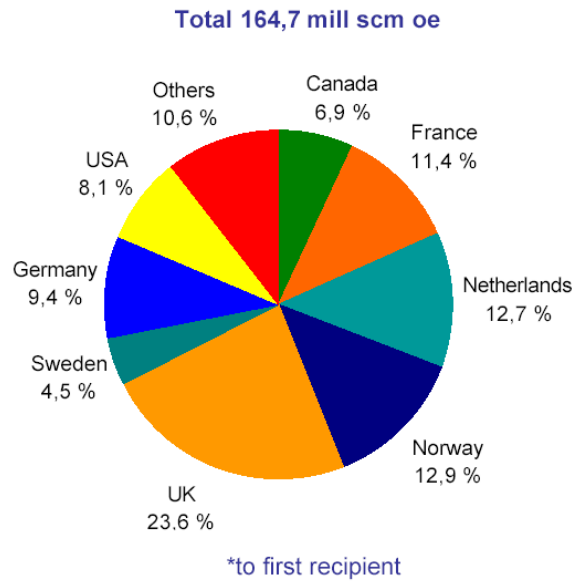
Figure 1. Net Export and Production of oil from selected countries, 2003. Mill b/d.



Source: Facts 2004 Figure 7.3 (Petroleum Economics Ltd)

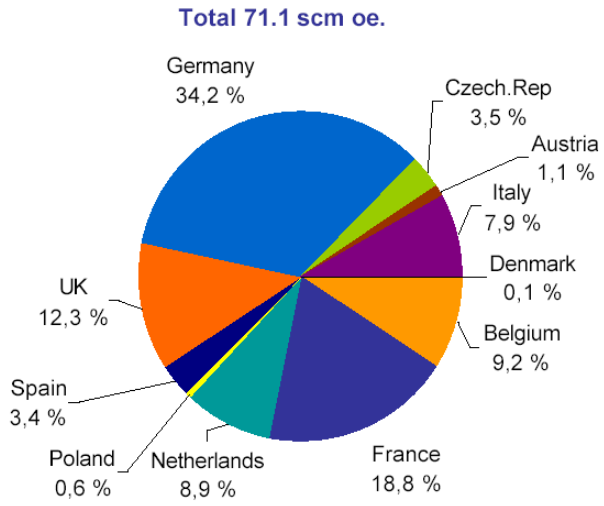
The following two figures provide information regarding the countries that purchase Norwegian crude oil and Norwegian natural gas. Again this information shows the importance of these Norwegian natural resources to the world economy and also more specifically to the European Union. The natural gas pipelines built from the Norwegian continental shelf to mainland Europe provide reliable, direct sources of natural gas to the European continent. In addition to oil sales and national gas exports there were also sales of 21.7 mill sm^3 o.e. NGL/condensate.

Figure 2. Sale of Norwegian Crude Oil, 2003



Source: Facts 2004 Figure 7.2 (OD)

Figure 3. Norwegian national gas exports, 2003

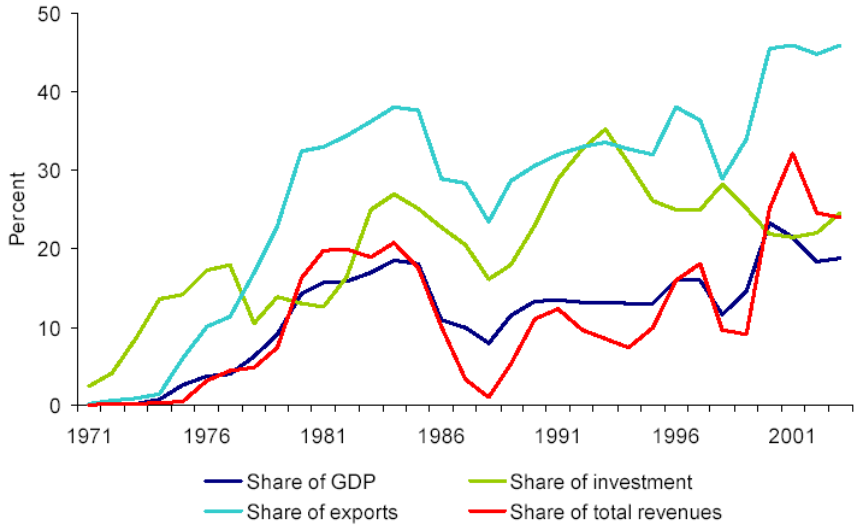


Source: Facts 2004 Figure 7.5 (OD)

4.2 Norwegian petroleum activities in the context of the national economy

From the following figure the importance of the Norwegian petroleum activities to the national economy is very easy to see. In terms of the share of exports petroleum products have been well above 40 per cent of total exports since 2000. The share of GDP and the share of investment are also very high. Since this one industry accounts for such a high proportion of national investment and share of GDP and it is an industry whose activities have substantial environmental impacts, it illustrates the importance of trying to identify environmental protection investment and current expenditures for this industry.

Figure 4. Contribution of the Norwegian petroleum activities to GDP, exports, investment and total revenues

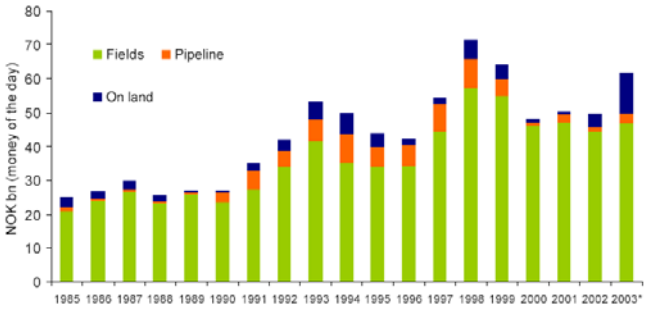


Source: OED, Facts 2004 Figure 4.1, Statistics Norway/Ministry of Finance

The figure on the left below shows historical investment levels related to the Norwegian petroleum activities. With such high levels of general investment, if environmental protection investment is only 1-3 per cent of the total investment on the Norwegian continental shelf, this would still have resulted in higher levels of environmental protection investment in the petroleum industry than in all of the Norwegian manufacturing industries combined. More detailed information regarding investment and current expenditures in the Norwegian petroleum industry are provided in section 4.4.

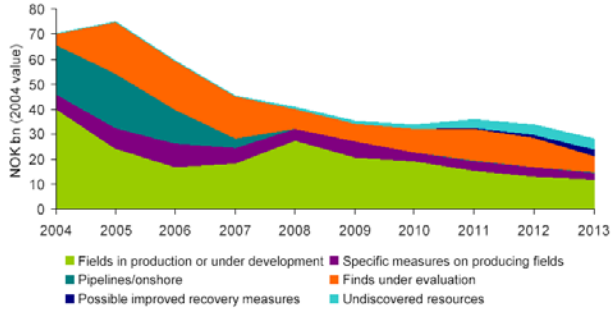
Since the Norwegian petroleum activities are very closely controlled and regulated through the Ministry of Petroleum and Energy, there have been estimates made for future investment in the Norwegian fields and pipelines. The figure on the right shows these estimates through 2013.

Figure 5. Investment in Norwegian petroleum activities. Billion NOK (current). 1985 – 2003*



Source: OED, Facts 2004 Figure 4.3 (Statistics Norway)

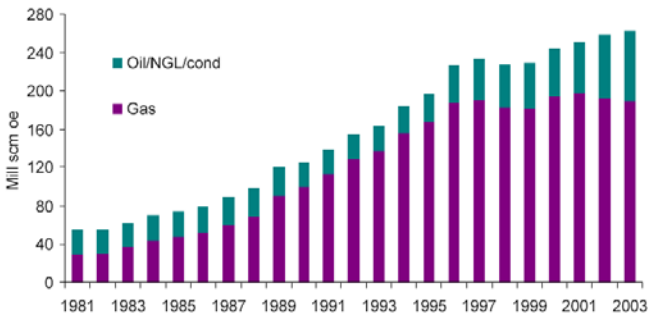
Figure 6. Estimates for future investment in Norwegian fields and pipelines. Billion NOK (constant 2004-NOK). 2004 – 2013.



Source: OED, Facts 2004 Figure 4.4 , (OED/OD)

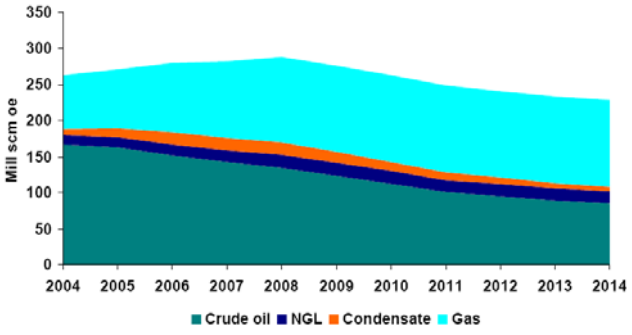
The production of oil and gas from the Norwegian continental shelf has been steadily increasing since the early 1980s, although the rate of growth has been slowing down during the last five years. The production from the Norwegian continental shelf is expecting to peak in the next few years and then to gradually go down (see figure of production forecasts). The length of time that Norway's oil and gas reserves will last, assuming the current rate of production and technology and the current evaluation of proven resources, are estimated to be just over 8 years for oil and just over 30 years for natural gas (R/P-rates). The figure showing production forecasts factors in other expected changes such as technology improvements and new discoveries which then results in a longer time period for the extraction of these resources.

Figure 7. Total production for oil and natural gas, historic profile. Million scm oe. 1981-2003.



Source: OED, Facts 2004 Figure 6.1 (OED/OD)

Figure 8. Production forecast for oil and natural gas. Million scm o.e., 2004-2014

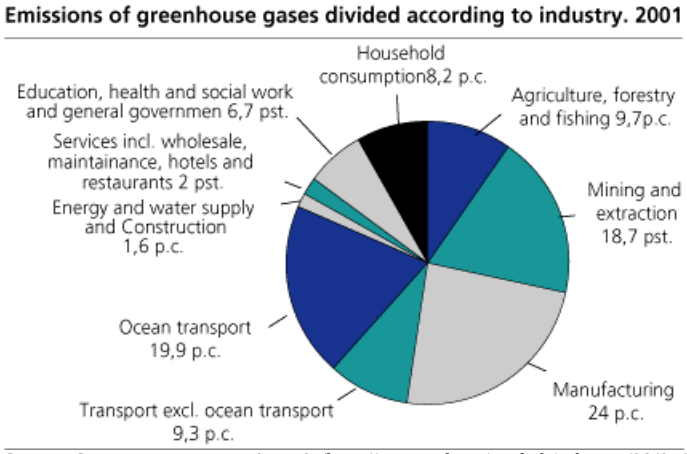


Source: OED, Facts 2004 Figure 6.4 (OED/OD)

4.3 Environmental consequences and challenges on the Norwegian Continental Shelf

Just as the Norwegian petroleum activity contributes substantially to the economy, it also accounts for over 18 per cent of Norwegian greenhouse gas emissions (ocean transport is included in the total). Only the manufacturing industries and the transportation industry contribute more to the total Norwegian greenhouse gas emissions than the oil industry (NACE 11).

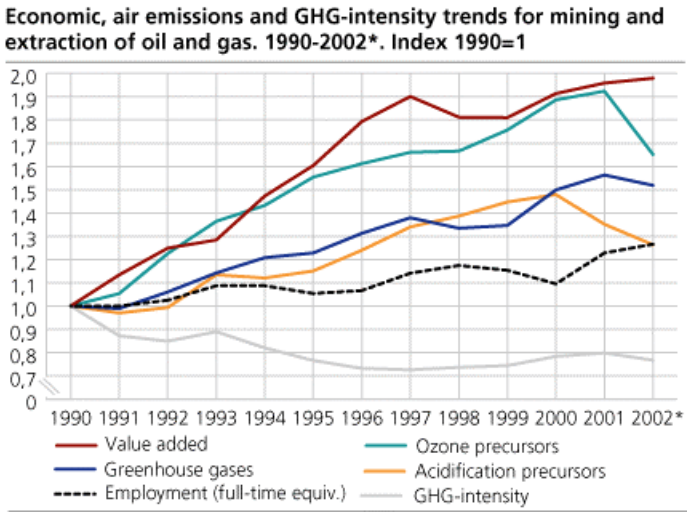
Figure 9. Emissions of greenhouse gas emissions divided according to industry. 2001



Source: Statistics Norway, NAMEA (http://www.ssb.no/english/subjects/09/01/nrmiljo_en/)

There have been specific measures taken to reduce air emissions by the industry due to specific requirements made from the Norwegian Pollution Control Authorities. In 2002 and 2003 these measures are now yielding results. Emissions of greenhouse gases, acidification precursors as well as tropospheric ozone precursors decreased from 2001 to 2002.

Figure 10. Economic, air emissions and GHG-intensity trends for mining and extraction of oil and gas. 1990-2002* (Index 1990=1)



Source: Statistics Norway, NAMEA (http://www.ssb.no/english/subjects/09/01/nrmiljo_en/)

Volatile organic compounds (NMVOCs) had the largest reduction in emissions from 2001 to 2002. The oil industry has focused on increasing the efficiency of turbines with respect to CO_2 emissions which is a result primarily due to adapting to a tax on CO_2 emissions. The CO_2-tax for offshore

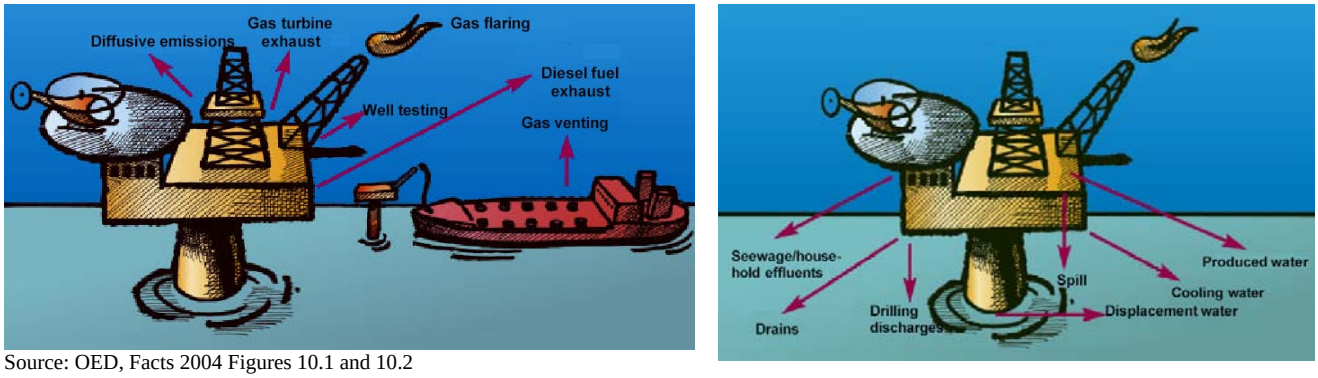
petroleum activities was introduced in 1991, and in 2004 the tax was approximately 320 NOK per tonne CO_2 (please note that the tax is put on the measured volumes of fuel and flare gas consumed (0,76 NOK/Sm3) and diesel consumed (0,76 NOK/l) on the production units). An unfavourable side effect of this is an marginal increase in the NO_x emissions from the turbines. However, less flaring and better use of diesel oil counteracted the increased NO_x emissions from turbines, so that in sum NO_x emissions decreased. This is shown in the following figure as a decrease in emissions of acidification precursors.

Over the period 1990-2002, value added in this industry has increased. The growth in value added, together with decreased emissions of greenhouse gases, produced lower greenhouse gas intensity for the industry. Improvements in efficiency can be seen from 1990 to 1997, with the intensity going down, but after 1997 there has been a slow worsening with the first improvement being seen from 2001 to 2002.

Although we have very good information regarding the contribution of the Norwegian petroleum activities to the economy, with detailed information regarding investments and emissions, there is little systematically structured information available regarding environmental protection investment or environmental protection current costs.

There are a number of environmental challenges facing the North Sea petroleum industry. The following figure illustrates a number of different types of emissions that occur due to the extraction of crude oil and natural gas. As mentioned above, the air emissions from this industry are of major concern. In addition, the discharges to the sea are also important especially since an increased level of petroleum activities are expected in the Northern part of the Norwegian continental shelf, e.g. in the Barents Sea area which is one of Norway's best fishing areas. And finally there is some solid waste that is transported to land for disposal. Some of this waste includes low level radioactive waste.

Figure 11. Diagrams showing some of the important environmental challenges facing the North Sea petroleum industry, air emissions (left) and discharges to sea (right)



Source: OED, Facts 2004 Figures 10.1 and 10.2

During the development and production phase, air emissions occur from a number of different sources. A major source of CO_2 and NOx are from the gas turbines and the diesel engines used in the production of electricity on the platforms. Another source is from gas flaring, which is the burning of the excess natural gas that occurs during production. Emissions of non-methane volatile organic chemicals (nmVOCs) occur during the transfer of crude oil from the platforms to storage tanks and to and from the shuttle ships that transfer oil to storage tanks on land.

Discharges to sea, in this case the North Sea and Norwegian Sea, occur from the drilling cuttings and from the water that is produced together with the oil and gas which is pumped out of the wells. Discharges of water containing residual oil and chemicals are some of the main challenges for the production facilities.

During the closing (decommissioning) phase of the offshore fields, there are additional environmental requirements that need to be adhered to due to the Ospar convention. In 1998, ministerial meeting of the convention for the protection of the marine environment of the north-east Atlantic (Ospar) approved a general prohibition on abandoning redundant offshore installations in the area covered by the convention. Exceptions can be made for concrete platforms, the bottom section of large steel structures, and other installations in the event of exceptional or unforeseen circumstances. Until now, a total of twelve Norwegian offshore fields have been permanently shut down. The decommissioning of the redundant installations need to be done in compliance with the Ospar convention. In essence this means that the redundant offshore installations will be brought ashore for recycling or disposal. Exactly how these decommissioning costs should be classified as environmental protection expenditures and how they should be handled in the national accounts are issues that need to be determined.

4.3.1 Air emissions

The most important sources of air emissions in the North Sea production platforms include CO_2 and NOx from the turbines used in the production of electricity on the platforms and from a variety of diesel engines used in various production and drilling processes. Another source is from flaring, which is the burning of the excess natural gas that occurs during production. Well testing and other diffuse sources also account for various types of emissions from the platforms. Emissions of non-methane volatile organic chemicals (nmVOCs) occur during the transfer of crude oil from the platforms to the ships and from the ships to the storage tanks on land. There are also nmVOC emissions during the venting from ships which occurs when the ships are loaded and unloaded.

Measures to reduce CO_2 emissions

There are a number of measures used to reduce CO_2 emissions. Estimations from the oil and gas industry indicates that the CO_2-emissions from the offshore petroleum activities on the NCS would have been over 2 mill tones higher without the measures taken to reduce these emissions. In 2003 the total CO_2-emissions from the offshore petroleum sector was just above 12 mill tonnes.

Combined cycle systems, which use the waste heat in gas turbine exhaust fumes to produce steam for generating additional electricity, are operational on installations in the Oseberg, Snorre and Eldfisk fields. These are the only combined cycle plants that so far have been installed offshore on a global scale, and they represent an example of the effect from the CO_2-tax and the possibility to export natural gas that is not consumed on the installations. Such systems are partially initiated due to cost reductions from saving energy, and may therefore be classified as an integrated technology investment, but it depends on the specific system you are investigating.

On the Sleipner West field, CO_2 from the natural gas is separated and injected for disposal in the Utsira sandstone formation 1000 meters beneath the seabed. Over a million tons of CO_2 have been stored like this since 1996. Current estimates for CO_2 storage in natural geological formations and in drained oil/gas reservoirs on the NCS are roughly 1000 million tons of CO_2. CO_2 is also being used to replace or supplement the injection of natural gas and water to improve recovery rates in producing oil fields. This technique can provide substantially improved oil recovery and reduces CO_2 emissions.

Measures to reduce Nitrogen oxides (NOx) emissions

Turbines, flaring and diesel engines on installations are the major offshore sources of NOx emissions. There are also some emissions from exploration and gas receiving terminals on land. CO_2 and NOx emissions are closely linked because both arise from the same principle sources. One important measure that can be implemented is low NOx burner technology for gas turbines. The low NOx burners can reduce emissions by up to 90 per cent without affecting CO_2 emissions although in some cases there will be CO_2 increases using this technology. In most cases, such investment would be classified as end-of-pipe investment.

Low NOx burners are considered the most appropriate and cost effective way to obtain substantial emission reductions from the Norwegian offshore oil and gas activities. This equipment is standard for new fields, and 35 low-NOx units are now in operation on the Norwegian CS. The cost of retrofitting these devices on existing installations is significant and the costs associated with the increased downtime on installations as a consequence of refitting are also an important consideration. Turbines with low NOx burners also need more frequent and extensive maintenance than traditional machines. All of these costs add up to substantial additional expenditures.

Measures to reduce non-methane volatile organic compound (nmVOC) emissions
The bulk of nmVOC emissions in the petroleum sector are due to offshore storage and loading of crude oil and from the receiving terminals on land. Emissions from loading a unit of oil vary widely between the various fields. One of the main reasons for these variations is the different content of light, volatile components in the oil from the different fields. In the newer offshore developments, floating storage units are used. The use of the floating storage units may release more nmVOC than in the fields where the crude is stored in the platform base because emissions occur in the floating storage units when production is transferred to them.

Emission forecasts for nmVOCs show a sharp decline over the next few years due to the installation of recovery technology which is being imposed under the Pollution Act and an expected peaking in oil production within a few years. From 1st January 2003 vessels unloading at the crude oil terminal at Sture near Bergen will be required to have the emission reducing technology in order to be admitted to the terminal. Tankers must be equipped with the appropriate connectors so that the nmVOC recovery equipment can be utilized. It can be argued that this kind of equipment is an end-of-pipe investment, since it does not enhance the production or quality of the oil, and is mainly installed due to environmental regulation.

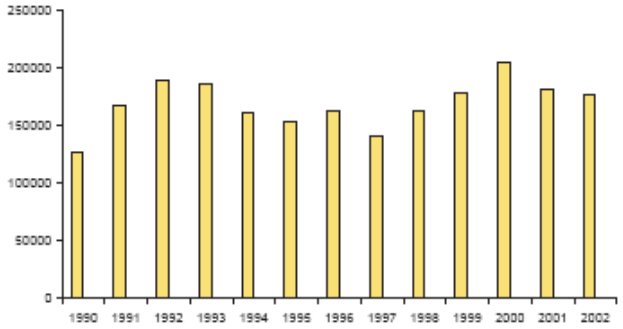
4.3.2 Discharges to the Sea

Water that is produced together with oil and gas is the main source of oil discharges to the sea from daily operations. Even if such water is carefully treated before discharged it still contains residues of chemicals, oil and dissolved organic compounds. According to the Ospar convention the content of dispersed oil in water discharged to the sea must not exceed 40 mg per liter. In 2006 this ceiling is reduced to 30. The annual average for Norwegian installations in 2002 was about 21.6 mg per liter and this concentration has been fairly stable since 1990.

Several of Norway's largest oil fields have now reached such a mature phase that their water cut is higher than before (water cut is the amount of water pumped up together with the oil). This boosts the volume of produced water which thereby increases oil discharges to the sea. One measure to help reduce discharges to the sea is to separate the water from the oil and to re-inject the water back into the reservoir instead of simply releasing it into the sea. In 2003 approximately 13 per cent of all produced water (water that is pumped up together with the oil) was injected below ground instead of released to the sea. This helps to reduce the amount of organic compound discharges to the sea. The most important types of organic chemicals from this type of water that has been in contact with oil are PAH and alkyl phenols.

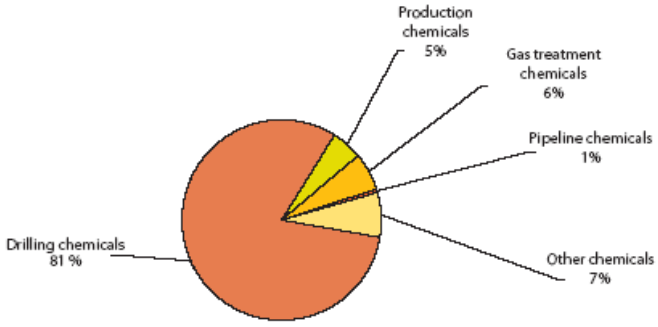
Drilling operations are another source for emitting chemicals. Discharging oily drill cuttings has been prohibited on the NCS since 1991. This ban has contributed to a significant reduction in oil discharges. Injecting cuttings below ground, new drilling methods and technologies, recycling, and disposal on land have all helped to reduce discharges of chemicals to the sea in recent years. The following figure shows, however, that even with these improvements, drilling operations account for the major portion of chemical discharges on the NCS; 81 per cent in 2002.

Figure 12. Total chemicals discharged from Norwegian petroleum operations



Source: OED, Environment 2004, Figure 17 (SFT)

Figure 13. Chemical discharges on the NCS by activity , 2002

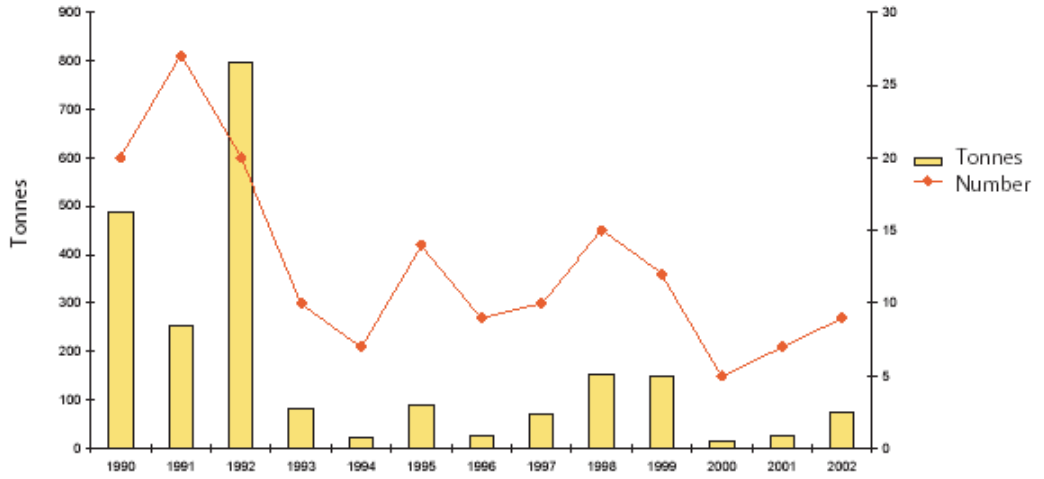


Source: OED, Environment 2004, Figure 16 (SFT)

The discharges of drilling chemicals per meter drilled have been substantially reduced from 1990 until 2002. Unfortunately there is starting to be an increase in the use of production and injection chemicals because of an increased use of water injection.

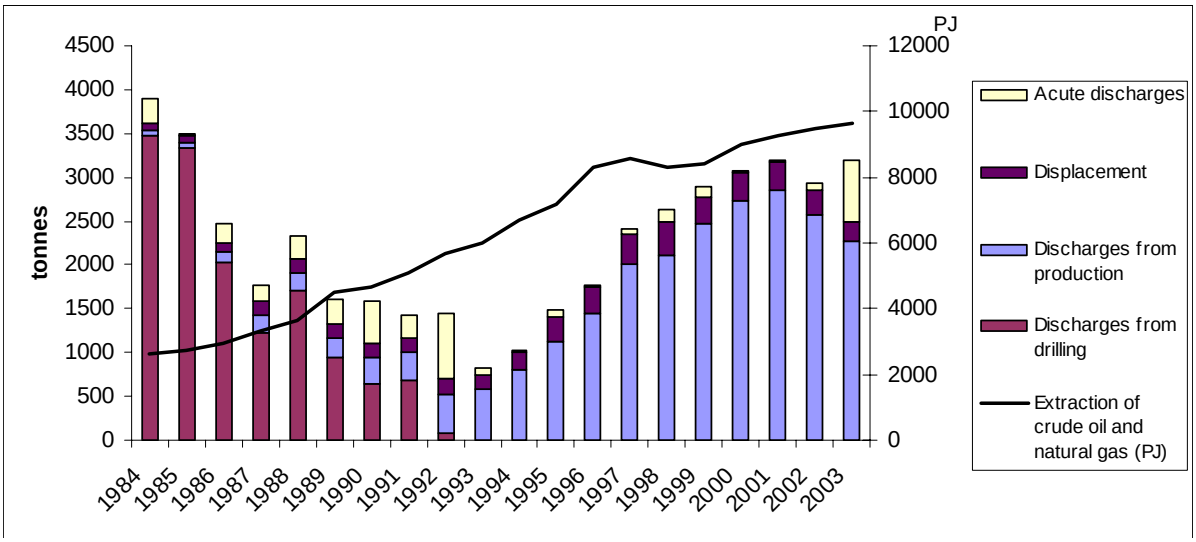
Acute oil spills can harm the natural environment. The spill site, season of the year, wind strength, ocean currents, effectiveness of emergency response and size of the spill are crucial factors that influence the scope of harm due to an acute spill. The most serious acute Norwegian oil spills have involved ships close to the coast. There are a relatively large number of acute oil spills that have occurred on Norwegian offshore installations. Few of these are larger than one tonne. The total volume of oil involved in acute spills is small compared with other sources of discharges of oil to the sea.

Figure 14. Acute oil spills over one tonne



Source: OED, Environment 2004, Figure 23 (SFT)

Figure 15. Discharges of oil from petroleum activities. Tonnes. Extraction of crude oil and natural gas. PJ. 1984-2003



Discharges of oil decreased between 1984 and 1992, and they have risen considerably since then. One reason for this development is increased awareness concerning emissions from drill cuttings and other unwanted effects of drilling activity, which has contributed to the fall in discharges until the early 1990's. At the same time, many fields have entered a production phase characterized by a larger amount produced water, which is contaminated with oil. The latter could be the reason for recent rises in discharges. There was a large increase in acute oil spills in 2003, this was due to a single accident on the Draugen field.

While there are other types of discharges to the sea such as, waste water (sewage) from the platforms where workers live, these discharges are minimal in comparison with the emissions to the North Sea due to the production processes.

The following table developed by the Norwegian Oil Industry Association (OLF) provides a good overview regarding the type of discharges, the sources of these discharges and the most important components with regards to discharges to the sea.

Table 10 Descriptions of discharges to sea

Type of discharge	Source	Most important components
Produced water	Water that comes up from the reservoir together with the oil and gas that are produced. The best water is separated from the water and gas on the platform. The water is then cleaned before it is discharged to the sea.	• Water • Minerals from the formation • Oil residues • Salts • Heavy metals • Natural low level radioactive compounds • Chemical residues
Ballast water	Seawater in the storage cells that is discharged from the platform as a storage cells are filled with oil.	• Sea water • May contain small residues of oil
Drainage water	Rainwater	• May contain dirt from the platform deck
Cooling water	Seawater	• Seawater at a higher temperature
Hydraulic fluid	Fluid used to operate valves on the seabed	• Hydraulic fluid

Source: OLF, 2004 Fact sheet, "Zero discharges"

Zero discharge strategy at sea

The concept of "zero discharge" was launched in Report no. 58 (1996-1997) to the Parliament concerning environmental policy for sustainable development. "Defined in accordance with the precautionary principle, the zero discharge goal aims to help ensure that discharges of oil and

environmentally-hazardous substances to the sea do not cause unacceptable health or environmental damage." (OED Facts 2004, p. 26) This goal now applies for all new stand-alone developments and by the end of 2005 for all existing installations. Reporting by enterprises in 2003 shows that a large number of measures have been implemented. If the additional measures planned for implementation are completed the targets set for 2005 will most likely be met.

New technologies for separating or blocking water before it reaches the installation are key to achieving the zero discharges goal. Separation of oil from water can be done on the seabed or downhole (in the well). This separation process will eliminate the need to pump water back from the platform, thereby saving energy and the associated air emissions. The water pumped back into the reservoir can help to improve oil recovery rates. Where water injection is not warranted, various types of treatment technology will be required in order to reach the zero discharge goal.

So far full or partial injection has been adopted or planned on more than 20 fields. Sub-sea separation has been implemented only as a pilot project in one installation. Downhole separation has been tested on land but trials in an offshore well will be needed before the technology can be developed further. Newly developed treatment technologies for removing dissolved PAHs and alkyl phenols (and not just dispersed oil) are also undergoing field testing.

All of these technological developments will contribute to the improvement of reducing discharges to sea and air emissions.

4.3.3 Solid Waste

In the early days of oil exploration on the NCS, solid waste was simply dumped in the sea. But that practice was stopped relatively quickly and now the waste on the platforms is sorted for recycling and transported to land for further recycling or final treatment.

In accordance with the new 1997 Norwegian regulations for hazardous waste each operator must have a plan for hazardous waste handling, storage and treatment that details exactly at which land-based facilities the waste will be treated.

The petroleum industry does not produce radioactive compounds, however, the production processes do result in waste that contains low level, naturally-occurring radioactive compounds. This low-level, radioactive waste is found in the drill cuttings and dissolved in the produced water (which then gets deposited on the inside of pipes in the form of radium sulfate). Approximately 10-20 tonnes of this type of low level radioactive waste are produced per year. There is an estimated 150 tonnes of low-level radioactive waste from the petroleum industry in temporary storage facilities. Construction of a new waste depository for this type of waste is being considered.

Drilling cuttings have been discussed under discharges to sea, while it can be argued that drilling cuttings should be classified as solid waste. In some cases, cuttings are shipped to land for further treatment, and could therefore be classified as waste. On the other hand, if drill cuttings were treated and discharged on site, it may be best classified as discharges to sea. These types of technical definitions, especially when they concern boundaries between different classification categories, are needed to be clarified and treated consistently.

4.3.4 Biodiversity, spill recovery/preparedness and other topics

The most important environmental issues that the petroleum industry is dealing with are air emissions, discharges to sea and solid waste. Many of the measures implemented to reduce discharges to the sea can also be considered measures that protect biodiversity. Initially the drill cuttings were simply disposed of on the seabed near the drilling site. This practice was stopped fairly quickly since it was shown that these drill cuttings were markedly influencing the surrounding area and sea life. Although some of the measures implemented to reduce discharges to sea could also be considered or classified under the category "protection of biodiversity," since these measures are connected to the "zero

discharges to sea" goal, they are currently being classified under the environmental protection expenditure domain, waste water and cooling water.

4.4 Survey methodology and results from 2002 (end-of-pipe investment)

As we have discussed earlier, the petroleum industry in Norway is facing certain environmental challenges, relating especially to air emissions and discharges to sea. Although there is a strong focus on reducing the environmental consequences in this industry,and there is an increasing focus on reducing costs, and there is very complete statistics regarding the standard industry variables of investment, turnover, employment, etc., there are no systematically collected figures for environmental protection investment or current costs.

In order to try to establish this type of information for NACE 11 in Norway, the initial approach used for the manufacturing industry was used. This means that end-of-pipe investment was requested as an additional specification of the total investment reported by enterprises on the annual standard industry survey. The results from the 2002 survey are presented below. An evaluation of this approach and a proposal for future developments regarding the collection of data and development of statistics for environmental protection investment and current costs is presented afterwards.

4.4.1 Methodology of the annual industrial survey of NACE 11

Statistics Norway conducts an annual census survey of the Norwegian oil and natural gas extraction industry. The survey is based on a questionnaire, which gives information from all the sectors about the activity onshore and on the Norwegian Continental Shelf (NCS). Separate questionnaire forms are used, depending on whether the activity is onshore or offshore. Onshore activities include offices, bases and terminals, while NCS operations include fields and pipelines on stream (in production) and drilling for crude oil and natural gas on contract.

In addition to a census survey on enterprises in NACE 11.10 (Extraction of crude petroleum and natural gas), which covers around 220 enterprises, a sample of 63 enterprises in NACE 11.20 (Service activities incidental to oil and gas extraction, excluding surveying) was included in the survey in 2002. Enterprises report data on employment, current costs including wage costs, production value, paid taxes, in addition to several other variables concerning operations. See the appendix for the survey instrument for fields on stream.

4.4.2 Main results from the annual NACE 11 industry survey for 1998-2002

The following tables give some of the main results for NACE 11 for recent years. Additional information and explanation of these figures can be found at: http://www.ssb.no/english/subjects/10/06/20/oljev_en/ and more detailed investment information can be found at: http://www.ssb.no/english/subjects/10/06/20/oljeinv_en/.

Table 11 Employment and wage costs for extraction of crude oil and natural gas. 1998-2002

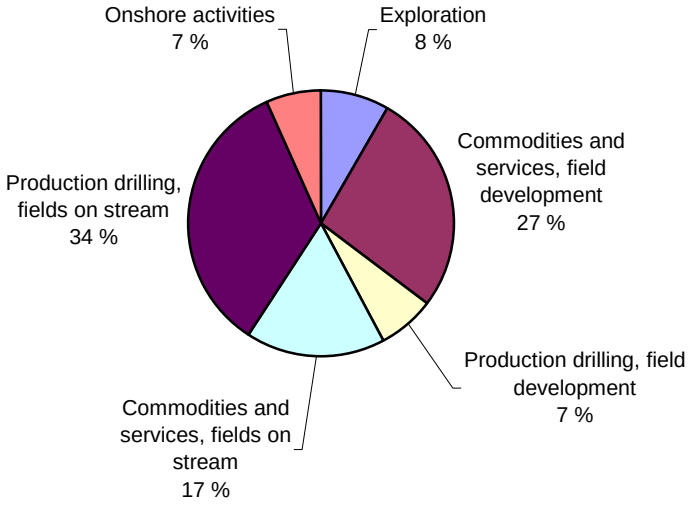
	1998	*1999*	*2000*	*2001*	*2002*
Number of employees	15 865	15 998	14 283	14 467	15 913
Offshore	5 192	5 485	4 822	5 179	5 186
Onshore	10 673	10 513	9 461	9 288	10 727
	NOK million	*NOK million*	*NOK million*	*NOK million*	*NOK million*
Compensation of employees	10 489	11 919	11 949	13 395	13 969
Offshore	3 303	4 010	4 562	5 754	6 043
Onshore	7 186	7 909	7 387	7 641	7 926
Royalties total	7 374	7 148	4 670	4 505	3 833
Of this					
Production royalties	4 200	4 073	2227	1 712	946
CO_2 - royalties	3 174	3 075	2 443	2 793	2 887

Table 12 Gross value added, intermediate consumption and accrued investments for extraction of crude oil and natural gas. 1998-2002. Mill. NOK

	1998	*1999*	*2000*	*2001*	*2002*
Gross value of production	138 781	187 296	365 420	336 772	285 550
Of this					
Value of goods produced on own account	129 065	174 270	348 809	319 213	267 106
Intermediate consumption	26 532	29 298	328 843	33 986	32 726
Of this					
Fields on stream	17 625	17 868	20 331	24 065	24 015
Non - operator costs	3 106	3 027	1 300	2 220	1 696
Accrued investments	70 830	64 403	52 898	54 967	52 924

In addition to the annual survey, Statistics Norway conducts a separate survey on investments in the petroleum industry on a quarterly basis. If we take a closer look on the results from the quarterly survey, we find that a large part of investments is in production drilling, both in the categories "field development" and in "fields on stream." Investments in field development and fields on stream are equally large, but in the development phase a larger fraction of investments are in commodities and services, while in the production phase it is production drilling that is the major contributor to investment costs.

Figure 16. Accrued investments for extraction of crude oil and natural gas, 2002.



Source: Statistics Norway, Extraction of crude oil and natural gas investment statistics
http://www.ssb.no/english/subjects/10/06/20/oljeinv_en/tab-2004-12-02-01-en.html

4.4.3 Results from the NACE 11 survey regarding end-of-pipe investments for 2002

In 2002 a section on end-of-pipe investments including five environmental domains was included in the standard industry questionnaire (see appendix). The five environmental domains were: Air/Climate, Soil and groundwater, Cooling/Production water and waste water, Waste and Other. For 2002, only fields on stream reported such types of investments. There were no data reported from the enterprises from the fields in development. The results are shown in the table below:

Table 13 Preliminary figures for end-of-pipe investments in fields on stream by environmental domain. 2002*. 1000 NOK

	Total	*Air and climate*	*Soil and groundwater*	*Cooling/process water and wastewater*	*Waste*	*Other*
End-of-pipe investments	**484 609**	85 022	-	380 348	16 909	2 330
EOP-investments as a per cent of total investments in fields on stream	**1.80**	0.32	-	1.41	0.06	0.01

8 fields (out of about 45 total number of fields) reported end-of-pipe investments for 2002. Most of the operators in these 8 fields reported investment in cooling/process water and wastewater, while those who reported investment for waste also reported investment in some other environmental domain. A few large investments account for a large portion of total investments, and by the nature of these data, it is expected that these values would fluctuate over the years.

Investments in end-of-pipe equipment in the oil and gas industry are large relative to similar investments in Norwegian manufacturing industry sector. While the manufacturing industries had about 426 mill. NOK in end-of-pipe investment, the end-of-pipe investment figures reported from the oil and gas industry were over 484 mill. NOK. Even so, if end-of-pipe investment is examined as a per cent of total investment, it is over twice as high in the manufacturing industries, around 3.8 per cent, compared to the 1.8 per cent in the fields on stream in the oil and gas industry.

The percentage of total investments that were used for end-of-pipe equipment in the oil and gas extraction industry ranged from 0 to 14.5 per cent. This can indicate that environmental challenges are different from field to field, some may be caused by governmental regulation while other investments may be caused by technical challenges. In 2002, there was in particular a single large investment in equipment for cooling/process water and wastewater, and this accounted for the largest share or 14.5 per cent of total investment in that particular field.

The data are obtained using a survey questionnaire where the environmental variables are only a small part of the questionnaire. Our experience with the manufacturing industries tend to indicate that there may be some high levels of non-response to the specific questions on environmental protection expenditure when using this approach. By sending out separate questionnaires for the environmental reporting, more respondents filled out the complete questionnaire in the manufacturing industries. Accuracy also appeared to improve. Similar tendencies may be seen in the oil and gas extraction industries but it is not easy to make any concrete conclusions at this time.

There can be some questions whether the estimates given by respondents reflect the actual costs. It is difficult to determine if the numbers reported are total investment or just the part of the investment that can be classified as environmental protection. This is the same type of problem regarding defining the investment portion, that is also found in the data reported by enterprises in the manufacturing industry survey. When the answer area is left blank (no reporting is recorded), it is impossible to know if there is no actual expenditure, if the expenditure is cannot be reported, or if it simply has not been reported. These are some of the common types of problems encountered when using this type of approach for collecting environmental protection expenditure. Since these preliminary figures for the oil and gas extraction industry were obtained in a census survey there is no need to gross up the figures, however the potentially high non-response rate to the environmental protection investment question does increase the uncertainty of these figures.

4.5 Existing surveys of the petroleum industry

It can be useful to examine what other countries and industry organisations are doing with regards to establishing environmental protection expenditure information in order to identify strengths and weaknesses using this approach.

4.5.1 American Petroleum Institute (API) Annual Sample Survey

The American Petroleum Institute (API) is a business organisation for the petroleum industry in the USA (similar to The Norwegian Petroleum Institute (marketing) and The Norwegian Oil Industry Association (exploration and production)). API has been conducting a survey on environmental protection expenditure in the American oil and gas industry since 1990. A questionnaire has been sent to a sample of companies that are representative for the industry and the data obtained from this survey is used for estimating totals for the whole industry. The main part of the questionnaire is shown in the appendix. The companies report both capital and operating expenditures according to environmental domain (air, water, wastes, remediation, spills and other) and according to sector (exploration and production, refining, marketing and transportation). In addition to the environmental variables, companies are asked to report production, trunkline transportation, refining capacity and gasoline sales.

More specifically, API's environmental protection expenditures survey is sent to a stratified sample of the industry: all large and mid-size companies, plus a randomly selected group of smaller companies. Even though only about 7 per cent of the companies completed the survey, these companies represent a large share (25- 66 per cent for 2001) of the variables used to estimate totals. The survey covers not only the extraction industry with related services, but also refining and marketing.

In the survey, costs for the category exploration and production are estimated from the share of upstream revenues. The share of reporting companies with respect to this variable were around 38 per cent, which may lead to some uncertainty in estimated totals. API calculates the uncertainty for this variable to be ±25.2 per cent for a 95 per cent confidence interval, with most other variables estimated with less uncertainty.

Grossing up estimation is done by ratio and regression analysis, and as mentioned, "upstream revenues" were used for grossing up the variable "exploration and production." In our earlier work on the manufacturing industry, we have found that the choice of proxy for grossing up expenditure is very important. Different choices can lead to different results (Hass, et al. 2000), and more specifically that current environmental protection costs are difficult to estimate in this way. Differences in technology, environmental regulation and age of facility are all variables that influence environmental current costs, and they are not necessarily correlated with total current costs. Even though estimation of environmental protection investment may face similar problems, we have found that using total investments as a basis for grossing up does provide more appropriate results. Our main concern with the choice of estimation method is that no differentiation has been made between current costs and investment in capital goods, as the nature of these costs are very different, different grossing up factors would be advisable.

API is aware of the possible practical difficulties with this kind of survey. One of the most important difficulties is that enterprises do not necessarily track environmental expenditures separately. Even if companies do keep track of such costs, their records may not reflect the definitions of variables used by the API. Therefore, firms often provide estimates instead of exact accounting data. This is a general problem with this kind of reporting, and does not just apply to the survey by the API.

In the "Notes and Instructions" that accompanied the questionnaire (see appendix), API has included a list over possible capital items that can be related to the environment. The capital items are classified according to environmental domain, and whether they are applicable to refining, exploration &

production, transportation or marketing. It is also indicated what fraction of the total investment that can be allocated as an environmental protection expenditure. Such a list greatly increases the accuracy of the survey, since enterprises answer the form in a more unified way. In our work in the manufacturing industries, we have found that different enterprises often have a different understanding of what "environmental protection expenditure" may be. A common, standard list can be a helpful tool in getting more consistent evaluations and reporting from enterprises.

Results from the survey show that in exploration & production 670 mill. USD was spent on capital investment while 617 mill. USD was spent on operations and maintenance. The fraction of capital investment is larger (more than 50 per cent) for this part of the industry than in other parts of the industry. For example, capital investment in the refining industry is only one-third of the expenditure for operations and maintenance. Even though there are differences between different portions of the petroleum industry surveyed by API, these results do show that both investment and current costs are an important part of environmental protection expenditure. However, focusing only on investments will not provide a total picture of environmental protection expenditure in the petroleum industry.

In the American oil and gas industry, over half of total environmental expenditures in the exploration and production, or 901 mill. USD went to measures for water. Of this, 508 mill. USD was spent on capital equipment and 393 mill. USD was spent on operation and maintenance. Expenditures for water was the largest fraction of total expenditures, and these results are similar to the Norwegian survey on end-of-pipe investment.

4.5.2 Environmental protection expenditure surveys in Canada and United Kingdom

Canada
Statistics Canada has conducted a direct mail, mandatory response, sample survey for environmental protection expenditure on a biennial basis since 1994. The sample drawn is stratified based on industry group. The total sample has varied between 2500 and 3000 units. The oil and gas extraction industry is conducted as a census survey, or in other words all establishments are included in the sample.

Estimates are made for all establishments that had 49 or more employees, which were not included in the survey. The grossing up methodology used is the mean of environmental protection expenditures to employment ratio for a particular industry group and province/region multiplied by the number of employees to determine an estimate for the non-sampled establishment. Due to the fact that the sample is not drawn in a random manner, variance estimates and error ranges are not calculated.

The only special information provided for NACE 11 enterprises is given in the "Guide to definitions and classification details" which accompanies the questionnaire. Here it states "please respond separately, if possible, environmental protection expenditures associated with different petroleum operations: exploration, refining, chemical products, pipeline transportation."

The environmental activities are not reported according to the CEPA international classification system. Instead the following 8 categories are reported for capital expenditures and operating expenditures: environmental monitoring; environmental assessments and audits; reclamation and decommissioning; wildlife and habitat protection; pollution abatement and control processes (end-of-pipe); pollution prevention processes; fees, fines and licenses; other.

In 2000 the oil and gas extraction industry accounted for 10.4 per cent of total operating expenditures (324.7 of 3 270.6 Million CD) for environmental protection and 21.4 per cent of total investment in environmental protection (465.1 of 2 177.9 Million CD). Pollution abatement and control processes (end-of-pipe) accounted for 52.6 per cent of environmental protection investment in the oil and gas extraction industry, whereas, pollution prevention processes (integrated technology) accounted for 24.7 per cent. Please note that by using this different environmental classification system, it means

that the addition of end-of-pipe investment and integrated technology investment does not add up to 100 per cent as it does in the European (Eurostat) statistics.

59 per cent of total environmental protection expenditures in 2000 in the oil and gas extraction industry are capital (investment) expenditures and 41 per cent are operating expenditures. This expenditure breakdown shows the importance of including operating expenditures and not simply focusing on investments when establishing environmental protection expenditure statistics for this industry.

United Kingdom
The UK conducts an annual sample survey for environmental protection expenditure in industry (URS Corporation Ltd, 2004). The population of the survey in 2002 included all enterprises with ten or more employees. Enterprises with fewer than ten employees were excluded from the sample frame. The survey was conducted as a voluntary response survey, which resulted in the overall response rate of 19.7 per cent. Investment (both end-of-pipe and integrated) and current expenditures were requested according to 7 environmental domains (wastewater, air, solid waste, soil/ ground water, noise, nature protection, other).

The overall response rate to the annual survey has consistently been around 20 per cent for the last three years. Reasons cited by enterprises for not responding to the questionnaire included that the information is not readily available and that gathering the required information would necessitate too much time to be devoted to this voluntary reporting

Statistics for NACE Section C Mining and Quarrying (including NACE 10-14) were developed and not statistics at the two-digit division NACE level which would provide information specifically on NACE 11. The mining and quarrying industry has a relatively small number of enterprises in the UK and there are a number of large enterprises that do not consistently report to the survey from one year to the next. This type of erratic reporting of large enterprises increases the potential for skewing the results and not providing very high quality data over time. For NACE 10-14 in the 2002 survey, 78 enterprises participated in the survey resulting in a response rate of 21 per cent, which is equivalent to 6 per cent of the total survey response.

In 2002, total environmental protection expenditures were 139 £M which was equal to 5.3 per cent of total investment and operating expenditures in this industry. Current environmental protection expenditure accounted for about 60 per cent of total environmental protection expenditure. Investment expenditure was dominated by integrated investment by a ten to one ratio to end-of-pipe investment (53:5 £M respectively).

In 2002 the environmental domain for air protection measures had the highest level of expenditure at nearly £60 million, most of which was in integrated technology. In 2001 the highest expenditure was on soil and groundwater protection. These results show that large changes can be expected from year to year. The UK data tables also contain a footnote that warns about making comparisons between the various years due to the low response rates obtained in the surveys of this industry.

The guidance notes provided as help for filling out the survey questionnaire provided lists of the different types of operating costs and investment types to be included in the various reporting sections of the questionnaire. There were no special instructions that were tailored to specific industries. The number of employees was used as the factor for grossing up this figures from the survey to the whole population.

In both of the country surveys there was an increase in the uncertainty of the results due to low response rates and also due to the various interpretations given when filling out the survey instruments. Perhaps the use of a common, standard list can be a helpful tool in getting more consistent evaluations and reporting from enterprises as is used in the API survey

4.6 Statoil's evaluation of implementing a survey methodology in Norway

Statoil is one of the largest Norwegian oil and gas corporations and is a major operator on the Norwegian continental shelf, in addition to having an increasing involvement in projects abroad. In 2002, the company made an assessment of what would be the costs of implementing corporate environmental accounting that would be needed in order to report to a questionnaire on environmental protection expenditure (Statoil unpublished 2002). The background for the study was pressure to improve cost efficiency in fulfilling environmental regulations, in addition to addressing possible future demands from Statistics Norway for this reporting. This information was also thought of as being relevant for investors and the community as a whole.

There had been earlier attempts on establishing a corporate environmental cost accounting system. A separate system outside of the regular accounting system provided some information on environmental expenditures in the company, but since interest in the data was not sufficient, this practice was discontinued. There were also problems with inaccuracies in the data, which contributed to a lack of confidence in the data.

The latest assessment emphasized the need to motivate managers to use the system and the data in a active way. Managers could, for example, be held responsible for environmental benchmarks, which would raise awareness of these issues in the organization. This is also seen as a way to improve the quality of the data, as the environmental accounting system would be given more attention.

Two ways of implementing a system were proposed. A separate system, detached from the regular accounting system has the advantage that it can be specifically designed for the purpose, but may not be prioritised by managers, for the reasons mentioned above. It was also suggested that environmental variables could be included in the existing accounting system.

Either a separate or an integrated system was considered costly (on the order of several million NOK) and this was the main reason for not recommending implementing either type of system. The judgement was that only if Statistics Norway made this reporting mandatory, could the implementation of such a system be justified. Still, several possible uses of data from the environmental accounts were proposed in case of mandatory reporting in the future.

5 An alternative approach to be developed and evaluated

Due to the active governmental management of the Norwegian oil and natural gas resources there is a good deal of information regarding environmental protection measures that could be used as sources of data. By using the existing information from the responsible Ministry and Directorates it may be possible to make cost estimates that are more consistent with the definitions for the various variables to be reported. Although in the initial phases of collecting and systematizing the information there will be substantial development costs, in the long run it is expected that a centrally administered model-based approach to developing these statistics will be more cost effective for the industry than a survey based methodology. The following sections present this alternative approach in more detail.

5.1 Need for considering an alternative to the survey methodology

Earlier attempts at mapping environmental expenditures in the oil industry have been based on surveys, either a census or a sample survey, where enterprises fill out a questionnaire and totals are estimated from the sample. While this is a common way to obtain data, several disadvantages with the method suggest that another methodology be considered. Both quality of data and cost effectiveness may improve by using another method.

In the analysis by Statoil, the cost perspective was particularly emphasized. Changing the accounting system and implementing a system that includes the environmental dimension is costly, both in direct and indirect costs. The alternative is to report data from the existing accounting system, which would mean that enterprises would most likely report crude estimates of the environmental variables, thus data quality would suffer, and it is not certain that this approach would prove to be less costly. Statistics Norway is under pressure to reduce the reporting burden for enterprises, and there is a constant pressure to avoid double reporting and to use existing reporting and databases to obtain information. In addition, the oil and gas industry in Norway already has a high cost level, partly due to the cost structure of offshore drilling. Not increasing the reporting burden to Statistics Norway would be a contribution to not increasing the already high costs in this industry. The Ministry of Petroleum and Energy is also very interested in keeping cost increases to the industry to a minimum and is positive towards considering the use of existing reporting for the development of new information.

The Norwegian oil industry represents a very large part of Norwegian industry, particularly when you look at production value and investment levels. Investment projects on the continental shelf are of a much larger scale than any land-based industry in Norway. Therefore, poor data quality in this sector will affect total numbers to a great extent. As we saw earlier, just the reported end-of-pipe investments in the oil and gas industry were larger than the end-of-pipe investment total for all of the other Norwegian manufacturing industries combined for 2002.

When enterprises estimate environmental protection expenditures, there has not been a clear definition of which expenditures to include as "environmental" and what to include as "non-environmental". From our work with the manufacturing industry, we found that the understanding of "environmental protection expenditures" varies between enterprises, and this could lead to poor estimates and reporting. In the oil and gas industry, there are numerous examples of equipment that may have an environmental benefit, but would not necessarily fall into the category of environmental protection expenditures as defined be the EU regulation. In the survey of end-of-pipe investments for 2002, one field reported a large investment for Wastewater and production water that contributed to over half of total investments. To control whether the reported investment can be recognized as environmental protection expenditures is difficult, especially ex post of reporting.

It may also be difficult to determine which environmental domain investments should be included. One example is investments made for separating water from oil and re-injecting the water into the well. Should this investment be classified as investment in Wastewater and production water or in the

category Soil and groundwater? And how much of the total investment should be considered for environmental protection since the investment also increases the efficiency of the production and increases the recovery rate of the field? These types of questions always have to be considered with regards to environmental protection expenditure but the scale of investment on the NCS makes these boundary issues even more important than in the manufacturing industry since the evaluations influence the data so dramatically.

The American Petroleum Institute provided respondents with a list of capital items according to environmental domain and also estimates for the amount of the investment that is considered "environmental protection" (see appendix), but such a list is not likely to include all possible items. Thus, some judgement will be left to the reporting enterprises, which will most likely have different evaluations regarding the definition of environmental protection expenditures. If a central authority, which already has access to all investment information and related current costs since it must approve any investment or changes in operations on the Norwegian Continental Shelf, made such judgements, one would presumably achieve a more uniform treatment of these issues.

5.2 Mapping available information from NPD and OED

As a part of the general mapping of costs on the Norwegian Continental shelf, the Ministry of Petroleum and Energy (OED), in addition to the Norwegian Petroleum Directorate (NPD), have produced some estimates on specific areas where there have been environmental protection expenditures. The estimates are in some cases relatively crude, but might give some insight into the scale of the expenditures in the industry.

For 2003, the Ministry has estimated environmental taxes and environmental investment to be about 12 per cent of the total current costs of NOK 31 billion on the continental shelf, which is mainly CO_2-royalties of between NOK 3.5 - 4.1 billion. The amount of environmental investment (estimated at NOK 400 million in 2003 and rising to 2.1 billion NOK in 2005) is still considerable relative to similar investments in the manufacturing industry.

Looking into the details, most of environmental investment is made to achieve the goal of zero emissions from new platforms. This is estimated to be around NOK 1 bill. in 2004, while investment for reducing emissions of VOC (Volatile Organic Compounds) is projected to be around NOK 600 mill. An intra-industrial cooperation project was initiated in 2003 to reduce VOC emissions, and in the first year the investment amounted to NOK 131.2 mill. Investment of this type is expected to be considerable in 2005 and 2006, while no additional investment is expected in the years after 2006. When new fields come on line they will be required to have this type of equipment installed before they are allowed to begin operation.

Other projects initiated by the Ministry include possible scenarios for reducing emissions on the Norwegian Continental Shelf by replacing the gas fuelled power plants on-site with electricity supply through underwater cables. The conclusion was that the cost per ton of reduced emissions was larger than current CO_2 fees, meaning that this measure will not be profitable for the enterprises at the current levels of fees.

The Ministry has access to information about the NCS from several sources. First, all new fields have to be given a concession on the basis of a thorough evaluation concerning both commercial and environmental issues. The evaluation has to include information on expected investment costs, possible pitfalls, extraction methods and so on. Also known as PUD (plan for development and operations), this document is not publicly available, but is accessible for the Ministry. A similar evaluation, known as PAD (plan for installations in operation) has to be made concerning operations and current costs, which may also be of interest. The problem with these documents is that they do not

have a uniform layout, the information has not been systematized into a database so it may therefore be rather a large challenge to extract the necessary information from these extensive documents.

Secondly, the Ministry has access to a database, Licenceweb, which covers all information regarding extraction permits. This includes budgets and technical reports, and the system is easier to use than the evaluation reports mentioned earlier. Information from this database is strictly confidential, so it is not possible to publish the data except in an aggregate way.

5.3 Proposed non-survey approach to calculating environmental protection expenditure for the petroleum industry

When developing a new approach to establishing environmental protection expenditure statistics in the oil and gas extraction industry it is important to identify the appropriate unit of analysis. The unit of analysis must be at a detailed enough level so that all of the different types of investments and current costs for all of the different types of equipment will be able to be identified and connected to a unique unit. If the unit of analysis is too large it will not be possible to connect the information at the appropriate level and the possibility for double counting will occur. It is also important that the unit of analysis can be aggregated to other commonly used aggregation levels in the industry.

Identifying what is the "correct" unit of analysis is not necessarily that easy. There are no "correct" answers however some options can be evaluated. It is also important to use the terminology that is prevalent in this industry so that misunderstandings can be avoided when information is verified by the enterprises.

After discussions with the Ministry of Petroleum and Energy and the Norwegian Petroleum Directorate it would appear that the installation level would be an appropriate unit of analysis. Not all installations are considered platforms so the ambiguity of the term "platform" should be avoided if possible. The installations can then be aggregated up to provide information at the field level or other higher aggregation levels. It is also important to try to set up a system that not only works now but is also flexible enough to include the increasingly important decommissioning costs in the future. For these reasons it appears that the installation is an appropriate unit of analysis.

When developing a calculation framework or model some assumptions are made. One assumption is that there are similar solutions used on a number of different installations. In other words each unit is not unique. It would then be possible to identify certain types of investment that are used in a number of situations/installations. This would mean that the estimates for the investments and the current costs resulting from these investments could be used for a number of different installations. Although many of the solutions used it on the various installations in the North Sea are specially engineered, there are examples of certain solutions that have been implemented on a number of different installations. One example of this is the recent installation of low NOx burners on a number of production platforms.

Initially the entire population of the unit of analysis (installations) needs to be identified. Then the solutions related to each of the different types of air emissions, discharges to sea and waste handling systems needs to be identified. Then the specific solutions connected to each of the different installations needs to be matched. Once this initial mapping is done, then the investment and current costs related to each of the different solutions needs to be identified/estimated. After all of this information is systematized, cost calculations need to be made over time, in other words, the investment would take place in one year and the current expenditures connected to that investment would then start in the next year and would continue for the following years until modifications have been made. Periodical updates of these cost estimates would need to be considered.

Approaching the calculation model in this way will make it possible to produce calculations on an appropriate level that can then be quality checked with the operators on each of the fields, perhaps during their annual meeting with the authorities at the Norwegian Petroleum Directorate.

A number of classification variables would probably need to be included for each of the units of analysis (installations) in order to allow appropriate aggregation and to help in estimating costs. Examples of these classification variables are: field name, installation identification numbers, status in terms of production, development or decommissioning, life phase in terms of start up, plateau or tail.

Some production information may be also useful in estimating costs, although for some types of environmental protection costs there is no strong relationship between production and costs related to the treatment equipment. The running costs are related mostly to the investment and not to the production levels reflecting a type of on-off cost structure rather than a production related cost structure.

Investments in end-of-pipe equipment and integrated equipment could be identified according to the main type of emissions that it is trying to reduce. In recent years investments in CO_2 and VOCs have been required by the authorities and implemented widely on the NCS facilities so this information should be fairly current and easy to identify and obtain. This would be a good starting point for trying to develop this type of calculation model.

It is expected that a good deal of the needed information will be available from the documents and other reporting channels at the Ministry of Petroleum and Energy. Unfortunately this information is not yet systematized in a database and it will require a good deal of digging through documents in order to find the information that is needed. For this reason a stepwise approach to developing this calculation model is foreseen. These plans are described in the next section.

5.4 Plans for developing and evaluating a trial calculation model

In order to obtain the information we need, and to increase our knowledge of the Norwegian petroleum industry, we invited the Ministry of Petroleum and Energy, in addition to the Norwegian Petroleum Directorate, to give their recommendations and possibly contribute to the project on a regular basis. Through a number of meetings, we have discussed the annual required reporting to Eurostat regarding environmental protection expenditure and presented our alternative suggestion to a survey-based methodology. We discussed both possibilities and limitations of our proposed model. Representatives from the Directorate have been helpful in mapping out existing information, and determining the key areas for additional work.

As emissions to air are currently an area of special focus, because of the implementation of the Kyoto Protocol and other treaties, it has been decided to focus on this environmental domain first. The industry has invested in measures for air in recent years, both concerning NOx and nmVOC, and it is expected that data for these investments are fairly readily available since the investments are recent. Identifying the investment data and resulting current costs related to the investments will be the first step in collecting and developing the information needed in the calculation model.

For the coming year, we plan to establish cooperation between Statistics Norway and the other relevant governmental institutions. It is planned that first estimates of investments and current costs related to air emissions will be available by the late spring. This is particularly important since the Petroleum Directorate has close contact with the enterprises that operate on the NCS and have regular scheduled meetings with the operators before the summer. At these meetings we are hoping that the initial calculations and methods can be given an quality check by the representatives of the enterprises that are operators.

An important forum for this project is the "Miljøforum" (Environmental Forum), which is a collection of representatives that meet each year to discuss environmental issues in connection with operations on the NCS. The representatives are both from the government ministry and control authorities and from industry, in addition to experts and others who have special knowledge or interest in the industry. During 2005, we intend to present our preliminary findings for this forum, thereby increasing interest for this approach to developing the required statistics. We also hope to receive constructive comments on the methodology, which will help us improve both the method and the results.

Assuming that the work on air emissions is of adequate quality so that the methodology can be used and further developed, the next phase (expected to start in 2006) will be to map investments in reducing discharges to sea. Earlier studies show that investments in reducing discharges to sea represent the largest fraction of environmental protection investment. Since the goal of the Norwegian Government is to eliminate all harmful discharges to sea from the petroleum industry by the end of 2005, this ambition is likely to necessitate large investments in the industry.

5.5 Challenges in NACE 11 that need to be considered

There are a number of challenges that need to be addressed during the development of a new statistical area. Obtaining consistent information is important and is key to obtaining good quality, consistent information over time. Definitions and classification hierarchies can be helpful in this case. It is also important to identify the boundaries defining the problem. Identifying which elements should be included or excluded and being consistent in these definitions is important. In the oil and gas extraction industry determining whether decommissioning costs and oil spill/disaster preparedness should be included or excluded also makes a big difference in the expenditure levels reported.

5.5.1 Consistency in evaluating the different types of investment with respect to end-of-pipe and integrated technology

The distinction between end-of-pipe investments and process-integrated investments is not an easy one. Equipment may be categorized as end-of-pipe investments because they are not needed for the production process, but still be regarded as integrated investment since the installation of such equipment enhances the performance of the production plant. One example in terms of the oil industry is re-injection of produced water back into the reservoirs or into surrounding formations. This is primarily done for environmental reasons, but the increased pressure may also increase the extraction ratio.

The survey by the American Petroleum Institute (API) tried to solve this definition and interpretation problem by enclosing a list of capital items classified into environmental domains and sectors. If such a list also included the dimension of whether the capital items could be classified as end-of-pipe or integrated investments, it would be possible to ensure at least to some degree that a common standard or understanding existed and was used. A uniform definition of which types of equipment are put in the different categories is important for the quality of data.

The approach of the API requires a thorough technical knowledge that is constantly updated to stay abreast of new technical developments. This expertise is probably found in the oil companies thus some kind of cooperation/consultation concerning the classification of capital items would be necessary. This has been the logic behind asking for estimates from enterprises in similar studies in the manufacturing industry. We assume that the people closest to the information often have the best knowledge. Even so, the oil and gas industry are more uniform than the manufacturing industry in terms of capital equipment employed in production, so it may be possible to produce a list similar to the one from the API. Acknowledging that the oil and gas industry is a very large part of the Norwegian economy and the level of environmental investment and current expenditures would also be of similar importance, it would appear that an evaluation of specific capital items according to

whether they are end-of-pipe or integrated investments would be an important step towards developing consistent evaluations of investments.

5.5.2 Decommissioning costs

According to Commission of The Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) it is prohibited to leave installations that are not in operation in the area applicable to the convention. Some types of installations are exempt from this, mainly concrete platforms. This means that there is a great challenge ahead for the offshore oil industry, since many of the fields in operation today will have to be decommissioned in the coming years.

Since decommissioning costs on the NCS are largely incurred in order to comply with environmental requirements and agreements it would be assumed that these costs should be considered environmental protection expenditures. However some of the costs may be recovered through the sale of recyclable portions of the dismantled installations. Exactly how decommissioning costs are included in the national accounts is still under discussion at international levels and the results of these discussions needs to be taken into account when determining how and if these costs should be classified as environmental protection expenditure.

In a report from DNV (Det Norske Veritas), decommissioning costs for installations in the period 2001-2020 are estimated. From a mere NOK 10 million per year in the period 2001 to 2005, costs are expected to rise to about NOK 120 million per year when we approach 2020. The total for the whole period is estimated to about NOK 2.1 billion, but it is emphasized that this number is highly uncertain. In any case, the costs concerning decommissioning in the coming years represent a large and important factor for the industry.

As mentioned earlier, we believe that the right approach to mapping environmental costs and environmental investment is to focus on the installation level, not using fields or enterprises as statistical units. One good reason for this approach is that it enables us to follow each installation through its "life cycle", from exploration and drilling through production operations and finally ending with decommissioning. It will make it easier to provide good estimates for future environmental expenditures.

5.5.3 Costs for oil spill recovery

Oil spill recovery and other related services are the responsibility of NOFO - Norwegian Clean Seas Association for Operating Companies. This is an organisation established by the operating companies on the NCS, and ensures that the authorities' oil spill recovery guidelines are followed. NOFO has an administration in Stavanger, which organizes a number of local suppliers of recovery equipment dispersed strategically along the country. This is an oil spill recovery "pool" which does not provide commercial services, therefore data for investments and costs are not readily available for this organisation.

There has been much focus on oil spill recovery in Norway, especially after a major blow out on the Bravo platform in 1977. One reason is the fragile nature of the coastline and the importance of clean waters for the large Norwegian fishing industry. Awareness concerning oil spills have been a major consideration in the political debate on opening new areas and fields for drilling and production, and also when allowing for oil to be transported along the coast.

In many ways, expenditure for oil spill recovery should be classified as environmental expenditure, as governmental regulation on this issue aims to reduce harm to the environment. But in terms of industry classification, NOFO is not classified as a part of NACE 11 Oil and gas extraction, but as "other technical consultancy activities" (NACE 74.209). Thus we consider that these expenditures are not a part of the required reporting about NACE 11, however it could be argued that these could be included as services related to oil and gas extraction (NACE 11.2).

The costs for operating NOFO are covered by the operating companies and are part of the general current costs for NACE 11. By identifying these costs from the supply side (NOFO) may be easier than identifying them from the demand side (the operating companies) if these costs should be included. Including these expenditures in the current model may be problematic since they are not connected to any specific installation and much of the equipment is land-based. A separate model/calculation section for this type of expenditure could be included in the calculation model if it is determined that these costs should be included.

In the next phases of development for the petroleum industry it will be important to clarify the definitions and classifications of the different types of environmental issues and to define the appropriate boundaries for the related expenditures. Connected to this work it would be helpful to have bilateral discussions with the Eurostat experts regarding these issues.

6 Future plans with regards to environmental protection expenditure reporting according to the SBS regulation

At Statistics Norway the strategy used for implementing the new reporting requirements from the SBS regulation with regards to the environmental protection expenditure variables has involved implementing a number of changes to existing surveys administered by the Division for Energy and industrial production statistics. The regulation states that statistics are to be developed according to 4 environmental domains (air/climate; wastewater; waste and other), by size groups (0-49; 50-249; 250+) and by the NACE categories shown in the following table.

Table 14 Overview of current reporting status for Statistics Norway in relation to the environmental variables in the SBS regulation

NACE Category to be reported according to SBS regulation	Name of category	NACE Division	Current status for Statistics Norway's reporting:
Section C	Mining and Quarrying	10-13	Only e-o-p for 11 All 3 variables for 10, 12-13
Subsection DA	Food products, beverages, tobacco	15-16	All 3 variables
Subsections DB and DC	Textiles, wearing apparel, leather	17-18 and 19	All 3 variables
Subsection DD	Wood products	20	All 3 variables
Subsection DE	Pulp and paper	21-22	All 3 variables
Subsection DF	Refined petroleum products	23	All 3 variables*
Subsection DG and DH	Chemicals and rubber, plastic products	24 and 25	All 3 variables
Subsection DI	Other non-metallic mineral products	26	All 3 variables
Division 27	Basic metals	27	All 3 variables
Division 28	Metal products	28	All 3 variables
Subsections DK and DL and DM and DN	Machinery, electrical and optical equipment, transport equipment, furniture, other	29 and 30-33 and 34-35 and 36-37	All 3 variables
Division 40	Electricity, gas, steam and hot water supply	40	Only e-o-p for 40.3
Division 41	Collection, purification and distribution of water	41	No data currently available

*Although all three variables are available for NACE 23 the figures cannot be released due to confidentiality reasons since there are only 2 refineries in Norway. In the detailed tables in the appendix these figures are included together with NACE 24.

The table also shows the current status of the development of data with respect to the environmental variables in the SBS regulation. There still needs to be some development work regarding the grossing up methodology for all of the NACE where we have data for all three environmental variables. These improvements are considered more gradual , and not areas that need additional work in order to establish the statistics.

In the first phases of implementation the manufacturing industry (which in Norway is defined as NACE 10, 12-37) was the main focus of our development efforts. Withstanding future budget cuts it is expected that this survey will be continued in the future. Improvements to the methodology and establishing grossing up techniques will be the focus of our work in the future. Further details regarding this can be found in the report by Hass (2004).

A similar stepwise approach to that used for the manufacturing industry has been started for the Steam and hot water supply industry (NACE 40.3). In the 2002 census survey of this industry a question regarding end-of-pipe investment was added to the general investment portion of the standard industry questionnaire. Environmental protection expenditure for the other parts of NACE 40, i.e. the production and distribution of electricity and the manufacture of gas and distribution of gaseous fuels

through mains, will be very low in Norway since nearly all of the electricity produced in Norway comes from hydroelectric power plants and there is nearly no distribution of gaseous fuels in Norway. One exception is investment for biodiversity and landscape, which is often required when hydropower enterprises develop facilities. There are also considerable current costs associated with biodiversity and landscape in this industry. Since this environmental domain is only in the pilot phase in the SBS regulation, this work will not be of major focus in the near future.

In the future this situation may also change if a natural gas power plant is built or if an infrastructure to use natural gas is developed in Norway. Expanding the survey to include these other portions of NACE 40 (40.1 and 40.2) or to include all three environmental protection variables for NACE 40.3 may be considered in the future but due to limited resources this will not be where our efforts will be focused in the near future.

Based on our work with environmental accounts and in connection with the SBS regulation we have identified that only municipal-owned water works are currently included in the national accounts (in NACE 75) and that no statistics for NACE 41 are produced on a regular basis. Plans have been established for 2005 for work to begin on this area. It is necessary that we work together with the Division for national accounts, the Division for Energy and Industrial Production statistics and those responsible for the business register to improve and include information regarding private water enterprises into the national accounts. Coordination with The Norwegian Institute of Public Health is also expected since they are responsible for the maintenance and reporting to the national register over all water works (both private- and public-owned). Once the general industry variables are established for NACE 41 we could then consider what the options are for developing environmental protection expenditure for this NACE division. Until this division is included in the national accounts, any focus on environmental protection expenditures will be of a secondary consideration.

When examining which industries are not covered by the main manufacturing, mining and quarrying survey the most important industry excluded, which is also expected to have high levels of environmental protection expenditure, is the oil and natural gas extraction industry (NACE 11). This is an extremely important and large industry in Norway. For these reasons a special focus on this industry was taken in this project. Initially a purely survey-based approach was envisioned for this industry and it was believed to simply be a question of how to best implement this type of survey. Therefore, in the 2002 census survey of this industry, a question regarding end-of-pipe investment was added to the general investment portion of the standard industry questionnaires.

This evaluation has been revised due to the information obtained from contacts with the industry, the Ministry of petroleum and energy and the Norwegian Petroleum Directorate. At this time it is planned to develop a calculation model based on the investment plans and the operating plans that are provided by the operators on the Norwegian Continental Shelf to the Ministry. A stepwise development of the calculation model is planned focusing first on air emissions in 2005. Once this approach is evaluated by all parties involved, a second development phase focusing on discharges to sea will be planned. Until this calculation model is sufficiently developed, end-of-pipe investment will continue to be included in the annual survey of the petroleum industry. In this way statistics for end-of-pipe can be reported in accordance to the SBS regulation and can also be used to evaluate the calculation model until the model can become fully operational.

Although there are still some gaps in the environmental protection expenditure statistics for Norway, major portions of these statistics are now fairly well established and only need some refining. In the near future establishing statistics for the oil and natural gas extraction industry (NACE 11) will be given priority in terms of development work. A close cooperation between the Norwegian Petroleum Directorate, the Ministry of Petroleum and Energy and the Division for Environmental Statistics in Statistics Norway is currently being established with the purpose of developing a calculation model for environmental protection expenditure in the Norwegian oil and gas extraction industry.

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Environmental protection expenditures in manufacturing, mining and quarrying industries:
http://www.ssb.no/english/subjects/01/06/20/miljokostind_en/
Manufacturing statistics. Structural data:
http://www.ssb.no/english/subjects/10/07/sti_en/
District heating statistics:
http://www.ssb.no/english/subjects/10/08/10/fjernvarme_en/
Oil and natural gas statistics:
http://www.ssb.no/english/subjects/10/06/20/oljev_en/

8 Abbreviations

API	American Petroleum Institute
NCS	Norwegian Continental Shelf
NOFO	Norwegian Clean Seas Association for Operating Companies
OED	Ministry of Petroleum and Energy
NPD	The Norwegian Petroleum Directorate

9 Appendices

9.1 Environmental protection investment in pollution treatment (end-of-pipe) and integrated technology in large establishments in Manufacturing, Mining and Quarrying. 2002

9.2 Current expenditures for environmental protection in large establishments in Manufacturing, Mining and Quarrying. 2002

9.3 American Petroleum Institute's (API) List over types of environmental capital investment included as part of instructions for filling out survey

9.4 American Petroleum Institute's (API) survey questionnaire response sheet

9.5 Survey instrument for Manufacturing industry (NACE 10, 12-37): Instructions and questionnaire for 2002 including all 3 environmental protection expenditure variables

9.6 Survey instrument for NACE 40.3 Steam and Hot Watter Supply 2002 (and 2001)

9.7 Survey instrument for NACE 11

9.1 Environmental protection investment in pollution treatment (end-of-pipe) and integrated technology in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Investment in pollution treatment equipment (end-of-pipe) and integrated technology (pollution prevention). 1 000 NOK															Gross investment (Acquisitions less disposals of fixed assets)	Environ-mental protection investment as per cent of Gross investment	Total acquisitions	Environ-mental protection investment as per cent of total acquisitions	Production Value
		Air/climate		Wastewater		Solid waste		Soil and groundwater		Biodiversity and landscape		Other		Totals			1 000 NOK	Per cent	1 000 NOK	Per cent	1 000 NOK
		End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	Total					
10, 12-37 MANUFACTURING, MINING AND QUARRYING	990	190 391	75 657	109 184	35 302	105 171	9 648	2 099	3 710	3 635	180	15 235	313 164	425 715	437 660	863 375	11 135 857	7.8	12 403 017	7.0	242 786 902
NACE C, 10, 12-14 MINING AND QUARRYING	45	2 838	100	4 491	-	2 264	-	193	40	860	-	1 088	1 000	11 734	1 140	12 874	106 584	12.1	129 880	9.9	2 657 572
10 Coal and peat	1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
13 Metal ores	1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
14 Other mining and quarrying	43	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
NACE D, 15-37 INDUSTRY	945	187 553	75 557	104 693	35 302	102 907	9 648	1 906	3 670	2 775	180	14 147	312 164	413 981	436 520	850 501	11 029 273	7.7	12 273 137	6.9	240 129 330
15-16 FOOD PRODUCTS; BEVERAGES AND TOBACCO	272	11 579	2 968	24 347	8 649	1 758	2 300	70	746	-	-	335	2 020	38 089	16 682	54 771	1 771 712	3.1	2 200 967	2.5	69 577 134
15.1 Meat and meat products	67	6 883	1 300	1 041	870	960	200	-	-	-	-	10	-	8 894	2 370	11 264	487 964	2.3	527 489	2.1	26 097 903
15.2 Fish and fish products	69	3 470	302	7 443	367	220	-	-	-	-	-	5	325	11 138	994	12 132	359 203	3.4	396 857	3.1	6 200 402
15.5 Dairy products	55	986	542	11 531	2 296	350	1 797	70	-	-	-	20	615	12 957	5 250	18 207	438 272	4.2	455 762	4.0	12 370 585
15.3-4/6-8 Other food products	54	40	-	4 332	3 326	228	303	-	746	-	-	100	-	4 700	4 375	9 075	257 002	3.5	294 668	3.1	6 856 259
15.9/16 Beverages and tobacco	18	-	500	-	1 790	-	-	-	-	-	-	-	950	-	3 240	3 240	185 104	1.8	469 449	0.7	9 760 059
17-19 TEXTILES AND TEXTILE PRODUCTS, LEATHER AND LEATHER PRODUCTS	12	-	-	455	-	90	-	-	-	-	-	-	-	545	-	545	17 907	3.0	21 126	2.6	528 864
17 Textiles	11	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
18 Wearing apparel, dressing and dyeing of fur	1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

9.1 Environmental protection investment in pollution treatment (end-of-pipe) and integrated technology in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Investment in pollution treatment equipment (end-of-pipe) and integrated technology (pollution prevention). 1 000 NOK															Gross investment (Acquisitions less disposals of fixed assets)	Environ-mental protection investment as per cent of Gross investment	Total acquisitions	Environ-mental protection investment as per cent of total acquisitions	Production Value
		Air/climate		Wastewater		Solid waste		Soil and groundwater		Biodiversity and landscape		Other		Totals			1 000 NOK	Per cent	1 000 NOK	Per cent	1 000 NOK
		End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	Total					
19 Leather and leather products	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
20 WOOD AND WOOD PRODUCTS	47	689	401	262	-	10	380	-	-	-	-	20	-	981	781	1 762	126 353	1.4	149 590	1.2	4 111 146
21 PULP, PAPER AND PAPER PRODUCTS	26	6 600	14 594	4 263	23 205	74 018	-	317	10	384	-	1 802	4 925	87 384	42 734	130 118	594 169	21.9	632 338	20.6	12 788 566
21.1 Pulp, paper and paperboard	15	6 600	14 594	4 263	23 205	73 928	-	317	10	384	-	1 802	4 925	87 294	42 734	130 028	569 481	22.8	595 690	21.8	11 176 416
21.2 Articles of paper and paperboard	11	-	-	-	-	90	-	-	-	-	-	-	-	90	-	90	24 688	0.4	36 648	0.2	1 612 150
22 PUBLISHING AND PRINTING ETC.	40	400	-	-	-	845	-	-	-	-	-	-	-	1 245	-	1 245	102 538	1.2	207 041	0.6	11 238 275
23-24 PETROLEUM PRODUCTS AND CHEMICAL PRODUCTS	58	46 301	46 479	9 391	2 090	1 315	826	1 290	374	50	-	8 490	1 556	66 837	51 325	118 162	1 771 488	6.7	1 783 607	6.6	43 436 280
23-24.1 Refined petroleum products and basic chemicals	42	41 191	46 329	6 281	1 865	1 189	250	1 290	374	50	-	8 440	1 556	58 441	50 374	108 815	1 658 902	6.6	1 668 939	6.5	39 075 070
24.2-24.7 Other chemical products	16	5 110	150	3 110	225	126	576	-	-	-	-	50	-	8 396	951	9 347	112 586	8.3	114 668	8.2	4 361 210
24.3 Paints, varnishes and similar coatings, printing ink and mastics	5	60	30	-	225	126	576	-	-	-	-	-	-	186	831	1 017	58 757	1.7	59 292	1.7	1 708 382
24.4 Pharmaceuticals, medicinal chemicals and botanical products	5	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
24.5 Soap and Detergents, cleaning and polishing preparations, perfumes and toilet preparations	2	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:

9.1 Environmental protection investment in pollution treatment (end-of-pipe) and integrated technology in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Investment in pollution treatment equipment (end-of-pipe) and integrated technology (pollution prevention). 1 000 NOK															Gross investment (Acquisitions less disposals of fixed assets)	Environ-mental protection investment as per cent of Gross investment	Total acquisitions	Environ-mental protection investment as per cent of total acquisitions	Production Value
		Air/climate		Wastewater		Solid waste		Soil and groundwater		Biodiversity and landscape		Other		Totals			1 000 NOK	Per cent	1 000 NOK	Per cent	1 000 NOK
		End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	Total					
24.6 Other chemical products	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5 927	-	6 277	-	504 907
25 RUBBER AND PLASTIC PRODUCTS	31	540	-	404	210	100	250	-	-	-	-	155	500	1 199	960	2 159	79 051	2.7	155 425	1.4	1 692 649
26 OTHER NON-METALLIC MINERAL PRODUCTS	157	2 264	1 833	1 464	-	13 159	4 069	59	40	10	-	130	653	17 086	6 595	23 681	221 740	10.7	416 982	5.7	7 763 080
27 BASIC METALS	37	117 396	7 175	58 965	-	10 553	543	155	-	2 331	180	851	302 090	190 251	309 988	500 239	5 008 397	10.0	5 026 801	10.0	26 900 765
28 METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT	47	120	1 020	150	-	56	-	-	-	-	-	50	-	376	1 020	1 396	89 095	1.6	109 927	1.3	3 486 568
29 MACHINERY AND EQUIPMENT N.E.C	51	160	83	776	83	180	-	15	-	-	-	84	-	1 215	166	1 381	100 249	1.4	313 219	0.4	13 316 668
30-33 ELECTRICAL AND OPTICAL EQUIPMENT	34	8	318	706	395	35	980	-	-	-	-	-	420	749	2 113	2 862	226 742	1.3	236 043	1.2	10 862 195
30 Office machinery and computers	1	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
31 Electrical machinery and apparatus n.e.c.	20	8	318	706	395	15	980	-	-	-	-	-	420	729	2 113	2 842	116 183	2.4	118 006	2.4	4 522 597
32 Radio, television, communication equipment	9	-	-	-	-	20	-	-	-	-	-	-	-	20	-	20	58 409	0.0	65 606	0.0	3 867 743
33 Medical, precision and optical instruments	4	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
34-35 (-35.114/5) TRANSPORT EQUIPMENT	43	450	640	3 445	670	128	-	-	-	-	-	2 000	-	6 023	1 310	7 333	459 337	1.6	467 894	1.6	11 325 737
34 Motor vehicles, trailers and semitrailers	11	450	-	870	670	-	-	-	-	-	-	-	-	1 320	670	1 990	328 887	0.6	329 429	0.6	3 489 812

9.1 Environmental protection investment in pollution treatment (end-of-pipe) and integrated technology in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Investment in pollution treatment equipment (end-of-pipe) and integrated technology (pollution prevention). 1 000 NOK															Gross investment (Acquisitions less disposals of fixed assets)	Environ-mental protection investment as per cent of Gross investment	Total acquisitions	Environ-mental protection investment as per cent of total acquisitions	Production Value
		Air/climate		Wastewater		Solid waste		Soil and groundwater		Biodiversity and landscape		Other		Totals			1 000 NOK	Per cent	1 000 NOK	Per cent	1 000 NOK
		End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Inte-grated	End-of-pipe	Integrated	End-of-pipe	Inte-grated	Total					
35 (-35.114/5) Other transport equipment	32	-	640	2 575	-	128	-	-	-	-	-	2 000	-	4 703	640	5 343	130 450	4.1	138 465	3.9	7 835 925
35.114/5 OIL PLATFORMS	37	466	40	15	-	360	300	-	-	-	-	-	-	841	340	1 181	362 605	0.3	396 761	0.3	18 497 664
36-37 MANUFACTURING N.E.C.	53	580	8	50	-	300		-	2 500	-	-	230	-	1 160	2 508	3 668	97 890	3.7	155 416	2.4	4 603 739
36 Furniture and manufacturing n.e.c.	39	480	8	50	-	-	-	-	-	-	-	30	-	560	8	568	77 565	0.7	132 743	0.4	4 092 056
37 Recycling	14	100	-	-	-	300	-	-	2 500	-	-	200	-	600	2 500	3 100	20 325	15.3	22 673	13.7	511 683

9.2 Current expenditures for environmental protection in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Current expenditures for environmental protection. 1 000 NOK							Costs of goods & services consumed + compensation of employees	Current expenditure for environmental protection as per cent of Costs of goods & services consumed + compensation of employees	Number of persons employed	Current expenditure for environ-mental protection per person employed	Production Value
		Air/climate	Wastewater	Solid waste	Soil and groundwater	Biodiversity and landscape	Other	Total	1 000 NOK	Per cent		Per cent	1 000 NOK
10, 12-37 MANUFACTURING, MINING AND QUARRYING	990	265 551	491 250	459 149	26 578	15 252	63 876	1 321 656	217 616 534	0.6	100 170	13.2	242 786 902
NACE C, 10, 12-14 MINING AND QUARRYING	45	50 503	26 095	18 452	285	350	4 714	100 399	2 159 135	4.6	1 198	83.8	2 657 572
10 Coal and peat	1	:	:	:	:	:	:	:	:	:	:	:	:
13 Metal ores	1	:	:	:	:	:	:	:	:	:	:	:	:
14 Other mining and quarrying	43	:	:	:	:	:	:	:	:	:	:	:	:
NACE D, 15-37 INDUSTRY	945	215 048	465 155	440 697	26 293	14 902	59 162	1 221 257	215 457 399	0.6	98 972	12.3	240 129 330
15-16 FOOD PRODUCTS; BEVERAGES AND TOBACCO	272	4 741	150 994	85 333	2 497	2 124	3 580	249 269	56 859 181	0.4	23 899	10.4	69 577 134
15.1 Meat and meat products	67	1 631	37 450	30 232	-	105	937	70 355	25 176 931	0.3	9 212	7.6	26 097 903
15.2 Fish and fish products	69	687	8 864	9 588	-	29	1 155	20 323	6 243 144	0.3	3 195	6.4	6 200 402
15.5 Dairy products	55	294	44 165	14 067	-	1 740	518	60 784	11 720 112	0.5	3 871	15.7	12 370 585
15.3-4/6-8 Other food products	54	839	29 935	18 083	2 455	-	652	51 964	5 942 302	0.9	3 572	14.5	6 856 259
15.9/16 Beverages and tobacco	18	290	29 764	12 594	17	-	68	42 733	5 334 184	0.8	3 430	12.5	9 760 059
17-19 TEXTILES AND TEXTILE PRODUCTS, LEATHER AND LEATHER PRODUCTS	12	162	1 132	1 126	10	-	77	2 507	529 711	0.5	579	4.3	528 864
17 Textiles	11	:	:	:	:	:	:	:	:	:	:	:	:
18 Wearing apparel, dressing and dyeing of fur	1	:	:	:	:	:	:	:	:	:	:	:	:
19 Leather and leather products	-	-	-	-	-	-	-	-	-	-	-	-	-
20 WOOD AND WOOD PRODUCTS	47	1 039	2 307	7 414	349	-	1 020	12 129	3 868 151	0.3	3 222	3.8	4 111 146
21 PULP, PAPER AND PAPER PRODUCTS	26	19 892	123 300	48 723	500	435	8 440	201 290	11 576 142	1.7	5 696	35.3	12 788 566
21.1 Pulp, paper and paperboard	15	19 745	120 103	44 053	500	435	8 440	193 276	10 076 965	1.9	4 526	42.7	11 176 416
21.2 Articles of paper and paperboard	11	147	3 197	4 670	-	-	-	8 014	1 499 177	0.5	1 170	6.8	1 612 150
22 PUBLISHING AND PRINTING ETC.	40	710	1 722	8 445	-	-	180	11 057	10 032 265	0.1	8 216	1.3	11 238 275

9.2 Current expenditures for environmental protection in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Current expenditures for environmental protection. 1 000 NOK							Costs of goods & services consumed + compensation of employees	Current expenditure for environmental protection as per cent of Costs of goods & services consumed + compensation of employees	Number of persons employed	Current expenditure for environ-mental protection per person employed	Production Value
		Air/climate	Wastewater	Solid waste	Soil and groundwater	Biodiversity and landscape	Other	Total	1 000 NOK	Per cent		Per cent	1 000 NOK
23-24 PETROLEUM PRODUCTS AND CHEMICAL PRODUCTS	58	54 420	108 819	66 053	16 478	143	16 838	262 751	41 748 246	0.6	7 977	32.9	43 436 280
23-24.1 Refined petroleum products and basic chemicals	42	52 975	104 887	56 467	16 478	75	15 564	246 446	37 902 544	0.7	5 771	42.7	39 075 070
24.2-24.7 Other chemical products	16	1 445	3 932	9 586	-	68	1 274	16 305	3 845 702	0.4	2 206	7.4	4 361 210
24.3 Paints, varnishes and similar coatings, printing ink and mastics	5	99	1 316	4 091	-	18	1 023	6 547	1 596 971	0.4	953	6.9	1 708 382
24.4 Pharmaceuticals, medicinal chemicals and botanical products	5	:	:	:	:	:	:	:	:	:	:	:	:
24.5 Soap and Detergents, cleaning and polishing preparations, perfumes and toilet preparations	2	:	:	:	:	:	:	:	:	:	:	:	:
24.6 Other chemical products	4	220	441	1 589	-	-	151	2 401	461 039	0.5	171	14.0	504 907
25 RUBBER AND PLASTIC PRODUCTS	31	910	1 819	5 937	-	-	941	9 607	1 541 152	0.6	1 149	8.4	1 692 649
26 OTHER NON-METALLIC MINERAL PRODUCTS	157	37 858	27 094	73 201	1 621	10 613	2 980	153 367	6 877 739	2.2	4 566	33.6	7 763 080
27 BASIC METALS	37	78 207	30 179	70 350	3 385	919	17 862	200 902	24 334 625	0.8	7 808	25.7	26 900 765
28 METAL PRODUCTS, EXCEPT MACHINERY AND EQUIPMENT	47	544	1 849	4 171	100	-	423	7 087	3 216 811	0.2	2 439	2.9	3 486 568
29 MACHINERY AND EQUIPMENT N.E.C	51	12 261	1 831	25 431	923	532	1 212	42 190	11 873 121	0.4	5 823	7.2	13 316 668
30-33 ELECTRICAL AND OPTICAL EQUIPMENT	34	398	2 323	6 804	35	105	1 130	10 795	10 395 872	0.1	5 827	1.9	10 862 195
30 Office machinery and computers	1	:	:	:	:	:	:	:	:	:	:	:	:
31 Electrical machinery and apparatus n.e.c.	20	307	1 851	4 834	20	15	1 130	8 157	4 331 938	0.2	2 458	3.3	4 522 597
32 Radio, television, communication equipment	9	76	372	1 021	15	90	-	1 574	3 720 117	0.0	2 092	0.8	3 867 743
33 Medical, precision and optical instruments	4	:	:	:	:	:	:	:	:	:	:	:	:

9.2 Current expenditures for environmental protection in large establishments in Manufacturing, Mining and Quarrying. 2002

Industry division (SIC 94)	Number of Local kind of activity units	Current expenditures for environmental protection. 1 000 NOK							Costs of goods & services consumed + compensation of employees	Current expenditure for environmental protection as per cent of Costs of goods & services consumed + compensation of employees	Number of persons employed	Current expenditure for environ-mental protection per person employed	Production Value
		Air/climate	Wastewater	Solid waste	Soil and groundwater	Biodiversity and landscape	Other	Total	1 000 NOK	Per cent		Per cent	1 000 NOK
34-35 (-35.114/5) TRANSPORT EQUIPMENT	43	1 996	8 066	14 824	100	-	1 973	26 959	10 767 835	0.3	6 493	4.2	11 325 737
34 Motor vehicles, trailers and semitrailers	11	1 313	6 569	5 013	100	-	1 120	14 115	3 223 605	0.4	2 680	5.3	3 489 812
35 (-35.114/5) Other transport equipment	32	683	1 497	9 811	-	-	853	12 844	7 544 230	0.2	3 813	3.4	7 835 925
35.114/5 OIL PLATFORMS	37	858	1 065	7 714	65	-	1 391	11 093	17 651 185	0.1	11 640	1.0	18 497 664
36-37 MANUFACTURING N.E.C.	53	1 052	2 655	15 171	230	31	1 115	20 254	4 185 363	0.5	3 638	5.6	4 603 739
36 Furniture and manufacturing n.e.c.	39	485	2 269	3 922	-	1	246	6 923	3 735 873	0.2	3 388	2.0	4 092 056
37 Recycling	14	567	386	11 249	230	30	869	13 331	449 490	3.0	250	53.3	511 683

9.3 American Petroleum Institute's (API) List over types of environmental capital investment included as part of instructions for filling out survey

APPENDIX II
CAPITAL ITEM LIST

Environmental Capital Investment	% Allocated to Environmental Exp.			
	Ref.	E&P	Trans.	Mktg.
Air				
Additional facilities for reformulated/alternate fuels:				
a. Additional dispensing pump and auxiliary equipment				100
b. New storage				100
Bag filters	100			
Biodiscs	100			
Bottom-fill loading and vapor collection lines on trucks and tank cars			50-100	50-100
Carbon absorption canister	100			
Catalytic converters on internal combustion engines & turbines		100		
Cat cracking facilities	10-20			
Closed pressure and relief value systems	100			
CO boilers	50-100			
Coke pilehousing	100			
Covers on API separators	100			
Crude or product desulfurization	100			
Cyclones (25% on fluid units)	25-100			
Desulfurized diesel fuel	100			
Dust suppression systems	100			
Electrostatic precipitators	100			
Emission and ambient air monitors	100			
Environmental monitoring & sampling equipment	100	100	100	100
Evaporation control (product storage and transfer to service stations)				100
Extra tall stacks (20% for 200s; 30% for 300s, etc.)	10-100			
External covers on floating roof tanks			100	
Flare gas recovery systems	75			
Flare systems	50-100	50-100		
Floating roof tanks (conversion to)	75-100		75-100	75-100
Floating roof tanks (new const.)	20		20	20
Fuel gas desulfurization (Amine, etc.)	100			
Gasoline volatility control:				
a. Additive facilities for segregated storage (i.e., NYC)				100
b. Auxiliary equipment				100
Gas well and gas line automatic shut-down devices		50-100		
Hazardous chemical controls for ethylene oxide, benzene and HF releases	100			
Hydrocracking facilities	10-30			
Hydrodesulfurizers	50			
Incineration of waste gases	100			
Leak detection systems	100			
Leakless seal technology	100			
LPG odor control facilities	100			
Microballoons			100	
MTBE plants, and specifically related equipment	100			
Odor control	100	100	100	100
Particulate road paving installation		100		
Polishing filtration	100			
Reformulated gasoline and oxygenates	100			
Regenerative caustic systems with sulfur recovery (Merox, etc.)	25-100			
Reverse osmosis and ion exchange	100			
Smoke control equipment	100		100	
Smokeless flare systems	100	100		
Sour H20 stripper O.H. recovery facilities	100			

Environmental Capital Investment	% Allocated to Environmental Exp.			
	Ref.	E&P	Trans.	Mktg.
Steam generators		50-100		
Steam stripping of waste streams, etc. to meet benzene - NESHAP	100			
Stripping and disposal of trace hydrocarbons	100			
Sulfur recovery plants	50-100	50-100		
Sulfuric acid plant	35-100			
Vapor balancing systems	100			100
Vapor conservation equipment	50-100	50-100		
Vapor recovery systems	100	100	100	100
Water				
Activated carbon absorption	100			
Activated sludge plants	100			
Aerial and ground pipeline patrol equipment and related communications equipment			50-100	
Air cooling	20-40			
Air flotation	100			
API separators	50-100			
Approved collection pits		100		
Ballast & slop treatment equipment	100		100	
Cathodic protection of pipelines			50-75	
Cathodic protection surveys			50-75	
Clarification equipment	100			
Collection systems (separate sewer, etc.)	100			
Control of effluent discharge at terminals				100
Cooling towers	50-100		50-100	
Deep well disposal	100			
Double bottoms or segregated ballast on tank vessels			100	
Double hull tankers (incremental costs over single hull)			100	
Environmental monitoring & sampling equipment	100	100	100	100
Flocculators	100			
Ground bed replacement for cathodic protection systems			50-75	
Increased platform, drilling and completion costs to comply with Gulf Coast OCS Orders 5,7,8,9 and similar regulations		100		
Leak detection surveys (all types)			50-100	
Oil recovery and handling systems	100			
Oil/water separators & oil monitors			50-100	
Oxidation ponds and mechanical aerators	100			
Pipeline reconditioning			50	
Pipeline replacement			50-100	
Pipeline reroute (pollution prevention)			50	
Product recovery at bulk terminals				100
Pumpout systems			50	
Replacement of wooden station platforms with concrete			50	
Salt water disposal (do not include secondary recovery systems)		100		
Sanitary systems	100	100	100	100
Sour H20 strippers and/or oxidizers	50-100			
SPCC plan requirements	100	100	100	100
Spent caustic treating systems	100			
Spoil disposal from dredging operations			50-100	
Surface casing		100		
Tank farm skimming ponds			100	
Tank stripping equipment on tank vessels			50-100	
Trickling and sand filter plants	100			
Underground tank replacement				100
Waste product recovery or recycle facilities				100

Environmental Capital Investment	% Allocated to Environmental Exp.			
	Ref.	E&P	Trans.	Mktg.
Wastes				
Drilling mud disposal facilities		50-100		
Environmental monitoring & sampling equipment	100	100	100	100
Facilities to replace pits & cellars		100		
Incinerators	100	100	100	100
Low temperature thermal treater for sludge to meet benzene - NESHAP	100			
Sludge farming installations	100			
Solid waste hauling & disposal equipment	100		100	100
Tank bottom disposal & treatment facilities	100	100	100	
Toxic and hazardous waste disposal	100	100	100	100
Other				
Absorbers on cryogenic processes to reduce waste	100			
Building aesthetics and landscaping	50-100	50-100	50-100	50-100
Control devices on onshore leases (check valves, hi-level shut down, hi-lo pressure, etc.)		100		
Environmental monitoring & sampling equipment	100	100	100	100
Equipment noise insulation	100	100		
Fire walls or tanks dikes	100	100	100	100
Groundwater recovery & treatment facilities	100			100
Dehydration facility sand plants installation		50-100		
Land restoration, revegetation, etc.	100	100	100	100
Mufflers	100			100
Netting of tanks, pits, etc.		100		
Noise reduction	100	100	100	100
PCB transformer/drum facility		50-100		
Product spill prevention facilities at bulk terminals				100
Sanitary land fills	100	100	100	100
Screening or buffering equipment	100			
Spill booms and other spill cleanup equipment	100	100	100	
Waste oil collection tanks				100

9.4 American Petroleum Institute's (API) survey questionnaire response sheet

See following page

2003 U.S. ENVIRONMENTAL EXPENDITURES SURVEY

ENVIRONMENTAL SITE/PROCESS AND CLEAN FUELS RELATED EXPENDITURES

	EXPENDITURE TYPE/ CLASS	AIR	WATER	WASTES	REMEDIATION	SPILLS	OTHER	TOTAL
I. E & P	Capital site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
	O & M, Direct Admin. site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
II. TRANSPORTATION	Capital site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
	O & M, Direct Admin. site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
III. REFINING	Capital site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
	O & M, Direct Admin. site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
IV. MARKETING	Capital site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
	O & M, Direct Admin. site/process **AND** clean fuels	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
V. OTHER	Research & Development	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**	**$,000**
	Corporate Programs	**$,000**	**$,000**	**$,000**	NA	NA	**$,000**	**$,000**

OP CODE (for API staff use, Please do not fill) _____

9.5 Survey instrument for Manufacturing industry (NACE 10, 12-37): Instructions and questionnaire for 2002 including all 3 environmental protection expenditure variables

Statistisk sentralbyrå
Statistics Norway

Miljøvernutgifter i industri og bergverkdrift - 2002

Hvorfor spør vi?
Formålet med denne undersøkelsen er å kartlegge industriens og bergverkdriftens miljøvernutgifter. Resultatene skal brukes til statistikk, analyse og internasjonal rapportering og sammenligning.

Hvem bør svare?
En regnskapsansvarlig person i din bedrift har sannsynligvis den mest egnede kompetansen for å besvare skjemaet. I bedrifter med egen miljøansvarlig kan også denne personen ha oversikt over utgifter knyttet til miljøvernaktiviteter.

Hva er miljøvernutgifter?
Miljøvernutgifter er utgifter knyttet til tiltak og aktiviteter som har som **hovedformål** å forebygge, redusere eller behandle forurensning eller andre skader på det fysiske miljøet. Vi spør i dette skjemaet etter tre typer miljøvernutgifter:

1. Driftsutgifter
2. Prosesseksterne investeringer (end-of-pipe)
3. Prosessinterne investeringer (integrert teknologi)

Definisjonen av utgifter skal bygge på avgrensningen i regnskapsføringen og det som oppgis som hhv. drifts- eller investeringsutgifter i annen statistikkrapportering. Utgifter til forberedelse, installasjon og tester mv. av utstyr og anlegg føres som investerings- eller driftsutgifter i samsvar med regnskapsføringen ellers. Utgifter til reparasjon og vedlikehold av utstyr er driftsutgifter.

Alle utgifter skal oppgis eksklusive moms/investeringsavgift, og eksklusive eventuell finansielle støtte.

Hva er <u>ikke</u> miljøvernutgifter?
Hvis utgiften ikke først og fremst er rettet mot miljøvern, skal den ikke klassifiseres som en miljøvernutgift. Energiøkonomiseringstiltak og arbeidsmiljøtiltak skal ikke inkluderes som miljøvernutgifter, og heller ikke miljøvennlige produkter.

Hvilke typer miljøformål skal rapporteres?
Utgiftene skal kategoriseres etter hvilket miljøformål tiltakene i hovedsak er rettet mot. Hvis et tiltak dekker mer enn ett miljøformål, skal utgiftene settes på hovedformålet:

1. avløp og produksjonsvann
2. avfall
3. luft og klima
4. jord og grunnvann
5. biologisk mangfold og landskap
6. andre miljøvernformål (f.eks. støy, vibrasjoner, stråling, miljørapportering og -styring, forskning)

Merknadsfelt
Bruk eventuelt merknadsfeltet til slutt i skjemaet for å gi kommentarer og forklaringer på spørsmål du har besvart med "vet ikke" og på vanskelige avgrensingsforhold.

Frist for innsending er: 13.juni.2003

Statistisk sentralbyrå
Statistics Norway

Seksjon for energi- og industristatistikk og
Seksjon for miljøstatistikk
Postboks 8131 Dep., 0033 Oslo
Telefon: 21 09 00 00, Telefaks: 21 09 49 96

Undergitt taushetsplikt
Oppgaveplikt

Undersøkelsen om miljøvernutgifter
Industristatistikk 2002

Viktig: Blanketten skal leses maskinelt, så det er derfor viktig at utfyllingen blir utført nøyaktig. Fyll ut skjemaet fortløpende etter nummereringen på spørsmålene. **Bruk blå eller svart penn.**

Sett kryss slik: ☒ og ikke slik: ☒ Hvis kryss i feil rute: ▮ Skriv tall slik: 1 2 3 4 5 6 7 8 9 0

Del 1. Driftsutgifter

Hva skal med?

- Lønnskostnader til ansatte som arbeider med miljøspørsmål, rapportering og utslippstillatelser
- Utgifter til eksterne konsulenter, kjøp av andre tjenester
- Utgifter til utslippstillatelser, avfallsgebyr og avløpsgebyr mv.
- Kjøp av varer, kontorkostnader mv. som inngår i produksjon av miljøverntiltak
- Drift, reparasjon og vedlikehold av miljøvernutstyr, utgifter til operasjonell leasing av miljøvernutstyr

Hva skal ikke med?

- Generelle miljøskatter, f.eks. CO_2-avgifter (SSB får denne informasjonen via andre kanaler og trenger ikke direkte rapportering fra bedrifter)
- Avskrivninger (utgifter relatert til kapitalslitasje)
- Renter på lån
- Bot for brudd på utslippstillatelser eller andre miljørelaterte bøter eller kompensasjon o.l. til tredje part for skader knyttet til miljøskadelig utslipp

1 Hadde bedriften driftsutgifter knyttet til ***avløp og produksjonsvann*** i 2002?

For eksempel: avløpsgebyrer, drift og vedlikehold av oppsamlingstanker, forbehandling av avløp eller produksjonsvann, overvåkings- og analyseutgifter, bruk av filtermedia, utgifter relatert til utslippstillatelser.

☐ Ja → 1 000 kr. eks. MVA ☐☐☐☐☐☐☐ Hvor stor andel av dette var kjøp fra andre aktører (inkl. gebyrer)? Gi et estimat. → Prosent ☐☐☐

☐ Nei
☐ Vet ikke

Gå til 2

2 Hadde bedriften driftsutgifter knyttet til ***avfall*** i 2002?

For eksempel: avfallsgebyrer, forbehandling og transport av avfall, sortering, dehydrering, avgifting, avvanning, sammenpressing osv., utgifter relatert til utslippstillatelser for spesialavfall, overvåkings- og analyseutgifter.

☐ Ja → 1 000 kr. eks. MVA ☐☐☐☐☐☐☐ Hvor stor andel av dette var kjøp fra andre aktører (inkl. gebyrer)? Gi et estimat. → Prosent ☐☐☐

☐ Nei
☐ Vet ikke

Gå til 3

3 Hadde bedriften driftsutgifter knyttet til ***luft og klima*** i 2002?

For eksempel: utgifter knyttet til bruk av filtermedia eller andre metoder for redusering av utslipp, overvåkings- og analyseutgifter og utgifter relatert til utslippstillatelser.

☐ Ja → 1 000 kr. eks. MVA ☐☐☐☐☐☐☐ Hvor stor andel av dette var kjøp fra andre aktører (inkl. gebyrer)? Gi et estimat. → Prosent ☐☐☐

☐ Nei
☐ Vet ikke

Gå til 4

4 Hadde bedriften driftsutgifter knyttet til ***jord og grunnvann*** i 2002?

For eksempel: driftsutgifter knyttet til å forebygge forurensing til jord og grunnvann, utgifter til bruk av måleutstyr og utgifter for kontroll, behandling og fjerning av forurensing i jord og grunnvann.

☐ Ja → 1 000 kr. eks. MVA ☐☐☐☐☐☐☐ Hvor stor andel av dette var kjøp fra andre aktører (inkl. gebyrer)? Gi et estimat. → Prosent ☐☐☐

☐ Nei
☐ Vet ikke

Gå til 5

5 Hadde bedriften driftsutgifter knyttet til ***biologisk mangfold og landskap*** i 2002?

For eksempel: vedlikehold av områder som beskytter eller rehabiliterer fauna, flora eller naturlandskap, vedlikehold av utvendig og allment tilgjengelig parkanlegg.

☐ Ja → 1 000 kr. eks. MVA ____ Hvor stor andel av dette var kjøp fra andre aktører (inkl. gebyrer)? Gi et estimat. → Prosent ____

☐ Nei
☐ Vet ikke

Gå til **6**

6 Hadde bedriften driftsutgifter knyttet til ***andre miljøvernformål*** i 2002?

For eksempel: utgifter rettet mot å redusere støy, vibrasjoner eller stråling. Utgifter til forskning og utvikling. Generelle driftsutgifter knyttet til arbeid med miljørapportering, miljøstyringssystemer, årsmeldinger om miljøresultater og miljøvernrelatert opplæring av ansatte (men ikke intern HMS). Andre utgifter som ikke kan fordeles etter miljøområde tas også med her.

☐ Ja → 1 000 kr. eks. MVA ____ Hvor stor andel av dette var kjøp fra andre aktører (inkl. gebyrer)? Gi et estimat. → Prosent ____

☐ Nei
☐ Vet ikke

Gå til *Del 2. Investeringer*

Del 2. Investeringer

Spørsmålene om investeringsutgifter er delt i to ut fra type investering: spørsmålene 7 til 13 omhandler prosesseksterne investeringer, mens spørsmålene 14 til 24 omhandler prosessinterne investeringer. Skillet mellom prosesseksterne og prosessinterne investeringer er vanskelig. Les forklaringen nedenfor nøye før du begynne å fylle inn svarene, slik at du unngår å måtte korrigere utfyllingen.

Prosesseksterne investeringer: Investeringer i utstyr og anlegg for å samle opp, måle eller fjerne forurensing etter at den er oppstått i produksjonsprosessen, samt behandle og deponere avfallsstoffer. Dette er utstyr og anlegg som er uavhengig av produksjonsprosessen. Slikt utstyr betegnes også som "end-of-pipe-utstyr."

Prosessinterne investeringer: Investeringsutgifter knyttet til renere teknologi i selve produksjonsprosessen, dvs. utstyr eller anlegg som skal forhindre at forurensing oppstår eller som reduserer omfanget av den. Slikt utstyr og slike anlegg betegnes også som integrert teknologi, renere teknologi eller "pollution prevention". Utgiftene til miljøverninvesteringer vil her kunne være deler av de totale utgiftene til nytt utstyr eller anlegg. Dette kan gjøre det vanskelig å anslå selve miljøvernutgiften. Se veiledning før spørsmål 14 for utdypende forklaring.

2a. Prosesseksterne investeringer

7 Har bedriften gjort investeringer i prosesseksterne anlegg eller utstyr i 2002? ☐ Ja → Gå til **8**

☐ Nei
☐ Vet ikke

Gå til del 2b om prosessinterne investeringer

8 Har bedriften gjort investeringer i prosesseksternt utstyr eller anlegg rettet mot ***avløp eller produksjonsvann*** i 2002?

For eksempel: tiltak som begrenser utslipp, oppsamlingsbasseng for lekkasjer, eget renseanlegg, rørledninger til renseanlegg og avløpsnett, kjølesystemer for produksjonsvann, nøytraliseringstanker, sedimenteringstanker, utstyr for behandling av avløpsslam, overvåkingsutstyr.

1 000 kr. eks. MVA

☐ Ja → ____

☐ Nei
☐ Vet ikke

Gå til **9**

9 Har bedriften gjort investeringer i prosesseksternt utstyr eller anlegg rettet mot ***avfall*** i 2002?

For eksempel: containere, sorteringsutstyr, godkjente forbrenningsovner, egne deponier, avfallspresse, slamtørkeseng, utstyr for hygienisering eller forbehandling, biler for transport av avfall.

1 000 kr. eks. MVA

☐ Ja → ____

☐ Nei
☐ Vet ikke

Gå til **10**

10 Har bedriften gjort investeringer i prosesseksternt utstyr eller anlegg rettet mot ***luft og klima*** i 2002?

For eksempel: filter, sykloner, kjølesystemer, katalysatorer for behandling av prosessgasser, renseutstyr med posefilter eller elektrofilter, andre tiltak for begrensinger av utslipp av støv og partikler, tiltak som begrenser utslipp, overvåkningsutstyr.

1 000 kr. eks. MVA

☐ Ja → ____

☐ Nei
☐ Vet ikke

Gå til **11**

11 Har bedriften gjort investeringer i prosesseksternt utstyr eller anlegg rettet mot ***jord og grunnvann*** i 2002?

For eksempel: utstyr for rensing av forurenset jord, tiltak for å forebygge forurensing av jord og grunnvann, beskyttelse mot erosjon, samt forsaltning, utstyr for å reduseres bruk av grunnvann i produksjonsprosessen.

☐ Ja → 1 000 kr. eks. MVA

☐ Nei

☐ Vet ikke

Gå til 12

12 Har bedriften gjort prosesseksterne investeringer rettet mot bevaring av ***biologisk mangfold og landskap*** i 2002?

For eksempel: skogplanting med formål å bevare arter, beplantning av trær og busker for å lage naturlige korridorer for fauna eller skjule bygninger og andre tekniske inngrep, opparbeiding av parker tilgjengelige for allmennheten, bevaring av områder pga. biologisk mangfold, rehabilitering av landskap.

☐ Ja → 1 000 kr. eks. MVA

☐ Nei

☐ Vet ikke

Gå til 13

13 Har bedriften gjort investeringer i prosesseksternt utstyr eller anlegg rettet mot ***andre miljøvernformål*** i 2002?

For eksempel: lydfeller, støyvegger, innbygging av støykilder, utstyr for å redusere vibrasjoner, kjøp av datasystemer for miljøstyringssystemer og miljørapportering.

☐ Ja → 1 000 kr. eks. MVA

☐ Nei

☐ Vet ikke

Gå til delen om prosessinterne investeringer

2b. Prosessinterne investeringer

I denne delen skal du oppgi alle investeringer knyttet til renere teknologi i selve produksjonsprosessen, dvs. utstyr eller anlegg som skal forhindre at forurensing oppstår eller som reduserer omfanget av den. For den enkelte investering skal det oppgis en prosentandel knyttet til miljøvern (miljøvernutgiften).

For investeringsutgifter der formålet med investeringen i sin helhet har vært redusert utslipp/bedre miljø regnes hele investeringsutgiften som en miljøvernutgift.

For investeringer der hensikten delvis har vært miljøhensyn og dels å få en mer effektiv produksjonsprosess el., er det bare utgiftsdelen som er knyttet til miljøvern som regnes som miljøvernutgift. Dette kan det være vanskelig å identifisere. I slike tilfeller kan følgende framgangsmåte brukes:

1. Dersom det finnes rimeligere alternativer til den investeringen som er gjort, men som ikke ville gi de oppnådde miljøeffekter, regnes differansen mellom den faktiske utgiften og det rimeligere alternativet som miljøvernutgift.
2. Dersom det er mulig å anslå en merkostnad som skyldes miljøvernhensyn, kan denne *merkostnaden* regnes som miljøvernutgift.
3. Dersom det ikke er mulig å gi et anslag på miljøverndelen av investeringen, gi likevel en beskrivelse av investeringen, men sett 0 i prosentfeltet i stedet.

Utgifter til nytt utstyr og maskiner som har bedre miljøegenskaper enn de som skiftes ut, regnes ikke som miljøvernutgifter dersom disse bedrede egenskapene har blitt standard teknologi.

Eksempler på prosessinterne investeringer:

Avløp og produksjonsvann:
Resirkuleringssystemer, lukkede kjølesystemer, vakuumpumper, utstyr for gjenbruk av eller for å redusere bruken av vann i produksjonsprosessen.

Avfall:
Investeringer i utstyr/prosesser som gir mindre avfall, mindre skadelige avfallstyper eller mer effektiv bruk av råstoffer, f.eks. ved at de muliggjør endringer i innsatsvarer.

Luft og klima:
Tanker med flytende tak (sammenliknet med f. eks. tanker uten tak), systemer for damputveksling og resirkulering av prosessgasser, kontrollsystemer for optimal forbrenning/drift, endringer som er nødvendig for bruk av mindre miljøskadelig kjølemedia, endringer i produksjonssystemer som betyr at mindre miljøskadelige produkter kan brukes i produksjonsprosessen.

Jord og grunnvann:
Dobbeltveggede tanker (sammenliknet med enkeltveggede tanker) installert for vern av jord og grunnvann. Utskrifting av kabler som inneholder PCB.

Biologisk mangfold og landskap:
Ekstrakostnader for bevaring av verdifullt landskap eller vernede områder ved utbygging av infrastruktur som f.eks. avløpsnett, el-nett, veier.

Andre miljøvernformål:
Fundamentering som demper vibrasjoner og lavstøybrenner, lavstøyutstyr og -motorer. Tiltak for å reduserer magnetfelt.

14 Har bedriften gjort investeringer i integrert eller renere teknologi i 2002?

☐ Ja → **Gå til introduksjonen før spørsmål 15**

☐ Nei

☐ Vet ikke

Gå til 25

Kan du gi en kort beskrivelse av investeringen? Oppgi både totalbeløpet for investeringen og et estimat i prosent for den delen av investeringen som er tilknyttet miljøvern. Hvis bedriften har gjort flere små investeringer rettet mot det samme miljøformålet, kan disse slås sammen ved utfyllingen av tabellen.

Hvis du trenger flere linjer, ta kopi av denne siden, fyll den ut og send den som vedlegg!

Beskrivelse av de prosessinterne investeringene	Total investeringsutgift (1000 kr, eks. MVA)	Prosent tilknyttet miljøvern	Hovedmiljøformål (sett bare ett kryss)					
			Avløp/ vann	Avfall	Luft/ klima	Jord/ grunn- vann	Biologisk mangfold/ landskap	Annet
15			☐	☐	☐	☐	☐	☐
16			☐	☐	☐	☐	☐	☐
17			☐	☐	☐	☐	☐	☐
18			☐	☐	☐	☐	☐	☐
19			☐	☐	☐	☐	☐	☐
20			☐	☐	☐	☐	☐	☐
21			☐	☐	☐	☐	☐	☐
22			☐	☐	☐	☐	☐	☐
23			☐	☐	☐	☐	☐	☐
24			☐	☐	☐	☐	☐	☐

25 Oppgi hvor mange minutter det tok å fylle ut skjemaet, inkludert datainnhenting og skjemautfylling ..... minutter

26 Kryss av for å motta e-postmelding når SSB publiserer resultatene fra denne undersøkelsen ..... ☐

Merknader:

Hvem kan vi kontakte hos dere?

Navn: Tlf.: e-post:

Sted/dato: Underskrift:

Hvis dere har noen spørsmål, ta gjerne kontakt med oss:

Angående utfylling av skjema: Julie Hass, Seksjon for miljøstatistikk, tlf. 21 09 45 15, e-post: julie.hass@ssb.no

Angående utsettelse av innsending: Guro Henriksen, tlf 21 09 47 65, e-post: guro.henriksen@ssb.no

9.6 Survey Instrument for NACE 40.3 Steam and Hot Water Supply 2002 (and 2001)

There were no changes in the questionnaire for 2002 so this example is also relevant for the data collection for 2002.

The last section in the questionnaire, section 13, is the relevant reporting part of the questionnaire. In this section, total investment, sales of capital goods and repairs are requested for the production plant (line 1301) and the distribution plant (line 1302) and 'other' (line 1303). The question for environmental protection investment in pollution control and reduction (end-of-pipe) is requested in line 1305 and is divided up into 6 categories, Air/climate, waste water and production water, waste, soil and groundwater, biodiversity and landscape and other. The instructions clarify that the figures reported for environmental protection expenditure are already included in the reporting in lines 1301-1304.

English translation of the reporting section is given in parentheses.

13. Investeringer og reparasjoner i 2001	Produksjonsanlegg (production plant)	1301	Anskaffet (Aquisitions) 1000 kr	Solgt (sales) 1000 kr	Reparasjoner (repairs) 1000 kr
	Distribusjonsanlegg (distribution plant)	1302			
	Annet (other)	1303			
	I alt (total)	1304			
	Miljøverntiltak: Investeringer i anlegg og utstyr for rensing og utslippsredukjson (også kalt "end of pipe") i løpet av året. Post 1305 skal være inkludert i postene 1301- 1304 over. Beløp i 1000 kr. (Environmental protection measures: Investment in plant and equipment for cleaning and reducing pollution (also called "end of pipe") during the year. Post 1305 is included in the posts 1301-1304 above. Amount in 1000 NOK.)	1305	Luft/klima (Air/climate)	Produksjonsvann og avløp (cooling water and wastewater)	Avfall (Waste)
			Jord og grunnvann (Soil and groundwater)	Biolog. mangfold og landskap (Biodiversity and landscape)	Annet (Other)

Instructions for filling out the questionnaire were also provided to help in filling out the posts (Norwegian only):

13. Investeringer og reparasjoner
Disse postene gjelder bare investeringer og reparasjoner foretatt i oppgaveåret. Omfatter anskaffelse av fast kapital f.eks. produksjonsanlegg, som normalt ikke slites ut i løpet av et år, og reparasjoner og vedlikehold utover daglig stell. Investeringsavgift skal være inkludert.

Post 1305 Miljøverntiltak: Omfatter utstyr som er uavhengig av produksjonsprosessen og som kan behandle, forhindre, kontrollere eller måle forurensning. Overvåkningsutstyr og bygninger inkluderes. Investeringer for å forbedre arbeidsmiljø skal *ikke* inkluderes. Investeringer i "renere teknologi", dvs. modifiserte produksjonsprosesser der miljøvernutstyret er integrert i øvrig produksjonsutstyr, er ikke klassifisert som "end of pipe" løsning og skal ikke være med. Totalbeløpet for miljøinvesteringene skal ikke overstige totale investeringer i og med at post 1305 er en andel av post 1304. Kostnadene klassifiseres etter hvilken type forurensning som er bekjempet. Her følger inndelingen samt noen eksempler:

- *Luft/klima*: Skorsteiner, eksossystemer med filter (scrubbers), tiltak som begrenser regulære og akutte utslipp. Overvåkningsutstyr inkluderes.
- *Produksjonsvann og avløp*: Renseanlegg, rørledninger til renseanlegg, kulverter, oppsamlingsbasseng for lekkasjer, tiltak som begrenser regulære og akutte utslipp til avløpsnett, kjølesystemer for vann før det slippes ut til avløpsnett.
- *Avfall*: Forbrenningsovner, deponier, avfallspresse (utstyr for sammenpressing), slamtørkeseng, utstyr for hygienisering, sedimenteringstanker, søppelbiler.
- *Jord og grunnvann*: Rensing av jord og innsjøer, tiltak for å forebygge infiltrering av forurensing til jord og grunnvann, beskyttelse mot erosjon og annen fysisk degradering, samt forsaltning. Investeringer i utstyr for å redusere bruk av grunnvann. Måleutstyr inkluderes også.
- *Biologisk mangfold og landskap*: Investeringer gjort for å beskytte eller rehabilitere fauna, flora, økosystemer, habitater eller (natur)landskap, f.eks. skogplanting med formål å bevare arter. Beplantning av trær og busker for å lage naturlige korridorer for fauna. Bevaring av områder pga. biologisk mangfold. Måle- og analyseutstyr inkluderes også.

Annet: Her føres andre investeringer innen miljøverntiltak.

Norsk Fjernvarmeforening
Postboks 7184, 0307 Oslo
Tlf: 23088909 ***Fax: 23088901***
Heidi Juhler, hmj@ebl.no

Kopi til: SSB
pb 8131dep, 0033 Oslo
tlf:21 09 44 20, ***Fax:21 09 49 96***
Pål Marius Bergh pmb@ssb.no

FRIST 18.mars
Fjernvarmestatistikk 2001

Nytt navn
Ny adresse

Forespørsler kan rettes til:

Navn _____ Telefon nr. _____ Underskrift _____

Om virksom-heten	Har foretaket investert i fjernvarmeanlegg i 2001?		☐ Ja	☐ Nei
	Har foretaket produsert fjernvarme i 2001?		☐ Ja	☐ Nei
	Hvis nei på begge spørsmål ovenfor: Har foretaket planer om investering i/produksjon av fjernvarme?		☐ Ja	☐ Nei
	Hvis ja: Planlagt investeringsstart:	Planlagt igangsettingsdato:		
1. Syssel-setting	Gjennomsnittlig antall:		Kode 0101	
	Utførte timeverk		0102	
2. Drifts-inntekter	Salgsinntekter fjernvarme	- Forbruker (fra 0614 kol. 2)	0201	1000 kr
		- Eget foretak (fra 0701 kol. 2)	0202	+
		- Fjernvarmeverk/everk (fra 0801 kol. 2)	0203	+
	Salgsinntekter elektrisitet, kraftvarme		0204	+
	Andre driftsinntekter (unntatt tømmeavgifter)		0205	+
	Tilskudd fra det offentlige		0206	+
	Avgifter til det offentlige		0207	-
	Driftsinntekter i alt		0208	=
3. Drifts-utgifter	Kjøp av fjernvarme (fra 0901 kol. 2)		0301	
	Forbruk av brensel, elektrisitet etc. (fra 0416 kol. 2)		0302	+
	Lønnskostnader		0303	+
	Andre driftskostnader		0304	+
	Driftskostnader i alt		0305	=

				I alt		Av dette til produksjon av fjernvarme	
4. For-bruk av brensel			Kode	Mengde 1	Verdi, 1000 kr 2	Mengde. Bruk samme enhet som i kolonne 1. 3	MWh 4
	Steinkull/koks	tonn	0401				
	Bensin	liter	0402				
	Parafin	tonn	0403				
	Mellomdestillater (nr. 1, nr 2, diesel)	tonn	0404				
	Tungdestillater (nr. 3A og nr. 4A)	tonn	0405				
	Tunge fyringsoljer (nr. 5 og nr. 6)	tonn	0406				
	Elektrisitet i alt	MWh	0407				
	Av dette til: - elektrokjeler	MWh	0408				
	- varmepumper	MWh	0409				
	Avfall	tonn	0410				
	Flis/bark	tonn	0411				
	Spillvarme	MWh	0412				
	Gass	1000 Sm3	0413				
	Annet, spesifiser:		0414				
	I alt (kolonne 2 til post 0302.)		0416				
	Gj.snittlig energiinnhold: - avfall		0417	kWh/tonn			
	- flis/bark		0418				

5. Fjern-varme-balanse	Egen bruttoproduksjon (fra 1100 kol.1)	0501	Mengde (MWh)
	+ Kjøp av fjernvarme (fra 0901 kol. 1)	0502	+
	- Levert til produksjon av elektrisitet	0503	-
	- Avkjølt til luft	0504	
	- Tap i fordelingsnett	0505	
	- Levert til fjernvarmeverk/everk (fra 0801 kol. 1)	0506	
	- Levert til bedrifter i eget foretak (fra 0701 kol.1)	0507	
	= Levert forbrukere (fra 0614, kol 1)	0508	

6. Leveranse av fjern-varme til forbruker		Kode	Mengde (MWh) 1	Verdi (1000 kr) 2	Antall hushold-ninger og bedrifter som mottar fjernvarme 3
	Husholdninger	0601			
	Industri og bergverk i alt:	0602			
	Bergverk	0603			
	Produksjon av næringsmidler, drikkevarer og tobakksvarer	0604			
	Treforedling	0605			
	Produksjon av kjemiske råvarer	0606			
	Produksjon av kjemiske produkter ellers	0607			
	Produksjon av jern, stål og ferrolegeringer	0608			
	Produksjon av ikke-jernholdige metaller	0609			
	Annen industri	0610			
	Tjenesteyting, offentlig og privat	0611			
	Jordbruk, skogbruk, fiske og fangst	0612			
	Andre	0613			
	I alt (kol.1 til 0508 og kol. 2 til 0201)	0614			

7. Leveranse til bedrifter i eget foretak	Levert til (navn):		Mengde (MWh)	Verdi (1000 kr)
	Leveranse i alt (kol.1 til 0507 og kol. 2 til 0202)	0701		
8. Leveranse til fjern-varme-verk/ever k	Levert til (navn):		Mengde (MWh)	Verdi (1000 kr)
	Leveranse i alt (kol.1 til 0506 og kol. 2 til 0203)	0801		
9. Kjøp av fjern-varme	Kjøpt av (navn):		Mengde (MWh)	Verdi (1000 kr)
	Kjøpt i alt (kol.1 til 0502 og kol. 2 til 0301)	0901		
10. Elek-trisitet produsert i mot-trykksanl.	Levert til (navn):		Mengde (MWh)	Verdi (1000 kr)
	Produksjon av elektrisitet i alt (kol. 2 til 0204)	1001		

11. Varme-sentraler, produk-sjon av fjern-varme

Kodeliste for produksjonsanlegg:

Elektrokjeler…….	1	Spillvarme…….	4
Oljekjeler……	2	Varmepumpe……...	5
Avfallsforbrenningsanlegg…..	3	Flisfyringsanlegg……	6
		Andre (spesifiser): ……	7

Navn på varmesentral:		Kode for type prod.anl:	Produksjon av fjernvarme (MWh) 1	Maks. effekt (kW) 2
	Kode 11			
	11			
	11			
	11			
	11			
	11			
	11			
	11			
	11			
I alt (kol.1 til 0501))	1100			

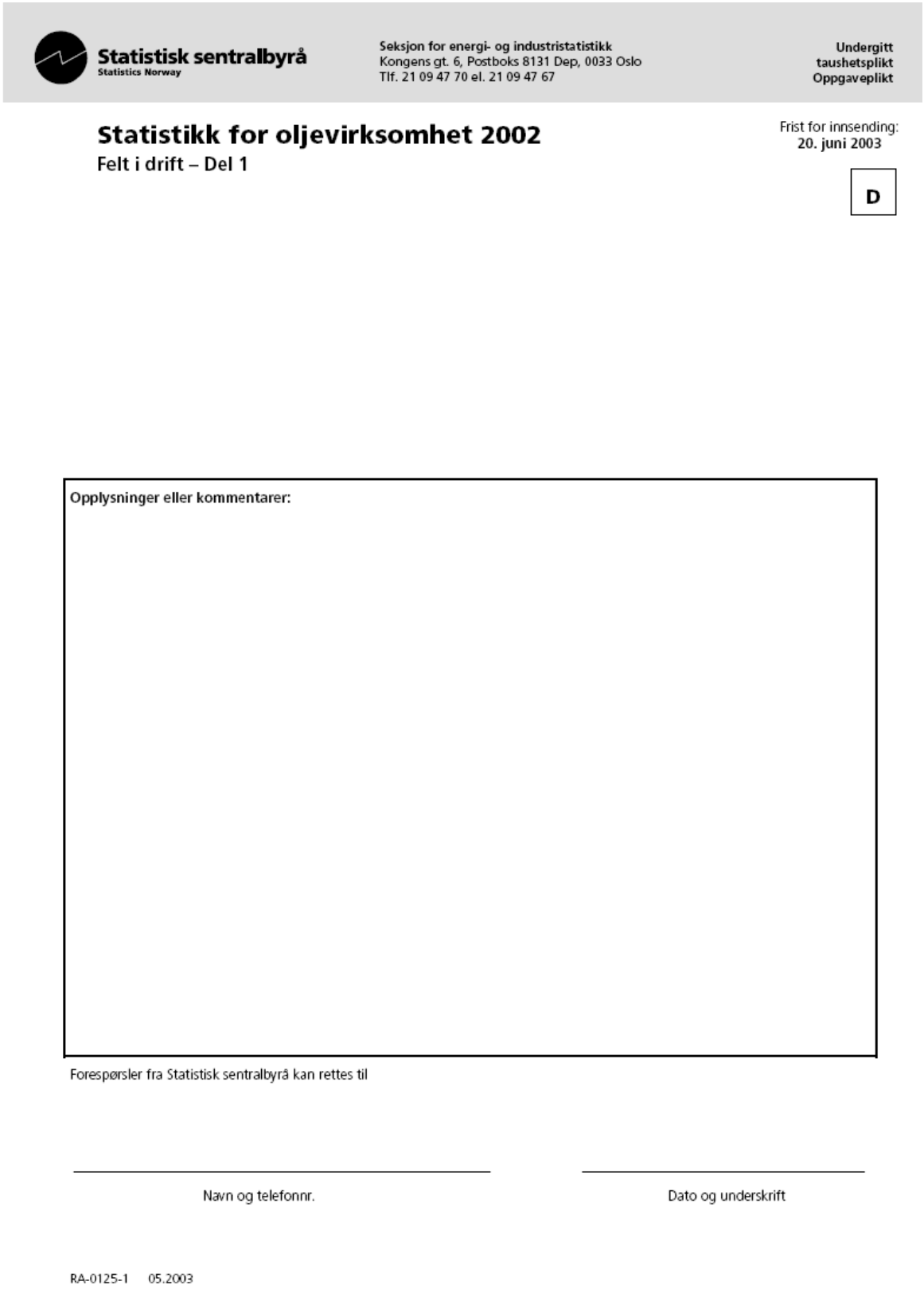
12. Distri-busjons-nett

Primært distribusjonsnett fjernvarme (grøftelengde i meter)	1201	
Abonnentsentraler (antall)	1202	
Sekundært distribusjonsnett (lengde i meter)	1203	
Tap i fordelingsnett	1204	

13. Invest-eringer og repara-sjoner i 2001

		Anskaffet 1000 kr	Solgt 1000 kr	Reparasjoner 1000 kr
Produksjonsanlegg	1301			
Distribusjonsanlegg	1302			
Annet	1303			
I alt	1304			
Miljøverntiltak: Investeringer i anlegg og utstyr for rensing og utslippsredukjson (også kalt "end of pipe") i løpet av året. Post 1305 skal være inkludert i postene 1301- 1304 over. Beløp i 1000 kr.	1305	Luft/klima	Produksjonsvann og avløp	Avfall
		Jord og grunnvann	Biolog. mangfold og landskap	Annet
Tilknytningstilskudd til abonnenter	1306	1000 kr		
Tilknytningsavgift fra abonnenter	1307			

9.7 Survey instrument for NACE 11 Oil and gas extraction



Statistisk sentralbyrå
Statistics Norway

Seksjon for energi- og industristatistikk
Kongens gt. 6, Postboks 8131 Dep, 0033 Oslo
Tlf. 21 09 47 70 el. 21 09 47 67

Undergitt taushetsplikt
Oppgaveplikt

Statistikk for oljevirksomhet 2002
Felt i drift – Del 1

Frist for innsending:
20. juni 2003

D

Opplysninger eller kommentarer:

Forespørsler fra Statistisk sentralbyrå kan rettes til

Navn og telefonnr.

Dato og underskrift

RA-0125-1 05.2003

2

1. Sysselsetting

Antall sysselsatte på kontinentalsokkelen	101	
Utførte timeverk	102	

2. Produksjonskostnader

			1 000 kr
Vareforbruk	Råstoffer	201	
	Brensel og drivstoff (tilsvarer post 690 kol II i skjemaets del 2)	202	
	Annet forbruksmateriell	203	
	Vareforbruk i alt	209	
Vedlikehold	Materialer	211	
	Styring, inspeksjon, oppfølging	212	
	Brønner	213	
	Undervannsarbeider	214	
	Overflatebehandling	215	
	Reparasjoner	216	
	Annet vedlikehold	217	
	Vedlikehold i alt	219	
	Av dette: Lønnskostnader egne ansatte	218	
Leie av driftsmidler	Leie av floteller, plattformer	221	
	Leie av maskiner og utstyr	222	
	Leie av driftsmidler i alt	229	
Tjeneste-forbruk	Helikoptertransport	231	1 000 kr
	Forsyningsskip/Vaktbåter	232	
	Annen transport og kommunikasjon	233	
	Forpleining	234	
	Teknisk assistanse	235	
	Leieprosessering	236	
	Transport av olje og gass	237	
	Andre tjenester	238	
	Tjenesteforbruk i alt	239	

2. Produksjonskostnader (forts.) 1 000 kr

Direkte lønns-kostnader	Lønn til ansatte	241	
	Andre ytelser til beste for lønnstakerne	242	
	Arbeidsgiveravgift	243	
	Direkte lønnskostnader i alt	249	
Indirekte kostnader	Lønnskostnader på land	251	
	Andre administrasjonskostnader på land	252	
	Indirekte kostnader i alt	259	
Andre kostnader	Andre produksjonskostnader	261	
	Finanskostnader	262	
Produksjonskostnader i alt (Sum 201-261 minus 218)[1]		290	
Import	Andel av varer (postene 201-211) importert i "direkte transitt" eller direkte til sokkelen	298	Prosent
	Andel av tjenester (postene 212-238) kjøpt fra selskaper registrert i utlandet	299	

[1] NB! Post 218 er inkludert både under postene 219 og 249. Unngå dobbelttelling i post 290.

3. Inntekt av annen virksomhet på feltet 1 000 kr

Leieprosessering	301	
Transport av olje og gass for andre	302	

4 A. Produksjonsavgift

		Gjennomsnittlig avgiftssats (prosent)
Råolje	401	
NGL	403	

4 B. Miljøavgift

Forbrukt og avfaklet gass og dieselolje i 1 000 Sm^3	404	
Påløpt avgift 1 000 kr	405	

5 A. Investeringer til miljøverntiltak i utslipps - og renseutstyr i løpet av året

Investeringer i anlegg og utstyr for rensing og utslippsreduksjon (prosessekstern, også kalt end-of-pipe) **i 1000 kr, *ikke* beholdningsverdier**	551.	Luft/klima	
	552.	Jord og grunnvann	
	553.	Produksjonsvann og	
	554	Avfall	
	555.	Annet	

Translation of relevant section (5A):

The field 5A is the relevant one for reporting end-of-pipe investments.	
551: Air/Climate	554: Waste
552:Soil and groundwater	555:Other
553: Production water	

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