Environmental Policy Tools and Firm-level Management Practices

National report: Norway

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in cooperation with

OECD Environment Directorate
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Preface

Economic trends: An open, resource based, growing economy

The Norwegian economy experienced strong growth during the 1990s. GDP increased by 35% and in 1999. GDP per person was 25.600 USD compared to an OECD average of 21.300 USD. Economic performance was strongly influenced by the growth of the petroleum sector.

The Norwegian economy has a strong international orientation. Exports contribute 38% of GDP. Crude oil and natural gas exports represent 35% of total export revenues. Norway is the world's second largest exporter of crude oil (OECD, 2001). Fisheries are another important industry. Fish catches increased by 60% in the nineties and aquaculture production, mainly of salmon, with 120 per cent in the same period. In value terms, Norway is the largest fish exporter in the world.

The manufacturing industries contribute less than 15% to GDP and employment. The manufacturing output has an intensive energy mix because of cheap hydroelectricity. Norway is one of the world's largest producers of primary aluminium, magnesium, ferro- alloys and pulp and paper.

In addition to the energy and polluting intensive sectors, machinery, ship and platform-building related to the oil and gas industry are dominating the economy and labour market in areas where they are located. Principal figures for the main manufacturing sectors are shown in the Annex I, Table A.

In order to shorten the description, we present selected economic trends for Norway, 1980 – 99 in the box on the next page:

Selected Economic trends, 1980 – 99
(% change in volume)

	1980 - 90	1990 - 99
GDP	27	35
Population	4	5
GDP/capita	22	28
Agricultural production	12	-8
Manufacturing	11	19
Oil and gas production		74
Fisheries production		
Wild fish		60
Aquaculture		120
Total primary energy supply	14	18
Energy intensity (per GDP)	-10	-12

Source: Statistics Norway and OECD (2001)

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Table of contents

Executive summary

Objectives

The objective of this study is to provide practical policy advice concerning the effectiveness and efficiency of alternative policy tools, including environmental management systems (EMS's) and other programs that encourage environmental innovations. Questions to be addressed include:

- Do different types of policies (i.e. market-based measures, voluntary approaches, direct regulation) result in different organisational responses within the firm?
- How can public authorities support the introduction of management practices that lead to improved environmental performance (including innovation)?
- How can scarce public resources be better targeted to ensure that both "leaders" and "laggards" improve their environmental performance?

Context of the study

To provide understanding of the firm's commercial performance motivations, decision-making procedures and organisational structure when designing and implementing environmental policies, the OECD Environmental Directorate initiated a project called "Environmental Policy Design and Firm-Level Management". This project was supported financially by OECD's Working Party on National Environmental Policies. Seven countries have executed an industrial survey exploring the links between public (government) environmental policies and private (firm) environmental management and innovation. The participating countries were Canada, France, Germany, Hungary, Japan, Norway and the U.S.

A list of participating research teams are presented in Annex II

Research method and Norwegian sample characteristics

The research method used was a standardised survey sent to most manufacturing facilities in Norway with minimum 50 employees. The respondents were chief executive officers and heads of environmental, health and safety departments. Selected sample characteristics are presented on the next page:

- **Sample:** 891 manufacturing facilities
- **Response rate**: 34,7%
- **Firm size:** Nearly 40% of the respondents were facilities between 50 – 100 employees
- Average **number of employees in facility** (fully employed in the last three years): 193
- Average annual **value of shipment** over the last three years (45 Mill Euro): 377 Mill NOK
- Responding firms listed on **the stock exchange**: 15,5%
- **Scope of market**: More than **48%** characterized their main market as **global.**
- **Facilities customers:** 50% of the primary customers were firms in other manufacturing sectors.
- Relative share of facilities with **R&D** budgets specially related to environmental matters: 15%

Key findings

Environmental Management
Share of facilities having:

- At least one person responsible for environmental concerns: 85%
- A written environmental policy: 77%
- A public environmental report: 54%
- Environmental training programmes: 45%
- External environmental auditing: 45%
- An environmental management system (EMS) in place: 39%
- A certified EMS in place: 28%

Environmental performance

- Sectors like Pulp and paper, Chemicals and Basic metal are more active than other sectors in implementing environmental activities, i.e. environmental management practices and undertaken (technical) actions to reduce environmental impacts.
- We observe a positive relationship between firm size and the likelihood of having an EMS in place.
- A certified EMS may matter:
    - Certified EMS firms undertake more actions to reduce damages caused by environment than non-certified firms.
    - A certified EMS may be a good predictor for firms' environmental progress.

Environmental stakeholders

- The most important stakeholders in an environmental context were: Public authorities, management employees, corporate headquarters, non-management employees and commercial buyers. Stakeholders, which the respondents perceive as "not important", are banks and other lenders, suppliers of goods and services and household consumers. These results are consistent with our previous findings.
- A ranking of the stakeholders by sectors, are supporting the general picture. Public authorities and/ or management employees are ranked in 1st or 2nd place in most sectors.

Motivations

The most important motivations with respect to the environmental practices were: Regulatory compliance, prevent or control environmental incidents, corporate profile/ image and cost saving. Innovation factors like new technology/ product development were perceived of less importance. These findings are also consistent with our previous studies.

The role of public environmental policy

- The assessment of different environmental policy instruments in terms of their impact on their production activities, are in accordance with our description of the environmental policy regime in Norway:
    - Direct regulations and especially performance-based standards (i.e. emission permits) were assessed between very and moderately important.
    - Economic instruments like taxes and charges got a score as moderately important.
    - Voluntary agreements were assessed between moderately important and not important.
    - Tradable emission permits were perceived as not important/ not applicable by 75% of the respondents.
- 16% of the respondents characterized the environmental policy as "Very stringent". Most of these represented facilities in Basic metal and Pulp and paper.

The most frequently used environmental policy and programme to encourage use of an EMS, was reduced frequency of inspections.

Environmental practice and commercial performance

- Nearly 20% of the companies confirm that revenue had been well in excess of costs. But these "profitable" facilities did not undertake more environmental activities than other firms: Profit seems not to be a main driver in undertaking environmental actions.

- Firms having both a certified EMS and an environmental department ("leaders") compared to "laggards" (Having neither a certified EMS nor an environmental department) did not differ significantly due to economic performance. These results did not support the hypothesis: "It may pay to be Green".

Further research

Empirical analysis of the database from the study (approximately 4200 observations) will be followed up during 2004/2005. Four main sets of theme are to be addressed. [Responsible national research teams in brackets]

- The factors behind a facility's choice to introduce an EMS and other environmental management tools [Canada and Hungary]
- The determinants of a facility's likelihood of having undertaken specific types of environmental investments [OECD and France]
- The determinants of the degree of environmental innovation and integration exhibited by the facility [Japan and Germany]
- The links between the aforementioned factors and the facility's commercial performance (profitability and sales) [United States and Norway]

In all cases, the specific role of public environmental policy is to be emphasised.

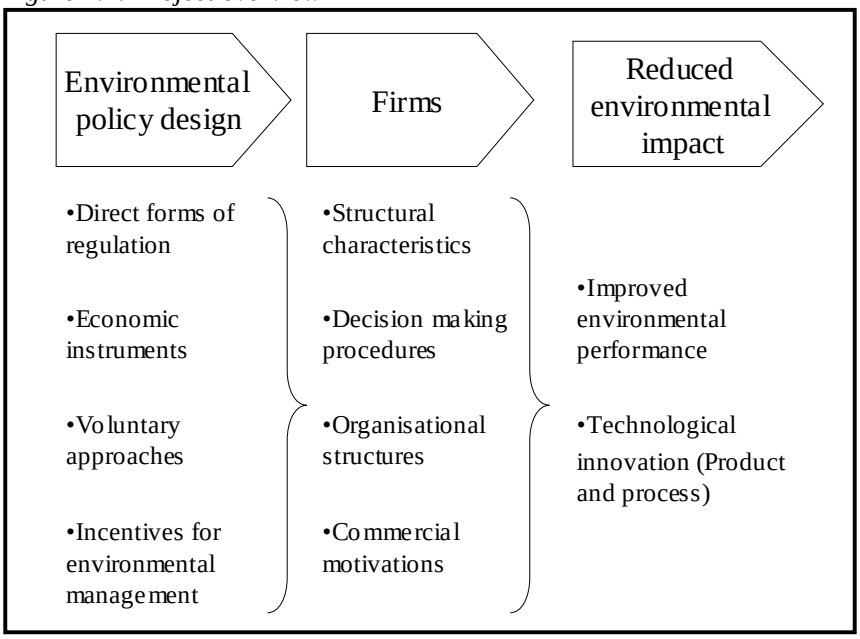
1. Introduction

The objective of this report is to provide understanding of the firm's commercial motivations, decision-making procedures and organisational structure when designing and implementing environmental policies. Such organisational issues are usually not reflected in discussions of the relative merits of different policy instruments. Assessment of the public environmental policy measure often treat the internal workings of the firm as a "black box", assuming that firms will respond in a predictable manner.

However, heterogeneity of different firms' responses to extreme pressure, including regulatory pressure, has created interest for exploring the role of firm-specific factors in determining environmental performance. During 2002, the OECD Environmental Directorate initiated a project called "Environmental Policy Design and Firm-Level Management" supported financially by OECD's Working Party on National Environmental Policies. Seven countries[1] have executed an industrial survey exploring the links between public (government) environmental policies and private (firm) environmental management and innovation. Figure 1.1 highlights the main elements of the project.

[1] The participating countries are Canada, France, Germany, Hungary, Japan, Norway and the U.S. List of participating research teams are presented in Annex II.

Figure 1.1: Project overview



The Norwegian partner in the OECD project is Centre for Environmental Studies, Norwegian School of Management (BI). Since 1994 we have executed an industrial survey called the Business Environmental Barometer (BEB). The mission of the BEB-project has been to contribute to the improvement of environmental management and environmental performance of business and industry and tracking changes over time. The BEB-project started out in the Nordic countries (Wolff R. et al, 1995 and Ytterhus B. & Synnestvedt, 1996). Since then surveys has been conducted periodically by research teams in 10-12 European countries and mapping "The Greening of Industry". (Belz F. & Strannegård L., 1997 and Kestemont M.P. & Ytterhus B. 2001)

The objectives of the BEB-project are to map how the chief executive officers in manufacturing companies perceive:

- The driving forces behind companies' environmental strategies and actions.
- The companies' implementation of environmental strategies and action.
- Economic and environmental performance in manufacturing firms.

Compared to our OECD project, the BEB-project has focused mainly on the links between stakeholders, the firm and the environmental performance and less on public environmental policy measures. The shift in focus to environmental policy design, but also keeping the internal workings of the firm in mind, means that we have expanded the scope in combining environmental economics and environmental management.

When reading our report, we hope to clarify the following questions:

- Is there a distinct role played by environmental management tools? (Chapter 4)
- Does a certified environmental management system (EMS) matter? (Chapter 4)
- What are the most important stakeholders for the firm's implementation of environmental activities? (Chapter 5)
- How do firms assess different environmental policy instruments? (Chapter 6)
- What are the most frequently used environmental policies and programmes to encourage use of an environmental management system? (Chapter 6)
- Is there a relation between commercial and environmental performance? (Chapter 7)

The research method used was a standardised survey sent to most manufacturing companies in Norway.

2. Overview of sample

The Norwegian sample consists of 891 manufacturing companies with minimum 50 employees i.e. most firms within the population[2]. The respondents were chief executive officers and heads of environmental, health and safety departments. The questionnaire was sent out by post in March 2003 and we received 197 responses. In May 2003 we kindly asked the missing respondents to fill in the questionnaire and another 112 responses were received. In total we got 309 responses obtaining a response rate of 34,7%, which is acceptable for a questionnaire of 10 pages length.

Table 2.1 illustrates the represented sectors, number of respondents and respond rates in more details. All tables and figures in the main chapters are based on responses from facilities of 50 employees or more. In Annex I we present some results based on all responding firms.

[2]According to Statistics Norway, the total population was approximately 1100 facilities in 2003 (NACE code 15-37).

Table 2.1: Represented sectors, number of respondents and response rates

Nace/ code	Manufacturing sector	Total sample [1]	Responses n_0 [2]	Responses n_1 [3]	Response rates [4]
15	Man. of food products and beverages	144	32	29	22,2 %
16	Man. of tobacco products	1	1	1	100,0 %
17	Man. of textiles	27	8	8	29,6 %
18	Man. of wearing apparel; dressing and dyeing of fur	7	2	2	28,6 %
19	Tanning and dressing of leather; manufacture of luggage, handbags, footwear etc.	2	0	0	0,0 %
20	Man. of wood and products of wood and cork except furniture	70	29	20	41,4 %
21	Man. of paper and paper products	22	10	10	45,5 %
22	Publishing, printing and reproduction of recorded media.	32	15	12	46,9 %
23	Man. of coke, refined petroleum products and nuclear fuel	0	0	0	
24	Man. of chemicals and chemical products	42	18	15	42,9 %
25	Man. of rubber and plastics products.	25	6	6	24,0 %
26	Man. of other non- metallic products.	38	14	12	36,8 %
27	Man. of basic metals	39	18	16	46,2 %
28	Man. of fabricated metal products, except machinery and equipment	98	36	27	36,7 %
29	Man. of other machinery and equipment	84	32	23	38,1 %
30	Man. of office, accounting and computing machinery	4	0	0	0,0 %
31	Man. of electrical machinery and apparatus	37	11	8	29,7 %
32	Man. of radio, television and communication equipment	18	4	4	22,2 %
33	Man. of medical, precision and optical instruments, watches and clocks'	22	8	6	36,4 %
34	Man. of motor vehicles, trailers and semi-trailers	22	11	11	50,0 %
35	Man. of other transport equipment	93	33	26	35,5 %
36	Man. of furniture	59	20	16	33,9 %
37	Recycling	5	1	0	20,0 %
	All manufacturing sectors	**891**	**309**	**252**	**34,7 %**

[1] Includes some facilities with less than 50 employees

[2] All respondents

[3] Responding facilities with 50 employees or more

[4] Based on all respondents

Selected industries and firm[3] size by respondents, are shown in Figure 2.1 and 2.2:

Figure 2.1: Selected sectors of industry

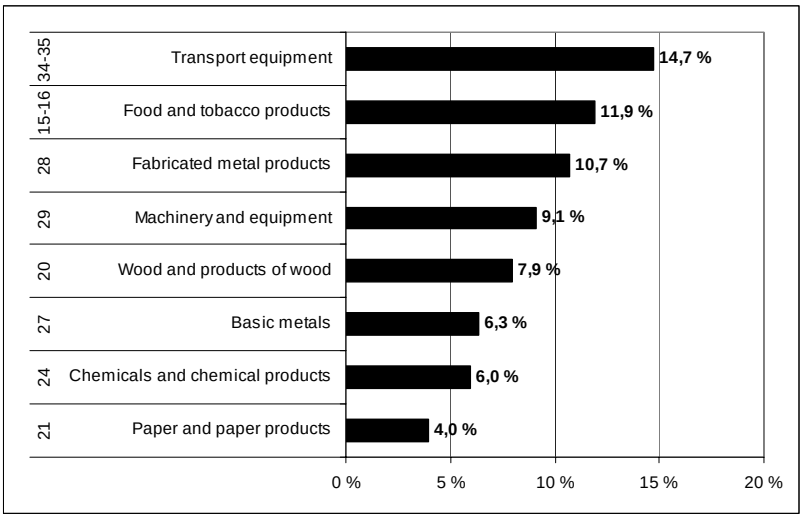
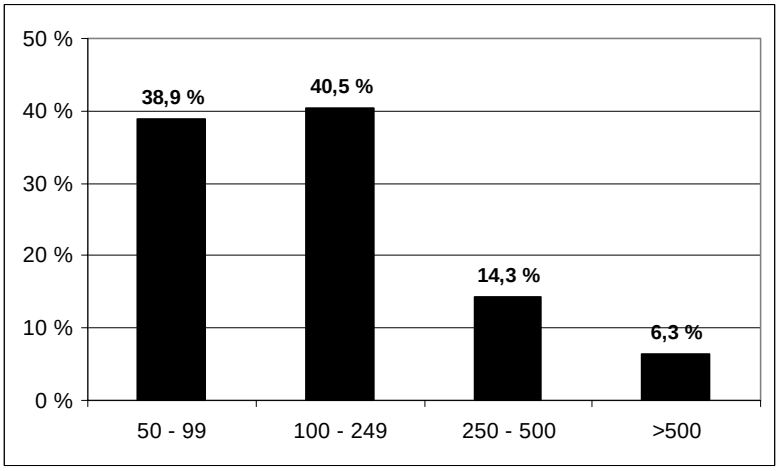


Figure 2.2: Distribution of facility size (number of employees)



[3] We use the word "firm" sometimes, but all tables and figures in the Chapter 2-7 are based on responses from facilities with 50 employees or more.

The most represented industries in the survey were manufacturers of transport equipment, fabricated metal products, food and beverages, machinery and equipment and wood product, see Figure 2.1[4].

Firm sizes by respondents are shown in Figure 2.2. Nearly 40% of the respondents are firms within the interval 50-100 employees and 80% are SME's, i.e. firms with less than 250 employees.

Previous reports have shown that large firms have implemented more activities than smaller companies (Ytterhus and Synnestvedt, 1996). Therefore, we might expect a relatively higher response rate by large companies, since environmentally active firms may answer to questionnaires more often than others. In Table 2.2, we present the frequency distribution of responses by size of the firm relative to the similar distribution of the sample.

Table 2.2: Number of respondents by size of the facility

Facility size (Number of employees)	Total sample (N_i) [1)]	Responses n_{i0} [2)]	Responses n_{i1} [3)]	Response rates [4)]	I = N_i / N (%)	II = n_i / n (%)	II − I
50-99	458	155	98	33,8 %	51,4 %	50,2 %	-1,2 %
100-249	288	102	102	35,4 %	32,3 %	33,0 %	0,7 %
250-499	88	39	36	44,3 %	9,9 %	12,6 %	2,7 %
More than 500	57	13	16	22,8 %	6,4 %	4,2 %	-2,2 %
Total	**N = 891**	**n = 309**	**252**	**34,7 %**	**100,0 %**	**100,0 %**	**0,0 %**

[1)] Includes some facilities with less than 50 employees
[2)] All respondents
[3)] Responding facilities with 50 employees or more
[4)] Based on all respondents

The last column in Table 2.2 indicates the differences between the frequency distribution of the total population and the responses by the size of the firm.[5]

A last check on representation and survey bias was done in analysing if there were any differences in the answers we received during March and May 2003, i.e. from the first postal questionnaire and the reminder.

There were no significant differences between the answers in the 1st and 2nd response rounds. This observation supports a hypothesis that those who did

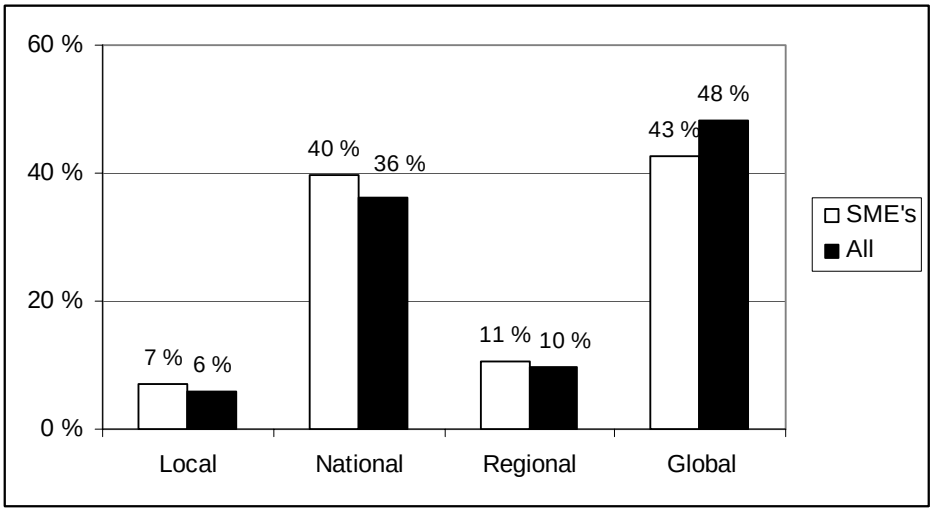
[4] In the Annex, Table A, principal figures for the main Norwegian manufacturing industries are presented.
[5] In the Annex, Table B, we present a similar comparison by sectors. For most sectors there are just minor differences, except "Food and beverages" which are "underrepresented". Sectors like "Pulp and paper", "Chemicals", and "Basic Metals" are "over-represented".

not respond at all, would not have responded very differently. i.e. it is not likely to be any response bias.

2.1 Scope of market: Small, but international

The respondents were asked to answer which market they considered to be their most important. The results are presented in Figure 2.3:

Figure 2.3: Scope of facilities' market

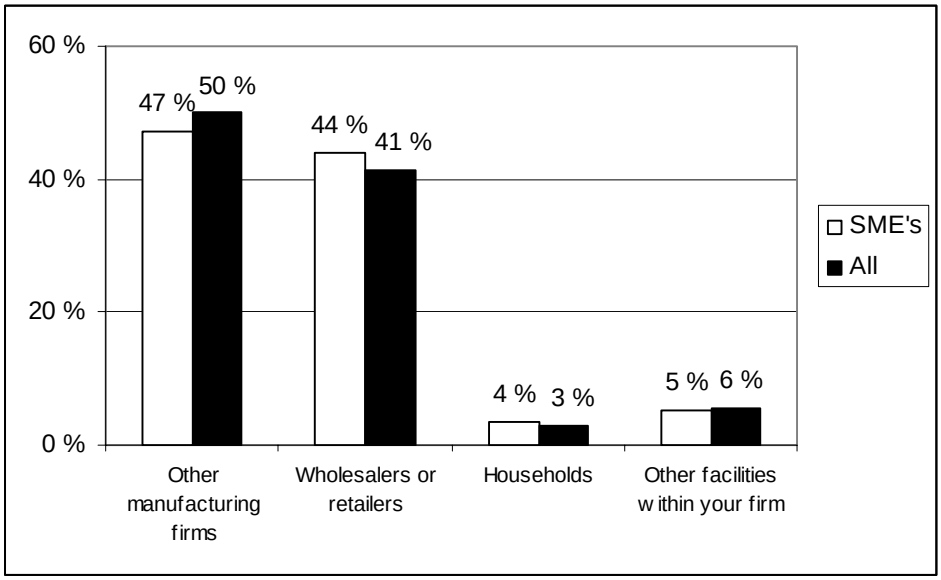


Nearly 50% of the respondents characterized their most important market as global, while only 6% reported they mainly were local producers. While 80 percent of the facilities consisted of SME's, more than 40% operated in global markets. These results may be surprising since we generally do not associate SME's with international trade. There are at least two explanations:

- The respondents' facilities are subsidiaries to large, international companies.
- Many small Norwegian firms within sectors like pulp and paper, metal products, machinery and equipment are suppliers to international enterprises.

Figure 2.4 confirms that the manufacturing facilities are marketing their products to other firms. Half of the facilities identified their primary customers as firms in other manufacturing sectors, while more than 40% of the primary customers were either wholesalers or retailers.

Figure 2.4: Facilities' customers



2.2 R&D expenditures

The average annual budget on R&D over the last three years was 7,9 million NOK (0,95 million EUR). Only 15% of the facilities had an R&D budget specially related to environmental matters.

Chapter 2: Norwegian sample characteristics: A summary

- **Sample:** 891 manufacturing facilities
- **Response rate**: 34,7%
- **Firm size:** Nearly 40% of the respondents were facilities between 50 – 100 employees
- Average **number of employees in facility** (fully employed in the last three years): 193
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- **Facilities customers:** 50% of the primary customers were firms in other manufacturing sectors.
- Relative share of facilities with **R&D** budgets specially related to environmental matters: 15%

3. Environmental policy in Norway: Trends and challenges[6]

This chapter follows the Pressure-State-Response model (OECD, 1994), looking at

- Environmental pressure (Chapter 3.1)
- State of environment (Chapter 3.2)
- Responses to environmental problems (Chapter 3.3)

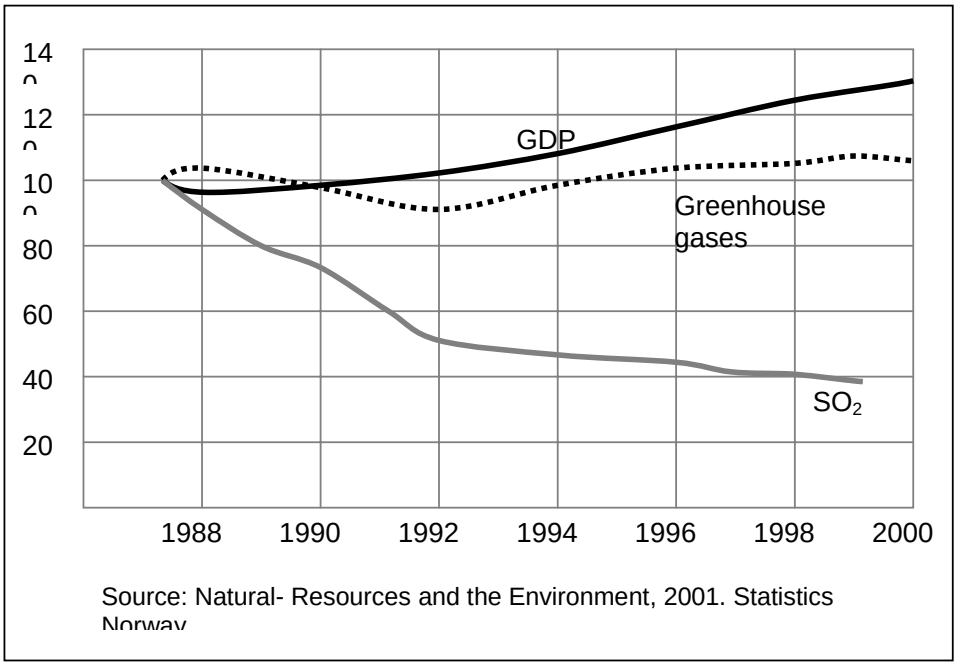
3.1 Environmental pressure: Selected indicators to illustrate decoupling or not

In the introduction, we presented main driving forces behind environmental pressure. While GDP grew with 35% in the 1990s, SO_2-emissions were reduced by 44% during the same period. This is an example of strong decoupling between economic and environmental development. Strong decoupling makes it possible to "Produce more with less environmental burden" in terms of emissions and waste quantities.

Concerning greenhouse gases (GHG), only weak decoupling has been achieved. Since 1990, GHG-emissions have risen by 8 per cent measured in CO_2-equivalents (Statistics Norway, 2002). This development is mainly due to a rise in CO_2-emissions. To summarize these trends, we present the relative growth in mainland Norway's GDP, greenhouse gases and sulphur dioxide emissions during 1987 – 2000 in Figure 3.1:

[6] The text is mainly based on White papers no. 58 (1996 – 97) and no. 25 (2002 – 2003) to the Parliament, OECD's review of Norwegian Environmental Policy (OECD, 1999 and 2001) and Bent Arne Sæther, Ministry of Environment (1997).

Figure 3.1: Relative trends in gross domestic product and emissions of greenhouse gases and SO_2.



For each year, the figures above are expressed as percentages of the 1987-level (Index=100). For example, the figures for mainland GDP are 30% above the 1987- level in 2000. But sulphur emissions in 1999 were only 39% of the 1987- level.

In Table 3.1, selected indicators on environmental pressure, 1980 – 99, are presented:

Table 3.1: Environmental pressure indicators 1980 – 99 (% change)

	1980 - 90	1990 - 99
Selected environmental pressures		
CO_2 emissions from energy production and use	-3	19
SO_2 emissions	-62	-44
No_x emissions	16	2
Coastal eutrophication		
Total P		-19
Total N		-9
Pesticide use	-14	-33
Municipal waste	18	32
Total final energy consumption	10	11
Road freight traffic	57	55

Source: Statistics Norway and OECD (2001)

Table 3.1 experiences strong decoupling for SO_2-emissions, use of pesticides and partly coastal eutrophication. Weak decoupling has been achieved in CO_2, NO_x and nitrate in effluents. Municipal waste grew at the same rate as GDP. In addition, concern has grown about pollution from offshore petroleum operations and fragmentation of wilderness areas (OECD, 2001).

Another way to illustrate the linkage between economic and environmental development, is using the eco-efficiency concept (OECD, 1997). Eco-efficiency is often defined as a ratio between an economic and environmental indicator. In Table 3.2, percentage changes in two indexes are calculated for selected industries in our sample:

1. Gross product relative to global warming potential (GWP measures by CO_2-equivalents)[7]
2. Gross product relative to acidification compounds (Potential Acid Equivalents)[8]

A positive sign on the change in the eco-efficiency indexes, illustrates a decoupling.

[7] GWP: A weighted sum of greenhouse gases in CO_2-equivalents
[8] PAE: A weighted sum of SO_2, NO_X and NH_3

Table 3.2: Economic and environmental indicators for selected industries

NACE code	Industry	Percentage change in 1991-96				
		Gross product (fixed prices)	Global Warming Potential GWP	Potential Acid Equivalents PAE	1: Gross product/ GWP	2: Gross product/ PAE
15 - 16	Food and tobacco	2	32	-17	-25	19
21	Pulp and paper	23	90	31	-34	-6
24	Chemicals	19	20	41	4	-12
27 - 28	Metals (Basic and fabricated)	16	-25	-33	56	74
29	Machinery	10	21	-17	-9	34

The food industry had a decoupling in respect of acidifying compounds but deterioration in respect of GHG-emissions during 1991 – 96. The pulp and paper sector had the poorest development measured with changes in the eco-efficiency indexes among the industries in Table 3.2.

The metal industry had a very positive development in respect of decoupling, but metal firms still have major CO_2-emissions as a result by using carbon in its production process. The chemical industry experienced weak decoupling in respect to GHG-emissions but deterioration in respect of acidifying compounds.

3.2 State of the environment

The environmental pressure results into changes in the state of the environment. In the White paper no. 58 (1996 – 97) to the Parliament (Stortinget) on environmental policy for sustainable development, eight priority areas were established, see table 3.3. These priority areas provide the basic structure for the result of monitoring system used by the environmental authorities in Norway. Strategic objectives and national targets have been set for each of these priority areas. Some targets reflect international agreements ratified by Norway, e.g. the Kyoto Protocol.

Table 3.3: Eight priority areas of environmental policy, 1999

Priority area and topic	Pressure indicators	Target	Base year	Deadline	1999 level
1. Biodiversity	Road density				
	Areas without infrastructure development	Establishment of national monitoring system		2003	
2. Outdoor recreation	% pop. living < 500 m from edge of urban settlement	100 metre strip along shoreline free from development			
3. Cultural heritage	Change in land use				
	Average farm size				
4. Eutrophication and oil pollution	Nitrogen nutrients	–50%	1985	2005	–27%
	Oil discharges				
5. Hazardous chemicals	6 types of priority substances	Elimination		2005	. .
	12 types of priority substances	Substantial reduction		2010	. .
6. Waste and recycling	Waste generated and recovery rate	Max. 25% to final treatment		2010	. .
	Methane from landfills				
7. Climate change, air pollution and noise	GHG emissions	+1%	1990	2008-11	+10%
	Ozone depleting substances				
	CFCs, HBFCs produced	-100%		–	–100%
	Methyl bromide	-100%	1995	2005	–25%
	HCFCs	-100%		2015	948 t
	Long-range air pollution				
	SO_2	-58%	1990	2010	–70%
	NO_x	-28%	1990	2010	+4%
	VOCs	-37%	1990	2010	+40%
	NH_3	+0%	1990	2010	+17%
	Local air quality (PM_{10}, NO_2, SO_2, benzene)	Specific targets for 10 cities		2002	. .
	Noise	-25%	1999	2010	. .
8. International co-operation and protection of polar areas					

Source: Statistics Norway; OECD.

3.3 Responses to environmental problems

3.3.1 The framework for environmental policy in Norway

"*Norway probably has the most extensive framework for environmental policy of all countries in the world*" (OECD, 1999).

Norway was among the first countries to establish a Ministry of Environment, in 1972. The Ministry is responsible for nature conservation and pollution control, assessing, and reporting on environmental trends and proposing cross-sectoral measures and national goals. Under the authority of the Ministry, there are different environmental bodies including the important State Pollution Control Authority (SFT in Norwegian).

Various inter-ministerial committees have supported co-ordination on environmental matters. In 1997 (white paper no. 58) the authorities reshaped and reinforced policy on economic-environmental integration. To improve sectoral integration, ministries were requested to define and adopt sectoral action plans. As reported in section 3.2, eight areas of environmental policy were identified.

Norway has a three-tier governmental system with 19 counties and 435 municipalities. Municipalities were given greater responsibilities for implementation of environmental policies during the 1990s. Today municipalities have primary authority over waste water treatment and waste management.

3.3.2 Instruments of environmental policy

The environmental policy instruments are often divided into three main categories:

I. Command and control instruments like performance based standards (e.g. emission permits), technology-based standards (e.g. abatement equipment) and input bans.
II. Economic instruments such as taxes, charges, subsidies and tradable emission permits.
III. Voluntary agreements and information (e.g. negotiated agreements and eco-labels).

In addition, voluntary actions like environmental management systems (EMS) to follow-up environmental activities have been established in many industries during the last decade (cf. chapter 4).

I. Command and control instruments

Direct regulations based on environmental legislation were established in the last part of the 1970s and the first part of the 1980s. Several amendments have been made during the 1990s as part of an environmental regulatory reform. Regulations are still a dominant instrument in Norway.

The Pollution Control Act (1981 and amended in 1989 and 1993) contains provision that SFT may grant emission permits. The SFT relies on ambient air and water guideline, which forms an important basis for granting emission permits (Sæther, 1997). The Pollution Control Act covers all forms of pollution from stationary sources, and is based on "Integrated pollution control". Issued under the Pollution Control Act, discharge permits have been the main instruments to reduce emissions from industry, i.e. a reduction in SO_2 emissions from industry by more than 40% during the nineties. Maximum limits on the sulphur content of fuel oil, may also be an important cause to this development.

During the 1980s, the emission permits covered large and easily visible emissions, and the system could be described as "recipient-oriented". The emission permit system with air/water quality guidelines paid much attention to large point source of industry and too little attention to diffuse source and municipal waste.

During the 1990's, we observed a gradual development in the flexibility of regulations. Regulation relating to internal control (safety, environment and health at work, called the HSE-regulation) took effect in 1992, and the SFT concentrated more on the control of internal systems in industry. Technology-based standards also became less important in this period.

Regulation of SMEs would be very resource consuming in issuing permits. Therefore, SFT issues regulations covering particular parts of industry (i.e. regulation of photo-chemicals). The Product Control Act (1976, and amended in 1990 and 1993) came as a response to growing concern from an increasing flow of products, containing hazardous chemicals. The Act covers in principle all kinds of products.

The Pollution Control Act and the Product Control Act provide the foundation of direct environmental regulation in Norway (Sæther, 1997)[9].

[9] Other laws like the Planning and Building Act (1985) are also important instruments in providing basis for land-use and protection of the environment. For nature protection, the Nature Conservation Act and the Wildlife Act are important laws.

II. Economic instruments

"Norway has consistently been one of the leaders among OECD-countries in using economic instruments" (OECD, 2001).

During the 1990s, a move away from command and control instruments towards strengthening the use of taxes/charges began.

The more general search for increasing the efficiency of policy instruments put more emphasis on the economics of environmental regulations. Three major commissions provided a comprehensive basis for decisions on the use of implementing economic instruments in environmental policy. Several environmental taxes[10] were launched in the 1990s, such as the CO_2-tax (1991), non-refillable beverage containers (1994), final waste treatment (1999) and a large increase in the sulphur tax (2000). Energy products are also subject to a range of taxes in Norway, motivated by environmental and fiscal objectives. There is a relatively high rate of taxation on petroleum products, representing up to 70% of the market price. More than 8% of tax revenue in Norway was produced by environmental related taxes in 1998, compared to 5.3% as an OECD average.

The implementation of environmental taxes in Norway strikes a balance between cost-effectiveness, international competitiveness and regional development, with the latter two often overriding environmental and cost-effectiveness concerns (OECD, 1999). The Environmental Tax Commission (1992) pointed out that 40% of CO_2 emissions and 60% of SO_2 emissions were exempted from taxation at that time. The main reason was that Norway would suffer a considerable loss of unemployment from a unilateral increase in the carbon tax. Energy intensive industries were exempted from the sulphur tax until 2000[11].

In 1999, 64% of total CO_2 emissions were covered by the CO_2 tax. Several mainland exporting industries are still totally exempt from CO_2 taxation, such as the aluminium, ferro-alloys, fertilizer and chemicals firms.

An important challenge for Norway today is to meet the Kyoto Protocol Commitments, cf. Table 3.3. By 1999 the manufacturing sectors were responsible for 28% of the GHG emissions[12]. During the 1990s, the

[10] Taxes with an explicit environmental purpose.

[11] Later analysis has shown that the SO_2-tax to energy intensive industries is lower than the marginal abatement costs.

[12] 16,2 mill out of total 56.2 mill. tonnes of CO_2-equivalents. Norway has an annual emission allowance of 52.5 mill. tonnes CO2-equivalents under the Kyoto Protocol.

manufacturing sectors GHG-emissions increased by 8 per cent and are estimated to rise by 17% during 1990 – 2010.

To cope with this challenge, a Commission in 1999 recommended an extensive national trading quota system to be introduced. During 2002, the Storting decided to reduce GHG emissions by means of a combination of a domestic emission-trading system for some branches of industry from 2005. The emission trading system will also apply to emission sources that do not pay a CO_2 tax. The overall ceiling for quotas is based on a reduction of total GHG emissions by 20% from 1990. Plans are made to link the Norwegian System to the proposed EU emission-trading scheme.

III. Voluntary agreements and information

"The quality of environmental information in Norway is generally very good" (OECD, 2001)

During the 1990s we observed less control of details towards a control of internal systems in firms and implementation of economic instruments. More focus on products and "diffuse" sources of environmental problems like waste generation, was the background for implementing "voluntary agreements" to promote waste recycling. Several agreements were signed during the mid-nineties with various industry branches and the Ministry of Environment regarding paper, cardboard, glass, lead accumulations and car parts. These agreements were developed within the existing regulatory framework.

As the emissions of greenhouse gases increased and several commissions proposed a CO_2 tax on fossil fuel, the industry preferred voluntary agreements to reduce greenhouse gas emissions to a CO_2 tax. In 1997, the aluminium industry signed such an agreement with the Ministry of Environment to reduce greenhouse gas emissions per unit of aluminium by 55 per cent in the period of 1990-2005. This corresponds to a 4 per cent reduction in total Norwegian GHG emissions.

An industrial Energy Efficiency Network, covering 80% of energy use in the industrial sector, has improved energy efficiency and reduced emissions through voluntary agreements with industry since 1989. But in spite of these examples, agreements between authorities and industry have not played an important role in the environmental policy in general, except areas like waste management policies.

Information as a policy instrument is important when it comes to products. The Product Control Act (1976) has been amended as a response to growing concern over potential environmental damage from new products, in particular hazardous chemicals. The common Nordic scheme for voluntary eco-labeling, "The Nordic Swan", encompasses products such as detergents, paper products, glue and sanitary products.

Energy eco-labeling on 'white goods' (refrigerators, washing machines etc.) has been carried out since 1996 to provide consumers with information concerning energy efficiency.

A review of the existing rules in the Accounting Act is another example to introduce a general provision to provide information from industry with a significant impact on the environment, i.e. such firms should report on pollution, energy use and waste management[13].

The GRIP Centre for Sustainable Production and Consumption was established by the Ministry of Environment in co-operation with Trade Associations. GRIP is providing private and public sectors with information tools and sector manuals on different topics, e.g. on "Best Practice" and "Eco-Efficiency".

Green Business Network Norway (BBU) is another important player in promoting voluntary environmental activities in Norwegian businesses and industries.

[13] A study by Ruud and Larsen (2003) states that just 30% of the largest companies in Norway are reporting in accordance with these new regulations in the Accounting Act.

Chapter 3: A summary

- Environmental management policies in Norway aim to strike a balance between considerations of cost-effectiveness, international competitiveness and regional development – with the latter two considerations often overriding environmental and cost-effectiveness concerns. (OECD, 1999)
- Direct environmental regulations are still dominant. The Pollution Control Act and the Production Control Act provide the foundation of direct environmental regulation in Norway.
- Two important trends have taken place over the last decades:
- A shift from technology-based standards towards performance-based standards
- A swing from control of details towards a control of internal systems in business and industry
- Increased ambition levels in environmental policy, increased the emphasis on cost-effectiveness and use of economic instruments and negotiated agreements.
- Norway has consistently been one of the leaders among OECD countries in using economic instruments. (OECD, 2001). More than 8 per cent of tax revenue was produced by environmental related taxes in 1998 compared to 5.3% as an OECD average.
- In 1999, 64% of the total CO_2-emissions were covered by the CO_2 tax, but important industries like aluminium, ferro-alloys and cement have still got an exemption from the CO_2 tax.
- To meet the Kyoto Protocol commitment, the Storting has been decided to implement a domestic GHG-emission trading scheme in Norway from 2005, applying also to emission sources that do not pay a CO_2-tax today.
- Agreements between authorities and industries have not played an important role in the Norwegian environmental policy, except in waste management policies.

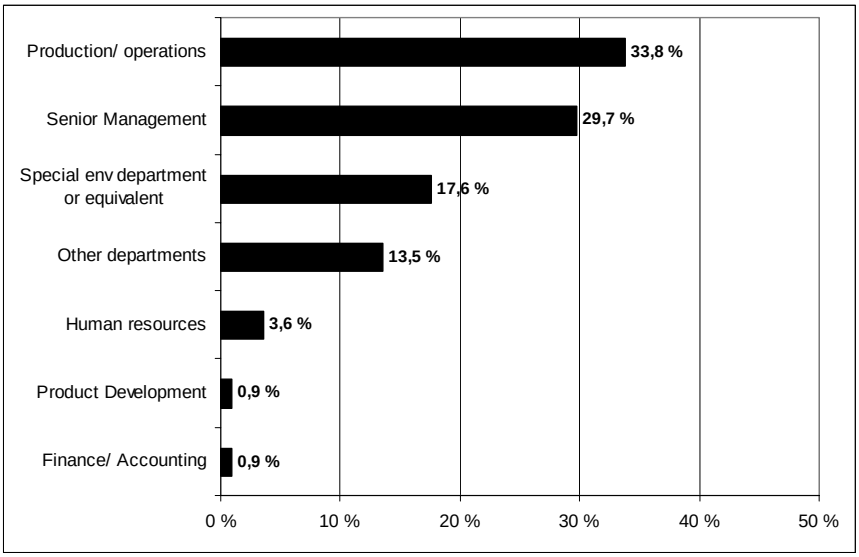
4. Environmental management and performance

4.1 Environmental management systems and tools

Even if an environmental management system (EMS) is voluntary, EMS has become an essential prerequisite for international business exchange. One goal of the project is to examine whether the presence of an EMS is associated with improved environmental performance or not.

To follow-up environmental activities over time, 85% of the Norwegian manufacturing companies reported to have at least one person with explicit responsibility for environmental concerns. The location of this individual within the firm is shown in Figure 4.1:

Figure 4.1: Location of persons with responsibility for environmental concerns

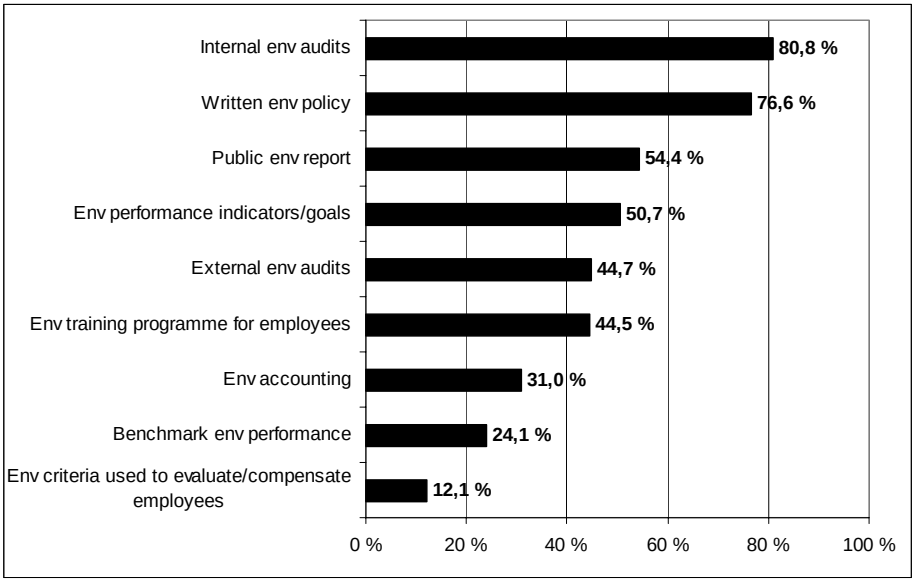


The graph indicates that nearly 2/3 of the individuals responsible for environmental concerns belong to line management, equally split between production/operations and senior management. Just 17% of the individuals were located in special environmental departments.

An environmental management system will enable the enterprise to co-ordinate and carry out environmental actions. In Figure 4.2, we are

presenting the status for practices that have been established in order to implement an environmental management system in the firms:

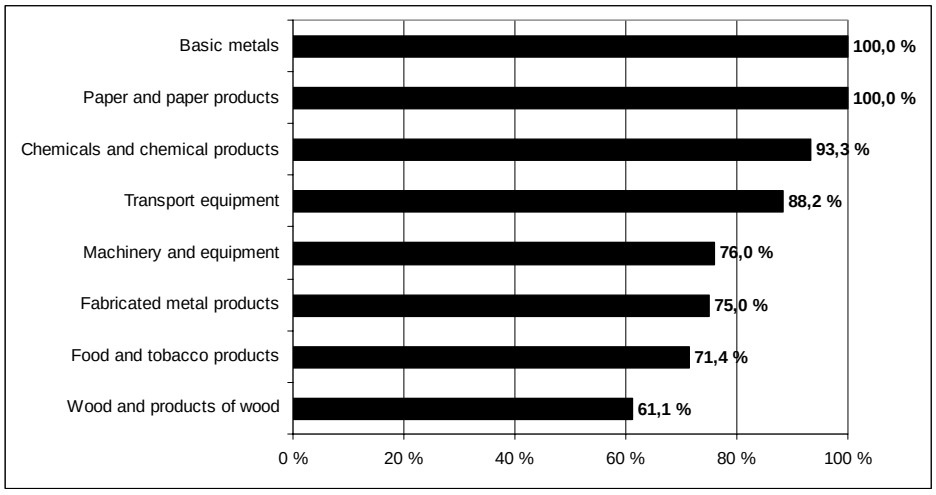
Figure 4.2: Activities in respect of environmental management systems
(share of facilities that responded affirmatively)



Almost 8 out of 10 firms have prepared a written environmental policy and have carried out internal environmental activities. More than 5 out of 10 are publishing a public environmental report and 45% are setting up training programmes in the environmental area.

In Figure 4.3, we present the share of firms in different sectors that confirmed they have a written environmental policy:

Figure 4.3: Written environmental policy by sectors
(share of facilities that confirmed the activity had been carried out)

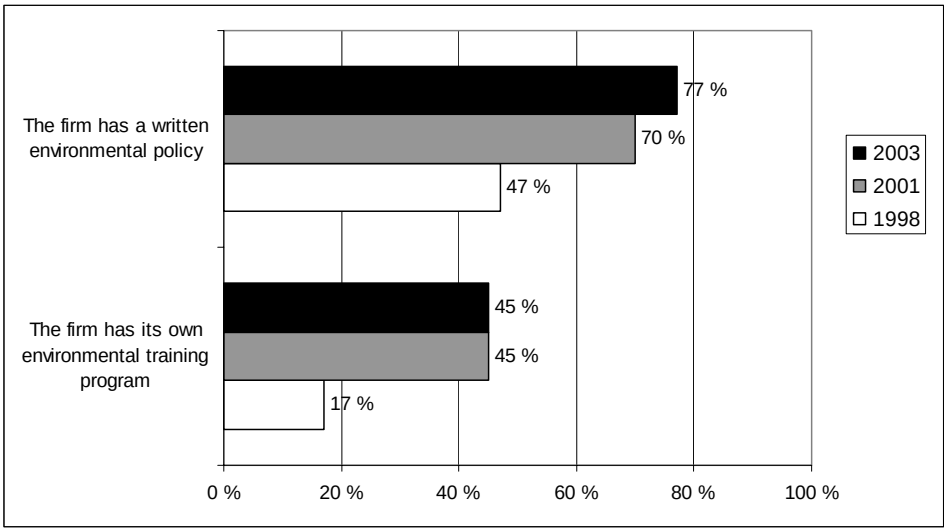


The "polluting" sectors (Basic metal, paper an chemicals) are on the top of the list, while the "wood sector" is lagging behind the others. In the BEB-project (Ytterhus, 2002), we have been mapping practices in environmental management for nearly a decade, and some trends may be of interest to the reader.

Here we select two indicators of environmental practices from the BEB-project in 1998 and 2001[14] to compare with the 2003 results: These indicators were " Having a written environmental policy" and "Having an environmental training program".

[14] See Ytterhus (2002) for more trends on Environmental management in Norway.

Figure 4.4: Practices in environmental management.
Results from surveys in 1998, 2001 and 2003. Share of firms that confirmed that the activities had been carried out.



The degree of activities in environmental management, indicate a positive trend:

- Whereas in 1998, 5 of 10 enterprises had a written environmental strategy, this share increased to 7 of 10 in 2001, and nearly to 8 of 10 in 2003.
- From 1998 to 2001 we observe a great progress with respect to training. The reason for this may be that in the 1998-survey; "lack of competent personnel" was reported to be the most important obstacle to the implementation of environmental activities (Kestemont and Ytterhus, 2000). Since the 2001, the reported degree of having a training program has not changed.

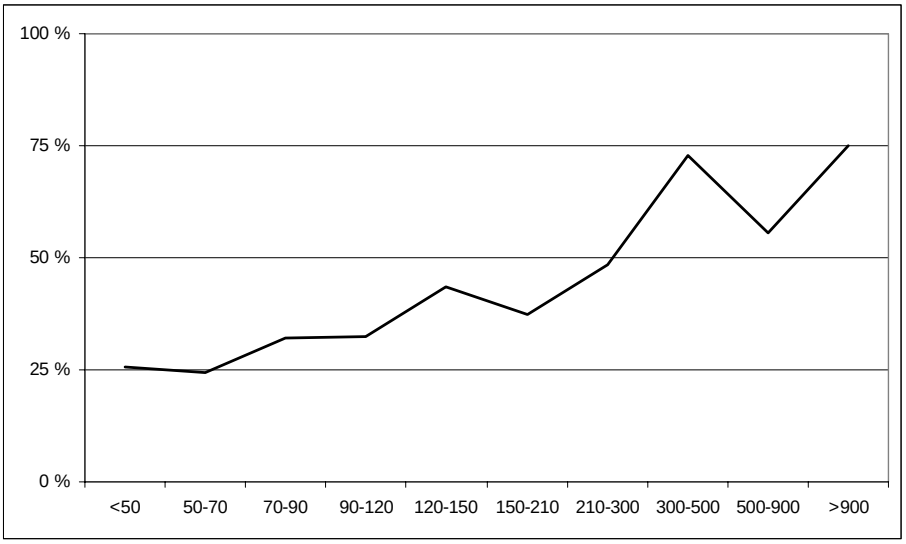
4.1.1 Environmental Management Systems (EMS)

Routines for implementation and follow-up of environmental activities over time are established through environmental management practice like introducing and environmental management system (EMS). In our sample, 35% of the respondents confirm they have an EMS in place.

It is often found that there is a positive relationship between firm size and the likelihood of having an EMS in place (Johnstone et al, 2002). This may be explained by economies of scale in administration costs or by the reason

that management systems in general are more extended in large than smaller firms, increasing the potential benefits from their introductions.

Figure 4.5: Facilities that have actually implemented an EMS by size of facility
(number of employees).

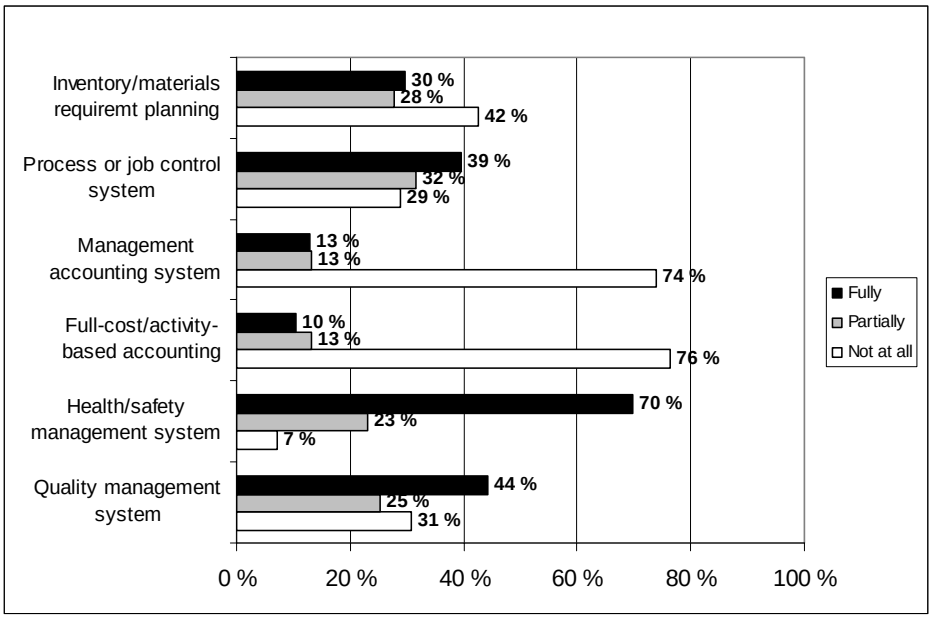


The relationship between having an EMS in place and firm size, is positive as expected, cf. Figure 4.5: While just 25% of the smallest firms have an EMS in place, 75% of the largest firms have implemented an EMS.

Out of facilities with 50 employees or more, 71 confirmed they had a certified EMS in place. An environmental certification such as ISO 14001 requires a management concern to be addressed in the same systematic manners as business issues like cost and quality (Coglianese and Nash, 2001)

Since the introduction of environmental activities in firms have been increasing during the last decade, we were curious as to whether these activities are integrated with other management practices. We should for example expect integration between environmental activities and quality management systems, because of the links between quality management systems standards such as ISO 9000 and environmental management systems standards such as ISO 14001.

Figure 4.6: Environmental activities integrated with management practices



From Figure 4.6, we can read that only 4 of 10 have fully integrated their environmental activities with the quality management system and their process or job control system. However, 7 of 10 confirm they have integrated their environmental activities with health/safety management systems.[15]

4.2 Environmental measures, innovation and performance

The environmental problems occur in different stages of the product life cycle. In Ytterhus (2002) we have shown that the most reported environmental actions undertaken are related to the last part of the value chain.[16] The environmental activities reported undertaken in this chapter, may be seen as complement to the management practice.

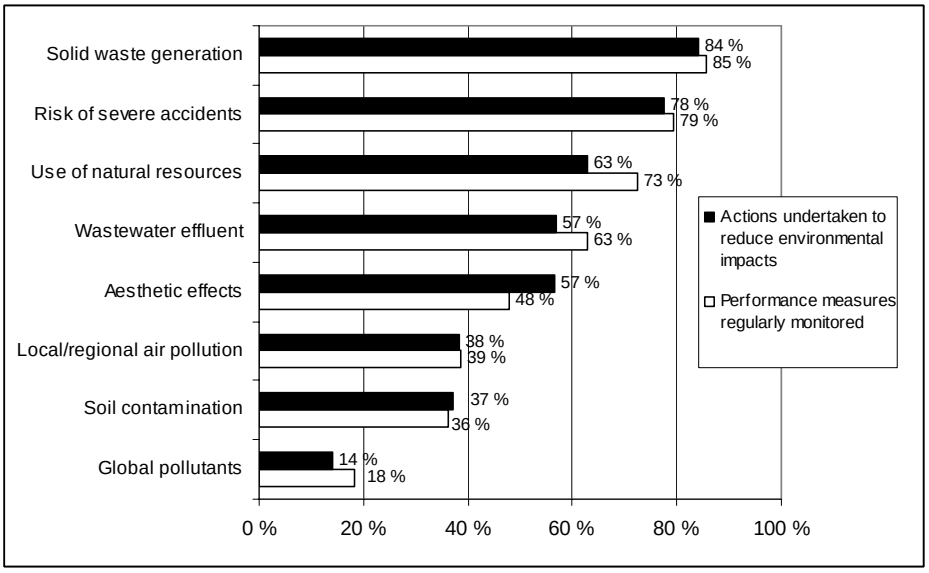
[15] In 1992, a regulation relating to internal control in pursuance with the Pollution Act, took effect. This regulation applied to all private and public enterprises and covered both the internal and external environment, i.e. safety, environment and health at work.

[16] For example did 80% of the respondents undertake actions to reduce solid waste, 70% reducing discharges of effluents to water, and just 50% reducing use of water and substitute hazardous inputs.

First we compare the results on

- Environmental performance measures monitored
- Environmental actions undertaken to reduce environmental impacts

Figure 4.7: Actions undertaken to reduce environmental impacts and performance measures regularly monitored



There is certainly a positive correlation between performance measures monitored and undertaken environmental actions, cf. Figure 4.7.[17]

Some more results on undertaken environmental actions, are found in Annex I:

- In Table C, we report results on actions to reduce environmental impacts by selected sectors. As we may expect, the "polluting" sectors (Paper, chemicals and basic metals) have undertaken more actions than the sample average.
- In Figure D, we have shown results on undertaken actions by company size: For example report 25% of the smallest firms that they have taken actions to reduce local or regional air pollution versus 60% of the largest companies. On actions to reduce solid

[17] Surprisingly, just 46 of 306 (i.e. 15%) confirmed to have undertaken actions to reduce impacts of global pollutants (greenhouse gases) while 110 out of 305 (i.e. 36%) confirmed they had undertaken action to reduce local or regional air pollution.

waste generation and risk of severe accidents, we observe just minor differences regarding facility size.

- In Figure E, we report how the respondents perceive changes in environmental impacts per unit of output:
    - A significant decrease in environmental impacts per unit of output are perceived in most areas, but especially concerning use of natural resources, solid waste generation and risk of severe accidents. These are also "the three on top" reported actions undertaken, cf. Figure 4.7.

4.3 A certified EMS may matter

The presence of an EMS[18] may be associated with improved environmental performance. Therefore an issue of general interest would be to explore if the presence of a **certified** EMS is significantly associated with firms' propensities to undertake actions to reduce their environmental impacts. The relationship is summarised in Table 4.1.

Table 4.1: Relationship between certified EMS and undertaken technical environmental actions

	Certified EMS		
Actions	**No**	**Yes**	**P-value**
use of natural resources	53,9 %	85,9 %	0,000
solid waste generation	78,3 %	98,6 %	0,000
wastewater effluent	51,7 %	70,4 %	0,005
local/regional air pollution	33,5 %	50,7 %	0,009
global pollutants	10,0 %	23,9 %	0,005
aesthetic effects	52,2 %	67,6 %	0,018
soil contamination	28,9 %	57,7 %	0,000
risk of severe accidents*	75,1 %	83,8 %	0,097
***) Not statistically significant**			

The overall results support our hypothesis: "A certified EMS may matter".

- In Table 4.1 we observe that certified EMS firms (n=68) undertake more activities to reduce damages caused to environment than non-certified firms (n=177). All actions were statistically significant

[18] An EMS is built on the concept of total quality management (TQM), i.e. it requires managers to continuously improve their environmental performance (plan-do-check-act cycle)

based on results of a chi-square test, except actions to reduce risk of severe accidents.

To explore whether EMS make a difference in firms' environmental performance or improvements are caused by other factors, we group the firms using the following selection criteria.

- Firms with a **certified** environmental management system (ISO 14001, EMAS) form one group.
- Management commitment refers to the priority given by the board of directors or top management to environmental improvement. Firms with a separate environmental department are used as a proxy variable for management commitment in the following paragraphs.

By differentiating firms based on two factors affecting environmental performance, we can put the firms into one of four groups, cf. Table 4.2 (Coglianese and Nash, 2001):

Table 4.2: Environmental department and certified EMS facilities

		Env. department		
		Yes	No	**Total**
Certified EMS	Yes	[1)] 40	[2)] 28	**68**
	No	[3)] 69	[4)] 108	**177**
	Total	**109**	**136**	**245**

[1)] "Leaders" (Having both a certified EMS and Env deptartment)

[2)] "Only EMS" firms (Having a certified EMS but no Env department)

[3)] "Only Env. department" firms (Having an Env department but no certified EMS)

[4)] "Laggards" (Neither having a certified EMS nor Env department.)

Based on the differentiation of the firms in Table 4.2, we are able to explore the relationship between "leaders"[19], "laggards" and undertaken environmental actions.

[19] Some characteristics of the "Leaders" (i.e. having both a certified EMS and an environmental department): They are larger and more global than the average facility. As many as 25% (10 out of 40) are in Basic metal. Transport equipment facilities are also "over-represented" (7 out of 40 facilities).

Table 4.3: Relationship between "Leaders", "Laggards" and undertaken actions

Actions	"Leaders"	"Laggards"	P-value
use of natural resources	90,0 %	54,6 %	0,000
solid waste generation	97,5 %	76,9 %	0,001
wastewater effluent	77,5 %	48,1 %	0,001
local/regional air pollution	60,0 %	30,8 %	0,001
global pollutants	32,5 %	5,6 %	0,000
aesthetic effects	77,5 %	48,1 %	0,001
soil contamination	65,0 %	24,1 %	0,000
risk of severe accidents	92,1 %	70,8 %	0,005

Table 4.3 supports our previous findings: The presence of a certified EMS (and environmental department) is associated with improved environmental performance. In all cases, "leaders" are more likely to undertake more environmental actions than the "laggards". The results based on a chi-square test confirm that the results are statistically significant.

4.4 Some additional characteristics by EMS firms[20]:

- Global firms have a stronger probability of having implemented an EMS than other firms.
- Firms listed on the stock exchange have a stronger probability of having implemented an EMS than other firms.
- Firms with head office in a foreign country have more often implemented an EMS than other firms.

[20] Results from analysis of the Norwegian data undertaken by Mrs. Celine Thévenot, OECD.

Chapter 4: Environmental management and performance: A summary

Environmental Management

Share of facilities having:

- At least one person responsible for environmental concerns: 85%
- A written environmental policy: 77%
- A public environmental report: 54%
- Environmental training programmes: 45%
- External environmental auditing: 45%
- An environmental management system (EMS) in place: 39%
- A certified EMS in place 28%

- We observe a positive development over time concerning environmental practices

Environmental performance

- Sectors like Pulp and paper, Chemicals and Basic metal are more active than other sectors in implementing environmental activities, i.e. environmental management practices and undertaken (technical) actions to reduce environmental impacts.
- We observe a positive relationship between firm size and the likelihood of having an EMS in place.
- A certified EMS may matter:
    - Certified EMS firms undertake more actions to reduce damages caused by environment than non-certified firms.
    - A certified EMS may be a good predictor for firms' environmental progress.

5. Influence of stakeholders and importance of motivations

5.1 Environmental stakeholders

Many aspects influence the management's view of the company's future possibilities on the market. One of them is the pressure from their stakeholders.

Public authorities, customers, employees and competitors are examples of stakeholders in an environmental context. Since enterprises are players in social systems, they have to take into account the demand made by their stakeholders to survive in the long term. Enterprises adapt to the demands from the stakeholders in different ways:

- Minimum solutions where enterprises, for instance observes statutory environmental requirements. This means that they pursue a "neutral" strategy.
- A "proactive" strategy where the enterprise implements activities beyond the statutory requirements. Examples of such activities would be the introduction of an environmental management system, a certified EMS, as well as environmental labelling of products. These are all examples on non-statutory environmental activities. However, cost reductions for example through the reduced use of energy and less waste, will make it profitable for enterprises to implement an environmental management system. Moreover, environmental labelling may in some cases give enterprises a competitive advantage by offering a brand product.

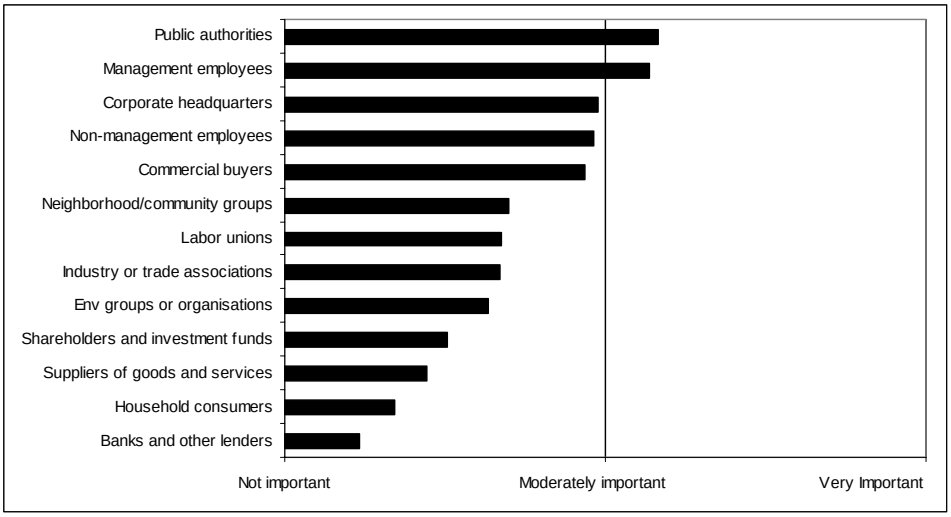
In the next paragraphs we are assessing the role played by regulatory, commercial and other stakeholders in firms' incentives to undertake environmental initiatives. Firms were requested to rank the influence of various stakeholders on environmental behaviour. The stakeholders can be classified as follows (Johnstone et al, 2002):

- Public authorities (environmental enforcement agencies, national or European legislators)
- Internal stakeholders (manager, parent firm, employees)
- External community stakeholders (NGO's, scientific institutes, local communities, etc.)
- Supply chain (consumers, retail companies, etc.)

- Financial companies (accountants, banks, insurance companies, etc.)

The results of ranking the relative influence of the various stakeholders is summarised in Figure 5.1.

Figure 5.1 - The most important stakeholders



The respondents considered the following interest groups as the most important: Public authorities, management employees, corporate headquarters, non-management employees and commercial buyers. Players from whom the firm felt little pressure include among others: NGO's, shareholders and investment funds, suppliers of goods and services, household consumers and banks. These results are supporting our findings from the 1998 and 2001-surveys, cf. Table 5.1:

Table 5.1: The most important stakeholders in 1998 and 2001

Ranking		Results	
		1998	**2001**
"Top" five	1	Management	Management
	2	Environmental Enforcement Agencies	Employees
	3	Owners	Environmental Enforcement Agencies
	4	Employees	Owners
	5	Buyers	Buyers (firms)
'"Bottom" five	5	Consumer organisations	Consumer organisations
	4	Competitors	Scientific institutes
	3	Suppliers	Retail companies
	2	Retail companies	Accountants
	1	Banks	Banks

Source: Ytterhus, 2002.

A ranking of the most important stakeholders by sectors, is shown in Table 5.2:

Table 5.2: Ranking of stakeholders' importance by sector

NACE	15+16	20	21	24	27	28	29	34+35
Rank	**Food and tobacco products**	**Wood and products of wood**	**Paper and paper products**	**Chemicals and chemical products**	**Basic Metals**	**Fabricated metal products**	**Machinery and equipment**	**Transport equipment**
1st	Public authorities	Public authorities	Commercial buyers	Public authorities	Management employees	Management employees	Management employees	Management employees
2nd	Management employees	Management employees	Management employees	Management employees	Public authorities	Public authorities	Public authorities	Public authorities
3rd	Commercial buyers	Non-management mployees	Industry or trade associations	Neighborhood/ community groups	Non-management employees	Non-management employees	Non-management employees	Non-management employees
4th	Non-management mployees	Labor unions	Public authorities	Non-management employees	Labor unions	Labor unions	Commercial buyers	Commercial buyers
5th	Corporate headquarters	Corporate headquarters	Neighborhood/ community groups	Corporate headquarters	Commercial buyers	Commercial buyers	Corporate headquarters	Corporate headquarters
6th	Industry or trade associations	Neighborhood/ community groups	Corporate headquarters	Industry or trade associations	Env groups or organisations	Corporate headquarters	Shareholders and inv funds	Neighborhood/ community groups
7th	Neighborhood/ community groups	Commercial buyers	Non-management mployees	Commercial buyers	Corporate headquarters	Industry or trade associations	Env groups or organisations	Labor unions
8th	Env groups or organisations	Industry or trade associations	Env groups or organisations	Labor unions	Neighborhood/ community groups	Env groups or organisations	Neighborhood/ community groups	Shareholders and inv funds
9th	Labor unions	Env groups or organisations	Shareholders and inv funds	Env groups or organisations	Shareholders and inv funds	Neighborhood/ community groups	Labor unions	Industry or trade associations
10th	Suppliers of goods and services	Shareholders and inv funds	Suppliers of goods and services	Household consumers	Industry or trade associations	Shareholders and inv funds	Suppliers of goods and services	Env groups or organisations
11th	Household consumers	Suppliers of goods and services	Labor unions	Suppliers of goods and services	Banks and other lenders	Suppliers of goods and services	Industry or trade associations	Suppliers of goods and services
12th	Shareholders and inv funds	Banks and other lenders	Household consumers	Shareholders and inv funds	Household consumers	Banks and other lenders	Household consumers	Banks and other lenders
13th	Banks and other lenders	Household consumers	Banks and other lenders	Banks and other lenders	Suppliers of goods and services	Household consumers	Banks and other lenders	Household consumers

The sectoral results are supporting the general picture in Figure 5.1: Public authorities and/or management employees are ranked in 1st and/or 2nd place in all sectors. But paper producers are ranking Commercial buyers in first place[21]. Chemical producers are ranking Neighbourhood/community groups as the third most important stakeholder.

[21] Some commercial buyers such as German publishing companies have since the mid- nineties put pressure on their suppliers to deliver paper from well-managed forests. An example often mentioned in Norway was the Axel Springer Verlag claiming the Norske Skog to process timber from sustainable forests. This development has created international labelling schemes for forest products like FSC

On the opposite end of the ranking, i.e. stakeholders that the respondents perceive as "not important" in an environmental setting, we find banks and other lenders, suppliers of goods and household consumers. Pressure from household consumers and the financial sector is perceived as very weak in Norway. These results are similar to our previous findings (Ytterhus, 2002).

5.1.1 Environmental obstacles

What obstacles may have made difficult the implementation of environmental activities? Among others, this question is relevant for environmental authorities when deciding how to stimulate environmental adaptation in business and industry. We had no specific question about "obstacles" in the OECD-survey, but some previous results may be of interest to the readers. These findings support the results of why "household consumers" had a very low ranking as an environmental stakeholder.

In the BEB-survey in 2001 the following question was asked: "To what extent may the following obstacles have made difficult the implementation of environmental activities in your enterprise?" A similar question formed part of the BEB-survey from 1998. Thus, we are able to compare the opinions of the business leaders as to what the biggest obstacles were in 1998 and 2001 cf. Table 5.3:

Table 5.3: The biggest obstacles to the implementation of environmental activities

Ranking	Largest obstacles	
	1998	2001
1	- Lack of skilled human resources	- Too costly
2	- Too costly	- No competitive advantage
3	- No market demand for "green" products	- No market demand for "green" products
4	- No competitive advantage	- No legal requirements
5	- No technical solutions available	- Lack of skilled human resources

Source: Ytterhus, 2002.

Some conclusions to be drawn:

- In 2001 "too costly" is classified as the most important obstacle. Both in the Norwegian survey, and even more clearly in the European study from 1998, financial circumstances were focused on as an important obstacle. (Kestemont and Ytterhus, 2001)

(Forest Stewardship Council) and PEFC (Pan European Forest Certification). By the end of 2000, 70% of the timber traded in Norway was subject to forest management certified by PEFC.

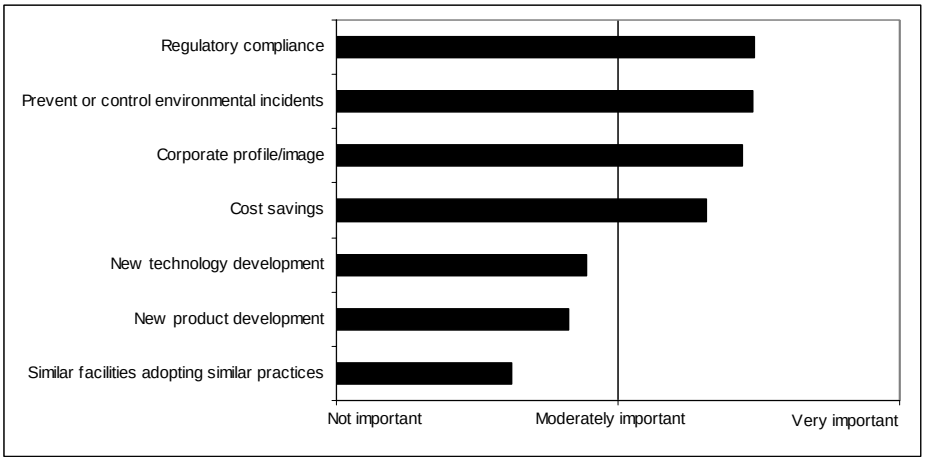
- Both in 2001 and 1998 “No market demand for “green” products” was perceived as an important obstacle. This is consistent with the perceived low pressure from household consumers by the respondents.

5.2 Importance of motivations

Traditionally, the prevailing view on the relationship between environmental activities and the goals of the enterprise has been that environmental activities increase costs and thus reduces the profitability of the enterprise. During the 90s, however, concepts like eco-efficiency were introduced. Eco-efficiency could be defined as “to produce more by using less” (WBCSD, 1997). In real terms this means that it is possible to add more value without a corresponding increase in the effects on the environment. If an enterprise can reduce the use of energy or other input factors, this will be beneficial to the environment and the enterprise may save money. Environmental activities may also result in a more positive profile for the enterprise. In total, *cost reductions and an improved image* in the markets due to environmental activities may lead to win/win situations that both the enterprise and the environment will benefit from.

In the questionnaire, two questions on motivation were asked. First, we present results on the most important motivations to the environmental practices in Figure 5.2:

Figure 5.2: The most important motives with respect to the environmental practices

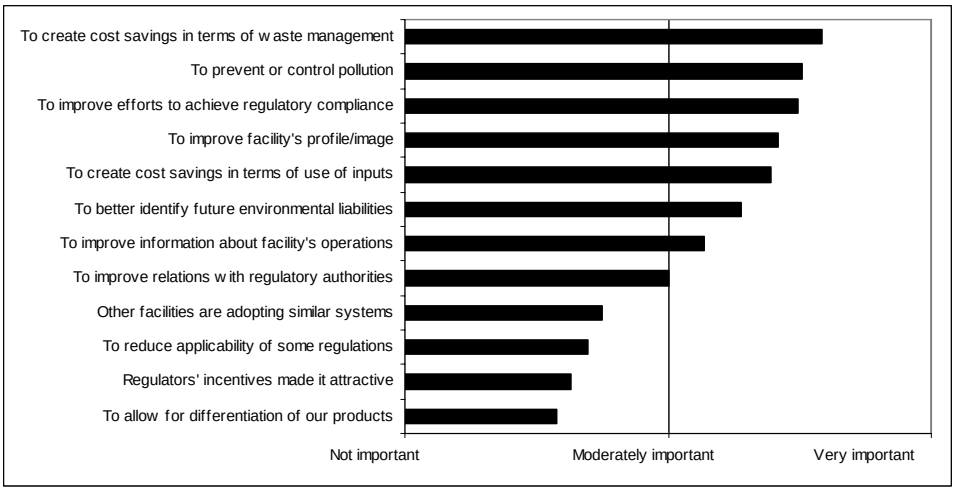


Four factors were ranked as moderately important/very important: Regulatory compliance, prevent or control environmental incidents, corporate profile/image and cost savings. Innovation factors like new product/new technology development clearly got a lower ranking. The most important factors are all, directly or indirectly, influenced by the "bottom" line:

- Environmental incidents and non-regulatory compliance may result in reduced corporate image and a loss of revenue.
- "Soft" factors like corporate profile/ image have been listed as an important motivation for implementing environmental activities in our previous surveys (Ytterhus, 2002).
- Cost savings by reducing the use of energy or inputs are reported in several case studies (www.wbcsd.org).

The results from Figure 5.2 are supported by another question in our survey on motivation to introduce an EMS, cf. Figure 5.3:

Figure 5.3: Most important motivation factors for introducing an EMS



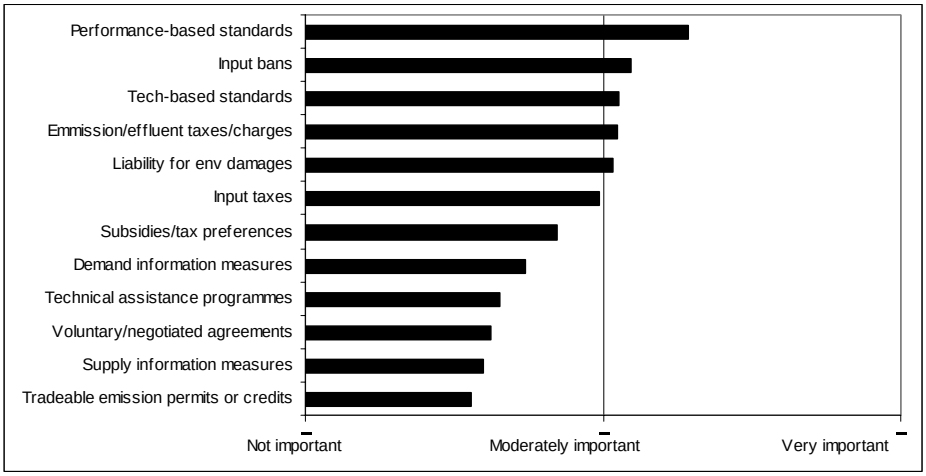
Again, factors like cost savings, prevent pollution, regulatory compliance and companye profile/image were ranked as important motives in introducing an EMS. Regulator's incentives to make it attractive, got a very low ranking by the respondents.

6. The role of public environmental policy

As stated in chapter 3, various types of direct regulation are still dominant in Norwegian environmental policy. But a gradual increase in economic instruments, such as taxes and charges during the 1990s and decisions on a domestic GHG-emissions trading scheme from 2005 to meet the Kyoto Protocol commitments, make economic instruments more important. Some agreements between authorities and business have been negotiated, but voluntary agreements have not played an important role in Norway, except in waste management.

In the survey we asked the respondents to assess different environmental policy instruments in terms of their impact on their production activities. The main results are found in Figure 6.1:

Figure 6.1: The role of public environmental policy



The respondents assessed direct regulations, and especially performance-based standards (i.e. emission permits) between very and moderately important. Taxes and charges got a score as moderately important. Demand information measures and voluntary/negotiated agreements got a lower rank. Tradable emission permits was perceived as not important/not applicable by 75% of the respondents.

A ranking of the most important instruments in terms of their impact on the production activities by sectors, are presented in Table 6.1:

Table 6.1: The role of public environmental policy - Ranking of instruments by sector

NACE	15+16	20	21	24	27	28	29	34+35
Rank	**Food and tobacco products**	**Wood and products of wood**	**Paper and paper products**	**Chemicals and chemical products**	**Basic Metals**	**Fabricated metal products**	**Machinery and equipment**	**Transport equipment**
1st	Emmission, effluent taxes or charges	Input taxes	Input taxes	Input bans	Performance-based standards	Emmission, effluent taxes or charges	Input bans	Liability for env damages
2nd	Tech-based standards	Input bans	Tech-based standards	Tech-based standards	Liability for env damages	Tech-based standards	Emmission, effluent taxes or charges	Input bans
3rd	Liability for env damages	Tech-based standards	Emmission, effluent taxes or charges	Performance-based standards	Input taxes	Input bans	Tech-based standards	Subsidies/ tax preferences
4th	Input taxes	Emmission, effluent taxes or charges	Subsidies/ tax preferences	Emmission, effluent taxes or charges	Emmission, effluent taxes or charges	Input taxes	Liability for env damages	Tech-based standards
5th	Performance-based standards	Liability for env damages	Input bans	Input taxes	Tech-based standards	Liability for env damages	Input taxes	Input taxes
6th	Demand information measures	Demand information measures	Liability for env damages	Liability for env damages	Demand information measures	Demand information measures	Subsidies/ tax preferences	Emmission, effluent taxes or charges
7th	Input bans	Performance-based standards	Voluntary/ negotiated agreements	Subsidies/ tax preferences	Supply information measures	Supply information measures	Technical assistance programmes	Performance-based standards
8th	Subsidies/ tax preferences	Technical assistance programmes	Tradeable emission permits or credits	Voluntary/ negotiated agreements	Voluntary/ negotiated agreements	Subsidies/ tax preferences	Voluntary/ negotiated agreements	Demand information measures
9th	Technical assistance programmes	Voluntary/ negotiated agreements	Demand information measures	Demand information measures	Subsidies/ tax preferences	Voluntary/ negotiated agreements	Performance-based standards	Technical assistance programmes
10th	Voluntary/ negotiated agreements	Subsidies/ tax preferences	Performance-based standards	Technical assistance programmes	Input bans	Technical assistance programmes	Tradeable emission permits or credits	Supply information measures
11th	Supply information measures	Supply information measures	Technical assistance programmes	Tradeable emission permits or credits	Tradeable emission permits or credits	Performance-based standards	Demand information measures	Voluntary/ negotiated agreements
12th	Tradeable emission permits or credits	Tradeable emission permits or credits	Supply information measures	Supply information measures	Technical assistance programmes	Tradeable emission permits or credits	Supply information measures	Tradeable emission permits or credits

The picture in Table 6.1 is more mixed than the overall results in Figure 6.1: Performance-based standards got one of the highest scores in "polluting" industries like Basic metals and Chemicals. In four industries, (i.e. Food, Wood, Pulp & paper and Fabricated metal) economic instruments were ranked as the most important. Voluntary agreements and tradable emission permits got a very low ranking in most industries as instruments in terms of their impacts on production activities.

The results in Table 6.1 are more or less as we would expect:

- Direct regulations are still dominant in many sectors, especially performance-based standards like emission permits.
- Economic instruments like taxes and charges were launched during the 1990s, but some exporting industries (aluminium, fertilizer and chemical firms) are exempted from CO_2-taxation.
- Voluntary agreements have not played an important role in the Norwegian environmental policy, cf. the low ranking in Table 6.1.

The relationship between the most important policy instruments and undertaken actions to reduce environmental impacts, are shown in the Annex, Table F:
The respondents who perceive performance-based standards as most important, have undertaken most actions in areas like solid waste generation, wastewater effluent, local/regional air pollution and aesthetic effects. Among the few respondents perceiving voluntary agreements as very important, these had relatively undertaken most action to reduce global pollutants and soil contamination.

Further, the respondents were asked to describe the environmental policy regime to which their facility was subjective. Results are shown in Figure 6.2 and 6.3:

Figure 6.2: Description of environmental policy regime

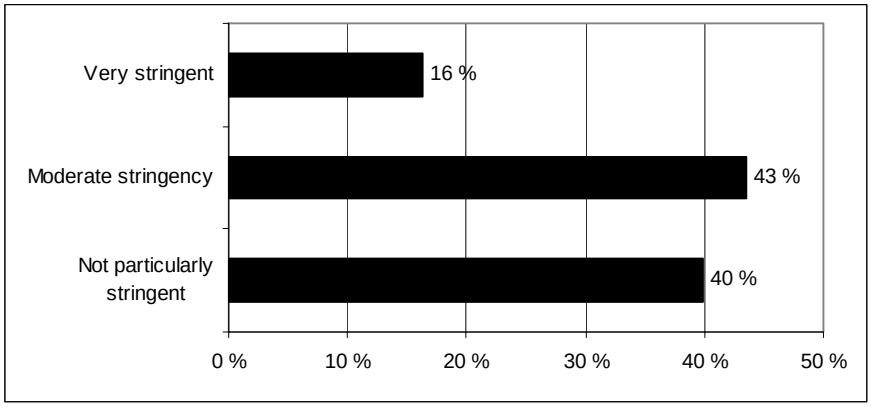
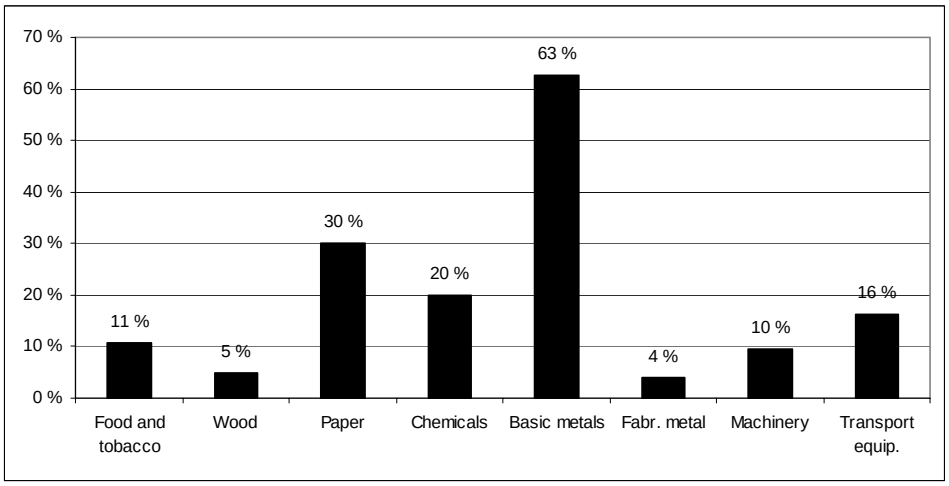


Figure 6.3: Percentage of facilities describing they had a very stringent environmental policy regime by sectors

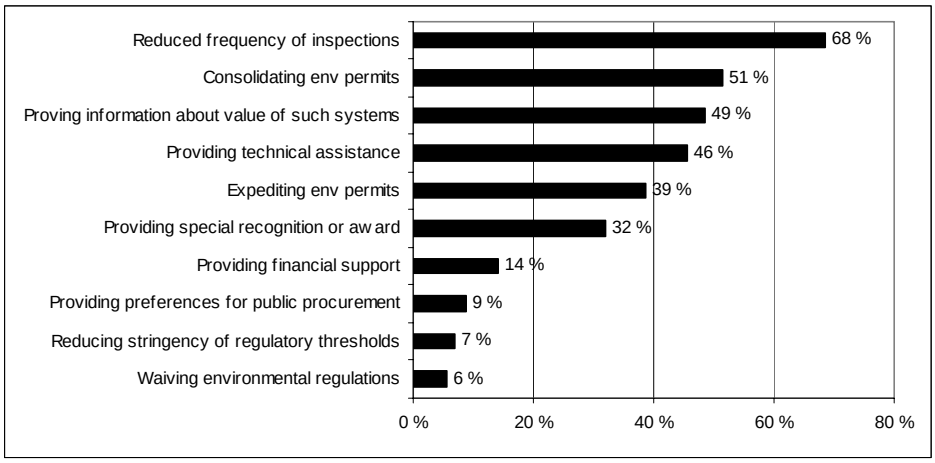


Most respondents describe the environmental system they are facing as moderately stringent (43%) or not particularly stringent (40%). Only 16% of the respondents characterized the policy as "very stringent". Most of these respondents belonged to industries such as Basic metal and Pulp and paper.

The numbers in Figure 6.3 means: 63% of the firms responding in Basic metal perceive the policy as "Very stringent", while just 4% of the responding firms in Fabricated metals, had the same opinion.

In chapter 4 we concluded by saying: A certified EMS might be a good predictor for a firm's environmental progress. Therefore some programmes and policies have been put in place to encourage firms to implement an environmental management system (EMS). In Figure 6.4, the most frequent incentives mentioned by the respondents are shown:

Figure 6.4: The most frequently used environmental policies and programs to encourage an EMS

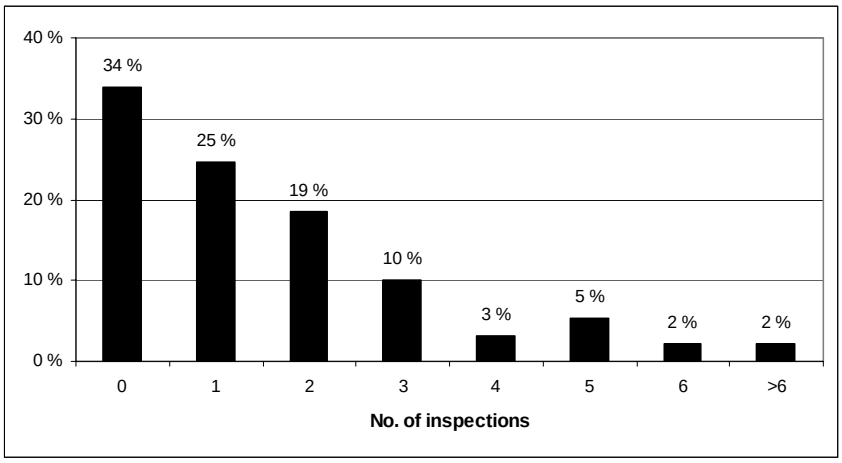


Reduced frequency of regulatory inspections[22] were mentioned by 68% of the firms responding and consolidating environmental permits was perceived as a motivation for implementing EMS by 50%.

Frequency of inspections during the last three years reported by the respondents, are found in Figure 6.5:

[22] According to a newsletter from State Pollution Control Authority (SFT) from January 2003, SFT reduces inspection frequencies in firms with a certified EMS (EMAS or ISO 14001). Firms have to pay a charge for such inspections and fewer inspections will therefore reduce costs for the firms.

Figure 6.5: Frequency of inspections



Chapter 6: A summary

- The assessment of different environmental policy instruments in terms of their impact on their production activities, are in accordance with the description of the environmental policy in chapter 3:
  - Direct regulations and especially performance-based standards (i.e. emission permits) were assessed between very and moderately important.
  - Economic instruments like taxes and charges got a score as moderately important.
  - Voluntary agreements were assessed between moderately important and not important.
  - Tradable emission permits were perceived as not important/ not applicable by 75% of the respondents.
- 16% of the respondents characterized the environmental policy as "Very stringent". Most of these represented facilities in Basic metal and Pulp and paper.
- The most frequently used environmental policy and programme to encourage use of an EMS, was reduced frequency of inspections.

7. Environmental practice and commercial performance

The link between corporate environmental performance and financial performance has received significant attention over the last, in the business community as well as in economic research. A large number of papers present arguments supporting the view that improved environmental performance is profitable[23], challenging the more "traditional" view that corporate environmental protection primarily increases the costs of the firm. A general argument forwarded by most economists is: "There are no $100 bills lying on the pavement". If it pays to take environmental concerns, why do not all companies operate within a higher environmental standard? This argument indicates that the profitability is unaffected or actually reduced by taking environmental concerns. However, taking information imperfections and time consuming adjustments to changed incentive structures (due to changed stakeholder preferences, new regulations etc) into consideration, this argument might be too simple. By investing in improved technologies or improved business practice, a company may signal a good environmental profile to customers and other stakeholders, as well as increasing its chances of qualifying for inclusion in screened funds. It may take some time before incentives for improved environmental practice materialize in improved economic performance.

A number of empirical studies on the relation between environmental and financial performance subject have also been conducted in recent years[24]. Perhaps not surprisingly the studies give no clear picture of the sign and strength of the correlation between the two (groups of) variables. Differences in data sets, e.g. data from different countries, sectors or time span, in addition to differences in the choice of indicators and methods, are all factors affecting the outcome of the analysis. The empirical literature indicates that there is a considerable uncertainty about the relation between environmental performance and economic performance; and the relation to good management in general. The empirical studies in this field investigate firms with a wide range of environmental profiles, reflecting different priorities with respect to the implementation of environmental management systems, investments etc.

[23] See e.g. Schmidtheiny and Zorraquin (1996), Porter and van der Linde (1995a, 1995b).
[24] See e.g. Hart and Ahuja (1996), Klassen and McLaughlin (1996), Hamilton (1995).

Some results are presented in the following figures and tables. But the reader has to keep in mind that this survey was not designed to focus directly on the links between commercial and environmental performance.

7.1 Commercial performance

In Figures 7.1 and 7.2, we report on two commercial performance indicators for the facility, by changes in the value of shipments and profitability over the last three years:

- 41% report on stagnation, while 36% confirm an increase in the value of shipments.
- Nearly 50% report on a small profitability, and nearly 18% confirm that revenue has been well in excess of costs. We define these facilities as "profitable", in the following sections.

Figure 7.1: Changes in the value of shipments during the past three years

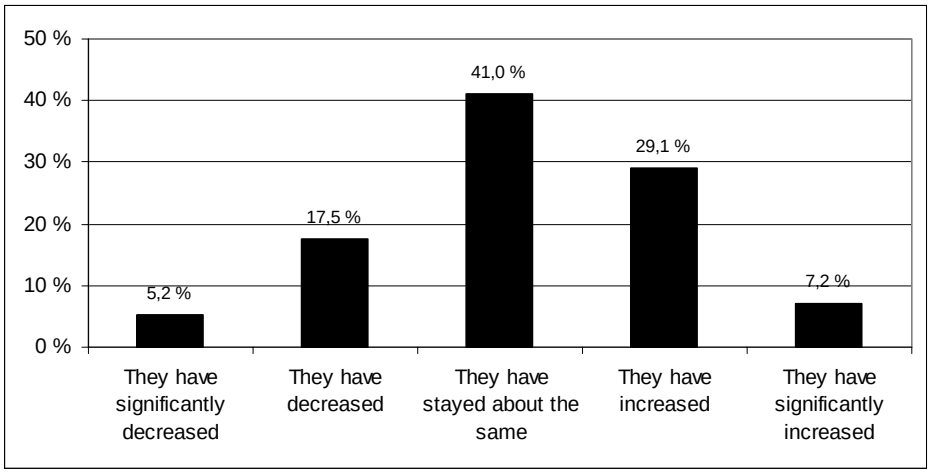
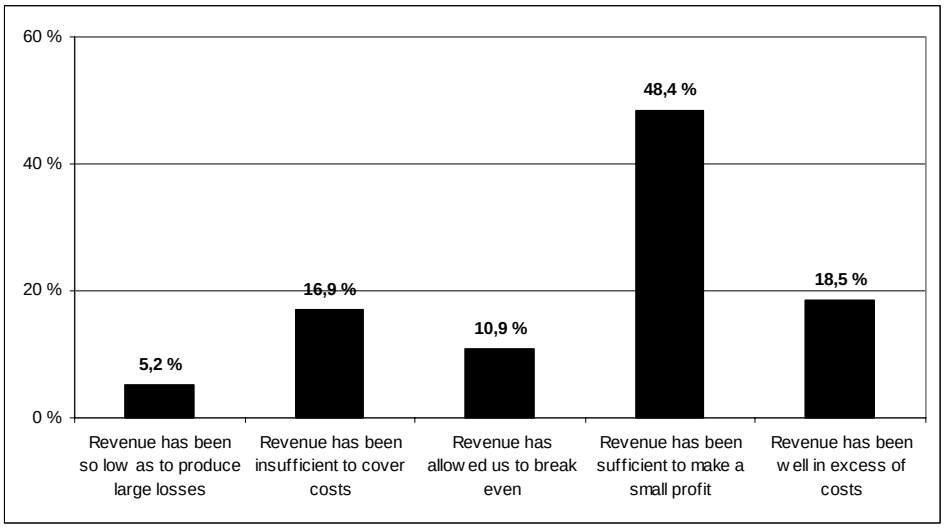


Figure 7.2: Assessment of facility's overall business performance over the past three years



7.2 Relationship between commercial performance and environmental practice

Tables 7.1 and 7.2 report on management practices and undertaken actions to reduce environmental impacts in the most "profitable" facilities (i.e. facilities where revenue was well in excess of costs) and the average facility (cf. Figures 4.2 and 4.7 in Chapter 4).

Table 7.1: Management practices in "profitable" facilities vs. average figures

Practice Implemented:	Profitable facilities n=43	Other facilities n=192	p-value
Written env policy	85,7 %	79,3 %	0,234
Env criteria used to evaluate/compensate employees	18,6 %	10,6 %	0,120
Env training programme for employees	48,9 %	43,5 %	0,310
External env audits	40,9 %	45,5 %	0,350
Internal env audits	80,0 %	81,0 %	0,510
Benchmark env performance	31,0 %	22,6 %	0,173
Env accounting	34,1 %	30,4 %	0,381
Public env report	62,8 %	52,6 %	0,146
Env performance indicators/goals	50,0 %	50,8 %	0,522

Table 7.2: Environmental actions undertaken in "profitable" facilities vs. average figures

Action undertaken:	Profitable facilities n=46	Other facilities n=250	p-value
Reduce use of natural resources	69,6 %	61,5 %	0,196
Reduce solid waste generation	89,1 %	82,9 %	0,211
Reduce wastewater effluent	60,9 %	56,1 %	0,337
Reduce local/regional air pollution	41,3 %	37,7 %	0,387
Reduce global pollutants	13,0 %	14,1 %	0,531
Reduce aesthetic effects	58,7 %	56,1 %	0,440
Reduce soil contamination	34,8 %	37,6 %	0,431
Reduce risk of severe accidents	78,3 %	77,4 %	0,536

As shown in the two tables above, there was no statistically significant difference between the "profitable" facilities and the other firms on management practices and environmental action undertaken.

The conclusion drawn from Table 7.1 & 7.2 may therefore be:

- Profit is not a main driver in implementing environmental practices and undertaking environmental actions.

7. 3 Environmental and commercial performance

In Chapter 4, Table 4.2, we grouped the facilities into

- "Leaders" (Having both a certified EMS and an environmental department)
- "Laggards"[25] (Having neither a certified EMS nor an environmental department)

Figures 7.3 and 7.4 present a comparison between "leaders" and the "laggards" versus commercial performance.

[25]The "laggards" are smaller in average than the other facilities (60% have 50-99 employees) and mainly representing sectors like Food, Wood and Fabricated metals.

Figure 7.3: "Leaders'" and "laggards'" changes in value of shipment the past three years

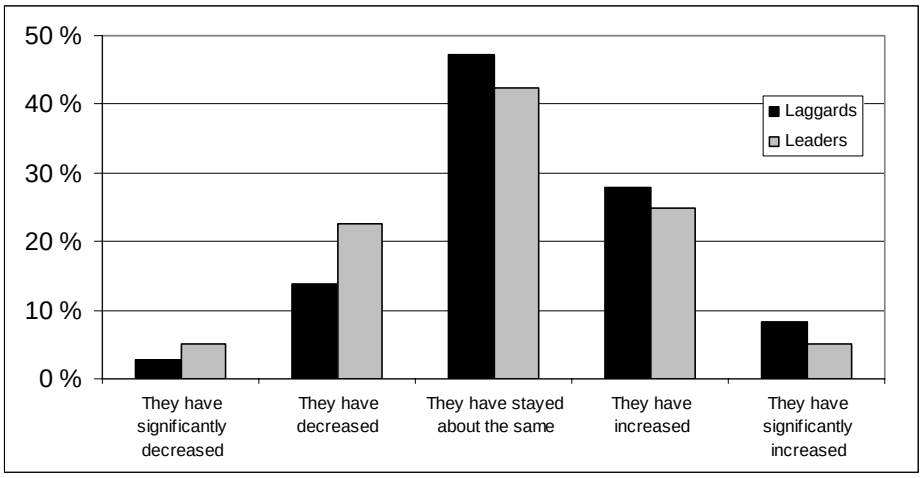
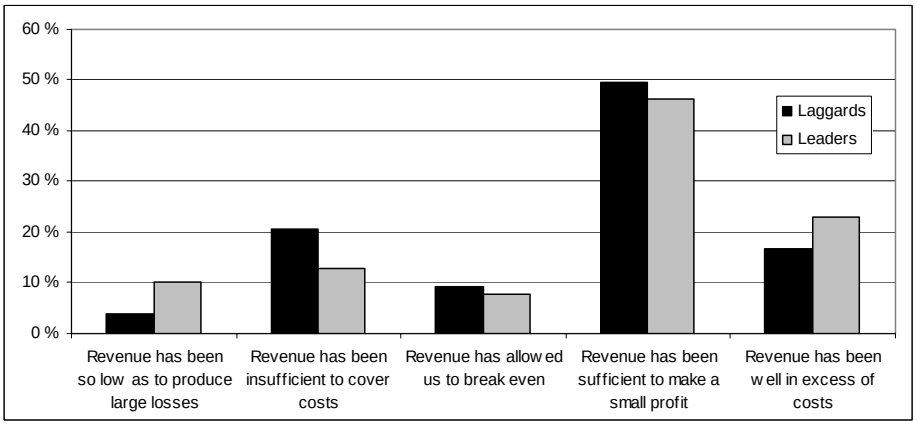


Figure 7.4: "Leaders'" and "laggards'" economic performance



The comparison between "leaders" and "laggards" indicates no significant differences in economic performance.[26] One reason might be the aggregation of firms into two categories. This aggregation does not catch specific sector

[26] In Ytterhus (2002), another definition of "leaders" and "laggards" was used. The firms were ranked according to management practice/ environmental actions undertaken by using specific environmental indicators. The "leaders" were defined as the best (e.g. the top 20) and the "laggards" as the firms that got the lowest ranks. This report supported the hypothesis: It may pay to be "Green".

development for domestic and international firms. For Norway this is important, since we have observed a counter-economic development in the mainland economy and the international markets.

Chapter 7: A summary

- Nearly 20% of the companies confirm that revenue had been well in excess of costs. But these "profitable" facilities did not undertake more environmental activities than other firms: Profit seems not to be a main driver in undertaking environmental actions.
- Firms having both a certified EMS and an environmental department ("leaders") compared to "laggards" (Having neither a certified EMS nor an environmental department) did not differ significantly due to economic performance. These results did not support the hypothesis: "It may pay to be Green".

8. References

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9. List of tables and figures

9.1 List of tables

9.2 List of figures

Chapter 7:

Annex I:

Annex I: Additional results

Table A: Principal figures for the main manufacturing industries (1999)

Nace-code	Manufacturing sector	Value added		No. of employees	
		Billion NOK	% of total	In 1000	% of total
15-37	**Total for all manufacturing sectors**	**139,3** [1)]	**100,0 %**	**291,5** [2)]	**100,0 %**
15-16	Food, beverages and tobacco	29,4	21,1 %	54,0	38,8 %
20	Wood and wood products	4,8	3,4 %	14,6	10,5 %
21	Pulp, paper and paper products	5,8	4,2 %	9,5	6,8 %
24	Chemicals and chemical products	10,6	7,6 %	13,9	10,0 %
27	Basic metals	9,7	7,0 %	13,9	10,0 %
28	Metal products	8,4	6,0 %	21,0	15,1 %
29	Machinery and equipment	10,9	7,8 %	23,7	17,0 %
34-35	Transport equipment	7,4	5,3 %	21,0	15,1 %
	Sum of the most important sectors	**87,0**	62,5 %	**171,6**	123,2 %

[1)] 12% of total GDP

[2)] 14% of total employment

Source: Manufacturing statistics, 1999. Statistics Norway.

Figure B: Representation of sectors in sample

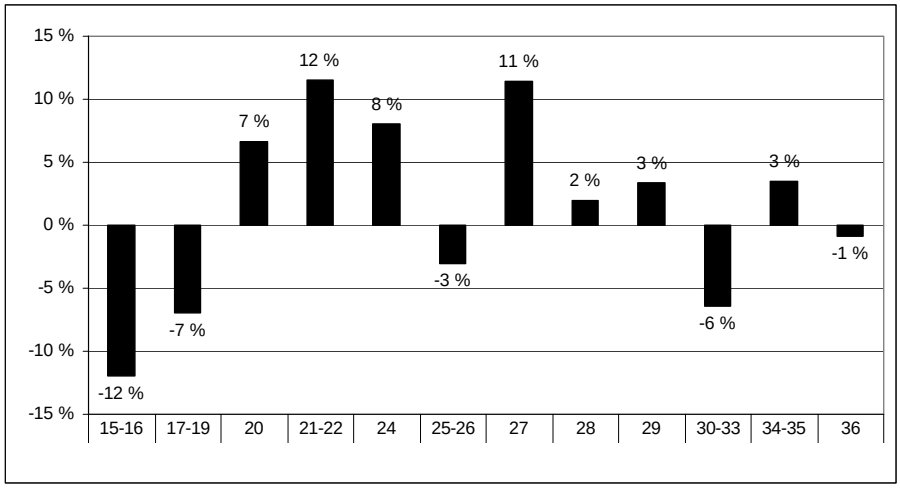

Table C: Actions to reduce environmental impacts - by sectors

NACE	Sector	use of natural resources	solid waste generation	wastewater effluent	local/ regional air pollution	global pollutants	aesthetic effects	soil contamination	risk of severe accidents
15+16	Food and tobacco products	78,8 %	84,8 %	69,7 %	33,3 %	9,1 %	57,6 %	15,2 %	65,6 %
20	Wood and products of wood	60,7 %	79,3 %	58,6 %	31,0 %	10,3 %	41,4 %	48,3 %	76,9 %
21	Paper and paper products	90,0 %	100,0 %	90,0 %	70,0 %	20,0 %	80,0 %	50,0 %	90,0 %
24	Chemicals and chemical products	66,7 %	83,3 %	88,9 %	61,1 %	27,8 %	66,7 %	61,1 %	87,5 %
27	Basic Metals	88,9 %	94,4 %	83,3 %	61,1 %	22,2 %	88,9 %	66,7 %	88,9 %
28	Fabricated metal products	31,4 %	71,4 %	31,4 %	37,1 %	8,6 %	51,4 %	25,7 %	68,6 %
29	Machinery and equipment	41,9 %	71,0 %	48,4 %	6,5 %	6,5 %	40,0 %	38,7 %	60,0 %
34+35	Transport equipment	56,8 %	84,1 %	52,3 %	45,5 %	18,2 %	65,9 %	56,8 %	90,5 %
15-37	**Total (all sectors)**	**60,7 %**	**83,3 %**	**56,9 %**	**36,1 %**	**15,0 %**	**55,1 %**	**39,9 %**	**76,8 %**

Figure D: Actions to reduce environmental impacts - by size

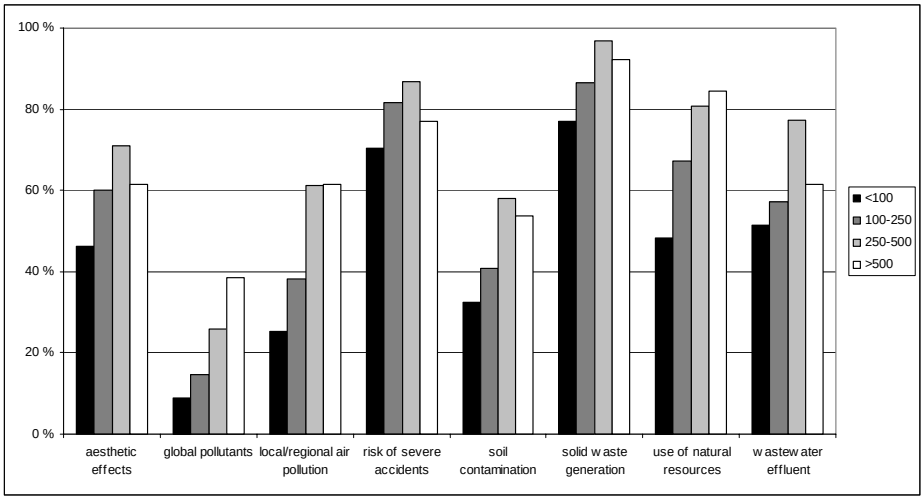

Figure E: Changes in environmental impacts per unit of output

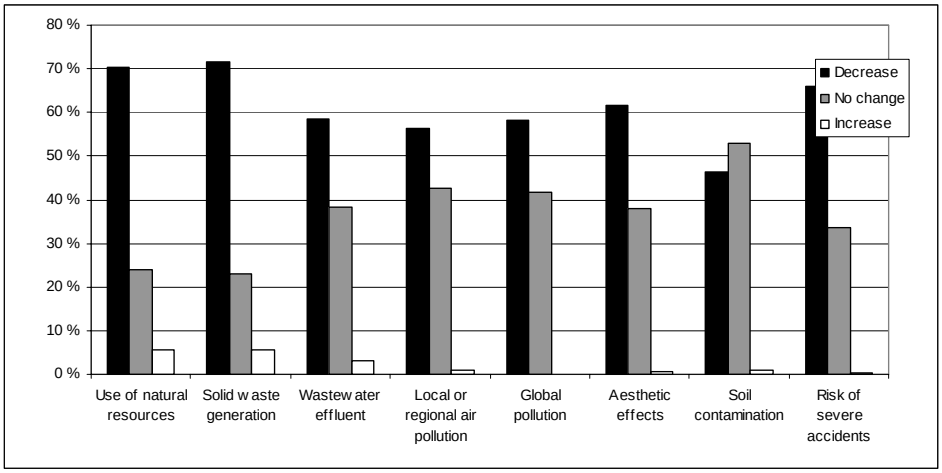

Table F: Relationship between the most important environmental policy instruments and actions to reduce environmental impact

			Undertaken environmental action							
		Freq.	use of natural resources	solid waste generation	wastewater effluent	local/regional air pollution	global pollutants	aesthetic effects	soil contamination	risk of severe accidents
Impact of env policy instruments on production (Very important):	input bans	84	66 %	87 %	68 %	39 %	23 %	52 %	45 %	78 %
	tech-based standards	63	67 %	92 %	68 %	41 %	21 %	64 %	46 %	83 %
	performance-based standards	54	74 %	96 %	82 %	54 %	26 %	74 %	52 %	93 %
	input taxes	22	76 %	97 %	61 %	36 %	19 %	53 %	40 %	84 %
	emmission/effluent taxes/charges	69	77 %	94 %	71 %	37 %	19 %	61 %	44 %	84 %
	tradeable emission permits or credits	26	81 %	89 %	81 %	50 %	19 %	62 %	58 %	96 %
	liability for env damages	67	71 %	93 %	70 %	40 %	25 %	63 %	51 %	83 %
	demand information measures	36	64 %	86 %	58 %	33 %	19 %	64 %	39 %	78 %
	supply information measures	18	61 %	72 %	44 %	17 %	22 %	39 %	39 %	72 %
	voluntary/negotiated agreements	20	75 %	80 %	55 %	40 %	50 %	68 %	65 %	70 %
	subsidies/tax preferences	50	72 %	86 %	66 %	35 %	20 %	50 %	46 %	80 %
	technical assistance programmes	16	63 %	94 %	56 %	25 %	31 %	38 %	44 %	73 %

Annex II: Participating research teams

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