

Training in environmental management -  
industry and sustainability

Part 3

The role and requirements of categories  
of middle management

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EUROPEAN FOUNDATION  
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### **Acknowledgements**

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## Foreword

Education and training has for some time been recognised as an important element in the improvement of environmental and resource management performance in all sectors of economic activity, and its significance was emphasised in the recommendations in the Community's Fifth Environmental Policy and Action Programme. This, together with the fact that a number of, mainly larger, companies, notably in manufacturing industry, had started to develop new and innovative corporate environmental strategies, led to a proposal at a European Round Table on "Industry, Social Dialogue and Sustainability" in late 1992, that the Foundation should include a project on Training in Environmental Management in its four-year programme 1993-1996.

The aims of the project were:

- to identify the environmental management training requirements in industry in the light of EU policies aimed at sustainable development and the new corporate responses and to indicate how these requirements can be met and the structures needed;
- to ensure a better and more effective response to the new challenge of industrial management relating to environmental protection and improvement and the associated health and safety issues, resource management and economic performance; and
- to contribute to a better implementation of EU environmental policies and to increase environmental awareness among the workforce in industry.

For practical and financial reasons the project was divided into three stages, each of them covering one of the three groups primarily involved in the implementation of the new corporate strategies, i.e.:

- top/executive management with responsibility for the development of industrial and business strategies;
- categories of lower management and workers; and
- categories of middle management.

The first part of the project was carried out in 1993-1994 and covered Denmark, Germany, France and the U.K.. It was based on existing literature, enquiries and case studies and looked into corporate environmental and resource management introduced in recent years in a number of European companies and the education and training provision which is and will be required in relation to managers concerned with developing integrated and environment-related industrial and business strategies. It analysed the new environmental management practices, the higher education and training of the relevant categories of future managers as well as the inadequacies of and mismatches between providers and users of higher management education. It also discussed some of the major obstacles to improvements of the present situation and potential solutions which might contribute to closing, at least, part of the gap identified between the higher management education and training provision and the needs of industry. Moreover, this part of the project provided the basis of the following stages in relation to corporate managerial practices and the definition of corporate sustainability.

The second part of the project, covering Denmark and Germany only, was undertaken in 1995 and combined existing knowledge and original research (an enquiry and case studies). It focused on the role and education and training requirements of categories of lower management and skilled and semi-skilled workers in the light of the new corporate environment-related strategies and highlighted, inter alia, some of the key issues raised by the new practices at the shop floor and the perceptions and response of the workforce. It also analysed the content and quality of the courses provided at vocational training establishments and elsewhere, the teaching approaches, the qualifications of the teachers/instructors involved and the problems they were facing, e.g. regarding the lack of adequate teaching materials, the lack of time and the insufficient access to retraining. Furthermore, it examined the possibility of developing a coordinated approach to environmental education and training of lower management and workers.

The present work contains the findings of the third part of the project and deals with the role and requirements of categories of middle management involved in the implementation of the new corporate responses to environmental challenges. It was carried out, in 1996-1997, in Denmark, Germany and Finland and was based primarily on enquiries and case studies. The operational aspects of environmental management and how they are experienced by middle managers are examined together with the contribution of middle managers to the new corporate strategies and the problems they face, notably in terms of skills. In addition, the development of various training initiatives relating to middle management and the barriers in this respect are highlighted, and detailed examples of training programmes are provided. Finally, the question of a EU-sponsored coordinated approach to environmental training of middle managers, at least in some areas, is discussed.



This report was discussed at a meeting on 26 November 1997 in Brussels to enable representatives of the employers, trade unions, governments and the European Commission - the constituent bodies of the Foundation's Administrative Board - to evaluate the findings of the research. The participants welcomed the report which, they felt, was a valuable contribution to the debate on environment-related education and training requirements in industry and an important step in the Foundation's work on this topic. They emphasised the pressure on many companies created by the pace of change and hence the need to make constant adjustments. This had affected the role of management at all levels, but perhaps that of middle managers, in particular. It also meant that skill adaptation and continuous training, not least on environmental and resource management issues, had become essential and that new measures, including, for instance, incentive schemes, and new approaches such as distance learning would have to be introduced on a large scale. Furthermore, it was necessary to ensure a more efficient use of existing education and training structures. There was, however, a major problem of environmental awareness and access to information and knowledge among many firms, notably SMEs, which, in addition, were likely to experience difficulties in coping with the extra burden of middle management training, not only because of the financial implications but also, and perhaps even more so, as a result of their limited personnel resources. These issues would have to be addressed effectively through the new measures and approaches. Finally, the participants agreed on the need for a EU-wide dimension or common curricula on professional environmental training.

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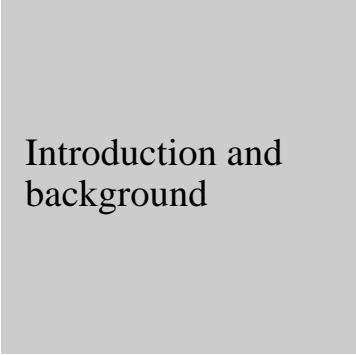


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## Acronyms

BS 7750	British Standard 7750 - The British Environmental Certification Standard
EU	European Union
EMAS	Environmental Management and Auditing Scheme - EU's Environmental Standard
EMS	Environmental Management Systems
ISO 14000	International Quality Certification Standard
LCA	Life Cycle Assessment
HRM	Human Resource Management
TEM	Training in Environmental Management

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## Introduction and background

### **Sustainability and the European context**

Environmental awareness is not of recent date, but it is only since the 1970s that the importance of environmental problems have become recognised on a global level. Landmarks in the process leading to our present level of awareness were the report of the "Club of Rome" *Limits to growth* (Meadows et al., 1972), and the report of the UN-sponsored World Commission on Environment and Development, *Our Common Future* (WCED, 1987).

The first of these landmarks identified the dynamics and complexity of human interaction with natural environments, and predicted that, at current levels of resource use, the "limit" of nature's carrying capacity could be reached in the near future. The second landmark report emphasised the conditions under which the problems foreseen in *Limits to Growth* might be avoided, stressing dimensions of equality between members of the current generations, and also between different generations.

There are many definitions of the concept of sustainability, some of them even predating the formulation of the WCED (1987). These were described at some length in the first report of this project (Ulhøi et al., 1996). The essential feature in a training and education context is that progress towards the goal of sustainability requires significant changes in the values and beliefs held by individuals, which also relates to the socioeconomic dimensions of sustainability. This study, however, only addresses the environmental dimension of sustainable development. Moreover, the attainment of sustainability depends on how individuals apply these values, both as consumers and as members of business organisations.

At the European level, environmental objectives are part of the Treaty on European Union (Art. 130R), and they were further elaborated in the extensive Fifth Environmental Policy and Action Programme, 1992 (Com, 1992a). These policy documents view environmental action by Member States and their business enterprises as actions which will improve competitiveness in different ways, even if these improvements come at a cost. The view that progress towards sustainability depends (among other things) on the ability of industry to improve environmental performance implies that the actions of individuals within organisations play a very important role.

The two features described above show the need for a more sustainable way of life, and the commitment to this at EU level forms the background for the present study. This report is the third in a series which presents the results of a research project on training in environmental management. The purpose is to analyse both actual practice and the needs of industry for environmental management skills, and the efforts of educational institutions in providing such skills. Previous reports have concentrated on corporate top environmental management (Ulhøi et al., 1996), and on certain categories of lower managers and skilled workers (Ulhøi et al., 1997). The present report concentrates on middle managers, primarily from technical functions.

In the following sections, the foundations, objectives and methods of the study of job functions versus the training and education of middle managers in relation to environmental issues are presented. Terms are defined and the methodology is briefly described.

### **Corporate environmental challenges**

The environmental challenges facing industrial companies in the European Union are numerous and increasing, both in number and importance. The traditional problems of polluting emissions from industrial sites remain important, and are often exacerbated by historical problems in the form of soil contamination and long-forgotten dumps of more or less toxic waste. Not to mention the environmental impact associated with the distribution, use and disposal of the products.

Many of these problems have long since attracted the attention of regulators, and a lot of companies are now paying for "sins of the past". For many conventional forms of production, the problem is similar: companies are forced to reduce impacts, though not always in the most socially efficient way. The challenge facing companies in this area is one of solving the pollution problems most efficiently within the given regulatory constraints. In many cases this challenge directly involves personnel who are responsible for the day-to-day running of the production processes (i.e. managers with an engineering or operations management background).

Whereas the traditional regulation of existing (and past) activities is often based on command and control, companies also face other environmental challenges. Among the most prominent of these are pressure from consumers (other industries as well as end-users) for "greener" products (sometimes transmitted through a chain of intermediate manufacturers), and increased costs due to the imposition of environmental costs at previous stages in the materials cycle.





The pressure from consumers is partly aimed at current products and production processes, but the important point is that consumers will expect new products to be increasingly green. Industrial consumers in particular are demanding that products match their own environmental standards. Internal environmental pressure from employees (i.e. bottom-up pressures) is aimed at process technologies and daily routines, representing both the perspective of the external environment and, in particular, the internal environment, i.e. health and safety. Because they live with a continuous process of increasing environmental awareness throughout society, employees cannot adopt different sets of environmental values at work and at home. In other words, irrespective of origin, environmental concern adopted from one sphere will affect the other. This is why providers of training and education also play an important role in general, as they provide highly-skilled employees but also influence the values and concerns of future employees. This is also a challenge that cannot be met just by adding technological solutions to existing products and processes. Instead it requires a much greater degree of attention to product design and product range in a way that minimises environmental impacts over the full life-cycle of the product and product portfolio.

These longer term design and product range challenges are important for environmental management training and education in other ways than the adaptation to externally prescribed environmental conditions. Initially, the challenges of product design and range must be met by the narrowly defined functional areas of environmental management and R&D, and thus also by the managers in these areas. In the longer term, however, the management focus can gradually be expected to shift from a design focus to an implementation focus.

Middle managers play a particularly important role in this implementation phase, as they are typically in the forefront of implementation. At this stage, they have to be able to adopt new products, processes and product portfolios, regardless of whether it involves dedicated environmental activities or new activities and routines which only indirectly serve corporate environmental objectives. Due to the crucial role of middle managers in this process, the implications for their training and educational backgrounds are of considerable interest.

### **Middle management education and sustainability efforts**

Middle managers in industry are widely involved in the practical implementation of all operational decisions made at higher levels. As a result, they play an important role in improving environmental performance, towards the ultimate goal of sustainability. This role combines both the prudent use of resources in existing production systems, and the development and introduction of new and more sustainable products, technologies and practices, including instruction, guidance and monitoring employees under them.

However, progress in realising the potential contribution of middle managers depends on their ability to incorporate environmental elements and considerations into their work. Two distinct approaches, which may be called specialisation and integration respectively, are identified in this study. Specialisation implies that special environmental managers are appointed at the middle management level, with the task of introducing and maintaining environmental improvements in

the firm or plant. The alternative is to adopt a more integrated approach, where all managers have the environment as a natural and integrated part of their responsibility.

Both approaches are relevant, and may also overlap within the individual organisations. The important point, however, is that they require different things from the educational system. In this sense, therefore, there is a need for middle managers with a high degree of environmental knowledge and skills for solving problems at the operational level. At the same time, however, there is a need for all middle managers to be more environmentally aware.

### **Research objectives**

As a result of the above, the following set of research objectives was formulated for the present study.

The general objective is to identify pressures for including environmental considerations in business decisions, and to analyse both how it is implemented and how it is reflected in the training practices of middle managers in EU Member States.

This general objective includes six specific objectives which are addressed by the present study:

- To identify current environmental management practices and derived educational needs at the middle level.
- To identify the environmental training requirements of categories of middle managers in different branches of industry in the light of EU policies aimed at sustainable development and the new corporate response to environmental challenges.
- To assess how the identified training needs are met by educational institutions.
- To identify possible courses of action aimed at improving the environmental training and education of middle managers.

### **Method of approach**

The present study rests on four elements, which complement each other. Firstly, the results of a series of interviews (40) with middle managers (technical managers) in environmentally leading manufacturing companies in three EU countries (Germany, Finland and Denmark). Secondly, interviews (9) with representatives of environmentally leading educational institutions in the same three countries. These institutions are typically those where individuals who become middle managers obtain most of their education after leaving school/high school. Thirdly, a survey of a group of Danish middle managers (sample size: 990), and fourthly, the use of information about environmental initiatives and training obtained from companies and institutions throughout the European Union.

The results presented here are based on limited data, and general conclusions should be drawn with care. For a further description of methodology, refer to annex 1.

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## Environmental management at the middle level: state of the art

This chapter addresses existing environmental practices at the middle management level in the companies interviewed. These companies are at the forefront of environmental management, and have taken an important lead in designing and implementing environmental management systems.

### **Environmental management challenges in European industry**

#### **Profiles of companies and their main environmental challenges**

In this section, each company interviewed is described briefly in terms of its main environmental challenges. The companies are identified only by a number and the main industry in which they operate. The companies vary in size and operate in different sectors of industry, with production processes that are mainly of a secondary or tertiary nature.

#### *Food Sector Company no. 1 (GER)*

This company is a small, partially integrated, manufacturing and consumer sales company in the food industry. Turnover is around 45 million ECU, with a workforce of some 60 full-time employees and up to 900 part-timers. The company has developed a very thorough environmental philosophy, but the main emphasis is derived from a strong consumer focus on product quality and wholesomeness. One reason for this is likely to be the integration between production on the one hand, including dialogue with the suppliers, and retail outlets on the other hand, combined with a very tightly defined organisation and the presence of a top management which also owned the company and initiated the environmental philosophy.

*Food Sector Company no. 2 (FIN)*

The second food industry company was part of a division of a diversified food group. Total group turnover is around 12 billion ECU, with the division accounting for around a third. The site itself was a processing facility with a strongly seasonal pattern of operations, with about 1200 employees. Environmental issues at the site were partly related to the seasonal operations, since the concentration of activity within a few months had a big impact. Specific problems were related to disposal of waste water, which contained significant amounts of both nutrients and sediment. Further impacts were related to the farming generating the input materials. In this area, the company was engaged in close dialogue with individual farmers about crops, use of pesticides and herbicides, and about harvesting and intermediary storage.

*Food Sector Company no. 3 (DEN)*

The third company in the food sector was a branch of a large processor of primary agricultural products. This processor is part of a major food industry conglomerate with some 11,000 employees and a turnover of around 2 billion ECU. Environmental problems were partly related to the seasonal operations which had a severe impacts on the surrounding town, and partly to the disposal of waste water from the operation. These wastes contain both high levels of nutrients and considerable amounts of sediment.

*Service Sector Company no. 1 (DEN)*

The service at this transportation company borders on manufacturing, since there is a large element of equipment maintenance involved. The actual site visited did not publish separate financial or employment data, but group turnover is around 1 billion ECU and total employees around 20,000. There were two main areas of environmental impact. One was waste disposal from the company's maintenance workshop, and the other was the reduction of emissions from machinery, mainly to air and soil. The main initiatives were in the areas of machinery re-engineering and, for the workshop, waste, a heavy emphasis on recycling, and waste sorting.

*Manufacturing Company no. 1 (FIN)*

The first manufacturing company was part of a medium-sized integrated mining and metals manufacturing group. Total turnover of the group is some 3 billion ECU, of which the site visited accounted for nearly 400 million ECU. The environmental impacts of this site were caused by the metals manufacturing. Environmental problems were dominated by materials and liquids used in the manufacturing process. A large part of environmental work at this location concentrated on containing and preventing these materials from escaping into the environment. Other important issues at this site were related to dust from ventilation, and to energy consumption and materials efficiency.

*Manufacturing Company no. 2 (GER)*

This company (plant) is part of a large multinational company with approximately 70,000 employees and a total turnover of 27 billion ECU. The site visited, however, has 300 employees producing cabin air filters, abrasives and intermediate products for automobile catalysers. Key environmental problems reported at this site included waste problems related to the production of

air filters. This problem was fairly easily solved, since it was profitable to recycle them - they contain materials which can be recycled and thus substantially reduce costs. There were also traditional environmental problems, mainly related to production, handling and the transportation of organic solvents.

*Manufacturing Company no. 3 (FIN)*

The third manufacturing company was a producer of installations used in the building industry. The site was a production facility of a division concentrating on the building industry. Other divisions of the parent group were active in heavy industry, steel-making and paper. Group turnover is around 2 billion ECU, the building products division accounting for about a third of this, and the actual site generating a turnover of around 50 million ECU, with around 400 employees. This company was a remarkable place to visit, having by far the most advanced and detailed quality and environmental management system, fully implemented on a PC network. The existence of the system did not mean that all environmental problems had been solved, but management was considerably more occupied with addressing products' life-cycle impacts from a design perspective than most of the other companies visited.

*Manufacturing Company no. 4 (FIN)*

This manufacturing company was active in the forest products sector, engaged in paper manufacturing on a very large scale, with 10,700 employees and a turnover of around 2 billion ECU. The facility was located in a remote town, but nevertheless subject to strict regulation. The main environmental problems at the site were related to waste water effluents and energy use. However, as in many paper mills, energy consumption was derived from wood inputs and process waste.

*Manufacturing Company no. 5 (DEN)*

The fifth manufacturing company was a fairly small branch (turnover 30 million ECU) of a large chemical and paint group, with only 144 employees. Production at this site was characterised by considerable variation in terms of inputs and use of hazardous materials. The main environmental problems reported were disposal of solid waste, some of it with low toxicity. Since such waste must be specially incinerated, costs are significant and avoidable only if the volume is kept down. Environmental management was extensive and had been implemented at a fairly low level in the organisation. However, dealing with problems such as waste reduction was sometimes made difficult by a lack of understanding at the lowest organisational levels.

*Manufacturing Company no. 6 (DEN)*

This was a small and highly specialised textile company. Its specialisation lies principally in its environmental work, which is aimed at producing very environmentally friendly textiles sold under an ecological brand. The company is small compared to the others participating in this study, with only around 100 employees, and a turnover of around 20 million ECU. The small number of employees is deceptive, however, since many operations are subcontracted to other countries to take advantage of large wage differentials. The main environmental problem is of a secondary nature. It follows from the high level of subcontracting, which requires close

monitoring across a considerable number of sites. As a result, a large fraction of environmental management is devoted to maintaining an environmental management system that can keep track of the many subcontractors and their activities.

*Chemical Sector Company no. 1 (GER)*

This company is a large multinational enterprise with approximately 147,000 employees and a total turnover of around 22 billion ECU. It is perceived by the respondents to be one of the world leaders in the chemical-pharmaceutical industry. The company is highly R&D-oriented, spending approximately 7% of total turnover on research and development. Typical existing environmental problems were related to traditional emissions into the soil, air and water. So far, these problems have been addressed with traditional end-of-pipe-technology. A number of other problems related to health and safety issues have also been addressed.

*Chemical Sector Company no. 2: (GER)*

The second chemical company is also a very large multinational, with an annual turnover in the region of 26 billion ECU and some 140,000 employees. The site visited accounted for a large fraction of the company's production operations, and the company had operated from this site for many decades. A substantial part of the environmental management effort of the company was oriented towards solving problems originating from the site's long history of chemical manufacturing. Despite this special preoccupation, the main thrust of environmental efforts was aimed at current operations. In general, there was a heavy emphasis on training, both in operations generally, and in the special waste disposal unit on the site. Another characteristic feature was the scale of disposal facilities for waste effluents from production. These large disposal facilities, which treated both current water streams and recovered streams from site rehabilitation, suggest that there were significant economies of scale at this site.

*Chemical Sector Company no. 3 (FIN)*

The third chemical manufacturer was a specialised branch of a large chemicals conglomerate. Group turnover is around 2 billion ECU and employees numbered around 10,000. The site visited employed close to 2,000 people and generated a sixth of the total group turnover. Operations at the site were concentrated around a single material, which was processed and used for a single purpose in a range of products. The main environmental problems of the operations were related to dust and atmospheric emissions, as well as energy consumption.

**Characteristics of the respondents**

The respondents interviewed in the various companies were all from the technical or operational middle management level. However, this is a very broad category, and separating it from other levels in each organisation is not always easy. The respondents interviewed certainly represented a very broad range within the middle management category. The variation also reflects the fact that the size of the middle management layer varies enormously between organisations. Small, family-run companies seem to have a very thin layer of middle managers, while large industrial corporations have a very large and internally stratified group of middle managers. The



respondents in the smaller companies are typically very close to top management, whereas the organisational position of respondents in larger companies is more variable.

### **Operational aspects of environmental management**

All the companies interviewed in this project operate in countries with significant regulatory constraints. These constraints are of several kinds, but are mainly derived from one, or more commonly, two levels of government. These regulations typically focus on the operational aspects of the companies' operations, and typically involve giving additional permits every time a new process is introduced or an existing process modified.

### **Goals and initiatives**

The respondents in the companies visited had knowledge of quite a wide variety of environmental goals and objectives formulated by corporate management. For example, respondents were often aware of in-house recycling policies. Many of these were rather conventional, in that they were directed at known problems using established procedures. However, in some cases the goals were more far-reaching and involved a more rigorous approach. For example, some companies were pursuing a strategy aimed at eliminating synthetic and environmentally harmful substances from products and production processes, while other companies had a more traditional emission-control-oriented strategy.

The most commonly expressed goal was compliance with existing environmental regulations. At the same time, however, respondents also clearly expressed the view that compliance need not involve a costly and possibly innovation-inhibiting preference for end-of-pipe solutions. More innovative examples, such as a desire to close material cycles so that discharges into the environment were eliminated, were observed in a few cases, but almost invariably as a response to externally determined environmental constraints originating from regulatory authorities or higher level corporate environmental strategies.

Alongside regulatory compliance, the second most highly emphasised goal of the companies interviewed is certification of their environmental management system using one of the three certification systems (BS7750, ISO14000 series or EMAS). A considerable number of the companies were either already certified or in the process of obtaining certification for some of their operations and sites. More importantly, there was widespread acknowledgement among respondents that EMAS is the most advanced of the alternatives, and not necessarily much more difficult to obtain than the more narrow ISO14000 certification.

The move towards certification was argued to be driven by different factors, but the most commonly expressed view was that certification was customer-driven. While this may be a valid conclusion in general, some responses suggest that the importance of this depends on the industry involved. For example, certification was mentioned most commonly in association with firms in, or related to, the chemical and manufacturing industries. This reflects the long history of tight regulations in these industries.

Many respondents had been involved in certification work, either being directly involved or through having to supply information for the process, and certification was universally seen as an important step towards promoting the environmental awareness throughout the organisation.

One of the environmental management tools most frequently mentioned in the literature is the Life Cycle Assessment (LCA) of products. Surprisingly, this approach was rarely mentioned as a central element in the practical environmental work of participating companies, which concentrated on more localised initiatives such as recycling, working environment and emission reduction.

Companies emphasising the importance of information as a central goal in relation to environmental management were more rare, particularly as regards the dissemination of information within the organisation. In contrast, the fact that a significant proportion of respondent companies had decided to use EMAS rather than the more recent, but less (external) information-intensive ISO14000 series, suggests that internal information is governed by processes very different from those determining external information. Nevertheless, those respondents who did mention internal information as an important element in environmental management stressed provision of relevant and precise information at all organisational levels as perhaps the most essential part of their work.

In a number of companies, a central goal of their environmental efforts was the identification of the key processes and procedures responsible for environmental impacts. The purpose of this approach was to identify the risk of accidents or failures, which, under certain circumstances, could lead to serious impacts.

A distinct goal observed in some of the industries close to the primary resource processing stage is "closing of loops", i.e. these companies strive to eliminate discharges from operations by permanent recirculation of materials like water and coolants. This is of course a fundamental impossibility, but many discharge problems in the companies interviewed had been significantly reduced through higher degrees of recirculation.

A special goal in some companies was the integration of environmental and quality objectives. This was particularly evident where product rejections involved irreversible environmental impacts, the response being to avoid impacts by improving quality in the production process beforehand.

Many of the goals described above represent efforts to reduce environmental "slack" in organisations, but only a few companies went much beyond this very traditional and static conception of environmental work. The two exceptions are product redesign and inclusion of the environment as a corporate mission. Product redesign goes beyond fixing environmental problems in the production process, and it represents an effort to examine the complete life cycle of products.





The final goal identified in the companies visited is pervasive "greenness", in the sense that the main logic of the company is a desire to have environmental impacts that are as limited as possible. This goal was only observed in very few companies, and even there it often had to be tempered by some of the practicalities of being in business.

### **Experiences and practices at the middle management level**

A central aspect in the move towards more environmentally sustainable companies is the gradual development of managerial behaviour and practices which consciously and explicitly include environmental considerations in all decision-making. To explore these issues, the interviews included questions related to operational aspects of middle managers' environmental work.

#### *Environmental management systems*

Many respondents in the companies visited had some form of experience with either environmental management systems or had worked with quality-related management systems. The experience with environmental management systems varied considerably, from project managers deeply involved in design and implementation, to more peripheral managers whose only contact with the environmental management system had (so far) been submission of data to an initial activity survey (the first step in developing the environmental management system). A general impression gained from most of the respondents was that they were firmly convinced of the usefulness both of an environmental management system in general and its certification in particular. Only rarely were concerns over possible lock-in effects of certifying a system voiced.

The widespread use of environmental management systems was driven by two different groups of stakeholders. The most commonly reported reason for developing an environmental management system was that industrial customers required their products to be produced by a company with a certified system. Less commonly, regulatory pressure played a role, not in the form of a direct requirement to have a system, but through a feeling among respondents that regulators would become distinctly more accommodating if and when the company began to develop an environmental management system.

#### *The certification of Environmental Management Systems*

Being involved in developing an environmental management system had for some been a new experience, since this was very different from other management tasks. However, getting a system certified under BS7750, ISO14000 or EMAS was far less daunting, because many respondents had some experience from previous work with implementing ISO9000 certification of quality management systems.

#### *Personal liability*

In one country, the personal liability of employees was a very important aspect in the implementation of environmental management systems. The fact that an individual could be held personally liable for environmental damage by the authorities meant that some respondents reported a degree of hesitancy in relation to environmental management systems, both on their own behalf and on the part of some of their subordinates.

#### *Incentive schemes*

All respondents were asked about their knowledge of and involvement in incentive schemes aimed at improving corporate environmental performance. These questions elicited a range of very interesting replies. A majority of the companies interviewed did have some form of incentive scheme. However, the schemes were almost always of a general nature, rewarding anything that improved operations efficiency, quality of products (i.e. cost savings to the company), etc., and were not specifically aimed at the environment. Reward mechanisms also varied considerably among those companies that used incentives. Some took a very cautious approach, and rewarded groups rather than individuals, with standardised payments or alternative activities. Other schemes were aimed at individuals but with a standardised payment (so that each good suggestion receives the same reward, regardless of the value of the suggestion to the company), and in others again, there was a direct link between the value of a suggestion and the reward paid to its originator. For example, one company regularly paid 5 or 10 % of the (net) value of a savings proposal over the first 3 years after it had been implemented. In this case, environmental suggestions were treated in the same way as others.

While the use of some form of incentive is widely used to reward suggestions for improvement, some respondents expressed reservations about the practice. When asked whether the respondent could imagine a wider use of incentives, the responses indicated that many were concerned about the equity of such a scheme. They believed that many of the ideas that did end up in a suggestion box were not necessarily one individual's own contribution, but represented a process of interaction within a larger group in the workplace. As such, a suggestion by an individual was sometimes thought to lead to an unfair reward to the person concerned, while his or her colleagues missed out.

The responses about incentive schemes mainly referred to rewards for suggestions. None of the interviewed companies had tried more advanced approaches, where the use of input materials and generation of waste were parameters in determining an incentive payment, and few believed this would be a feasible approach in their organisation.

#### *Inter- and intradepartmental conflicts*

The interviews clearly showed that environmental work did not create any significant environmental disputes between departments within the organisation.

#### *Workload*

A slight tendency to feel an increased workload was reported in some companies, but the trend was not unambiguous.

#### *Capital investment and Environmental Impact Assessment*

In many of the companies visited, the easy improvements had been made already, and further improvement would require either a change in output (product redesign or outright change to other products), or very large capital investments. This aspect was particularly important in the

chemical and heavy manufacturing industries, where processes are both highly integrated and very complex.

Respondents in these industries emphasised that, although their own environmental training ('both basic and post-employment') was important, being able to operate a capital intensive production system was of equal, if not more, importance.

The importance of large capital investment in some industries also brought out the question of Environmental Impact Assessments. Middle managers seemed to have a problem in keeping track of all the implications, both environmental and economic, of large capital projects, and found it difficult to assess relative costs and benefits associated with these projects. One possible way out of this problem is the wider use of dedicated Environmental Impact Assessments, a procedure that may also serve to prove or disprove the environmental and economic relevance of a capital project in discussions with regulators.

### **Training experiences of middle managers**

The middle managers interviewed in the three countries had very different technical backgrounds (e.g. Machine technicians and Ph.D.'s in chemistry), and had experience of a wide range of training and education courses. Backgrounds included

- unskilled workers, who had risen from the shop floor to become managers of smaller sections in production departments in medium-sized companies,
- production managers, holding Ph.D. degrees or the equivalent, in large-scale production facilities.

In general, this diverse group of managers had attended very few dedicated courses or courses with an environmental content typically related to the working environment. Where they had attended a course or seminar, the environmental component had often been derived from an emphasis on health and safety in the workplace, rather than on external environmental protection.

More than two thirds of middle managers from the Danish sample had a professional background as skilled workers.

#### *Educational background*

Most of the respondents did not believe that their main educational backgrounds had prepared them very well for tackling environmental problems. At the time they left the educational sector (often some 7-10 years ago), environmental awareness was only just emerging and had not yet become part of typical training programmes. However, respondents believed that this lack in their own training background was a temporary problem that would become less important for future managers, as environmental issues become increasingly integrated into all existing training and educational programmes.

*The provision of environmental course*

For respondents who had experienced dedicated environmental training as part of their job, several things were clear. First of all, getting the resources required to attend courses in this area was seldom a problem, either for middle managers themselves or for their subordinates. Secondly, many courses were organised internally by the company for a group of middle managers, albeit sometimes in close co-operation with local educational institutions. In general external instructors were used for these courses.

*Learning environmental management by doing it*

All the companies interviewed had made significant efforts to improve environmental performance, and in many cases significant results had been achieved, both in terms of actual reduction of emissions, process redesign, and the design and implementation of environmental management systems, which in many cases were certified according to EMAS, ISO14000 or BS7750.

During the interviews, an interesting observation was made by many of the respondents. Even if some managers (typically the environmental manager) had attended courses in environmental management, much of the work associated with designing and implementing an environmental management system fell to other managers. For many of these, participating in the process involved a lot of "learning by doing", and they felt that they came out of the process with significantly improved knowledge.

*Career implications*

While respondents could easily imagine that poor environmental performance, either personally or of their department or section, could adversely affect their future career prospects, there were no similar expectations that positive environmental performance would enhance their career prospects. This suggests that environmental excellence does not (yet) create any opportunities for "career push".

*Future development perspectives*

The future direction of environmental efforts was viewed very differently by respondents. While all agreed that further improvement was both necessary and desirable, some believed that these improvements could be obtained through a gradual process which would not involve high capital investments. In contrast, another group saw future environmental efforts as a set of major tasks which involve significant capital and operating costs.

These different views of the future of environmental management are also reflected in respondents' view of their own work: Those expecting new tasks also expect significant changes in their work, while those expecting smaller, but gradual and continuous, change felt that their work could easily be adapted to this.



### **Concluding remarks. Characteristics of environmental practices and perceptions at the middle management level**

The management practices identified through interviews with middle managers in a number of different, but environmentally advanced, companies in many ways confirm the impressions gained from the first two studies in this series (Ulhøi et al., 1996; Ulhøi et al., 1997), which concentrated on corporate environmental managers and skilled workers and certain categories of lower managers, respectively.

Companies are engaged in a range of environmental activities, some of which are aimed at very specific problems, often identified as a result of regulatory intervention. Other efforts, such as the design, implementation and certification of environmental management systems, do not in themselves affect a company's environmental impact. Rather, these efforts are driven by demand from consumers, customers and other stakeholders, in addition to the regulators already mentioned.

From an operational point of view, perhaps one of the most important aspects of middle managers' view of their experience with environmental management and related issues was that this group of managers feel somewhat caught in the middle. On the one hand, they are included in top managers' sweeping statements about the company's environmental policies and overall intentions. On the other hand, these same managers are reluctant to provide the resources required to transform grand statements into operational policies and decisions.

Other notable characteristics include scepticism with respect to incentive systems (despite their widespread use), and the additional benefits of having a certified environmental management system (e.g. kinder treatment from the regulators).



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## Examples of the environmental contribution of middle managers

In this chapter, four examples are used to illustrate the contribution of middle managers to environmental performance and initiatives in their companies. The four examples were chosen to represent small, medium-sized and large companies in various industrial sectors, and at the same time show that different companies use distinct approaches to solving environmental problems.

### **Example 1: An information technology approach**

The first example comes from a medium-sized (by EU standards) company producing goods for the building and construction industry. A short company profile is provided at the beginning of the previous chapter.

The products of this company are characterised, in environmental terms, by two very different features. One is the materials and energy inputs, which together represent the most obvious impacts of the products. However, the products have a very long life once they have been installed, and during this life they also use material inputs, which are different from the inputs of the production process. While these inputs are not of the same type as in the production process, they certainly have a much greater volume, even if the associated impacts are not fully comparable.

The dual nature of the products' environmental impact has profound implications for the contribution of middle managers. The long-term life-cycle impacts are mainly a result of product design, which is influenced by a narrow range of middle managers, while the impacts from the production phase represent a wider range of steps in the production process, and thus also a greater number of middle managers. The middle managers interviewed at this site were from the upper end, from a local organisational point of view, in the sense that they represented the management of production, plant and quality departments.



The interviews clearly identified one of these as the key person driving and inspiring the greening process, although the other respondents also contributed significantly to the process in the company. This had been initiated about 5 years previously, as a combined reaction to waste water discharge reporting requirements and experiences with ISO9000 certification for quality management. Facing a reporting requirement dictated by regional authorities, it was natural to set about solving the problem in an organised way, which led to the development of the present environmental management system, a system which was later certified under BS7750.

The most characteristic feature of the environmental management system in this company is its quite advanced use of a computerised management information system, which is completely integrated with the quality management system and widely accessible to all employees at terminals throughout the plant. The system allows close monitoring of emissions and target achievement, and also allows managers to link quality decisions to environmental issues. This was a particular advantage in the case of energy conservation, since a large amount of energy was used in processes where quality defects mean that items have to be re-processed, which used almost an equal amount of energy as in the original production.

In many ways, this company was a leader in relation to its sister companies in the parent conglomerate. According to the respondents, these other members of the corporate family lagged some way behind the company itself in terms of commitment to environmental improvement, implementation of environmental management systems and the certification of these.

During the interviews with the technical managers at this company, it also became clear that efforts to become an environmental leader were far from over. Instead, it seemed quite clear that there had been a spill-over effect from environmental management in production to the product development and design side. This spill-over was represented by the inclusion of environmental and resource-use considerations in the product design process. While this had large potential implications for materials consumption in the use phase, it was also clear that many potential improvements in the life cycle of the product were inhibited by infrastructural constraints in building and existing infrastructure networks.

### **Example 2: A human resource management approach**

The second example of middle managers' environmental contribution comes from a specialised branch of a large multinational enterprise producing software and videocassettes, cabin air filters for the aircraft industry, and abrasives and intermediate products for catalysers for the automotive industry. The middle manager function analysed in this company was the technical management function responsible for all technical aspects at the site. Put differently, this middle manager was in the upper end (from the perspective of the local site visited), and exerted an enormous influence on the possibilities for solving and/or preventing environmental problems related to production. This function served as technical support for all other departments at the site and it was further represented in a national co-ordinating group (including middle managers from all national plants and departments concerning health and safety related issues). Examples were provided which

demonstrated that this middle management function also occasionally included responsibility for local environmental R&D activities which led to environmentally improved production processes.

In 1993 it was decided to implement EMAS. With only around 300 employees at the site, this proved relatively easy to implement due to previous experiences from an ISO9000 certification. The process was also strongly influenced by external stakeholders (the automotive industry in particular). This company did not recommend the integration of the quality and environmental management systems because it would complicate any future need to adjust one of the management systems.

The technical management function also undertook responsibility for developing training packages for local operators, who were perceived as the key environmental promoters, i.e. the process is expected to be a 'bottom-up' greening process, fully in line with the overall environmental policy of the parent organisation. To support this, a number of 'information centres' have been installed in paper form throughout the plant, and which contain all available health and safety information, albeit in condensed form. The technical management function on site is responsible for updating this information.

In general, local environmental responsibility is distributed to local environmental co-ordinators at the middle / lower management level in the various operations and departments. The technical management function also included the formal responsibility for bringing environmental considerations into the decision basis when new R&D projects were funded internally.

The technical management function was also responsible for monthly meetings with operators and union representatives. Local environmental regulators and suppliers have also been invited and informed about the EMAS environmental management certification.

From time to time, the technical management function contributes with articles to a local environmental magazine which is published by a local brokerage company. The technical management function has also been invited by the National Industry and Trade Association to present their experiences with training and the use of local information centres.

### **Example 3: A decentralised approach**

The third example, representing the chemical-pharmaceutical industry, is a typical large multinational enterprise with some 147,000 employees. The interviewees perceived 'their' company to be the greenest chemical company in the world.

Corporate environmental management has in part been oriented towards addressing typical industry-related environmental problems, most of which were the result of decades of manufacturing at the company's main site. Increasingly, however, management is aiming to enter into a constructive dialogue with stakeholders, including environmental and other companies, in order to find practical solutions to existing and/or new environmental problems.





Since a revision of corporate environmental policy in 1995, environmental efforts have increasingly been directed towards delegating responsibility throughout the entire organisation and involving employees at all levels, so that they ensure that environmental policy objectives and goals are met. At the same time, increasing attention has been given to addressing environmental protection in a cradle-to-grave perspective.

Each year, about 30,000 employees (20% of the entire workforce) participate in environmental protection courses.

The middle managers interviewed in this company included various middle manager functions (technical manager; R&D; plant manager) trained in different academic disciplines (a chemist, who at present was actually involved with the assessment of environmental costs; a chemical engineer responsible for international corporate policies and affairs related to the environment; a biologist, who was responsible for internal training) - and some middle managers in this company have a Ph.D. in their original technical discipline.

Throughout the corporate environmental management certification process (EMAS), technical middle management tended to play a key role, and one was responsible (project manager) for the process. During this process, one of the technical managers sent out questionnaires to all the different plants in the company to ensure that the best available technology was used.

This company has also decentralised environmental responsibility. Each operating unit has a person responsible for environmental issues.

Another middle manager was responsible for evaluating and monitoring costs related to both existing and future environmental projects.

A third middle manager was a member of a corporate 'round table', with representatives from environmental units from all sites. During these meetings (3-4 times per year) corporate environmental programmes were discussed and evaluated.

A middle manager responsible for corporate training activities found that people from service functions (administration) tend to be critical or hostile towards the idea of participating in environment-related training activities.

It was reported during the visit that middle managers typically lack information and/or up-to-date information about health, safety and environmental issues in their basic education. A need was also felt for more knowledge about the administrative aspects of environmental management, the role of trade unions, and updated knowledge about toxicology.

At the time of the interview, however, a major organisational restructuring process has been initiated by top management. A new top management has been put into place, followed by a new holding structure of rather independent units, in order to boost internal competition. Now, each

internal production and service function is seen as just one among other (external) functions that can be considered when buying a service. If internal services cannot compete with alternative external and similar services they will not 'get the job' - and if this happens more than once, the future of the unit in question will be at risk through outsourcing.

#### **Example 4: A top-down approach**

The last example comes from a small/medium-sized family-owned company in the food sector. The company has approximately 1000 employees and operates within a limited regional area. As the products are rather specialised, competition is low. Middle managers interviewed included staff members responsible for marketing, personnel, and environmental control.

In recent years, the company has increased its environmental involvement in production as well as administrative matters. Thus, when potential new employees are evaluated, their background, training and experience in environmental issues relevant for the position in question are also taken into account. This was a crucial point, as employees must be able to understand and follow the environmental guidelines established in the company from their very first day on the job. Likewise, quality and environmental subjects are included in the job descriptions of all employees, as it is considered to be a natural part of their job function. Examples of essential environmental areas in the company include waste handling in production as well as administration, the use of energy for production purposes, and handling of cleaning materials. As energy is a critical factor in the production process, a special monitoring system had been installed which allows the fine tuning of the entire production process, balancing energy consumption against sufficient production conditions to ensure the quality of the products.

The interviewed middle managers in this example generally agree that the environmental attitude of the company was positive and open-minded. In fact they consider the company to be ahead of similar companies in some areas. The major production facility received its EMAS certificate in 1995 and a minor facility was certified in 1996, so in 1997 the entire company was ready to pass an audit for the EMAS certificate. It was believed that such an event would be another motivating factor for future initiatives and work within the environmental area. A major source of motivation has been the owner of the company, who formulated the basic environmental philosophy of the company as early as 1978. Suggestions from employees are often received as well. Furthermore, it is considered an advantage that the targets for three years ahead are clearly stated and known to everybody in the company. This definitely supports the effort to reach the targets and to check the actual level of fulfilment. But the increasing involvement has also implied a more complex situation, which is often difficult to handle and explain to consumers. For example, the major production facility is located in the centre of a large town, in an area of 4-5 storey residential housing. In order to ensure fresh products, deliveries begin to arrive at 5 a.m. Likewise, the environmental initiatives imply increasing costs, which results in higher prices to consumers.

Employees' attitudes are generally considered to be very positive. The impression is that the image of a "green" company attracts employees who are interested in environmental issues. A training plan is made for each individual employee in co-operation between the immediate superior and



the personnel department. As it is often difficult to arrange training activities for an entire production unit at the same time - especially external training activities - another strategy is normally followed: The key persons in a production unit are identified - in general the supervisor of the retail shop assistants - and these key persons are then given the required training. These key persons then go back and inform, instruct and motivate the remaining employees in the production unit. Due to special working hours it is not always easy, but it works.

It is generally recognised that, to ensure the environmental targets are met, employees must be fully informed and their personal role explained to them. Such information includes visions and targets as well as planned and operating initiatives. Information is distributed partly by personal communication and partly by an internal newsletter. It is recognised that it is not possible to meet the targets without doing well in the market. But on the other hand money cannot do it alone.

In the future, the company intends to integrate the quality and the environmental management systems. It will also increase the present co-operation with its partners in the supply chain, which includes producers directly involved in agricultural production and manufacture of intermediate products, in order to ensure an improved ecological balance without reducing the actual quality. Information to customers will similarly play an essential role, so that, for example, they know how to dispose of the packaging material in an environmentally correct way.

The interviewed managers argued that educational institutions need to improve their curricula. Thus, there are rarely specific courses in environmental issues in many training programmes. But it is important to have courses for specialists as well as courses which improve consciousness in general. Furthermore, it is important that educational institutions are up-to-date with their training. There is little use in spending too much time on what happened in the past and in trying to prepare students for specific jobs in the company. Instead they should be taught the basics and leave it to the companies to add the more company-specific dimension.



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## Training and education of middle managers

The other side of the issue addressed in this report is training provision, and particularly the amount of environmental training middle managers receive today. Trying to discover the state of the art in this area is complicated by the considerable variation in backgrounds of such managers. Based on the interviews with companies, three broad categories of educational backgrounds can be identified.

- The first of these is some form of engineering training (essentially from machinist up to graduate-level engineering).
- The second alternative is some form of business management training, essentially from business college and upwards.
- The third category is more diverse, and includes managers who have risen to their present positions from a quite limited educational background.

The teaching institutions interviewed fall mainly into the first two (engineering and business management) categories defined above, albeit with some emphasis on the undergraduate level. In general, the institutions, which were chosen for their active engagement in improving environmental education, provided some elective courses in environmental subjects.

The following sections examine the nature of study programmes, followed by an analysis of the background factors which seem to have influenced the development of the study programmes.

### **Types of study programmes**

Of the categories described in section 4.0, the last one is almost impossible to generalise about, since this category is characterised by self-made managers with no or very limited formal post-



skilled worker education. Attention is therefore concentrated on the first two categories. For each, the presence of dedicated environment-oriented study programmes and programmes which integrate the environment is considered

### **Profiles of educational institutions**

#### *Institution 1 (GER)*

This institution educates students in the general field of business economics and management. The programme lasts four years and there are no graduate-level extensions taught. Around 3000 students attend the institution, which has some 100 academic staff. Environmental subjects are not taught as part of the obligatory course programme, although there are electives available with environmental content. Nevertheless, a smaller amount of environmental issues are part of the general courses in economics.

#### *Institution 2 (GER)*

This institution specialises in practical and applied training in business management. There are 1700 students, with 40 professors and 10 assistant professors. The institution offers a 4-year study programme, which includes two 6-month trainee periods outside the institution. The environment as a subject is mainly available as a specialisation option towards the end of the study programme. Within this specialisation a total of seven environment courses are available.

#### *Institution 3 (FIN)*

This is a medium-sized engineering school, with around 1100 students at the undergraduate level and 70 teachers. The study programmes are mainly the standard branches of engineering (i.e. chemical, mechanical, electrical). Environmental courses are taught with a strong focus on practical aspects, such as environmental management systems, life cycle assessment, and certification according to EMAS and ISO14000.

#### *Institution 4 (FIN)*

This institution is similar to the one described above, although it is almost double the size, with 2000 students and some 200 teaching staff. The study programme is four years and leads to an undergraduate degree in engineering, with a strong practical orientation. The environmental content is present in the form of courses on life cycle assessment, environmental auditing and certification of environmental management systems according to EMAS and ISO14000.

#### *Institution 5 (FIN)*

This institution is slightly larger than the other two described above, with 2600 students and 360 staff members in all (including teaching staff). Degrees are all at the undergraduate level, and this institution offers both general engineering degrees and specialised degrees in environmental management and environmental engineering. The environmental content of non-specialised degrees is significantly smaller but nevertheless plays an important role.

*Institution 6 (DEN)*

This institution is very small, with 500 students and 50 teachers, some of whom are part-time. The school provides diploma courses in mechanical and civil engineering. The environmental management courses, which are very applied, are an integral part of the study programmes.

*Institution 7 (DEN)*

This institution is a medium-sized engineering school offering 3-year diploma programmes in four engineering specialisations: civil, mechanical, electrical and electronic. Students number 1150 and the teaching staff consists of 150 full-time and 40 part-time teachers. Environmental subjects are obligatory courses in the civil and mechanical engineering programmes, but not in the electrical and electronic engineering programmes.

*Institution 8 (DEN)*

This school is fairly small and trains intermediate technicians, and also provides the course input for the training of skilled workers. There are 500 students and 50 teachers. One short environmental management course is available only as an elective option for environmental technicians, but not for other study programmes.

**Dedicated study programmes**

The term is used to indicate study programmes which are aimed at environmental production, as distinct from production management with some form of environmental component. The distinction is somewhat artificial, since there are no programmes which can be described as being dedicated to environmentally responsible or aware production. When dedicated study programmes were reported they were typically aimed at a well defined environmental management function, and were distinct from more production-oriented programmes.

**Study programmes integrating the environmental dimension**

Some of the institutions interviewed were pursuing a strategy whereby environmental topics were included in general study programmes. However, the level of commitment varied. Some respondents argued that all management and engineering programmes should spend at least 10% of their time on environmental issues and problems during their stay at the institution. Many others did not express a clear opinion about how much time and resources should be allocated to environment.

A different and more interesting observation was that, in most cases, the emphasis on the environment came late in the educational programme, almost invariably as some form of optional elective course or as a specialisation. In contrast, only one institution reports that environmental issues had a prominent position in the first part of study programmes, in this case in the first year of the undergraduate applied engineering programme.

The content of existing courses varies. The technically-oriented institutions, which dominate among those interviewed, generally had a very practical orientation. Typical course subjects in these institutions were:



- Environmental management systems
- Certification under EMAS, ISO14000 and BS7750
- Life cycle assessment
- Environmental auditing.

Not all institutions taught all these subjects, and sometimes they were partially obscured by course titles such as "Environmental Management 1" and "Environmental Management 2".

The business-oriented institutions were less practically-oriented, preferring to keep to a managing perspective in their course offerings. However, the level of attention given to environmental subjects varied even within this group, from some integration of the environment into economics courses to the development of a comprehensive package of environmental electives, all with a business perspective.

### **Teaching approaches and experiences**

The respondents were asked to comment on the teaching approaches most suited to giving their students some degree of environmental awareness and understanding. Three distinct approaches were identified:

- Traditional lectures
- Internal projects
- Practical and collaborative projects with industry.

Lectures were widely used, despite their somewhat one-directional flow of information. One of the frequently mentioned reasons for using lectures rather than other teaching methods was that this form is by far the cheapest in terms of providing a specified amount of information to students, irrespective of the quality of the learning process. However, despite the fairly pessimistic view many respondents had of the lecture form, it was frequently noted that one way of improving the quality of these sessions was to invite guest speakers from industry.

Internal projects were reported by respondents as much more popular among students, and also very well suited for the often practical nature of environmental management work. One respondent went further, describing lectures as relatively unimportant, since the theoretical concepts of environmental management were essentially very simple and well suited for independent reading by students. For this respondent, the main challenge was providing the students with a degree of experience and routine in applying the well defined tools of environmental management.

The third option mentioned by respondents was external projects carried out in co-operation with industry. This approach was seen as perhaps the best approach to learning about environmental management, but also one which was used the least. A typical situation would be one where a student or group of students write their final project or dissertation as a documentation of a project carried out in collaboration with an external enterprise. The use of this approach is reported to be

more limited than the others, mainly because it requires students who are particularly interested in the subject, students who are very likely to complete the project and thus not embarrass the institution or school. Similarly, the more limited use of this form may be linked to the fact that students need a more extensive grounding in environmental management than is provided by a single course, which may leave out some of the less committed students.

A final observation was that it was sometimes difficult to find enterprises which would welcome students for project work, since many companies already had a large number of more or less serious enquiries from students wanting to come to the company to carry out an educational project.

### **Teaching materials**

For the most part, institutions relied on a combination of conventional teaching materials such as books, articles and videos. In addition, some institutions mentioned computer programs. A widely used source of material was descriptions and specifications of environmental standards such as EMAS and the ISO14000 series. The use of standards, documentation material and associated regulatory texts (legislation, environmental auditing and reporting guidelines, etc.) represents a highly practical approach in the environmental courses offered by the institutions.

### **Development of environmental training initiatives**

The environmental training and education activities of institutions do not develop in a vacuum, but are strongly dependent on interaction with industry and students. This section examines some important factors influencing this training. The first section concerns the initial impetus for institutions' educational efforts, while the second section concentrates on the continuing relationship between industry and educational institutions. The final section concerns an aspect of environmental education which is both internal and external to the institutions, the role and backgrounds of individual educators.

### **Origins of demand for environmental training**

A number of factors were reported as being important in creating the demand for environmental training, both within existing engineering and managerial programmes, and for dedicated environmental disciplines. These include:

- Industry in general
- Specific industries
- Students
- The local community
- Teaching staff
- Government
- News media

In a general sense, the main demand was seen as coming from industry. However, some of the industrial demand was believed to have been expressed in terms of demand from students. These





may be more perceptive than industry and see environment as a problem that will never go away. Indeed, in one educational institution, the initiative was completely taken over by students, who demanded environmental training and went far beyond the internal decision-making process at the institution to obtain additional government funding for this.

Several institutions emphasised the very important role played by individual teachers with strong environmental convictions. Very often these were regarded as key agents of change within the institution.

The influence of industry was reported to have two forms. One was in a sense quite vague, and came in the form of general calls from industry for more environmental content, both in general and in dedicated environmental programmes. The other form was more clearly defined, and came as a growing demand for company-specific training and courses.

### **Interaction with industry**

A large share of the interaction between institutions and industry comes about through student projects carried out in co-operation with companies. Additional interaction comes through limited research projects carried out by educational institutions. However, this aspect is less important than for higher-level institutions (universities), since middle managers typically come from institutions which are more oriented towards practice than research and theory development.

As noted above, the development of company-specific courses is another way in which teaching institutions interact with the business sector. This aspect may be more important than interaction primarily driven by research. Contacts related to research tend to be very focused on the specific research topic involved, and they may not give a more general idea about the educational needs of a company.

### **The role of individual educators**

The previous studies in the present investigation of training in environmental management (Ulhøi et al., 1996; Ulhøi et al., 1997) have clearly indicated that, at institutions which provide training for graduate level business and environmental management and for lower management positions, individual teachers play a very important role in developing the green component of such institutions. Furthermore, these agents of change were often randomly distributed and only rarely did their presence reflect a conscious effort by the institution to become green - or maintain their environmental profile once it had been established.

While agents of change are considered important, the institutional respondents also suggested very clearly that institutions were well aware of their own limitations. Several respondents indicated that their own contribution would not be sufficient and that ideally each institution should have a group of specialists covering the environmental area.

Only one of the institutions interviewed was moving in the direction of introducing the environment as a general topic at an early stage of their programme, and even there it was in the form of a separate module.

### **Barriers to the greening of study programmes**

The most frequently mentioned barrier to the greening of environmental study programmes is lack of resources. With one notable exception, described in detail in chapter 5, educational institutions are tightly constrained by fixed budgets. If they want to introduce a new course or activity such as the environment, the resources must be taken from existing activities. Even worse, some institutions face decreasing funding, which makes the problem of changing priorities even more difficult.

At the same time that institutions are coming under pressure to make their programmes more green; however, respondents suggest that as long as they are not specifically required to implement greening and as long as additional resources are not forthcoming, they are to some extent justified in not doing more. Whether this opinion is in accordance with the role of providers of education (i.e. to educate future employees with up-to-date skills) can be questioned.

### **Concluding remarks**

In contrast, if a company and an educational institution co-operate about training activities, the potential for interaction is much greater, since such a collaboration requires that both parties engage in a quite thorough dialogue about training needs and existing knowledge in the organisation.

However, this approach would mainly be good in terms of the depth of coverage, and would be unrealistic to expect in most institutions. The specialist group approach also reflects one side of the specialisation vs. generalist debate about middle management environmental training: A very good case can be made for providing all prospective middle managers with a limited general knowledge, which transfers into a need for a general introduction to environment, ideally at a fairly early stage in educational programmes.

The preponderance of specialised environmental electives in the late stages of many study programmes (see also Ulhøi et al., 1996) suggests that many teachers with strong environmental interests find an attractive outlet in this form of teaching.

These responses, and the responses about the role of individual educators in promoting the environmental dimension in the training of middle managers, suggest that many institutions face a considerable degree of organisational inertia when it comes to the environmental dimension. This problem, however, has to be seen in the light of what the requirements of companies really are.

While many companies will probably need a staff of dedicated and specialised environmental managers, this staff will always have to co-operate and communicate with a much larger group of



less environmentally specialised staff. In middle management, where many important operational decisions are made, this aspect is particularly important, since a dedicated environmental manager (or management group) cannot control all decision-making.

That part of environmental improvements which depends on the behaviour of staff and managers thus depends very much on the quality of the environmental component of general management training and education. The barrier to advances in this area is the currently fragmented and specialist-oriented nature of management training. This barrier may partly be related to agents of change being preoccupied with advanced education late in study programmes, and partly to organisational inertia at educational institutions.

Two types of institutions were examined: Engineering schools and management schools, in both cases with a strong practical orientation. In these schools, two approaches were observed. One involved dedicated environmental study programmes, while the other involved some element of environmental course-work as part of a more general or "mainstream" programme of study.

In general, engineering institutions seemed to be more concerned with the environment than business institutions, although this conclusion rests on very few observations. Another feature worth noting was that even quite small institutions located in remote regions seemed to be engaged in environmental teaching efforts.

The influence of industry, however, may be more important than this. It can be argued that the interest of students and teachers is indirectly driven by industry demand for environmental education. This at least is a more likely explanation than the alternative, which is that students and teachers promote environmental training out of pure altruism.

*Overview of study programmes in Denmark*

Institution no.	Type	Program duration	Fields	Environmental courses
1	Diploma in engineering	3 years	Mechanical, Electrical	(R) (R)
2	B.Eng.	3 years	Civil Mechanical Electrical Electronics	R + E R + E E E
3	Tech. assistant	2 years	General Environment	E R

R: Required environmental course; E: Elective environmental course; () Environment integrated in other courses

*Overview of study programmes in Finland*


Institution no.	Type	Program duration	Fields	Environmental courses
1	BSc/BEng.	3 years	Chemical Mechanical, Electrical	E E E
2	BSc/BEng.	4 years	Automation & technology Business & technology	R + E R + E
3	BSc/BEng.		Civil Electronics Mechanical Process Textile	R + E R + E R + E R + E R + E

*Overview of study programmes in Germany*

Institution no.	Type	Program duration	Fields	Environmental courses
1	BA/BSc	4 years	Economics Land management Agricultural management Business management	R + E R + E R + E E
2	BSc/BEng	4 years	Engineering	E
3	BA/BSc	4 years	Business studies	(R) + E

R: Required environmental course; E: Elective environmental course; () Environment integrated in other courses

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## Examples of training programmes for middle management trainees/students

### **Introduction**

As noted in the previous chapters, individuals who hold middle management positions come from extremely diverse backgrounds. Some have virtually no formal qualifications other than primary and secondary school, many have some engineering-related training, either in vocational form or as engineers with formal degrees. Still others have high-level scientific backgrounds at Ph.D. level and above. The individuals with the lowest formal qualifications have risen to their present positions from the shop floor, by virtue of their performance in successively more challenging jobs. In contrast, other middle managers have relied more on the school and training system for obtaining the qualifications for middle management positions.

The great variety in middle managers' backgrounds means that it is very difficult to track careers and that identification of representative examples of training programmes is not straightforward. However, based on the experience accumulated during the interviews in companies and educational institutions for the present report, three fairly representative institutions have been selected. It is important to note that, while these institutions in many cases provide basic training aimed at a management position, most students are likely to be influenced by their experiences after leaving the institution.

### **Example 1: A finnish institution**

This institution offers five very different study programmes:

- Engineering;
- Media and arts;
- Business studies;

- Environmental management;
- Teacher training.

Of these, media and arts and teacher training are assumed, a priori, not to include any elements of environmental training and education relevant for middle managers. This leaves a dedicated degree programme in environmental management, as well as general programmes in business and engineering.

The engineering programme, which also leads to an undergraduate degree, consists of five separate areas of specialisation:

- Civil engineering;
- Electronic engineering;
- Mechanical engineering;
- Process engineering;
- Textile engineering.

All students in all five programmes have a common obligatory course on environmental issues. To the extent that engineering students require additional environmental courses they can attend selected courses in the environmental management programme.

The business management degree programme offers a mainstream approach to business issues, and concludes with four areas of specialisation:

- Business administration
- Marketing and communication
- Real estate management
- International trade

The undergraduate degree programme does not include any obligatory or optional environmental courses. However, since a dedicated environmental management degree programme is available (see below) it is likely (though not documented) that students with a particular interest in the environment may be allowed to attend courses in the environmental management programme.

The environmental management programme itself is strongly focused on the management dimensions, while providing the tools required for students to have a broad background. The following list of components that make up the programme gives a very precise impression of the degree's content:

- General studies
- General professional studies
  - Natural sciences
  - Business and leadership



- Basics for environmental studies
  - Soil and geomorphology
  - Ecosystems
  - Global environment
  - Remote sensing and mapping
- Basics for environmental management
  - Environmental economics
  - Environmental legislation
  - Principles of zoning
  - Environmental assessment and auditing
  - Total quality and risk management
- Environmental quality monitoring
  - Computing for environmental management
  - Scientific methods
  - Environmental chemistry
  - Environmental physics
  - Ecotoxicology
- Basics for environmental protection
  - Basics for environmental technology
  - Industrial processes
- Advanced professional studies
  - Environmental technology (8 courses)
  - Business and the environment (5 courses)
  - Nature conservation

Teaching methods included lectures, group work and external projects, while teaching materials included books, lectures, standards, videos, etc.

### **Example 2: A german institution**

The second example is a management-oriented institution with some 2200 students and around 50 professors. A total of four study programmes are offered at the practice-oriented undergraduate level. The programmes last four years, but this includes two periods in which students are trainees in companies and organisations outside the institution.

- Business Management
- Economics
- Agricultural Production Management
- Land Management and Planning

These four programmes can then be further enhanced by addition of one of the following extensions. However, these programmes are also open to other students with appropriate backgrounds.

- Environmental Management
- International Business Relations

The environmental content of the four basic programmes varies considerably:

**Business Management** is the only one of the programmes which excludes environmental topics completely.

**Economics** is a programme with a clear public service orientation (in contrast to business management above), but also an area where several environmental courses are present. Environmental economics is obligatory, whereas corporate environmental management is optional.

**Agricultural Production Management** contains a different type of environmental training. First of all, the close relationship with natural growth processes requires an understanding of soils and soil ecology. The programme then goes on to deal with operational issues, such as management of farmland, and includes, as a part of the course in agricultural production, issues related to ecological food production. The separate course on farmland management covers landscape ecology as a central topic.

**Land Management and Planning** is the fourth main programme available at this institution. The introductory courses do not contain any environment-related topics. In the main part of the programme, a course called "ecological foundations" stands alongside landscape planning and land-use management.

In addition to these basic four year programmes, the institution also offers the two continuing education programmes noted above. Only one, environmental management, has any significant environmental content.

The environmental protection advanced programme is a joint project between the institution described here, and three others, which are mainly technical institutions. This technical focus is also indicated by the fact that the programme is mainly described for people with a background in engineering or the natural sciences.

Apart from a general diploma in environmental protection, students can, depending on the content of their specific study programme, obtain special supplementary documentation or diplomas for their area of specialisation. Five different areas are available:





- Radiation Protection
- Emissions Control
- Water Protection
- Noise Protection
- Waste Management

The institution represents an example of a high-level practice-oriented programme dedicated to environmental management, with some attempt to integrate environmental dimensions in the main undergraduate programmes. However, major omissions remain in some of the programmes (notably business management).

This may to some extent have been rectified very recently as a result of student action. Pressure from students, both on the institution itself and on the political system allocating its budget, has resulted in the appointment of a professor in environmental management and the development of a broader range of environmental options, even for the business management students.

Teaching methods included lectures, group work and external projects, while teaching materials included books, lectures, standards, videos, etc.

### **Example 3: A danish instituion**

This college offers four engineering programmes leading to the degree of Bachelor of Science (Engineering) in one of the following areas:

- Civil engineering
- Mechanical engineering
- Electrical engineering
- Electronic and computer engineering.

#### *Civil and mechanical engineering*

The environmental content of these programmes varies considerably. In civil engineering, the environment is introduced as early as the first semester. This is an obligatory course which is both general and wide-ranging. Key topics covered in this course include:

- Working environment
- Health and safety in the workplace
- Materials balances - input/output
- Environmental integration technologies.

In addition to the basic introductory course in the environment, the obligatory programme also includes three other courses with an environmental content:

- Management of problems in the working environment
- Resources
- Energy Systems

As part of a course on management of construction processes and sites, the course on the working environment mainly reflects the fact that the majority of work-related environmental problems encountered by civil engineers are associated with the construction process rather than with the subsequent use of the finished structures. The last two of the obligatory courses are only marginally related to the environment, but they are either indirectly generated by, or potentially useful for this area.

The civil engineering programme also includes a series of environment-related electives:

- Environmental management of water
- Energy systems management
- Solid waste management and groundwater protection
- Water purification
- Chemistry
- Environmental Chemistry
- Technical and workplace hygiene


The combination of obligatory courses and electives means that a very dedicated environmental engineering profile can be obtained by the student if desired.

The mechanical engineering option is significantly different in terms of its obligatory courses. Health and safety at the workplace is the only concession to the environment. However, this is to some extent compensated by the possibility of specialising in either the environment or energy. These options involve the same offering of electives as for civil engineers.

#### *Electrical and Electronic and Computer engineering*

In contrast to civil and mechanical engineering, the two other options seem virtually unaffected by the wave of environmental awareness that has swept across many educational institutions. There are no indications that the environment plays a role in any course. Until recently a basic environmental course, such as that described for civil and mechanical engineering, was part of a basic introductory year of study common to all four specialisations. When each specialisation became autonomous study programmes, the previously obligatory engineering component was immediately eliminated for electrical and electronic engineering students.

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## Conclusions and possibilities for future action

### **The present role and contribution of middle managers**

A low emphasis on LCA may be a result of the well established nature of many of the products manufactured by the respondent companies. Alternatively, the low knowledge of LCAs may indicate that such assessments are not being carried out in the respondent's area of the firm, or that there might be problems in integrating all environmental initiatives within the same company.

The desire and ability to redesign products may sometimes be based on specific life cycle analyses, but may also be the outcome of a less formal and qualitative examination of life cycle impacts. In this area of goals, the difference between engaging in well-publicised LCA exercises and the implementation of redesign efforts with significant environmental improvements as a result are two very different things.

The most interesting aspect of these "green" goals is that they were observed in companies that had not originally been distinguished by environmental concern. This may be significant, in the sense that not all of the companies interviewed were initially conceived on a "green" foundation. Thus, the focus on being green represents a significant shift in corporate values.

Whether this is an accurate reflection of reality is, however, questionable. While there may be a relative absence of interdepartmental conflicts at the moment, it may be argued that the level of conflicts may increase if and when the more easily accomplished environmental improvements have been made.

This view is important, since it reflects the fact that, in these industries, much of the environmental improvement must be obtained through the design and construction of capital

assets, rather than through managers (and workers) being or becoming highly trained in environmental disciplines.

### **Educational institutions and provision of environmental training and education**

The relative absence of environmental content in production- and management-oriented study programmes suggests that institutions have concentrated most of their efforts on specialist environmental management training while to some extent neglecting the more general study programmes.

A cynical view of this might be that it is easier to preach to the converted than it is to integrate an environmental dimension into all of the traditional management and engineering disciplines. Alternatively, this situation offers a new set of opportunities for career development. A pragmatic view, however, suggests that the inclusion of the environment in many traditional disciplines cannot simply happen by addition. Instead, complete redesign of the programme in question is required. Unfortunately, many teachers may not find such redesign worth their while, due to, for example, lack of time and money, lack of interest beyond their traditional area of teaching.

### **Overall conclusions**

It has been found throughout this study that the middle managers tend to play a critical role in the realisation of corporate environmental policies and strategies. This role is related to the implementation and adoption of corporate environmental initiatives, as middle managers are closest to front-line operations, i.e. where environmental impacts actually occur. However, this critical role is complicated by frequent conflicts of interest and needs, which are constantly channelled up and down the organisational hierarchy.

#### *Environmental management at the middle management level*

Based on the interviews in the companies, the following main conclusions can be drawn:

With respect to corporate environmental management at the middle management level, the key findings from this study can be summarised as follows:

- Few companies had adopted a cleaner technology approach in their overall approach to environmental problems, for example in the form of design for the environment or substitution of environmentally problematic materials and substances;
- Signs of the latter included a few scattered attempts at closing material cycles;
- Companies involved in primary resource processing tend to invest most effort in recycling and loop-closing;
- The majority of visited companies, although sometimes ahead of existing regulations, were still 'trapped' in a traditional end-of-pipe orientation, engaging mainly in mitigation approaches rather than focusing on preventive strategies;
- A growing acceptance of the 'necessity' of being environmentally certified according to one of the available standards (primarily EMAS), although there was some criticism and reservations about the related costs and bureaucracy;

- EMAS was generally perceived as the environmentally most advanced system of certification, although several respondents pointed out that it will become increasingly important to have one internationally harmonised system (as markets are seldom restricted to the EU but are increasingly global in nature);
- Previously identified trends (from TEM 1 and 2) with respect to the relative importance of different stakeholders seem to have increased, as customer and peer pressure are increasingly seen as more important drivers than regulation;
- The longer the corporate environmental 'history' and environmental regulation of the company visited, the more it seemed to favour environmental certification;
- Surprisingly, LCA was a practice which was rarely adopted or integrated into existing corporate environmental management systems;
- Common to most environmental management systems in the companies visited was a strong tendency to focus on identifying key processes and procedures responsible for environmental impacts;
- Many middle managers found that previous experiences from ISO9000 were useful when implementing environmental certification schemes;
- Personal liability for impacts created by environmental damage (as is the case in Germany) tended to cause some degree of hesitancy towards the use of environmental management systems;
- None of the companies visited had any incentive scheme for rewarding environmental excellence among middle managers;
- A general reservation towards incentive schemes among the middle managers was identified (many believed that such systems could not be designed in a just way);
- Corporate greening in the individual firm was generally not found to cause new disputes or interdepartmental conflicts, and some reported a positive opposite effect;
- The professional profile of the respondents varied considerably, from 'self-made' managers to highly trained managers with a Ph.D. degree;
- Most respondents did not find any internal resistance to, or a lack of resources for, specific environmental training; and
- Many middle managers have participated in internal cross-functional environmental-management-related courses, often in close collaboration with local educational institutions.

### *Skills in demand (as perceived by middle managers)*

The key findings of the study with respect to skills in demand can be summarised as follows:

- The balancing of often conflicting goals of short-term pay-back efficiency with more long-term environmental efficiency led many respondents to call for a more managerial economics orientation in environmental management skills to support their existing technical skills;
- Many respondents found themselves poorly equipped to keep a full overview of all associated implications related to environmental impact assessments;

- Workable tools to assist middle managers assess the relative costs and benefits associated with environmental improvement projects; and
- Most of the interviewed middle managers found their main educational background insufficient when confronted by environmental problems.

In general, the middle managers interviewed were well aware of their role in relation to implementing corporate environmental policy. They felt that top management above them as well as shopfloor employees below them had a positive attitude towards the environment. However, they often felt as though they were caught between the devil and the deep blue sea. Top management tended to underestimate the time and resources required to realise environmental goals and policies, and often change their expectations of management performance without at the same time adjusting their performance evaluation schemes accordingly. At the other end, front (operational) personnel often tended (with good reason) to be more immediately concerned about the internal working environment.

Generally speaking, middle managers had a slightly higher degree of awareness of corporate environmental policies and goals than skilled workers and certain categories of lower managers, as described in TEM 2.

#### *Educational institutions*

The key findings of the study as regards the provision of middle management education can be summarised as follows:

- In general, most training and educational courses at the interviewed institutions were offered as elective courses at the latter stage of an undergraduate programme;
- Environmental subjects are generally not taught as part of existing compulsory courses in the different programmes;
- Environmental courses generally focused on practical and operational tools such as EMSs, LCAs, environmental accounting and auditing;
- The relative importance of environmental courses and subjects as perceived by the respondents varied greatly;
- The teaching approach used at the interviewed institutions included traditional lectures, project work and assignments, and project work in direct collaboration with companies;
- Some respondents mentioned the important problem that it was often difficult to find enough companies willing to welcome student projects;
- Cost considerations were found to be the main reason for the relative dominance of the lecture approach to teaching;
- More guest speakers from industry was generally found to partly compensate for the shortcomings of the lecture approach;
- Relevant teaching materials were not felt to cause the same problem as in the case of providers of vocational environmental training;
- Frequently used sources included the formal description and specification of EMS (e.g. EMAS and ISO14000 series);



- A multiplicity of different factors were found to drive the continued greening of educational institutions, varying from industry, staff and students, to other stakeholders, e.g. the local community, environmental regulators and the media;
- Industry was increasingly found to call for more 'tailor-made' products, e.g. training courses specifically designed for the individual company;
- Many respondents stressed the importance of internal environmental 'champions' as key agents of change;
- Several institutional respondents stressed the perceived need for having a group of specialists covering environmental issues at the institutions, as they did not believe that it was realistic to assume that the other teachers could keep abreast with more than their traditional core competences; and
- The most frequently cited barrier to the continued greening of educational institutions for middle managers was lack of resources - resources for new initiatives had to be taken from existing courses.

Generally, there was a similar strong underlining of the relative importance of an internal environmental champion to promote the necessary changes, and similar institutional barriers, e.g. lack of resources, traditional specialisation focus in existing programmes, lack of willingness to learn new skills among teachers, which worked as a brake on this development, as in the previous studies.

### **Future Action and Research Needs**

Apart from the problems described above, this study did not identify any significant financial or HRM-related constraints on middle managers' attempts to respond to environmental challenges. Middle managers in industry tend not to be met by significant financial constraints when they ask for additional training. As in the previous studies, industry still has to bear a large part of the responsibility and burden for updating the workforce with adequate environmental-management-related skills itself. However, an apparent lack of capacity or willingness to integrate corporate environmental policies with other important corporate policies, including HRM-strategies, tends to hinder the full exploitation of corporate investments in new environment-related practices and training initiatives. As in the previous studies, there is still a surprisingly limited knowledge below corporate management level of corporate environmental policies and goals, even though many employees are genuinely interested in a range of environmental issues.

Despite the time which has passed since TEM 1 was launched in 1993 and the completion of this study in 1997, it has been somewhat surprising to find how little has actually changed. Most notably, more institutions have adopted similar add-on electives addressing environmental issues. As we near the end of this study, there are quite strong indications that providers of training and education still lag behind the needs and expectations of those middle managers at various organisational departments who have to address environment-related issues on an everyday basis.

This is a serious problem, and one which needs further clarification. As argued in previous reports from this study (see Ulhøi et al., 1996), educational institutions cannot justify a satisfactory degree

of legitimacy if they cannot deliver the products which their customers demand. With respect to educational institutions aiming at offering skills important for future middle managers, it is vital that such skills adequately reflect what is demanded by industry.

The continuous improvement of training programmes is not only a responsibility of the individual institution and the individual teacher. Change takes time and resources. More hands-on teaching requires a closer partnership between the educational institution and the firm, where both parties are willing to invest the time and energy needed. Industry and providers of management and operations education bear joint responsibility for this.

Other barriers relate to existing institutional culture, which manifests itself in a lack of willingness or capacity to develop new initiatives. As in the previous studies (TEM 1 and TEM 2), there are still many educators who seem to resist changes that affect their areas of specialisation. Unlike their scientific counterparts at universities, there tend to be more similarities between the providers of management education for middle managers and their colleagues at vocational institutions. Both groups seem to have some degree of inherent resistance towards change in general, and both groups tend to suffer most from budgetary constraints. As suggested in the previous study (TEM 2, on the providers of vocational training), this problem may also in part be overcome by training the trainers on a regular basis, along with a re-evaluation of existing programmes and budgets, and by implementing incentives that reward such behaviour and penalties to those who tend to ignore the need to make their courses more green. The emergence of continuous evaluation in some EU countries can be seen as an important step in this direction.

It was argued in the two previous studies that it seems reasonable to consider whether or not there is a case for a joint approach to making educational institutions in the EU who target middle managers more green in ways that apply to all their students. Apart from traditional precautions related to differences in local cultures, the following suggestions can be made. In line with the TEM 2 report, it is difficult to see any sound argument that goes against a 'harmonised approach', at least in some areas. In fact it may actually solve some of the budgetary problems identified in this study, e.g. if joint materials and course descriptions were available on the Internet (at the individual institutions' homepage), institutions would not have to 'slice the same bread time and again'. This would leave the strongly requested extra time for teaching improvements.

Arguments in favour of a joint strategy are the same as for TEM 2:

It offers cost-effectiveness;

- It may enable the institutions which are under the greatest financial pressure to become more green after all;
- It may give individual institutions and educators more time to develop their teaching approaches; and
- It will improve the possibilities for implementing similar corporate environmental standards at the same pace as the harmonisation of the skills taught at institutions for middle managers.





Before attempting to realise a harmonised strategy, more needs to be known about:

- The specific content of such a design;
- The limitations of a harmonised approach with regard to local culture, industry boundaries, etc.;
- How it can most effectively be adopted at institutions throughout the Union (in relation to rewards and penalty systems); and
- Statistical needs preventing an overview and monitoring of the environment-related educational situation.



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## References

COM (1992a) 23/III. *"Miljøsituationen i det Europæiske Fællesskab"*, catalogue number CB-CO-92-151-DA-C, Kommissionen for de Europæiske Fællesskaber, Office for the Official Publications of the European Communities, Luxembourg.


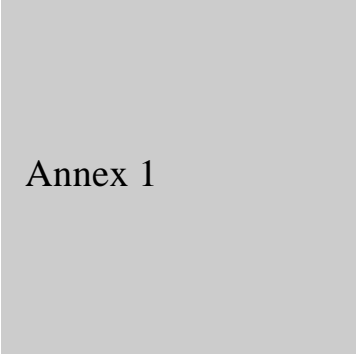
Meadows, D.H., Meadows D.L., Randers, J., Behrens III, W.W. *The Limits To Growth*. N.Y.: University Books.

Ulhøi, John P., Madsen, Henning & Rikhardsson, Pall M. (1996). *Training in Environmental Mangement - Industry and Sustainability. Part 1 - Corporate Environmental and Resource Management and Educational Requirements*. European Foundation for the Improvement of Living and Working Conditions, Dublin

Ulhøi, John P., Madsen, Henning & Villadsen, Susanne (1997). *Training in Environmental Mangement - Industry and Sustainability. Part 2 - The Role and Requirements of Categories of Lower Management and Workers*. European Foundation for the Improvement of Living and Working Conditions, Dublin

WCED (World Commission on Environment and Development (1987). *Our Common Future*. Oxford: Oxford University Press.

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Annex 1



Detailed methodology

### **Objectives of the data collection**

The overall objective of the data collection was to identify leading management and engineering training institutions and companies as regards environmental performance, both to reveal the present state of the art and to compare the intentions of management and engineering training institutions with the requirements of business organisations. The data collection part of the project was designed with this in mind.

### **Structure of the data collection**

The data collection method was designed in accordance with the overall approach of the TEM 1 study (Ulhøi et al., 1996). In order to identify state-of-the-art management and engineering institutions and relevant companies with respect to environmental activities, the data collection was divided into three phases.

#### *Phase 1*

In Phase 1, selected resource persons, especially those at management and engineering institutions who could indicate institutions and companies which were leading in areas of environmental awareness and training activities, were identified and contacted.

The selection of resource persons was based on existing personal research networks, a survey of participants at recent conferences and workshops, a survey of authors of relevant literature, and organisations and government agencies concerned with managerial training, and the environment. In this phase, relevant information collected, but not used, during the TEM 1 and TEM 2 study was included whenever possible and appropriate. This resulted in 285 names in 15 European countries.

### *Phase 2*

This resulted in a collection of material about 80 companies and 44 educational institutions. This material was further expanded for the TEM3 project with information about 13 additional companies and 9 educational institutions.

To begin with, available written material was collected from companies on environmental activities in general and environmental training activities in particular, and from training institutions students in management and engineering areas regarding their educational programmes, curricula, and other training initiatives, including environmental subjects. This material was later analysed (see below).

Given the experiences from TEM 1 and TEM 2, a similar selective approach was adopted in the present report which concentrates on a smaller number of institutions and companies.

Denmark, Finland and Germany were selected for this part of the study, for (among others) the following reasons:

- the TEM 1 study showed that Denmark and Germany have a long history of environmental protection and legislation;
- it also revealed that environmental management training differed somewhat in the two countries;
- preliminary investigations showed that Germany and Denmark were among the most environmentally progressive countries as regards vocational activities.
- Finland in many ways fitted the descriptions and was included as the representative of recent new EU members.

From the list drawn up in phase 1, 9 educational institutions and 13 companies in Germany, Finland and Denmark were selected and invited to participate in the study. This formed the sample for phase 2, in which the subsequent in-depth, semi-structured personal interviews were carried out.

It is important to note that this is not meant to be a representative sample, from which generalisations about European industry and educational institutions can be made. The sole intention is to find and describe typical examples of the state of the art in industrial environmental management and business environmental education and related trends.

### *Phase 3*

Since the collected material and employee interviews only gives a first impression of how employees see the environmental situation of their own company, how their job influences the environment, how they obtain environmental information, how they improve their basic education through courses, etc., and their attitude to environmental matters in general, it was decided to carry out a more general survey.



Due to various budgetary and other practical constraints, it was decided to carry out a structured questionnaire survey of 990 Danish middle managers who are members of the Danish Association of Managers and Executives. The questionnaire was based on the interview guide developed for the manager interviews at the companies visited.

### Data collection

#### *The data collection method*

In order to provide a broad overview of the situation in EU countries, information was collected from a survey of the literature, available documentary materials (which were generally of a limited and varied nature), and consultations with key persons from industry and management and engineering training institutes.

In view of the environmental situation in companies and management and engineering training institutions, the data collection method had to be flexible enough to allow the researchers to follow interesting leads and issues. On the other hand, some level of standardisation was also needed. This was achieved by a combination of a content analysis of the material received and personal semi-structured interviews. This involved designing both a registration form for the material analysis and (based on the former) interview guides for the interviews.

#### *Developing tools for data collection and data analysis*

The material analysis framework had to take account of differences in the information published by management and engineering training institutions, as well as differences within the category of middle managers. However, companies tend to disclose specific information about their environmental activities and initiatives for internal use only, and this is regarded as strictly confidential. Management and engineering training institutions, on the other hand, publish descriptions of environment-related educational initiatives primarily for students and lecturers. The main aim, therefore, to the extent it has been possible, was to evaluate the content and form of the information in the case of companies, and record the characteristics of teaching and research activities in the case of institutions.

The company material analysis was based on the same registration form used in TEM 1, since it includes a special section on internal training activities, etc.

A second registration form was developed to analyse the environmental training activities of educational institutions. As regards teaching, the aim is to clarify the main characteristics of environmental educational initiatives at the institution in question. Teaching initiatives are described for a number of parameters, including the type of educational activities, educational approaches, and the materials used. This results in a register of environmental management courses and educational approaches.

The main aim of the interviews in the companies was to provide an understanding of how increasing corporate environmental concern, as reflected in training needs and requirements, was

perceived/experienced at the middle management level. The interview thus both supplemented - and was supplemented by - the material analysis. Accordingly, the interview guide was divided into 8 subject areas, based partly on the structure used for the material analysis, including knowledge of the environmental consequences of their job, special training activities, knowledge of the company's environmental policy, and attitudes to environmental matters in general.

Interviews were generally carried out by two interviewers (a senior researcher and an assistant), using a tape recorder and field notes. One interviewer concentrated on asking the questions and guiding the interview, while the other took notes and asked occasional supplementary questions. At the end of the interview round, the field notes and tapes were transcribed while the interviews were still fresh in the minds of the interviewers. The tapes were then listened to again in order to catch any vital information that might have been missed the first time and to correct any misinterpretations. Compared with "standard" methods, in which interviews are typically carried out by students or other third parties and the transcripts typed by secretaries, this "dual" approach not only increases the validity and reliability of the data, but also optimises the time available. It should be noted that the method used in transcribing the tapes is not "ad verbatim", but transcription by issue, i.e. the respondent's answer to a specific question is registered in shortened form, and not necessarily in the respondent's own words. However, the precise meaning and context of the responses are the same.

As with the material analysis, the interview guide for management and engineering training institutions was divided into environmental-management-related teaching activities, including subjects covered, teaching methods, as well as drivers and barriers.

The interviews with key representatives from the management and engineering training institutions in Germany (3 interviews), Finland (3 interviews) and Denmark (3 interviews) were carried out as taped telephone interviews.

### **Data analysis**

The collected data consisted of annual reports, environmental reports, internal confidential documents, course descriptions, press materials, leaflets, booklets, books, folders, etc. Two reports were written, one for companies and one for educational institutions. These are based on a synthesis of all information about a given company or institution. In-depth analysis of selected companies and institutions supplements the general reports.

The information obtained from the questionnaire survey was analysed using the SPSS statistical program.

Based on an analysis and synthesis of the findings of the previous stages, the final stage of the study involved identifying and assessing the problems and potentials associated with, and discrepancies between, environmentally leading operational practices and middle management training needs and requirements.



In reading this report, the following should be kept in mind:

- All information mentioned in this report has been collected during the project period 1994-97;
- there is an ongoing development of existing training and education as well as management practices and initiatives;
- all participants have been guaranteed full confidentiality - thus no specific information in the report can be linked to either an individual company or educational institution;
- it is the general policy of the research team not to rank countries, companies or educational institutions according to environmental performance.



## Annex 2

## Definition of key concepts

### **Introduction**

This annex defines some key concepts related to training and education. The definitions are based on the way the terms are used in the report, and they do not purport to have much wider applicability.

### **Education**

This concept is used to signify the process of education an individual goes through early in life. In this sense it can be applied to the seven or eight years of school which someone with minimal education typically possesses before they start their working life. Similarly, it can apply to the twenty or so years it takes from the first grade in a primary school to the completion of a doctoral dissertation.

### **Educational institutions**

As a consequence of the previous definition, educational institutions range from primary schools over vocational training and high schools to a variety of higher level institutions such as engineering and technical colleges, schools of commerce and, at the highest level, universities and similar institutions. There is often a clear progression, in terms of the higher level institutions open to graduates from lower levels; for example, transfer from a vocational school to university is fairly difficult compared to transfer from a higher secondary school (grammar school 'gymnasium', 'lycée', etc.), which typically has a more academic orientation. It is important to note, however, that some educational institutions are also providers of training of different forms.





### **Training**

The second key concept used in this report is training. In broad terms training refers to all knowledge-increasing activities undertaken by a individual after completion of an education, regardless of its length. Training involves a much broader range of activities than education, which is commonly built on teaching in classes. Class teaching is but one of many training activities, which can include individual training (coaching), exercises, working in teams, "on the job" training (learning by doing), and distance learning based on modern information technology.

### **Training institutions**

The providers of training are a far more heterogenous group than the educational institutions. Given the variety of activities which fall under the definition of training, provision is also diverse. Three main groups can be identified: Educational institutions, as noted above, private firms specialized in training courses, and internal training providers (training and development departments in organizations).

European Foundation for the Improvement of Living and Working Conditions.

**Training in environmental management - Industry and sustainability**  
**Part 3 - The role and requirements of categories of middle management**

2001 – 60 pages – 21 x 29,7 cm