Environmental Management Systems and Certification

Philipp Weiß and Jörg Bentlage

Book 4 in a series on Environmental Management

The Baltic University

Environmental Management

book series

1. Environmental Policy – Legal and Economic Instruments
2. Cleaner Production – Technologies and Tools for Resource Efficient Production
3. Product Design and Life Cycle Assessment
4. Environmental Management Systems and Certification

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All four books in the Baltic University environmental management series are printed by Nina Tryckeri (Nina Printhouse), Uppsala, Sweden. Nina Printhouse introduced an environmental management system and became certified in accordance with the ISO 14001 standard in December 2005 as part of the preparation for the production of these books. The process is described on page 251 as well as in a film on the accompanying CD.
http://www.ninatryckeri.se

Introduce your own environmental management system
Users of the book are encouraged to introduce at least a simple environmental management system as part of their education. A short instruction for how to do this is available on the Baltic University website: http://www.balticuniv.uu.se/ under the menu: Courses/Environmental Management.

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Preface

Why Read this Book?

Environmental management has been, is today and will even in the future be an important issue. This applies not only to the industrialised countries of the world but ever more also to the transition countries around the Baltic Sea. This book deals with Environmental Management Systems (EMSs), and aims to explain everything from the theory behind them to actually implementing one and beyond. The ISO (International Organisation for Standardisation) 14001 standard and the European Union Eco-Management and Audit Scheme (EMAS) are closely examined. Basic information and examples are included that make it possible to determine whether or not it is appropriate for an organisation to implement an EMS, and if so, the value of the EMS.

A method of self-assessing the status of an EMS is provided, and the basic steps for implementing an EMS are explained, as well as the purposes of and techniques and tools for every step. The tools covered are:

- Environmental policies.
- Environmental auditing.
- Eco-balances.
- Environmental reporting.

Most of this course book deals with the systematic management work included in EMAS, a regulation of the European Union for EMS, and the ISO 14001 EMS standard. The course book is designed to give an introduction of how to introduce an EMS according to these standards.

As organisations differ greatly, this book attempts to, on the one hand be specific enough to provide the tools needed to set up and implement an EMS, and on the other hand general enough to allow the flexibility for addressing unique characteristics.

The book provides step-by-step procedures, sample documents or templates, and practical help for developing and implementing an EMS that is appropriate to most organisations and their operations. It is intended to be a guidance document and not a rigid instruction book.

This book does not aim to cover every aspect of environmental management in exhaustive detail. To do so would make it much thicker and would probably ensure that no one would read it! Instead it aims to provide solid instruction about the various environmental management tools presented. It also provides sources of additional information.

The chapters in this book have been written in "stand-alone" therefore the book does not have to be read from start to finish. However, if you are new to EMS it is suggested that you read them in order as this will provide a systematic introduction.

The purpose of this course book is to spread knowledge of environmental management in the Baltic Sea region, which will be very useful for future cooperation with other parts of Europe. The main target group of the course are MSc level students as well as professionals who need to or want to acquire knowledge on environmental management.

How this Book Fits into the overall Course

This course is one of four courses on environmental management. This course material is made up of three parts:

- Main part: All you need to know about EMS.
- Part A: Tools and Exercises.
- Part B: Case Studies.

The main part is made up of nine chapters that explain, step by step, how to design an EMS. In each chapter there are references to the tools and case studies. With these you can check your knowledge and practice what you have learned. At the

beginning of each chapter there is a box with a short description of the contents.

Part A is made up of about 60 tools. Each tool has a short explanation, and it is not necessary to read the entire course book to be able to use the tools. They can be used to practice what has been learned, or in "real life" when trying to implement an EMS.

Part B describes how some organisations fared when they tried to implement an EMS. This part should give more insight into how, what has been read, is used in reality. There will also be the chance to use the tools together with the case studies to "implement" an EMS in a virtual company.

This book follows roughly the EMS outline set by both EMAS and ISO 14001, but goes beyond these in many places. The following table displays which EMS elements are addressed in each chapter. Chapters 1 and 4 provide much information on commitment and policy. In these, as well as chapter 3, there is also information on planning an EMS. Here, a great variety of tools on this matter are also provided. Finally, chapters 5 and 7 deal with the implementation, evaluation and review of EMS.

IS0 14001 EMS Components	Chapters
Commitment and Policy	1, 4
Planning	1, 3, 4
Implementation	5, 7
Evaluation	3, 5, 7
Review	5, 7

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We would like to improve and update the book in future editions. All comments, large or small, will be much appreciated and will be incorporated into changes we will make.

Please send your comments to: weiss@beracon.de

Köln, November 21, 2005
Philipp Weiss and Jörg Bentlage

Introduction

Introducing the Logic of Environmental Management Systems

Management is most often connected with economy and running a company. But it is not at all limited to that. It could in principle apply to any activity or unit, from the individual to the world, and in fact any process that could be steered in some way.

To run a management system is just to get organised.

In economy the idea of a management system is basic. This may due to the fact that chaos – the opposite of being organised – in this case may be quite costly. If you do not know which your costs are, and when to pay them, it will have consequences. For a person and the personal economy the costs may not be large, but for a company they may be. Here the economic operations are larger and costs higher. No company can afford not to have a proper economic management.

Today we need to recognise that the same can be said about the environment. No company can afford not to have a proper environmental management. Resources are too scarce and expensive. Emissions are already, or on their way to be, very tightly controlled and connected to fees and taxes.

Environmental Management on the Personal Scale

Environmental management on a personal scale can be used as an example. This would include keeping track of e.g. electricity consumption, as well as electricity bills and heating costs and find out if they can be lowered. Perhaps it is possible to change to low energy lamps e.g. or be more careful to turn off the lamp in the bathroom, when no one is there.

Personal environmental management may also involve water use, and more importantly the warm water use, and see if that is too high or under control. Leaking faucets, unreasonable amounts of warm water for laundry, etc would be things you should check.

In a normal western family there may be quite much to be gained from this. In a school in the city of Nacka (just south of Stockholm) the teacher suggested that the 10-12 year old kids should offer their parents to let them be responsible for energy management in the family. In return they should receive half of the money that they could save. Many families agreed to this. After a year many kids (for Christmas!) could count about 500 Swedish Crowns (50 Euro).

Stepping up

In situations where the personal involvement is less direct, there may be even more to be done. In the city hall in Uppsala, Sweden, costs could be lowered about 150,000 SEK in a year when inside temperatures were fine tuned, the pumping system for warm water was renovated, and lamps were exchanged.

On a Personal Scale. *One way to lower electricity bills can be to invest in more energy efficient appliances. © European Communities, 1995-2005.*

In general it is not difficult to reduce energy use up to 25% in the housing sector without investing in new technologies However, it looks like these possibilities will not be used much as long as energy costs are low, but it is on its way, as costs for fossils are increasing.

Is Environmental Management Complex?

Environmental management is different from economic management in the sense that it may have many more items to keep track of. In fact there may be hundreds of them. The most important ones include resources, such as energy and water, emissions and wastes, and the various pollutants, which may be emitted during the process the organisation runs or is involved in.

(Of course also economic management may be quite complex. There are not only salaries and invoices, but also shares, obligations, ownerships, loans, etc. so the difference is perhaps not that large).

It is clear from the cases described in the end of the book, that also in situations where hundreds of "aspects" – potential dangers – were identified they are grouped to categories and managed together.

Management Systems Standards

Management system refers to the organisation's structure for managing its processes – or activities – that transform inputs of resources into a product or service.

The standards for management systems were introduced by ISO, the International Organisation for Standardization, in 1987. This was a new type of standard. The previous standards were used for physical objects or processes. The management standards have become a global success. From a slow beginning the introduction of the systems is now fast. The ISO 14001 standards for environmental management systems and the ISO 9001 for quality management systems are by far the best known. In 2005 almost 800,000 companies or other organisations in 154 countries have been certified according to these standards, and numbers are increasing all the time. The growth of certificates from 2003 to 2004 was 35%. In Sweden alone today 3478 ISO 14001 certificates at the end of 2004 places the country in top with a record number of certificates per capita or GDP. To this should be added all those who use other, often less comprehensive, standards.

The vast majority of standards are highly specific to a particular product, material, or process. However, the management standards are generic. This means that the same standards can be applied to any organisation, large or small, whatever its product or service in any sector or whether it is a business enterprise, a public administration, or a governmental department. This is a main reason why they have been so successful.

Is Environmental Management Costly?

It seems obvious that careful environmental management as described should be profitable in economic terms. Still one of the main arguments against environmental management is that it is costly. Of course a lengthy work with documentation, education and training, and involvement of consultants may be expensive.

The case studies in the end of this book have a different message. Many of those cited find that it pays off. The municipality of Nacka (in Sweden), which worked three years with introducing an integrated management system, is already judging it to be profitable. The Chestochowa Steelworks (in Poland) environmental manager says that it is "better to invest in people than waste", referring to the relatively limited costs of training and resulting much-reduced fees for pollution.

It is doubtful if the management systems should have been such a success if they had not been good business. Even the very best idea will be turned down in a business environment if it costs more than you profit.

Expanding the Management to Quality and Work Safety

Management is in many ways one task; it is not a good idea to divide it into many different unconnected jobs. That is why recently the introduction of a environmental management system typically is integrated with other types of management of an organisation or a company.

Today more often than not quality management, certified in the ISO system by standard ISO 9000, is introduced together with environmental management. Equally often management of the health and safety aspects – sometimes according to ISO standard ISO 18000 series – is included. This is called Integrated Management System or IMS, or total quality management TQM. It should be obvious that a good environment and work safety is part of the quality of an operation.

Social Responsibility

The phrase Corporate Social Responsibility, CSR, refers to the not so well defined idea that an organisation or company has responsibility for the effect of its activity in the surrounding world. One may point out that if the outer environment is seriously degraded it is of course have negative consequences for the society and people. From that point of view environmental management is relevant for social responsibility.

CSR, however, normally refers to such things as safety, poverty, culture, or in general development. The requirements of CSR are often part of labour union programmes, human right agendas and NGO concerns. All of these may be seen as an additional not only responsibility but also cost for a compa-

ny or organisation. CSR is not as well developed or recognised as environmental management. Still it increases. It is important to say that more often than not companies, which have a well-developed CSR programme, underlines that this is good business. It is in economic terms profitable.

CSR starts to be included in the general management agenda. During 2005 the ISO organisation has started to create a first standard for social responsibility, ISO 26000. Increasingly often we see that the TQM approach includes the social responsibility as one component. It is on its way to be included in the main stream.

A Total Management System

When environmental concerns are joined with concerns for the work environment, the quality and social responsibility we only need economy to be fully integrated. Economic management is already there. It does not need to be invented, it needs to be integrated. There are endless numbers of management tools for economic management, with all kinds of indicators for keeping track of how an activity is working economically both in the short and the longer term. All these should be considered together with the other kinds of systems to make the management of an organisation or company optimal.

In fact the "management of the management systems" also needs to be worked out. Comparing scorecards is one techniques used by some to achieve this. It is a way not to forget any of the components when working with integrated systems.

What we have described is typical for the direction of the development today; it is towards more integrated systems. Another direction is to be more aware of the sustainability agenda. The general trend towards higher degree of integration will support sustainability approaches in management, as these should integrate economic, environmental and social aspects of an activity. In the end we may thus see a system for sustainability management.

We see a similar approach in the reporting from companies as well as public institutions. The GRI, Global Reporting Initiative, is perhaps the most recognised format for reporting in which economic, environmental and social aspects are all covered, that is sustainability reporting guidelines. GRI, created in 1997, today works with ISO and UNEP.

A Variety of Roads to Good Management

It is not always easy or appropriate to implement a full-scale management system. Most small companies do not do it. Most very complex operations – such as cities and regions – do not do it. For these there are other ways to deal with proper management.

Many small operations cooperate and introduce a management system together. If consultants are brought in as a common resource it is less expensive. If training is made together it is less costly per individual. Such opportunities for "management in association" is offered by e.g. chambers of commerce, branch organisations, or industrialists associations. They may very well serve the purpose asked for.

In other cases simplified systems is the more common approach. This may be most typical for public administration or cities. Even if the ISO standards are generic, and thus in principle possible to use everywhere, it may be too complicated or too costly, and the certificate may not be so relevant. We will probably see a large market in future years of management systems, just as we today have a large variety of economic management tools.

Studies and Environment

The introduction of a management system always includes an important component of education and training. In many cases all personnel in a company get basic information and training, and several – those who are responsible – very considerable education, which also is regularly updated.

The introduction of environmental management systems in fact has the potential to be a main mechanism for environmental education. If the understanding received in the work place were to be implemented at home it may be the best way to environmental improvement.

Hopefully the students, who will study this course, will have the competence needed to introduce environmental management in their future working places as well as their homes and personal lives.

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Internet Resources

ISO Management Systems

http://www.iso.org/iso/en/iso9000-14000/ims/ims.html

ISO 9000 and ISO 14000 – In breif

http://www.iso.org/iso/en/iso9000-14000/understand/inbrief.html

Global Reporting Initiative (GRI)

http://www.globalreporting.org/

1 Basics of Environmental Management Systems

1.1. The Development of Environmental Management

1.1.1. What is Environmental Management and an Environmental Management System?

Environmental management is management of an organisation's activities that have or can have an impact on the environment.

Figure 1.1 shows the evolution of environmental management since the wave of environmental awareness in the early 1960s. The figure illustrates the short history of the current concept of environmental management.

An EMS is a continuous cycle of planning, implementing, reviewing and improving the processes and actions that an organisation undertakes to meet its environmental targets and requirements. It is a system to comply with the requirements of international standards such as ISO 14001 and EMAS. The definition of an EMS used by ISO 14001 is:

"The part of the overall management system that includes organisational structures, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing achieving, reviewing and maintaining the environmental policy" [European Committee for Standardization, 1996-08-21, section 3.5].

An EMS thus manages the environmental impacts of an organisation. The expected outcome is continuous improvement in environmental management.

Due to the fact that ISO EMS standards are intended to be applicable in many or even all parts of the world, they are kept very general. Organisations that implement an EMS can thus adapt their EMS exactly to their needs. Organisations that do not have significant environmental impacts themselves may focus their EMS on the environmental performance of suppliers, while organisations with significant environmental impacts may focus on operating more environmentally friendly.

This great flexibility means that two different EMSs can not be compared, though they both have to meet the requirements set by the standard setting organisation. An outside observer must be able to understand what an EMS is trying to achieve. Certification of an EMS means that the organisational

Main Contents of this Chapter

- What an EMS is.
- Why establishing an EMS is a good investment.
- How an EMS can improve an organisation's overall performance.
- The costs of an EMS.
- Why it will become more and more important for organisations in the Baltic Sea region to have an EMS.
- EMS and quality management.
- EMS and risk management.

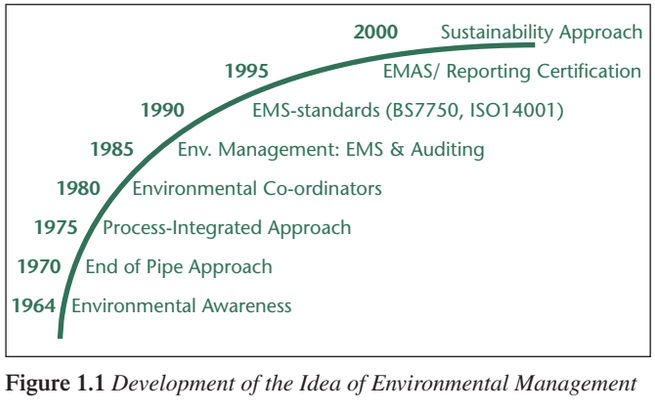


Figure 1.1 *Development of the Idea of Environmental Management [UNEP/ICC/FIDIC, 1996, p. 4 (modified)].*

structures required have been established and that the EMS is designed to achieve continuous improvement.

ISO 14001 requires organisations to commit themselves to compliance with applicable environmental legislation. As environmental legislation differs widely from country to country, there is a range in level of difficulty to achieve national environmental compliance. This is not as much a problem with EMAS as it is applied in a more homogenous economic area with the same environmental laws applicable.

1.1.2. Why Establish an EMS?

The challenge of responding to the ISO 14001 EMS standard is on the agenda of organisations in both the public and private sectors and their environmental stakeholders. Customers, governments, communities, public interest groups and others may ask for ISO 14001 or EMAS certification to ensure that the organisation's environmental responsibilities are being managed in an organised and serious way. However, developing an EMS that meets the ISO 14001 or EMAS requirements is a very ambitious undertaking, and obtaining certification of an EMS requires additional effort and cost – especially if an outside registrar audits the EMS and verifies that it meets the requirements.

Both the ISO 14001 EMS standard and EMAS only specify the structure of an EMS. The content is up to the organisation itself. The organisation decides what it wants to do, and the EMS organises the tasks necessary. Operating costs can only be reduced and environmental risks minimized if the organisation focuses the EMS on specific operational practices. The objectives for improvement are set by the organisation itself.

There are many organisations that are subject to environmental regulations without being aware of it. It can be said that basically any organisation irrespective of its size or sector which causes any kind of impact on the environment, such as the production of waste or emissions into the air, may be subject to environmental regulations.

At first glance, most organisations that are subject to environmental regulations may not seem to be so at all. However, restaurants, medical offices, auto repair companies, bakeries, supermarkets, copy shops, etc., may all be affected by environmental regulations. There are of course many variations and exemptions to environmental regulations, but often it is best to start developing an EMS as soon as possible to avoid the costs of possible non-compliance. A great problem in this context is the complexity of environmental legislation, which may confuse affected organisations. This is a problem for Eastern European countries joining the EU, as European environmental legislation is quite complex. Thus, the EMS of many organisations in Eastern Europe may have to give particular attention to maintaining compliance. This is not as costly as is often claimed. On the contrary, there may be significant benefits [Forbes, 1999].

Many people view environmental compliance as an additional cost that reduces profit. It is true that environmental compliance can be costly in the beginning. However, there is a wide variety of programmes that can be introduced to minimize this effect, e.g. waste reduction may result in significantly lowered disposal costs. In some countries, good environmental compliance gives tax breaks and exemption from certain environmental regulations. The "image" effect should also always be kept in mind. A good public image is often worth much more than the cost of compliance. Good environmental performance can be used for advertising purposes, as "green" organisations are very popular with consumers and stakeholders.

EMS consultant S. Forbes [1999] wrote that:

"There are unfounded fears which inhibit many organisations from inquiring into their regulatory status, or contacting the regulatory agency for assistance. In fact, the environmental regulatory agency usually will cooperate and assist the sincere organisation to achieve compliance, as best as they can."

Though most regulatory agencies are allowed to take action against organisations who are not in compliance, this is seldom experienced by organisations who are known to be seeking environmental compliance. According to Forbes [1999]:

"Enforcement action is generally reserved for those facilities which make no effort to comply after repeated warnings and notifications."

Briefly, an EMS is a systematic approach for an organisation to achieve environmental and other organisational goals. Since organisations of all kinds increasingly want to achieve and demonstrate sound environmental performance, an EMS can help to comply with environmental laws and regulations as well as with expectations from customers and other stakeholders. It can combine an organisation's organisational goals with its environmental goals and enable environmental obligations to be managed effectively. Furthermore, an EMS can manage potential liabilities by systematically identifying risks and avoiding environmental and financial damages.

An EMS has two core goals: pollution prevention and compliance with environmental regulations. Other ways of achieving these goals are not addressed here. Very few organisations reach these goals without using an EMS.

National Sanitation Foundation (NSF) International, a US based non-governmental organisation, wrote that if an organisation answers yes to one or more of the following questions, it can benefit from an EMS [NSF International, 2001, p. 4.]:

- Is your organisation required to comply with environmental laws and regulations?

- Are you looking for ways to improve your environmental performance?
- Is the state of your organisation's environmental affairs a significant liability?
- Does a lack of time or resources prevent your organisation from managing its environmental obligations effectively?
- Is the relationship between your organisation's environmental goals and other goals unclear?

1.1.3. Benefits of an EMS

As most organisations implementing an EMS seek monetary benefits, a main concern is always: is an EMS an investment or just a cost? The answer depends on the approach taken and on the goals set. B. Hamner, Professor at Universidad de Pacifico in, Lima, Peru and expert on cleaner production wrote [1997]:

"If the ISO EMS is focused on compliance assurance, it will be an expense for those whose major benefit will be potential liability reductions. In developing countries where recognition of the business benefits of improved environmental performance is very low, this compliance-focused approach appears to be the dominant one. If the system is focused on improved production processes and product designs, then it can significantly prevent pollution, reduce operating costs and potential liabilities, and also increase customer satisfaction and market share."

In the more industrialized countries, many organisations have come to realize that ISO 14001 can be a useful tool to move beyond compliance. In any case, the more complex an EMS grows the more expensive and time-consuming it becomes.

Some of the numerous benefits of an EMS, listed by NSF International [2001, p. 7] are:

- Improved environmental performance.
- Enhanced compliance.
- Prevention of pollution.
- Resource conservation.
- New customers/markets.
- Increased efficiency/reduced costs.
- Enhanced employee morale.
- Enhanced image with the public, regulators, lenders, investors; i.e. stakeholders.
- Employee awareness of environmental issues and responsibilities.
- Reduced liabilities.
- Competitive advantages.
- Fewer accidents.

More examples of benefits of an EMS can be found in the case studies.

1.2 The Economy of EMS

1.2.1. Does an EMS Reduce the Cost of Regulation?

An important concern is the extend to which EMSs can reduce the cost of regulation, in both macro-economic terms and the cost of compliance for each individual organisation. In many countries there is a discussion about whether or not ISO 14001 or EMAS registration can replace certain statutory reporting requirements, especially in those countries where regulatory requirements are extensive and are a burden on industry. A study by the World Bank [1998, p. 163] found that:

"It is now clear that an EMS is not a substitute for a regulatory framework, but the monitoring and reporting systems of a well managed enterprise might substitute for some of the statutory inspections, audits and reports normally required under government regulations. The issue is when and how the government can trust the capabilities and commitment of an enterprise to self-monitor its environmental performance and whether some formal EMS and certification system, such as ISO 14001, would provide the mechanism to convince the regulators that scarce government resources were better used elsewhere in pursuing less co-operative organisations."

Even though there are few studies that prove the benefits of an EMS, there are indications that a well implemented EMS almost always improves profits and resource efficiency and reduces the amount of waste and pollution produced. Other aspects that are hard to measure, such as increased organisational transparency, teamwork among the employees or employee identification, are also often a result of successful EMS implementation. It is important to be aware that implementing an EMS is a labour-intensive process and that it may not result in financial gain, though it does in most cases. Therefore, the costs involved in implementing an EMS need to be carefully examined.

1.2.2. Potential Costs of an EMS

Generally, the costs of implementation depend on the scale and nature of an organisation's environmental impacts, on the existence and stage of development of environmental management in the organisation, and on the speed at which implementation is undertaken. It is possible to distinguish between both internal and external costs caused by implementing an EMS. Internal labour costs, for both managers and other employees, are the greatest cost for most organisations [NSF International, 2001, p. 7].

External costs mainly occur during the process of implementation of an EMS and possibly also on further external coaching of the improvement process after certification. These external costs include:

- Outside staff training.
- Consultant fees.
- In-house training and specialized training costs.
- Certification costs.
- Internal manpower costs.
- Investment costs for improving environmental performance (depending on the objectives set up in an environmental management programme).

Usually the implementation of an EMS results in more benefits than costs. In any case, in order to help prevent unpleasant surprises, the potential costs of implementation need to be evaluated before the process starts.

An EMS often builds on existing production or quality management systems. When such systems are weak, ineffective or simply do not exist (which is often the case in organisations which have poor environmental performance), then there is a need to establish a better management framework before focusing on the details of the EMS.

1.3. Implementing EMS in Eastern Europe

1.3.1. Why Implement EMSs in the Baltic Sea Region?

In the wake of economic improvement in the Baltic Sea region more and more environmental laws and regulations are being established to combat pollution and improve the environment. The increasing fines and taxes on pollution and waste demand the introduction of EMSs in industry. Waste management and cleaner production are therefore main concerns of the Baltic countries, and EMSs can help.

Reduction of pollution in the Baltic Sea region also plays a major role in the process of European Union (EU) integration. The Baltic countries have to comply with strict EU regulations and directives as members of the EU. As well, since many Western organisations have implemented EMSs, certification of organisations in the Baltic Sea region is essential for extensive cooperation. (Compare case studies 1 and 2 from countries in the Baltic Sea region.)

1.3.2. Consequences for International Trade

There has been considerable discussion about the extent to which ISO 14001 certification can help developing countries to become more involved in international trade with industrialized countries. Some say ISO 14001 widens the gap between developed and developing countries, as it is mostly developed countries who support implementation of EMSs according to ISO 14001. Others say that adoption of ISO 14001 will on the contrary help developing countries gain an competitive edge [World Bank, 1998, p. 164].

In recent years there has been a shift in attitude about ISO 14001. Many major national and international organisations (e. g. the major car manufacturers in the US and Europe) now either recommend or require their suppliers to be certified according to ISO 14001.With this type of market pressure these major organisations try to promote both their reputation as well as their environmental performance. Overall world-wide environmental performance can improve as many of the elements of the ISO 14000 series of standards address product design and production process issues. These issues are areas of considerable environmental importance, though are not regulated by trade law nor other international regulations. On the other hand, these requirements of course represent a market barrier which many small organisations or companies from developing countries may not be able to overcome, due to the costs of implementation and certification of an EMS.

Morrison, et al. from the US Pacific Institute for Studies in Development, Environment, and Security [2000, p. 4] wrote:

"While the ISO 14000 series will not be mandated by international law, conformity to it may become a de facto requirement for doing business, as has happened with the ISO 9000 quality management series in some industries. The increasing number of multi-national corporations that are 'encourag-

Figure 1.2 *Map of the Baltic Sea Region.*

ing' their suppliers to become ISO 14001 certified suggests a similar trend. Small firms in developed and less developed countries may face disproportionate costs, technical hurdles, and infrastructure difficulties, precluding implementation and third-party certification to ISO 14001."

Today, it is often multinational organisations that pressure their suppliers in developing countries or countries on the threshold to being industrialized (such as Chile or many Eastern European countries), to apply environmental standards such as ISO 14001. This is being done in order to improve performance in certain business areas. The certification according to ISO 14001 is in these cases usually a long-term goal, as multinationals more and more desire cooperative long-term relationships with their suppliers.

The World Bank [1998, p. 164] found that:

"Nevertheless, even if ISO 14001 is not likely to be a contractual constraint in the foreseeable future, environmental performance is increasingly becoming a factor in commercial transactions and organisations looking to establish a presence in the international marketplace are considering whether a 'green badge' would be an advantage to them. In practice, it is often marketing concerns rather than environmental ones which drive the ISO certification process."

In the recent past there has been an increased interest in Eastern Europe in EMAS and especially ISO 14001. Many of the new and future EU member states have translated and adopted the standards (See Internet Resources: EMAS – Accession countries.) Nevertheless, there is huge pressure on many organisations to comply with environmental legislation and other requirements. Such compliance requires large investments for some out-of-date industries, and in some cases presents the opportunity to implement ISO 14001 on a wide scale. Proper planning can decrease pollution and increase production efficiency.

1.3.3. Barriers for EMS Implementation in Eastern Europe

At present there are very few EMS experts in Eastern Europe. At the same time, the need for experts who can assist organisations in the EMS implementation process is growing and most organisations in Eastern Europe cannot afford to hire experts from other EU member states or elsewhere.

Another major problem is the lack of national accreditation in Eastern European countries. The result is that certification is conducted by expensive certification bodies from the UK or Germany. Furthermore, M. Gelber [1998], noted that in Eastern Europe:

"The organisational culture is generally very hierarchical and top down. For ISO 14001 and EMAS to be efficient as value-added systems they rely on a living and open organisational structure."

Even though the level of awareness in Eastern European regulatory bodies seems to be quite low, they have been promoting ISO 14001 and EMAS. The problem seems to be with the organisations themselves as they seem to be reluctant to implement EMSs, either because they think ISO 14001 and EMAS require an unattainable level of environmental performance, or because it is too much effort to produce the necessary documentation. These fears need to be overcome to increase the extend to which EMSs are implemented.

M. Gelber [1998] wrote that:

"ISO 14001 and EMAS are based on people making use of a system's framework to steer the environmental performance of an organisation in a planned way. Human resources based efforts, such as training, awareness and communication will be a cost-efficient way for Eastern Europe to achieve a higher level of environmental performance in certain areas. Therefore, practices such as prevention of pollution will save money by avoiding the necessity of investing in end-of-pipe technology."

1.4. Principles of an EMS

What is quality? How does it relate to an EMS? Is all EMS information based on serious research? These are questions that are being asked frequently in the ever changing world of EMS. An attempt is made at answering these questions in the following section.

1.4.1. The Deming Cycle as the Main Principle of an EMS

To improve environmental management, an organisation needs to focus not only on what happens but also on why it happens. Over time, the systematic identification and correction of system deficiencies leads to better environmental and overall organisational performance.

Most EMS models (including the ISO 14001 standard, which is explained in detail later) are built on the so-called "Plan, Do, Check, Act" quality management model introduced by Deming in the US in the 1950s. This model puts great emphasis on the concept of continuous improvement.

In the following we will explain and discuss in detail the requirements of an efficient EMS according to the basic *Deming Cycle* (see Figure 1.3).

1.4.2. Total Quality Management

Most organisations apply *Total Quality Management* (TQM) principles to some of their operations and activities. An effective EMS is built on TQM concepts. TQM was mostly devel-

oped in the US, though the Japanese were the first to visualize its benefits and apply it successfully. They found that if management and employees solved problems together, everyone was committed to the solution. TQM differs from traditional quality improvement techniques in several ways. Most important is that it focuses on system problems. Statistical methods are used to find the reasons for problems, and active employee involvement is required. TQM uses new and alternative methods to improve an organisation's performance while involving all hierarchical levels of staff – from top-management to front-line workers.

Some of the many benefits of a TQM system are:

- Reduction of operating costs.
- Increase in customer satisfaction.
- Improvement of organisation morale.
- Establishment of a process of continuous improvement and business process reengineering.
- Gaining competitive advantage.
- Establishment of a base for ISO registration.

There are three core principles of quality management:

- Quality means that customer specifications are satisfied by a product or a service. Quality cannot be seen as something that is better or more expensive, it only relates to customer satisfaction.

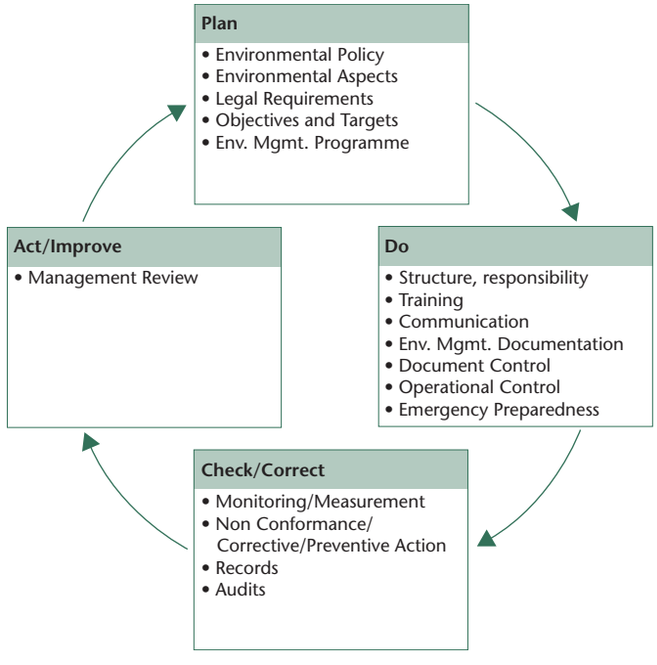


Figure 1.3 *Elements of ISO 14001 at Each Step of the Deming Quality Management Model [UNEP/ICC/FIDIC, 1996, p. 7].*

Figure 1.4 *Many industrial sites in the region are in need of better management.*

- Everything that is being produced in an organisation, whether it be a product or a service, must be defect free. Being close to that is not enough, and every employee of the organisation must be aware that their own attitude influences quality. This makes TQM both an "organisational philosophy as well as a question of individual commitment."
- Quality is measured by the price of non-quality (PONQ). PONQ is what it costs an organisation in time, money and other factors that are harder to quantify, when the organisation is not performing properly (See Internet Resources: Customer Focused Quality).

TQM is not only quality management. It involves many more issues such as work safety, risk management, financial management and of course environmental management, depending on the individual situation of every organisation.

TQM influences all employees of an organisation. It enables an organisation to be more flexible and increases the motivation of the employees. As well, it makes it easier to develop long term relations between both an organisation's customers and employees.

1.5. Risk Management and EMS

"A life without adventure is likely to be unsatisfying, but a life in which adventure is allowed to take whatever form it will is likely to be short." [Bertrand Russel]

This section deals with risk management, though it is not a key element of environmental management. It is, however, an important issue that should be addressed by every EMS. The reason is that uncontrolled risks can cause tragedy and fi-

nancial ruin. Risk management experts Hargreaves and Mikes [2001] give the following definition of risk:

"Risks are uncertain future events that could expose the organisation to the chance of loss. Loss is a relative concept: a reference level needs to be defined to measure it. A frequently used reference level […] is the list of objectives set out in the business plan. Therefore risks may be regarded as uncertain future events that could influence the achievement of the [organisation's] strategic, operational and financial objectives."

In recent years insurance companies and banks have shown a growing interest in environmental risks (for business reasons only). The question was whether an organisation that has a well functioning EMS has real control over its environmental risks and potential liabilities. The result was that many organisations in high risk sectors were able to lower their insurance rates or increase their credit rating with banks and insurance companies [World Bank, 1998, p. 164].

The main objective of risk management is to reduce risks for both an organisation and its owner. Risk management tries to erase an ever existing uncertainty. This uncertainty can have different sources as shown in Figure 1.5.

Appropriate risk management is meant to ensure compliance with relevant legal requirements and to assess existing risks in order to optimise resource utilization. It should also enable risk prevention in the planning, controlling and monitoring stages of business activities. Business responsibility is impossible to separate from risk responsibility.

Inappropriate risk management involves great liabilities, as is shown in Figure 1.6. Appropriate risk management requires good technical risk assessment. Based on this, impacts on humans and the environment can be minimised while maximising sustainability. Inadequate risk assessment on the other hand can lead to environmental damage, risk to humans and unsustainable activities.

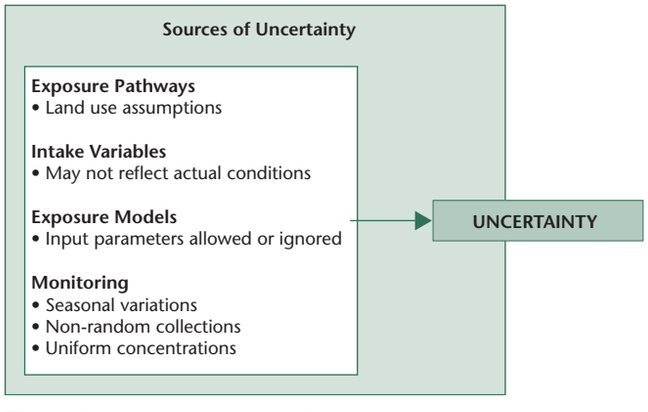


Figure 1.5 *Uncertainties in Risk Management [UNEP, December 1999].*

Different kinds of risks need to be distinguished in order for management to be most effective:

- **Organisational risks** (i.e. follow-up regulation, legally consistent assignment of tasks).
- **Financial risks** (i.e. organisation financing, loan/interest / currency risks, bad debt loss).
- **Operative risks** (i.e. insurance of production, process control, quality management, safety know-how, IT-risks).
- **Market risks** (i.e. dependency on single customers and suppliers, risk of sudden changes in market situation, image risks).
- **Legal risks** (i.e. liability resulting from non-compliance with legal requirements, risks resulting from product liability, patent risks).
- **Environmental risks** (residual waste, gaps in insurance coverage, emergency preparedness).

A risk management system can consist of six modules:

1 **Risk analysis:** Identification of the organisation's risks.
2 **Risk assessment:** Assessment according to quantifiable and reproducible criteria (risk categories).
3 **Enhanced analysis in problematic sectors:** Examination of sectors identified as being problematic by specialists.

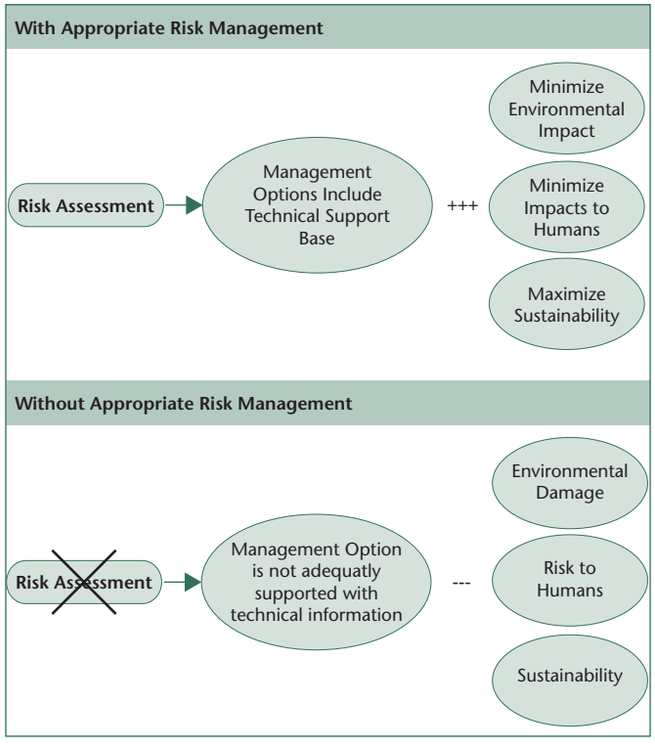


Figure 1.6 *Importance of Risk Management in Environmental Management [UNEP, December 1999].*

4 **Action plan:** Establishment of adequate instant measures (prevention before minimization before shifting before self support).
5 **Realization of measures:** Realizing planned measures.
6 **Risk controlling:** Introduction of an early warning system with regular audits and reviews (establishment of early warning indicators).

A good way of managing risks is to classify them. This classification should cover all activities of an organisation. The risks can then be expressed in terms like high, medium, or low, but a more detailed classification may be chosen as well. It should be remembered that all employees need to be involved in risk management. Employees have to deal with most of the risks, so their awareness should be raised as much as possible. In connection with the classification into high, medium and low, it may also be useful to develop a probability scale, that forecasts how often an incident may take place.

A working EMS is an efficient instrument which can help manage and control risks due to an organisation's activities.

More information about risk management is available in the "Technical Workbook on Environmental Management Tools for Decision Analysis". (See Internet Resources: Technical Workbook on Environmental Management – Tools for Decision Analysis.)

Study Questions

1. Think of a company or organisation that you are familiar with. Why would this company possibly need an EMS? And what could be some of the benefits?
2. Why is it so expensive to establish an EMS? How can costs be kept down without reducing the EMS's effectiveness?
3. Why are EMSs an especially important issue in the Eastern European countries? What are the problems?
   Can you think of a company or organisation you are familiar with that already has established an EMS? What were the benefits?
4. The Deming Cycle forms the base of most EMSs.
   How does it work and what do you think are advantages with this approach? Are there any disadvantages?
5. How can uncertainties increase an organisation's vulnerability? Can risk management help overcome these uncertainties? Can environmental management have any positive impact on risk management, and if yes, how?

Internet Resources

EMAS – Accession countries

http://europa.eu.int/comm/environment/emas/activities/accession_en.htm

Customer Focused Quality

http://www.customerfocusedquality.com

Technical Workbook on Environmental Management – Tools for Decision Analysis

http://www.unep.or.jp/ietc/publications/techpublications/techpub-14/index.asp

EMAS – Member State activities

http://europa.eu.int/comm/environment/emas/activities/index_en.htm

The Deming Cycle

http://www.balancedscorecard.org/bkgd/pdca.html

Nonprofit Risk Management Center

http://www.nonprofitrisk.org/

European Institute for Risk Management

http://www.eirm.net/

The costs of EMAS

http://europa.eu.int/comm/environment/emas/tools/faq_en.htm#costs

The benefits of EMAS

http://europa.eu.int/comm/environment/emas/tools/faq_en.htm#benefits

2 Overview of Environmental Standards

2.1. Introducing the EMS Standards

2.1.1 The ISO 14000 Series, EMAS, and Other International Standards

Since an EMS cannot be implemented in a random manner, standards have been developed to enable well structured and comparable EMSs. This chapter presents both past and current standards in environmental management.

In the early 1990s, several countries developed their own EMS standards, with British BS7750 probably being the most prominent. However, They were all withdrawn in favour of ISO 14001, which was implemented in 1996 and updated in November 2004, and which then became the global EMS standard. As well, the EU member states have EMAS (Eco-Management and Audit Scheme), a European Union regulation that incorporates the ISO 14001 standard. Organisations applying an EMS according to these standards build up a system through which environmental protection can be integrated into both long-term strategy and day-to-day management. These standards benefit the organisations themselves and the economy as a whole. Adopting the standards can lead to natural resources and the biosphere being used in a more sustainable way, and enhancement of economic performance.

Main Contents of this Chapter

- Detailed information on the ISO 14000 series (with an emphasis on ISO 14001).
- Detailed information on EMAS
- A comparison of ISO 14001 and EMAS.
- Other international standards that are directly or indirectly linked to environmental management.
- Other elements that can be included in an environmental management system.

2.1.2 The ISO 14000 Series

ISO 14000 is a series of internationally recognized standards for structuring an organisation's EMS and managing the environmental performance of the system to induce environmental improvement and cost savings. The series of standards are managed by the International Organisation for Standardization (ISO). There are 22 standards, guides, technical reports and documents under development of which 16 have were released as of December 2005. These documents, illustrated in Figure 2.1, address the following subjects:

- EMS (ISO 14001, ISO 14004 and ISO/TR 14061).
- Environmental Auditing and EMS Auditing (ISO 19011).
- Guidelines for Environmental Auditing – Audit Programmes, Reviews & Assessments (ISO 14015).
- Environmental Labelling (ISO 14020 and ISO 14021).

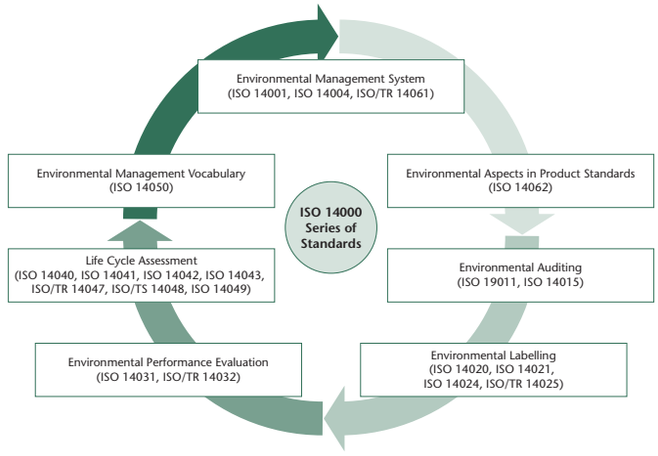


Figure 2.1 *The ISO 14000 Series of Standards [International Network for Environmental Management (INEM)].*

- Environmental Labelling – Practitioner Programmes – Guiding Principles, Practices and Certification Procedures of Multiple Criteria Programmes (ISO 14024 and ISO/TR 14025).
- Environmental Performance Evaluation (ISO 14031 and ISO/TR 14032).
- Environmental Management through Life Cycle Assessment (ISO 14040, ISO 14041, ISO 14042, ISO 14043, ISO/TR 14047, ISO/TS 14048 and ISO/TR 14049).
- Vocabulary of Environmental Management Terms (ISO 14050).
- Guide for the Inclusion of Environmental Aspects in Product Standards (ISO 14062).

This book focuses mainly on the ISO 14001 standard. It is the only standard in the ISO 14000 series that is auditable using the conformity assessment process. Thus, it is the only standard in the series for which an organisation can be certified.

2.1.3 A Short History of EMS Standards and ISO 14001

The world's first standard for EMS was BS 7750. It was developed and published by the British Standards Institution (BSI) in 1992. This standard was the model for the ISO 14000 series.

The ISO 14000 series of standards was introduced due to the ISO's commitment to sustainable business development. In 1991, ISO formed a Strategic Advisory Group on the Environment (SAGE) to assess the need for international environmental management standards and to recommend an overall strategic plan for such standards. The 1992 United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro carried the discussion on environmental management further. In 1992, based on the SAGE findings, ISO formed Technical Committee 207 for Environmental Management Standards (TC 207). Finally, in 1996, ISO 14001 was introduced as a means to support self-regulation measures in contrast to public regulation. ISO 14001 was then adopted in developed and developing countries. As of December 2004, the number of organisations that had introduced an EMS according to ISO 14001 was over 90,000. The countries with the largest number of organisations that have introduced ISO 14001, in absolute figures, are Japan, China, Spain, UK and Italy [Peglau, R. and Tsujii, K., April 2005], see Figure 2.5.

Figure 2.2 Changes in ISO 14001:2004. *The ISO 14001:2004 standard was develop to make EMS more effective. It does not add new requirements as compared to the original 1996 version. It mostly clarifies previously unclear statements by introducing some new definitions and descriptions – e.g. environmental aspects now clearly incorporate products and services – and it asks for improved evaluation of compliance. It also enhances compatibility with ISO 9000:2000, e.g. by specifying the management review inputs as in ISO 9001, and asks for evaluation of conformity with other standards. The changes are described for example on: http://www.bvqi.com http://www.ermcvs.com*

2.2. The ISO 14000 Series of Standards

2.2.1.Organisation-based and Product-based Standards

The standards in the ISO 14000 series fall into *two major groups*: organisation-based standards and product-based standards, as follows:

Organisation Evaluation:
- Environmental Management Systems (ISO 14001 and ISO 14004).
- Environmental Performance Evaluation (ISO 14031 and ISO/TR 14032).
- Environmental Auditing (ISO 19011 and ISO 14015).

Products, Services and Processes:
- Life Cycle Assessment (ISO 14040, ISO 14041, ISO 14042, ISO 14043, ISO/TR 14047, ISO/TS 14048 and ISO/TR 14049).
- Environmental Labelling (ISO 14020, ISO 14021, ISO 14024 and ISO/TR 14025).
- Environmental Aspects in Product Standards (ISO 14062).

The organisation-based standards provide comprehensive guidance for establishing, maintaining and evaluating an EMS. They are also concerned with other organisation-wide environmental systems and functions.

The product-based standards are concerned with determining the environmental impacts of products and services over their life cycles, and with environmental labels and declarations. These standards help an organisation gather information needed to support its planning and decisions, and to communicate specific environmental information to consumers and other interested parties.

2.2.2 Structure of ISO 14001

It is important to note that ISO 14001 is an environmental management standard – not an environmental performance standard. The standard is general and no precise requirements concerning environmental objectives are set. This means that improved environmental performance is not guaranteed. The ISO 14001 standard is voluntary and is meant to be applicable anywhere in the world. Though ISO 14001 is not regulated by law, there are strict rules on legal compliance. Improving efficiency of resource consumption and control of environmental impacts are about equally important issues in this standard.

Each of the *five key principle sections* (see Figure 2.3) of the ISO 14001 standard mentioned above consist of one or more parts. The **Environmental Policy section** contains a single principle that does not consist of further parts.

The **Planning section** is subdivided into:
- Environmental aspects.
- Legal and other requirements.
- Objectives and targets.
- Environmental management programme(s).

The **Implementation and Operation section** consists of:
- Structure and responsibility.
- Training, awareness and competence.
- Communication.
- EMS documentation.
- Document control.
- Operational control.
- Emergency preparedness and response.

The **Checking and Corrective Action section** contains:
- Monitoring and measurement.
- Non-conformance and corrective and preventive action.
- Records.
- EMS audits [ISO 14001:1996, p. 3].

The **Management Review section** is another section that consists of one element only.

Requirements are made in some of the parts. For example, an environmental policy is required to be:

- Appropriate to the nature, scale and environmental impacts of an organisation's activities, products or services.
- A commitment to continuous improvement and prevention of pollution.

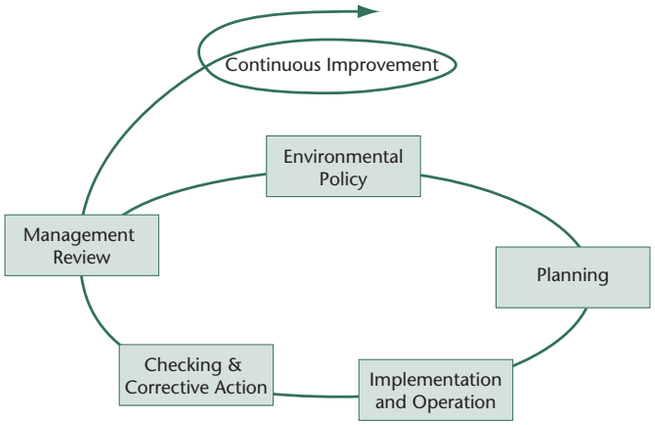


Figure 2.3 *Model of the ISO 14001 environmental management system [European Committee for Standardization, 1996-08-21, Introduction].*

- A commitment to comply with relevant environmental legislation and regulations, and with other requirements to which the organisation subscribes.
- The framework for setting and reviewing environmental objectives and targets.
- Documented, implemented, maintained and communicated to all employees.
- Available to the public.

2.2.3. Environmental Impacts and Legal Requirements

The main chapters of ISO 14001 are briefly explained below.

According to ISO 14001 an environmental impact is: "any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services." [ISO 14001:1996, section 3.4] Environmental impacts could be for instance:

- Air pollution.
- Resource depletion.
- Noise.
- Water pollution.

Environmental impacts need to be identified in the course of implementing an EMS. The procedures on how to do this are addressed later.

Legal and other requirements need to be identified and assessed on a regular basis to ensure legal compliance. The environmental objectives and targets arise from the environmental policy. To ensure that the objectives and targets set can be achieved, the organisation needs to establish and maintain one or more (depending on the size of the organisation) environmental management programmes. These programmes are supposed to determine responsibilities, means, and a time-frame by which the targets and objectives are to be achieved.

2.2.4 Implementation

The section 5.1.2 "Structure and Responsibility,", explains how an EMS needs to be structured. Accordingly, roles, and responsibilities need to be:

- Defined.
- Documented.
- Communicated.

Top management has to supply the resources necessary for implementation and appoint one or more management representatives as responsible for the EMS.

ISO 14001 requires all staff whose work may create a significant impact on the environment and all personnel involved in the EMS to be trained appropriately. Furthermore, establish-

ment of communication procedures are required with respect to internal and external concerns. The EMS needs to be documented. This documentation can either be on paper or in the form of a computer file. A document control system needs to be established so that no relevant information is lost. To keep track of all previously identified operations associated with environmental aspects, establishment of an operational control system is required. Furthermore, procedures for identification of potential for and response to accidents need to be implemented.

2.2.5. Maintenance of an EMS

The section 5.6 "Checking and Corrective Action" explains how an already implemented EMS can be maintained and improved. First of all, a system needs to be established on a regular basis to monitor and measure the key characteristics of an organisation's operations and activities. Based on this system, procedures concerning non-conformance and corrective and preventive action have to be established and maintained. All actions related to the EMS have to be recorded to enable demonstration of conformance with ISO 14001. To ensure continuous improvement, EMS audits need to be conducted on a regular basis. The results of the audits have to be reported to the organisation's top management.

Top management then has to, at intervals it determines itself, review the EMS to ensure its continuing suitability, adequacy and effectiveness. To carry out this evaluation, top management needs to be provided with all necessary information, which is all data collected on the performance of the EMS. This information is usually provided by the person responsible for the EMS, who collects the information from the EMS representatives or the specific employees.

Figure 2.4 *Bus with the EMAS logotype. © European Communities, 1995-2005.*

2.3. EMAS

2.3.1. Implementing EMAS

EMAS (Eco-Management and Audit Scheme) is a management tool for organisations to "evaluate, report and improve their environmental performance." (See Internet Resources: EMAS – What is EMAS?). It is a voluntary scheme that aims at promoting on-going improvements in environmental performance of organisations and the provision of environmental information to the public. Private and public organisations operating in the European Union and the European Economic Sphere – Iceland, Liechtenstein and Norway – can participate in EMAS.

To achieve EMAS certification an organisation has to:

1. Develop an environmental policy.
2. Make an initial environmental review.
3. Develop an environmental programme.
4. Establish an EMS.
5. Carry out an internal environmental audit.
6. Review once more.
7. Develop an environmental statement.
8. Get validation and register.

A qualified third party checks the system and statement to see if EMAS requirements are met. If so, the system and statement are validated and the site can be registered. When it has been registered, the site receives a declaration of participation which can be used to promote its participation in the scheme.

EMAS became operative in April 1995. It was restricted to industrial sites only until March 2001, when it became open to all private and public organisations of all sectors. The version of EMAS after the March 2001 revision is called EMAS II [Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001]. However, current common use of the term EMAS (i.e. without the "II") refers to the revised version.

2.3.2. Changes in EMAS II

As noted above, EMAS II was introduced in 2001. The most important changes compared to EMAS 1995 are:

- EMAS II is fully compatible with ISO 14001. All of the requirements of ISO 14001 are integrated in EMAS II.
- External validation of an EMS ensures that all relevant legal requirements are met.
- Employees are more integrated in the EMS via a suggestion book system or project based group work.
- The term "site" was replaced by "organisation" as used in ISO 14001:1996.

- The possibility of using the EMAS logo in public relations and advertising is improved, though the logo can only be used on products and their packages if the logo is clearly connected to information validated [Office for Official Publications of the European Communities. 2001, p. 6] (for more information regarding the logo see section 6.2).
- New logos were introduced.
- The requirements for the environmental statement have been altered.
- Environmental statements need to be updated and validated annually.
- Indirect environmental aspects also need to be considered when identifying environmental aspects (i.e. those aspects occurring somewhere else but not at the site of the organisation; e.g. triggered by planning or investment decisions of the organisation).
- There is no longer a restriction on the business sector, now any organisation can participate in EMAS.

The restriction to the business sector was not only lifted, but the European Commission (EC) actively supports the implementation of EMAS in both the service and financial sectors. The EC realized that the demand from stakeholders for environmentally-friendly products and services has increased more and more. The service sector consumes large amounts of energy, water and office materials, with much room for improvement of resource efficiency. In the financial sector, services and products may have great influence on the environment (e.g. when a bank finances building a dam). The environmental aspects and risks of these activities need to be managed, which can best be achieved by implementing an EMS.

2.3.3. EMAS is a Governmental Regulation

Another important fact about EMAS is that it is a government regulation, not an international standard. This means that it is the member state's governments that have to organise the registration process of sites within their territory. They designate the Accreditation Body, who is an independent and impartial institution or organisation responsible for the accreditation and supervision of environmental verifiers. Environmental verifiers, on the other hand, are experts on the field of EMAS and need to be both independent of the organisation being verified and that organisation's auditor or consultant. They ensure that organisations seeking registration are in compliance with EMAS requirements. In particular they check that an organisation:

- Is in legal compliance.
- Has carried out an initial environmental review (if appropriate).
- Has a fully operational EMS which is audited in a systematic, objective and periodic way.
- Has prepared an environmental statement in accordance with the EMAS regulation. (See Internet Resources: EMAS – How does EMAS work?)

Furthermore they verify that that all data and information in the environmental statement and other information provided by an organisation is reliable, credible and correct.

After having acquired some background information on both EMAS and ISO 14001, the questions are: Are there any significant differences between EMAS and ISO 14001? Why choose the one or the other? The following section will give answers to these questions.

Table 2.1 *Comparison between EMAS and ISO 14001 [European Commission, April 2001].*

	EMAS	ISO/EN ISO 14001
Preliminary environmental review	Verified initial review	No review
External communication and verification	Environmental policy, objectives, EMS and details of organisation's performance made public	Environmental policy made public
Audits	Frequency and methodology of audits of the EMS and of environmental performance specified	Audits of the EMS (frequency or methodology not specified)
Contractors and suppliers	Required influence over contractors and suppliers	Relevant procedures are communicated to contractors and suppliers
Commitments and requirements	Employee involvement, continuous improvement of environmental performance and compliance with environmental legislation	Commitment of continual improvement of the EMS rather than a demonstration of continual improvement of environmental performance

2.4. Comparison Between EMAS and ISO 14001

2.4.1. Similarities and Differences

Generally, the main difference between EMAS and ISO 14001 is that EMAS has a strong focus on provision of information to the public, external communication and responsibility outside of the organisation, and on environmental performance, that ISO 14001 does not have. Table 2.1 summarises the differences.

Figure 2.5 below shows the world-wide distribution of ISO 14001 and EMAS certifications. The data is updated regularly (See Internet Resources: Number of ISO 14001/EMAS certification of the world). Obviously ISO 14001 is in more widespread use than EMAS. The number of EMAS certifications has in fact been decreasing over a number of years now, while the number of ISO 14001 certifications is increasing rapidly.

The ISO 14000 series of standards is a set of voluntary instruments that was adapted to the needs of a large variety of interest groups worldwide. The documents in the series are intended to be applicable in all countries, regardless of the type of government.

EMAS is a regulation developed to meet the needs and expectations of governments, citizens and consumers in the EU member states and European Economic Area. The EMAS Helpdesk notes that:

"Within this series, 'EN ISO 14001:1996 environmental management systems – specifications with guidance for use' is the only certifiable standard, the remainder being supportive guidelines. The aims of EN ISO 14001:1996 is to promote environmental protection in light of socio-economic concerns. It is very similar to EMAS but because EMAS has legal status within Member States, it can take a more prescriptive approach to environmental management issues; the ISO 14000 standards, by contrast, rely on voluntary acceptance by all interested parties, and therefore must maintain a balance between the needs and expectations of each of these parties." (See Internet Resources: EMAS – What is environmental management?)

For most organisations there is no difference between implementing an EMS according to ISO 14001 or EMAS, or even both together depending on the organisational objectives. However, ISO 14001 was written *"with more clarity and with a flexibility which is increasingly appreciated by industry."* [Gelber, M. 1998] (See also Internet Resources: INEM – EMAS and ISO 14001) What is meant is that EMAS is often viewed by industry as too strict, and more costly to implement. The results can been seen in Figure 2.5. However, EMAS has a major advantage when it comes to communicating with stakeholders using the environmental statement.

2.4.2. Implementing Both EMAS and ISO 14000

In general, conformance with one of the international standards can lead to the implementation of other standards. For example, once an organisation has implemented ISO 14001, it can later satisfy the requirements of EMAS (and also of other

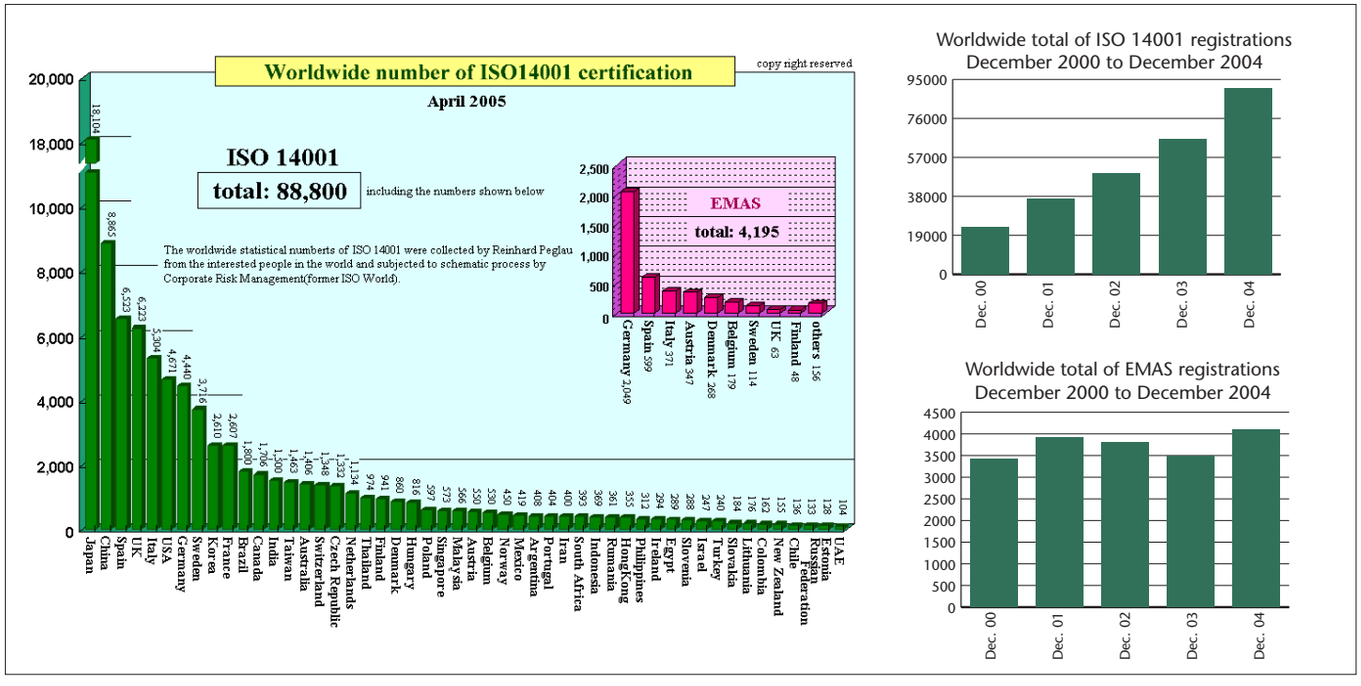


Figure 2.5 *The Number of ISO 14001/EMAS registrations of the world [Peglau, R. and Tsujii, K. April 2005].*

management system standards such as ISO 9001 for quality management systems). Figure 2.6 is a comparison of the steps to achieve ISO 14001 and EMAS registration.

Step 1 (initial environmental review) shown in Figure 2.6 is not required to be performed as long as the environmental aspects as set out in Annex VI of the EMAS regulation are fully considered in the certified EMS.

EMAS is stricter than ISO 14001. ISO 14001 includes only a commitment to compliance with relevant environmental legislation. EMAS on the other hand requires compliance with all relevant legislation. As mentioned above, the requirements on the type of environmental aspects to be addressed is more specific with EMAS. The great emphasis on active employee participation in the implementation process is not included in ISO 14001. Last but not least, for EMAS the frequency of the audit cycle must be at intervals of no longer than three years, while there is no specification in ISO 14001. The strictness of the EMAS regulation is a problem for many organisations.

2.5. Other International Standards

In this section some additional standards are described. More and more organisations recognize the benefits of integrated and process-based management systems that cover more than a single aspect (such as environment or quality). Following are the most important international standards.

2.5.1. The Occupational Health and Safety Assessment Series OHSAS 18001

OHSAS 18001:1999 is an Occupation Health and Safety Assessment Series (OHSAS) for occupational health and safety (OH&S) management systems to enable an organisation to control OH&S risks and to improve performance (see section 9.4 for more details). OHSAS 18001:1999 was released in April 1999. OHSAS 18002:2000 is the occupational health & safety management systems guideline for the implementation of OHSAS 18001.

The specification takes a structured approach to OH&S management. The emphasis is placed on practices being pro-active and preventive by the identification of hazards and the evaluation and control of work related risks. OHSAS 18001:1999 is compatible with ISO 9001:2000 as well as ISO 14001:2004.

OHSAS 18001 features include BS8800 and SCC, which are explained below.

2.5.2. The British guidance standard BS 8800

The British guidance standard BS 8800 provides non-certifiable guidance based on occupational health and safety management systems. It was developed by the British Standards

Figure 2.6 *Comparison of Steps Required for Registration Between ISO14001 and EMAS [EMAS Helpdesk Frequently Asked Questions].*

Institution. The distinctive feature of BS 8800 is that it enables the integration of OH&S management into an overall management system that includes quality management and environmental management. The primary objective of an OH&S management system is to help organisations manage health and safety risks associated with their business activities. BS 8800 is compatible to OHSAS 18001.

2.5.3. The Security Certificate Contractors (SCC)

The Security Certificate Contractors (SCC) standard applies to the evaluation and certification of the safety management system used by contractors, based on the requirements of SCC. The standard was initially developed for the petrochemical industry together with DNV (Det Norske Veritas – a worldwide risk manager and registrar), but is now an accredited public standard used by many other industries. The SCC concept describes a general procedure for certification of a safety, health and environmental protection system. SCC is currently widely accepted within the petrochemical industry. SCC basically consists of a checklist that evaluates safety, health and environment in ten categories with 64 questions. There are two types of SCC certificates: SCC*, for organisations with up to 35 employees; and SCC**, for organisations with more than 35 employees.

2.5.4 Standard on Quality Management ISO 9001:2000

ISO 9001:2000 is an international standard on quality management. This standard explicitly supports process based integrated management systems because business processes need to be described, reviewed, evaluated and continuously improved (see section 9.3 for more details). Even processes that are not part of production have to be built up, controlled and developed. According to ISO 9001:2000 an organisation is required to:

- Identify processes necessary for quality management.
- Define succession and interaction of these processes.
- Define criteria and required methods to ensure effective execution and control of these processes.
- Ensure availability of information required for execution and control of these processes.
- Measure, control and analyse these processes and to take measures to achieve the anticipated targets and continuous improvement.

The intent of ISO 9001 is to *"enhance customer satisfaction by meeting customer requirements."* [ISO 9001]. ISO 9001 is very closely related to ISO 14001. Many elements that exist in ISO 14001 also exist in ISO 9001, such as documentation, document control, communications, continual improvement, etc. Therefore management systems that are certified to one of the two standards can be "upgraded" without too much effort to also meet the requirements of the other standard. The "Plan-Do-Check-Act" principle is also well known in quality management.

Currently there are close to 800,000 (2005) organisations worldwide certified according to ISO 9001/2/8:94 and ISO 9001:2000.

Study Questions

1. What is the key difference between ISO 14001 and EMAS and in what way does that affect the implementation process?
2. EMAS is said to be more comprehensive than ISO 14001. Why is that so and what are advantages or disadvantages?
3. An organisation can choose to implement both ISO 14001 and EMAS. This causes greater implementation costs. Why do you think many organisations still implement both? What are the benefits?
4. Why has the number of EMAS certifications constantly been decreasing the past years?
5. Older, domestic environmental management standards were removed in favour of ISO 14001 and EMAS, the only ones remaining. This is generally seen as a positive development. But what could be some negative impacts, especially when it comes to applicability of the standards in different countries?

Internet Resources

EMAS – What is EMAS?

http://europa.eu.int/comm/environment/emas/about/summary_en.htm

EMAS – How does EMAS work?

http://europa.eu.int/comm/environment/emas/about/work_en.htm

EMAS – What is Environmental Management?

http://europa.eu.int/comm/environment/emas/about/enviro_en.htm

INEM – EMAS and ISO 14001 (Gelber, M.)

http://www.inem.org/htdocs/eco-baltic/workshop-texts/gelber.html

Number of ISO14001/EMAS certification of the world

http://www.ecology.or.jp/isoworld/english/analy14k.htm

International Organisation for Standardization

http://www.iso.org

ISO 14000 Information Center

http://www.iso14000.com/

ISO 14000 Toolkit

http://www.14000-toolkit.com/

NSF-ISR, International Strategic Registrations

http://www.nsf-isr.org

ISO 9000 and ISO 14000 Introduction

http://www.iso.org/iso/en/iso9000-14000/index.html

OHSAS 18001 Occupational Health and Safety Zone

http://www.ohsas-18001-occupational-health-and-safety.com

3 Environmental Aspects and Impacts

3.1. Environmental Aspects and Impacts

3.1.1. How to Begin

In most EMS manuals "Environmental Aspects and Impacts" are dealt with after "Planning an Environmental Policy." Due to practical experience from several consulting projects it is advised that "Environmental Aspects and Impacts" be treated first. The reason is simple: there is a greater likelihood of success if the environmental situation is known before planning a policy. An organisation's individual policy can then be formulated in a more substantial and precise manner.

But before it can be determined which environmental aspects and impacts will be included in the environmental policy, an initial review needs to be carried out to comprehensively identify environmental aspects and related impacts.

3.1.2. Carrying Out an Initial Review

An initial review provides a snapshot of an organisation's environmental performance at a particular moment in time. A thorough and comprehensive review provides a solid basis for developing a register of environmental aspects and impacts, and an environmental management programme. The initial review is sometimes also called a preliminary review. The process involves collecting information on an organisation's environmental aspects and impacts, and the management structures in place to deal with them.

The following definitions used in ISO 14001 provide a clear understanding of the terms.

- **Environmental Aspect:** Element of an organisation's activities, products, or services that can interact with the environment.
- **Environmental Impact:** Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services [ISO 14001:1996, sections 3.3 and 3.4].

Figure 3.1 illustrates the difference between these two terms.

3.2. Identifying Environmental Aspects

3.2.1. What is an "Aspect"

As seen above, ISO 14001 defines an environmental aspect as an "element of an organisation's activities, products or services that can interact with the environment." To plan for and control its environmental impacts, an organisation must know what these impacts are and which aspects they are related to.

Tool 1 *Measuring the Importance of Environmental Problems* can help make a first classification of areas that may be potentially relevant to an organisation. Thus, an organisation needs to establish and maintain procedures to identify the environmental aspects that it can control and have influence over. Direct and indirect aspects need to be distinguished.

Direct aspects result directly from facility operations, such as raw material use in production. Indirect aspects can only be indirectly connected to a facility operation, such as aspects related to the production of raw materials that are purchased from a supplier. An organisation is not expected to actively

Main Contents of this Chapter

- What environmental aspects and impacts are.
- Why it is important to identify significant environmental aspects and impacts.
- How to identify legal requirements.
- How to ensure legal compliance.
- Environmental documents.

manage issues outside its sphere of influence, though such issues should be kept in mind.

The term "aspect" is neutral. Environmental aspects can be either:

- **Positive** (such as manufacturing a product out of recycled materials).
- **Negative** (such as creating toxic materials).

It is almost impossible to work on all aspects identified. However, when an improvement process is continuous, some aspects may be taken care of right away and others addressed in the future. Some aspects that may not seem significant in the initial identification process may turn out to be significant in the long run. Therefore, all aspects need to be monitored continuously, and environmental aspects ranked. This can be achieved in a number of ways, for instance by ranking according to criteria such as risk involved, material consumption, waste generated, etc. The aspects worked on are determined by another set of criteria, for example technical and economic feasibility and benefit for the organisation. Desired improvement objectives need to be determined for the aspects selected in this process [US EPA, October 2000, p. 37]. In the Toolkit (Tool 2 🏭 *Sample Procedure: Instruction for Environmental Aspects Identification Form*) there is a very useful tool for evaluating the impacts of all activities of an organisation. (A new approach for impact evaluation is described in case studies 1 and 7. Case studies 1, 4 and 5 describe some impacts that were taken into closer consideration and how they were dealt with in the EMS.)

3.2.2. Input-output Analysis; Ecomaps

Input-output analysis is very helpful in identifying environmental aspects. This analysis should cover an organisation's inputs and outputs generated by material and energy flows at the site. For most organisations the most important inputs and outputs are:

Table 3.1

Inputs	Outputs
raw, operating and packaging materials (including hazardous materials)	products
energy	waste materials (including hazardous waste)
water	wastewater
air	exhaust air
soil	noise and odours

Figure 3.2 is an example of what a first draft of an input-output-diagram could look like. Based on this first draft, a more detailed level can be moved on to until all relevant aspects have been identified. Tool 3 🏭 *Input-Output Sheet* may help understand the purpose of input-output-diagrams.

There are different methods to find the information needed to identify environmental aspects. One way is to visualize the physical reality of an organisation's activities through ecomaps (see Figure 3.4). This method is thoroughly explained in the Toolkit (Tools 4 ⓘ, 5 ⓘ and 6 ⓘ 🛠 🏭 *Process Mapping and Eco Mapping*) Another way may be to interview employees. They presumably don't know exact figures, but they know which processes involve which environmental aspects and where to get reliable data. Checklists or questionnaires can also be a means to identify environmental aspects.

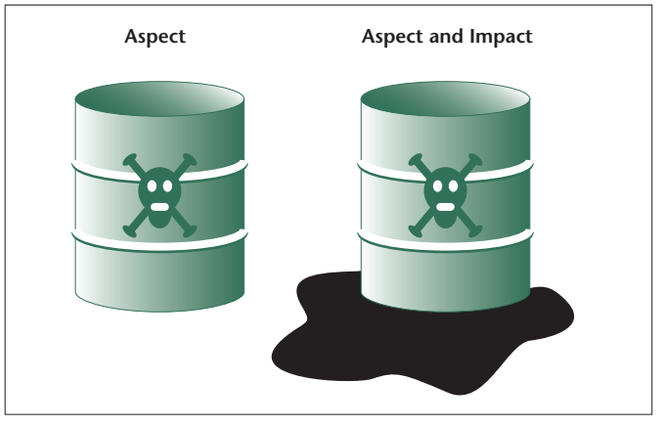


Figure 3.1 *The Linkage between Environmental Aspects and Environmental Impacts [US EPA, 1999, p. 3].*

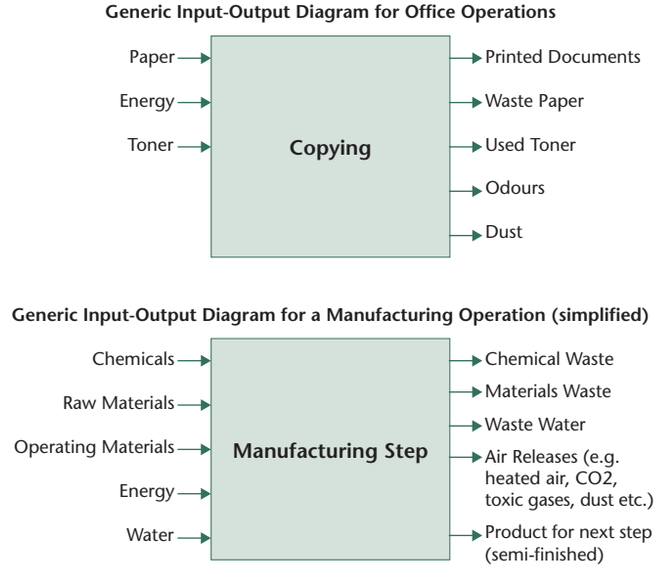


Figure 3.2 *First Draft of an Input-Output Diagram [US EPA, March 1999 (modified)].*

3.2.3. Which Aspects are Significant

Identifying environmental aspects is very important, because the entire EMS builds on this process of identification. Once the environmental aspects are identified, it needs to be determined which of these aspects have or can have significant impacts on the environment.

Figure 3.3 shows the steps involved in identifying environmental aspects.

Determining which aspects are significant includes making subjective decisions. For this reason, results will improve by having a team of people who represent different job categories. They can provide a cross-section of operational experience. Tool 7 ⓘ *Environmental Review Questionnaire* is an example of how an environmental review is structured.

3.3. Identifying Environmental Impacts

3.3.1. What is an Impact

To plan for and control its environmental impacts, an organisation must know what these impacts are. But knowing what the impacts are is only part of the challenge – it is also necessary to know where these impacts are generated. How the organisation and its products, services and activities interact with the environment needs to be found out.

If an organisation has undertaken pollution prevention projects, one must know how and where a special waste is generated in order to minimize or eliminate it and, even better, avoid its generation in the future. Like pollution prevention, the identification and management of environmental aspects

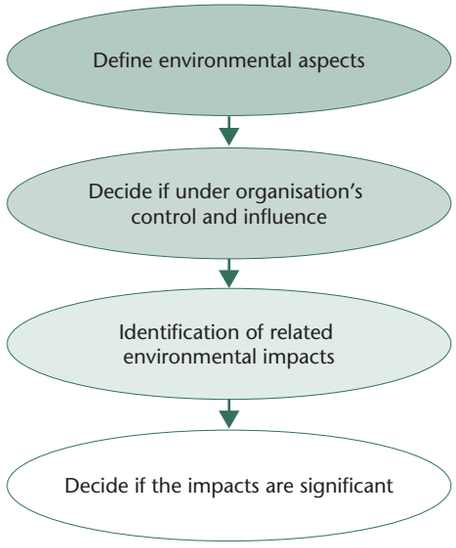


Figure 3.3 *Identifying Environmental Aspects [NSF International, 2001, p. 20].*

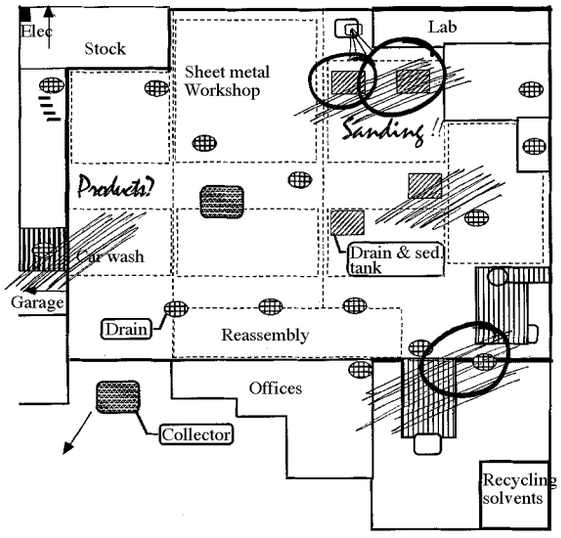


Figure 3.4 *Eco-mapping is an original and simple tool which helps small companies when implementing environmental management and EMAS. It is an inventory of practices and problems; a systematic method of conducting an on-site environmental review; a collection of information which shows the current situation using pictures; a work and awareness-raising tool; a do-it-yourself tool for SMEs; a tool which allows employee involvement and participation*

can have a positive financial effect and provide comprehensive environmental improvements.

Thus, an EMS needs to include a procedure to identify and assess environmental impacts that the organisation can control and influence.

For further information on aspect and impact evaluation refer to the Toolkit (Tool 8 *Measuring the Envionmental Impacts of an Organisation* and Tool 9 *Aspect/Impact Evaluation*).

3.3.2. Impacts Caused by Products

Business activity has a substantial impact on the environment:

- The manufacturing of products starts with extracting raw materials from the environment after which they are processed into items that can be sold. Consequently, in the production process there are various forms of waste produced that enter the environment.
- Environmental impacts are not only generated by industry but also by service organisations, for instance due to use of paper, electricity consumption or transport.
- All activities that can be associated with the manufacturing process, such as maintenance or packaging, can also cause environmental impacts.

- Additionally, all products have to be disposed of at the end of their life cycle and enter the environment as waste.
- Service organisations also cause waste to enter the environment due to their activities [Starkey, R. and Andersson, I. 1998, p. 12].

An organisation is not expected to manage issues outside its sphere of influence or control. In many countries, for example, it is not possible to choose the form of production for electricity consumed, e.g. from renewable energy sources or from a nuclear power plant. Similarly, suppliers can seldom control how their products are used. Thus, the focus should be on the environmental aspects of the primary products or services. Therefore only the inputs, outputs and stock of an organisation are considered. Everything else lies beyond the scope of most EMSs.

The toolkit includes a number of tools related to that topic. Tool 10 ⓘ *Inputs: Coverage and Purpose* displays the various inputs that need to be taken into consideration. Tool 11 ⓘ *Stock: Coverage and Purpose* and Tool 12 ⓘ *Outputs: Coverage and Purpose* do the same for, respectively, stock and output. The information gathered can be put together in an eco-balance as displayed by Tool 13 🛠 *Checklist: Eco-Balances*.

Once the environmental aspects of products, activities and services have been identified, it needs to be determined which aspects have or could have significant impacts on the environment. Aspects that have one or more single significant impact should be considered significant environmental aspects. These significant aspects should be considered when establishing environmental objectives, defining operational controls and considering other actions, as will be discussed later.

A multi-step process can be used to make this evaluation. The resulting information should be kept up-to-date so that potential aspects of new products, services and activities are factored into the objectives and controls.

Some of the issues that need to be kept in mind when identifying environmental impacts are:

- When identifying aspects and impacts, one should look beyond activities covered by laws and regulations. A compliance programme could in this context provide useful information. Permits, audit reports and monitoring records can be useful inputs. Beyond regulated aspects, land, energy and natural resource use for example, should be considered as well.
- Both services and products need to be looked at. The need to examine site operations is obvious but there can be significant environmental impacts involved with activities that do not take place at the organisation's site (such as servicing for customers). At the same time, environmental aspects of products, vendors, and contractors playing a role in the organisation should also be considered, even if their environmental aspects may not be obvious.
- The identification of environmental aspects and impacts can be seen as one of the most critical steps in the EMS implementation process. It is therefore important that this step be taken carefully. The initial effort will be rewarded later [NSF International, 2001, p. 21].

3.3.3. Processes in the Organisation

In many cases it is difficult to understand why certain environmental impacts occur. In that case it may be helpful to take a look at the processes existing in the organisation that can cause possible environmental impacts. Visualizing the processes using flow charts or process maps can help the identification process. A sample flow chart is provided in the Toolkit (Tool 14 🏭 *Sample Process Map*). Once the identification process is finished, the impacts identified need to be ranked according to their significance. How this significance is determined varies from organisation to organisation, but it is usually the EMS implementation team that sets the criteria for the ranking process. The ranking is important as it may not be possible to work on all environmental impacts. After having ranked the environmental impacts they need to be worked on. This process requires careful planning to decrease the amount of work involved.

Below is a list of some questions that could be asked to help identify environmental impacts:

- Which aspects might affect the organisation's ability to comply with regulations and other requirements?
- Are there pollution prevention opportunities?
- Are there potential cost savings or business opportunities (e.g. potential customers who require their suppliers to have an EMS)?
- Are there concerns that might be shared by customers or suppliers?
- Is there a "low-hanging fruit" that might provide early success which can serve both to educate employees and to build confidence in the EMS?
- Are there opportunities to integrate environmental management with occupational health and safety requirements?
- Are there community concerns regarding the organisation's activities?
- Are there unregulated hazardous chemicals that could be better managed or substituted?
- Are some of the "solutions" to environmental concerns or regulations shifting waste from one media (air, water, land) to another?

- Could resources be used more efficiently, e.g., energy, water, materials? [US EPA, 2000, p. 38]

As soon as a suitable process for the significance assessment has been found for the organisation, one can start describing the process in form of a written procedure. Tool 2 provides a sample procedure for performing the assessment.

Once there is a reduced list of environmental aspects, they can be ranked using environmental risk information (see below and section 1.5.) to determine the level of significance.

3.3.4. Using Environmental Risk Information to Rank Environmental Impacts

Although we have gone deeper into the issue of risk management before, we will take another look at it because risk information can be a very good criterion for ranking environmental impacts. Basically this method is very simple: the greater the risks related to an environmental impact, the higher its position in the ranking system. The top ten impacts have highest priority. These are the impacts that should be addressed first as they represent the greatest danger to the organisation. Removing the risks will ensure a healthy environment and decrease an organisation's liabilities. To make sure that these impacts are dealt with correctly and to minimize the risks involved one will have to analyse how the organisation deals with these aspects. It needs to be found out whether:

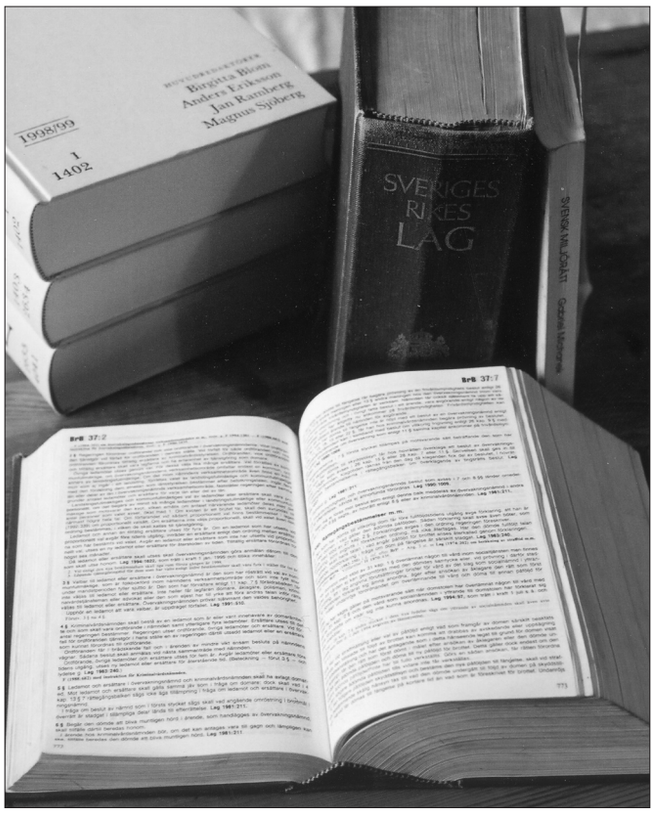


Figure 3.5 Law books. *Environmental legal compliance is an element of an EMS stipulated by ISO 14001 or EMAS. Photo: Lars Rydén.*

- There is additional information required about the impact or process, such as processes that are not documented correctly or processes that require special precautions.
- The right people are involved.
- The results are dealt with according to their significance.

The next challenge is to organise the information collected in a way that makes the different impacts comparable. If little information is available about a certain impact, perhaps it is possible to collect sufficient data and set rules for dealing with the impact.

The next step is to determine which impacts will actually be worked on. This can be done by considering economic and technical feasibility as well as expected improvements for the organisation (see section 3.2.). Sometimes it may be better to work on impacts that have a lower ranking, as less effort is needed to deal with them [US EPA, 2000. p. 39 et seq.].

3.4. Ensuring Compliance with Legal and Other Requirements

3.4.1. Legal Compliance is Part of an EMS

An organisation complies with environmental legal requirements if:

- It complies with all environmental laws and regulations relevant to the organisation.
- Non-compliance with legislation is accepted by the competent authority, for example by way of a special approval, a remediation order with a transitional period, or with some form of documented or written approval, though in any case through stringent regulatory control by the competent authority.

Environmental legal compliance is an element of an EMS stipulated by ISO 14001 or EMAS. Organisations are required to themselves comprehensively document environmental legal compliance. In addition, it must be ensured that this documentation is systematically reviewed, revised, and kept up-to-date as required [Roos-Rohrer, C. N. 1998].

In order to comply with laws and regulations, an organisation, needs to know what rules apply and how they affect the activities of the organisation. Legal compliance can be seen as part of the foundation of an EMS. The reason is that the cost of non-compliance (e.g. fines, possible damage to the environment, revenue loss and impact on public image) can be very high. Therefore, there are processes required to identify and

communicate legal and other requirements that apply to an organisation's activities [NSF International, 2001, p. 25].

In case study 2 there is a brief description of how a specific company manages its legal requirements.

3.4.2. Identifying Legal Requirements

Legal requirements include:

- National, regional and local requirements.
- Standards in locations where an organisation sells products/services.
- Permit conditions.
- Regulatory obligations.

Other requirements might include (for example):

- Organisation-specific codes.
- International Chamber of Commerce (ICC) Charter for Sustainable Development.
- Other industry codes or programmes to which the organisation voluntarily subscribes (e.g. UNEP declaration for the banking and insurance sector, Responsible Care Programme for the Chemical Industry, and others).

Identifying applicable regulations, interpreting them, and determining their impacts on an organisation's operations can be a time consuming task. To save time, a tool such as Tool 15 ⓘ *Envionmental Legal Compliance Checklist* can be used.

Even though small organisations usually do not have an in-house lawyer, they can deal with environmental legal compliance at a reasonable cost. For a start, organisations often have some important resources such as:

- Internal expert(s) who are very familiar with operations.
- Written documentation of operations and activities.
- Contact with authorities.

By checking and using existing resources significant costs can be avoided. Tapping the resources named above should ensure identification of all legal requirements. Note that contacting government or other authorities is usually the best way for small organisations to become aware of their legal compliance needs. Larger organisations can rely on their in-house lawyer. Whether the responsible person is a lawyer or an internal expert, the person must have a general understanding of both the legislative system and on environmental legislation in the specific country. Unless otherwise decided, the person chosen in this context is also responsible for ensuring that the organisation continues to comply with environmental legal requirements.

To help understand the topic better, a tool is provided that shows how identification and communication of legal requirements can be carried out (Tool 16 🏭 *Checklist: Regulatory Compliance Sample*). Once the legal requirements have been identified, procedures need to be implemented to ensure compliance. The following section presents ways that can be achieved.

3.4.3. Ways of Ensuring Legal Compliance

Ensuring legal compliance is part of the continuous improvement process. In some business sectors, legal requirements may change rapidly. Compliance with legal requirements is a critical consideration in EMS development and implementation. EMS implementation requires an organisation, among other things, to:

- Develop and communicate an environmental policy that includes a commitment to compliance.
- Develop and implement a procedure to identify, analyse and have access to environmental laws and regulations.
- Set objectives and targets in line with its environmental policy, which includes a commitment to compliance.
- Establish management programmes to achieve its objectives,
- Train employees and communicate relevant EMS requirements to them.
- Establish and implement operational control procedures.
- Establish and implement a procedure for periodically evaluating compliance.
- Establish and implement a procedure to carry out corrective and preventive actions [NSF International, 2001, p. 18].

New or revised legal requirements might require modification of the environmental objectives or other EMS elements. By anticipating new requirements and making changes to the operations, this might avoid some future compliance obligations and their costs.

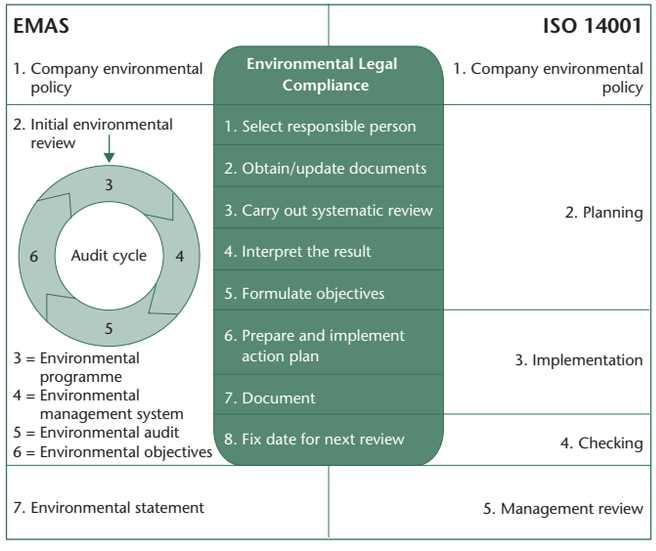


Figure 3.6 *The Linkage Between ISO 14001 and EMAS [INEM, 1998, p. 73].*

Any EMS should include procedures for identifying, accessing and analysing applicable legal requirements.

There are many methods for obtaining information about applicable laws or regulations. These methods include:

- Commercial services (with updates offered online, on CD-ROM or in paper form).
- Regulatory agencies.
- Trade groups/associations.
- The Internet.
- Public libraries.
- Seminars and courses.
- Newsletters/magazines.
- Consultants and attorneys.
- Customers, vendors and other organisations [US EPA, July 2001, p. 60].

Once applicable requirements have been identified and analysed for potential impacts, these requirements (and plans for complying with them) need to be communicated to employees, onsite contractors and others, as needed. Communicating "other applicable requirements" (as well as their impacts on the organisation) is an important but often overlooked step. It needs to be kept in mind that not all departments need information on all legal requirements. A good way of making all relevant information accessible to everybody concerned is charting all legal requirements previously identified. Tool 17 *Ways of Ensuring Legal Compliance* provides an example.

Figure 3.7 *Audit officer Mattias Widmark from BVQI performing an external audit on Nina Printhouse, Uppsala. Photo: Nicky Tucker.*

All organisations have to of course comply with relevant legal requirements. An EMS is a good means systematising compliance. EMAS for instance requires organisations to regularly check and document compliance and ensure that there are procedures existing in case of non-compliance. Figure 3.6 illustrates how environmental legal compliance is part of an EMS implemented according to EMAS and ISO 14001 respectively.

3.5. Obtain and Update Documents

3.5.1. Legal Compliance Reviews

It is extremely important for an organisation to have a regularly updated register of environmental laws and regulations. It is important to keep in mind that although at a particular point in time an organisation may comply with a law, or the law may not be relevant, this situation can change, e.g. when products or processes change. Tool 18 *Checklist: Environmental Legal Compliance* provides a sample checklist that may help identify compliance needs.

The results of the legal compliance review should show areas of compliance, or areas which do not apply to the organisation's activities. It should also show weak points regarding environmental legal compliance. Some main scenarios should exist when answering the question, "does the organisation comply with a specific piece of legislation?"

An overview of all answers to this question should be prepared. This will help the person responsible for legal compliance to quickly identify the areas where action is needed. If individual results are "still open" or "not fulfilled," the overview also serves as a list of points requiring attention, e.g. on the basis of the weaknesses identified during the review. Objectives – and accompanying deadlines for realisation – should be formulated to achieve and/or maintain environmental legal compliance. Remember that the priority of achieving legal compliance does not depend solely on organisation objectives; priorities and objectives must take into account relevant deadlines set by authorities. Nowadays, relations between organisations and environmental authorities in some countries are becoming more positive and constructive. It is advisable to discuss any cases of non-compliance and the action plan with the responsible authority. Any agreement should be recorded in written form.

EMAS requires an external review of the entire EMS to be conducted at least once every three years, depending on [EMAS Annex II point 2.9]:

- Nature, scale and complexity of the activities.
- Significance of associated environmental impacts.
- Importance and urgency of the problems detected by previous audits.
- History of environmental problems.

Activities that are more complex and therefore associated with more significant environmental impacts are supposed to be audited more frequently.

The ISO 14001 standard also includes a "regular review." Regular internal reviews are recommended (e.g. once a year). It makes sense if environmental legal compliance, as part of the overall system, is reviewed at the same intervals.

3.5.2. The Role of Legal Compliance

"The environmental regulations are complex, confusing, ambiguous and often a matter of interpretation" [Forbes, 1999]. There are many regulations to be kept in mind, on all levels of administration. Organisations have to balance between over-complying with given environmental regulations, which can be very expensive, and not to complying with regulations, which can be just as risky. The more complex an organisation's processes and activities are, the more likely it should consider getting help from an expert in environmental legislation.

It cannot be assumed that all regulations existing are still appropriate and necessary. It is just as wrong to assume that compliance with all regulations will automatically result in a clean environment. But nevertheless we can say that environmental legislation has helped to decrease impacts on the environment from human activities in many countries, especially in Europe. As EU environmental legislation will be applied in the new EU member states in Eastern Europe, this effect is also expected to take place in these countries [Forbes, 1999].

Finally one must understand that conformance to ISO 14001 requirements does not mean that all relevant environmental regulations are complied with. EMAS certification does however, require compliance with relevant environmental regulations. In any case, management must ensure that a process of continuous compliance with environmental regulations is implemented.

In court EMS documentation can be used to uncover and prove violation of environmental legislation. At the same time, though, it may be an advantage for organisations to have a well functioning EMS as this will demonstrate its efforts to comply with environmental legislation.

3.5.3. Should External Help be Used?

External help is very often used concerning legal compliance. But there are also other instances when an organisation may turn to a consultancy. It is usually not cheaper to hire a consultant compared to using in-house employees. But the work is in most cases done faster and better. Many organisations for instance hire consultants to help them implement an EMS because they feel they are not experienced enough and that the consultants will do a better job.

Whether to use external help or not is usually a matter of whether an organisation can pay for it. Using external help can be very costly, therefore it is important to get the best service possible. There is a simple way of finding the best consultant: by personal recommendation. If that does not seem to be too reliable, an organisation can also acquire information through:

- The industry/trade association.
- Professional institutes or associations of consultants.
- Environmental business clubs.
- Environmental/trade journals.
- The local business information centre.

A first rather rough selection of potential consultants can be made by:

- Creating list of potential consultants.
- Preparing a shortlist using information from brochures, referrals or other criteria.
- Interviewing short-listed consultants.
- Obtaining of proposals/price quotations from consultants favoured in the interview.
- Re-interviewing where necessary to make sure the consultant appropriate to the organisation's needs has been chosen.

After one or more consultants are selected, their competency can be checked by asking about:

- Experience with relevant organisations or sectors.
- Qualifications of the individual consultants who will undertake the consultancy.
- Previous clients that can be contacted to obtain references.
- Technical facilities available to conduct the necessary measurements, monitoring, testing, etc.

Once a final selection has been made, there are several ways of making best use of the consultant, for example by:

- Making a contract with the consultant.
- Providing any information requested.
- Actively co-operating instead of just leaving the work to the consultant.

- Making sure that regular updates on the work being undertaken are given.
- Reviewing a draft of the consultant's final report.

In addition, a payment on delivery policy will decrease financial risk and encourage the contractor to deliver the work expected [Starkey, R. and Andersson, I. 1998, p. 31].

The next step after the identification of legal requirements is to develop an environmental policy. This is one of the key steps in EMS development as it describes what the EMS aims to achieve. The following chapter thoroughly discusses the topic.

Study Questions

1. Make a list of environmental aspects and impacts for a company you are familiar with. What is the important difference between aspect and impact?
2. Try to produce an eco-map for the room you are sitting in. Even of you are sitting at home there may be environmental aspects and impacts!
3. Take a look at the list you created above (Review Question 1). Try to associate risks with the aspects you identified. Rank them accordingly.
4. Why would a service sector organisation introduce an EMS? Do such companies have any significant environmental aspects and impacts?
5. Can you name some of the environmental legislation in your country that companies have to comply to? Are there any examples of what happened to companies that did not comply to environmental legislation?
6. Your organisation produces wood chips as a by-product in the process of furniture production. Try to find out whether the wood chips are considered as waste and which legal requirements apply to it. Name your sources.
7. How is environmental legal compliance obtained with EMAS and ISO 14001 respectively? What are important differences?

Internet Resources

What is an initial environmental review?

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_5.htm

Environmental Aspects

http://manaxis.com/environmental_aspects.htm

Environmental Assessment

http://europa.eu.int/comm/environment/eia/home.htm

International Association for Impact Assessment

http://www.iaia.org/Index.htm

What is compliance with environmental legislation?

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_5_2_15.htm

Ford Motor Company
– Environmental Management System Workbook

http://www.p2pays.org/ref/08/07378.htm

Appendix B – Aspects, Objectives & Targets

http://www.p2pays.org/ref/08/07378/0737806.pdf

Appendix C – Legal & Other Requirements

http://www.p2pays.org/ref/08/07378/0737807.pdf

4 Planning an Environmental Policy

4.1. How to Write an Environmental Policy

4.1.1. What is an Environmental Policy?

An environmental policy is a set of fundamental principles and objectives which helps an organisation to put its environmental commitment into practice. It is the foundation upon which improvement of environmental performance and an EMS can be built.

The environmental policy is the basis for any organisation's EMS. It is the policy that establishes the objectives against which an EMS will be judged. It sets both long term and short term strategies, it defines the direction in which the EMS is supposed to go. The policy should create a vision for everybody working in the organisation. Since the policy can greatly influence an organisation's public image, it should be clear, understandable and verifiable.

Many organisations already have some type of environmental policy, even if it is not written down. This could be, for instance, that an organisation has committed itself to complying with environmental legislation or to avoid major environmental impacts. Documenting these written or unwritten commitments may be a first step in developing an environmental policy [NSF International, 2001, p. 16 et seq]. Three sample policies are included in the Toolkit (Tools 19, 20, and 21 *Sample Policy*).

Main Contents of this Chapter

- How to write an environmental policy.
- What ISO 14001 and EMAS require.
- How to establish objectives for a policy.
- Why it is useful to involve stakeholder interests.
- How to manage an EMS project.

It is very important to systematically approach the work required for EMS implementation. Setting up a work plan could be a first step. This plan is of course unique for each individual organisation. The first step would be to identify the different tasks and put them into a logical order. After that, the required decisions, resources, and time have to be determined. The following points could be helpful hints for establishing a work plan:

- The level of management involvement required and the decisions needed from both middle and senior management will have to be determined.
- A deadline for developing the EMS needs to be set and a schedule established.
- It will have to be determined how the EMS will be documented (either on paper or computer based).
- The budget needs to be estimated.
- Estimating resources and time can be difficult. A schedule will need to be created and resources for completing the EMS estimated. As work begins on each module, intermediate steps may be identified for which target completion dates can be set [US EPA, July 2001, pp. 1-14].

The policy should relate to products and services, as well as supporting activities. The results of a preliminary review and the analysis of the environmental aspects of products, services and activities need to be considered before finalizing the policy. This may give insights on how the organisation interacts with the environment and how well environmental challenges are being met. For example, information obtained during the preliminary review might help define specific policy commitments.

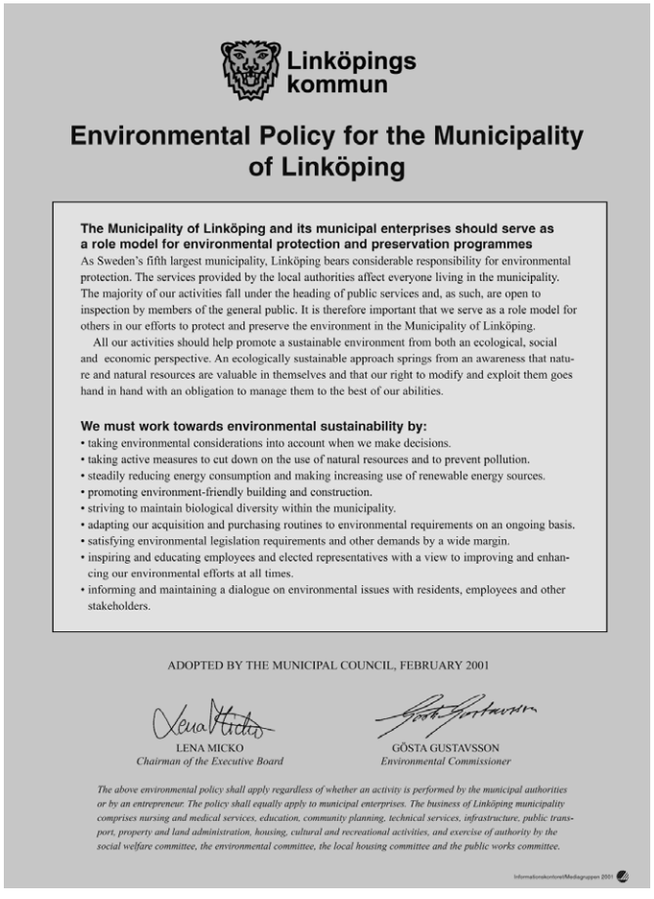
The environmental policy needs to be explicit enough to be audited. This means that it cannot be too general. Measurable goals and commitments need to be set. Commitments made in

the policy must be realistic, and how these commitments will be met needs to be planned [US EPA, July 2001, pp. 2-3].

The organisation has the choice between making its environmental policy a stand-alone document or integrating it into existing documents, such as health and safety, quality or other organisational policies. The second possibility may be more cost-effective, but in some cases the policy can "get lost" in these documents, which makes it hard to communicate the organisation's efforts.

The organisation also has to decide who will participate in developing the environmental policy, and a procedure is required that defines how it will be written. Involving all employees is democratic and will probably increase the acceptance of the policy but at the same time this approach can be too complicated for organisations with several hundred employees. Thus a solution appropriate to the size of the organisation needs to be found.

Employees should understand the policy. Section 5.1.3. provides examples of different communication practices that can be used to communicate the policy. It is a good investment to occasionally check whether the employees have really understood the meaning of the environmental policy to themselves and the organisation as a whole [NSF International, 2001, p. 17].



Linköpings kommun

Environmental Policy for the Municipality of Linköping

The Municipality of Linköping and its municipal enterprises should serve as a role model for environmental protection and preservation programmes

As Sweden's fifth largest municipality, Linköping bears considerable responsibility for environmental protection. The services provided by the local authorities affect everyone living in the municipality. The majority of our activities fall under the heading of public services and, as such, are open to inspection by members of the general public. It is therefore important that we serve as a role model for others in our efforts to protect and preserve the environment in the Municipality of Linköping.

All our activities should help promote a sustainable environment from both an ecological, social and economic perspective. An ecologically sustainable approach springs from an awareness that nature and natural resources are valuable in themselves and that our right to modify and exploit them goes hand in hand with an obligation to manage them to the best of our abilities.

We must work towards environmental sustainability by:

- taking environmental considerations into account when we make decisions.
- taking active measures to cut down on the use of natural resources and to prevent pollution.
- steadily reducing energy consumption and making increasing use of renewable energy sources.
- promoting environment-friendly building and construction.
- striving to maintain biological diversity within the municipality.
- adapting our acquisition and purchasing routines to environmental requirements on an ongoing basis.
- satisfying environmental legislation requirements and other demands by a wide margin.
- inspiring and educating employees and elected representatives with a view to improving and enhancing our environmental efforts at all times.
- informing and maintaining a dialogue on environmental issues with residents, employees and other stakeholders.

ADOPTED BY THE MUNICIPAL COUNCIL, FEBRUARY 2001

LENA MICKO
Chairman of the Executive Board

GÖSTA GUSTAVSSON
Environmental Commissioner

The above environmental policy shall apply regardless of whether an activity is performed by the municipal authorities or by an entrepreneur. The policy shall equally apply to municipal enterprises. The business of Linköping municipality comprises nursing and medical services, education, community planning, technical services, infrastructure, public transport, property and land administration, housing, cultural and recreational activities, and exercise of authority by the social welfare committee, the environmental committee, the local housing committee and the public works committee.

Figure 4.1 *The Environmental Policy of the municipality of Linköping in Sweden. An example of a fairly breif policy document.*

The policy also needs to be communicated externally. The policy could be chosen to be communicated proactively or in response to external requests (or both). This decision should be factored into an overall strategy for external communication.

The next two sections discuss the environmental policy requirements of ISO 14001 and EMAS.

4.1.2. What Does ISO 14001 Require?

As we have seen above, ISO 14001 is an international standard for EMS that sets criteria for formulating an environmental policy and environmental objectives while taking into account environmental impacts and compliance with applicable environmental legislation. The standard only applies to those environmental aspects the organisation can control and over which it can have an influence. Environmental criteria themselves are not specified in the standard.

There are no normative references. What is required is that the implementation of ISO 14001 is embedded in a process of continuous improvement.

The most important ISO 14001 policy requirement is the support of top management. The policy sets the tone for the establishment of the principles of an EMS. It is the policy that sets environmental targets and objectives, distributes responsibilities and establishes milestones in EMS development against which the management system must be judged. It is top management that is responsible for initiating the environmental policy and for providing resources and directions for others who may have the task to develop the final policy [Martin, R. 1998, p. 18].

The policy should reflect the following issues:

- Reflect the moral and ethical basis for the organisation's action.
- Account for regulatory/self-imposed requirements.
- Stress commitment to continuous improvement.
- Provide coordination to other organisational policies.
- Provide attachments to requirements, internally and externally alike.
- Be appropriate to the organisation's products and services as they impact the environment.
- Be clear, concise and implemented at all levels of operations.
- Be publicly available.
- Strive toward prevention and continuous reduction of adverse environmental effects, thus supporting sustainable development.

- Set and allow for publication of environmental objectives and targets, improvement plans and management reviews.
- Satisfy the requirements of third parties concerned such as insurance organisations, banks, shareholders etc.
- Be updated and checked routinely [Martin, R. 1998, p. 18].

There are several things that need to be considered when an environmental policy is developed. The overall goal is to keep the policy as simple as possible. It is meant as a rough guideline, and how the objectives are met are dealt with in detail in the environmental programmes. The policy should nevertheless not be too general in nature. On the contrary it should reflect specific company characteristics and be related to the products and services the organisation offers. A good approach is always employee participation. If all employees have the chance to participate they will more likely identify with the policy. The policy can also be integrated into other documents that are part of other management systems (see section 7.3. *"Integrated Management Systems, IMS"*). Once the policy has been prepared it needs to be communicated to the employees and stakeholders of the organisation. Communicating the policy involves making it available to the public, which is compulsory for organisations that seek EMS certification. The key areas the environmental policy has to cover according to ISO 14001 are:

- Compliance with environmental laws and regulations.
- Pollution prevention.
- Continuous improvement [ISO 14001, section 4.2 and Annex A 2].

4.1.3. What Does EMAS Require?

EMAS precisely defines the requirements for environmental policies. They are very similar to the requirements defined in ISO 14001. Top management is supposed to define the organisation's environmental policy and ensure that it:

- Is appropriate to the nature, scale and environmental impacts of its activities, products and services.
- Includes a commitment to continuous improvement and prevention of pollution.
- Includes a commitment to comply with relevant environmental legislation and regulations and with other requirements to which the organisation subscribes.
- Provides the framework for setting and reviewing environmental objectives and targets.
- Is documented, implemented and communicated to all employees.
- Is available to the public [EMAS Annex I A 2].

EMAS furthermore requires commitment of the organisation to reasonably improve its environmental performance on an on-going basis with a view to reducing environmental impacts to levels which can be achieved with the economically viable application of best available technology (EVABAT), [INEM, 1998, p. 21]. According the EMAS the policy should be based on good management practices. Many equivalents can be found for ISO 14001. The most important are:

- Assess the environmental effects of all new activities, products and processes in advance.
- Assess, monitor and examine the impact of current activities on the environment.
- Implement actions necessary to prevent, eliminate or reduce pollution, emissions and waste generation to a minimum.
- Implement actions to prevent accidental emissions of materials or energy.
- Establish and apply monitoring procedures to check compliance with the environmental policy.
- Establish and update procedures and actions in case of non-compliance.
- Cooperate with public authorities to establish and update contingency procedures to minimize the environmental impact of any accidental discharges.
- Ensure that the contractors working at the site on the organisation's behalf apply environmental standards equivalent to those of the organisation itself and that they follow environmental rules set for suppliers/contractors by the organisation [INEM, 1998, p. 22].

4.2. Setting Objectives and Targets

4.2.1. Policy Objectives

Both ISO 14001 and EMAS require the environmental policy to state a commitment to continuous improvement. This process can only be controlled by establishing a set of environmental targets and objectives. These targets and objectives can only be effective when they are specific enough to be audited, meaning all targets need to be quantified and measurable.

Setting objectives requires an analysis of the exposure to different environmental aspects:

- Environmental aspects which have high public priority and to which the organisation contributes heavily. Here environmental objectives should be set.
- Environmental aspects which have low public priority and to which the organisation contributes heavily. These aspects will have an impact on an organisation if public priority changes (e.g. due to new scientific knowledge, accidents, etc.). Therefore the objective should be to keep an

eye on possible changes in public perception and hence, priorities, and to prepare alternatives.

- Environmental aspects which have high public priority and to which the organisation has a low contribution. These objectives should be added to the above if any investments or changes in technology (products and production processes) are planned. Due to the high public priority the objective should be to hold the current position by not contributing more to these problems [Sturm, A. with Upasena, S. 1998, p. 36].

The objectives previously set can be used later on to evaluate the environmental performance of the organisation. This is done by comparing the current state to the target level set by the environmental objectives and targets. Once this is done top management should set a time frame in which the objectives are to be achieved. This involves evaluating the environmental objectives according to their importance for the organisation [Sturm, A. with Upasena, S. 1998, p. 36]. Tool 22 🛠 *Checklist: Environmental Objectives* provides a sample checklist for evaluation of environmental objectives.

4.2.2. How to Establish Objectives for Environmental Management

"Objectives and targets help an organisation translate purpose into action" [NSF International, 2001, p. 28]. An attempt should be made to connect these goals with other existing strategic plans. This can help increase the effectiveness of an EMS and help integrate it into other management processes.

Whether or not the objectives and targets set are appropriate are the decision of the person responsible for implementing the EMS. Once the goals have been set it needs to be decided how they will be applied: organisation-wide or to individual units, departments or functions.

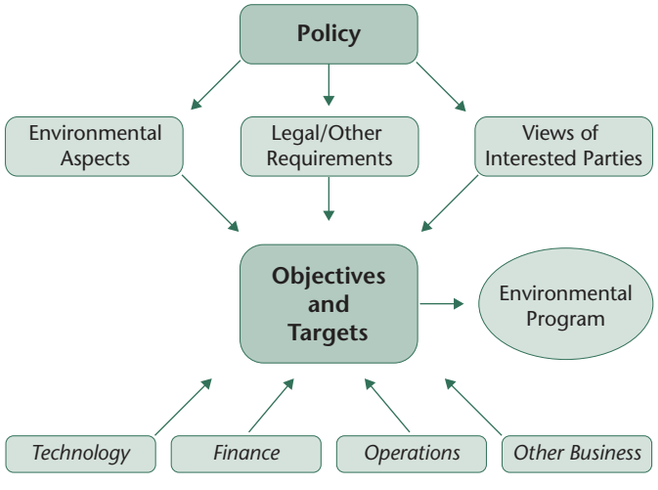


Figure 4.2 *Environmental Objectives and Targets are Determined by Many Different Factors [NSF International, 2001, p. 28].*

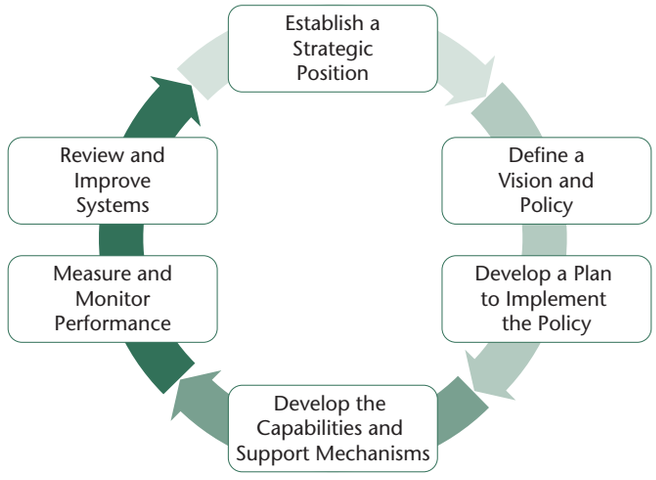


Figure 4.3 *Six Sets of Activities for Integration of Stakeholder Interests [Camarota, 1999].*

In setting objectives, the environmental policy should be kept in mind. Significant environmental aspects, applicable legal and other requirements, the views of interested parties, technological options, and financial, operational and other organisational considerations should also be considered (see Figure 4.2).

Environmental objectives are in most cases unique for every organisation. The objectives and targets should reflect what the individual organisation does, how well it is performing and what it wants to achieve [NSF International, 2001, p. 28].

Environmental objectives can be set in detail or in general, as can be seen by the examples in the case studies.

Setting a time frame and monitoring the targets and objectives set is another important step in EMS implementation. Therefore one will have to establish ways of measuring the progress in meeting the targets. This will help evaluate both the progress of implementation as well as document success. Setting a time frame will help assess resource needs and increase the effectiveness of the EMS. There are of course quite a few ways of actually setting environmental objectives and targets. Three different approaches are presented in Tools 23 🏭, 24 ⓘ, and 25 ⓘ *Objectives and Targets*.

There are of course a whole variety of issues to be kept in mind when developing environmental objectives and targets. First of all it is important to involve the people of the relevant areas in setting objectives, because they often know best what can be achieved and how. On the other hand support from top management is required because they are the ones who can

supply the resources needed. Top management can also help integrate the environmental objectives set into other organisational goals.

Once the objectives have been established they need to be communicated to the employees, who have to fully understand the objectives to be able to work towards achieving them. From time to time it should be checked whether the objectives are set according to the requirements of the environmental policy and that they are clear enough to be measured. At the same time they should be flexible enough to be able to be altered when necessary.

There are two types of environmental targets that can be set: environmental targets that are supposed to maintain the environmental performance and environmental targets that are supposed to improve the environmental performance. The number of targets should not be too large. Experience has shown that about five targets is a good number to start with for small and medium sized organisations. The number can increase in the course of time after first successes have been achieved. In any case, it needs to be made sure that the environmental targets set are realistic and that procedures exist to measure the degree of achievement towards them. Last but not least it is very important to not only focus on the organisation itself to achieve the environmental targets. It may be helpful for instance to look at the suppliers as well, who may supply the organisation with environment friendly products that may help achieve a certain target [NSF International, 2001, p. 29].

Another issue that is very closely linked to developing an environmental policy and establishing environmental objectives and targets is managing stakeholders. They play a very important role for any EMS and therefore require special attention. Section 4.3. deals with this issue.

4.3. Managing Stakeholders Within an EMS

4.3.1. Six Key Steps

The ISO 14001 standard is based on six primary sets of activities that integrate the environmental interests of each stakeholder group as well as set the stage for further interaction among the different groups. These six sets of activities are shown in Figure 4.3.

Managing stakeholders within an EMS involves six key steps:

- Establishing a strategic position.
- Implementing stakeholder interests in the environmental policy.
- Setting environmental objectives and targets with respect to stakeholder interests.
- Measuring and monitoring the performance.
- Reviewing and improving the system.

Thus, stakeholder management is part of each step in the implementation of an EMS. Since these steps were already discussed or will be discussed later we will only briefly address the above issues. The first step is of course the identification of stakeholders. This issue is discussed in section 5.7. Therefore, it is assumed that the stakeholders are already known.

Establishing a strategic position can be seen as part of the initial review. Stakeholder management next involves relating the identification process to issues that may concern stakeholders. Stakeholder perception of the organisation may be helpful to start with, and identifying aspects and impacts that may affect stakeholders is also important. The main questions that can be asked in this first step are: Where are we? Who are we? and How are we related to our stakeholders? Stakeholder interests come into play again when it comes to developing the environmental policy. The views, perceptions and requirements of the stakeholders should be taken into account when developing the environmental policy. The results of the initial review can be used for that. Once the policy is developed it needs to be communicated to all stakeholders. Information has to be made available on the organisation's commitment to performing in an environmentally sound manner.

4.3.2. Stakeholder Demands

In the next step, stakeholder demands should be assessed and evaluated. If management feels the demands that were identified in the initial review are of great importance to the organisation (which in many cases they are), they are formulated into environmental objectives, targets and programmes the organi-

Figure 4.4 *Stakeholder management is part of each step in the implementation of an EMS. © European Communities, 1995-2005.*

sation wants to achieve. These objectives should be communicated again to stakeholders. Communication also involves communicating risks that are posed by the organisation's activities and products. Management of risk is also closely related to stakeholder management. A good way to communicate risks can be by providing information about emergency preparedness and response procedures.

Once the EMS is established it is important to measure and monitor its performance. To keep stakeholders involved and satisfied it is important to keep them informed about how the EMS is performing. This will impact positively on stakeholder perception of the organisation. The same goes for reviewing and improving the system. In the course of time stakeholder demands and requirements may change. Regular review of these demands and requirements is therefore important. Changes can then easily be implemented in the EMS. This review can be seen as the essence of active stakeholder management as it helps an organisation to stay in the continuous improvement process [Camarota, 1999].

Mr. Anton G. Camarota, president of the Denver, US based company AESIR International, wrote, *"Stakeholder management is a central activity within any environmental strategy. Increasingly, business leaders around the world are recognizing the importance of developing an environmental strategy that supports sustainable development and integrates stakeholder issues, concerns and requirements"* [Camarota, 1999].

Both ISO 14001 and EMAS offer effective, practical and certifiable tools for stakeholder management. Stakeholder satisfaction has become a major business objective and is one of the keys to a sustainable business. Therefore, stakeholder management should be kept in mind during all steps of EMS development.

Another important issue is managing EMS projects. The following section explains how this can be done.

4.4. Project Management for Developing an EMS

4.4.1. Challenges of EMS Project Management

Effective project management is essential to successfully implement an EMS. Project management needs to cope with the various problems and challenges that can occur in the process of implementation of an EMS. The US EPA and NSF International [1998, p. VIII] list the main challenges of EMS project management as:

- Obtaining resources.
- Communicating with management and staff.
- Setting objectives and measuring progress.
- Integrating management (systems), procedures, work instructions etc.
- Working with supporting departments that lack formal systems.

Of these, a lack of resources is often the greatest limitation to successful EMS development.

There are problems that reoccur in many EMSs. Problems are often identified too late and solving them becomes very difficult. However, there are easily identifiable early warning signs for most problems. The first warning sign is passive management support. In many organisations top management is enthusiastic about EMS implementation in the beginning but loses interest after a while as the implementation effort grows bigger and the costs for implementation rise. Passive management support means that management does not say "no" to EMS development, but on the other hand does not actively support the process. Trying to allocate resources can consume a great amount of time in such cases and EMS implementation will take a much greater amount of time than originally anticipated. In the end it sometimes turns out that management abandons the project because too few of the objectives were achieved.

4.4.2. EMS in Small Organisations

A problem that often occurs in small organisations is that there is great resistance towards establishing tight structures. Written procedures and documented systems are often seen as unnecessary and are not handled properly. Small organisations often have an informal structure. Further, employees may wonder why an EMS is needed, and may not see any benefits but only additional work [US EPA/NSF International, 1998, p. 8 et seq]. This limitation needs to be overcome in order to successfully implement an EMS. These are obstacles that occur initially in many EMSs, but there are strategies to overcome these problems.

A good start is to select a person who is very familiar with the organisation and who can communicate the intentions to all employees and possibly to management as well. That person should be able to organise and help different departments work together. Another step that is especially important when suffering from passive management support is estimating resources and schedules. Though this can be very difficult, an estimate of staff, resources and other costs is required [US EPA, March 1999, pp. 4-7]. Tool 26 🛠 *EMS Development Schedule and Resources Worksheet* gives an example of how this can be achieved.

4.4.3. Passive Management Support

Passive management support is often based on a lack of understanding of the ISO 14001 requirements. Fears fall into two categories:

- An EMS will commit the organisation to act in a specific way.
- What if the evaluation of aspects uncovers something negative (e.g. regulatory non-compliance, environmental damage, etc.)? The organisation may be better off not knowing about it.

Educating management on EMS concepts to counter these arguments is a necessary first step. If management support is still lacking, EMS development may still move forward by showing how the EMS will support other organisational programmes and goals.

Some limitations, especially when facing resource limitations, may be overcome by developing an EMS network. Two variations of networking are:

- Networking within a project group where all participants are working toward similar goals of EMS implementation.
- Networking of each programme leader with people outside the organisation who can assist in EMS development.

A networking group can be formed with other organisations that have a common goal of EMS implementation. Networking can facilitate implementation by sharing expertise, advice and encouragement [US EPA/NSF International, 1998, p. 26].

Identifying environmental aspects and impacts followed by formulating an environmental policy are the first steps that need to be taken when developing an EMS. All subsequent steps build on these. The following chapter examines the implementation process of these subsequent steps in detail, with a number of tools at hand to support the learning process.

Study Questions

1. Why is the environmental policy an important part of the EMS?
2. What is meant by ”the policy needs to be appropriate to the organisation’s products and services” (p. 46)?
3. How do you think an environmental policy can help support sustainable development?
4. Environmental objectives can be distinguished according to their priority for the organisation and their priority for the public. Why is it important to consider the public when establishing environmental objectives? What is more important, aspects with high public priority and low company priority or aspects with low public priority and high company priority? Explain.
5. Why do stakeholders need to be managed in an EMS? What can happen if they are managed improperly?
6. What is meant by “passive management support” and what are the problems resulting from it?
7. Try to find sample environmental policies from companies in your country (call companies, do research on the internet etc.), find out whether they are specific enough to be audited and list some of the objectives set in the policy. Do you think these objectives are realistic? Are they maybe even too weak?

Internet Resources

IBM's environmental affairs policy

http://www.ibm.com/ibm/environment/policy/index.shtml

Canon Europe's environmental policy

http://www.canon-europe.com/about_us/about_canon/environmental_activities/environmental_policy.asp

Lexmark's environmental policy

http://www.lexmark.com/uncomplicate/sequentialem/home/0,7070,133978162_2600_0_en,00.html

STMicroelectronic's environmental policy

http://www.st.com/stonline/company/environm/policies.htm

Environmental policy of the Austrian Environmental Protection Agency

http://www.umweltbundesamt.at/ueberuns/u-management/?&tempL=1

Belfast City Hospital Trust Environmental Policy

http://www.bch.n-i.nhs.uk/working/Environmental_Policy_PDF_86Kb.pdf

Fraport's (Airport Frankfurt) environmental policy

http://www.fraport.com/cms/environment/rubrik/3/3003.environmental_management.htm

Trelleborg's environmental policy

http://www.trelleborg.com/template/T005.asp?id=986&lang=2

Stakeholder Management

http://www.themanager.org/resources/Stakeholder%20Management.htm

Stakeholder Management

http://www.valuebasedmanagement.net/methods_strategic_stakeholder_management.html

5 Developing an EMS

5.1. Developing an Environmental Management Programme

5.1.1. Developing an EMS

This chapter is the core of this book as it describes in detail the different steps of EMS implementation required by both EMAS and ISO 14001. Chapter 5 can be seen as step by step instructions on how to develop the key elements of an EMS and what needs to be kept in mind in the process. Figure 5.1 illustrates the EMS implementation process. Take this figure as a reference when working with this chapter, it is a useful map if one should get lost on the way.

Main Contents of this Chapter

- How to structure an effective EMS and delegate responsibility.
- How to implement an EMS.
- The importance of appropriate training and how this is conducted.
- The significance and ways of communicating the EMS efforts to stakeholders.
- How an effective document control system is implemented.
- Why operational control is a key EMS element and how it works.
- The significance of emergency preparedness and response in an EMS and the best way of implementing a functional system.
- Importance of EMS evaluations
- How to conduct audits.
- How to do a management review.
- How and why environmental audits are performed.
- The traits a good auditor should possess and how organisations can find the right auditor.
- How an environmental statement (as required by EMAS) is developed.
- Why an environmental statement is also useful for ISO 14001 with regards to stakeholder interests.

All the companies presented in the case studies describe how their EMSs were implemented. They provide valuable information on how EMS implementation is done in practice.

An environmental management programme is a set of specific objectives and actions for improving the environmental performance of an organisation. It is a detailed work plan for putting an organisation's overall environmental goals, i.e. the environmental policy, into practice. According to ISO 14001 [European Committee for Standardization, 1996-08-21, section 4.3.4] the following needs to be included:

a) "Designation of responsibility for achieving objectives and targets at each relevant function and level of the organisation.
b) The means and time-frame by which they are to be achieved."

Again, the environmental management programme should be directly linked to an organisation's objectives and targets. It should be integrated into existing organisational structures such as financial management, purchasing, legal, operational and management information systems [NSF International, 2001. p. 32.]. It is especially important that development of the environmental management programme be given the same status as other programmes in the organisation. This would include input into issues such as:

- Access to capital.
- Choices in technology.
- Production procedures.
- Employee training.
- Emergency protocols [Martin, R. 1998, p. 37].

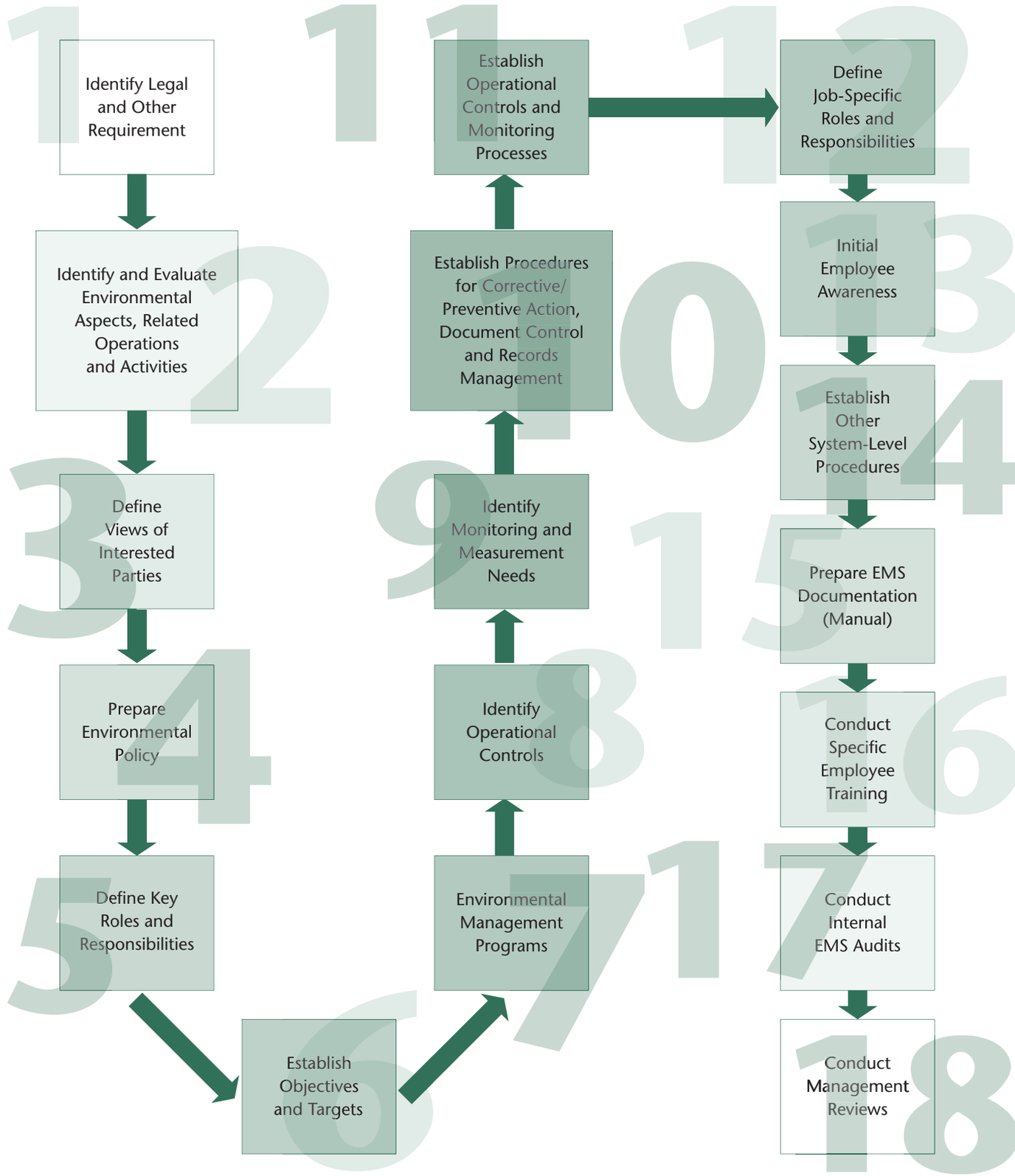


Figure 5.1 *Roadmap for EMS Development [NSF International, 2001, p. 78 (modified)].*

Organisations often find out in the process of EMS implementation that the existing management structures are not adequate to achieve the set targets and objectives. New structures then need to be developed. The best way to do this is to have the employees, in the specific department, participate. Those employees who are involved in establishing and maintaining the EMS may also be involved in this process.

Table 5.1 *How Various Functions Can Support an EMS [NSF International, 2001, p. 37].*

Functions	How They Can Help (Possible Roles)
Purchasing	Develop and implement controls for chemical/other material purchases.
Human Resources	Define competency requirements and job descriptions for various EMS roles. Train temporary workers and contractors; maintain training records. Integrate environmental management into reward, discipline and appraisal systems.
Maintenance	Implement preventive maintenance programme for key equipment. Support identification of environmental aspects.
Finance	Track data on environmental-related costs (such as resource, material and energy costs, waste disposal costs etc.). Prepare budgets for environmental management programmes. Evaluate economic feasibility of environmental projects.
Engineering	Consider environmental impacts of new or modified products and processes. Identify pollution prevention opportunities.
Top Management	Communicate importance of EMS throughout organisation. Provide necessary resources. Track and review EMS performance.
Quality	Support document control, records management and employee training efforts. Support integration of environmental and quality management systems.
Line Workers	Provide first-hand knowledge of environmental aspects of their operations. Support training for new employees

Environmental management programme developmental activities often lead to initiation of projects. These projects may lead to investments in new products, processes and equipment, which will eventually lead to a reduction of environmental effects, increased efficiency, and cost reduction. Potential for such projects might be identified during the initial review and be set as targets [Martin, R. 1998, p. 37].

Despite the complexity, an environmental management programme should be kept simple and understandable. Separate programmes can be developed for new products, processes or services, depending on the nature and scale of the activities of the organisation. All existing programmes must be reviewed on a regular basis to ensure their effectiveness, their main focus should always be on continuous improvement. Environmental programmes can be developed using Tool 27 🛠 *Environmental Programme Worksheet*, though this is just one suggestion.

5.1.2. Structure and Responsibility

For an EMS to be effective it is essential that individual roles and responsibilities be defined, as it is the individual employees of an organisation who will help achieve environmental objectives and targets. As EMS expert Raymond Martin puts it [1998, p. 39]: *"Top management must supply the necessary resources, both financial and staff, to ensure that the EMS is effectively implemented. They are also responsible for appointing a management representative (MR) to oversee the operation of the EMS. Supplying resources is one of the most important tasks of top management."*

The management representative:

- Ensures that the EMS is established and implemented as planned.
- Regularly reports on its performance.
- Works with others to modify and improve the EMS as needed.
- Coordinates actions and projects for the continuous improvement process [NSF International, 2001, p. 35].

Certain responsibilities need to be assigned right from the start. This could include the MR, an EMS coordinator who is in close touch with top management as well as a committee responsible for promoting and developing the EMS. Small companies may not have the resources to employ many people in environmental management. In such cases it may be practical for one person do all the tasks required.

To document all efforts made for EMS implementation, the organisational structure should be defined in writing. An organisational chart could be used as a tool (see Tool 28 🛠

Distributing Responsibilities). To get started the following questions can help determine the most suitable organisational structure for environmental management:

- What is the scope of the environmental management programme?
- What are significant environmental aspects and compliance needs?
- What are the results of previous audits or other assessments?
- What are the current responsibilities for environmental management?
- What are objectives and targets, including those related to compliance and pollution prevention?
- What quality management and/or other management systems exist? [NSF International, 2001, p. 35 et seq.]

Using flow charts to display already existing management activities can be very helpful in the course of EMS implementation. The system should be designed to be flexible, as environmental management needs will change over time. Once the roles and responsibilities are defined, they need to be communicated to the employees. A responsibility matrix can be found in the Toolkit (Tool 29 *Environmental Responsibilities Matrix*).

Table 5.1 shows how different functions within an organisation can take responsibilities within their field of activity in order to support the EMS. Note that virtually every section within an organisation has a certain responsibility towards the environment.

If it is difficult to identify each employee's personal environmental responsibilities and tasks. A good approach is for the employees to draft their tasks and responsibilities. The results of this survey can be compared to what management identified previously and weaknesses can be corrected. The opportunity should be used to review the individual perspectives of the current management structure and individual responsibilities. In many cases this process can lead to improvements in organisation structure and efficiency [Martin, R. 1998, p. 40 et seq.].

Figure 5.2 *An effective EMS requires effective communication, both with regard to content and means of distribution.*

5.1.3. Training, Awareness and Competence

EMS training is basically intended *"to explain the importance of the EMS to staff, and to explain their responsibilities for EMS operations"* [Martin, R. 1998, p. 48]. Adequate training is essential for employees and all levels of management to fully understand their responsibilities. Passive management support is often caused by management's ignorance about the EMS (see section 4.4). Executives need to understand both their own responsibilities and their employees' responsibilities [Martin, R. 1998, p. 48].

Training of all employees is very important because every employee:

- Can have potential impacts on the environment through his or her daily activities.
- Can be a useful resource for generating ideas about establishing operational control for a process, defining environmental aspects or defining structural responsibilities.

All staff members should be trained according to their specific environmental responsibilities. Too much training may confuse employees and is not cost-effective. Training should be carried out in direct relation to significant aspects, targets and objectives in the EMS. It needs to be made sure that all employees understand the potential consequences of not following the EMS, as well as the positive effects of following the EMS. If they do not have significant roles, the employees should at least be trained on EMS content and purpose. Training should be planned around existing meetings to keep the financial expenses for training as low as possible [NSF International, 2001, p. 39].

Training must take place when:

- New employees are hired.
- A change in job descriptions takes place.
- The corrective action process notes failure to follow instructions.
- New procedures are introduced or already existing procedures are altered.
- EMS aspects/objectives/targets have changed.
- New regulations are introduced.
- Job performance is unacceptable

[Martin, R. 1998, p. 48].

Nevertheless, training is not the only means to achieve competence. Competence is typically based on a combination of education, training and experience. For those jobs that can

have significant environmental impact, criteria for measuring the competence of the employee performing this job should be established. These criteria should be as objective as possible. Competence can be assessed in an informal way by directly questioning employees that are involved in environmentally critical functions. They are the ones who can tell best how they perform in various aspects of their jobs (e.g. "Show me how you..."). Their responses can be used to determine whether or not they have the skills and understanding required to perform their job safely. This procedure can help assess further training needs [NSF International, 2001, p. 39 et seq.].

5.1.4. Training Programmes

Key Steps in Developing a Training Programme:

Step 1: Assessment of training needs & requirements.
Step 2: Defining training objectives.
Step 3: Selecting suitable methods and materials.
Step 4: Preparing training plan.
Step 5: Conducting training.
Step 6: Tracking of training (and maintaining records).
Step 7: Evaluating training effectiveness.
Step 8: Improving training programme (as needed)
[NSF International, 2001, p. 40].

The Toolkit includes examples of training plans and training planners (Tool 30 🛠 *EMS Training Planner*, Tool 31 🛠 *Training Plan Operational Control* and Tool 32 🛠 *Training and Awareness*).

In many cases, the planning of training does not need to be started from scratch. Many organisations may already have qualified staff on the basis of experience or previous training. Some training procedures may already exist. Developing a training programme for new employees may be very important to ensure safety and a working EMS. If temporary or contract workers are used in the organisation, their training needs may also have to be assessed. In some organisations, environmental awareness training can be included with existing safety training programmes [NSF International, 2001, p. 40]. The Toolkit includes samples of different types of training and training purposes (Tool 33 🏭 *Training Purposes* and Tool 34 ⓘ *Training and Workshop Methods*).

As the development of training programmes is a costly process it is advised to integrate EMS training into already existing training programmes or to present EMS information at other meetings, where in-depth training is not required. New employees, especially those with only little work experience require much more training than other employees. This represents a serious challenge for many organisations. A good way to solve this problem is to develop a "training package" for new employees. Video tapes of EMS training courses could be included in the package. The training needs of the environmental managers and trainers also needs to be considered. They also require regular training to be kept up-to-date with, for example, legislative development. Temporary or contract workers also need to be trained [NSF International, 2001, p. 40].

5.2. Communication

5.2.1. Internal and External Communication

Stakeholders usually show great interest in the environmental performance and management efforts of an organisation. An effective EMS requires this information to be communicated both internally and externally [NSF International, 2001, p. 43].

Internal communication is the communication within a facility or organisation that is directly related to the EMS. It is required to establish communications on and between all relevant levels of functions within the organisation. External communication is the communication between the organisation and interested parties outside the organisation. There are numerous benefits resulting from effective communications.

Internal communication will:

- Motivate the workforce.
- Gain acceptance for management's plans and efforts.
- Explain the environmental policy and the EMS and how they relate to the overall organisational vision.
- Ensure understanding of roles and expectations.
- Demonstrate management commitment.
- Monitor and evaluate performance.
- Identify potential system improvements
[NSF International, 2001, p. 43].

Effective **external communication** will:

- Demonstrate management's commitment to the environment.
- Make others aware of the organisation's environmental policy and commitment to environmental responsibility.
- Address concerns about the organisation's environmental activities by external parties.
- Announce the organisation's strategic environmental management approach.
- Establish a line of communication that clearly defines emergency responsibilities [Martin, R. 1998, p. 53].

Often, good external communications can avoid problems with regulatory agencies and non-governmental organisations (NGOs). Communication with these sources may even help in the process of setting aspects, objectives and targets.

5.2.2. Communication Systems

A good communications system includes flow of information top-down as well as bottom-up. This means that management needs to inform the employees as well as the employees need to inform management about environmental issues. A frictionless and quick flow of information is especially needed in emergency situations or when stakeholders urgently need information related to environmental risk. The release of contradictory or confusing information creates an atmosphere of mistrust and fear and is counter-productive towards EMS efforts [Martin, R. 1998, p. 52].

"Communication should be clear enough to leave no room for misinterpretation." [Martin, R. 1998, p. 53]. The communication work plan provided in the Toolkit (Tool 35 🛠 *Communication Work Plan*) is an example of how communication can be conducted systematically.

The following questions are of importance for communication efforts:

- Are processes established that apply for receiving and responding to concerns from internal and external interested parties that relate to environmental issues?
- How is the organisation's environmental policy and performance communicated (internally and externally), and are the results of environmental audits and other self-assessments included in this communication?
- Are environmental communications adequate to support the continuous improvement cycle? [Martin, R. 1998, p. 54]

There are certain issues that should be communicated by any organisation:

- Environmental policy and corporate profile.
- Established targets and objectives.
- Measurable environmental performance evaluation such as waste reduction figures, recycling efforts, energy savings etc.
- Identified environmental opportunities.
  and/or
- Independent verification of communicated results.
  [Martin, R. 1998, p. 54]

5.2.3. Stakeholders or Who is the Audience?

To successfully implement a communications system, the relevant audiences need to be determined. Once they have been identified, it has to be found out what these audiences need to know and how the information can be transmitted. Tool 36 🛠 *Identification of Stakeholders* gives an example on how these relevant audiences, the stakeholders, can be identified. Existing methods for communication can help to solve the problem. Table 5.2 gives examples of these methods [NSF International, 2001, p. 44].

Table 5.2 *Communication methods.*

Internal Methods	External Methods
newsletters	open houses
intranet	focus or advisory groups
staff meetings	website or e-mail list
bulletin boards	press releases
brown bag lunches	annual reports
training	advertising
	informal discussions

Communication should always be kept as simple, clear, concise and accurate as possible.

In the EMS development process it is more desirable to just fulfil the requirements by EMAS and ISO 14001. However, once an EMS has been successfully established, it can be very useful to extend the communications programme to other "softer" forms of communication such as open houses for interested parties, routine press releases concerning environmental activities, and sending environmental performance reports to the press and others [Martin, R. 1998, p. 53].

5.3. EMS Documentation

5.3.1. What Constitutes EMS Documentation?

EMS documentation consists of:

- The environmental policy.
- The organisational structure and key responsibilities.
- A description or summary of how an organisation satisfies EMS requirements (e.g. "How do we identify environmental aspects?" and "How do we control documents?" and "How do we comply with legal requirements?").
- System-level procedures (e.g. procedures for corrective actions).
- Activity or process-specific procedures/work instructions.
- Other EMS-related documents (such as emergency response plans, training plans, etc.)
  [NSF International, 2001, p. 48].

When undertaking a new activity like EMS development, documenting discussions, plans, targets, and programmes is crucial. Documentation ensures that no information is lost, and enables performance to be tracked. It ensures that the EMS is well understood and operating as designed. However, adequate information must be provided to the people doing the work. There also may be external parties that want to un-

derstand how the EMS is designed and implemented, such as customers, regulators, lending institutions, registrars and the public. For these reasons, the various processes that make up an EMS should be documented.

How an organisation interprets "documentation" will depend on the particular experience of the organisation. But generally it can be said that the documentation should include the environmental policy, an overview of the organisational structure and certain responsibilities and a description or summary of how EMS requirements are being satisfied within the organisation. Furthermore documentation should constitute system-level procedures such as procedures for corrective actions and activity or process-specific procedures as well as work instructions. Other EMS related documents may also be included, such as emergency response plans or training plans.

5.3.2. The EMS Manual

The EMS manual is a kind of a "road map" or description that shows how the different pieces of the EMS fit together. It is a very useful tool to keep an overview of the structure of the EMS. It can be seen as a series of explanations on the processes an organisation has to implement to be in conformity with the requirements of the specific EMS standard. It is not practical to have a single manual that contains the entire EMS documentation. Rather, a summary manual can be made that:

- Describes the core elements of the system (and how the elements relate to each other).
- Provides direction to related documentation.
  [NSF International, 2001, p. 47]

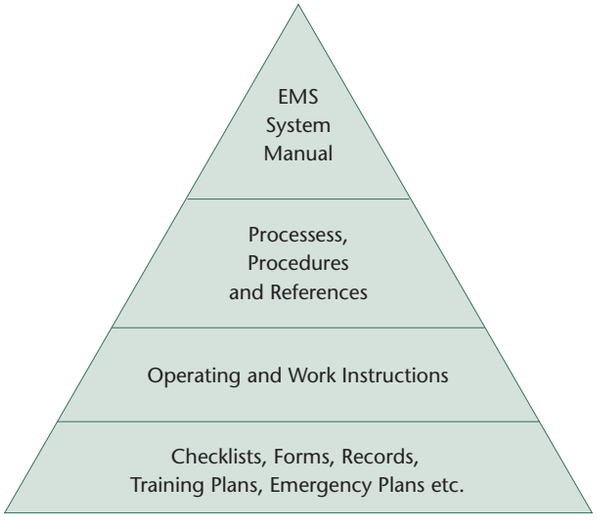


Figure 5.3 *Levels of Documentation [Adapted from US EPA, October 2000, p. 152].*

5.3.3. How to Develop Documentation – Four Steps

The preparation of EMS documentation consists of four basic steps:

1. Determining how EMS documentation can be integrated into existing documents.
2. Fitting the documentation to the organisation's needs.
3. Determining a standard format for all documents.
4. Prototyping each document [US EPA 2000, p. 148 et seq.].

The **first step** involves identifying existing documentation, what the purpose of this documentation is and whether it works the way it is supposed to. The aim of this first step is to locate the documentation that can be used as a starting point for EMS documentation. Already existing documents could be documents such as a quality plan or work safety instructions. Tool 37 🛠 *Documentation Sheet* is a sample documentation sheet.

Step two is meant to adapt the documentation on the one hand to what the EMS team desires and on the other hand to what the organisation is able to afford. These questions may help to determine what fits the needs of an organisation:

- How can those documents existing be extended rather than having to create new ones?
- Does the business operate in a single location or many? This will affect who creates some of the documents and where they are located. It may also affect how many versions of a document might be necessary to cover different circumstances.
- What is the organisation's current computer capability? Many organisations use an electronic system to maintain documents (i.e. a digital network/intranet documentation).
- What security precautions are needed? As a computer system becomes larger and can be accessed by more people, electronic information can more likely be edited and destroyed. Security, or at least restrictions on data access and data change rules, can be a critical issue for many organisations [US EPA 2000, p. 150].

The **third step** in the documentation development process is to ensure that all documents have the same format. This means that the document structure and page appearance should be standardized. If the organisation already has a standard style, that style should be used if possible. Once a consistent format has been developed it needs to be used by everyone. If the organisation uses electronic documentation (which saves paper) it is best to provide a sample format file. An advantage of having a standard is that all documents can more easily be identified as coming from the organisation. However, the main advantage is that documents are easier to read and understand when they are consistent.

Prototyping as required in **step four** means that before the relevant information is filled in, one has to visualize what will be needed in the document and create an outline for it. This practice can be applied as well to the entire EMS development process. The prototyping should be done by the people who will later use the documents. This way the documents will be closer to reality and more effective. The US EPA [October 2000, p.151] suggests the following questions to help the prototyping process:

- What is the document's purpose?
- Who will use it, and how will they use it?
- How long should the document be?
- What must be included in the document? Which information is most critical?
- Is it process-focused? Process-focus rather than regulation or programme-focus helps people who use the documents to better understand how their jobs fit into the rest of the actions of the organisation.
- How is the information best arranged? Will the user read sequentially or randomly?

Figure 5.3 illustrates how documentation as a whole is organised. The EMS system manual at the top of the pyramid is quite general and not very detailed, but degree of specificity, amount of detail and number of pages increase from the top to the bottom of the pyramid.

5.3.4. Document Control

An organisation's staff are not able to consistently perform their jobs in the right way unless they are provided with the proper tools. These tools include all EMS related documents, such as the environmental policy, objectives and targets, information about roles responsibilities and authorities, a description of the EMS, procedures on the system-level and process or activity-level, and emergency response plans. Without a mechanism to manage these EMS documents, an organisation cannot be sure that people are working with the right documents.

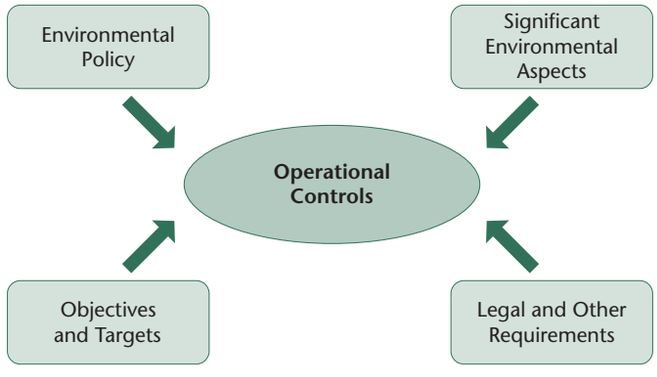


Figure 5.4 *Influences on Operational Controls [NSF International, 2001, p. 53].*

To ensure that everyone is working with the proper EMS documents, every organisation should have a procedure that describes how such documents are controlled. Implementation of this procedure should ensure that:

- EMS documents can be located.
- They are periodically reviewed.
- Current versions are available where needed.
- Obsolete documents are removed
  [NSF International, 2001, p. 50].

It has also to be made clear who has the responsibility for preparing documents, making changes to documents and keeping them up-to-date. Document control should address certain issues such as preparation, distribution, revision, periodic review and removal of documents that have become obsolete. These responsibilities have to be distributed clearly if the documentation system is supposed to function effectively.

The procedure should generally be kept as simple as possible. For larger organisations these document control processes are usually more complex while small organisations use simpler processes.

Limiting the distribution of documents can help. It should be determined how many copies are needed and where they should be kept for ease of access. Using a paperless system can be considered if the people who need access to documents are connected to a local area network (LAN) or have access to the organisation's internal website. Such systems can greatly help controlling and reviewing documents. There are also various commercial software packages that can simplify the document control effort. Another good idea is to prepare a document control index that shows all of the organisation's EMS documents and the history of their revision. This index should be included in the manual. If multiple paper copies exist, a distribution list can be prepared that shows where each copy is located. Changes in documents should be highlighted after revision to make the changes visible to readers [NSF International, 2001, p. 51].

5.4. Operational Control

5.4.1. Identify Existing Controls

Operational controls are required to control significant environmental aspects and impacts, but also to keep track of legal and other requirements, objectives and targets as well as environmental policy, as illustrated in Figure 5.4. Some of these aspects may already be controlled before the EMS is implemented. The first step is to identify those aspects that already

Figure 5.5 Emergency preparedness. *This sign announces the location of a fire extinguisher.*

have operational controls as well as those that still require them. Operational controls that may already exist could, for example, be procedures for compliance with environmental and health and safety regulations [US EPA 2000, p. 119]. A chart should be made to keep track of the activities where control procedures are needed. Tool 38 🛠 *Operational Control* is an example of such a chart.

Documented procedures can help an organisation to manage its significant environmental aspects, ensure regulatory compliance and achieve environmental objectives. There are certain activities that require specific documented instructions because of their high potential of resulting in non-conformance or their high risk of environmental impact. Determining which operations should be covered by documented procedures and how those operations should be controlled is a critical step in designing an effective EMS. It has to be kept in mind that operational controls might even be necessary for managing significant aspects or legal requirements that have no established legal targets or objectives. In determining which operations and activities need to be controlled, it is necessary to look beyond routine production or service. Activities such as equipment maintenance, management of on-site contractors, and services provided by suppliers or vendors can significantly affect an organisation's environmental performance.

5.4.2. How to Identify Procedures to be Controlled

The process of identifying the procedures that need to be documented is best started by looking at the environmental aspects and legal requirements that have already been identified. Then, the operations related to these aspects and legal requirements must be identified and the controls necessary to manage these need to be considered. Flow charts that are available or can easily be developed may simplify the identification of the process steps where some type of control might be appropriate. The preparation of draft procedures may ensure that they are appropriate, realistic and practical.

Following are a few hints for writing procedures. The existing process needs to be understood. Starting with a flow chart, if one is available, can be very useful. Where possible, it should be built on informal procedures.

- It should be focused on steps needed for consistent implementation.
- A consistent format and approach should be used.
- Draft procedures need to be reviewed with employees that will have to implement them. (Better yet: enlisting employees to help write them.)
- Keeping procedures simple and concise is very important. Excessive detail does not necessarily provide better control and may confuse the user.
  [NSF International, 2001, p. 54]

Note that the draft procedures need to prepared and reviewed with the people who will be implementing them. It is often the case that the reviewers come up with a simpler way to achieve the same results.

5.5. Emergency Preparedness and Response

To prevent or to at least minimize the impacts of uncontrolled events, an emergency preparedness and response programme should be established. Such a system can "reduce injuries, prevent or minimize environmental impacts, protect employees and neighbours, reduce asset losses and minimize downtime" [NSF International, 2001, p. 57]. There are of course also financial implications as accidents can be much more costly than the implementation of an emergency preparedness and response programme. Tool 39 🏭 *Checklist: Emergency and Response* is an emergency preparedness and response checklist.

To be effective the programme needs to include provisions for:

- Assessing the potential for accidents and emergencies.
- Preventing incidents and their associated environmental impacts.
- Plans/procedures for responding to incidents.
- Periodic testing of emergency plans/procedures.
- Mitigating impacts associated with these incidents [NSF International, 2001, p. 57].

To ensure continuous improvement it is important to review an organisation's emergency response performance after an incident has occurred. This is helpful for assessing where incidents are most likely to occur and how they may be prevented in the future. If performance is poor, emergency plans and procedures will have to be reviewed.

Many organisations overlook two important steps in EMS development: identification of potential accidents and emergencies, and how the impacts of such incidents can be mitigated. This problem can be solved by creating a team made up of staff from all the relevant departments. The staff can identify

potential emergencies by asking "what if" questions related to their activities. This team should consider both normal and abnormal situations.

Every staff member has to know what to do in case of an emergency. Useful procedures for insuring this are mock drills and the posting of emergency plans around the site. Feedback from staff may help to improve the procedures [NSF International, 2001, p. 57 et seq.].

5.6. Checking and Corrective Action

5.6.1. Performing Environmental Audits

Both EMAS and ISO 14001 require organisations to carry out an environmental management system audit. This means that an organisation must check to see whether its environmental management system fulfils the specified requirements.

It is important to distinguish EMS audits from other forms of auditing. EMS audits are often more complex than other audits, such as legal compliance audits or quality management audits. EMS audits often combine elements of the other types of audits. This of course requires highly qualified auditors (see below).

They can often be well combined with other audits such as regulatory compliance audits, health and safety audits, quality management system audits, etc. A combined environmental compliance audit and EMS audit makes the most sense. The requirements of ISO 14001 do not require compliance with regulations, but they do require the commitment to compliance and routine monitoring of the compliance status. As a result, compliance is more closely related to EMS auditing than quality auditing [Martin, R. 1998, p. 81].

Two important aspects of auditing are the subject matter of the audit and the audit criteria. The subject matter of an audit is whatever is being audited, e.g. conformance with environmental objectives or compliance with environmental legislation. The audit criteria are policies, guidelines, standards or other requirements against which the subject matter of the audit is being checked. As Starkey and Andersson [1998, p. 69] put it, *"An environmental audit seeks to determine whether or not the audit subject matter conforms with the audit criteria."*

For example, the audit criteria of a legislative compliance audit would be the applicable environmental legislation while the subject matter of the audit would be the environmental activities and conditions covered by legislation. For an EMS audit the audit criteria would be the EMAS or ISO 14001 requirements while the subject matter of the audit would be the EMS of the organisation.

The basic intent of auditing is to provide management with information that can be used to make better decisions. Auditing is usually carried out by external contractors as it may be difficult for in-house staff to be critical and objective. However, employees could perhaps audit each other's department. To increase audit effectiveness internal and external auditors can cooperate. In this context it is "essential to develop procedures that clarify audit scope, audit frequency, auditor qualifications, reporting requirements, and follow-up". Two major objectives should be expected from an audit:

- The determination of compliance with the environmental management system as outlined by the objectives and targets, aspects, environmental management programme, the environmental manual, procedures, and work instructions, and to check for effective implementation of them all.
- Determine if the system is effective in achieving the expectations of the policy [Martin, R. 1998, p. 83].

Auditing should take place regularly (see section 7.1). This is particularly important in small organisations because there we often find that staff are not aware of bad habits and problems because they are so tightly involved in the work. Audit results should be incorporated as quickly as possible in the corrective and preventive action process. It is often recommended to perform audits annually. The actual audit frequency can be determined by:

Table 5.3 *Different Audit Situations [Starkey and Andersson, 1998, p. 71].*

Situation	Auditee	Audit Team	Client	Audit Description
An organisation (C) undertaking routine internal audits	C	C	C	Internal, first party
A retailer (R) undertaking audits of a supplier (S) using its own auditing staff	S	R	R	External, second party
An organisation (C) commissioning audits of a waste contractor (W) by an auditing organisation (A)	W	A	C	External, third party
A certification body (B) auditing the EMS of an organisation (C) seeking certification to ISO 14001	C	B	C	External, third party

- The nature of the organisation's operations and activities.
- The significant environmental aspects/impacts (which were identified earlier).
- The results of monitoring processes.
- The results of previous audits.

Tool 40 🛠 *Internal Environmental Audit Plan* and Tool 41 🛠 *Checklist: Internal Environmental Audit* are checklists and audit procedure templates for an internal auditor.

The last step in auditing involves determining whether or not the audit subject matter conforms with the audit criteria. This is done by collecting the audit evidence, which means verifiable information and records or statements of fact. It is important to be aware that auditors can only use existing information, they never generate information themselves. Audits can only take place if enough audit evidence is available

5.6.2. The Auditing Teams

The people involved in an audit are:

- **Auditee** (the organisation to be audited).
- **Audit team** (the group of auditors, or a single auditor designated to perform a given audit. The leader of the team is known as the lead auditor).

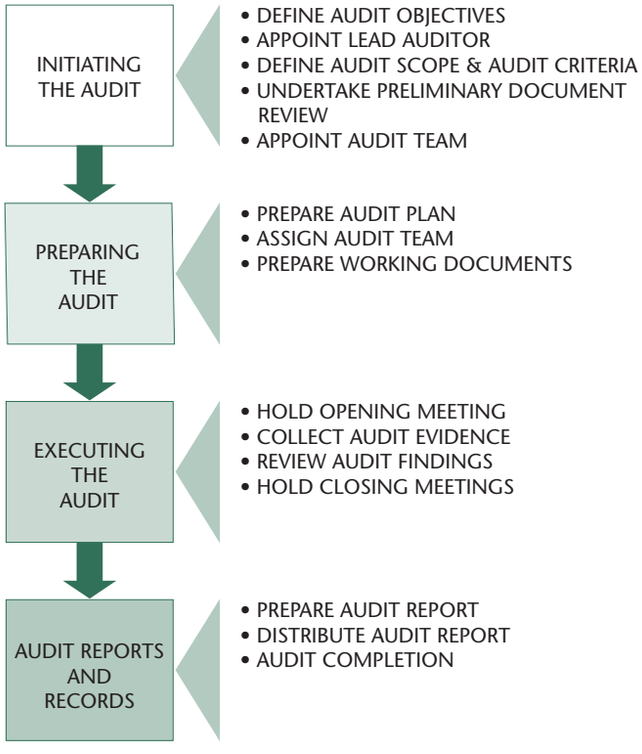


Figure 5.6 *The Four Stages of EMS Auditing [Starkey and Andersson, 1998, p. 73].*

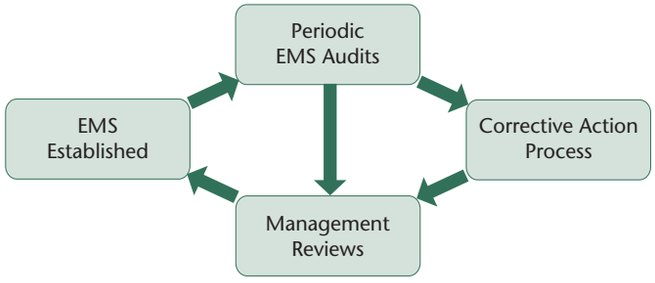


Figure 5.7 *Linkage Among EMS Audits, Corrective Action and Management Reviews [NSF International, 2001, p. 73].*

- **Client** (the organisation in which the audit is performed), [Starkey, R. and Andersson, I. 1998, p. 71].

The audit team should be selected by the organisation itself. If there are no resources available for this inside the organisation, external training may be required. If an organisation is already certified according to ISO 9001, it may be feasible to use the quality auditors for the EMS audits, as they already possess many of the skills required.

Table 5.3 shows how the above terms apply in different situations.

Auditing an EMS is a very complex process and therefore it is useful to divide the process into different audit stages, as illustrated in Figure 5.6.

Tool 42 ⓘ *Internal Environmental Audit Procedure Template* provides more information about how to carry out an audit and Tool 43 🛠 *Internal Environmental Audit Report* is a blank sheet for audit reporting.

There are several aspects of EMS audits that need to be considered. The auditing team needs to resist the temptation to evaluate why certain non-conformances have occurred. Auditing involves only collecting facts. Evaluation comes later. Nevertheless, in the audit process an auditor should discuss with employees any deficiencies detected. This verifies the audit findings and raises the awareness of employees about EMS requirements. If an organisation is using internal auditors (which is usually not recommended, see above), at least two people should be trained. An auditing team usually performs better than a single auditor, and some flexibility is provided if one of the auditors has a schedule conflict. If prior notice of an audit is not given, employees may feel intimidated and confusion may be created. Therefore, it is important to communicate the audit scope, criteria, schedule and other relevant information to the employees concerned. Audits are meant as a check on how well an EMS meets EMAS, ISO 14001, or local requirements. It is not an assessment of how well employees perform their job. Audits should be judged according to the quality of the findings and not the quantity.

Figure 5.7 illustrates how EMS audits are linked to other key elements of the continuous improvement process. Note that without periodic EMS audits there is no corrective action nor management review.

5.6.3. Traits of a Good Auditor

A good auditor needs to be independent of the activity audited. As NSF International [2001, p. 72] notes, an auditor should be *"objective, impartial, tactful and attentive to detail."* As well, to conduct an audit effectively, an auditor must be well informed and prepared.

Whether or not internal or third party auditors are used, they should also possess the qualifications outlined in ISO 14012, which was replaced by ISO 19011 in the year 2002:

- Expertise in environmental science and technology.
- Expertise in the technical and environmental aspects of facilities operations.
- Expertise in environmental law, regulations.
- Expertise in environmental management systems.
- Expertise in EMS auditing techniques [ISO 14012:1996].

These qualifications are essential. An auditor should be registered with a recognized environmental auditor certification scheme. However, ISO does not require that individuals working as auditors for ISO 14001 registrars have to be certified.

Without the above areas of expertise, an EMS audit will not provide the information needed to make improvements. Auditors who have a great amount of experience with quality management system audits or legal compliance audits may not be able to perform an EMS audit if they lack the necessary technical background.

5.6.4. Monitoring, Measurement and Evaluation

NSF International [2001, p. 60] summarized the importance of monitoring and measurement as follows:

"An EMS without effective monitoring and measurement processes is like driving at night without the headlights on – you know that you are moving but you can't tell where you are going! Monitoring and measurement enables an organisation to:

- Evaluate environmental performance.
- Analyse root causes of problems.
- Assess compliance with legal requirements.
- Identify areas requiring corrective action.
- Improve performance and increase efficiency.

In short, monitoring helps you manage your organisation better. Pollution prevention and other strategic opportunities are identified more readily when current and reliable data is available."

The next step required in EMS development after the implementation of the environmental policy is measuring the environmental impacts of an organisation. This can be achieved by establishing an environmental inventory. Accurate measuring can only be done when all equipment for monitoring and measuring works accurately and is regularly calibrated. The inventory also includes information about the status of legal compliance. Another issue worth including in this initial collection of data is information about the financial consequences of environmental protection [Sturm with Upasena, 1998, p. 42].

Another key step in the monitoring process is to evaluate the environmental performance of an organisation. This is done by assessing the environmental performance against the objectives and targets that were set in the environmental policy as well as against environmental legislative requirements the organisation is subject to. In this context it is important to develop well structured procedures for monitoring and measuring. NSF International [2001, p. 60] suggests organisations develop procedures to:

- Monitor key characteristics of operations and activities that can have significant environmental impacts and/or compliance consequences.
- Track performance (including progress in achieving objectives and targets).
- Calibrate and maintain monitoring equipment.
- Periodically evaluate compliance with applicable laws and regulations through internal audits.

Monitoring and measuring is a costly activity, and applying these procedures may help to decrease the costs. Further, only relevant data should be collected, and not data already collected in other contexts, e.g. regulatory compliance. It may be possible to start with simple monitoring and measuring processes that can be expanded as experience is gained and the EMS grows more complex.

5.6.5. Management Review

The management review process in ISO 14001 is basically the same as the internal environmental audit for EMAS. It is a key to continuous improvement and determines whether the system is alive, effective and in daily use. By performing a review, management shows its interest in the system and makes employees aware that it is serious about using the system to improve the environmental performance of the organisation. Management itself determines the intervals in which it performs reviews. Generally, the scope of the review should be comprehensive, though not all elements of an EMS need to be reviewed at once.

Management reviews are an opportunity to make decisions on keeping an EMS cost-effective and efficient. It may turn out that some processes initially put in place are not needed to achieve the objectives and target or to control key processes. Such processes can be eliminated. One of the main objectives of a management review is to assess whether or not employees have been following the guidelines and procedures intended to be implemented for the EMS. In this context it should be considered whether or not the environmental aspects the employees are dealing with are still appropriate. The second main objective of the management review is assessment of the appropriateness of environmental targets and objectives, as well as indicators of environmental performance, which often become obsolete due to, e.g., changing legislative requirements, new stakeholder demands or market pressures. Furthermore the management review needs to determine whether the environmental targets and objectives are being met and whether the financial resources are adequate for supporting the EMS. Other objectives of the management review are to:

- Review regulatory compliance and to determine the causes of non-compliance.
- Determine whether or not operational controls, procedures, corrective actions, preventive measures and continuous improvement efforts were able to improve the environmental performance of the organisation.
- Determine process improvements due to EMS measures.
- Determine if there is operational areas existing that could possibly be improved with EMS measures.
- State corrective action and preventive measures to deal with the non-conformances identified in the review, and to verify that the corrective actions taken were appropriate [Martin, R. 1998, pp. 86-87].

5.6.6. Management Review: Questions to Ask

When conducting a management review the following questions are worth asking in order to achieve satisfying results:

- Were the objectives and targets achieved? If not, why not? Should the objectives be modified?
- Is the environmental policy still relevant to what is being done?
- Are roles and responsibilities clear, do they make sense and are they communicated effectively?
- Are resources being applied appropriately?
- Are the procedures clear and adequate? Are other controls needed? Should some of them be eliminated?
- Are problems being fixed when they are found?

Table 5.4 *Stakeholders Who May Require Environmental Information.*

Stakeholders	Reasons for wanting environmental information
Employees	• To satisfy themselves that their employer is responsible, and that any environmental or health risks are being managed effectively. • To assess how their work has contributed to overall environmental performance. • To understand the business reasons for any environmental actions and how such actions may affect their jobs.
Local communities	• To understand how the organisation's operations affect the local area's air, land and water quality. • To know that there are processes and programmes in place to manage environmental risks and impacts.
Regulators	• To establish what the organisation is doing to manage and improve environmental performance.
Customers	• To assess the suitability of the organisation as a potential supplier. • To compare the organisation's performance to that of alternative suppliers. • To be informed of possible risks/liabilities • To be informed of the environmental impacts associated with products or services.
Suppliers	• To understand its customer's approach to environmental management.
The financial community	• To assess environmental risk in order to make informed decisions on insurance, lending and investment.
Environmental campaigners	• To identify examples of best practice. • To benchmark environmental performance.

- Is the EMS being monitored (e.g., via system audits)? What do the results of those audits tell?
- What effects have changes in materials, products, or services had on the EMS and its effectiveness?
- Do changes in laws or regulations require changes to some of the approaches?
- What other changes are coming in the near term? What impacts (if any) will these have on the EMS?
- What stakeholder concerns have been raised since the last review? How are concerns being addressed?
- Is there a better way? What can be done to improve?" [NSF International, 2001, p. 76].

Tool 44 🛠 *Non-Compliance and Correction Report* can be used to learn how a management review can be conducted to ensure continuous improvement.

5.7. Development of an Environmental Statement

5.7.1. What is an Environmental Statement?

There is considerable evidence that an informed public has a strong influence on the environmental performance of industrial enterprises, through a variety of mechanisms including market forces, social pressures and support for improved regulatory controls. ISO 14001 does not include specific requirements for the disclosure or publication of environmental performance measures or audit results, although other EMS models (e.g. EMAS) do have some such requirements.

An environmental statement is a document which an organisation produces to inform stakeholders about its environmental activities. It is generally accepted that environmental statements are: stand-alone printed documents, annual publications, normally voluntary undertakings, the principal vehicle for company communication on the environment, and should be a fair and credible reflection of the organisation's environmental activities.

Figure 5.8 *Collage of different environmental statements.*

This step is only required when implementing an EMS according to EMAS. It is a way for an organisation to make information on its environmental performance publicly available. EMAS puts great emphasis on delivering information about an organisation's environmental activities to the public. The environmental statement can be used to communicate success, problems and objectives in the field of environmental management. Furthermore it can also be used to:

- Motivate employees to get actively involved in environmental protection measures.
- Document environmental activities and performance.
- Reinforce commitment to the on-going implementation of environmental management.
- Monitor success.
- Aid planning.

EMAS requires this statement to be:

- Examined and validated by an accredited environmental verifier.
- Published only once it has been validated.
- Published in accordance with the audit cycle, that is once every year [EMAS, Annex III point 3.2].

5.7.2. The Drivers for Environmental Reporting – Stakeholder Demands

Calls for environmental reporting of organisations have been around for some time. As early as 1991, the International Chamber of Commerce (ICC) called on organisations to report on their environmental management activities in its ICC Business Charter for Sustainable Development.

Today, employees, customers and neighbours, in addition to environmental pressure groups demand more transparency regarding pollution caused by organisations and their products and about measures taken to reduce or avoid pollution. This means that active communication about environmental issues has become increasingly important in recent years.

Reporting mainly aims at measuring environmental performance, conducting regular environmental audits and assessments of compliance with organisation requirements, and periodically providing appropriate information to, where relevant, the board of directors, shareholders, employees, the authorities and the public.

Table 5.4 lists some of the various stakeholders that may require environmental information regarding an organisation and the reasons they require such information. This demand for information can often be met by the publication of an environmental statement.

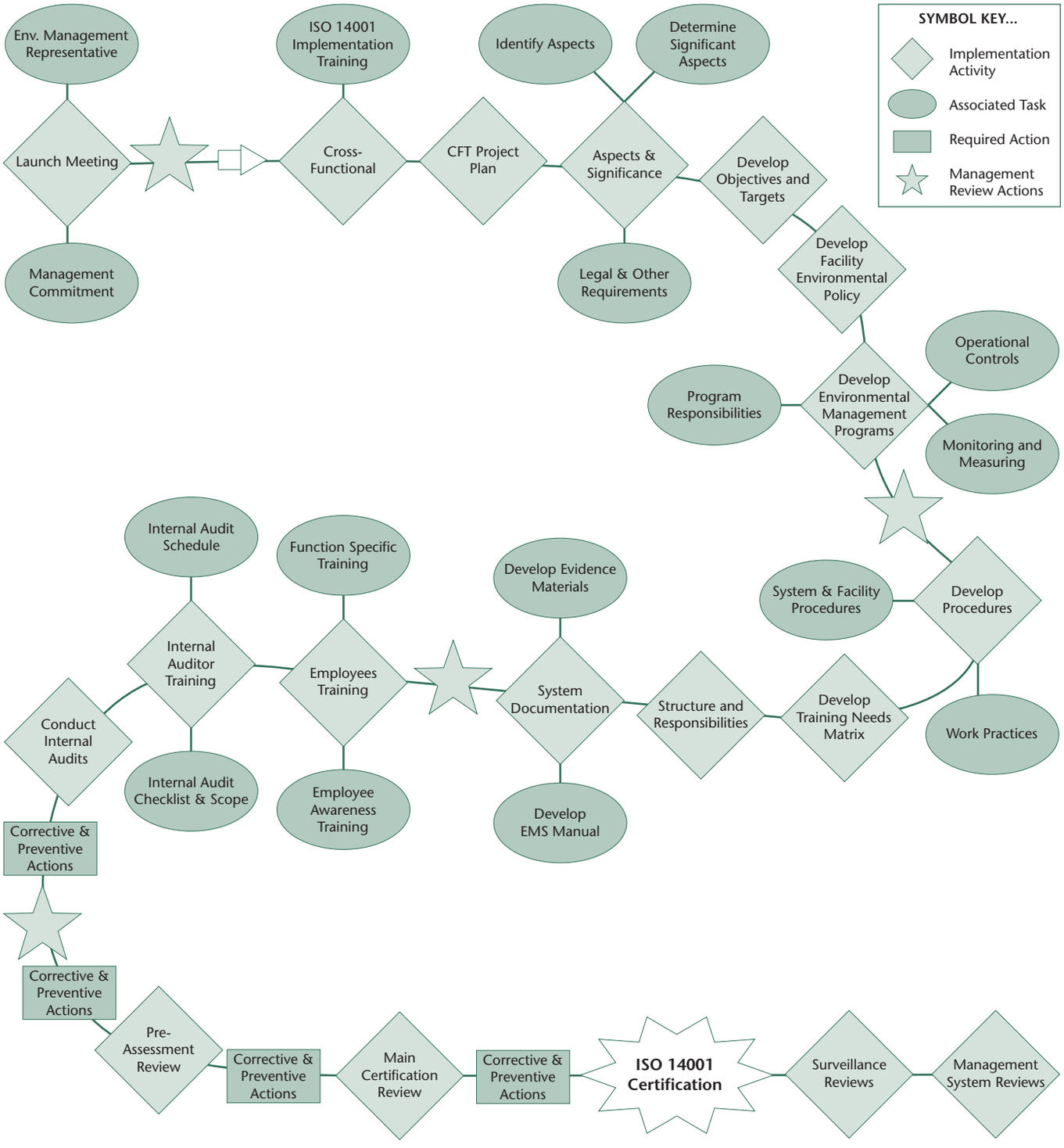


Figure 5.9 *EMS Development and Implementation*
[North Carolina Division of Polution Prevention and Environmental Assistance. (PPP) June 2000. (modified)].

Producing an environmental statement involves the following six steps. Refer also to Tool 45 ⓘ *Environmental Statement*, which describes the information that should be included in an environmental statement.

- Description of the organisation's activities at the site considered.
- Assessment of all the significant environmental issues of relevance to the activities concerned.
- Summary of figures on emissions, waste generation, consumption of raw material, energy and water, noise and other significant environmental aspects.
- Other factors regarding environmental performance.
- Presentation of the environmental policy, programme and management system of the organisation.
- Deadline set for the next statement.
- The name of the accredited environmental verifier [Iandoli, C. and Cozzolino, M. 1999].

This section discussed the different stages that EMS development involves. Figure 5.1, Roadmap for EMS Development, illustrates these stages. Figure 5.9 provides another example (see also Tool 46 *EMS Development and Implementation).* These are two of several ways of visualizing the EMS implementation process. Implementing an EMS is not the end of the EMS development process. It is just the beginning. Chapter 6 explains how official recognition can be achieved for both EMAS and ISO 14001, and chapter 7 turns to what comes after implementation.

Study Questions

1. What is an environmental management programme and how should it be related to the environmental policy and other management programmes?
2. Which is the most important task of top management? Why is it important to designate responsibilities clearly?
3. When does training have to be carried out?
4. Do you believe training helps raise awareness? Or do you agree with people who say that most employees not directly involved with the EMS don't really care about the EMS and become annoyed with training? What would you do to try motivate employees to participate in the EMS?
5. What is meant by internal and external communication?
6. What measures could be taken in your opinion to make information flow quickly between top management and the employees? What could be done to prevent misinterpretation? Do you agree with the statement made in the text that internal communication can help motivate the workforce?
7. How can effective documentation be developed?
8. What could be some negative results of bad EMS documentation? Do you think the risk of employees manipulating EMS documents to make their department look better does exist? Explain. How could manipulation be prevented?
9. What could the results be of a badly controlled EMS documentation? Can you see a paperless system come into existence in the near future
10. In which way can operational controls help control environmental aspects and impacts? Are there limitations to their effectiveness?
11. Are there other negative impacts than financial impacts connected to bad emergency preparedness and response? What can external results be?
12. What is an environmental audit and what can be achieved from it?
13. Do you believe that internal auditors ever can be objective? Under which circumstances would this be so?
14. Is monitoring the same as auditing?
15. How does the effectiveness of a management review depend in the employees' will to cooperate?
16. Are there reasons for developing an environmental statement for companies certified according to ISO 14001? Do you agree that the environmental statement is a very important element of the EMS development process? Or would you rather say that there must have been reasons for ISO not including this requirement into the ISO 14001 standard?

Internet Resources

Implementing an Environmental Management System

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_8.htm

Ford Motor Company
– Environmental Management System Workbook

http://www.p2pays.org/ref/08/07378.htm

What is an environmental management programme?

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_7.htm

How to control and monitor environmental performance

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_15.htm

What is a management review?

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_20.htm

Auditnet

http://www.auditnet.org

What is an environmental statement?

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_21.htm

The Environmental Statement Library

http://europa.eu.int/comm/environment/emas/es_library/library_en.htm

6 How to Get Official Recognition

6.1. ISO 14001

6.1.1. Registration of Companies and Certification of Products

The ISO 14001 EMS standard is intended to be applicable to any organisation of any size, anywhere in the world. The EMS structure described in the standard is therefore very general. Implementation of specific environmental management strategies is not required. It is only required that organisations commit themselves to legal compliance, continuous improvement, and pollution prevention. ISO does not define "commitment," but it is expected that an organisation is able to demonstrate to its stakeholders and other interested parties that the commitment is in fact being implemented. This is a necessary condition for achieving ISO certification of an EMS.

EMS registration refers to the process where *"a non-biased third-party attests that an organisation's EMS conforms with the requirements of the ISO 14001 Standard"* [NSF International, 2001, p. 179]. ISO 14001 is the only standard in the ISO 14000 series for which an organisation can be certified. Note that generally, the terms certification and registration mean the same thing. Technically though, registration may refer to an organisation while certification may refer to a product.

There is the possibility in the standard for so-called "self-certification" which means that an organisation can declare that it conforms to ISO 14001. According to the World Bank [1998, p. 162]:

Main Contents of this Chapter

- The ISO 14001 registration process.
- The difference between registration and certification.
- The registration of an EMS according to EMAS.

"There is considerable scepticism as to whether this approach would be widely accepted, especially when there are legal or commercial consequences of certification."

On the other hand, obtaining certification can be very expensive for organisations in those countries where national certification bodies are not accepted internationally. These organisations have to rely on the few internationally recognized certifying organisations and the cost of bringing them in is quite high [World Bank, 1998, p. 163].

6.1.2 Accredited Registrators

The third-party organisation that performs registration is called the "registrar." The registrar is selected by the organisation that seeks registration. Accredited registrars are registrars whose competency was accredited by an independent organisation, usually the national accreditation bodies. The issue of accreditation of certifiers is becoming more and more important as the demand increases all over the world. Countries which have adopted ISO 14001 as a national standard can accredit qualified organisations as certifiers. Such accreditation can satisfy national contractual requirements. The issue of international acceptance remains. The World Bank [1998, p. 163] wrote:

"However, the fundamental purpose of ISO is to achieve consistency internationally and therefore if certificates from certain countries or agencies are not fully accepted or are regarded as "second class" the goal will not have been achieved. It is probable that the international marketplace will eventually put a real commercial value on high-quality certificates but at the moment this level of sophistication and discrimination has not yet been achieved. It is essential to the ultimate success of the whole system that there be a mechanism to ensure that certification in any one country has credibility and acceptability elsewhere."

6.1.3. Planning for Audit and Evaluation of Implementation

All registration processes all over the world follow the same basic two stage process: planning for the audit and evaluating implementation.

The purpose of the first stage is to determine if an organisation is prepared for the registration audit, which is the point when documentation is reviewed and an on-site visit performed. The main objective of the first stage is to asses whether the EMS is capable of dealing with the significant environmental aspects.

The second stage is an on-site audit to evaluate and verify the conformance of the EMS with the ISO 14001 requirements and that the standard is implemented and maintained [NSF International, 2001, p. 184].

It may seem surprising at first to learn that an EMS must conform to even more than the ISO 14001 requirements. It must also conform to policies and procedures set by the organisation itself. This is the case when an EMS goes beyond ISO 14001 requirements. Certain statements made in the environmental policy such as promotion of sustainable development or support of environmental interest groups become registration audit criteria. Often the registrars themselves have certain policies and procedures of their own that they want their customers to fulfil, such as specific time frames for corrective actions or standard procedures for handling non-conformances [NSF International, 2001, p. 180].

Once registration is achieved, regular surveillance audits are required. These may be conducted once per year (with a re-audit after three years) or at least twice per year with all EMS elements audited in a three year period. Surveillance audits cover only certain EMS elements while re-audits cover the entire EMS.

Figure 6.1 *Preparation before an audit. The equipment is a laser for measuring gradient and alignment of pipelines. © KCM consulting.*

Registration does not mean that the organisation is a "green, environmental friendly facility" or that superior environmental performance has been demonstrated. It only means that the organisation can claim to have a documented EMS that is fully implemented and consistently followed.

6.1.4. Registration and Certification

The ISO 14001 Standard does not require third-party registration. However, this has become a market requirement for some industries. For example, the major automobile manufacturers require that all suppliers have an EMS certified according to ISO 14001. In other industries EMS certification is not a direct market driver, but there are other reasons to obtain registration:

- Maintenance of current market position.
- Opportunities for a competitive advantage.
- Help ensure regulatory compliance.
- Improve relationships with regulators and/or the surrounding community.
- Support state and federal regulatory incentive programmes [NSF International, 2001, p. 181].

Beside these rather obvious benefits of registration, there are also internal benefits that are often not recognized. The investment made by introducing an EMS is being protected by registration and regular audits will help the EMS remain on the agenda and will enforce continuous improvement [NSF International, 2001, p. 181].

In summary, certification according to ISO 14001 does not automatically mean that an organisation is more "eco-friendly" than another. It only states that there is an approach taken to control environmental aspects and impacts, and that continuous improvement is the overall goal of this organisation. Whether the organisation really is more "eco-friendly" has to be stated and proven individually by providing the relevant information to the stakeholders. The certificate that can be obtained often looks like the one in Figure 6.2 for Nacka kommun.

It should be noted that focussing too strongly on obtaining ISO 14001 certification may in some cases be counterproductive. Many organisations tend to forget that certification is only the starting point of the continuous improvement process and not the overall goal to be achieved. Often these organisations then fall back into old habits, and the investment of implementing an EMS can not pay off in such cases.

6.2. EMAS

6.2.1. Validation and Registration

EMAS validation is when an independent external party, known as an accredited environmental verifier, examines an

organisation's EMS and environmental statement to see if they meet EMAS requirements. If the verifier is satisfied with the results of the examination the environmental statement will be validated. The next step is registration. The organisation sends its validated statement to the national EMAS competent body. After having paid the registration fee, the site is registered in the official list of EMAS sites. Finally, the organisation receives the EMAS statement of participation.

To get official recognition certain requirements need to be fulfilled:

- An environmental policy that meets the relevant requirements must have been established.
- An environmental programme with specific objectives and measures must have been set up.
- An EMS must be in place and applied.
- An environmental review and environmental audit must have been carried out in accordance with the relevant requirements.
- The data and information in the environmental statement must be exact and sufficiently detailed and meet the requirements of the system.
- The validated environmental statement must have been sent to the EMAS competent body.


ISO 14001

CERTIFIKAT

CERTIFICATE

Härmed intygas att miljöledningssystemet för
This is to certify that the Environmental management system of

Nacka kommun
Org.nr/*Reg.no* 212000-0167

är i överensstämmelse med standarden SS-EN ISO 14001:2004.
has been approved according to SS-EN ISO 14001:2004 standard.

Miljöledningssystemet omfattar verksamheten:
The Environmental management system is applicable to:

Stadsbyggnad, Teknisk försörjning och Miljö, Folkhälsa & Säkerhet
Urban Planning, Public Works and Environment, Public Health & Safety

Certifieringens omfattning och villkor framgår av certifieringsbeslutet.
The scope and conditions of certification are specified in the certification decision.

Certifikat nr / *Certificate no* 14500942

Göteborg den 4 april 2005
BMG TRADA Certifiering AB

BMG TRADA CERTIFIERING

Figure 6.2 *The ISO 14001 certificate of the municipality of Nacka, Sweden [http://www.nacka.se].*

First-time registration also requires submission of the following information:

- Name of the organisation.
- Name and location of site.
- Brief description of activities at the site.
- Name and address of accredited environmental verifier who validated environmental statement.
- Deadline for submission of next validated environmental statement.
- Short description of EMS.
- Description of audit plan [EMAS Annex VIII].

6.2.2. Using the EMAS Logo

The EMAS logo is a means to communicate official recognition to interest groups. It is supposed to:

- Indicate the reliability and credibility of information provided by an organisation with regard to its environmental performance.
- Indicate the organisation's commitment to improvement in environmental performance and to the sound management of its environmental aspects.
- Raise awareness about the scheme in the public, among interested parties and among organisations willing to improve their environmental performance (See Internet Resources: EMAS – FAQ.)

There are two different versions of the logo: one for *"verified environmental management"*, and one for *"validated information"* (see Figure 6.3).

Version 1 of the logo can be used on the letterheads of registered organisations and on information advertising an organ-

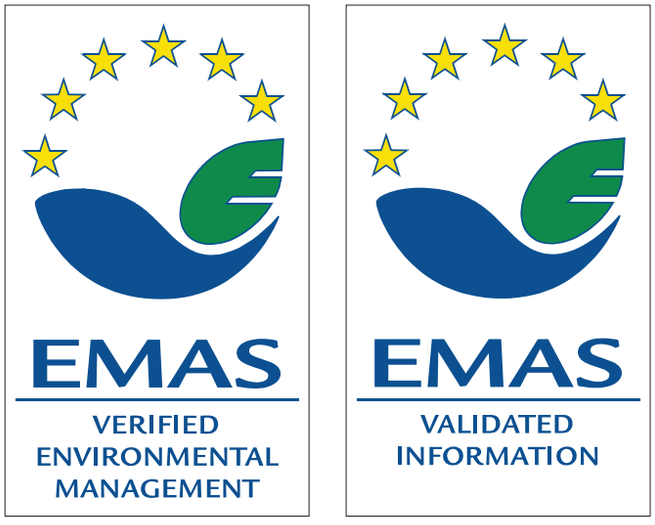


Figure 6.3 *EMAS Logo Version 1 and 2 [EMAS Annex IV].*

isation's participation in EMAS. Version 2 of the logo on the other hand can be used on validated information as described in Annex III of the EMAS regulation, on validated environmental statements and on adverts for products, activities and services. The registration number of the organisation using the logo always has to be included. Note that the logo must not be used *"on products or their packaging or in conjunction with comparative claims concerning other products, activities and services"* [Ibid].

Study Questions

1. Describe in a paragraph or so how ISO 14001 certification can be achieved.
2. In which way is EMAS registration different from ISO 14001 certification?
3. Can you think of other industry sectors other than the automotive sector where certification to ISO 14001 is a market requirement?
4. Looking back at what you have learned, do you think implementing an EMS will be worth the effort? Explain.
5. Is it really necessary to keep the ISO 14001 standard as general as it is? Would it still be applicable if it were more detailed?

Internet Resources

EMAS – FAQ

http://europa.eu.int/comm/environment/emas/tools/faq_en.htm

ISO 14001 certification

http://www.iso.org/iso/en/iso9000-14000/certification/index_two.html

ISO 14001 certification process

http://www.tuvps.co.uk/iso-14001.asp

Publicizing your certification

http://www.iso.org/iso/en/iso9000-14000/certification/publicizing/index.html

ISO 14001 accreditation bodies

http://www.iso.org/iso/en/info/ISODirectory/intro.html#

Guide to EMAS registration

http://europa.eu.int/comm/environment/emas/registration/index_en.htm

National EMAS bodies

http://europa.eu.int/comm/environment/emas/tools/links_en.htm

List of EMAS accredited verifiers

http://europa.eu.int/comm/environment/emas/tools/contacts/verifiers_en.htm

EU register of EMAS organisations

http://europa.eu.int/comm/environment/emas/about/participate/sites_en.htm

7 Beyond Certification

7.1. Regular Audits

A regular and systematic assessment of an EMS forms the basis of the continuous improvement process. Such an audit can be either internal or external. Internal audits are management reviews and are carried out by top management. External audits are usually performed by an external validation team and do not take place very often. Regular audits start taking place after the first certification of an EMS by an external certification body. Audits are vitally important to the effectiveness of an EMS because they:

- Help the organisation find out whether the EMS is correctly implemented and functions properly.
- Provide stakeholders with the confidence that the system is being checked regularly to identify possible correction needs.
- Help motivate the employees to actively participate in the EMS.

It is important that the regular audits are planned carefully. Not all elements of the EMS need to be audited at once, but they should all be audited on a regular basis. The same tools can be used for regular audits as for the initial review, though with the aim of comparing the objectives set with the objectives actually achieved. It is important to address questions to employees about their environmental performance, as they are the ones who eventually apply the objectives. Employees at the bottom of the organisation hierarchy should also be questioned. It is most practical and efficient to interview employees at their place of work, rather than using less personal methods such as questionnaires. Employees should not be intimidated by the interviewers. On the contrary, employees should be encouraged to participate in the EMS and minor failures should not be punished. The aim of an audit needs to be defined before it is performed.

In every audit there are three areas of compliance that must be controlled:

- With the environmental targets the set by the organisation.
- With relevant environmental legislation.
- With the procedures and instruments that were defined for the EMS.

Main Contents of this Chapter

Some of the issues that need to be addressed after implementation of an EMS are regular audits, continuous improvement and considering the development of an integrated management system (IMS). These topics are discussed in this chapter. They are not directly part of the EMAS or ISO 14001 requirements, but are nevertheless very important for sustainable environmental management.

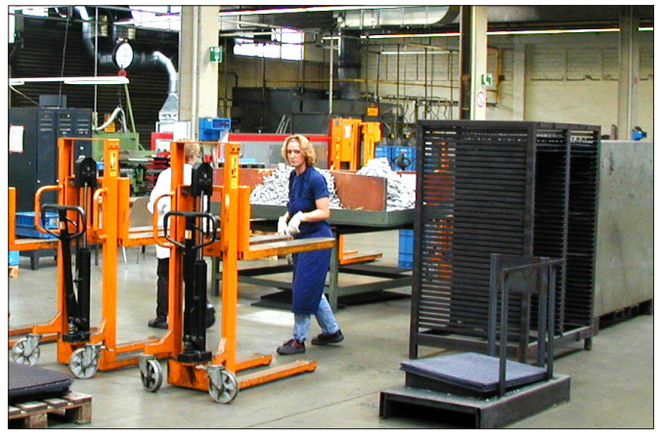


Figure 7.1 *A production hall may need more regular audits, since work safety aspects are especially important. Photo: Jörg Bentlage.*

The results of the audits must be documented and then evaluated carefully. The audits should be assembled into an audit report to help top management take appropriate measures to eliminate the deficiencies detected.

Figure 7.2 shows the different steps a regular audit should involve.

7.2. Continuous Improvement

Continuous improvement is one of the key elements of effective environmental management. In most cases, the first version of an EMS is not perfect. An EMS should improve with time. It involves continuous work to both maintain the status quo and to improve environmental performance.

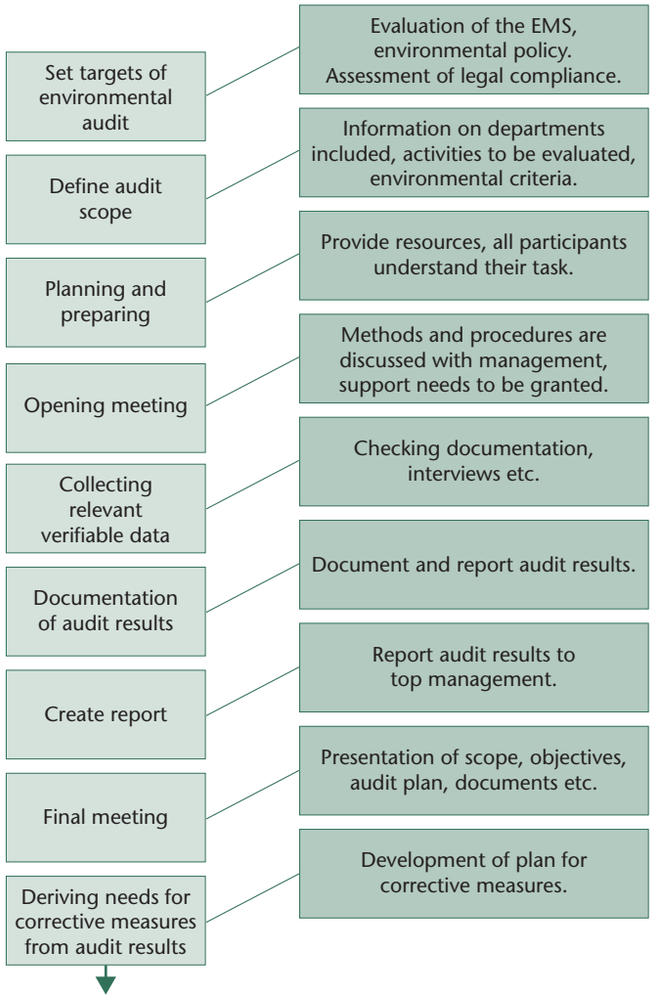


Figure 7.2 *Conducting Regular Environmental Audits [Ministry of Environment and Transport for Baden-Württemberg, et al. 2001, p. 13 (modified)].*

An organisation's EMS is just like the organisation itself: which may be dynamic and ever changing as new tasks arise that need to be adapted to. As most organisations grow more complex in the course of time, most EMSs will do the same. The challenge is to maintain efficiency and effectiveness despite the ever growing complexity of the EMS. This process could involve six elements:

- Opportunities for improving the EMS need to be identified, this will lead to an improved environmental performance.
- The cause or causes of non-conformances or deficiencies need to be determined in order to solve the problem.
- Plans for corrective and preventive action need to be developed and implemented to address the causes previously identified.
- Once implemented, the effectiveness of the corrective and preventive actions needs to be verified.
- Any changes in procedures from the process improvement need to be documented.
- The measures taken should be compared to the objectives and targets set in the environmental policy [International Finance Corporation, 2000].

The key to continuous improvement is to not only identify what is happening but also to identify why it is happening. The continuous improvement process is directly derived from the results of the management review or the regular audits. Possible non-conformances detected have to be analysed and translated into corrective measures. The results of the corrective measures have to be analysed again and new deficiencies identified and corrected. This is an on-going process that has to be carried out during the entire life span of the EMS (which is usually the life span of the organisation itself).

Note that the efforts an organisation makes for continuous improvement should always be balanced with the expected results. Putting too much resources into continuous improvement does not make sense when it does not pay off in the end. Nevertheless, the emphasis of an EMS should be placed on continuous improvement, which is the core of an EMS. It is continuous improvement that is responsible for most of the benefits an EMS can deliver.

7.3. Integrated Management Systems, IMS

7.3.1. The IMS Approach

Integrating an EMS into a larger scheme of management systems can be seen as an advance compared to having standalone systems. One definition of integrated management systems (IMSs) is:

"Integration means to manage different issues like quality, environment, safety, information, further education etc. under a common roof, within one common framework inside the [organisation]. Therefore integration is far more than mere coordination" [Funck, D. et. al., 2002, p. 7].

However, there is no theory that thoroughly describes the IMS approach and therefore there have been no satisfactory drafts for the standardisation of IMSs, which is mainly due to their great complexity. Nevertheless there are some key characteristics that are widely agreed on, something we will look at in detail in chapter 9.

An IMS is usually a bundle of different management systems within an organisation. However, an IMS is more than just the "sum of its parts" as it combines the advantages of each sub-system and creates an effective and efficient overall management system.

There have been discussions among experts to develop a standard comparable to ISO 14001 or ISO 9001 for IMS. This may not be realistic as IMSs are far too complex to develop a common implementation approach. The implementation process always depends on the management systems already in place in a particular organisation and in the way different specific activities are connected. One could argue that an IMS standard could be kept very general, or just address a limited area, such as environmental management and quality management. However, ISO 9001 already harmonises standards for environmental management and quality management. As well, a general IMS standard could be too superficial and easy to achieve.

Surveys about this issue have shown that an IMS is not limited to quality management or environmental management. Today organisations are increasingly concerned about social issues such as work safety and health or job satisfaction. Nevertheless, environmental impact and work safety remain the main concerns for most organisations. The benefits perceived are increased employee motivation, an increased innovative potential, and the ability to adapt to changes. Developing a sustainable, e.g. a long-lasting, effective and efficient management system, is the overall goal of an IMS.

7.3.2. Process Management as Key Element of IMS

The basis of an IMS is process management. The advantage of using process management for an IMS is that the elements of the different management systems can be applied to each and every process step separately. This is however a very time consuming activity. The implementation of an IMS can take up to two years, [Funck, D. et. al., 2002, p. 4] depending on the number and degree of maturity of the different management systems as well as other organisation-specific characteristics. IMS implementation has similar requirements as EMS implementation, such as the commitment of top management, employee participation, and involvement of all organisational levels.

Communication is another foundation of an IMS. In-house communication plays a major role, as all employees should be actively involved in the system. They are not only supposed to participate in following the instructions established but also to help improve and shape the system. Another element is risk management. It plays a major role in an IMS, and to a greater extend than in environmental management. It is not merely restricted to environmental issues but to all issues that may affect an organisation's processes and activities.

7.3.3. Implementing IMS

The IMS implementation process requires good coordination from one or more system managers. The system manager needs to distribute the resources provided by top-management, co-ordinate the implementation process and motivate the employees. The person performing the task should be well aware of all processes in the organisation and be familiar with the tasks the employees perform. Surveys have shown that building an IMS out of existing management systems is more difficult than planning an IMS from scratch. Many problems can be solved by performing an initial review of the entire organisation, and then performing a "gap and overlap analysis" of the different systems in order to get rid of redundancies and fill the gaps. A general rule for IMS development is to include fewer organisational processes the bigger the organisation is, to decrease the complexity of the IMS. At the same time it is important to integrate those processes which have the greatest strategic relevance for the organisation [Funck, D. et al., 2002, p. 4 et seq.].

In conclusion, it can be said that an IMS can be an advance compared to stand-alone systems. However, to be effective an IMS needs to be planned carefully and requires much time and effort. A well planned IMS can provide a competitive advantage and increase an organisation's efficiency and employee motivation and identification with the organisation. This is something companies have realized, and in recent years IMSs have become more and more wide-spread. This trend will probably continue and IMSs will eventually replace all stand-alone systems, where feasible.

The previous sections have provided facts and background information on EMSs. In the following chapter the strengths and weaknesses of ISO 14001 and EMAS are discussed.

Study Questions

1. ”Regular EMS audits are the key to continuous improvement.” Do you agree with this statement? Explain. What would happen to an EMS if no regular audits were performed?
2. How can continuous improvement be assured in an EMS? What are the instruments and how do they interact with each other?

Internet Resources

Continuous Improvement and Corrective Action

http://www.inem.org/new_toolkit/comm/environment/emas/toolkit/toolkit_17_1.htm

Integrated Management Systems in Small and Medium-sized Enterprises

http://www.baua.de/english/info/tb00_01/tb102_139.pdf

Integrated Management System Fact Sheet

http://www.iqa.org/information/d2-6.shtml

8 Strengths and Weaknesses

8.1. EMAS

8.1.1. Criticism from Industry, Science Sector and NGOs

EMAS is criticized by a great variety of interest groups. In the commercial sector, organisations with great environmental impacts praise EMAS for its high internal management advantages. But the lack of external benefits and incentives is widely criticized. This represents a great problem for many organisations seeking EMAS registration as implementing the scheme can be very costly compared to the potential benefits, such as resource savings. For many organisations, EMAS registration does not pay off (at least in the short term). This problem is very serious. In Germany the number of registrations decreased by more than 150 between January and December 2002. This is partly due to the economic recession that resulted in many companies going out of business. However, the number of registrations had been stagnating before the recession, mainly because organisations realized that implementing the scheme does not always result in economic gain. Many organisations now demand benefits and incentives such as tax reductions, regulatory relief, financial grants, credits and public procurement. As a reaction to critics, some member authorities, such as the Catalan and Austrian governments, established incentive programmes.

The same arguments apply to the service sector, though there the financial challenge of implementing an EMS according to EMAS is even greater. This is because there are not as many large environmental impacts in the service sector as in industry. Further, organisations find it hard to collect quantifiable data on their resource savings. As well, one of the greatest benefits of all, legal security through guaranteed compliance, can not be quantified.

There is also criticism from NGOs. Some NGOs regard the great flexibility that EMAS offers for designing an EMS, as its greatest weakness. This flexibility enables organisations to take measures without having to comply with environmental performance targets. This leads to the problem discussed above: the benefits of EMAS are basically not quantifiable. Comprehensive statistics are not available about the benefits of EMAS to the environment nor to the financial situation of the registered organisations.

8.1.2. Use of EMAS in Administration

EMAS is widely implemented in the public administration sector. The public administration sector plays an important role in promoting EMAS because it is the main actor that establishes contact between the various EMAS stakeholders. Large organisations are involved that have large environmental impacts, and they can encourage their suppliers to achieve EMAS registration. An example of the importance of environmental management in the public sector is the April 2000 resolution by the German Parliament that calls on all federal administrative bodies to implement an EMS according to either EMAS or ISO 14001. Even the European Commission is working towards obtaining EMAS registration.

Main Contents of this Chapter

ISO 14001 and EMAS are of course not perfect and both receive much criticism. This chapter summarises the current state of strengths and weaknesses of EMAS and ISO 14001. The systems are first looked at individually, followed by some concluding remarks. In many cases, the strengths and weaknesses are the same for both standards.

8.1.3. The EMAS Logo

There is some criticism by almost all organisations and many NGOs involved with EMAS. Through EMAS, organisations hope to gain competitive advantages over organisations that are not registered to EMAS. A complaint is that both the scheme and the logo lack public recognition. Most people have never heard of EMAS and don't know what the logo means. This lack of awareness is due to a variety of reasons. A major reason is that the European Union, member states, and public authorities have not actively promoted the scheme. The position of the European Commission is that promotion is the task of the member states, but few have done so. Austria and Germany are exceptions, and there the number of organisations registered for EMAS is the highest in Europe. The other member states though have been very reluctant. In general, there is very little educational material available, which is a problem that the European Commission is trying solve. A step in the right direction was establishment of the EMAS Website, http://europa.eu.int/comm/environment/emas/index_en.htm.

Another reason for EMAS not having been widely accepted is the existence of several hundred other eco-labels in Europe, which make it hard to distinguish one from the other. This problem is also due to the restrictions of the European Commission regarding use of the EMAS logo for advertising. As noted above, the EMAS logo can only be affixed to products and packaging under certain circumstances to make sure that it cannot be confused with product labels. Many organisations demand these restrictions be lifted to gain competitive advantage for the efforts made during EMS implementation. The European Commission is currently exploring exceptional circumstances under which the EMAS logo might be used on products and their packaging.

Figure 8.1 *It is easier to obtain certification for ISO 14001 than EMAS. It is also more widely recognised. The number of ISO 14001 certificates is increasing rapidly. © Samtek AB.*

Figure 8.2 Coal kills the climate. *Coal using facilities may still recieve ISO 14001 certificates. © Greenpeace/Fred Dott.*

8.1.4. Positive Aspects of EMAS

None-the-less, there are several positive aspects of EMAS implementation. Many organisations say that implementation of their EMS significantly improved communication with their stakeholders. EMAS is also a helpful way to demonstrate compliance with environmental legislation. Furthermore, EMAS links very well with other management systems, such as quality or health and safety management systems. All in all, EMAS can boost the performance of all management systems within an organisation, particularly by using resources very effectively [Altman-Schevitz, J. et al., 2002].

8.2. Comparing EMAS and ISO 14001

8.2.1. Differences Between EMAS and ISO 14001

Much of the criticism of EMAS can also be applied to ISO 14001. Nevertheless, there are some very important differences.

There are far more organisations certified according to ISO 14001 than EMAS. This is of course partly due to the fact that ISO 14001 is an international standard while the application of EMAS is limited only to the EU and European Economic Area. On the other hand, ISO 14001 is regarded as less strict than EMAS. That means that it is easier to obtain certification for ISO 14001 than EMAS. This difference between the two standards is partly due to the fact that ISO 14001 needs to be applicable in all countries of the world, while EMAS needs to be applicable to a small number of countries only that are relatively homogeneous. The mandates of the sponsoring bodies plays also a role beside the geographic coverage. ISO is an international non-governmental organisation while EMAS is a government regulation. A third reason ISO 14001 is more popular is the fact that it is more widely known and recognized.

8.2.2. Criticism on ISO 14001

A major criticism by NGOs of ISO 14001 is that it is not strict enough. They believe that ISO 14001 is too general in nature, as only an organisational structure is set while the rest is up to the organisation itself. Another criticism is that it should not be enough to only intend to decrease environmental impacts in the future, but that certification should require meeting specific performance targets.

Another consideration is the price of ISO documents that describe the standards. It is a paradox that the standards are meant to be applicable to all types of organisations and activities, but that the price may stop interested parties from getting them. This is particularly a consideration for small organisations in poorer countries, as EMS development may fail due to lack of money. For example, from the central distribution centre in Switzerland, a copy of the ISO 19011 standard costs CHF 114 (~71 Euro) and the ISO 14001 standard costs CHF 71 (~45 Euro) [ISO Store].

8.2.3. EMAS and ISO 14001 Weaknesses

Both EMAS and ISO 14001 receive much criticism. Both have their strengths and weaknesses and both are far from perfect. Two major weaknesses remain to be mentioned. One is the fact that fees for registration and tax breaks vary significantly from country to country. In many countries it is too expensive to establish an EMS because of expensive fees for registration or auditing, or because there are no tax breaks or other incentives whatsoever. In other countries, however, there are tax breaks for organisations that have a certified EMS. This system is obviously not fair. A common system is needed to guarantee equal terms for everyone.

The second major weakness is that neither EMAS nor ISO 14001 certify that an organisation operates in an environmentally sound manner. Any organisation, no matter how polluting its activities are, can obtain ISO 14001 and EMAS registration. For example, certification can be received by both nuclear power plants and power plants that burn brown coal, despite their serious environmental impacts. This damages the credibility of EMAS and ISO 14001.

How are consumers supposed to be convinced to buy products from organisations certified or registered when in many cases there is no real advantage for the environment? What is the macro-economic benefit of registration or certification according to EMAS or ISO 14001? Have ISO 14001 and EMAS been introduced to promote sustainable development? These are questions that need to be answered in order to improve the effectiveness of ISO 14001 and EMAS and to improve their credibility. Both organisations and their stakeholders must be convinced that establishing an EMS improves their situation. This can only be achieved by further promoting both ISO 14001 and EMAS and by adapting them to current demands. Furthermore, much more research is needed on the effects of EMS implementation. These steps combined can help improve the environmental situation and promotion of sustainable development worldwide.

Figure 8.3 *Belchatow, the largest power plant in Poland, is certified in accordance with ISO 14001 although it uses lignite. The plant was the first in Poland to recieve a permit according to the procedure in the IPPC directives. Photo: Barbara Kozlowska.*

Study Questions

1. How can the criticism put forward against EMAS be summarised? What seems to be the major problem?
2. How is ISO 14001 criticised on the other hand? What are the differences?
3. What is your personal opinion, what do you criticise from what you have learned so far?
4. Can you imagine any other than financial reasons for the fact that ISO charges large amounts of money for its documents?
5. From what you have learned, which of the two approaches would you apply if you were the environmental manager of a European company? Explain.

Internet Resources

Report on SMEs and the environment

http://europa.eu.int/comm/environment/sme/pdf/smestudy.pdf

EMAS FAQ

http://europa.eu.int/comm/environment/emas/tools/faq_en.htm

ISO 14001: irrelevant or invaluable?

http://www.iso.org/iso/en/iso9000-14000/addresources/articles/pdf/specialreport_2-01.pdf

ISO 14001: one for all, or just for some?

http://www.iso.org/iso/en/iso9000-14000/addresources/articles/pdf/viewpoint_5-02.pdf

Applauding the success of ISO 14001 should not deafen us to the challenges

http://www.iso.org/iso/en/iso9000-14000/addresources/articles/pdf/viewpoint_1-02.pdf

The future of management system standards

http://www.iso.org/iso/en/iso9000-14000/addresources/articles/pdf/viewpoint_6-02.pdf

9 Integrated and Simplified Management Systems

9.1 Integrated Management

9.1.1 What is, and What is Not, an IMS

A management system is the interconnection of components to achieve a given objective more effectively in a company or an organisation. These components include the organisation, resources and processes. Therefore, people, equipment and culture are part of the system as well as the documented policies and practices.

An integrated management system (IMS) is a management system which integrates several or all components of a business into one coherent system so as to enable the achievement of its purpose and mission. Except from the core business aspects, many other aspects could be important for the company strategy e.g. quality, effects on external environment, health of employees, safety for employees and third parties, security, equity, social responsibilities, gender etc.

Actually anything, which has an effect on business results must be part of the management system. Therefore, an IMS should integrate all currently formalised systems focusing on quality, health and safety, environment, personnel, finance, security etc. What this means is that all the processes and the documents that describe them would be integrated.

For something to be integrated it does not just sit next to the other components – it has to be fixed to the others so as to make a whole. Therefore, putting the financial system, the quality system and the environmental and safety system into one book of policies and procedures is not enough. It does not constitute an integrated management system. Creating one national standard for management systems is not integration either. Buying a software package which handles quality, safety and environmental documentation is not integration, nor is merging disciplines such as putting the quality manager, safety manager and environmental manager in one department.

Integrated management is a concept whereby functional management is dispersed throughout an organisation so that managers manage a range of functions together. As an example it may be a manufacturing manager who manage planning, manufacturing, safety, personnel, quality, environment, finance etc. as one package.

In this chapter we will focus on the integration of Quality, Environment, and Occupational Health and Safety (OH&S), as those aspects are the most common to integrate. Health is dealing with health aspects for the employees including all work-related activities during normal operation. Safety is

Main Contents of this Chapter

The whys and hows to integrate management systems in a company or an organisation are discussed and explained in this chapter. The components – most often quality, environment, and occupational health and safety – should have a common structure to be successfully integrated, although a standard for the integrated system, the IMS, is lacking.

Quality management according to the ISO 9000 standard, with a focus on customers' satisfaction, is described as well as how to introduce and use quality management in an organisation. The introduction and use of an Occupational Health and Safety Management Systems, OH&S focuses on hazard identification, risk assessment and risk control. Corporate Social Responsibility, CSR, is sometimes included.

In many instances, such as for small companies, the ISO standards for management do not fit and for them simplified systems are used. Also very large organisations, such as cities, have their own simplified systems for environmental audits, while environmental labels function as standards for products and services.

dealing with accidents, which can cause effects on personnel, third parties, property and the environment.

9.1.2 Why Management Systems Should be Integrated

There are several good reasons for integration of management, especially Occupational Health and Safety (OH&S) together with Environmental management. Examples of advantages are:

- Reduce duplication of activities and therefore costs.
- Balance conflicting objectives e.g. between occupational health and environment.
- Eliminate conflicting responsibilities and relationships.
- Harmonise and optimise practices.
- Create consistency.
- Improve communication.
- Facilitate training and development.

Integrating the management systems also facilitates the focus on the most important aspects in a company. Separate systems tend to put focus on each area instead of the common area.

9.1.3 Three Reasons for Introducing an IMS

The most important reason for an integrated management system, IMS, is that this will *reduce costs*, since many routines can be coordinated more effectively. For example when reporting deviations, this has to be done for all areas, as it effects all areas. Coordinated reporting is much simpler. There is a large potential for saving money with IMS as compared to separate systems.

Another important driving force is *legislation*. Legislation concerning management systems is predominant in the area of OH&S.

Legislation aimed at the prevention and control of accidents involving dangerous substances in the EU was significantly prompted by one particular disaster from the past. In 1976, a chemical plant manufacturing pesticides and herbicides in Seveso, Italy, accidentally released large amounts of poisonous dioxins into the air, contaminating ten square miles of land and vegetation. Over 600 people were evacuated with as many as 2,000 treated for dioxin poisoning.

As a result, in 1982, the *Seveso Directive* [Council Directive 82/501/EEC] on the major accident hazards of certain industrial activities was adopted, later amended in light of two other major accidents. The first was the 1984 chemical disaster at the Union Carbide factory in Bhopal, India, where over 2,500 people died. The second was the 1986 catastrophe at the Sandoz warehouse in Basel, Switzerland, where a major chemical leak laden with mercury led to the massive pollution of the Rhine River and the death of half a million fish.

In 1996, the *Seveso Directive II* [Council Directive 96/82/EC] replaced its predecessor. Still in effect, it aims to prevent major accidents involving dangerous substances and to limit their consequences for humans and the environment. It covers industrial activities and the storage of dangerous chemicals, expands the public's right to access information and requires governmental authorities to carry out regular inspections.

One of the main conclusions in the guidelines to the Seveso legislation [Guidelines on Major Accident Prevention Policy and Safety Management System, as required by Council Directive 96/82/EC, SEVESO II] is the importance of management. *"Failures of the management system were shown to have contributed to the cause of over 85% of the accidents reported."*

A third reason for integration is *customers' requests*. It is becoming more frequent that public authorities as buyers of products and services requires that in order to get a contract the company must have a management system. These management systems are usually simplified versions, which can include such aspects as environment, health and safety. These are described more in detail below.

9.2 Elements of Integrated Management Systems

9.2.1 A Common Structure of Management Systems

If an organisation has a certificated Quality management systems and/or an EMS, the IMS can be developed by adding the necessary processes to cater for the OH&S of management system standards. The general structure will remain the same. All systems should share the following processes:

- Document development and control.
- Training of employees.
- Internal audit of the elements in the IMS.
- Management review of the whole IMS.
- Corrective actions.

9.2.2 Standards for Management Systems

Most of the standards for management systems are ISO Standards.

OHSAS 18000 has been developed to be compatible with ISO 9001 and ISO 14001, in order to facilitate the integration of quality, environmental and occupational health and safety management systems by organisations, should they wish to do so.

The OHSAS specification gives requirements for an OH&S management system, to enable an organisation to control its OH&S risks and improve its performance. It does not state specific OH&S performance criteria, nor does it give detailed specifications for the design of a management system.

Many countries have also developed national standards for OH&S which can be certified through independent auditors.

A new standard for corporate responsibility, ISO 26000, is being developed. Corporate Social Responsibility addresses concrete questions related to human rights, business practices, communications and community involvement. Equality, safety, working conditions and child labour are examples of topics covered by the principles. The principles focus on the social and socio-economic aspects of sustainability.

9.3 Quality Management According to ISO 9000

9.3.1 The ISO 9000 System for Quality Management

The ISO 9000 family is primarily concerned with quality management. This means what the organisation does to "fulfil the customer's quality requirements, and applicable regulatory requirements, while aiming to enhance customer satisfaction, and achieve continual improvement of its performance in pursuit of these objectives" [ISO organisation].

The ISO 9000 family consists of 4 basic documents, which best are used together. ISO 9000, *Quality management systems Fundamentals and vocabulary*, contains the terminology and principles. ISO 9001 contains the first level of requirements for quality management. ISO 9004, *Quality management systems Guidelines for performance improvements*, describes the different solutions, which can be applied to introduce the quality management in the organisation. Finally ISO 9011 describes how to audit and certify the management system.

The four documents are also made to fit with the other management systems, especially the ISO 14001 family for environmental management, as well as branch specific standards, e.g. ISO/TS 16949 for the car industry. They are also made to fit with different programmes for good management, not only certification according to the ISO 9000 system, but also according to different national programmes and branch specific programmes.

Eight quality management principles are defined in ISO 9000:2000, and in ISO 9004:2000. They are the following:

Principle 1 Customer focus – to understand current and future customer needs and requirements and strive to meet customer expectations.

Principle 2 Leadership – to establish unity of purpose and direction of the organisation, and an internal environment to achieve its objectives.

Principle 3 Involvement of people – to secure the full involvement of the employees.

Principle 4 Process approach – to achieved efficient process management.

Principle 5 System approach to management – to identify interrelated processes in order to base management on systems understanding.

Principle 6 Continual improvement – to secure continual improvement of the overall performance.

Principle 7 Factual approach to decision making – to secure that decisions are based on analysis of monitored data and safe information sources.

Principle 8 Mutually beneficial supplier relationships – to create a constructive relationship with suppliers and others on which the organisation is dependent.

9.3.2 Use of the System

ISO 9001:2000 is used to establish a management system that provides confidence in the conformance of product to established or specified requirements. It is the only standard in the ISO 9000 family against whose requirements a quality system can be certified by an external agency. The standard recognizes that the word "product" applies to services, processed material, hardware and software intended for, or required by, a customer [ISO organisation].

There are five sections in the ISO 9001 standard that specify activities to be considered when implementing a system:

1. Product Realization.
2. Quality management system.
3. Management responsibility.
4. Resource management.
5. Measurement, analysis and improvement.

ISO 9001:2000 and ISO 9004:2000 are harmonized in structure and terminology to make it easy to move smoothly from one to the other. Both standards apply a *process approach*, that is, they recognize one or more linked activities, which require resources and must be managed to achieve predetermined output. The output of one process may directly form the input to the next process and the final product is often the result of a network or system of processes [ISO organisation].

9.3.3 To Introduce a Quality Management System

The introduction of a quality management system is a long-term commitment, which can be guided by the use of the ISO 9000 documents. The following procedure is recommended by the Swedish Standards Institute, SIS.

Step 1: Identify and define the goals of the organisation. These may be: to be more profitable, that products should fulfil the requirements of the costumers, satisfied customers, increased market shares, satisfied employees and improved work environment in the organisation, improved internal communication, reduce costs, or create a reliable production system.

Step 2: Identify and define requests of customers and surrounding society. Some examples of interest groups (stakeholders) are: customers and final users, employees, suppliers, shareholders, and society at large. Identify stakeholders requests, such as: high and reproducible quality of products, reliable shipments, good and open communications, predictable processes, and responsible employees.

Step 3. Education and training. Different handbooks and manuals on quality management and the ISO 9000 system as well as case descriptions are available. For more detailed training the ISO 9000 documents should be studied, especially ISO 9000, ISO 9001, ISO 9004 and ISO 9011. An external consultant is often engaged to carry out training.

Step 4. Add ISO 9001 requirements to the existing management system. Exactly which requirements should be introduced depends on if the organisation intends to seek certification. With ISO 9001 the organisation has the possibility to go on to certification.

Step 5. Assess the applicability of the different parts of the quality management system. This is made to see if the parts are applicable to the organisation and its goals. The components are:

- Project management – ISO 10006.
- Configuration management – ISO 10007.
- Measurements and monitoring – ISO 10012.
- Documentation of quality – ISO 10013.
- Economic effects of quality management – ISO/TR 10014.
- Training – ISO 10015.
- Audit – ISO 19011.

Step 6. Define the present situation and make a gap analysis. This is made to identify differences between existing management and requests according to ISO 9000. This can be done internally (according to ISO 9004) or through an external auditor.

Step 7. Define which processes are required to provide the products for costumers. The list in ISO 9001, section 7, can be used to see which parts are applicable in the organisation. The processes listed are:

- Costumers directed processes.
- Construction and development.
- Procurement of material and goods.
- Production of products and services.
- Work with monitoring and measuring equipments.

Step 8. Make a plan for how to bridge the gaps identified (step 6) and develop the processes defined (step 7). Identify the processes and set aside resources to take the steps needed. Define responsibilities and establish a time plan. ISO 9001 sections 4.1 and 7.1 give information relevant to the establishment of a plan.

Step 9. Carry out the plan.

Step 10. Make regular internal audits. Use ISO 19011 for information on audits, competence of auditors, and how audits are managed.

Step 11. Decide on certification. Identify the reasons for certifications properly. Reasons for seeking certification are different. They may be:

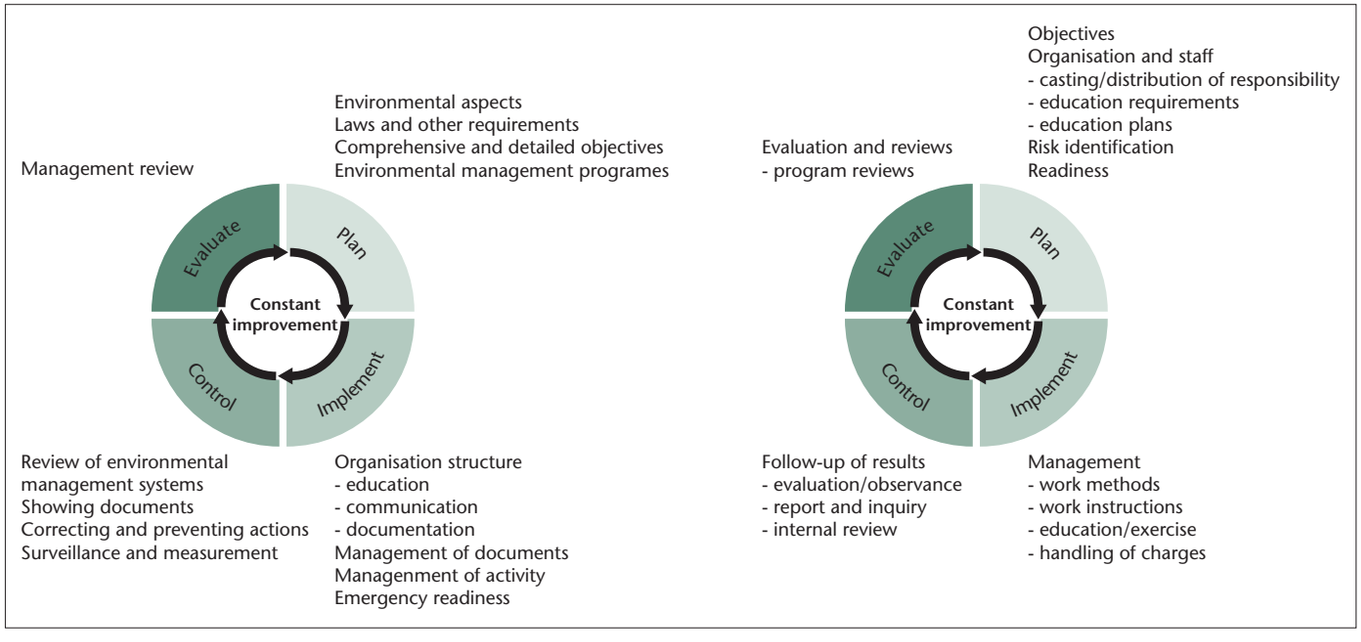


Figure 9.1 *The PDCA cycle (Plan-Do-Check-Act) cycle, also called the Deming cycle, for continuous improvement (see also Figure 1.3).*

- Contractual.
- Markets requirements.
- Customers' requests.
- Legal request.
- Risk management.

Step 12. Carry out an external audit. Use an accredited auditor for this. The requests for certification are listed in ISO 9000.

Step 13. Continue to improve the quality work of the organisation. Make regular reviews to identify the effects and judge the suitability of the management system introduced. ISO 9004 contains the methods used for continuous improvement.

9.4 Occupational Health and Safety Systems

9.4.1 Components of an OH&S Management System

The main components in OHSAS 18000 which are compatible with ISO 14000 are:

4.2 OH&S policy.
4.3 Planning.
  4.3.1 Planning for hazard identification, risk assessment and risk control.
  4.3.2 Legal and other requirements.
  4.3.3 Objectives.
  4.3.4 OH&S management programme(s).
4.4 Implementation and operation.
  4.4.1 Structure and responsibility.
  4.4.2 Training, awareness and competence 3.2.
  4.4.3 Consultation and communication 3.2.
  4.4.4 Documentation.
  4.4.5 Document and data control.
  4.4.6 Operational control.
  4.4.7 Emergency preparedness and response.
4.5 Checking and corrective action.
  4.5.1 Performance measurement and monitoring.
  4.5.2 Accidents, incidents, non-conformances and corrective and preventive action.
  4.5.3 Records and records management.
  4.5.4 Audit.
4.6 Management review.

The sequence of components for continuous improvement is essentially based on the so-called Deming or Plan-Do-Check-Act cycle (see Figure 9.1). Below we will develop some of the components more in more detail.

Probability					
> 1 time per year					
1 time per 1-10 years					
1 time per 10-100 years					
1 time per 100-1,000 years					
< 1 time per 1,000 years					
Persons	Temporary mild discomforts	Occasional wounded, lasting discomforts	Occasional serious wounded, severe discomforts	Occasional dead and several serious wounded	Several dead and tens of serious wounded
Environment	No decontamination, small spreading	Simple decontamination, small spreading	Simple decontamination, large spreading	Difficult decontamination, small spreading	Difficult decontamination, large spreading
Property	< 0.1 MSEK	0.1-1 MSEK	1-5 MSEK	5-20 MSEK	> 20 MSEK

Figure 9.2 *Matrix for risk assessment in preliminary hazard analysis (PHA) technique.*

9.4.2 Hazard Identification, Risk Assessment and Risk Control

The preliminary hazard analysis (PHA) technique is a broad method, which is commonly used to map risks (see Figure 9.2). It focuses on (1) identifying apparent hazards, (2) assessing the severity of potential accidents that could occur involving the hazards, and (3) identifying safeguards for reducing the risks associated with the hazards.

Brief summary of characteristics:

- Relies on brainstorming and expert judgment to assess the significance of hazards and assign a ranking to each situation. This helps in prioritising recommendations for reducing risks.
- Typically performed by one or two people who are knowledgeable about the type of activity in question. They participate in review meetings of documentation and field inspections, if applicable.
- Applicable to any activity or system.
- Generates qualitative descriptions of the hazards related to a process. Provides a qualitative ranking of the hazardous situations; this ranking can be used to prioritise recommendations for reducing or eliminating hazards in subsequent phases of the life cycle.

Usually a semi-quantitative scale is used to judge the severity of identified hazardous events. In this way the company can set priorities for acceptable risk levels for different aspects.

9.4.3 Working with Risk Management

The quality of the evaluation depends on the quality and availability of documentation, the training of the review team leader with respect to the various analysis techniques employed, and the experience of the review teams

Other important methods for risk assessment are:

- What-If Analysis can be regarded as a PHA where checklist can be used to support the analysis team by asking questions "What happens if?"
- Fault Tree Analysis (FTA) and Event Tree Analysis (ETA) can be used to logically structure scenarios for undesired event. Based on statistics frequencies for events can be calculated. The methods are difficult to use for untrained personnel.
- Failure Mode and Effects Analysis (FMEA) is traditionally used too analyse effects of failures in technical systems.
- HAZOP Analysis is a very structured method to analyse processes where a detailed design exists. It is a very time consuming method and it can be used both for safety and operability analysis.

Management-wise the following items should be considered.

Emergency preparedness and response. Based on the risk assessment process, the company should develop scenarios for "worst" accidents that could occur. Worst case is referred to as an accident, which could cause substantial damage to property and personnel. For these scenarios the company should develop, communicate and practice an emergency plan.

Performance measurement and monitoring. The performance of the different components in the IMS should be monitored through audits. These audits can be carried out by internal personnel through different questionnaires. It is though advisable to also engage external in the audits. It is also important to develop indicators for measurement of effectiveness throughout the organisation. It is amazing how many companies do not have in place ways of measuring the effectiveness of their processes. It is also important to measure the company against available benchmarking figures in the trade.

Accidents, incidents, non-conformances and corrective and preventive action. All management systems require that deviations from normal operation are documented and that preven-

Figure 9.3 *The work environment of a welder has to be properly arranged to be safe. Risk assessment relates to e.g. fire, temperature, intense light, and possible leakage of the gases used for the welding. Photo: Inga-May Lehman Nådin.*

tive actions are taken. This is a typical thing, which should be integrated as different deviations can combine and it is not really possible to foresee if these deviations can affect quality, environment, safety or health. The documented deviations are also of considerable value during risk assessment.

9.5 Experiences of Integrated Policies

9.5.1 Social Responsibility based on Safety, Health and Environment

The integrated policy for a company is a commitment from the highest management level in the company concerning which level of conditions the company is aiming for. Below is a short version of the integrated Safety, Health, Environment (SHE) Policy in the pharmaceutical company AstraZeneca.

AstraZeneca aims to be amongst the pharmaceutical industry leaders in SHE and intends to operate as a responsible member of society committed to continuous improvement in all aspects of SHE performance. The core priorities are:

- Integrate SHE considerations into all activities across the AstraZeneca Group of companies.
- Manage SHE as a fundamental component of governance systems and ensure compliance with applicable SHE-related laws and regulations.
- Train, empower and require individuals to take personal responsibility for safety, health and the environment.
- Aim to eliminate all work-related injuries and cases of ill health by providing a safe and healthy work environment and promoting health and wellbeing.
- Aim for continuous improvement in the sustainability of all our activities by, amongst other things, economising on the use of natural resources and working to eliminate pollution.
- Monitor existing and emerging SHE risks, assess their significance and manage their potential impact on people, the environment and the business.
- Monitor our SHE performance and communicate openly with the stakeholders.

The policy document clearly states the commitments of the company in such a way that it could be communicated to all personnel. The policy is not a summary of the management programme but it should be specific enough to enable anyone to judge whether the company fulfils its commitments.

9.5.2 Experiences from Using IMS

Many of the identified problems with IMS are common for all management systems (MS) like:

- Demand for resources, especially if the MS shall be certified.
- Long term efforts.
- Substantial documentation.
- A risk that the standard is guiding, rather than the demand of the company.
- Large efforts in education of all personnel are required.
- Not neutral regarding competitiveness; Within the EU authorities in different countries interpret rules in different ways.
- The MS can encourage a conservative control culture instead of a creative work for continuous improvements.
- An attitude ”the system takes care of everything” can develop.

Problems specific for integrated management systems are:

- Competing standards.
- Areas with vague indicators like safety can be neglected.
- Different cultures in the organisation regarding quality, environment and OH&S.
- In downsizing organisation economic factors can be the main driving force for IMS which can lead to resistance from personnel.

There are many experiences from companies working with IMS. One of the main experiences is that the IMS must be dimensioned according to the needs and conditions in the company.

Other experiences are:

- The IMS must be ”owned” by the users.
- The IMS must give simple and easily accessible information regarding what-when-who.
- IT-systems should not control the development of the IMS.
- One step needs to be taken at a time.
- Visions need to be created and communicated to employees.
- The engagement of top management is crucial starting from a communicated policy.

9.6 Simplified Management Systems

9.6.1 The Need for Simplified Systems for SMEs

The principles of IMS can be applied to every company, regardless of its size, type or industry. Having a good IMS in place will ensure that the products, services are of the highest standards, the customers are happy and the future of the organisation is heading in the right direction.

For many small and medium-sized enterprises (SMEs) it would, however, be too ambitious to develop integrated management systems that fulfils the requirements in the ISO standards. In these cases it is more realistic to develop only parts of the

systems, which are focusing on the most relevant aspects in the companies. This could be done in such a way that parts of the standards are implemented and the system can gradually grow according to the needs. The important thing is that the company on a high management level determines what aspects are important and what level of standard the company wants to achieve.

The City of Stockholm has developed an Environmental Diploma for SMEs. It is a simplified environmental management system where other aspects can be incorporated. It is a voluntary system open to Stockholm-based SMEs with up to 50 employees. In 2004, about 100 companies were working towards a diploma.

As proof for having fulfilled the criteria, companies receive a diploma during an annual ceremony at Stockholm City Hall. The diploma is managed by the City of Stockholm Environmental Centre for SMEs which is a department focusing on pro-active initiatives and projects targeting SMEs. The Centre is independent from the department handling authority issues such as environmental inspection, control and monitoring.The companies need no prior knowledge about environmental issues in order to start working on the diploma.

Figure 9.4 *Varbergs Låsservice, in Varberg on the Swedish west coast, is a small company working with installations and repair of locks. It is certified according to a simplified management system developed for small and medium sized companies [http://www.fr2000.org/]. Gert-Inge Arvidsson is proudly showing the certificate. © FR2000.*

The diploma is based on international standards such as ISO 14001 and EMAS. The diploma has three levels, each level corresponding to one year including audit and renewal of the diploma after each level.

The incentives for the City of Stockholm to spend resources on the diploma are:

Closer contact with local business, which enables the City to improve its work on business promotion and bottom-up democracy. Personal contacts are more efficient than indirect information. In this way Stockholm can obtain more of the advantage of a small town rather than an anonymous big city.

Reduced environmental load, which in the long term reduces costs for society in general and for the City in particular. The diploma has rendered concrete, substantial results in terms of reduced emissions of CO_2, chemicals etc. The companies' staff also uses its new knowledge and make conscious choices in their everyday lives.

The incentives for the companies to spend resources on the diploma are:

Improved business opportunities. Having an environmental management system is often a prerequisite for winning contracts when doing business with other companies and public organisations.

Reduced costs. Better control and environmental improvements often reduce costs. Saving energy, using resources more efficiently, choosing a more expensive investment alternative that renders lower running costs etc.

Improved contact with the City, which facilitates exchange of information and opinion.

Satisfaction from knowing that they are contributing to sustainable development.

Meeting other companies, networking, exchanging experience and making new business contacts.

9.6.2 Management and Audit Systems for Cities and Towns

Also for cities there exists a variety of *audit schemes* more or less simplified. The Union of Baltic Cities, UBC, to which more than 100 cities in the Baltic Sea region now belong, has used a municipal environmental audit scheme (MEA), originally based on a work of the World Bank, which in turn originates from the EMAS within the European Union.

The basic form of auditing, that is, compliance auditing, where performance is audited against legislation, regulation and codes of conduct, is typical for companies. In the UBC manual, the focus is on environmental management and the

Figure 9.5 Tallinn, Estonia, *was the first city in the Baltic Sea region to undergo an environmental audit by colleagues from Turku, Finland, according to the so-called Municipal Environmental Audit Scheme, MEA. Later the managers from Tallinn made the same audit in Turku and strengths and weaknesses were discussed. Photo: Toomas Volmer, © Tallinn City Tourist Office & Convention Bureau.*

auditing is done against self-determined targets. But it may change as municipal environmental management systems are subject to international standardization. The MEA standards were first published in Finland and Estonia in spring of 1997, and have since been used in a number of twin auditing arrangements (cities which audit each other).

The audit is typically performed against: (1) legislation; (2) environmental effects of production processes; (3) management and administration activities; (4) environmental economy, investment related to environment, and planning and (5) communication of results to the public. In MEA, specifically, 'non-polluting' environmental performance such as regulation of environmental health and, for example, safety in transport and storage of hazardous material is also included.

The audit is related to management work, in the sense that all points that arise from the audit influences the management in the city administration.

Auditing is usually visualised as progressing stepwise.

Step 1: Preparatory work. Introducing the audit methods and principles to city officials is crucial in order to achieve the commitment and to secure the final success of the audit. Being audited may be threatening and the auditors should make every effort to achieve a positive approach and commitment. Desirable characteristics for the audit team member are a thorough knowledge of municipal environmental issues and, as far as possible, independence from the management system.

Step 2: Collecting the data. After the field missions are completed, each auditor should prepare a preliminary list of findings and make sure that he or she has put the right questions to the right persons.

Step 3: Analysis of data. The data should be collected in a way that will demonstrate the strengths and weaknesses of the management procedures. Reliability of environmental monitoring systems should be addressed. For example, control values, such as maximum permissible concentrations (MPCs), should be used and time-series variation analyzed and shown. Some kind of cost/benefit analysis should be possible after the MEA.

Step 4: Reporting, recommendations and dissemination of auditing. The audit report has three basic purposes: 1) to provide management information, 2) to initiate corrective action and 3) to provide documentation of the audit and its findings. The report should include hints on technical solutions. All the findings, suggestions and conclusions from the audit must be mediated to both the governing bodies, management as well as to the public.

Step 5: Follow-up and the audit cycle. The nature of auditing is repetitive, which means that unfavourable findings are

Figure 9.6 *Labels on products is one form of certification as the permit to use a label is based on a careful auditing of the producer according to set standards. Here Alice Bah Kuhnke, Secretary General of the Swedish organisation Fairtrade, demonstrates labelled consumer products. Photo: Daniel Sommerstein.*

followed in the subsequent audits until they are eliminated. If the reporting is properly done, it should initiate corrective actions.

9.6.2 Management and Audit Systems Related to Environmental Labels

A number of systems exist for giving specific products labels to certify their environmental standard. All of these not only require that the product itself has certain properties, such as free from certain pollutants, but also that the production process follows specific rules. In this sense the labelling schemes are also introducing and auditing management.

This is an area where agriculture comes into the picture. To have food products labelled as e.g. organically grown food, or environmentally friendly food, requires that the cultivation is carried out in specified ways, that animals are managed according to established rules, etc. These management schemes are audited by the organisations that give certificates for using the labels.

Being audited and certified for the use of the environmental labels is often more requiring than introducing a management systems according to ISO 9001 or ISO 14001, since here we are dealing with specific requirements, not just a proper procedure.

Labels also exist for "fair" products, which have been produced in a "fair" way, that is with consideration of human rights and international agreements and other generally recognised ethical principles. These labels are thus related to Corporate Social Responsibility. Just as with the green labels, they require a proper management, audit and certification, although only in the aspects that relate to what the labels guarantee.

Study Questions

1. Which advantages do Integrated Management Systems have compared to stand-alone Management Systems? Mention some benefits and drawbacks.
2. List three reasons for introducing an Integrated Management Systems, IMS.
3. Describe the basic properties of the ISO 9000 standard for quality management.
4. Make a short process chart for the introduction and running a quality management system.
5. Describe the basic properties of an occupational health and safety management systems.
6. Describe how to do risk assessment in a working place, and work with risk management.
7. Describe how to carry out hazard identification in an organisation.
8. What is Corporate Social Responsibility, CSR? Give examples.
9. Describe the various ways to work with simplified environmental management systems, especially for SMEs, and describe why this is interesting to some companies.
10. Compare product environment labels with EMS in a company.

Internet Resources

European Commission – Chemical Accidents (SEVESO)
http://europa.eu.int/comm/environment/seveso/

Swedish Standards Institute (SIS)
http://www.sis.se

ISO 9000 and ISO 14000 – Introduction
http://www.iso.org/iso/en/iso9000-14000/index.html

OHSAS 18001 Occupational Health and Safety Zone
http://www.ohsas-18001-occupational-health-and-safety.com

AstraZeneca – Governance, Management and Measurement
http://www.astrazeneca.com/article/511594.aspx

Simplified Integrated Management Systems (in Swedish)
http://www.fr2000.org/

Union of Baltic Cities,
Municipal Environmental Auditing Scheme
http://euronet.uwe.ac.uk/emas/outputs/final/annex%207_9%20scoping%20review.doc

Fairtrade
http://www.rattvisemarkt.se/

Glossary of Key Terms

Audit:
Evaluation of an organisation, a system, process or product performed by a competent and objective auditor. The purpose is to see whether the auditee fulfils the requirements set to be audited.

Audit cycle:
The period of time in which all activities of an organisation are audited.

Audit team:
See "Auditor".

Auditee:
The organisation or part of the organisation to be audited.

Auditor:
An individual or team, belonging to the organisation personnel or external to the organisation, acting on behalf of the organisation's top management, being sufficiently independent of the activities they audit to make an objective judgement and possessing the competences required.

BS 8800:
British Guidance Standard, non-certifiable guidance based on occupational health and safety management systems.

Certification:
A procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements.

Compliance audit:
A procedure that determines whether an organisation complies with the requirements of laws, regulations, permits and/or its own environmental policy, objectives and targets applicable to its activities, products and services.

Conformity assessment:
An activity that demonstrates fulfilment of specified requirements relating to a product, process, system, person or body.

Continual improvement:
The process of enhancing the environmental management system to achieve improvements in overall environmental performance in line with the organisation's environmental policy.

Corrective action:
An action that is taken to eliminate the causes of an existing non-conformance, defect or other undesirable situation in order to prevent reoccurrence.

Eco-balance:
A tool that assembles an organisation's inputs, stock and outputs in one balance to get an overview of all environment related instances within the organisation.

Eco-mapping:
Systematic method of conducting on-site environmental reviews using pictures showing the current environmental situation. A simple but effective tool for awareness-raising that allows for employee involvement and participation.

Environment:
The surroundings in which an organisation operates, including the air, water, land, natural resources, flora, fauna, humans and their interrelation.

Environmental aspect:
An element of an organisation's activities, products or services that can interact with the environment.

Environmental impact:

Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities, products or services.

Environmental management programme:

All the steps, schedules, resources and responsibilities required for an organisation to achieve its stated objectives and policy conformance.

Environmental Management System (EMS):

The part of the overall management system that includes organisational structure, planning activities, responsibilities, practices, procedures, processes and resources for developing, implementing, achieving, reviewing and maintaining the environmental policy.

Environmental management system audit:

A systematic and documented verification process of objectively obtaining and evaluating evidence to determine whether an organisation's environmental management system conforms to the environmental management system audit criteria set by the organisation, and for communication of the results of this process to management.

Environmental objective:

An environmental goal, arising from the environmental policy, that an organisation sets, and which is quantified where practicable.

Environmental performance:

The measurable results of the environmental management system, related to an organisation's control of its environmental aspects, based on its environmental policy, objectives and targets.

Environmental policy:

The statement by an organisation of its intentions and principle in relation to its overall environmental performance which provides a framework for action and for the setting of its environmental objectives and targets.

Environmental review:

The comprehensive analysis of environmental issues, impact and performance related to activities of an organisation. An initial environmental review is a tool to assess an organisation's position with regard to the environment, and which takes place before EMS implementation.

Environmental statement:

A piece of information that needs to be produced by an organisation that seeks registration according to EMAS, and that needs to be validated by the environmental verifier.

Environmental target:

A detailed performance requirement, quantified where practicable, applicable to the organisation or parts thereof, that arises from the environmental objectives and that needs to be set and met in order to achieve those objectives.

Environmental verifier:

A person or organisation independent of the organisation being verified who has obtained accreditation, and can validate an environmental statement.

Initial review:

Involves collecting information on environmental aspects and impacts and provides a snapshot of an organisation's environmental performance at a particular moment in time. Provides the basis for developing a register of environmental aspects, impacts and management programmes.

Interested party:

An individual or group concerned with or affected by the environmental performance of an organisation.

ISO 9001:

An international and widely accepted quality management standard with the aim of "enhancing customer satisfaction by meeting customer requirements". Similar to ISO 14001 in structure.

OHSAS 18001:

Occupational Health and Safety Assessment Series, for occupational health and safety management systems to control risks and improve performance within occupational health and safety.

Organisation:

A company, corporation, firm, enterprise or institution, or part or combination thereof, whether incorporated or not, public or private, that has its own functions and administration.

Pollution prevention:

Elimination or reduction of wastes and pollutants where they are (or would be) first produced, so that there is less to manage and less enters the air, water and soil.

Preliminary hazard analysis:

Method for mapping risks, involves (1) identifying apparent hazards, (2) assessing the severity of potential accidents that could occur involving the hazards, and (3) identifying safeguards for reducing the risks associated with the hazards.

Preliminary review:

See “Initial review”.

Procedure:

A specified way to perform an activity.

Risk:

The probability that something that is not desired by an organisation or its stakeholders will happen, and is caused by an organisation’s activities, products or services.

Risk management:

The management of risks in order to minimize the probability of their occurrence or to minimize their effects.

Security Certificate Contractors (SCC):

A standard that applies to the evaluation and certification of the safety management system used by contractors.

SMEs:

Small and medium-sized enterprises.

Stakeholders:

The individuals, groups and organisations that have an interest or stake in an organisation’s EMS.

Total quality management:

Concepts which aim at reducing and eventually eliminating non-conformance to specifications and client expectations and at improving the efficiency of business processes.

Sources: ISO 14001, Section 3; ISO/IEC 2:1996; EMAS, Article 2 and Annex III, point 3.2; UNEP/ICC/FIDIC 2001, pp. 326; and US EPA March 1999, pp. G-1.

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Toolkit

A

Introduction

This second part of the Course Book is called "Toolkit". It provides 52 different tools with which the knowledge acquired in the first part of the book can be deepened and extended as it is being applied. Each tool can easily be identified by the "identification bar" at the top of each tool. An example is given below:

The tools are numbered according to the order they appear in the book. Furthermore they were put into three categories: Category 1 provides a number of examples, category 2 consists of descriptions, and category 3 includes blank sheets that can be worked with directly. Each category has its own symbol (see figures below).

Some tools are not named in the Course Book. These tools are blank sheets that refer to other tools in the toolkit (Tools 47 to 52).

In the following we will give a short explanation of each tool: what it was designed for and what the reader is supposed to learn when using the tool. Each tool has one or more short exercises.

Number of tool according to order of appearance in the book.

Name or title of the tool.

Tool 4 **Introduction to Process Mapping**
Source: U.S. EPA, July 2001, p. 170.

Source the tool was taken from. The exact source can be found in the bibliography.

Category 1: Examples

Category 2: Descriptions

Category 3: Blank Sheets

Tool Descriptions

Tool 1: Measuring the Importance of Environmental Problems

This first tool was designed to help make a first assessment of potential interactions with the environment, such as resource depletion, water consumption, direct environmental impacts etc. Using this tool is supposed to raise awareness of what may be important issues to consider for the EMS development process. It can be seen as an introduction to the topic.

Exercise: Take a look at an organisation you are familiar with (any type of organisation, even your university). Pick two different environmental problem areas and fill in the blanks.

Tool 2: Sample Procedure: Instructions for Environmental Aspects Identification Form

The tool presented here represents a quite complex sample procedure for the identification of environmental aspects. Note that this is one way of identifying environmental aspects, there are many more. With little modification the procedure can be used for identification of environmental aspects in any organisation.

Exercise: Do you think the procedure is thorough enough? Or would you make it more detailed? Explain. Develop your own procedure for identification of environmental aspects.

Tool 3: Input-Output Sheet

The input-output sheet presented here represents the most detailed level possible. As we discussed in the Course Book the input-output diagrams have to get more and more detailed the longer they are being worked on. This would be the last step of development as it is the most detailed. Note: Do not focus too much on technical details as this is only an example.

Exercise: Develop an input-output sheet as the one presented here for a production process of an organisation you are familiar with.

Tool 4: Introduction to Process Mapping

This tool provides additional information on process mapping. It explains what it is meant for and how it is being carried out. It is important to realize that process mapping can be a very powerful tool to improve processes within an information. The benefits perceived are mainly increased efficiency and significant cost reduction. This tool also provides a sample process map that is meant to display what a process map may look like.

Exercise: Develop a process map for one unit in an organisation you are familiar with.

Tool 5: Checklist: Eco-Mapping

This tool has to be seen in connection with Tool 06.00 to 06.10. It is a checklist for the issues and topics that need to be considered when developing an eco maps. It must not be seen as a checklist for one eco map but as a checklist that addresses all eco maps that may be needed in an organisation. There should not be too much focus on this tool as it can be better understood in connection with the other tools mentioned above.

Tool 06.00

This tool is more or less self-explanatory, it just needs to be made sure that you read the instructions carefully to enable you to understand the following tools. Note that developing eco maps is not something that is required by EMAS or ISO 14001. It is just a tool that helps developing the various EMS elements, which can be used but does not have to be used.

Tool 06.01

This tool was designed for making mini audits with an organisation's employees. All they have to do is to make one cross per question. The tool is being used before developing eco maps. You are then supposed to see that the results of this quick survey are very similar to the results acquired due to the development of the eco maps.

Exercise: Role play: Make groups of four. Three group members will be the employees, each working in a specific section of an imaginary or real company, one will make the survey. Make sure that the employees know as much as possible about the section they work in. Let them then answer the questions of the mini audit. Keep the results for later.

Tool 06.02

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Work out the urban situation for an organisation you are familiar with.

Tool 06.03

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Work out the eco map: nuisances for an organisation you are familiar with.

Tool 06.04

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Work out the eco map: water for an organisation you are familiar with.

Tool 06.05

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Work out the eco map: soil for an organisation you are familiar with.

Tool 06.06

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Work out the eco map: air, odours, noise, dust for an organisation you are familiar with.

Tool 06.07

This tool is basically self-explanatory. All you have to do is follow the instructions. Note that tool was also designed to raise the awareness of the negative effects of extensive energy consumption.

Exercise: Work out the eco map: energy for an organisation you are familiar with.

Tool 06.08

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Please do the exercise that is suggested in the text if you have access to company data. You can also do this exercise for the room you are in, there are many different types of waste in most buildings, whether they are private or public.

Tool 06.09

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Work out the eco map: risks for an organisation you are familiar with.

Tool 06.10

This tool is basically self-explanatory. All you have to do is follow the instructions.

Exercise: Put all eco maps you have developed on top of each other and follow the instructions given in the text. Keep in mind that you may have to develop your own indicators of environmental performance.

Tool 7: Environmental Review Questionnaire

This tool is a very detailed sample structure of an environmental review questionnaire. It helps assessing the current environmental state of an organisation. Environmental reviews are important in the initial phase of EMS development because they provide a snapshot of the organisation's environmental performance at that time. A thorough and comprehensive review provides a solid basis for developing a register of environmental effects and an environmental programme. A questionnaire is a good tool to perform such an environmental review.

Each of the elements of the review refers to one of the eco-maps also provided in the toolkit (Tool 06.00 to 06.10). These can be used in combination with the review questionnaire structure. Please note that not all questions in the review questionnaire can be answered by all companies. Companies in the service sector for instance seldom cause groundwater or soil contamination.

Exercise: Use the review questionnaire to assess the current state of environmental issues of an organisation you are familiar with, preferably for the one you developed the eco-maps for.

Tool 8: Measuring the Environmental Impacts of an Organisation

This tool is very similar to Tool 01. It can be used the same way. However, this tool was designed to help identify environmental impacts according to their importance in the different production processes. Not every environmental impact occurs in every step of the production process it is therefore necessary to distinguish. Note: this tool is not meant to display the different impacts accurately, but it can provide a rough overview of what impacts there are. *Note that there is a blank sheet available for this tool (Tool 48).*

Exercise: Fill in the blanks if you have data available for an organisation you are familiar with. Please consider also the environmental problem areas you may have identified for Tool 1.

Tool 9: Aspect/Impact Evaluation

This tool has a similar design compared with Tool 01 and 08 and can be seen as a continuation of the concept. It is being used for aspect and impact evaluation and is more detailed than the tool mentioned above. The categories filled in are sample categories and can be modified when necessary. The stages more or less describe the different stages of the product life cycle, the degree of detail depends on individual requirements. The next two columns are used to display how often a certain organisation activity is being performed (”Use”) and how often incidents are likely to happen in this sector (”Incident”). Use the terminology explained in the chart below for filling in the correct numbers. Use the numbers also for describing the severity of the incident on humans, animals/plants as well as the public. The last column names the impact connected to the incident. *Note that there is a blank sheet available for this tool (Tool 49).*

Exercise: Use this tool to rank the environmental impacts you identified previously. Add more ”categories” and ”stages” if required.

Tool 10: Inputs: Coverage and Purpose

This tool was designed to help understand the term ”Input” used in the Course Book. The first column names a possible input, the second column explains what is covered by this term and the third column explains why this type of input is being distinguished.

Exercise: Can you think of any other categories of inputs? What would be their coverage and purpose?

Tool 11: Stock: Coverage and Purpose

Similar to Tool 10, this tool was designed to help understand the term ”Stock” used in the Course Book. The first column names a possible stock, the second column explains what is covered by this term and the third column explains why this type of stock is being distinguished.

Exercise: Can you think of any other categories of stock? What would be their coverage and purpose?

Tool 12: Outputs: Coverage and Purpose

Similar to Tool 10 and 11, this tool was designed to help understand the term ”Output” used in the Course Book. The first column names a possible output, the second column explains what is covered by this term and the third column explains why this type of output is being distinguished.

Exercise: Can you think of any other categories of output? What would be their coverage and purpose?

Tool 13: Checklist: Eco-Balances

With this tool you can apply what you have learned when you used Tool 10, 11 and 12. This sheet can be used as an eco-balance. Note that this is just a sample sheet, there are other ways of designing an eco-balance sheet. It is excessive in detail as eco-balances need to be to be effective.

Exercise: If you have access to data, use this tool to develop an eco-balance.

Tool 14: Sample Process Map

Process maps are being used in environmental management to help identify problem areas of the specific process. These process maps should be as detailed as possible because it is often the details where problems occur. This tool displays a sample process map to help understand what is being meant by the term.

Tool 15: Environmental Legal Compliance Checklist

This tool was designed to help identify legal compliance requirements. The five questions at the beginning of the text must be asked for each law that can be put into connection with an area to be covered. To simplify the identification process, the different organisation activities are separated into four main areas that need to be covered:

- Construction or modification of plants, sites and facilities.
- Operation of plants, sites and facilities.
- Dealing with waste.
- Dealing with materials.

Each area is subdivided further to help identify all relevant legal requirements.

Exercise: Use the tool provided to identify the legal requirements of an organisation you are familiar with.

Tool 16: Checklist: Regulatory Compliance Sample

This tool provides a sample environmental management programme for ensuring compliance with regulatory requirements. It was designed to help you understand what an environmental management programme may look like. Please note that this is again just one way of designing an environmental programme sheet. The left column is being used to set specific tasks while the column beside it defines who is responsible for the specific task. Each task needs to be scheduled and monitored, this information is to be filled in in the next two columns.

Exercise: Use a chart like this to develop an environmental management programme for one of the activities of an organisation you are familiar with.

Tool 17: Ways of Ensuring Legal Compliance

Once the legal (environmental) requirements have been identified they need to be listed in a concise manner. This tool gives an example on how this could be done.

Exercise: Develop your own legal requirements chart and fill in the legal requirements you have identified before.

Tool 18: Checklist: Environmental Legal Compliance

This tool was designed to help assess the current state of compliance with legal environmental requirements after the legal requirements have been identified. The four questions presented here are only examples, there is a whole variety of other questions that can be asked. *Note that there is a blank sheet available for this tool (Tool 50).*

Exercise: Work in pairs. Try to think of 5 to 10 more questions concerning legal compliance and have your partner answer them for an organisation you are familiar with.

Tool 19: Sample Policy

This tool is an example of an environmental policy of an organisation. Note that this is only one way of writing down an environmental policy. There are many more possibilities of doing this, especially the level of detail can be raised significantly.

Exercise: Work in pairs. Take a look at all sample environmental policies given in the Tool Kit (Tool 19, 20, 21) and try to develop a new policy for a small-sized organisation you are familiar with. That could be the kiosk around the corner or any other small-sized organisation with environmental aspects that are easy to see and evaluate.

Tool 20: Sample Policy

See tool 19.

Tool 21: Sample Policy

See tool 19.

Tool 22: Checklist: Environmental Objectives

This tool can help assess whether the environmental policy of an organisation complies with the requirements of EMAS or ISO 14001. It is a good tool for companies that try to implement an EMS without outside contractors. An EMS can only be certified/registered if the policy complies with the requirements.

Exercise: Take another look at the environmental policy you have developed with your partner. Do the self-assessment and check whether your policy com-plies with the requirements. If there is significant non-compliance correct your environmental policy accordingly.

Tool 23: Sample: Setting Objectives and Targets

This tool is a sample procedure for developing environmental objectives and targets. Following the procedure closely will help the development process and will help speed things up.

Exercise: Develop objectives and targets for at least five aspects that were identified previously. Use a tool similar to this one or develop one on your own.

Tool 24: Sample: Setting Objectives and Targets

This tool is an example from an organisation on how environmental objectives and targets can be set. It is a chart that contains many different kinds information. The left column lists aspects that were identified in the initial review and says what their quantity is. The column in the centre says whether the aspect identified is significant and whether it is included in internal documents. The right hand column shows the objectives linked to the aspect and targets that were established.

Note that this is only one way of setting environmental objectives and targets. For many smaller companies this may already be too detailed. *Note that here is a blank sheet available for this tool (Tool 52).*

Tool 25: Sample Procedure: Setting Objectives and Targets

This tool provides another sample procedure for the establishment of environmental objectives and targets. You will notice that the approach taken here is different compared with the approach taken in Tool 24. Nevertheless this procedure will also help the EMS development process as it standardizes ever reoccurring steps. You are supposed to learn that there is not only one way of developing environmental objectives and targets, but that there are a whole variety of approaches that can be taken.

Exercise: Compare Tool 24 and 27. Which one of the two procedures would you prefer? Explain. Use the tool you prefer to develop a set of environmental objectives and targets for an organisation you are familiar with.

Tool 26: EMS Development Schedule and Resources Worksheet

This tool is a very useful one as it was designed to help keep track of the implementation process of an organisation's EMS. It provides an outline of the different steps that need to be taken in the EMS development process. Note that this is only a rough outline and that intermediate steps can and will have to be added to provide a more detailed overview. You need to learn that using a tool such as this is essential as one must not lose track of the EMS development process.

Exercise: Use the tool provided to create an overview of the development steps that you have already taken in previous exercises. Keep using the tool as you go on. Add intermediate steps when appropriate.

Tool 27: Environmental Programme Worksheet

The tool provided here is simple but effective for developing environmental programmes. Environmental programmes are needed to help realize the objectives and targets set for the EMS.

Exercise: Work in groups. Develop environmental programmes for three of the objectives you have set before (Tool 25).

Tool 28: Distributing Responsibilities

The purpose this tool was designed for is the same as the purpose Tool 29 was designed for. However, a different approach is taken. This tool is far more general and can therefore be better for smaller organisations as they have less employees and less tasks and responsibilities to be distributed. Note that there can be more "roles" added in the left hand column.

Tool 29: Environmental Responsibilities Matrix

This tool provides one sample and one blank matrix for the distribution of environmental responsibilities. The sample sheet pretty much explains how the tool is being used. Note that tasks and responsibilities need to be identified before the tool can be used. The tool is helpful as it shows up the organisational structure of an organisation and as it helps distribute tasks and responsibilities in a very precise way. *Note that there is a blank sheet available for this tool (Tool 47).*

Tool 30: EMS Training Planner

This tool is similar to Tool 29 and can be used in the same fashion. It was designed, though, to help plan training. It is a very useful tool because it helps an organisation to effectively distribute training hours among the employees concerned and it helps point out occasions where two types of training may be complementary. Training plans help assess training needs and they help keep track of training that has already been carried out.

Tool 31: Training Plan Operational Control

This tool was also designed to plan training needs. It is more detailed than Tool 30 but requires more background information to be used. You will have to decide which way you prefer, or whether you want to develop a training planner of your own.

Tool 32: Training and Awareness

This tool is another tool for developing a training plan. It is not as excessive in detail as Tool 31. You will have to decide which way you prefer, or whether you want to develop a training planner of your own.

Exercise: Decide which of the three training planners provided you prefer or develop one of your own and use the tool to establish a training plan for six different departments of an organisation you are familiar with.

Tool 33: Training Purposes

This tool was designed to point out the purposes of training different audiences in an organisation. You should become aware of these relations as they are very important for developing effective training programmes. *Note that there is a blank sheet available for this tool (Tool 51).*

Exercise: Try to develop a sample training programme for each of the audiences presented here, considering the training needs they have. Which type of training do you think is most effective?

Tool 34: Training and Workshop Methods

This tool presents two different training and workshop methods and explains the role of the moderator in these situations. The methods presented below are useful tools to make employees express their ideas on the environmental management system and problems in an organisation. How these methods are used is explained here.

Tool 35: Communication Work Plan

The tool presented here was designed to help develop a communications work plan. Communicating environmental issues of an organisation to the different stakeholders is essential for an EMS to be accepted widely. How to use the tool can be seen by the example given.

Exercise: Think of more target audiences. Develop communication work plans for three of them.

Tool 36: Identification of Stakeholders

This tool is similar to Tool 35, though it was designed for identification of stakeholders. It is being used in the same way, two examples are provided. You need to learn that being aware of its stakeholders is essential for any organisation trying to implement an EMS.

Exercise: Pick an organisation of your choice. Try to identify all stakeholders of that organisation and fill the information necessary into the chart provided.

Tool 37: Documentation Sheet

As discussed in section 5.3 documenting the EMS is vital to its effectiveness. An EMS that is not documented properly will not achieve registration or certification. Therefore documents need to be developed. In most organisations there will already be a whole variety of documents existing, though. In the first step the documents already existing will therefore be identified. The documents that will have to be created can only be identified after the first step has been achieved. This tool helps in this process.

Tool 38: Operational Control

This tool is more or less self explanatory, you just have to follow the instructions.

Tool 39: Checklist: Emergency and Response

In order to have an effective emergency preparedness and response plan all the questions in the checklist provided have to be answered with ”yes”. Questions that are answered with ”no” point out deficiencies in the emergency preparedness and response plan that need to be fixed.

Exercise: Try to acquire an emergency preparedness and response plan of an organisation of your choice. Use the checklist provided and present the results of your small research task.

Tool 40: Internal Environmental Audit Plan

The tool provided here helps planning environmental audits. All that needs to be done is to fill in the blanks with the information necessary. This tool help planning the time scale of audits but does not say anything about the results achieved in an audit.

Tool 41: Checklist: Internal Environmental Audit

This tool is used as a checklist for environmental auditing. All that needs to be done is to fill in the blanks with the information obtained in the audit. The information can then be collected and evaluated easily as all audit results are collected in the same way.

Tool 42: Internal Environmental Audit Procedure Template

Audits are used to evaluate the performance of the environmental management system. This tool gives an example on how an internal audit procedure may be realized inside an organisation. If the steps mentioned below are being followed closely an important part of the continual improvement process will already have been completed.

Tool 43: Internal Environmental Audit Report

This tool can be used after an audit has been performed. The results of the audit can be filled in the blanks.

Tool 44: Non-Compliance and Correction Report

This tool can be seen as the second part of Tool 43 as it helps document inefficiencies and non-compliances of an EMS. It is being used in the same way as part one.

Exercise: If you have access to an organisation that has an EMS, make a trial ”audit” of one department and use Tool 43 and 17 to document the results of the audit.

Tool 45: Environmental Statement

The environmental statement is required by EMAS. It is a way for an organisation to make information on its environmental performance publicly available. Most of the time it is used to communicate successes, problems and objectives in the field of environmental management to the organisation’s stakeholders. This tool shows which issues should be included in the environmental statement.

Exercise: Develop an environmental statement for a small-scale organisation as described in the exercise for Tool 19 as far as you can access information.

Tool 46: EMS Development and Implementation

This tool is a detailed roadmap of the EMS development process. You can use this and the roadmap (see Figure 5.1) provided in chapter 5 as a guideline for EMS implementation processes you may have to perform yourself in the future. It can also be seen as a visual summary of the previous chapters.

Tool 47: Environmental Responsibilities Matrix.

Blank sheet to Tool 29.

Tool 48: Measuring the Environmental Impacts of an Organisation.

Blank sheet to Tool 8.

Tool 49: Aspect/Impact Evaluation.

Blank sheet to Tool 9.

Tool 50: Checklist: Environmental Legal Compliance.

Blank sheet to Tool 18.

Tool 51: Training Purposes.

Blank sheet to Tool 33.

Tool 52: Sample: Setting Objectives and Targets.

Blank sheet to Tool 24.

Tool 1 — Measuring the Importance of Environmental Problems

Source: Sturm, A. and Müller, K. 1998, p. 6.

Topic / Perspective	Environmental Problem Area				
	Resource Depletion		Environmental Impact		
	Energy	Water	Global Warming	Toxic Waste	...
Importance given by scientific evaluation.					
Social awareness today.					
Social awareness in the near future.					
Governmental policy awareness today.					
Governmental policy awareness in the near future.					
Regulation density today.					
Regulation density in the near future.					
Total					
Ranking by Importance					

Scoring: 4=high; 3=middle; 2=low; 1=very low; 0=none

Tool 2

Sample Procedure: Instruction for Environmental Aspects Identification Form

Source: NSF 2001, p. 99 et seq.

OPERATIONAL PROCEDURE		Issue Date: August 04, 2000
Number: OP-EV0100.R06	**Author:** Ronda Moore	**Approval:** _____ Vice President Operations
Title: Environmental Aspects & Impacts		**Reviewed By:** _____ Waste Water Group Leader

1.0 Purpose

The purpose of this procedure is to provide a system and instructions to identify environmental aspects of ZEXEL's activities, products, and services in order to determine those which may have a significant impact on the environment.

2.0 Scope

This procedure covers all activities, products, and services associated with ZEXEL. For purposes of evaluation, activities, products, and services with similar characteristics may be grouped together.

3.0 Reference Documents

Document Name	Document Number
Objectives and Targets	OP-EV0103
Management Review	OP-ZX006
Aspect/Impact Evaluation Form	WF-ES002
Aspect/Impact Listing - Decatur	WF-ES008
Aspect/Impact Listing - Arcola	WF-ES058
Initial Production Control	OP-ZX001
Contract Review	OP-SA001

4.0 Procedure

4.1

The procedure consists of an initial screening of activities, products, and services, based on data submitted to the ISO 14000 Task Force by the Area Managers. The Task Force assesses the aspects, determines associated impacts, and assigns an impact rating. The Task Force will review the evaluation results, and up-date as needed.

4.2

Area Managers are responsible for developing a flowchart for their department(s) showing all inputs and outputs to their processes. Inputs into the process may include supplies, raw materials, chemicals, packaging, and energy consumption. Outputs from the process may include products, solid wastes, liquid wastes, emissions, noise, and odor. The flowcharts shall also include the current method of handling generated wastes.

4.3

The Task Force shall evaluate the information submitted on the flowcharts. The Task Force may call upon other ZEXEL Team Members to assist, as needed. Each activity, product, and service shall be evaluated from the time the material is accepted on site through the time of sale, at the sale location. If a waste is being evaluated, the timeline to consider is the time the material is accepted on site through ultimate disposal, as displayed by the diagram below.

```
Accept Material                    Sale Location
|----------Product-------------------------------|
                                          Ultimate Disposal
|----------Waste-----------------------------------------|
```

4.4

The Task Force shall assign an impact rating according to the scales described below, while considering each of the following stages: raw material storage, production (accidents, start up, and normal operation), product and waste storage, transportation, and ultimate disposal.

4.5

The Task Force shall ask for each aspect/impact evaluation:

a) Is it in our permits/permittable?
b) Is it regulated by law?
c) Do we have control over it?

If the answer to a and/or b is "yes", the impact must be included on the list of significant impacts. If the answer to c is "no", the impact shall not be included on the list of significant impacts. The following table explains the different possible answers.

Possible Answer	Permitted/ Permittable	Regulated by Law	Do we have Control
Yes	must include	must include	may include
No	may include	may include	shall not include

4.6

When evaluating the "frequency", the number shall be determined from the following scale, based on documented evidence, by asking the following questions to determine frequency of use and of accidents: (1). How often does the process occur? and (2). How often has a problem occurred?

Frequency	Scale
Continuously	10
once per shift	9
once per day	8
Weekly	7
Monthly	6
Quarterly	5
semi-annually	4
Annually	3
once every 1 to 5 years	2
over 5 years	1
Never	0

4.7

When evaluating the "severity" the task force shall assign an impact number by selecting the highest evaluated rate from the scale below, based on documented evidence. When considering human impact, it is important to include contractors, neighbors, customers, etc., as well as team members.

4.8

Impact ratings shall be determined by multiplying the frequency and severity numbers. The Task Force shall determine an appropriate cutoff level for significant impacts.

4.9

The Environmental Manager shall work closely with ZEXEL's Plant Management to ensure that the identified significant environmental aspects are considered in establishing environmental objectives and targets for ZEXEL, as stated in the Objectives and Targets OP.

4.10

The results of the most recent environment aspect/impact identification is reviewed as part of the Management Review process, as specified in the Management Review OP. From this review ZEXEL Management determines the need to update the environmental impact evaluation. Factors considered in the determination to update the assessment include improved methodologies, and major changes in ZEXEL's policies, products, or processes. Aspect reviews may also be triggered from the Initial Production Control (IPC) and Contract Review process. Environmental impact evaluations shall be conducted at least, on an annual basis, *by the end of each calendar year*, even if none of the factors listed above dictate a review.

Severity Scale	Human Impact	Animal/Plant Effect	Public Relations
10	multiple deaths	widespread permanent destruction	plant closure
9	single death	on-site permanent destruction	permanent public disfavor
8	disabling injury	widespread genetic impact	interrupted operations
7	long term health effects	on site genetic impact	loss of historical assets
6	lost time Injury/Illness	wide spread disfigurement	state or national protest
5	restricted duty	on-site disfigurement	city or county protest
4	medical only	wide spread appearance	employee protest
3	first aid treatment	reduction of natural beauty	public inconvenience
2	Discomfort	on-site appearance	public disfavor
1	None	none	none

Tool 3 — Input-Output Sheet

Source: INEM 1998, p. 38.

Baer Weichkäserei AG, Küssnacht am Rigi, Switzerland

Installation or description of installation system: Salting									
Person reponsible: Hans Feller							Location ZB 3.OG		
Area: Materials and energy	Production	Processing	Drying	Cooling	Packaging	Treatment of waste gas/ air	Treatment of wastewater	Others (what?)	
Please indicate									
Solids	**Inputs**		**Outputs**		**Waste**	**Waste air**	**Wastewater**	**Noise**	Remarks
	(Characteris-tics)	(Amount/ Year)	(Product)	(By-products)	(yes/no)	(yes/no)	(yes/no)	(yes/no)	
Raw materials	prematured milk	approx. 6 million kg	cheese	no	no	no	no	no	edges: fattening areas
Raw materials	salt/ mushrooms		in cheese	no	no	no	no	no	
Raw materials	rennin		in cheese	no	no	no	no	no	
Auxiliary materials	filter fleece		filter fleece, auxiliary materials	no	total amount (without) recycling for	no	no	no	
			whey	yes	the dairy:	no	no	no	
Liquids					23 t (1994)				
Auxiliary materials	freezing water for filter tunnel		circulation system	no		no	no	no	
Auxiliary materials	cold water (120)		cold water (120)	no		no	yes	no	
Auxiliary materials	phosphoric acids 2%		phosphoric acids 2%	no		no	yes	no	
Auxiliary materials	foam		foam	no		no	yes	no	

Auxiliary materials	disinfection agents		disinfection agents	no		no	yes	no	
Auxiliary materials	tepid water		tepid water	no		no	yes	no	
Gaseous substances									
Auxiliary materials	compressed air			no		no	no	no	
Auxiliary materials	water vapour			no		no	no	no	
Energy									
Heating oil (type)									
Gas (type)									
Other	air conditioning			no		no	no	no	

The limits values are respected (regularly, mostly , never)	Waste air	Wastewater	Noise	Is the correct functioning of the installation controlled/ recorded?	No	Yes	If so, how
	regularly	regularly	regularly			X	Pers. & TechD

According to our knowledge and experience the following laws/regulations are relevant: legislation on

Please indicate	Water protection	Water drainage	Cleaning of air	Noise	Incidents	Materials	Waste	other	other
Are there projects inspections, or plans for the above installation?	no	no	no	no	no	no	no	no	
		no	yes	deadline	Reason/remarks				
	shut down	X							
	remediation	X							
	rebuilding	X							
	change process	X							

Completed on:	By:	Position:	Stamp:
9.6.95	Peter Frey	Manager	

Tool 4 Introduction to Process Mapping

Source: U.S. EPA, July 2001, p. 170.

Process mapping is a tool that allows an organisation to visualize and understand how work gets accomplished and how its work processes can be improved. It is a simple but powerful tool through which an organisation can focus its efforts where they matter most and eliminate process inefficiencies. Used properly, process mapping can help an organisation understand its environmental aspects and reduce wastes and pollution. It also can help an organisation to reduce operating costs by identifying and eliminating unnecessary activities.

As an EMS tool, process mapping can help an organisation to:

- **Improve its understanding of existing processes**, including the key **inputs** (such as chemicals, raw materials and other resources used), **outputs** (including products, wastes, air emissions, etc.) and **interactions** with other processes.
- **Identify areas for process improvement** that can result in environmental performance improvements (such as pollution prevention opportunities).

Getting Started on Process Mapping

- **Select a process** (or set of related processes) to examine. Processes might be prioritized for review based on a number of criteria, such as relevance or importance to the organisation, prior assessments of the process, existing knowledge of the environmental significance of the process, or history of problems with the process, among others. Define the process boundaries.

Use a **team** to understand and map how these existing process(es) work. At a minimum, the team should include the process "owner" as well as individuals that are actively involved in carrying out the process. Many organisations use a facilitator that is independent of the process under review to manage team meetings. Don't be surprised

- If there are a diversity of opinions among team member regarding how the existing process works.
- **Clarify the objectives** of the process under review. Each process should have a primary customer and a primary performer, although additional (secondary) customers and performers also might exist.
- As a team, **determine the level of detail** needed to accurately map your processes. Initially, you might map at a fairly high level, then get into more detail as improvement opportunities as identified.
- Decide on a **set of symbols** that the team will use to visually describe the process. For example, use one symbol for work steps, another symbol for process inputs, a third symbol for process outputs, a fourth symbol for decision points, a fifth symbol for measurement points, etc.
- **Identify the key steps** (or "unit operations") in the process first, then go back and **analyze** each of these steps in more detail. Use lines or arrows to show the relationships among individual process steps. Use brainstorming and/or storyboarding techniques to identify the process steps, then agree upon the sequence of these steps.
- Start with the **preparation of an "as is" map** that describes how the process works now, including key process inputs to and outputs. For environmental purposes, key inputs might include energy and other resources consumed, and raw materials and chemicals used. Outputs might include products or services, air emissions, wastewater discharges, solid and hazardous wastes. This "as is" map can be analyzed to identify environmental aspects and key opportunities for improvement.
- Some processes can be extremely complex and might consist of numerous **sub-processes**. If the team gets bogged down, it might examine and map some of the key sub-processes first, rather than trying to tackle the entire process at once. As a rule of thumb: If the process is so complex that it cannot be shown on a single page, then it might be a good candidate for re-engineering.
- Depending on the purpose of the process mapping exercise, the analysis of the "as is" map can lead to the preparation of a **modified map** that defines how the re-engineered process is intended to function.
- A variety of **tools and materials** can be used to prepare process maps. For example, a number of commercial software packages exist. However, you can also employ simpler methods, such as self-sticking removable ("Post-It") note pads. These are particularly useful for moving individual process steps around on a board.

As a sample you will find an anonymized process map (Tool 14) we have used in one of our projects. This is one way of designing a process map. There are numerous others, try to design your own process map of the same or a different process system.

Tool 5	**Checklist: Eco-Mapping** Source: INEM 1998, p. 52.	

1. Data on the organisation
(address, NACE code, ...)

1. Calculation of material and energy flows in physical terms.

2. General data

1. Historical development.
2. Size of organisation.
3. Thematic eco-maps.

3. Organisation operations

1. Production processes.
2. Choice of products and raw materials.

4. Waste

1. Origin of waste.
2. Storage of waste.
3. Elimination of waste.
4. Waste management.

5. Wastewater

1. Quantity and quality of wastewater.
2. Treatment of wastewater.
3. Sewage system.
4. Taxes and charges paid for wastewater discharged.
5. Wastewater management.

6. Soil and groundwater

1. Storage of chemical products.
2. Impermeability of ground.
3. Risks in storage.
4. Soil analysis.

7. Noise and vibrations

1. Sources of noise and measurements.
2. Site and edge of site.

8. Air

1. Points of emissions.
2. Gaseous emissions and odours.
3. Reduction of emissions.

9. Impact on the environmental quality of the surroundings

1. Organisation's immediate environment.
2. Type of ground under the site and location in relation to drainage and collection of water.

10. Environmental costs

1. Investment, taxes, charges, insurance, fines.

11. Permits and licences

1. Relationship with authorities.
2. Relationship with local residents.
3. Responsibilities.

12. Environmental action plan

Tool 6-00	**Eco Mapping: What is Eco-Mapping?** Source: INEM 1998, pp 40.	

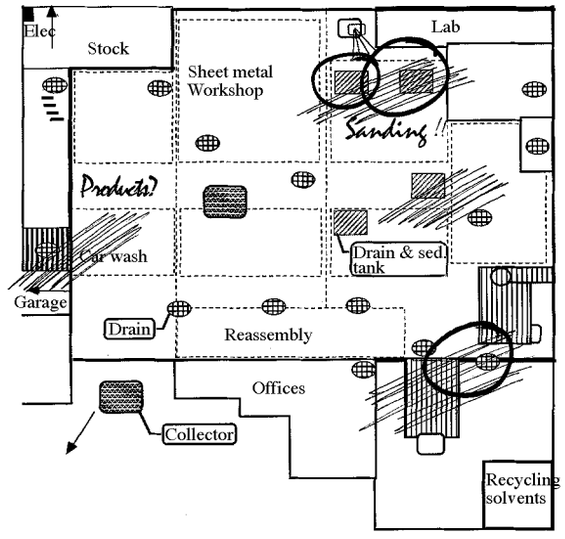
Eco-mapping is an original and simple tool which helps small companies when implementing environmental management and EMAS.

- An inventory of practices and problems.
- A systematic method of conducting an on-site environmental review.
- A collection of information which shows the current situation using pictures.
- A work and awareness-raising tool.
- A do-it-yourself tool for SMEs.
- A tool which allows employee involvement and participation.

Eco-mapping is environmental management «light»

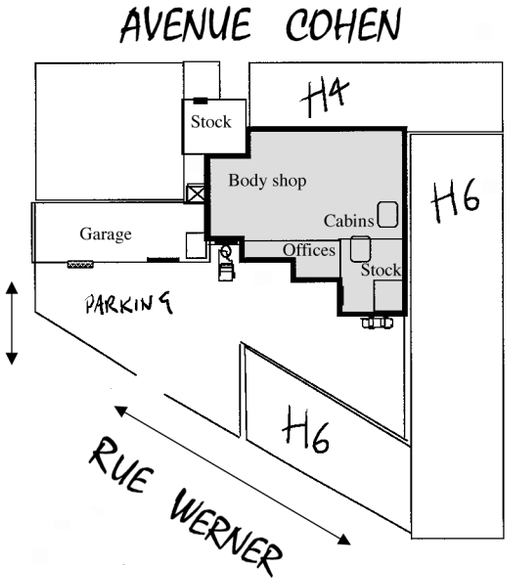
- A practical method for conducting an environmental review.
- Which helps in learning about and collecting data.
- A support for training and communication.
- The basis of environmental documentation for an organisation.
- Everyone in an organisation can use it as a support for their work and training.
- Everyone in an organisation can participate without having written procedures and instructions.
- A method which allows an organisation to define and prioritise problems.
- Useful for all stakeholders.

The development of eco-maps on water, soil, air, waste management, etc. is not a goal in itself. The main interest lies in the fact that it is a process which accompanies a review of environmental performance, and in the positive actions which result.



How to use eco-maps

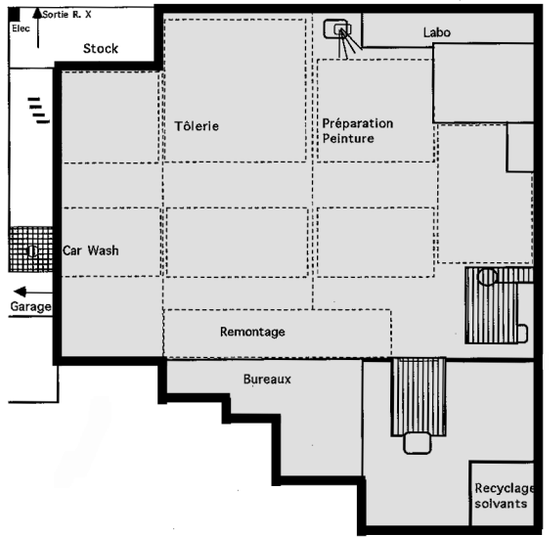
Indispensable materials	Squared A4 paper and a photocopy machine.
Time needed	Less than one hour of work for each map.
When to do it?	After the end of the accounting year.
How often should they be up-dated?	Once a year, or if the site is being renovated, extending of activities, etc.
Filing	With ISO 14001 and EMAS documentation for an environmental management system, with annual accounts.
Who can use them?	The maps can be used by many different types of companies: from small manufacturing and service companies to large structures and local authorities.



How to eco-map

1. Map of the urban situation

Make a map of the site, seen from above, including car parks, access areas, roads and the surrounding environment. It should show the real situation. (2 copies)



2. Map of the site

Draw the outline of the site using a scale and showing the interior spaces. This map should be copied (6 times) and will be the basis for the work to be done.

The maps should show the real situation – they should be simple, recognisable and in proportion. They should have a date, a name and a reference. You will have to integrate one or two significant objects which will enable you to orient yourself straight away in the site (e.g. machines, boilers, etc.).

If your site covers very different areas, you can do a map of the different areas and then bring them altogether.

3. Symbols

Develop your own symbols, but use at least two:
Hatched lines: small problem (area to be monitored, problem to be studied)
Circle: large problem (stop, corrective action)
The more serious the problem, the thicker the circle.

In order to improve the quality of your eco-maps, you can use standardised pictograms.

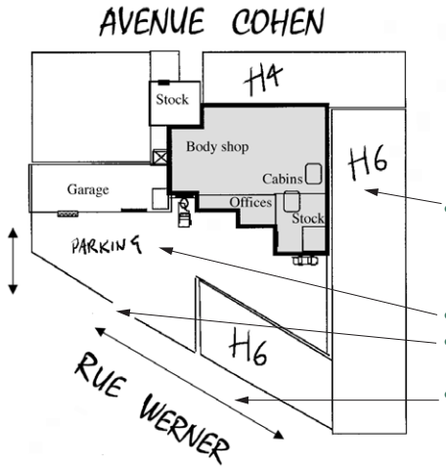
Tool 6-01	**Mini audit: Environmental "Weather" Map** Source: INEM 1998, p. 43.	

120 seconds for the weather map of environmental management in your organisation:				
Use of raw materials				
Use and choice of energy				
Use of water and wastewater				
Prevention and reduction of waste				
Recycling and selective separation of waste				
Air pollution, dust and odours				
Storage of products				
Reduction and control of noise and vibrations				
Health and safety in the workplace				
Mobility and transport of employees and goods				
Prevention of environmental accidents				
Environmental information (internal and external)				
Communication with suppliers				
Green planning for goods and services				
Neighbourhood				
Motivation of managers				
Motivation of employees				
Administrative situation				

Tool 6-02	**Eco Map: Urban Situation** Source: INEM 1998, p. 44.	

This map situates the site in its urban context.

- What are the areas of interaction between the site and its neighbours?
- What is the authorised use of the area covered (i.e. commercial, industrial)?
- What vehicle traffic is generated by the organisation's activities?
- What is the situation of the organisation in the neighbourhood?



- Indicate the number of floors above ground (not including roofs) of the buildings around the company within a radius of 50 metres.
- Use of land (car park or building).
- Entrance and main points of access to the company.
- Direction of traffic.

Do you link to calculate?

Count the number of vehicles in relation to the organisation's activities and estimate their number of movements within a radius of 1km. The table below will help calculate the pollution generated.

Emissions gr per km	Light vehicles, petrol	Light vehicles, diesel	Heavy vehicles, diesel
CO_2 (Carbon dioxide)	250	133	837
NO_x (Nitrogen oxide)	2.53	0.55	19.2
SO_2 (Sulphur Dioxide)	0.026	0.168	1.052

Croissants and traffic

The most important direct environmental impact of a small organisation is often related to the traffic it generates. For example, a small bakery in the city centre generates more than 350,000 movements of cars per year!

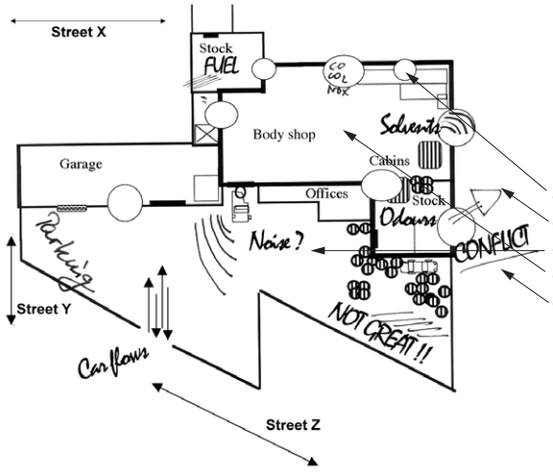
Draw	Document	Estimate	Work out
• Usage of neighbouring areas (residential, green areas, industrial) • Roads and direction of traffic • Consider importance of different types of traffic and size of roads	• Cadastral survey • Sector surveys, administrative status of the area • Recent permits for activity in question (after 1995)	• Fleet of vehicles (cars, trucks, etc.) • Parking areas available and used • In-coming and out-going movements (suppliers, bin-men, employees' and customers' cars, etc.)	• Surface in m^2 • Date of establishment 19xx • Number of employees • Age of buildings • Number of vehicle movements per unit of product/service

Tool 6-03	**Eco Map: Nuisances** Source: INEM 1998, p. 45.	

This eco-map represents the first work plan (following on from eco-map no. 1).

It is the result of a quick evaluation (Environmental Weather Map) and of discussions. It should be completed with an input-output analysis of the material and energy flows in an organisation in physical terms (kg, kWh, m^3, etc.).

If a problem of particular importance (such as noise) is being identified an eco-map especially for this problem should be developed.



- Chimneys and vents.
- Containers and bins.
- Noise.
- Area of important activity.
- Area of problem with neighbours.

All employees should be involved in this initial summary environmental review. Following this a complete assessment of material and energy flows needs to be prepared using data available from the organisation's accounting records. The figures should relate to the organisation's activities. Own indicators can be developed.

Input	Output
raw materials	solid and liquid waste
energy	air pollutants
water	nuisances, noise, odours
transport	nuisances, noise, odours
packaging	authorised use of land

Examples:

- Energy: x litres of heating oil/year/m^2 work area.
- Resources: x litres of water/kg of product.
- Waste: x kg of waste generated per unit of production or service.

Comparison of indicators over the period of a year shows how the organisation is evolving.

Assessment of consumption

Draw	Document	Estimate	Work out
• Points of discharge into air • Sources of noise and odours • Areas of storage of waste and hazardous products	• Tax declaration • Complaints from neighbours: letters, statements, legal proceedings • Certificates re. machine maintenance • Financial information	• First intuitive evaluation of your site • Analysis of flows • Materials assessment • Environmental performance	• Duration of permits (years) • Taxes paid • Taxes, charges, insurance • Consumption • Environmental costs

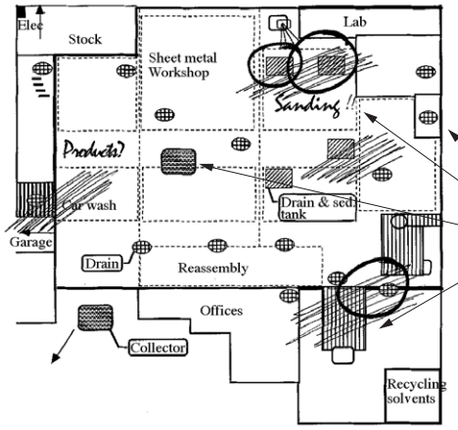
Tool 6-04	**Eco Map: Water** Source: INEM 1998, p. 46.	

This eco-map looks at the consumption of water and discharge of wastewater.

- Where is there a high level of water consumption?
- Where are hazardous products poured into the sewer?
- Possibilities for product substitution.
- Possible accidents.
- Wastage and bad habits.
- Areas of cost-savings.

One drop of water takes between five and 25 years to go from a cloud to your tap.

Water is a resource which must be protected and must not be wasted. One person consumes on average 70 litres of water a day. How much does an organisation consume per year in comparison with a normal person? Which areas of activities are dangerous in terms of water pollution, e.g. cabin for painting or paint stripping? Check to see where all drains are situated. Don't forget that one drop of petrol products contaminates more than 5,000 litres of water.



- Drains.
- Areas of bad practice.
- Piping system.
- STOP! unallowable.

Do you like to calculate?

Convert the water consumption in m^3 into equivalent per inhabitant, keeping in mind that a European consumes on average 120 litres of water a day.

- Check for leaks!
- Measure consumption!
- Save water!

Draw	Document	Estimate	Work out
• Areas where liquids are poured	• Annual water bills	• Wastage	• Consumption, m^3
• Piping and drainage system	• Permits for discharge of wastewater and taxes	• Activities which require water	• Major sources of consumption, %
• Treatment methods	• Plan of sewage system	• Water charges	• Annual consumption of cleaning products in litres, salt
• Major areas of consumption (washing machines,...)	• If treatment methods are used, technical description from supplier	• Pollutants	
		• Bad practices	• Other products
		• Impact of pollutants	• Measurements of discharges

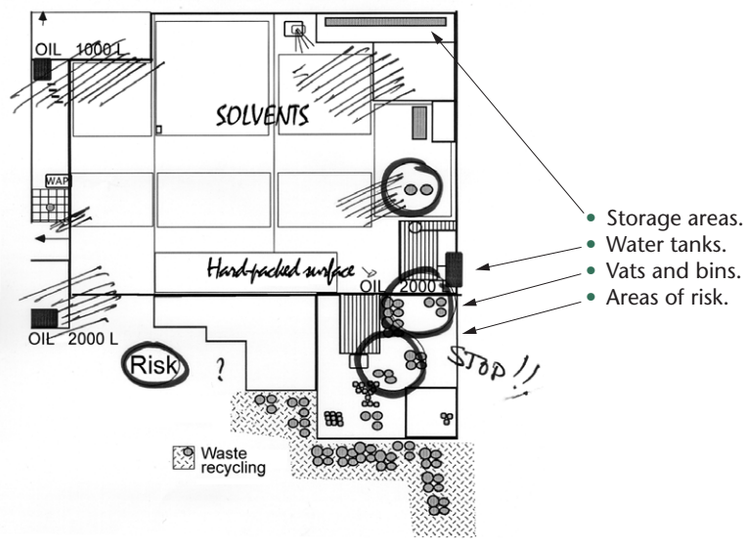
Tool 6-05	**Eco Map: Soil** Source: INEM 1998, p. 47.	

This eco-map looks at the storage of flammable, dangerous or hazardous products in relation to groundwater.

- Is there a threat to groundwater in the case of accidents?
- Where are old oil tanks?
- Soil pollution?
- Procedures in the case of accidents?
- Do storage areas have concrete floors, are they partitioned off, are they ventilated?

1 litre of petrol which infiltrates the soil can contaminate 1,000 m^3 of groundwater.

For this reason it is very important to know the history of a site, the positioning of old tanks, the ground surfacing used etc. Polluted soil will lower the value of a site. In certain European countries, when companies and the land upon which they are situated are being sold, lawyers require an attestation regarding soil quality. If the soil is polluted, it has to be decontaminated (costs at the moment average 128 USD/m^2).



Draw	Document	Estimate	Work out
• Storage areas • Water tanks • Drums, containers, "suspicious" pallets	• Products data safety sheets • Analysis of basements • Layout of tanks • Areas of water collection	• Old tanks • Impermeability of soil • Type of products • Storage in tanks and drums • Leakage	• Area of impermeable surfaces • Permanent stock in litres • Calculation of flows

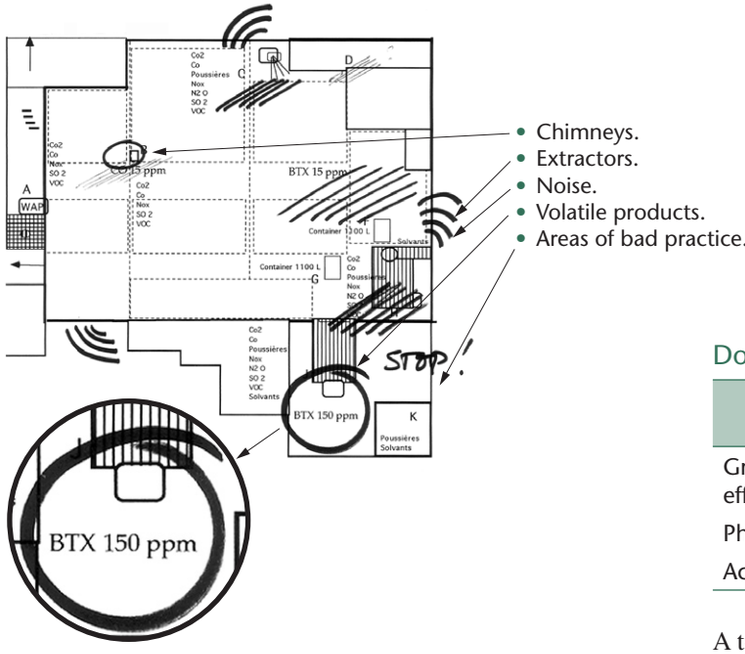
Tool 6-06	**Eco Map: Air, Odours, Noise, Dust** Source: INEM 1998, p. 48.	

This eco-map looks at all the points of emissions and the functioning of machinery.

- What is air quality inside the organisation?
- Is attention being paid to sources of noise?
- Are filters replaced regularly?
- When was maintenance work last carried out on the boiler?

If an organisation is located in an urban area particular attention should be paid to the problem of noise. A test can be done. If at the edge of the site you can no longer have a conversation without raising your voice, 65 db (decibels) are exceeded by the organisation.

Atmospheric emissions are mainly due to heating installations and generators.



- Chimneys.
- Extractors.
- Noise.
- Volatile products.
- Areas of bad practice.

Do you like to calculate?

	Natural gas (g/m^3)	Heating oil (g/litre)
Greenhouse effect: CO_2	1,879	3,136.5
Photosmog: NO_x	3.01	3.35
Acid rain: SO_2	0.027	3.6

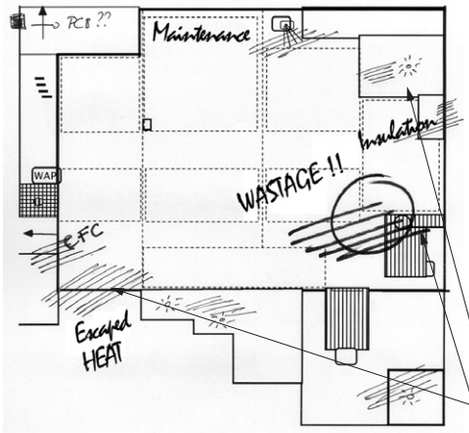
A total calculation of CO_2 can be done by multiplying the total calculated for the eco-map urban situation by 5. Make a comparison: a person living in a developing country generates 1.8 tonnes of CO_2 per year.

Draw	Document	Estimate	Work out
• Openings in roofs and ventilators • Main points of emissions	• Certificates of maintenance • Technical sheets • Product data safety sheets	• Work procedures • Product quality • State of filters and pipes • Disturbing odours	• Volume of volatile pollutants, litres • Regularity of maintenance • Noise levels

Tool 6-07	**Eco Map: Energy** Source: INEM 1998, p. 49.	

This eco-map looks at the consumption of energy and the impacts which it has.

- Where are areas of wastage?
- Compliant electrical installations.
- Where do heat losses occur?



- Aggressive lighting.
- Loss of energy.
- Oversized machinery.

Do you like to calculate?

Convert the energy consumption into kWh

Resources consumed	Energy generated (kWh)
Fuel: 1 litre	10
Gas: 1 m^3	11.28
Propane: 1 tonne	12,880
Coal: 1 tonne	8,500
Wood (broad-leafed tree): 1 stere	1.56

Visualise the equivalent quantity of resources necessary to generate this energy.

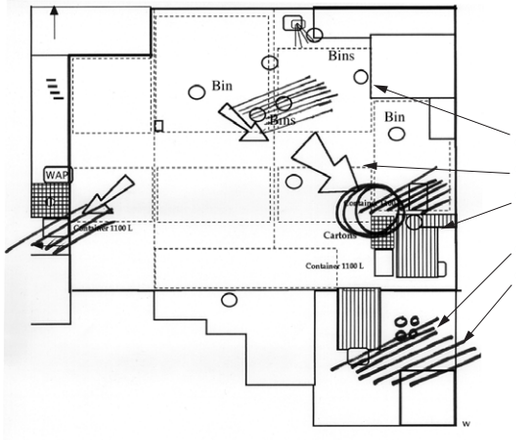
Resources necessary to generate 1,000 kWh	
Brown coal	1,300 kg
Low energy-value waste	3,500 kg
Solar panels	12,500 m^2
Uranium (nuclear power)	0.022 gr
Natural gas	270 m^3
Water (dam of 10m height)	43,200 m^3

Draw	Document	Estimate	Work out
• Location of machinery	• Maintenance certificates	• Type and use of energy	• Consumption kWh
• Useless lighting	• Bills	• Insulation	• Cos phi
• Areas of heat loss	• Technical instruction sheets for machinery	• Energy efficiency	• Savings due to energy efficiency

Tool 6-08	**Eco Map: Waste** Source: INEM 1998, p. 50.	

This eco-map looks at management and prevention of waste.

- What is the level of recycling?
- What preventative measures have been taken?
- Are your suppliers obliged to take back materials?



- Bins.
- Direction of disposal.
- Mix of household/non-hazardous waste and toxic/hazardous waste.
- Areas of bad practice.
- Containers.

Evaluate the level of waste management

1 to 5: More or less good management.
6 to 10: No management.
11 to 15: Lack of management is the source of problems.
16 to 20: Lack of management is the source of serious problems.

Scoring from 0 to 20 takes different criteria into account: dangerousness of products, potential of finding alternative solutions (recycling and others) . Fill your figures into a table. Make a radar graph and the areas of poor or no management will be visualised immediately! (This can be put up somewhere in the organisation where everybody can see it).

See the example given.

Example

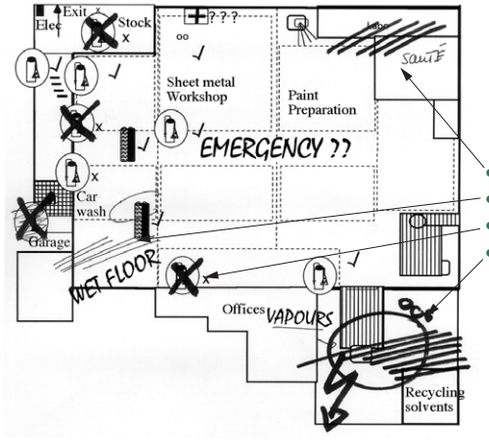
Paper and cardboard for packaging	3
Tyres	1
Non-metallic car body parts	5
Batteries	2
Waste from recycling	20
Empty oil filters	15
Aerosols	15
Packaging chemical products	16
Empty paint tins	15
Cabin filters	16
Scrap	10

Draw	Document	Estimate	Work out
• Bins and containers • Direction of waste flows • Areas of bad practice	• Certificate from transporters • Annual bills • Assessment and development of flows	• Type of wastes • Level of recycling • Prevention measures • Categories of waste	• Waste disposed per year, tonnes • Taxes paid on waste • Level of recycling

Tool 6-09	**Eco Map: Risks** Source INEM 1998, p. 51.	

This eco-map identifies risks of accidents and pollution.

- Accessible and clearly identified emergency exits.
- Known emergency procedures.
- Dangerous situations.
- Where are products being used which are carcinogenic, cause allergic reactions, etc.?



- Accidental spillage.
- Problems with falls.
- Non-compliance.
- Solvent clouds and risk of explosion.

Use standardised symbols.

Risks related to health, e.g. inhalation and absorption of dangerous products or accidents which cause bodily harm.




Risks related to the environment, e.g. leakage of products, accidental spillage and usage of toxic products.

Risk related to fire, e.g. explosions and dispersion of toxic products.

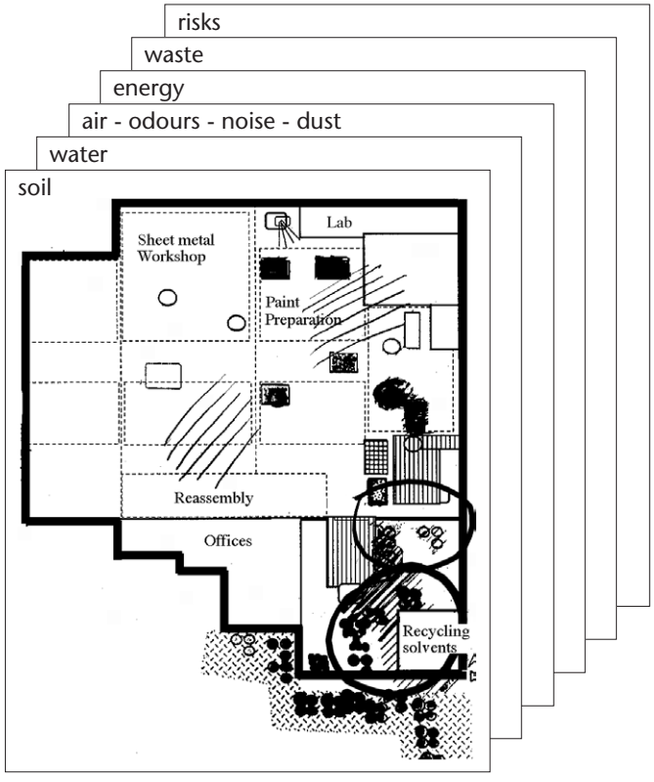

You must be prepared and know emergency procedures and telephone numbers.

Draw	Document	Estimate	Work out
• Location of extinguishers • Emergency exits • Areas of risk	• Toxicology sheets • Emergency procedures • Authorizations • Fire services • Accident reports	• State of machinery • Emergency facilities • State of ground	• Number of accidents • Hours of training for employees • % of dangerous and toxic products in stock

If you put your eco-maps one on top of the other (using overhead transparencies) environmental priorities will become clear straight away.

The problems should be ranked in terms of seriousness. First the problems surrounded by a thick circle need to be dealt with. Priority should be given to problems which link worker health and safety and the environment.

Then the areas of risks need to be thought about and solutions need to be developed. This approach should be repeated once a year.

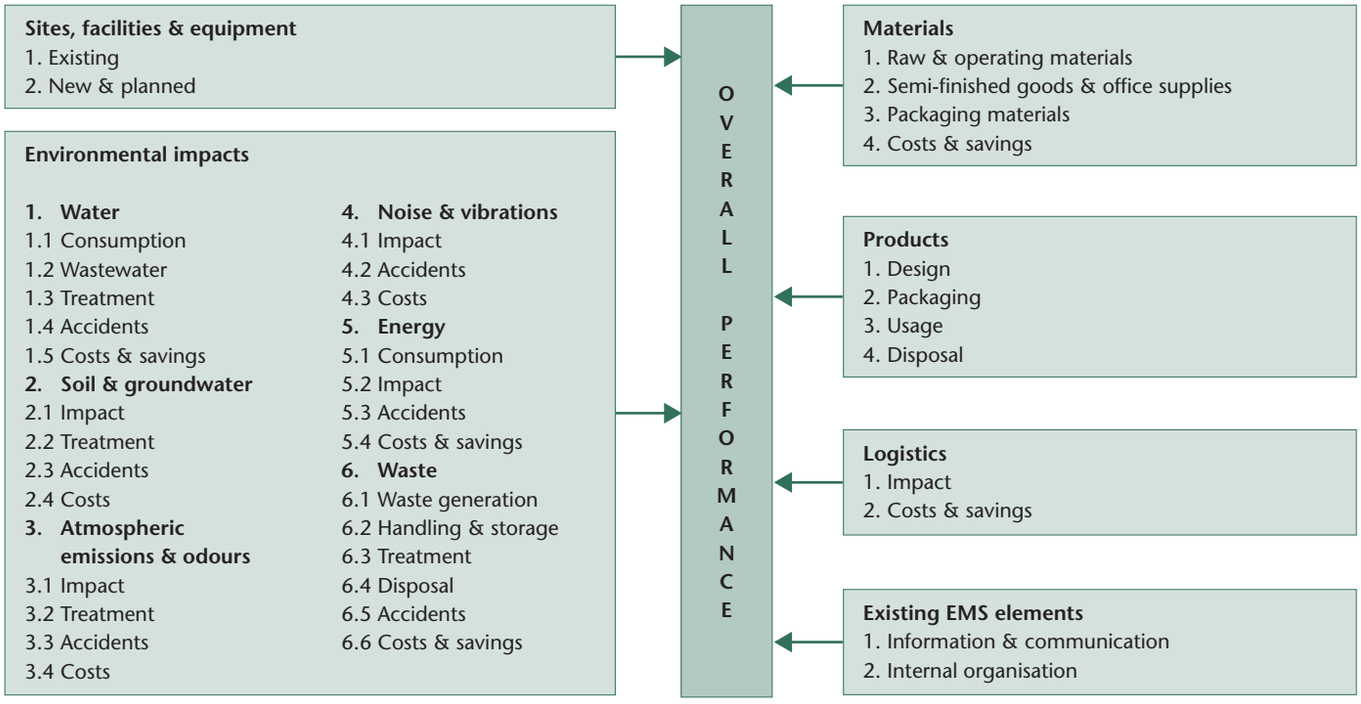


Develop your own indicators of environmental performance

- Quantity of waste (kg per #).
- Energy consumption (kWh per #).
- Emissions CO_2, NO_x, SO_2,... (kg per #).
- Packaging (kg per #).
- Transport (km per #).
- Money spent on the environment ($, DM, FRF , etc. per #).
- Environment actions undertaken (hours per #).
- Accidents per year (number per #).
- Training of employees (hours/year per #).
- Etc.

(# is the unit of product or service)

Tool 7	**Environmental Review Questionnaire** Source: INEM 1998, p. 54	



1. Existing

Refer to your Eco-map: Urban situation

- Does the location of your site, place any restrictions on your operations, e.g. no night-time operations are permitted because of location beside a residential area?
  If so, what are these restrictions?
- Do you require special permits or licences for your current activities?
  If so, do you have the appropriate permits and licences and what restrictions do they impose on your organisation?
- Have you identified any measures that could be undertaken to better integrate your site with its local environment in terms of visual impact, e.g. planting of trees, repainting of buildings?
  If so, which of these measures have been implemented?
- Does your organisation apply any environmental criteria when considering modifications to existing buildings, equipment and/or machinery?
  If so, what are these criteria?
- Do you already use clean technologies for your existing production processes?
  If so, which clean technologies do you use and for what?
- Do you know about clean technology options available were you to replace your existing equipment or machinery?

2. New & planned

- Does your organisation apply any environmental criteria when considering investing in new buildings, facilities and/or equipment?
  If so, what are these criteria?
- Do you consider clean technology options when purchasing new equipment and machinery?

Environmental impacts

Before reviewing your environmental impacts you should refer to your Environmental Weather Map and to your Eco-map: nuisances.

1. Water

Refer to your Eco-map: water

1.1 Water consumption

- Where does your organisation's water supply originate? You should consider all different sources e.g. public water supply, groundwater, lakes, etc.
- Is your organisation's water supply subject to seasonal restrictions due to specific climatic conditions, e.g. drought, flooding?
- How much water does your organisation abstract (m^3 per year)? You should differentiate according to the sources.
- How much water is consumed by your organisation (m^3 per year)?
- Do you monitor the quality of your water supply before it is consumed?
- Can you identify water consumption according to usage, i.e. volume used for processing, cleaning, etc. and the % of overall volume which this represents?
- Is the level of water consumption measured and recorded on a regular basis?
- Have procedures been developed for measuring and recording the volume and quality of water consumed? If so, what are these procedures?
- What pollutant substances come into contact with water during use, e.g. disinfectants?
- Have procedures been developed regarding handling of water pollutant substances? If so, what are these procedures?
- Does your organisation reuse process water before discharging it? If so:
  - What volume of water is reused (m^3 per year)?
  - What % of overall water consumption does this reused water represent?
  - What is the water reused for?
- Have you identified measures which could be implemented to reduce water consumption? If so, were best practices and clean technologies considered when measures were identified?
- Have any of these measures been implemented? If so, what are these measures, and have the results of implementing them been recorded and evaluated to see how effective they are?

1.2 Wastewater

- Do you have past records of the volume (m^3 per year) and types of wastewater discharged from your site?
- Can you locate all physical points on your site from which wastewater is discharged?
- What different types of wastewater are discharged from your site?
- What volume of wastewater is generated by your site, (m^3 per year)? You should differentiate according to the different types.
- What is the origin of each type of wastewater which you discharge, e.g. cooling, cleaning?
- Do you know the physical, chemical and biological properties which should be regularly monitored in wastewater?
- Is your wastewater monitored before being discharged?
- Is the concentration of pollution in your wastewater measured and recorded regularly? If so, how often is the concentration of pollution measured?
- Are the quantities of all pollutant substances detected measured and recorded?
- Do you know about the different types of methods and devices for measuring wastewater pollution and quality?
- Are the devices used by your organisation to measure wastewater pollution and quality checked on a regular basis to ensure that they are working properly?
- Have procedures been developed regarding:
  - Monitoring and measurement of wastewater pollutant content and quality.
  - Recording these measurements.
  - Use and checking of wastewater measurement devices.

  If so, what are these procedures?
- Where are the different types of wastewater generated by your organisation discharged to?
- What is the area of water into which your wastewater is discharged used for, e.g. drinking water supply, agriculture, leisure activities?
- Have procedures been developed regarding wastewater discharge? If so, what are these procedures?
- Do you monitor the quality of water in the area into which your wastewater is discharged on a regular basis?
- Have you identified measures which would reduce the amount of wastewater generated by your activities, and reduce and/or eliminate wastewater pollution? If so, were best practices and clean technologies considered when measures were identified?
- Have any of these measures already been implemented? If so, what are these measures and have the results of im-

plementing them been recorded and evaluated to see how effective they are?

1.3 Treatment

- Do you have on-site wastewater treatment facilities?
  If so, what volume is treated (m^3 per year) and what % of overall wastewater does this represent?
- What treatment process/es are used for which type/s of wastewater?
- Have procedures been developed regarding internal wastewater treatment?
  If so, what are these procedures?
- Do you know about clean technology options for wastewater treatment?
- Is treated wastewater reused in your organisation?
  If so:
  - How much wastewater is reused (m^3 per year) and what % of the overall volume of wastewater does this represent?
  - What is the treated wastewater used for?
  - Where is wastewater discharged to once it has been treated?
- Do you monitor the quality of wastewater in the areas into which your treated wastewater is discharged on a regular basis?
- Do you have contracts with external companies to treat your wastewater?
  If so, do these companies have to meet any environmental requirements and if so what are these requirements?
- Are on-site treatment facilities regularly checked to ensure that they function properly?

1.4 Accidents

Refer to your Eco-map: risks

- Do you have records of accidental water pollution in the past?
- What were the reasons for past accidents?
- What were the environmental and human impact of past accidents?
- What measures and/or procedures have been introduced to reduce and/or eliminate the risk of such accidents happening again?
- What would be the impact of an accidental discharge of materials used by your organisation into its water system or directly into the natural environment?
- What precautionary measures have been taken in order to isolate wastewater in the case of an accident, e.g. leakage, spillage?
- What emergency procedures do you have in the case of accidental water pollution?

1.5 Costs & savings

- Do you know all the costs associated with:
  - Water consumption, e.g. water charges.
  - Wastewater discharge.
  - Internal wastewater treatment, e.g. investment in treatment installations.
  - External wastewater treatment, e.g. services provided by external companies.
- Have you identified potential or realised cost-savings from reducing or eliminating water consumption, discharge and/or pollution, e.g. reduced water charges?

Make a list of the costs and savings which you already know about.

2. Soil & groundwater

Refer to your Eco-map: soil

2.1 Impact

- Has a history of operations on the site since they began, been compiled in order to determine possible soil and groundwater pollution?
- Do you know what substances should be monitored in terms of soil and groundwater pollution?
- Have any analyses of the soil and groundwater been done to check for pollution below and around your site (either by your organisation or by an external party)?
  If so, have the results of such analyses been recorded?
- Has any pollution been detected in the soil and/or groundwater below or around your site?
  If so:
  - Do you know when (before or after your activities began on the site) this pollution dates from and how it occurred?
  - Are soil and groundwater analysed regularly to check for pollution (either internally or by external companies)?
  - Do you know about the different devices for measuring soil and/or groundwater pollution?
- Are any devices used by your organisation to measure soil and/or groundwater pollution checked regularly to ensure they are working properly?
- Have procedures been developed regarding:
  - Analysis of the content of soil and/or groundwater.
  - Recording the results of these analyses.
  - Use and checking of soil and groundwater pollution measurement devices.

  if so, what are these procedures?

- Have all areas on your site where the ground should be made impermeable been identified in order to avoid soil and/or groundwater pollution, e.g. chemical storage areas?
  If so, have all of these areas been made impermeable?
- If you operate an on-site dump or landfill , have you established a management/remediation plan for this area once it has reached its full capacity?

2.2 Treatment

- Has your organisation already been obliged to remediate or decontaminate polluted soil and/or groundwater underneath or around your site?
- Have the results of implementing these measures been recorded and evaluated to see how effective they were?

2.3 Accidents

Refer to your Eco-map: risks

- Do you have records of accidental soil and/or groundwater pollution in the past?
- What were the reasons for past accidents?
- What was the environmental and human impact of past accidents?
- What measures and/or procedures have been introduced to reduce and/or eliminate the risk of such accidents happening again?
- What emergency procedures do you have in the case of accidental soil or groundwater pollution?

2.4 Costs

- Do you know the costs associated with preventing soil and/or groundwater pollution and with remediating or decontaminating polluted soil and/or groundwater?

Make a list of the costs which you already know about.

3. Atmospheric emissions & odours

Refer to your Eco-map: air, odours, noise and dust

3.1 Impact

- How do the climatic and geographical factors specific to your site influence the atmospheric emissions and odours caused by your activities, e.g. exposure to prevailing winds?
- Do you have past records of the types and quantities of emissions/exhausts, and dust generated by your operations?
- Has an inventory been done of on-site activities which may cause an odour problem?
- Do you know which air pollutant substances should be monitored?
- Can you locate all points from which atmospheric emissions and odours are emitted?
- Can you clearly identify the origin of these emissions, e.g. materials used during processing?
- What types and quantities of atmospheric emissions are generated by your activities? You should differentiate according to the source of emission.
- What effect do these emissions have on your employees' health and on the environment and residents in the immediate vicinity of the site?
- Are the quantities of atmospheric pollutants emitted regularly measured and recorded?
- Are solvents susceptible of emitting volatile organic compounds (V.O.C.) used in your products and/or in your manufacturing processes?
- Do you know about the different types of devices which can be used to detect air pollutants?
- Are the devices used to measure atmospheric emissions checked on a regular basis?
- Have procedures been developed regarding:
  - Monitoring and measurement of atmospheric emissions.
  - Recording the results of monitoring and measurements.
  - Use and checking of atmospheric measurement devices.

  If so, what are these procedures?
- Have you identified measures which would reduce and/or eliminate atmospheric emissions and/or odours?
  If so, were best practices and clean technologies considered when measures were identified?
- Have any of these measures already been implemented?
  If so, what are these measures and have the results of implementing these measures been recorded and evaluated to see how effective they are?

3.2 Treatment

- Do you have any on-site facilities for treating exhaust air before it is released into the atmosphere, e.g. dust filters?
  If so, what kind of facilities are used for which kind of emissions?
- Do you know about the different types of clean technologies available to treat or reduce air pollution?

3.3 Accidents

Refer to your Eco-map: risks

- Has an inventory been done of accidental atmospheric emissions in the past?
- What were the reasons for past accidents?
- What were the environmental and human impact of past accidents?

- What measures and/or procedures have been introduced to reduce or eliminate the risk of such accidents happening again?
- What would be the environmental impact of an accidental release of pollutant substances used in your operations into the air?
- What emergency procedures do you have in the event of accidental atmospheric pollution?

3.4 Costs

- Do you know the costs associated with reducing and/or eliminating atmospheric emissions, e.g. installation of filters?

Make a list of the costs which you already know about.

4. Noise & vibrations

Refer to your Eco-map: air, odours, noise and dust

4.1 Impact

- Has an inventory been done of the sources and levels of noise and vibrations under normal operating conditions?
- What are the different sources of noise and vibrations on the site of your activities?
- Have you had complaints about the noise of your activities from the local residents?
  If so, what have these complaints been about?
- Are noise and vibration levels monitored and recorded regularly at the source and limits of your site?
- Do you know about the different types of devices which can be used to measure noise levels and vibrations?
- Are the devices used by your organisation to measure noise levels and vibrations checked on a regular basis?
- Have measures to reduce and/or eliminate noise levels and vibrations been identified, e.g. sound-proofing of premises, stopping deliveries at night-time?
  If so, were best practices considered when measures were identified?
- Have any of these measures already been implemented?
  If so, what are these measures and have the results of implementing them been recorded and evaluated to see how effective they are?

4.2 Accidents

Refer to your Eco-map: risks

- Do you have any records of accidents which caused the level of noise or vibrations to become unacceptable for employees or local residents?
- What were the reasons for past accidents?
- What were the environmental and human impact of past accidents?
- What measures and/or procedures been introduced to ensure that such accidents do not happen again?
- What emergency procedures do you have if noise or vibrations reach unacceptable levels?

4.3 Costs

- Do you know the costs associated with reducing noise and vibration levels, e.g. installation of sound-proof walls?

Make a list of the costs which you already know about.

5. Energy

Refer to your Eco-map: energy

5.1 Consumption

- Do you have past records of the amount of energy consumed by your activities?
- Can you identify the points on your site at which energy is consumed?
- How much energy is consumed by your operations (kWh per year)?
- What types and quantities of energy are used by your organisation? Differentiate between sources, e.g. fuel (m^3 per year), gas (kWh per year), renewable and non-renewable energy, and external supply and own production.
- How much energy is consumed per unit of production and per employee?
- What is the level of energy consumption for each source as a % of overall energy consumption, e.g. 75% natural gas, 25% electricity?
- Can you clearly show your energy consumption according to usage, e.g. amount used for processing, heating, etc. and the % this represents of overall energy consumption?
- Is the level of energy consumption measured and recorded on a regular basis?
- Do you operate heat recovery facilities, e.g. heat recovery from an incineration unit?
  If so:
  - How much heat is recovered?
  - What % of total consumption does this represent?
  - What is the recovered heat used for?
- Have measures been identified to reduce energy consumption?
  If so, were best practices and clean technologies considered when these measures were identified?
- Have any of these measures been implemented?
  If so, what are these measures and have the results of im-

plementing them been recorded and evaluated to see how effective they are?

5.2 Impact

- What atmospheric emissions are generated by your energy consumption, e.g. CO_2?
- Are these emissions measured and recorded on a regular basis?
- Do you know about the different types of devices which can be used to measure emissions generated by your energy consumption?
- Are the devices used by your organisation to measure emissions generated by energy consumption checked on a regular basis?

5.3 Accidents

Refer to your Eco-map: risks

- Do you have a record of any accidents related to your energy facilities, e.g. broken thermostat leading to overheating and explosion of boiler?
- What were the reasons for past accidents?
- What were the environmental and human impacts of past accidents?
- What measures and/or procedures have been introduced to ensure that such accidents do not happen again?
- What emergency procedures do you have in the case of accidents relating to your energy facilities?

5.4 Costs & savings

- How much does your organisation pay per year for its energy consumption?
- Can you trace the changes in energy bills over time, and the reasons for changes?
- Do you know the costs associated with reducing energy consumption, e.g. installing a new heating system?
- Have you identified any potential or realised cost-savings from energy efficiency?

Make a list of the costs and savings which you already know about.

6. Waste

Refer to your Eco-map: waste

6.1 Waste generation

- Do you have past records of the amounts and types of waste generated by your operations?
- What types of waste are currently generated by your activities?
- Is the volume of waste generated measured and recorded regularly?
- How much solid waste is generated by your organisation, (tonnes per year)? You should differentiate according to the types of waste.
- Can any of the wastes generated by your activities be defined as hazardous?
  If so, which ones and why?
- How much hazardous waste is generated by your organisation, (tonnes per year)? You should differentiate according to the types of waste.
- What are the sources of the hazardous waste which you generate?
- Do you recycle or reuse any of your wastes internally?
  If so:
  - What quantities and types of waste are reused?
  - What % of overall waste does this represent?
  - What are the waste materials reused for?
- Have you identified measures for reducing, eliminating waste and/or recycling wastes?
  If so, were best practices and clean technologies considered when these measures were identified?
- Have any of these measures been implemented?
  If so, what are these measures and have the results of implementing them been recorded and evaluated to see how effective they are?

6.2 Handling & storage

- How are the different wastes generated by your operations collected and stored?
- Can you clearly identify all points on your site where wastes are collected and stored?
- Are the contents of the storage containers clearly labelled?
- Are storage facilities inspected regularly, to ensure they are intact and correctly labelled?
- What procedures been introduced for collection and storage of the different wastes?
- What procedures and instructions have been introduced for handling hazardous wastes?
- Are there special storage conditions for hazardous waste, before it is disposed of?

6.3 Treatment

- Do you have any internal treatment or pre-treatment facilities for your waste materials?
  If so, what processes are used?
- Do you know about the different methods for treating the types of waste generated by your organisation?

- Are any materials recovered during treatment or pre-treatment?
  If so:
  - Which materials are recovered and in what quantities?
  - What are these materials used for?
- Have procedures been introduced regarding treatment of different types of waste?
  If so, what are these procedures?
- Do you have contracts with external waste treatment companies?
  If so, do these companies have to meet specific environmental requirements?

6.4 Disposal

- How are the different types of waste sorted before being disposed of or treated?
- Do you know the appropriate disposal channel for each type of waste?
- Where does your waste end up once it has left the site of your operations?
- Are any of your waste materials recycled or reused externally?
- Do you return any waste directly to the supplier?
  If so, do you know if the supplier recycles or reuses this waste?
- Have procedures been introduced regarding disposal of different kinds of waste?
  If so, what are these procedures?
- Are records kept of hazardous waste disposal, e.g. consignment tracking numbers?
- Are hazardous wastes correctly sealed and labelled for transport purposes?

6.5 Accidents

Refer to your Eco-map: risks

- Do you have records of past accidents during waste handling, storage, treatment or disposal?
- What were the reasons for past accidents?
- What were the environmental and human impact of past accidents?
- What measures and/or procedures have been introduced to ensure that such accidents do not happen again?
- What emergency procedures do you have in the event of accidents during waste handling, storage, treatment or disposal?

6.6 Costs & savings

- Do you know all the costs associated with:
  - Waste disposal, e.g. collection fees.
  - Internal waste treatment or pre-treatment, e.g. investment in treatment facilities.
  - External waste treatment, e.g. fees paid to waste treatment companies.
- Have you identified any potential or realised cost-savings from reducing, eliminating, reusing and/or recycling of waste, e.g. reduction of waste disposal fees?

Make a list of the costs and savings which you already know about.

Materials

1. Raw & operating materials

- Do you have past inventories of the quantities and types of raw and operating materials used by your organisation?
- What quantities and types of raw and operating materials do you currently use?
- Do you keep a record of the cost and origin of these materials?
- What are the raw and operating materials which you use made up of?
- Do you have a coding or classification system for the different types of materials?
- If you use materials which contain hazardous substances are they clearly labelled?
- Do you have a register of hazardous materials bought, stored, processed and transported by your organisation?
- What are the environmental impacts of producing your raw and operating materials, e.g. use of pesticides while crops are grown?
- Do you have guidelines for purchasing raw and auxiliary materials?
  If so, what environmental criteria do they include, e.g. buy biodegradable cleaning products?
- Do suppliers of your materials have to meet specific environmental requirements?
  If so, what are these requirements?
- Can you follow the path of hazardous materials used by your organisation, from the time when they are purchased to when they are discharged from your organisation as waste?
- Are storage areas for raw and operating materials clearly labelled and equipped depending on the types of materials stored e.g. with fire protection devices?
- Is access to storage areas of hazardous materials regulated?
- Have you identified measures for reducing and/or eliminating the amount of materials used?
  If so, what are these measures?

- Have you already implemented any of these measures? If so, what are these measures, and have the results of implementing them been recorded and evaluated to see how effective they are?

2. Semi-finished goods & office supplies

- Do you record the type, quantity, cost and source of semi-finished goods and office supplies purchased by your organisation?
- Do you have any guidelines purchasing for such goods? If so, what environmental criteria do they include e.g. always buy recycled paper?
- Do suppliers of these goods have to meet any environmental requirements? If so, what are these requirements?

3. Packaging materials

- What quantities and types of packaging are used during delivery and storage of raw and operating materials, semi-finished goods and office supplies?
- Do any of these materials contain any toxic or hazardous substances?
- Do you apply environmental criteria when deciding which packaging materials to use? If so, what are these criteria?
- Have you identified any measures for reducing and/or eliminating the amount of packaging used for delivery and storage of materials, semi-finished goods and office supplies?
- Have any of these measures already been implemented? If so, what are these measures and have the results of implementing them been recorded and evaluated to see how effective they are?

4. Costs & savings

- Do you know the costs associated with reducing, and/or eliminating usage of materials, semi-finished goods and office supplies?
- Have you identified any potential or realised cost-savings from measures to reduce, eliminate and/or substitute the materials, semi-finished goods and office supplies which you use?

Make a list of the costs and savings which you already know about.

Products

1. Design

- Were any environmental criteria applied during the design of your existing products? If so, what are these criteria?
- Are environmental criteria applied when new products are designed, e.g. that products should be reusable, recyclable, easily disassembled? If so, what are these criteria?

2. Packaging

- Has an inventory been done of the quantities and types of packaging used during storage, packaging and transport of your finished products?
- What quantities and types of packaging are currently used for your finished products?
- Do the packaging materials which you use contain any toxic or hazardous substances?
- Do you apply any environmental criteria when choosing packaging materials? If so, what are these criteria?
- What % of the packaging used for your products is reusable or recyclable?
- Can purchasers of your products return the packaging to your organisation?

3. Usage

- Do you know the environmental impacts of your products when the final product is being used?
- Do you provide customers with information on minimising environmental impact during usage?

4. Disposal

- Where are your products and their packaging disposed of once they have been used?
- Do you provide users of your products with instructions for disposal?
- Can users of your products return them to you at the end of their product life?
- Does your organisation have the capacity to recycle or reuse all or parts of returned products or their packaging? If so, which parts are reused and for what purposes?

5. Costs & savings

- Do you know the costs associated with:
  - Designing products in order to reduce their environmental impact.
  - Reducing, eliminating and/or substituting materials used during manufacture.

  - Reducing, eliminating and/or substituting materials used to package your products.
  - Collecting, recycling and/or reusing your products at the end of their life.
- Have you identified potential and/or realised cost-savings from:
  - Designing products in order to reduce their environmental impact.
  - Reducing, eliminating and/or substituting materials used during manufacture.
  - Reducing, eliminating and/or substituting materials used to package your products.
  - Collecting, recycling and/or reusing your products at the end of their life.

Make a list of the costs and savings which you already know about.

Logistics

1. Impact

- What different types of transport are used by your organisation, and for what purposes, e.g. heavy vehicles for delivery of raw materials, rail for distribution of finished goods?
- Do you know the fuel efficiency and emission levels of the vehicles used by your organisation?
- If you use external delivery or distribution companies, do you consider the environmental impact of their services?
- Have you identified measures for reducing the environmental impact of transporting your goods, e.g. using other types of transport, conversion to low-emission vehicles?
- Have any of these measures been implemented?
  If so, what are these measures and have the results of implementing them been recorded and evaluated to see how effective they are?

2. Costs & savings

- Do you know the costs associated with reducing or eliminating the environmental impacts of your logistics, e.g. cost of purchasing more fuel-efficient delivery trucks?
- Have you identified potential and/or realised cost-savings from measures to reduce or eliminate the environmental impact of your logistics?

Make a list of the costs and savings which you already know about.

Existing EMS elements

1. Information & communication

- Do you have a written environmental policy (at least a draft version)?
  If so, is/will this policy be available to all employees and the general public?
- Have you developed specific environmental objectives or targets?
  If so, are they written down?
- Do you have a system for keeping track of the environmental impacts of your activities?
- Do you know about the environmental legislation relevant to your activities?
  If so, do you have a system for gathering information on and keeping up-to-date with environmental legislation?
  Describe briefly how this works and who is responsible.
- Do you have any written procedures relating to environmental issues?
- Have there been any complaints about the environmental impact of your operations from external groups, e.g. local residents, environmental organisations?
  If so, what have these complaints been about and who made them?
- Have you received protests or complaints regarding your products from external groups?
  If so, what have these complaints been about and who made them?
- Have you published any reports on your environmental activities and performance?
- Do you have a system for dealing with external requests for information on and/or complaints about your environmental performance?
- Do you inform local residents and authorities about your environmental accidents?

2. Internal organisation

- Has responsibility been allocated for co-ordinating environmental management at your site?
  If so, who is responsible?
- Does the person/s responsible have:
  - The appropriate level of qualification and training.
  - The authority to make decisions in their area of responsibility.
- Has responsibility for implementing environmental measures been allocated to employees?
- Do employees with environmental responsibilities have:
  - The appropriate knowledge and training.
  - The authority to carry out their environmental tasks?

- Do you have an organigram which shows who has what responsibility for environmental issues?
- Have job descriptions been developed for employees with environmental responsibilities which define these responsibilities and the related tasks?
- Have you introduced any training programmes on environmental issues?
  If so, who is the training for and what topics does it cover?
- Can employees provide input on environmental initiatives, e.g. suggestion schemes?
- How do you inform all employees about your environmental initiatives?

This questionnaire is based on the approach developed by the French environmental management association Orée (INEM France) in the *Guide d'Auto-diagnostic pour la Mise en place d'une Stratégie Environnement* © 1996.

Tool 8

Measuring the Environmental Impacts of an Organisation

Source: Sturm, A. with Upasena, S. 1998, p. 38 (modified).

Topic / Perspective	Environmental Problem Area				
	Resource Depletion		Environmental Impact		
	Energy	Water	Global Warming	Toxic Waste	...
Pre-production processes					
In-house production processes					
Consumption of our products					
Disposal processes					
Total					
Ranking by Importance					

Scoring: 4=high; 3=middle; 2=low; 1=very low; 0=none

Tool 9	**Aspect/Impact Evaluation** Source: NSF International, 2001, p.102.	

Aspect/Impact/Activity:						**Date:**	
		Frequency		**Severity**			
Category	Stages	Use	Incident	Human Impact	Animal/ Plant	Public	Impact Rating
Air Quality	Raw Material Storage						
Water Quality	Production (Start-Up)						
Land Quality	Production (Normal)						
Consumption	Product/ Waste Storage						
	Transportation						
	Ultimate Disposal						
						Overall Rating	

Please note

Significant Impact if:
- permittable
- required by law
- over the establish cut off

	Severity			
Frequency	**Human Impact**	**Animal/ Plant Effect**	**Public Relations**	**Scale**
continuously	multiple deaths	widespread perm. destruction	plant closure	10
1 per shift	single death	on-site permanent destruction	permanent public disfavor	9
1 per day	disabling injury	widespread genetic impact	interrupted operations	8
weekly	long term health effects	on-site genetic impact	loss of historical assets	7
monthly	lost time injury/ illness	widespread disfigurement	state or national protest	6
quarterly	restricted duty	on-site disfigurement	city or county protest	5
semi-annually	medical only	widespread appearance	employee protest	4
1 every 1 - 5 yrs	discomfort	on-site appearance	public disfavor	2
never *(Use Only)*				0

Tool 10	**Inputs: Coverage and Purpose** Source: Starkey, R. and Andersson, I. 1998,. p.99.	

Input	Coverage	Purpose
Land area bought or otherwise acquired by organisation.	Sealed land such as car parks; green land, including grassed areas and natural habitats; and, built-over areas, which is further subdivided in the next section.	To determine the quantity and quality of land used by the organisation.
Usable buildings bought or otherwise acquired by the organisation.	Production, including for example hotel rooms and other activities of the service industry, distribution and storage, administration and others.	To determine the types of uses of buildings to understand the nature of environmental risk.
Major pieces of plant and equipment bought or otherwise acquired by the organisation.	Production machines; office and communication machines such as photocopiers and computers; vehicles; and, industrial facilities such as technical equipment.	To determine the amount and type of resources used by the organisation.
Product and/or service related goods.	Includes materials that directly go into the product or service and is split into raw materials; semi-finished and finished good; auxiliary goods and ancillary goods.	To determine the amount and type of resources used by the organisation.
The consumption of energy.	Including gas, electricity, oil and other fuels.	To determine the amount and type of natural resources used by the organisation.

Tool 11	**Stock: Coverage and Purpose** Source: Starkey, R. and Andersson, I. 1998, p. 99 (modified).	

Stock	Coverage	Purpose
Land which is owned, leased or otherwise occupied by organisation.	Sealed land such as car parks; green land, including grassed areas and natural habitats; and, built-over areas, which is further subdivided in the next section.	To determine the quantity and quality of land used by the organisation.
Usable buildings which are owned, leased or otherwise occupied.	Production, including for example hotel rooms and other activities of the service industry, distribution and storage, administration and others.	To determine the types of uses of buildings to understand the nature of environmental risk.
Major pieces of plant and equipment owned, leased or otherwise used by the organisation.	Production machines; office and communication machines such as photocopiers and computers; vehicles, including type, number, distances driven, fuel consumption and oil consumption; and, industrial facilities such as technical equipment.	To determine the amount and type of resources used by the organisation.

Tool 12	**Outputs: Coverage and Purpose** Source: Starkey, R. and Andersson, I. 1998, p. 101.	

Outputs	Coverage	Purpose
Land area sold or otherwise divested by organisation.	Sealed land such as car parks; green land, including grassed areas and natural habitats; and, built-over areas, which is further subdivided in the next section.	To determine the quantity and quality of land used by the organisation.
Usable buildings sold or otherwise divested.	Production, including for example hotel rooms and other activities of the service industry, distribution and storage, administration and others.	To determine the types of uses of buildings to understand the nature of environmental risk.
Major pieces of plant and equipment sold or divested by the organisation.	Production machines; office and communication machines such as photocopiers and computers; vehicles; and, industrial facilities such as technical equipment.	To determine the amount and type of resources used by the organisation.
Products or services the organisation produces	Includes by-products, i.e. goods or services that are not categorised as waste; and packaging including product and transporting	To determine the efficiency of production from inputted materials and products to output products
Waste the organisation generates and the destination of the waste	i.e. treatment, landfill, incineration and others in the categories: hazardous waste; waste which is recycled, internal and external; and residual waste.	To determine the type, quantity and final destination of waste to land
Energy emissions	In form of heat and others which have not entered the product; and noise generated by activities of the organisation.	To determine the level of disturbance through noise and conversion of fuel to energy.
Waste water including the categories	Quantity; destination i.e. river, sewerage system, landfill, and others; and concentration of pollutants contained in the waste water.	Use, quality and destination of water disposal
Air emissions from the organisation	Quantity of emissions; and, the concentrations of pollutants in the air emissions	Conversion of fuel into energy and emissions direct to the atmosphere

Tool 13	**Checklist: Eco-Balances** Source: Starkey, R. and Andersson, I. 1998, pp. 105.	

Description	Total Annual INPUTS	Total Annual STOCK	Total Annual OUTPUT
1. Total Land (m^2)			
1.1. Total Sealed Land			
1.1.1. Roads			
1.1.2. Car Parks			
1.1.3. Built-over			
1.1.4. Others			
1.2. Total Green and Water Areas			
1.2.1. Gardens			
1.2.2. Fields			
1.2.3. Woodland habitats			
1.2.4. Water habitats			
1.2.5. Water ways			
1.2.6. Others			
1.3. Total Buildings (usable surface)			
1.3.1. Production			
1.3.2. Distribution & storage			
1.3.3. Administration			
1.3.4. Other			
1.4. Total Contaminated land			
1.4.1. Chemical works			
1.4.2. Metal processing industries			
1.4.3. Industries making or using wood preservatives			
1.4.4. Munitions production and existing sites			
1.4.5. Nuclear installation			
1.4.6. Paper and printing works			
1.4.7. Railway land			
1.4.8. Tanneries			
1.4.9. Waste disposal sites			
1.4.10. Others			
1.5. Total Other			
1.5.1. Quarries			
1.5.2. Landfills			
1.5.3. Others			

Description	Total Annual INPUTS	Total Annual STOCK	Total Annual OUTPUT
2. Total Plant &Equipment (pieces/value)			
2.1. Total Production Machines			
2.1.1. Itemised List of Production Machines			
2.2. Total Office & Communication Machines & Equipment			
2.2.1. Itemised List of Office & Communication Machines & Equipment			
2.3. Total Vehicles owned by the organisation			
2.3.1. Site vehicles (forklifts etc)			
2.3.2. Motorcycles			
2.3.3. Cars			
2.3.4. Vans & Minibuses			
2.3.5. Heavy Goods Vehicles			
2.3.6. Trains			
2.3.7. Ships			
2.3.8. Aeroplanes			
2.3.9. Others			
	Total Annual Distance	**Total Annual Fuel Consumption**	**Total Annual Oil Consumption**
2.4. Total Vehicles owned & used for organisation business			
2.4.1. Site vehicles (forklifts etc)			
2.4.2. Motorcycles			
2.4.3. Cars			
2.4.4. Vans & Minibuses			
2.4.5. Heavy Goods Vehicles			
2.4.6. Trains			
2.4.7. Ships			
2.4.8. Aeroplanes			
2.4.9. Others			
	Total Annual INPUTS	**Total Annual STOCK**	**Total Annual OUTPUT**
2.5. Total Specialist Equipment			
2.5.1. Itemised List of Specialist Equipment			

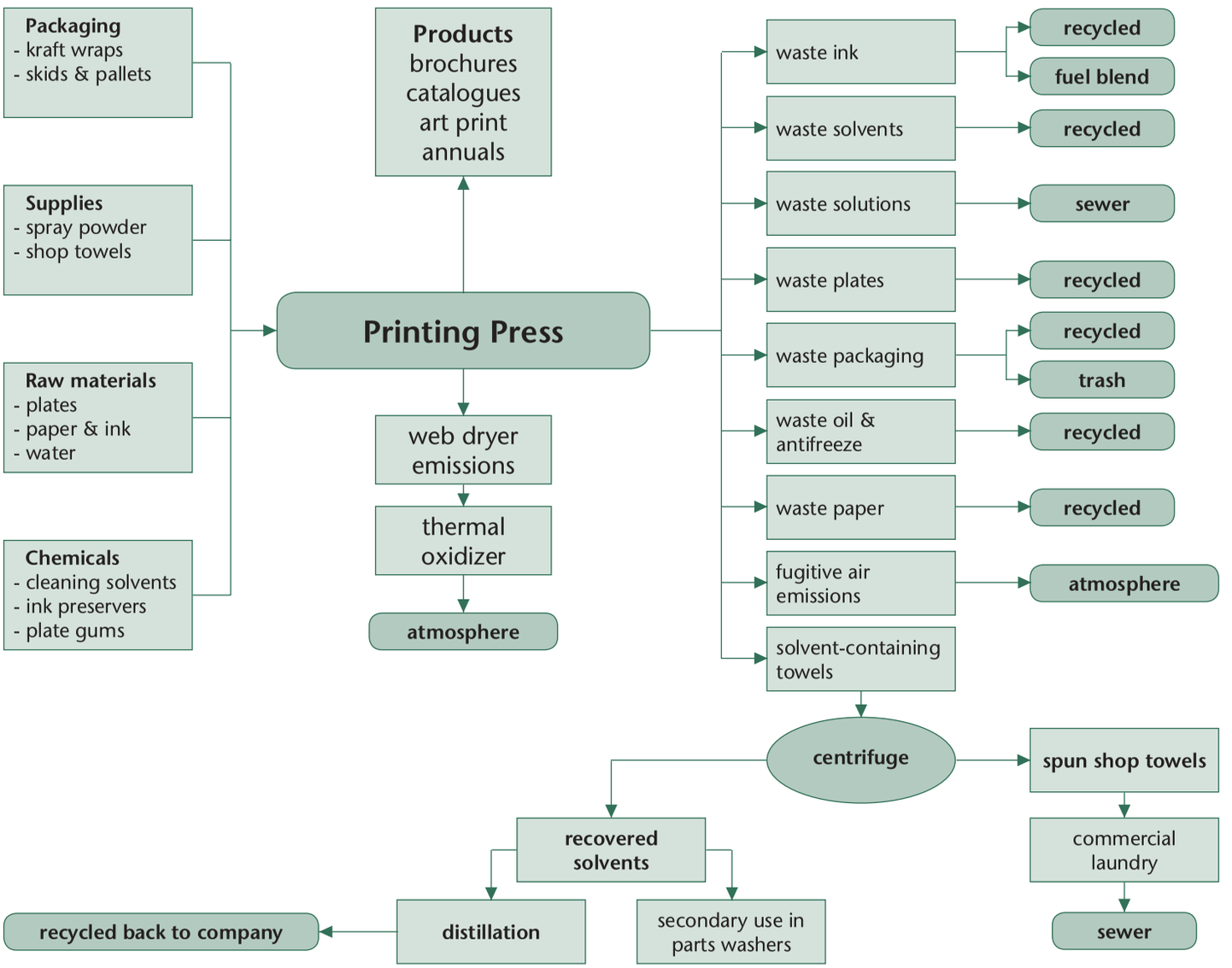
Description	Total Annual INPUTS	Total Annual STOCK	Total Annual OUTPUT
3. Total Product Related Goods (kg or money value or approx. % of total or specify other)			
3.1. Total Raw Materials			
3.1.1. Itemised List of Raw Materials			
3.2. Total Semi- and Finished Goods (Bought into the organisation)			
3.2.1 Itemised List of Semi- and Finished Goods			
3.3. Total Auxiliary Goods			
3.3.1. Itemised List of Auxiliary Goods			
3.4. Total Ancillary Goods (Consumables)			
3.4.1 Itemised List of Ancillary Goods (Consumables)			
3.5. Total Products (Marketed)			
3.5.1. Itemised List of Products (Marketed)			
3.6. Total By-products			
3.6.1. Itemised List of By-products			
3.7. Total Waste			
3.7.1 Total Hazardous Waste			
3.7.1.1. Solids			
3.7.1.2. Liquids			
3.7.1.3. Waste: Surface Treatment Metals			
3.7.1.4. Waste: Biocide Products			
3.7.1.5. Waste Oil			
3.7.1.6. Waste with PCBs			
3.7.1.7. Clinical and Pharmaceutical Waste			
3.7.1.8. Waste from Photographic Processes			
3.7.1.9. Organic Solvents			
3.7.1.10. Paints and Pigments			

Description	Total Annual INPUTS	Total Annual STOCK	Total Annual OUTPUT
3.7.1.11. Resins			
3.7.1.12. Batteries			
3.7.1.13. Electronic Scrap Metal			
3.7.1.14. Hazardous Waste - Others			
3.7.2. Hazardous Waste Disposal:			
3.7.2.1. Hazardous Waste - Treated			
3.7.2.2. Hazardous Waste - Recovered			
3.7.2.3. Hazardous Waste - Incinerated			
3.7.2.4. Hazardous Waste - Landfilled			
3.7.2.5. Hazardous Waste - Other Disposal			
3.7.3. Total Residual Waste			
3.7.3.1. Paper/Paper Board/Paper Products			
3.7.3.2. Plastics			
3.7.3.3. Glass			
3.7.3.4. Metals			
3.7.3.5. Others			
3.7.4. Residual Waste Disposal			
3.7.4.1. Non-hazardous Waste - Mechanically Sorted			
3.7.4.2. Non-hazardous Waste - Composted			
3.7.4.3. Non-hazardous Waste - Incinerated			
3.7.4.4. Non-hazardous Waste - Landfilled			
3.7.4.5. Non-hazardous Waste - Other Disposal			
3.7.5. Total Recycled			
3.7.5.1. Paper			
3.7.5.2. Plastics			
3.7.5.3. Glass			
3.7.5.4. Metal			
3.7.5.5. Hazardous			
3.7.5.6. Composted			
3.7.5.7. Others			
4. Total Energy (kWh or specify other)			
4.1. Gas			
4.2. Electricity			
4.3. Oil			
4.4. Fuel			
4.5. Combined Heat and Power			
4.6. Others			

Description	Total Annual INPUTS	Total Annual STOCK	Total Annual OUTPUT
4.7. Noise and Vibration (Description of Measurements and Reports):			
5. Total Water (m^3)			
5.1. Potable (Drinking Quality)			
5.2. Rain (Collected)			
5.3. Raw (Rivers, Lakes & Bore Holes)			
5.4. Waste Water			
5.5. Biological Oxygen Demand (BOD)			
5.6. Chemical Oxygen Demand (COD)			
5.7. Suspended Solids			
5.8. Cadmium (Cd)			
5.9. Mercury (Hg)			
5.10. Other Heavy Metals			
5.11. pH Range			
5.12. Temperature Range			
6. Total Air Emissions (m3 or kg or specify others)			
6.1. Ammonia (NH_3)			
6.2. Carbon Monoxide (CO)			
6.3. Carbon Dioxide (CO_2)			
6.4. Nitrogen Oxide (NO)			
6.5. Nitrogen Dioxide (NO_2)			
6.6. Sulfur Dioxide (SO_2)			
6.7. Chlorofluorocarbons (CFCs)			
6.8. Halons			
6.9. Dust			
6.10. Volatile Organic Compounds (VOCs)			
6.11. Others			
6.12. Odours (Description of Measurements and Reports):			

Tool 14 Sample Process Map

Source:NSF International 2001, p. 173 (modified).



Tool 15	**Environmental Legal Compliance Checklist** Source: INEM 1998, pp 83.	

Main types of questions:

- Is the law relevant to the activity, product, process, material in question?
- If so, have the requirements of the law been met?
- If not, are you in the process of doing so?
- Are there obligations to report to competent authorities and other parties?
- Has the competent authority approved a transitional period for compliance?

Main areas to be covered:

1. Construction or modification of plants, sites and facilities

Planning permission

- Construction of existing plants.
- Modification to existing plants.
- Construction of new plants.

Environmental Impact Assessment

- Construction of existing plants.
- Modification to existing plants.
- Construction of new plants.

Site history

- Existence of on-site waste deposits since the site was first established.
- Contamination of soil since the site was first established.
- Liability for past contamination.

2. Operation of plants, sites, facilities

Operation permits

- Operations on Sunday or during the night-time.
- Approvals for shift work.
- Permits for special operations e.g. mining, incineration.

Incidents

- Obligations to report on incidents to competent authorities.
- Reporting on the occurrence of incidents to competent authorities in the past.
- Safety measures required e.g. clearly marking toxic substances storage areas.
- Corrective measures.

Air

- Emissions:
  - Limits on maximum emissions allowed.
  - Compliance with these emission limits.
  - Emissions from sources of energy consumption or generation.
  - Other facilities which cause atmospheric emissions.
- Measurement of atmospheric discharges.
- Treatment installations for atmospheric discharges/waste air.
- Obligations to report to competent authorities.
- Treatment requirements in case of non-respect of limits.
- Obligations to inform relevant authorities about breaching of limits.
- Calibration, maintenance of measurement devices.
- Obligation to inform competent authorities about use of specific substances, e.g. Swiss regulation specification of air quality toxic substances:

• solvents • cleaning fluids • dyes, varnishes • thinner • anti-rust agents • adhesives, adhesive substances • propellants	• coating materials • impregnation materials • pickling materials • disinfecting fluids • radioactive materials • separating agents • bonding agents	• monomers (styrene), (vinyl, benzene, ethylene, benzole) • extracting agents • electrodes • fumigants • acids • alkalines

Odours

- Restrictions on processes/materials used which cause or could cause unpleasant odours.
- Complaints from local residents or other companies about the smell, to the organisation or to the authorities.

Wastewater

- Application of special conditions for sites located in or near areas of protected land, e.g. in a national park.
- Permits for discharge of untreated effluent into water systems.
- Conditions for drainage system.
- Permits for discharge of water directly into water areas-rivers, lakes, seas.

- Respect of wastewater discharge limits.
- Permits for the abstraction of water:
  - Facilities for treating or storing liquid effluents containing water pollutants.
  - Safety measures.
  - Maintenance of facilities for treating or storing wastewater.
  - Procedures under normal/abnormal operating conditions/when facilities are not in use.
  - Obligations to inform relevant authorities in case of leakage.
  - Internal procedures in case of leakage.
  - Requirements regarding old facilities, installed before introduction of specific legislation.
- Discharge of liquid effluents into public water channels.
- Measurement and control of wastewater.
- Information about incidents, malfunctions of wastewater treatment systems, during and outside operating hours.
- Storage facilities and drainage systems.
- Incidents which could lead to water pollution e.g. power failure.

Noise

- Limits on noise levels:
  - Noise caused by traffic to and from the plant.
  - Noise caused by maintenance work.
  - Operating hours: day, night.
- Permits.
- Review/measurement of noise levels on-site.
- Review/measurement of noise levels off-site.
- Safety or corrective measures in the case of non-respect of noise limits.
- Obligation to inform competent authorities.

Soil

- Special conditions for sites located in or near areas of protected land.
- Analyses of soil contamination.
- Site history: past contamination.
- Limits of soil contamination levels.
- Levels of pollutants in the soil e.g. heavy metals, volatile organic compounds.
- Obligation to inform authorities about contamination.
- Registering of contaminated areas.
- Remediation orders and deadline.
- Sealing of land.
- Land usage, e.g. production, storage, parking, green areas, other.
- Conditions for drainage system.

3. Dealing with waste

- Classifications of the different kinds of waste.
- Solid waste (household waste):
  - Permits for internal waste facilities.
  - Quotas.
  - Requirements for separation and collection of waste.
  - Requirements for external waste disposal.
- Hazardous waste:
  - Quotas.
  - Permits for internal waste facilities.
  - Separation and collection of waste.
  - External waste disposal.
  - Internal waste treatment facilities.
  - External waste disposal.
  - Transport.
  - Obligation to inform competent authorities.

4. Dealing with materials

- Use, production, emission, import or export of substances classified by law e.g. Swiss regulation on environmentally harmful substances:

• halogens, organic compounds • quicksilver • asbestos • materials which contribute to the destruction of the ozone layer • textile washing agents/ detergents • cleaning agents • plant treatment agents • wood protection agents • fertiliser	• melting material • fuel additives • condensers and transformers • compressed gas • batteries • cadmium containing synthetics • anti-corrosives • anti-fouling agents (underwater paints) • ozone layer degrading solvents • cooling agents • extinguishing materials • lead containing bottles

- Quotas.
- Handling requirements.
- Storage facilities.
- Safety procedures.
- Dealing with incidents.
- Obligations to report to competent authorities.

Tool 16	**Checklist: Regulatory Compliance Sample** Source: North Carolina Division of Polution Prevention and Environmental Assistance (PPP) June 2000.	

Environmental Management Programmes				
Significant Aspects: All aspects determined significant based on legal requirements			**Champion:**	EMR
Department/Area(s): All applicable			**Process/Activity:**	All applicable
Objective: Maintain regulatory compliance			**Target:**	Ongoing
Programme Plan: Regulatory Compliance Programme			**Date:**	September 21, 1999
Task	**Responsible Party**	**Schedule**	**Performance Monitoring**	**Key Characteristics/ Operational Controls/ Comments**
Identify applicable legal & other requirements	Env. Coordinator	Oct. 99 & anually thereafter	List of legal & other requirements	Prepare list as specified in EP-007
Communicate legal & other requirements changes to applicable area or dept. managers	Env. Coordinator	Ongoing	Communication record	Prepare memoranda or emial summarizing changes and provide to area or dept. Manager per EP-007 & EP-010
Communicate legal & other requirements changes to applicable staff	Affected area or dept. Managers	Ongoing	Communication record or meeting minutes	Report changes as specified in EP-010
Conduct internal compliance audits	EMR & Compliance audit team	As specified in audit schedule	Audit schedule, checklists, CARs & audit summary report	EMR reports non-compliances to Management Team
Prepare and maintain list of monitoring and reporting requirements and schedules. Conduct monitoring and submit required reports as specified by legal & other requirements.	Env. Coordinator	Ongoing	List of requirements & schedules, reports	List of monitoring and reporting requirements & schedules revised as needed. Reports to agencies reviewed & approved by EMR prior to submittal

Tool 17	**Ways of Ensuring Legal Compliance** Source: North Carolina Division of Polution Prevention and Environmental Assistance (PPP) June 2000.	

ASPECT	REQUIREMENT	CITATION/SOURCE
Material Usage	**GENERAL ENVIRONMENTAL REQUIREMENTS**	
	Hazardous Substances and Reportable Quantities (CERCLA)	40 CFR Part 302
	Hazardous Chemical Reporting: Community Right To Know (SARA Title III)	40 CFR Part 370
	Toxic Chemical Release Reporting: Communitiy Right To Know (SARE Title III)	40 CFR Part 372
Air Emissions	**AIR QUALITY REQUIREMENTS**	
	Air Quality (CAA)	40 CFR Parts 50-61
	CFC Containing Equipment	40 CFR Part 82
	State Air Permit #8580	State Act 336 Part 2
Stormwater Discharges	**WATER QUALITY REQUIREMENTS**	
	Discharge of Oil	40 CFR Part 110
	Spill, Pollution Control and Countermeasures (CWA)	40 CFR Part 112
	Water Discharge Permits	40 CFR Part 122
	Test Procedures for Analysis of Pollutants	40 CFR Part 136
	Spillage of Oil and Polluting Material	State Act 245 Part 5
	State Stormwater Permit #8585	State Act 246 Part 2
	City Water & Sewage Permit #123	City Ordinance 65
Wastewater Discharges	**WASTEWATER REQUIREMENTS**	
	State NPDES Wastewater Permit #8587	State Act 225 Part 6

Tool 18	**Checklist: Environmental Legal Compliance** Source: INEM 1998, p. 75.	

Question	Environmental Legal Compliance			
	Fulfilled	Not relevant	Still open	Not ful-filled
1a) Has an Environmental Impact Assessment (EIA) been conducted for building of a new facility?				
2a) Are the limits on atmospheric emissions respected?				
2b) Has the breach of the atmospheric emissions limits been reported to the competent authority?				
2c) In the case of breach of the atmospheric emissions limits has appropriate remediation been undertaken?				

CANON EUROPE
ENVIRONMENTAL POLICY

The Fundamental Principles of Environmental Assurance. We aim to achieve sustainable development and harmony between ecology and corporate activity, to contribute to worldwide prosperity.

At Canon we believe that in order to work towards a harmonious accord between people, technology and nature, all corporate activity must take the environment into consideration, and that a company incapable of environmental assurance does not deserve to continue operations.

Canon believes it can make a useful contribution to society by becoming a leading ”eco-tech” corporation. We strive to achieve harmony with ecology and the environment, the two fundamental components of Canon’s ”E” concerns.

Purpose of Environmental Assurance

The purpose of the programme is to achieve technological innovation with ecology as a top priority. We do this by developing products and manufacturing processes with minimised environmental impact to assist preservation, and through corporate activity contributing to conservation on a global scale.

Canon’s success and growth has been through our own technological innovations. We consider the environment from the initial stages of product development, and make ecologically sound goods in factories which harmonise corporate activity with nature.

Basic Guidelines

In all our corporate activities we will be aware of the global environment and actively and creatively promote conservation strategies. Ecology is at the forefront of Canons corporate policy of ”EQCD” which stands for ecology, quality, cost and delivery

SWINDON AND MARBOROUGH NHS TRUST
ENVIRONMENTAL POLICY

1. Summary

The Trust

Swindon & Marlborough NHS Trust provides services primarily from Princess Margaret Hospital in Swindon and Savernake Hospital in Marlborough. The Trusts main site of operations at Princess Margaret Hospital is due to relocate to The Great Western Hospital during November and December 2002.The Trust provides secondary level healthcare services to people throughout the Wiltshire area and adjoining counties.

The Policy

Like any large organisation the Trust recognises that in delivering healthcare services its sites may have adverse impacts on the environment and these may be greater than is avoidable. Furthermore the nature of and means by which healthcare services are delivered may have an impact on the sustainability of the organisation. This policy statement provides a 'statement of intent' committing the Trust to develop its environmental performance via an integrated approach based on the principle of continuous improvement.

Organisational Structure and Accountability

In order to address this issue the Trust will develop management systems and programmes that are integral to healthcare provision. The commitment of the Trust is demonstrated by the designation of a Director as having responsibility for environmental issues, whereas overall accountability for the Trusts environmental performance and liability rests with the Chief Executive. Commitment to improving environmental performance is further demonstrated by the appointment of the Environmental Project Co-ordinator with responsibility for delivering improved performance in this area in balance with the operational requirements of the Trust.

2. Background

There are many expectations on the part of stakeholders in the Trust relating to its environmental performance. The following offers a summary of these drivers.

Government and Department of Health

The NHS Plan, Environmental Quality and Illness

The impacts of various activities related to the hospital, both immediate and long-term, can have implications for human health. An example of the former would be the contribution of hospital-related car traffic increasing episodes of respiratory illness putting added pressure on the local health community ('transport'). An example of the latter would be the release of toxins from disposal of waste generated by the hospital leading to illness in future generations ('waste').

In a more contemporary sense point nine of the NHS Plan states the following: *"The NHS will help keep people healthy and work to reduce health inequalities.*"

Since healthcare delivery can have adverse impacts on the environment and hence human health then addressing the Trusts performance in this area and improving that performance is one of many ways to respond to this goal.

Sustainable Development and Sustainability in the NHS

Besides potential negative impacts on health the way that resources are used in delivering healthcare may have a future impact on the Trusts ability to continue to deliver healthcare in the future. An example could be the purchase of timber from non-renewable sources leading to loss of rainforests which harbour potential new medicines (related to 'green purchasing'). The Trust will strive to continue to deliver high quality healthcare whilst reducing as much as possible the extent to which current and future generations are deprived the means to meet their own needs.

Controls Assurance

The Controls Assurance system within the NHS provides a means of self-assessment of Trust performance in various spheres within a risk management framework. Three of the current standards are directly related to this policy statement: Transport, Waste and Environmental Management. This reflects the importance attached to these areas within the NHS.

Patients and the local community

Relocation to The Great Western Hospital provides the opportunity not only to deliver a better quality patient experience but in ways which reduce the burden on the local environment of that activity. An example being the setting of targets to reduce journeys to the site as a car driver irrespective of the number of patients treated there.

Employees

The programme of environmental improvement will support the operational needs of the hospital. This can be manifest in terms of better transport accessibility to the site; improvements in working practices that reduce both environmental and occupational hazards; an improved working environment via wildlife and planting programmes around the site; more comfortable working areas that maintain appropriate lighting, temperature and air quality.

Financial Stakeholders

Better environmental management is seen positively by both lenders and underwriters as indicating high standards of overall management. This can lead to more favourable terms which is ultimately of benefit to patients.

3. Focus Areas

NHS Estates guidelines on improving environmental performance focus primarily on five media: Transport, Waste, Energy, Water and Procurement.

At this stage the Trust will adopt this as a basic framework through which to engage with the environmental agenda.

1. Transport

The Trust is already committing substantial effort to improving its transport management in preparation for relocation via the 'Healthy Travel Plan' (due for publication during 2002 as a successor document to the Green Transport Strategy 1998). The measure of success of this programme during 2002 will be the ability of the Trust to accommodate the stipulations and constraints placed on the site by the local planing authority without prejudice to the operational needs of the hospital.

Once relocation is complete site transport pattern surveys will be undertaken which will both confirm the above (particularly achievement of 'Modal Shift Targets') and to provide baseline data for the site location. Targets for future improvement can then be established which reflect scenarios for given levels of clinical activity. These will deliver benefits in terms of compliance, operational efficiency and reduced environmental impact.

2. Waste

The various spheres of clinical activity also lead to production of large volumes of waste. The Environmental Audit of the new hospital site will provide measurement and analysis of the waste produced at the site and its management. The Trust will simultaneously strive for best practice in management of the waste which is generated and will also focus on improving performance in waste re-use, reduction and recycling. Better segregation of municipal and clinical waste via staff education and workplace design ca lead to reducing the waste flow, leading to cost savings and reduce environmental burden.

3. Energy

Department of Health targets for new healthcare estate stipulate a target of 35-55 Giga Joules per cubic meter. This is in addition to reducing the level of primary energy consumption between March 2000 and March 2010 by 15% or 0.15 million tonnes carbon.

The Great Western Hospital has been designed to operate at the vanguard of energy efficiency performance and the relocation should put the Trust at the forefront of energy efficient healthcare services in the UK. Additional investment in Building Energy Management Systems, Combined Heat and Power alongside a Demand Reduction Programme should lead to the Trust outperforming this target even with increasing levels of patient care up to 2010.

In terms of integrated environmental management a reduction in hospital journeys as a car driver, will given current dominant technology, help reduce energy consumed by the organisation as a whole as well reduce congestion and pollution.

4. Water

The Department of Health target for water consumption at healthcare facilities is 13 cubic meters per person per annum by March 2001. Data for PMH will be examined in order to assess the Trusts existing performance in this area prior to relocation whereupon a further survey will be undertaken within a wider Environmental Audit.

5. Procurement

This relates to both procurement of materials and supplies from vendors beyond the hospital itself but also and related to the areas discussed above, the procurement of the hospital facility itself form the private sector partner. The Trust will be committed to certain framework purchasing agreements and will look to NHS Purchasing and Supply Agency to show the lead in this area.

However the Trust is more directly involved in the procurement of The Great Western Hospital facility itself. This will have implications for other environmental spheres such as energy and waste management as discussed above and the Trust is more independent to improve aspects of its environmental performance that are influenced by the premises that it uses.

Additional Environmental Spheres

The Environmental Policy and Strategy will also recognise other environmental spheres not directly covered by the framework. This will include the potential to promote more diverse wildlife on the site and its environs which is already supported by agreements relating to grounds management. However the prospect of undertaking educational and community based projects for wildlife and in particular plants (linked where possible to plant derived medicines and complimentary treatments) will be explored. This may also be linked to patient care pathways, particularly in connection with the Commonhead Rehabilitation Centre (gardening therapy).

4. Outcomes

Approval of the Environmental Policy will necessitate the development of a strategy after relocation to deliver the policy goals. Alongside reduced environmental impact this will have the following benefits to the organisation itself:

Improved Regulatory Compliance

Both at the central government level via achieving certain targets, some of which are mentioned in this statement. Additionally improved performance under the Controls Assurance regime will be realised. At the local level achievement of the 'Modal Shift' targets will confirm the transport sustainability of the site and affirm the choice of location of the hospital.

Financial Benefits

Any project should at least cover its own costs in addition to benefiting the organisation. Many opportunities exist in improving environmental performance which have attractive financial impacts. Examples include: reducing the requirement and therefore cost for car parking; investing in energy saving equipment; improving awareness and segregation to reduce clinical waste flows. It is anticipated that implementation of the environmental strategy and management systems will at least be self-financing.

Improved Risk Management

Identification of potential environmental hazards will lead to improved corporate risk management not only in this domain itself but in related areas such as occupational health, infection control and radiological protection.

Public Private Partnership

The Environmental Policy of the Trust will set out goals and the programme to achieve these will be implemented in the context of a facility owned by The Hospital Company and serviced by Carillion Services Limited. The commitment of these partners to the environmental programme will be essential to the complete and successful implementation of the policy and in particular the introduction of an Environmental Management System. In so doing the partners have the opportunity to demonstrate improved environmental performance through cooperation between the public and private sector.

5. The Future

Once the relocation is complete the Trust will undertake a review of this statement leading to the agreement and publication of a comprehensive Environmental Policy and Strategy. This will be followed by the undertaking of an Environmental Audit to ascertain the impacts of the new facility through various media such as transport, waste production, energy and water consumption. Targets for improvement will then be established against these baselines and the necessary resources will be identified and committed to ensure their achievement during a given time frame. It is anticipated that the cost savings that can be achieved through such media-specific projects will finance the overall programme.

A process of continuous improvement will be conducted within the framework of the Trusts emerging 'Environmental Management System' (EMS). This will lead to the Trust being in a position to benchmark itself against similar healthcare facilities within the ISO 14001 scheme. Further, this programme of improvement will be contrasted with the levels of activity undertaken by the hospital in terms of patient care, such that real gains in 'resource productivity' or 'eco-efficiency' can be demonstrated.

This policy statement paves the way towards the production of a comprehensive Trust Environmental Policy upon relocation. This will set out the vision and strategy for achieving the goals that the Trust will set itself.

Swindon & Marlborough NHS Trust Environmental Policy Statement
Version 1.0
Author: Guy Bardoe (Environmental Project Co-ordinator), Trust Management
Issue Date: February 2002
Discussed by Health and Safety Steering Group 12.02.02
Discussed by Management Executive 12.02.02
Approved by Trust Board 22.02.02

Sample Policy

Source: http://www.linkoping.se/NR/rdonlyres/C3A72043-0965-4DBB-92DF-5E92EDED0551/0/Policy_eng.pdf

THE MUNICIPALITY OF LINKÖPING
ENVIRONMENTAL POLICY

The Municipality of Linköping and its municipal enterprises should serve as a role model for environmental protection and preservation programmes

As Sweden's fifth largest municipality, Linköping bears considerable responsibility for environmental protection. The services provided by the local authorities affect everyone living in the municipality. The majority of our activities fall under the heading of public services and, as such, are open to inspection by members of the general public. It is therefore important that we serve as a role model for others in our efforts to protect and preserve the environment in the Municipality of Linköping.

All our activities should help promote a sustainable environment from both an ecological, social and economic perspective. An ecologically sustainable approach springs from an awareness that nature and natural resources are valuable in themselves and that our right to modify and exploit them goes hand in hand with an obligation to manage them to the best of our abilities.

We must work towards environmental sustainability by:

- Taking environmental considerations into account when we make decisions.
- Taking active measures to cut down on the use of natural resources and to prevent pollution.
- Steadily reducing energy consumption and making increasing use of renewable energy sources.
- Promoting environment-friendly building and construction.
- Striving to maintain biological diversity within the municipality.
- Adapting our acquisition and purchasing routines to environmental requirements on an ongoing basis.
- Satisfying environmental legislation requirements and other demands by a wide margin.
- Inspiring and educating employees and elected representatives with a view to improving and enhancing our environmental efforts at all times.
- Informing and maintaining a dialogue on environmental issues with residents, employees and other stakeholders.

ADOPTED BY THE MUNICIPAL COUNCIL, FEBRUARY 2001

Lena Micko
Chairman of the Executive Board

Gösta Gustavsson
Environmental Commissioner

The above environmental policy shall apply regardless of whether an activity is performed by the municipal authorities or by an entrepreneur. The policy shall equally apply to municipal enterprises. The business of Linköping municipality comprises nursing and medical services, education, community planning, technical services, infrastructure, public transport, property and land administration, housing, cultural and recreational activities, and exercise of authority by the social welfare committee, the environmental committee, the local housing committee and the public works committee.

Tool 22	**Checklist:Environmental Objectives** Source: INEM 1998, p. 30. according to B.A.U.M. EPAG, Zukunftsorientiertes Umweltmanagement in kleinen und mitleren Unternehmen, 1998 according to Rüdnenauer, Ökologisch Rühren – funtionelle Kooperation stat hierarchischer Kontrolle, 1991 and Wruk and Zeschmann, Praxis-Checklisten Öko-Audit, B.A.U.M. e.V., 1996	

Environmental objectives					
To what extent do the following statements apply to your policy? **1= not at all (1 point), 5 = absolutely (5 points)**	1	2	3	4	5
1. The objectives clearly and objectively formulated					
2. They are consistent with the organisation environmental policy					
3. They promote environmental legal compliance at least					
4. They are compatible with continuous improvement of site's environmental performance					
5. They are relevant to the site's environmental impacts					
6. They focus on environmental legal compliance and reduction of significant environmental effects					
7. They are expected to result in significant improvement of environmental performance					
8. They are written					
9. They are quantified					
10. They include deadlines					
11. They take best available technology into account					
12. It is technically possible to realise the objectives					
13. Costs and benefits were considered when objectives were defined					
14. The relevant areas and employees were involved in developing the objectives					
15. The relation between the different objectives are known					
16. Possible "side effects" of activities to realise objectives have been considered					
17. Employees are regularly reminded of the main objectives					
18. The objectives are realistic and fair for the activity concerned					
19. Progress in realising objectives is reviewed regularly					
20. They are flexible enough to be adapted if necessary					
Total					
Maximum no. of points possible (100%) = 100 points **Score obtained: (%) points**					

Tool 23	**Setting Objectives and Targets** Source: NSF International, 2001, p.114 et sqq.	

Step 1:

A **cross-functional team** is a good way for an organisation to set realistic objectives and targets. Who needs to be involved on the team should be **listed here**:

Name	Contacted?
•	•
•	•
•	•
•	•
•	•
•	•

Step 2:

It needs to be thought about what **information sources** a team will need to establish objectives and targets. Information sources such as the ones listed below can be pulled together:

Information Sources	How they will help e.g.,
• Process maps. • Waste, and emission data. • Site maps. • Compliance audit reports. • List of identified environmental aspects and impacts. • Communications from interested parties. • Others? • • *(A plant tour or "walk through" may also be useful to identify other issues)*	• Identify process steps with environmental aspects. • Determine current wastes and sources. • Etc.

Step 3:

Is there other information that might be helpful to the team?

Other Information Needed	Where we will get it
•	•
•	•
•	•

Step 4:

The significant environmental impacts have to be listed (these were identified earlier). These impacts can be **categorized** by type:

Energy Use	Raw Materials	Air Impacts	Water Impacts	Waste Impacts	Land Issues	Other (specify)

Step 5:

Processes (such as plating or assembly) and **activities** (such as shipping or purchasing) need to be looked at. It needs to be found out whether there are any **other issues** the team should consider, in addition to those listed above as significant impacts (For example, an objective to reduce spills of hazardous materials at the loading dock may have to be established, even if this was not identified as a potentially significant environmental impact.)

Process or activity	Issues	Possible Objectives & Targets

Step 6:

Any new **regulatory requirements** that affect the facility (or other regulations for which the need for additional actions has been identified) need to be listed.

Regulations, other requirements	Possible Objectives & Targets

Step 7:

Inputs from **interested parties** need to be considered. It also needs to be found out whether there is any need for additional objectives related to views of neighbours, community groups or other parties.

Inputs from Interested Parties	Possible Objectives & Targets

Step 8:

The lists of **possible objectives developed in Steps 4 -7** needs to be looked at. The team can then **brainstorm** on whether these objectives are:

- Reasonable.
- Technologically feasible.
- Consistent with other organisational plans/goals.
- Affordable.

Preliminary objectives and targets then have to be **listed** based on this exercise:

Selected Preliminary Objectives
•
•
•
•
•

Step 9:

It has to be determined how each of the selected preliminary objectives will be **measured**. (If an effective way to measure it cannot be established, that objective can be put "on-hold" for later consideration).

Selected Objectives	Performance Indicator(s)

Step 10:

For each objective that was selected, it needs to be determined **who** is going to develop the **action plan** (who, what, when, where, how). These names can be listed below:

Selected Objectives	Responsibility for Action Plan

Tool 24	**Sample: Setting Objectives and Targets** Source: North Carolina Division of Polution Prevention and Environmental Assistance (PPP) June 2000.	

Person Completing Form: **Paint CFT**			**Area Department(s):** **Paint**								**Process:** **Painting/Topcoat**	
Aspect Identification			**Significance Determination**								**Objectives and Targets**	
Category/ Aspect	Description	Quantity	Regula-ted 7.3	Potential Release 7.4	Business Plan 7.5	Material of Concern 7.6	Load on Environ. 7.6	Other 7.6	Check if Significant	Rational for Significance, Non-Significance	Objective & Type	Target
Material Use												
Paints - Basecoats	Toles	High	x						x	Regulated	C, Control and Maintain Compliance	Ongoing
Paints - Clearcoats	Toles	High	x						x	Regulated	C, Control and Maintain Compliance	Ongoing
Air Emissions												
Particulates	Permit 276-88	Low	x						x	Regulated	C, Control and Maintain Compliance	Ongoing
VOCs	Permit 276-88	High	x						x	Regulated	I, Implement block painting programme	5% per unit reduction in VOCs based on 1996 baseline by year end 2000
Water Use												
Well Water	Process	High			x				x	Regulated, Business Plan	I, Reduce water consumption	10% Volume from 1996 baseline by 2002

Tool 25 — Sample Procedure: Setting Objectives and Targets

Source: NSF International, 2001, p.119.

I. Purpose

The purpose of this procedure is to ensure that the organisation establishes and maintains documented environmental objectives and targets.

II Scope

This procedure applies to environmental objectives and targets set at all relevant levels within the organisation.

III. Definitions

Environmental objective – A site goal that is consistent with the environmental policies and considers significant environmental impacts and applicable laws and regulations. Objectives are quantified wherever practicable.

Environmental target – A detailed performance requirement (quantified wherever practicable) based on an environmental objective. A target should be met in order for the underlying objective to be achieved.

IV. General

The organisation establishes environmental objectives and targets in order to implement the environmental policies. Objectives and targets also provide a means for the organisation to measure the effectiveness of its environmental efforts and improve the performance of the environmental management system. In establishing environmental objectives, the organisation considers:

- Applicable laws and regulations (and requirements of other programmes, such as ...).
- Environmental aspects of the organisation's activities and products.
- Technological, financial, operational, and other organisational requirements.
- The views of employees and other interested parties.

Based on the organisation's environmental objectives, targets are established for different functions and areas of the plant. For example, the organisation may establish an environmental objective to "reduce waste generation by 10% per year". Based on this objective, different areas of the plant might set targets for reducing individual waste streams in order to ensure that the organisation's objective was achieved. An organisation-wide environmental objective might also be translated into individual projects (such as changes in production processes, materials or pollution control equipment) in different plant areas.

V. Procedure

A. The organisation's top management is responsible for establishing environmental objectives on an annual basis. To initiate the process, the Plant Manager holds a meeting of all staff members to discuss the development of environmental objectives.

B. Objectives are action- and prevention-oriented and are intended to result in meaningful improvements in the organisation's environmental performance.

C. Each plant area or functional manager is responsible for providing input from his/her own function (Finance, Engineering, etc.) or shop area (Fabrication, Assembly, Shipping/Receiving, etc.). The organisation's environmental manager is responsible for providing input on applicable laws and regulations, significant site environmental impacts, and the views of interested parties. (These inputs are obtained from the separate analyses required by Procedure #'s).

D. As a starting point, the organisation's management evaluates its performance against environmental objectives for the current year. As part of this effort, management examines the results of its environmental performance evaluations.

E. Preliminary environmental objectives are developed for further discussion and evaluation. Each manager is responsible for evaluating the potential impacts within his/her functional or shop area (if any) of the proposed environmental objectives. The organisation's environmental manager reviews proposed objectives to ensure consistency with the overall environmental policy.

F. Environmental objectives are finalized, based on review comments from site managers and employees. Each manager identifies the impacts of the objectives in his/her function or shop area, establishes targets to achieve the objectives, and develops appropriate measures to track progress towards meeting the objectives and targets.

G. Each manager is responsible for communicating objectives and targets (and the means for achieving them) to others in his/her part of the organisation.

H. Progress towards the objectives and targets is reviewed on a regular basis at management meetings, and is also communicated to plant employees via bulletin boards etc.

I. At the end of each calendar year, the organisation's management reviews its performance with regard to achieving the objectives and targets. This information is used as input to setting objectives and targets for the succeeding year.

Tool 26

EMS Development Schedule and Resources Worksheet

Source: EPA 2000, p. 10.

Module	Participants	Budget	Target Completion
Laying the Groundwork: Identifying Environmental Aspects			
Intermediate Steps: (As appropriate)			
Making the Commitment: Creating a Policy Statement and Determining the Scope			
Intermediate Steps: (As appropriate)			
Determining Significant Environmental Aspects and Setting Objectives			
Intermediate Steps: (As appropriate)			
Setting Targets and Measuring Success			
Intermediate Steps: (As appropriate)			
Developing Operational Controls			
Intermediate Steps: (As appropriate)			
Evaluating Alternatives			
Intermediate Steps: (As appropriate)			
Implementing Your IEMS			
Intermediate Steps: (As appropriate)			
Setting Up Environmental Management Projects: Measuring and Achieving Success			
Intermediate Steps: (As appropriate)			
Establishing Continuing Improvement: Your EMS Programme, Audits, and Management Review			
Intermediate Steps: (As appropriate)			
Contact person:	Date completed:		

Tool 27	**Environmental Programme Worksheet** Source: INEM 1998, p. 98.	

Environmental Programme				**Time period:**		**Document ref:**	
OBJECTIVE	What MEASURE can we implement to realise objective?	Who is RESPONSIBLE for implementing measure?	What is DEADLINE for reaching objective	How much will measure COST?		What are expected BENEFITS?	
				Human	Financial	Economic	Environment
Approved by:						Date:	

Tool 28	**Distributing Responsibilities** Source: U.S. EPA, March 1999, 4-8.	

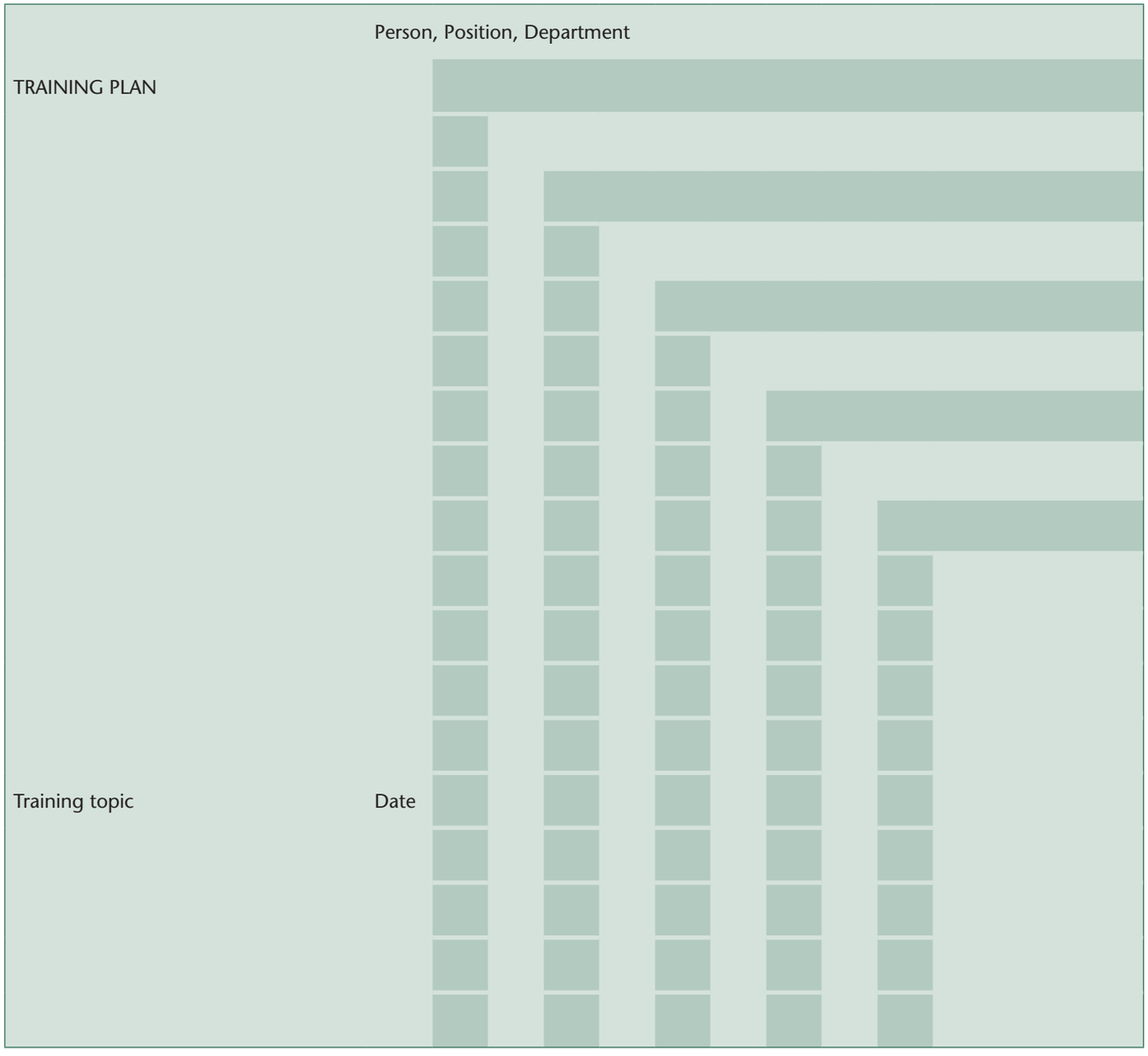
Roles	Individual Responsible	% of Time Designated	Budget
”Management representative” having responsibilityfor implementing the EMS (in a small business this person could be the owner).			
Identifying and determining significance of environmental aspects.			
Identifying and determining applicability of legal and other requirements.			
Compentency-based training.			
Operational controls.			
Emergency preparedness and response.			
Monitoring and measuring of ”key characteristics” of operations and activities that can have significant environmental impacts (i.e. the ”significant environmental aspects”).			
Periodic evaluation of environmental compliance.			
Handling and investigating non-conformance with the EMS.			
Records management.			
Internal EMS audits.			

Tool 29	**Environmental Responsibilities Matrix** Source: INEM 1998, p. 112, according to B.A.U.M. EPAG, Zukunftsorientiertes Umweltmanagement in kleinen und mittleren Unternehmen, 1998 according to Wruk	

Tasks and Responsibilities	Top management	Production manager	Purchasing manager	Sales and commercial manager	Administrative manager	Quality and environmental manager	Human resources manager			
Responsibility / task										
Carrying out routine purchases	D	S	I	In	S	In	S			
Obtaining and distributing safety data sheets	In	In	I		In	In	In			Safety folder
Filing safety data sheets					I					Safety folder
Reviewing routine purchases and documentation	In	In	I		In	In				
New purchases of chemicals, preparations and products with hazardous substances		D	I		S	S				
Purchasing office supplies and other products	D	S	I	S	In		S			For more information see EM
Choice and evaluation of suppliers	D	S	I	S	S	S	In			

D = person who is responsible for decision-making
I = person who is responsible for implementation
S = person who must support implementation
In = person who must be informed

Tool 30	**EMS Training Planner** Source: INEM 1998, p. 123 according to B.A.U.M. EPAG, Zukunftsorientiertes Umweltmanagement in kleinen und mittleren Unternehmen, 1998 according to Wruk	



Tool 31	**Training Plan Operational Control** Source: U.S. EPA, March 1999, p. 7-8.	

Environmental Aspect	Procedures	Responsible Person	Training Needs	What Vehicle	When/ Length	Budget	Completion Date	Person Responsible for Training

Tool 32	**Training and Awareness** Source: US EPA, October 2000, p. 146.	

Training Plan						
Jobs Affecting Environment	**Training Needs**	**How to Train**	**When/ Length**	**Budget**	**Completion Date**	**Who is Responsible?**
(Example) Staff EH&S Person	Environmental Policy	Staff Training Session	Once/ Two hrs.	?	?	?
(Example) Production Employees	Emergency Preparedness & Response	?	?	?	?	?
Contact Person:			Date Completed:			

Tool 33	**Training Purposes** Source: Martin, R. 1998, p. 51.	

Type of Training	Audience	Purpose
Raising Awareness of the strategic importance of environmental management	Senior Management	To gain commitment and alignment of the organisation's environmental policy
Raising general environmental awareness	All Employees	To gain commitment to the environmental policy, objectives and targets and to instill a sense of individual responsibility
Skills Enhancement	Employees with environmental responsibilities	Improve performance in specific areas - operations, R&D, engineering
Compliance	Employees whose actions can affect compliance	Ensure regulatory and internal requirements for training are met.

Tool 34	**Training and Workshop Methods** Source: INEM 1998, pp. 120 according to B.A.U.M. EPAG, Zukunftsorientiertes Umweltmanagement in kleinen und mittleren Unternehmen, 1998.	

1. The brainstorming method

Brainstorming is the oldest and best known creativity tool. It can be used to get past blocks in the search for ideas and to make group work more effective.

How to proceed

- Duration: about 20-40 minutes + time for follow-up evaluation.
- **Participants**: about 5-7 people, as mixed as possible (one moderator, one person to keep a record).
- **Materials**: board, large sheets of paper, e.g. on flipchart or pinboard, markers.

Stages

Preparation	Definition of topic /problem to be dealt, invitation of participants, preparation of room, etc.
Implementation	Introduction, description of problem, brainstorming, explanation of ideas. The moderator makes suggestions, all ideas are recorded.
Processing	Evaluation of ideas, if appropriate identification of more ideas. Classification of ideas, e.g. by category (”can be implemented immediately”, ”good, but cannot be implemented at once”, benefit not visible at the moment”).

Points to keep in mind

- Create an atmosphere without fear so that people do feel they are being assessed.
- Treat only one topic/problem.
- Do not criticise when ideas are being expressed!
- It’s the quantity, not the quality of ideas that counts.
- Let your imagination run riot!
- Note down all ideas. There is no such thing as a false idea.
- Allow joint suggestions and linkages of ideas.

Objective

Brainstorming promotes creative thinking by participants. Ideas and criticisms from participants create synergy so that a subject can be creatively thought through or the causes of a problem can be sought.

Advantages	Disadvantages
• Little time needed for preparation and implementation. • Lots of ideas are obtained in a short time. • Good opportunity for all participants to express ideas. • Suggestions, considerations and ideas come from different perspectives. • Promotes creativity, imaginativeness.	• Ideas are only recorded in words i.e. visually not so attractive. • Participation depends on mood. • Good presenter needed • People’s reluctance to come out with ”mad” ideas or to take part at all.

Example of topic to be brainstormed:

Causes for lack of employee involvement in environmental suggestion systems (Source: B.A.U.M. EPAG, Zukunftsorientiertes Umweltmanagement in kleinen und mittleren Unternehmen, 1998.) according to Hornung, Kreativitätstechniken, 1996.

2. The card method

With the aid of the card method, it is possible to develop topics, questions, ideas and possible solutions.

How to proceed

- **Duration**: depends on number of participants and cards.
- **Participants**: 5 - 10, as mixed as possible.
- **Materials**: pinboard, cards (different colours and shapes), adhesive tape, pins, thick markers.

The moderator poses a visualised question to the group on a pinboard (or normal wall with packing paper on it). The participants are to answer the question in writing. For this purpose, cards of uniform colour are distributed so that the replies are anonymous. Colours and shapes have particular meanings! Different colours are used for different subjects or questions.

What points should be kept in mind when writing on the cards:

- Write with thick markers.
- Write in capital letters.
- Write in big clear letters on the cards (maximum 3 lines, 7 words).
- Note down only one thought per card.

When collecting the cards, take care to collect them with the writing face-down. Open questioning on the cards should also be anonymous for the most part. Then, pin up the cards on the board.

In a joint discussion, the group decides card for card whether they belong to the other cards or a new group in terms of subject-matter. When all cards have been pinned up, the participants review the assignment of the cards again and write a suitable general heading above the individual groups.

Objective

The card method is an excellent way of collecting ideas on certain subjects. If properly applied, it ensures that all participants come up with ideas. If the collection is mostly anonymous, more critical objections and commentaries which would otherwise not be raised are also possible.

Advantages	Disadvantages
• All participants are involved. • All suggestions are equally important – there is no hierarchy or other differences. • Cards can be rearranged at any time.	• With a lot of participants or many mentions, overview is quickly lost. • Number of cards can be limited from the beginning. • Takes a lot of time.

Example of topic for which it can be used:

Collecting ideas on water saving measures

3. The role of a moderator

Preparation

- Prepares questions relating to content.
- Organises time planning.
- Determines structure and methods in line with the goals of an event/meeting.
- Deals with general matters (room, etc.).

Implementation

- Manages the event/meeting.
- Actively plays the role of moderator and has this confirmed by the group.
- Makes sure that different points-of-views are expressed.
- Is totally neutral.
- Aims to involve all participants.
- Acts with a view to achieving consensus.
- Encourages the transparency of the opinions expressed.
- Enables the group to work together democratically.
- Creates ”space” for all opinions.
- Protects the weaker members.
- Agrees on rules for the group and sees to it that they are observed.
- Ensures continuity throughout the proceedings.

Conclusion

- Summarises the results and presents them visually.
- Organises the conclusion.

Tool 35	**Communication Work Plan** Source: US EPA, March 1999 p. 4-5.	

Target Audience	What to Communicate	Mode of Communication	When	Budget	Who is Responsible?
(Example) Staff	Environmental Policy	Newsletter Staff Meetings	Monthly Weekly	? ?	? ?
Date Completed:		Contact Person:			

Tool 36	**Identification of Stakeholders** Source: US EPA, 2000, p. 4-4.	

Your Stakeholders	What you want to tell them:	What you want them to tell you:	How to communicate with/ tell them:
(Example) Employees	Environmental policy	How to get it done	Memo, bulletin board, meetings, suggestion box
(Example) Neighbours	Environmental policy and EMS plans	Their environmental concerns	Meetings, open house, flyers, suggestion box
Date Completed:		Contact Person:	

Tool 37	**Documentation Sheet** Source: US EPA, 2000, p. 4-6.	

List Existing Documents	Determine Format: Who/ Date Completed	Develop Prototype (Content): Who/Date Completed	Assign Writing: Who/ Date	Review Writing/ Compare to Prototype Who/ Date	Added to Document List/ Date	Who has Access	Where Located
List Documents to be Created							
Date Completed:			Contact Person:				

Tool 38	**Operational Control** Source: NSF International, 2001, p.54.	

Operation or Activity	Procedure is needed (none exists)	Procedure exists, but is not documented	Procedure exists and is documented	No procedure is needed
1				
2				
3				
4				

Tool 39	**Checklist: Emergency and Response** Source: NSF International, 2001, p. 58.	

Checklist for Emergency Preparedness and Response Plans

Does the plan describe the following:

- Potential emergency situations (such as fires, explosions, spills or releases of hazardous materials, and natural disasters)?
- Hazardous materials used on-site (and their locations)?
- Key organisational responsibilities (including emergency coordinator)?
- Arrangements with local emergency support providers?
- Emergency response procedures, including emergency communication procedures?
- Locations and types of emergency response equipment?
- Maintenance of emergency response equipment?
- Training / testing of personnel, including the on-site emergency response team (if applicable)?
- Testing of alarm / public address systems?
- Evacuation routes and exits (map), and assembly points?

Tool 40 Internal Environmental Audit Plan

Source: INEM 1998, p. 134.

Organisation/dept.	Plan for Internal Environmental Audit for year:								Form No. Date:				
	Team/person responsible	Months											
Area/procedure to be audited		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Week no. of planned environmental audit				Environmental audit completed					Follow-up on corrective actions				
Date:		Signature:				Position:							

Tool 41 — Checklist: Internal Environmental Audit

Source: INEM 1998, p. 135.

Organisation/division:		**Check-list for environmental audit**			Form No.: Page No. of
Department:			Audit leader: Audit team:		
Area/Procedure to be audited:			Responsible manager:		
Item in description	Contact person	Tested Check-point/ question/ document	Result OK/ non-compliance	Non-compliance in keywords and Comments:	Non-compliance report no.
Date:	Signature of environmental auditor:				

Tool 42	**Internal Environmental Audit Procedure Template** Source: INEM 1998, p. 138.	

Environmental manual Issued by organisation:	**Procedure for Internal Environmental Audit**	Ref. name/no.: Approved by:
Purpose:	To ensure that the environmental management system is used and is effective	
Scope:	The entire environmental management system	
Responsibility:	Environmental manager	
Forms and support material:	Plan for Internal Environmental Audit, Document ref. name/no.: Check-list for Environmental Audit, Document ref. name/no.: Audit Report, Document ref. name/no.: Non-compliance and Correction Report, Document ref. name/no.:	
Training:	The members of the audit team should have appropriate training. The audit leader must be independent of the area to be audited.	
Procedure:		Responsibility:
Annual plan	Each year an annual plan for the environmental audit in the following year is prepared and signed by management. This plan serves to ensure that the entire environmental management system is examined in the coming year and the plan must specify when the audit will be carried out and those responsible for carrying it out.	Environmental manager
Preparation	Before the individual audits are carried out, check-lists are developed for the area to be audited, based on procedures, objectives, action plans. They can be used to measure results in each area. The staff of the area to be audited should be informed in advance about when the audit will be done and what it will cover.	Audit team
Audit	Based on the check-lists, the audit is carried out in the form of interviews about - and observations of - the actual state of affairs.	Audit team
Wrap-up meeting	The audit team examines the observations and decides whether areas of non-compliance observed should be included in correction reports or whether they can be solved immediately. An audit report is prepared which is examined together with the manager responsible for the area in question; minor areas of non-compliance are taken care of immediately, while a conclusion for the audit as a whole is written down. Correction reports are examined with the manager responsible for the area audited and corrective action is agreed upon. The audit leader and the responsible manager sign the reports made. The reports are given to the environment manager, with one copy going to the responsible manager.	Audit leader
Follow-up	When deadlines for corrective action are reached, the manager responsible for the area audited is contacted and the environmental manager checks the corrective action carried out. If corrective action is effective, the case is closed. If not, a new report is prepared.	Responsible manager
Reporting	A joint report is prepared on the basis of all the internal environmental audits of the organisation. This report forms the basis for management's review of the whole system.	Environmental manager

Tool 43	**Internal Environmental Audit Report** Source: INEM 1998, p. 136.	

Audit Report Environmental Management	
Organisation/dept.:	Form No.:
Audit date:	Audit leader:
Area/procedure audited:	Responsible manager:
Procedure No.:	Employee(s) interviewed:
Purpose of audit:	

Description of non-compliance corrected during the audit:

How many check-lists are enclosed:

How many non-compliance and correction reports are enclosed:

Reference no./names of non-compliance and correction reports:

Description of the efficiency of the environmental management system:

How many observations are enclosed:

Signed/date:

Responsible manager:

Audit leader:

To be filled in by environmental manager:

Correction reports enclosed which have been satisfactorily completed:

Signed/date:

Tool 44	**Non-compliance and Correction Report** Source: INEM 1998, p. 137.	

Non-compliance and Correction Report		
Organisation/dept.:	Form No.:	Page No. of:
Area/procedure audited:	Audit leader:	Responsible manager:
Date:		

1. Non-compliance ascertained in environmental management:

Confirmation of observations made by manager in charge:

Date:

Signature, responsible manager:

2. Proposed changes, including dates for such changes:

Changes will be carried out by:

Person responsible for carrying out changes:

Name:

Position:

Date:

Signature, responsible manager:

3. Follow-up on change:

☐ Change works as intended

☐ Change does not work as intended – see audit report no.:

Date:

Signature, environmental manager:

Tool 45	**Environmental Statement** Source: INEM 1998, p. 162.	

Sample structure for environmental statement

1. General information on the organisation (sites, number of employees etc.)

2. Environmental policy/environmental guidelines

- Environmental guidelines
- Foreword by management
- Milestones in environmental protection and in the organisation

3. Organisation of environmental management/ environmental management system

- Overview/Organigram
- Environmental management responsibilities
- Employee information, training and involvement

4. Overview of the most important environmental issues

- Overview of material and energy flows
- Relation of organisation activities to environmental issues and problems
- Methodology: scope of data collection and evaluation criteria

5. Site and production related environmental issues

- Material consumption
- Energy consumption
- Water consumption
- Buildings, machinery, soil
- Residual materials and waste
- Atmospheric emissions, noise and odour pollution
- Wastewater
- Accidents and accident prevention
- Transport

6. Products and services

- Products or services sold
- Product life cycles
- Product development

7. Overview of the environmental programme and main objectives

8. Influence of environmental management on profit

9. Dialogue with target groups

- Previous contacts and activities with target groups
- Questions and advice for target groups
- Statements from external parties

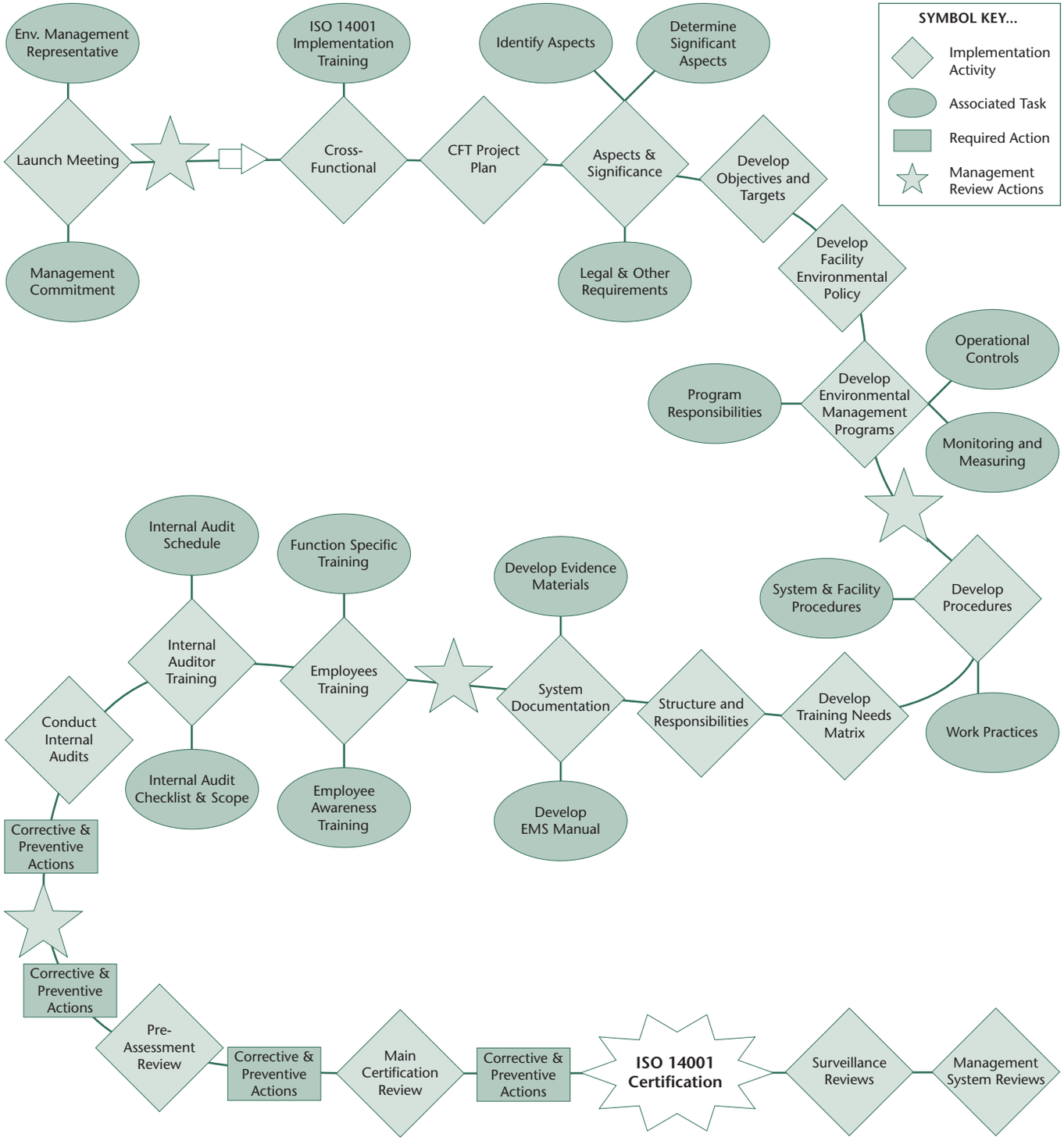
10. Conclusion

- Statement from the environmental verifier
- Deadline for the next environmental statement
- Responsibilities for writing the environmental statement
- Explanation of important technical terms
- Contact person, address, offer of additional information

Tool 46

EMS Development and Implementation

Source: North Carolina Division of Polution Prevention and Environmental Assistance (PPP) June 2000 (modified).



Tool 47	**Environmental Responsibilities Matrix. Blank sheet to Tool 29.** Source: INEM 1998, p. 112, according to B.A.U.M. EPAG, Zukunftsorientiertes Umweltmanagement in kleinen und mittleren Unternehmen, 1998 according to Wruk.	

D = person who is responsible for decision-making
I = person who is responsible for implementation
S = person who must support implementation
In = person who must be informed

Tool 48	**Measuring the Environmental Impacts of an Organisation. Blank sheet to Tool 8.** Source: Sturm, A. with Upasena, S. 1998, p. 38 (modified).	

Topic / Perspective	Environmental Problem Area				
	Resource Depletion		Environmental Impact		
Total					
Ranking by Importance					

Scoring: 4=high; 3=middle; 2=low; 1=very low; 0=none

Tool 49	**Aspect / Impact Evaluation. Blank sheet to Tool 9.** Source: NSF International, 2001, p.102.	

Aspect/Impact/Activity:						**Date:**	
		Frequency		**Severity**			
Category	Stages	Use	Incident	Human Impact	Animal/ Plant	Public	Impact Rating
						Overall Rating	

Please note

Significant Impact if:
- permittable
- required by law
- over the establish cut off

Tool 50	**Checklist: Environmental Legal Compliance. Blank sheet to Tool 18.** Source: INEM 1998, p. 75.	

Question	Environmental Legal Compliance			
	Fulfilled	Not relevant	Still open	Not ful-filled

Tool 51	**Training Purposes. Blank sheet to Tool 33.** Source: Martin, R. 1998, p. 51.	

Type of Training	Audience	Purpose

Tool 52	**Sample: Setting Objectives and Targets.** **Blank sheet to Tool 24.** Source: North Carolina Division of Polution Prevention and Environmental Assistance (PPP) June 2000.	

Person Completing Form: **Paint CFT**			**Area Department(s):** **Paint**								**Process:** **Painting/Topcoat**	
Aspect Identification			**Significance Determination**								**Objectives and Targets**	
Category/ Aspect	Description	Quantity	Regula-ted 7.3	Potential Release 7.4	Business Plan 7.5	Material of Concern 7.6	Load on Environ. 7.6	Other 7.6	Check if Significant	Rational for Significance, Non-Significance	Objective & Type	Target
Material Use												

Case Studies

B

Case Study 1	**Kunda Nordic Tsement Ltd.** Estonia	



Kunda Nordic Tsement – from environmental disaster to environmental recognition

1 The Cement Production in Kunda

Natural Conditions for Cement Production

A stretch of limestone going through the Baltic Sea region is very visible on the Estonian north coast, and on the islands of Gotland, and Öland in Sweden and Bornholm in Denmark. This has made possible three large cement factories, using limestone as raw material, situated on the coast of Gulf of Finland in Estonia (Kunda), on the east coast of Gotland (Slite) and in southern Öland (Degerhamn). Their locations on the coast allow them to export by ship large amounts of cement for construction work over the entire Baltic Sea region.

The Estonian cement factory in the small town of Kunda, established in the 1870s and state owned up to the recent systems change, was privatised in 1992 as Kunda Nordic Tsement. Later the owners changed and presently Heidelberg Cement Group (Germany) has 75% and CRH (Ireland) 25% of the shares.

The Worst Polluter

During Soviet times Kunda Tsement was environmentally a disaster. In 1992, according to statistics, cement production in Kunda was the third largest contributor to air pollution in Estonia, after two oil shale power plants. In particular it caused a significant deterioration in the quality of life in the town of Kunda, as thousands of tonnes of cement dust was emitted into air, covering houses, gardens, fields and people. Virtually everyone in the area suffered from breathing disorders. Relations between the company and the local community and environmental authorities were poor. At one stage, the closure of the factory was even discussed seriously as an option. The main reason for the environmental problems was that the equipment installed by Kunda in the 1960s to reduce air pollution was worn out and no longer able to deal with emissions. Kunda was losing 10% of cement – into the air – due to poor technology.

Thus in 1992 the situation was bad. In addition to the expense of production losses, Kunda also had to pay high environmental fines. Even in the case where fines were relatively low, there were clear signs that they would rise. Kunda was also faced with the danger that Western customers would refuse its cement because of its poor environmental reputation.

Production and Business

Kunda operates a wet cement production process. Its main energy source is oil shale. The main raw materials that it uses, oil shale ash, clay and limestone, are mined in nearby quarries. Cement, or Portland cement, is made when limestone, clay (or sand), and fuel is burnt in a rotating oven, so-called rotary kiln. The kilns in Kunda are about 4x150 meters, slightly slanted, and heated in its lower end up to 1450°C. During the burning process the material is forming a gravel-like, extremely hard-burned brick, clinker. The clinker is either used as such or

ground in cement mills together with small amounts of other material (plaster) to form the cement.

In 1994 Kunda operated four rotary kilns with a total annual capacity of over one million tonnes of cement. Today it operates two fully-renovated kilns with an annual capacity of over 560,000 tonnes of cement. The main products are cement and clinker. Since the mid 1990s Kunda produces around 600,000 tonnes of clinker and 400,000–500,000 tonnes of cement (506,000 tonnes in 2003) yearly. The number of employees has during the last ten years decreased from 650 (1994) to 350 (2003).

The company also operates a limestone quarry, a clay quarry, an oil shale quarry, and a port. All operations are located within a radius of 10 kilometres.

During the period of Soviet rule Kunda exported a significant percentage of its output to the north-western region of the Soviet Union and the Baltic States. Since then the market has opened up and Kunda competes with western manufacturers. Its main customers are retail trade companies, which sell cement to construction companies and wholesale agents in Scandinavia and in the Baltic States. In 2003 its net sails was 483 Mln EEK (about 32 Mln Euro).

The Main Environmental Problems

The main environmental impact of cement production is air pollution caused by emissions of dust and of sulphur dioxide (SO_2), nitrogen oxide (NO_x) and carbon dioxide (CO_2). Cement production is also energy intensive and involves the extraction of non-renewable mineral resources. The latter can also cause surface water and ground water pollution.

The cement industry is a significant contributor to carbon dioxide emissions. About 5% of global CO_2 emissions are due to cement production caused by (1) the decarbonisation of limestone, (2) the use of fossils fuels in the clinker kilns and (3) the high consumption of electricity for the motors in the plants.

Kunda Cement has addressed these problems by collecting dust in filters, reducing SO_2 and NO_2 emission by flue gas treatment, by substituting fossil fuel, and finally by substituting part of the clinker in the cement by e.g. burnt oil shale, limestone filler, slag etc. These changes will be described in some detail below.

2 Developments 1993–1998

Renovation and Environmental Policy in 1993–1998

The new owners started already in 1992 to discuss a plan for renovation of the plant. The plan incorporated substantial environmental investments. Loans were obtained from the International Finance Corporation (a subsidiary of the World Bank) and the Nordic Environmental Finance Corporation, institutions that consider the environmental performance of the projects that they fund.

The environmental considerations had to include not only the cement production itself but as well the quarries, the oil shale mining and the port. Even if the main concern at this point was dust emissions, also effluents into the Kunda River – the factory used large volumes of water – as well as solid waste and the landfill were important.

The environmental policy developed was based on three overall objectives:

- To meet Estonian environmental legal and regulatory requirements immediately.
- To meet all World Bank requirements within three years.
- To be the best environmentally-managed industrial company in Estonia within five years.

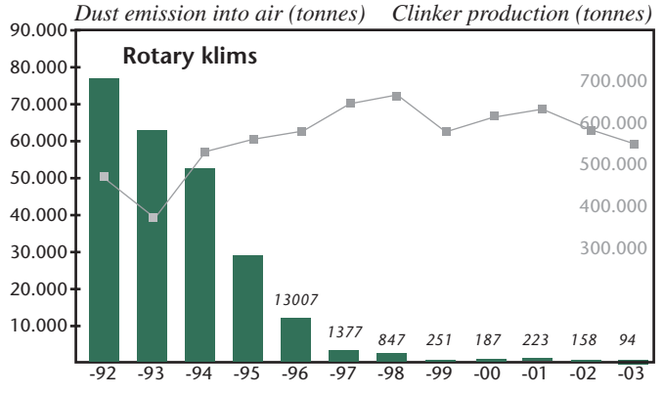


Figure 1.1 Dust emission from rotary kilns in 1992-2003.
The clinker production is shown as the dotted curve (■) in gray.

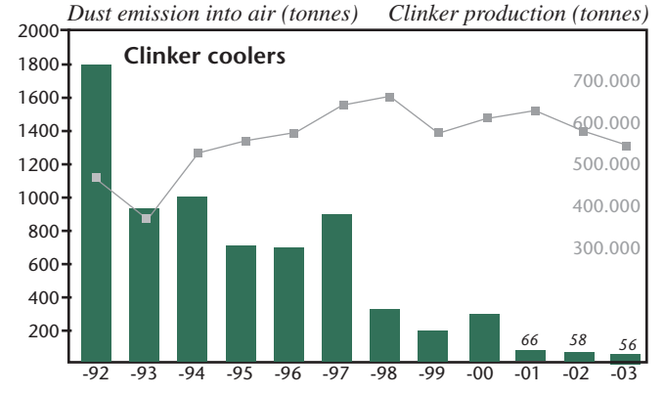


Figure 1.2 Dust emission from clinker coolers in 1992-2003.
The clinker production is shown as the dotted curve (■) in grey.

Figure 1.3 Port Kunda is the biggest commercial port between Tallinn and the Russian border. *The annual capacity of the port is up to 2 million tons of goods. The enlargement of wharf areas, the development of bulk materials warehouses and the preparations to receive new goods are ongoing.*

The following targets for improving environmental performance were also defined:

- Reduction of emissions of dust from the cement kiln.
- Reduction of emissions of oil shale dust.
- Construction of a new industrial landfill for solid waste.
- Reduction of risk from handling asbestos during renovation work.
- Prevention of oil spillage into the Kunda river.
- Development of a new port in accordance with environmental regulations.

Based on the policies a major renovation of the cement production facilities in Kunda took place in 1993–1997. Investments totalled nearly 800 million Estonian Kroons (about 53 Mln Euro), including 220 million for environmental protection. Progress, successes and problems in realising these objectives are assessed regularly. Results and future plans are communicated to different stakeholder groups.

Reducing Air Pollution

The majority of measures aimed to reduce air pollution. Renovation of the kilns and the installation of new electrostatic precipitators (filters) were expected to significantly reduce dust emissions. Of Kunda's original four kilns two were renovated and had new electrostatic precipitators installed. Production was carried out at the third kiln during renovation and during periods of peak demand. The electrostatic precipitator at the third kiln was repaired. The fourth kiln was closed down in 1996. To achieve further reduction of dust emissions, operations at the third kiln were stopped in 1998.

EEK 130 million (about 9 million Euro) were invested in the installation of new bag filters on three oil shale mills in order to reduce dust emissions. New filters were also installed in the cement mill and, in 1997, filters were installed at the cement packaging line and the kiln dust silo. The old multicyclones in the clinker cooling system were repaired to increase cooling efficiency. Dust emission from the kilns thus have decreased

from almost 80,000 tonnes (!) in 1992 to 2,000 tonnes in 1997, and even lower values later (see Figure 1.1). The installation of more efficient filters and electrostatic precipitators resulted in the generation of higher volumes of collected fine cement dust, in 1997 a total of 63,400 tonnes, a figure that increased to 86,000 in 2003. The cement dust represented almost 98% of the total waste volume of the operations. In 1997 12,000 tonnes were given to farmers for liming, and the remainder was disposed of in the company's landfill. To expand the use of dust for liming Kunda needed to develop further cooperation with farmers, and environmental and agricultural authorities. Kunda then launched a programme to promote the use of fly ash as fertiliser.

Reducing Emissions to Water

In the mid 1990s Kunda consumed about 2.5 million m^3 of water per year. 0.3 million m^3 were used for cement production and the remainder 2.2 million m^3 for cooling purposes. In 1998 the cooling water was reduced by some 20% to 1.8 million m^3. In 2002 the figure had decreased to 1.1 million m^3 and in 2003 to 784,000 m^3. Reductions were due to improved techniques, e.g. pumps, and later to recirculation of cooling water to the production (preparation of slurry), and the use of air instead of water for cooling.

Water is supplied from the local Kunda River. Wastewater is discharged into the same river. The company introduced a physical treatment (mud and oil removal) of its wastewater, making the quality of the water discharged within the permits. Extraction of mineral resources from Kunda's clay and limestone quarries results in high sulphate concentrations in the wastewater. New explosive and blasting technologies were introduced which resulted in the elimination of nitrogen pollution.

The wastewater which is drained from Kunda's landfill was heavily polluted. In 1997 Kunda diluted the wastewater from both its mining activities and its landfill with about 12,000 m^3 of water. Later the drainage water from the landfill was taken to Kunda town treatment plant, while the water from the quarries were taken to a special treatment plant of the factory.

Table 1.1 *Reduction in dust emissions.*

Year	Dust emissions per unit of production
1992	146 kg/tonne
1996	22 kg/tonne
1997	3.2 kg/tonne

Table 1.2 *Air quality improvement in Kunda town.*

Year	Number of times MPL* was exceeded per year
1994	120
1995	127
1996	50
1997	4

** MPL = Maximum Permitted Level.*

Relationships with Stakeholder and Local Community

In order to improve relations with the public and the local authorities, the company began to publish environmental reports. Each new report was presented at a public meeting where representatives of interested groups have the opportunity of finding out more about the company's environmental policies and activities. Initially, a report was published twice a year. As the most urgent environmental problems had been dealt with, a report is now published once a year. A dialogue has been established with the Ministry of Environment and local Regional Environmental Department of Lääne-Viru County and Kunda municipal government.

3 Developments 1998-2005

Introducing an EMS and ISO 14001 Certification

In late 1998 the company made the decision to implement the ISO 14001 environmental management system. Two consultancies were asked to lead the operations, the Estonian Emi-Eco and the Finnish Enemi Oy. 1999 became a year filled with documenting the industrial process in the cement plant, the procedures in the port, and in the administration.

Environmental responsibilities were allocated within the company. Top management became responsible for developing, reviewing and ensuring compliance with the environmental policy. The Administrative Manager, with the support of the Environmental Manager, was responsible for keeping up-to-date with developments in environmental legislation and regulations.

External support was obtained from international and Estonian consulting companies in conducting environmental audits and in measuring and monitoring environmental performance. The results of audits and performance measurements have helped Kunda to evaluate and modify its environmental policy and investment plans.

A very important part of the work was the training of the personnel. Top and middle managers participated in environmental training twice a month. The Environmental Manager did this training. The main message and the objective was that

environmental management was the concern of everybody's daily work, a constantly ongoing process with the objective to reduce the environmental impact caused by the company, and to each year reach the commonly set goals. The task has been received with enthusiasm by the personnel, and it has paid off financially as well.

The first audit was carried out in autumn 2000, and in December that year the company was certified according to ISO 14001, by Det Norske Veritas. The certificate was valid for the period Dec 2000-Oct 2003.

Using Clinker Dust in Agriculture

About 80,000 tonnes of clinker dust is collected as waste from the filters every year. This material consisting mostly of chalk is a valuable material to lime the acid soils in Estonia. In a state financed project Kunda cement during the period 1997-99 re-established the old procedure to lime agricultural fields. At the beginning the more than 30-year-old technology was used – compressed air was used to spread the dust on the fields – which had very uneven results. In cooperation with Finland the company Silento Oy constructed and delivered five machines for proper delivery of clinker dust to the fields in 1998. The amount of dust used for liming then increased dramatically:

Table 1.3
Amount of clinker dust used for liming of agricultural fields.

Year	**Clinker dust** (tonnes)
1996	500
1997	10,500
1998	50,300
1999	60,000
2000	63,000
2003	55,000

The project has the potential to develop, as a total of 180,000 ha in Estonia require annual liming for a good production. Simultaneously the amount of clinker dust sent to landfill in Kunda will be reduced or eliminated. In 2003 still 30,000 tonnes were sent to the landfill.

Energy Management

Cement production is an energy intensive operation. In 1995 the energy used per tonne of cement was 176 kWh, this figure decreased to 124 kWh in 2001 and to 116 kWh in 2003. The fuel used was oil shale from the local quarry. In 1999 a programme to introduce alternative fuel started. These were mostly petroleum coke and coal. The inclusion of residues of the fuel in the cement is a normal operation which produces a product that is of similar quality as ordinary Portland cement. Later burning of wastes has been an important part of the energy provision in the process (see below).

In 1999, the company installed a natural gas driven cogeneration plant for local production of electricity and heat. The capacity of this new plant was 3.1 MW of electricity and 3.2 MW of thermal energy. The plant provided for 25% of the electricity used by the company, while the thermal power was used for district heating of 2/3 of Kunda town. This allowed the town to close its old heating station operating on oil shale, and transfer its boilers to operate on liquid fuel. As a result the air pollution in the city was considerably reduced and the dumping of oil shale ash on the municipal land fill ended.

Waste Management

The burning of cement at a high temperature allows for incineration of all kinds of mixed-in organic material. This has been used as an opportunity of large-scale incineration of organic hazardous waste with a much higher efficiency than traditional dedicated waste incineration plants. The cement industry offers a possibility to incinerate waste safely, as the added waste stays in the rotary kilns a long period and at a high temperature. The owners of Kunda started in year 2000 a large-scale programme for utilisation of liquid waste (waste oils and oil shale refuse). A contract for management of hazardous waste from all over Estonia was at the same time signed with the Ministry of Environment.

In 2001 the amounts of waste fuel used in the new project was 1,200 tonnes of waste oil, 4,400 tonnes of oil shale refuse and 9,400 tonnes of semi-coke or a total of 15,000 tonnes. The total has increased rapidly and was 47,000 tonnes in 2003.

Figure 1.4 *The control room.*

Introducing an Integrated Management System

In October 2003 the ISO 14001 permit for the EMS expired. The company then decided not to prolong the EMS but rather to combine the two systems then in operation, the environmental management system, EMS, and the quality management system, QMS according to ISO 9000, and add an occupational health, safety and risk management system into a so-called integrated management system, an IMS. The plans were that the integrated system will be submitted to certification in late 2005. It should be noted that the EMS during the period will be operated in the same way as during the period of certification.

A development plan of the management for the period 2003-2005 was established. The plan contains a listing of all training periods for the different categories of personnel, as well as all audits that need to be done to develop all three partial management systems. It ends with the certification of an IMS in late 2005.

A complete plan for environmental improvements for the period 2004-2006 has also been published. The plan contains items such as renewal of the dewatering system in the limestone quarry, modernisation of cooler No 2, supplying clinker coolers with filters, with time of execution and budget and responsible project leader (See Table 1.4).

Table 1.4 *Kunda Environmental Plan 2004-2006.*

Measure	**Content**	**Reduction of environmental impact**	**Investment** (Mln. EEK)	**Year**
Renewal of the dewatering system of the limestone quarry.	Reconstruction of the dewatering pump station, replacement and automation of the pumps, renewal of the drainage system, construction of a sludge pool.	Prevention of the Toolse River from the pollution with plankton.	0.5 1.0 0.5	2004 2005 2006
Modernisation of cooler No 2.	Renewal of the hot end of the cooler No 2 and the aspiration ventilator.	Increase of the efficiency of the cooler. Reduction of the consumption of the electric energy and the amount of dust emitted into the air by the cooler.	2.5 4.4	2004 2005 2006
Project concerning the supply of clinker coolers with filters.	Elaboration of a certain solution to avoid dusting of clinker coolers.	Evaluation of the scope of investment and finding an optimum solution of the problem.	17.0	2004 2005 2006
Filter for the clinker cooler No 4.	Installation of dust collecting equipment (EP or a bag filter) on clinker cooler No 4.	Considerable reduction of dust pollution, in particular, near the plant.	18.0	2006
Filter for the clinker cooler No 2.	Installation of dust collecting equipment (EP or a bag filter) on clinker cooler No 2.	Considerable reduction of dust pollution, in particular, near the plant.	0.5	2007
Filters for cement silos.	Installation of bag filters on cement silos No 10-12.	Reduction of the amount of dust emitted into the air.	0.5 0.5 3.8	2004 2005 2006
Modernisation of cement silos.	Reconstruction of cement silos (discharging and control equipment).	Reduction of the amount of dust emitted into the air during cement discharging. Reduction of the risk of accidents with potentially big dust pollution.	1.5 0.5 2.0	2004 2005 2006
Use of alternative fuels.	Use of oil shale residues (refuse), semi-coke and other wastes in the burning process as a fuel component.	Reduction of the use of natural resources. A solution for waste recycling.	3.2 5.0 10.0	2004 2005 2006
Separator for cement mill No 1.	Reconstruction of the cement mill No 1 to be used for closed cycle grinding. Construction of a separator.	Reduction of energy consumption during cement grinding. Increase of the use of cement additives.	10.0 1.0	2005 2006

Economy and Public Image

Investments and improvements in technology have not only improved the environmental performance of Kunda Tsement. It has also helped the company to significantly reduce its costs. Total expenditure on environmental taxes and fines has decreased. Reduced fuel and electricity consumption have also cut energy costs. The company has achieved compliance with environmental regulations and improved its relations with the regional environmental authority in Rakvere and the Ministry of Environment. Undoubtedly one of the most significant outcomes is the improvement in Kunda's public image, especially vis-à-vis local people. The development has certainly contributed in a dramatic way to improve the social and public health situation in Kunda town.

During the period Kunda Nordic Tsement has won the environmental Top 10 Contest and has been declared the most environmentally friendly company in Estonia. Kunda continues to work towards its objective of being the best environmentally managed industrial company in the country. It has developed a plan to identify sites, which were polluted in the past, and carries out an inventory of the extent of the damage done to remediate the polluted sites.

Kunda Nordic Tsement is thus an example how an environmentally disastrous old heavy industry in the former Soviet Union can be transformed to modern environmentally safe production unit. It will continue its environmental activities with the aim of improving the quality of the environment and the ecosystems in and around the town of Kunda.

Table 1.4 continues...

Measure	**Content**	**Reduction of environmental impact**	**Investment** (Mln. EEK)	**Year**
Bag of filters for the fuel bunkers for oil shale mills.	Dust filters for the fuel bunkers of heating element of the fuel department.	Reduction of the amount of dust emitted into the air.	1.6	2004
On-line equipment for measuring gaseous emissions.	Installation of emission measuring equipment in accordance with the requirements laid down in the EU directive 2000/76/EC concerning waste incineration.	Reduction of the atmospheric emissions of gaseous wastes and optimization of the burning process.	0.5 1.6 0.5	2004 2005 2006
Measures concerning the reduction of dusting during storing on the industrial land fill.	Application of the watering system for the irrigation of clinker dust stored. Regular measurements in different types of weather.	Decrease of the amount of dust emitted into the air during storage on the land fill. Enables to plan the storage of dust pursuant to the conditions.	0.5 0.5 0.1	2004 2005 2006
Reconstruction of the mud and oil collector.	Procurement of the project solution and performance of the renovation.	Reduction of the risk of oil pollution in the Kunda River. Improvement of the cleaning effect.	1.5 0.6	2004 2005
Implementation of the solutions developed for the reduction of noise level.	Analysis of the projects and implementation of appropriate variants.	Reduction of the noise level and maintenance within standard.	0.6 0.7 1.3	2004 2005 2006
Increase of the return of the dust from the kilns.	Increase of the productivity of the fuller pumps of the kilns. Supply of each fuller pump with its own compressor.	Reduction of the amount of dust stored on the land fill. Reduction of the consumption of compressed air in the network. Increase of the productivity of the fuller pumps.	1.0 1.0	2004 2006
Dust collecting equipment for clinker loading trucks.	Dust collecting equipment for clinker loading.	Reduction of local dust emissions.	1.0 2.0	2006 2007
Blast furnace cement.	Equipment for producing and testing blast furnace cement.	Reduction of the share of clinker in cement and CO_2 emission.	13.0	2006 later

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The Coking Plant of Czestochowa Steelworks, Poland

1 Steel Industry in Poland

Steel Production in Silesia, Southern Poland

Silesia in southwest Poland is the heartland of Polish industrialism. Sine the 19th century, its rich finds of black coal with domestic and imported iron ore has been the basis of a large Polish and iron and steel production, expanding even more during communist years.

The industrial production was, however, causing considerable pollution. The Silesian region was at the time of the systems change, 1989, considered an environmental disaster area, reflected in, e,g, a drastically lower life expectancy and larger incidence of especially respiratory diseases, than the rest of Poland. Emissions from the mines and the coal power plants were the main causes. Most industries then used outdated technologies and had been unable to replace worn out equipment.

At the systems change new environmental policies were adopted in Poland. A few factories were closed immediately. Among the continuing industries a list of the 80 worst polluters was established ("the list of 80"), most of them in Silesia. Work started to improve these facilities. Czestochowa Steelworks was among these.

The Czestochowa Steelworks *(Huta Stali Czestochowa)* is together with Nowa Huta in Krakow, among the largest steel industries in Poland. The Czestochowa Steelworks specializes in steel sheets and produces today over 65% of steel sheets manufactured in Poland, which is a total of 1 Mln tonnes per year, used e.g.in ship building. Additionally, the Steelworks produces semi-products like blooms used mainly in pipes and tubes production, as well as metallurgic and fuel coke.

The Technology of Iron and Steel Production

Iron and steel are made by reducing iron ore with carbon. Iron ore is mixed and heated with coal in key proportions in the hut (*huta* in Polish). Carbon is added in the form of coke to produce wrought iron with 3-4% carbon content. Steel is produced when the carbon content in the iron is reduced with oxygen (air) in the further process.

Coke is thus a basic component in iron and steel production. Coke is formed as black coal is dry-heated up to 1300 °C in the process of pyrolysis. In the process up to a third of the components of the black coal are evaporated as gases or forming tar. The solid remain, the coke, consists of up to 95% of pure carbon. The coke is a porous light weight material forming large agglomerates. They are mechanically divided into smaller more manageable pieces. The process of coke production is made in a *coke works*, or coking plant.

The gases collected during coke production are mostly hydrogen, but also considerable amounts of hydrocarbons. Most of them are aliphatic e.g. methane, ethane, propane and butane. All of these are valuable energy carriers and either used for the energy needs of the production (as in Czestochowa Steelworks) or fed into the gas net of the city. At the same time

Box 2.1 Czestochowa Steelworks Coking Plant

Currently the Coking Plant has two coking batteries of stamping system of PWR 51B type. The total amount of chambers is 114 (2x57). The annual production capacity of the Coking Plant equals to 550,000-600,000 tonnes of coke, which corresponds to about 1,500-1,600 tonnes of coke per day, with an annual carbon mixture consumption of about 800,000 tonnes.

The main products of the Coking Plant include: coke (stabilized, blast-furnace, industrial-combustible, and small size-nut, peanut, quick coke), coke gas and raw coke tar.

Moreover, benzene, sodium phenolate, ammonium sulphate and sulphur are produced.

they are slightly toxic and also green house gases, considerably more potent than carbon dioxide. Another group of hydrocarbons produced are the aromatic ones, e.g. benzene, and poly-aromatic hydrocarbons, PAH. These are toxic and cancerogenic. The same can be said of the tar that is formed during coke production.

Coke production may also use considerable mounts of water. Water is added to the coke to make it more porous and easier to work out later in the process. Most of the water leaves through the chimney as vapour together with various gases. This may also be an environmental concern.

Coke Production

Czestochowa Steelworks has two main production lines for coal products. The Coke Production Section consists of the Bunker, the Fire-basket, and the Sorting Plant. The second, the Carbon Derivatives Production Department, produces chemicals, in particular the gases mentioned above.

The Coking Plant with four coking batteries was built in 1958-1962. It was expanded in 1972-1973 with two more coking batteries. The overall production capacity was then at a maximum of 2.14 Mln tonnes of coke per year.

Emissions and Environmental Concerns

The environmental impact of steel production includes the production of considerable amounts of slag, emissions to the air, and water effluents. The air impurities are the most severe, including aromatic hydrocarbons, aliphatic hydrocarbons, acidifying oxides, especially sulphur and nitrogen oxides, and carbon monoxide. These are mainly caused by coke production.

Thus the Czestochowa Steelworks in 1996 as a whole gave rise to about 200,000 tonnes of slag, ash and rubble as solid waste. Of this almost all was caused by the steel production. Emission to the air amounted to 650 tonnes of gases and particles (see Table 2.1). Almost all of this came from the coking plant. The company payed a total of 1,343,000 PLN (~335,750 Euro) in environmental charges.

Work to reduce the negative environmental impact of the coke production began already in 1985. During 1989-1991 three of the six coking batteries were closed and the remaining three were modernized and renovated. Later on, one more battery was closed, and from the mid 1990s only two are in operation. The annual capacity is 600,000 tonnes of coke, or about 1.5 to 1.6 thousand tonnes per day, that is a third of the peak capacity. About 800,000 tonnes of black coal are used in the production (2004).

2 Introducing and Certifying an EMS in the Czestochowa Steelworks Coking Plant

The Environmental Management Systems and Certification

In mid 1990s systematic work to implement an environmental management system became a priority in the company. The first certificate according to ISO 14001 was received in 1997. The Coking Plant of Czestochowa Steelworks was the second company in Poland and the second coking plant in Europe to implement a certified environmental management system according to the ISO 14001 norm. The certificates were granted by the Polish Centre for Testing and Certification (PCBC) and Bureau Veritas Quality International (BVQI) and in the year 2000 by BVQI and Polish Register of Shipping (PRS)- certification associations.

Table 2.1 *Emission to the air from Czestochowa Steelworks in 1996 (tonnes/year). Almost all of this came from the coking plant.*

Ash	SO_2	NO_2	Benzene	Aliphatic hydro-carbons	Aromatic hydro-carbons	Benzo(a)-Pyrene	CO
107	58	367	7	104	6	0.016	49

After re-audit in 2000, the company decided to work to develop an integrated management system, IMS, which finally resulted in a new certification in 2005. The integrated management system includes the environmental quality management according to ISO 9000:2000 requirements, environmental management system according to ISO 14001:1996 requirements and industrial safety management system according to PN-N (OHSAS) 18001:1999 requirements.

The company has received a number of awards recognising its good environmental work, including the Gold Medals at the 1992 World Exhibition of Innovation, Research and New Technology "Eureka" in Brussels for the modernization of the coking battery, and the prize of "Pantheon of Polish Ecology" for the introduction of the EMS.

The Environmental Management System

The EMS was used both to establish and maintain the environmental profile of the company and to safeguard that legal requirements in the area were implemented. It was used to assure a continuous improvement of environment-oriented activities.

The directives of the Coking Plant Manager became the basis for launching work on the environmental management system. The head of the department issued a statement on the action of preparing and implementing environmental management system in the department.

In early 1996 an initial investigation of the Coking Plant was performed and training of the staff within the field of environmental management system and environmental protection was launched. The whole staff of the Coking Plant was familiarized with the environmental management system, its ideas and goals, and the employees, whose job might have an influence on the environment, were additionally trained.

Firstly, the EMS was prepared according to the British Norm BS 7750:1994. Soon, however, the decision was made to change the standard to the ISO 14001 norm. The internal auditing programme started in September 1996. In March 1997 BVQI performed an initial audit to prepare the Coking Plant for the certification process. The certifying audit was performed in May 1997 and the certificate issued in June 1997. The system was then in operation up to 2003, with a re-audit in 2000.

Table 2.2 *List of the significant aspects, 1997.*

No	Aspect	Source	Significant
1	Carbon ash emission	Coal-milling Plant I – system I	yes
2	Carbon ash emission	Coal-milling Plant I – system II	yes
3	Carbon ash emission	Coal-milling Plant II – system I	yes
4	Carbon ash emission	Coal-milling Plant II – system II	yes
5	Waste production – carbon ash	Coal-milling Plant	yes
6	SO_2 emission	Coking battery No 2 (battery trailing)	yes
7	NO_x emission		yes
8	CO emission		yes
9	Ash emission		yes
10	Aromatic hydrocarbons emission		yes
11	Aliphatic hydrocarbons emission		yes
12	CS_2 emission		yes
13	NH_3 emission		yes
14	Benzene emission		yes
15	Benzo(a)pyrene emission		yes
16	Hydrogen cyanide emission		yes
17	Phenol emission		yes
18	Pyridine emission		yes
19	Emission		yes
...			
...			
159	Aromatic hydrocarbons emission	Warehouse containers	yes
160	NH_3 emission		yes
162	Benzene emission		yes
163	Hydrogen cyanide emission		yes
164	Phenol emission		yes

Rationality of the EMS

The implementation of an EMS was seen as a rational continuation of the technical investments done. It has much lower costs than investment in further new equipment or technology, and it is at the same time an organizing tool, which serves to improve the ecological awareness of the staff and decrease the negative impact on the environment. It is an investment in the organisation and the people, being one of the most effective ways of investing.

A new organisation has been established, reference and responsibilities of the people involved in management of the company detailed. A new post as Specialist in Ecological Sys-

tems was created. This organisation safeguarded a proper information flow, the control of the function of people, the technical and measurement devices, and the documentation of all data and information. It also supported the required actions.

Environmental Policy

The starting point for environmental management, according to the requirements specified by the norm of the EMS, is the establishment of an environmental policy. From the policy environmental goals are derived, after recognition of the environmental impact of the company. Goals are accomplished through actions, which limit the harmful impact of production processes on the environment. This requires that management appoint people responsible for accomplishment of these tasks within a certain timeframe and provide proper technical and financial tools. In other words, it amounts to the establishment of an environmental protection programme.

3 Environmental Work

Identifying Environmental Problems (Aspects)

The environmental work started with the identification and evaluation of potential environmental threats, so-called, aspects (see Table 2.3). When this work started we went into detail in the process of the Coking Plant. Looking into the uncontrolled emissions from the coking batteries (so-called battery-trailing) we specified a dozen aspects (e.g. carbon monoxide, aromatic hydrocarbons, aliphatic hydrocarbons, benzene, ammonia, hydrogen sulphide, phenol and other emissions). In practice it was not meaningful to divide the emission into its components, and in the next round of the identification process, emissions was considered to be one aspect. There were more such examples. Some aspects were not identified at all, which was revealed during the audit.

Establishment of criteria how to evaluate the aspects became an even bigger problem. A first criterion was the legal

Table 2.3 *List of significant aspects, 2002.*

No	Activity/product	Aspect	Status
1	Coal-milling plants	Carbon ash emission from coal-milling plant 1 and 2	S
		Waste – carbon ash precipitated in dust collectors	S
2	Coke sorting plants	Coke ash emission – W1, W2, W3, W4, W5	S
		Waste – carbon ash precipitated in dust collectors	S
3	Battery trailing (filling-in, coking, pushing-out)	Ash emission from the process of coking chambers stuffing	S
		Waste – carbon ash precipitated in dust collectors	S
		Raw coke gas emission during break-down	S
4	Coke battery firing	Dust-gas emission from batteries 2 and 4	S
5	Coke extinction	Dust-gas emission	S
		Increased dust-gas emission connected with coke tower activity at the time of break-down	S
6	Carbon derivatives (condensation, ammonia plant, benzol plant, desulfurization plant, tar and benzol store, dephenolization plant, mechanical treatment plant)	Waste production: quick coke	S
		Waste production: saturator black blende	S
		Waste production: total salts	S
		Waste production: waste sulphur	S
		Sewage discharge to sanitary sewer system during break-down	S
		Sewage discharge to storm water-industrial sewer system during break-down	S
		Increased gaseous pollutants emission in the process of coke gas purification at the time of break-down	S
7	Administrative and production activities of the Coking Plant	Waste production: left after repairs	S
		Waste production: hazardous (fluorescent lamps, batteries, waste oils)	S

limits. However, then it was hard to accept e.g. emission of coal ash from the Coal-milling Plant as a significant aspect, as the allowable emission value was 1 kg/h, and the measured emission was 0.1 kg/h; in the same way for the emissions of coke ash from the Sorting Plant, the allowable emission values was 2 kg/h, and the measured value was 0.1-0.2 kg/h level.

Other criteria involved the Environmental Policy and costs connected with an emission or aspect. When performing the evaluation according to these criteria over 150 significant aspects were identified.

However, since it became difficult to supervise so many items in a proper way, it was necessary to change the criteria. It was thus decided that emissions were to be significant aspects, if its value will exceed 50% of the value specified by the norm. Later on other criteria were also changed. The change in the definition of criteria reduced the number of significant aspects in the Coking Plant to 19. Table 2.2 shows examples of significant aspects from the 1997 list, and Table 2.3 shows a full list from 2002.

Environmental Goals

After identification and evaluation of environmental aspects, it was possible to get down to evaluation of the "Environmental Management Programme". However, in order to evaluate a programme, it is necessary to already in advance establish which goals we want to achieve.

The Coking Plant used an algorithm for environmental goals identification. Based on this the tasks and undertakings were established. As these are achieved the environmental goals are accomplished. Realization of the "Environmental Management Programme" allows the plant to develop in accordance with its environmental policy and legal requirements and constantly improve its impact on the environment.

Table 2.4 presents an example of environmental goal establishment regarding waste water. Table 2.5 shows how tasks and undertakings are identified to reach the goal.

Figure 2.1 Converter. *Steel is melted from such raw materials as pig iron, scrap and alloy additions. Photo: Stahl-Zentrum.*

Table 2.4 *Development of environmental goals regarding waste water from the coking plant.*

Significant aspect	Source	Exceeded law limit?	Incompatibility with politics?	Signals from interested parties?	Necessity for improvement?	Goal
Wastewater discharge	Wastewater treatment plant	No	No	Yes	Yes	Decrease cyanides content in wastewater

Training of Staff

Establishment and implementation of an EMS requires training and education of the employees and the whole staff to increase the environmental awareness and prepare them for the new responsibilities within the EMS implementation. The training was performed to inform the employees about:

- The meaning of acting in accordance with environmental policy and procedures as well as requirements of the environmental management system.
- Significant, current or potential impact of a workers' performance on the environment, as well as environmental benefits resulting from the improvement of their performance.
- Their tasks and responsibilities in achieving in accordance of performance with environmental policy and procedures as well as requirements of the environmental management system, together with the requirements related to readiness in case of break-downs and responding to them.
- Potential consequences of disobedience of the set operational procedures.

A detailed process was developed to identify the training needs based on linking significant environmental aspects with a corresponding post job. Next a list of posts, on which work might exert a significant influence on the environment (so-called key staff) was selected. Those key staff were given an additional, so-called detailed, training.

Training materials set for the key staff within a department, include all the information necessary for the work done on the posts in a way that assures meeting the environmental policy requirements of the department as well as the legal requirements connected with EMS, and documents for operational piloting. They were divided into four parts (see Box 2.2).

Apart from the training programme for management of the department, training for engineering-technical staff was performed. For these, the training materials were prepared in the form of a booklet including the following set of information. (1) the impact of the Coking Plant on the environment, (2) future planned changes, (3) costs connected with environmental protection, (4) information on the environmental management system and components of the system according to ISO 14001, (5) ways of implementing EMS in the plant, (6) benefits resulting from implementation of the system in the light of environmental impact.

Documents

The initial training included the whole crew of the Coking Plant. There was a special information pamphlet prepared for them, which contained short information on their responsibilities resulting from the implementation of environmental management system, department policy, significant environmental aspects, and environmental protection regulations.

Having a well-trained crew and precise identification of environmental aspects and their evaluation, it was necessary to set the range of activities of the plant, needed to be put under a detailed operational supervision. Therefore, we drew up systems documents (procedures, instructions, specifications etc.), in which operational criteria were defined. Proper monitoring

Table 2.5 *Environmental Management Programme (4 PLN~ 1 Euro).*

No	Task/subject	Deadline	Person responsible, Executor	Plan type, in which the task was included	Expected costs [PLN]	Effects
1	Testing new technology of after-generation water treatment of cyanides.	31.12. 1999	Head of the Carbon Derivatives Department/Head of the of Environmental Protection Laboratory	Included in investment costs	5,000	40% decrease in the amount of cyanides present in after-generation water by 31.12.2000 with respect to the 2nd half of 1998.
2	Construction of new installation for after-generation water treatment of cyanides.	31.06. 2000	Vice Head of the Coking Plant Department/Main power engineer	Included in investment costs	10,000	
3	Implementation of new technology for after-generation water treatment of cyanides.	31.12. 2000	Head of the Carbon Derivatives Department/Head of the Environmental Protection Laboratory	Included in investment costs	5,000	

Box 2.2 Content of the training for staff responsible for environmental management

Part I.

The environmental management system according to ISO 14001

1. Historical draft of the environmental management system
2. Description of the ISO 14001 norm
3. Overall definitions
4. Elaboration and implementation stages of EMS
5. Methodology of performing an initial inspection of the plant (wpw)
6. Documentation of the system
7. Organisational changes
8. EMS audits
9. EMS inspection by the management of the plant
10. Certification
11. Expected effects of the running EMS

Part II.

Environmental protection, the impact of the Czestochowa steelworks and coking plant on the environment

1. General information
2. Information on the plant
   - 2.1. Ecological investments in the Steelworks in the past 10 years
   - 2.2. Values characterizing the impact of the Steelworks on the environment
   - 2.3. Perspective for further planned changes with relation to ecological requirements
3. Coking Plant Department
   - 3.1. Initial information
   - 3.2. Type of pollution emitted by the Coking Plant
   - 3.3. Existing devices and installation of the Coking Plant eliminating environmental pollution
   - 3.4. Atmospheric emissions
   - 3.5. Noise
   - 3.6. Water and wastewater
   - 3.7. Soil and groundwater contamination
   - 3.8. Current way of acting in the case of a breakdown
   - 3.9. Waste
   - 3.10. Technological-production information
     - *3.10.1. Raw products*
     - *3.10.2. Products*
     - *3.10.3. Energy*
   - 3.11. Utilization of raw materials for production and as energy carriers
   - 3.12. Analysis of the impact of the Coking Plant Department on the environment
   - 3.13. Costs spent on environmental protection by the Coking Plant in 1996
4. Register of law annotations connected with environmental protection
   - 4.1. Overall part
   - 4.2. Water – overall part
   - 4.3. Air protection
   - 4.4. Wastewater
   - 4.5. Waste
   - 4.6. Decisions
   - 4.7. Internal regulations
   - 4.8. Allowable levels of pollutants in wastewater

Part III.

Environmental management system in the coking plant department

1. Introduction
2. Statement of the Head of the Coking Plant Department
3. Environmental Policy of the Coking Plant Department
4. Relations with Czestochowa Steelworks
5. The range of responsibility
6. Information transfer
7. EMS documents checklist
8. Typical irregularities causing ecological threats

Part IV.

Description of the coking plant departments

1. Carbon-sorting Plant
   - 1.1 Characteristic of equipment in the Carbon-sorting Plant
   - 1.2 Characteristic of emitters and dust collectors in the Carbon-sorting Plant
   - 1.3 Register of significant aspects of the Carbon-sorting Plant
2. Fire-basket Plant
   - 2.1 Description of the equipment in the Fire-basket Plant
   - 2.2 Characteristics of emitters and dust collectors in the Fire-basket Plant
   - 2.3 Register of significant aspects of the Fire-basket Plant
3. Carbon derivatives
4. Hazardous and flammable materials

of these areas and sticking to set operational criteria allowed a supervision over significant environmental aspects and at the same time decreases harmful environmental impact of the plant. Table 2.6 shows a list of a few procedures and instructions serving as an operational supervision tool.

4 Results of the EMS

Results of the Implemented Changes

Tables 2.7 and 2.8 show the effects of the "pro-ecological" changes in the Coking Plant between 1996 and 2004. The charges for emissions decreased to almost a quarter (see Table 2.7). The emissions (see Table 2.8) are all deceasing with the exception of carbon monoxide. The "increase" in carbon monoxide emission results from employing new measurement methods – analysers instead of gas volumetric analysis with an Orsat apparatus (after J. Kapala)

The costs of the implementation of the environmental management system did not exceed 250,000 PLN (~62,500 Euro). The value includes working time of the staff employed at the time of implementation, training costs, and the inspection carried out by the consulting and certification company. In the previous period significant costs were borne due to technical and technological modernization. They are however not directly linked to the costs of the implementation of the system.

The issuing of the environmental management system certificate was certainly one of the most important points. As a result the Coking Plant was taken off the list of companies having the most harmful impact on the environment (so-called "80 list").

Many of the benefits resulting from implementation of the environmental management system cannot be assessed in terms of financial benefits. It involves improvement of ecological awareness of the staff, arrangement of the activities connected with environmental protection, improvement of how the department is evaluated by others, and so on.

In addition it should be mentioned that the coking plant emitted 89,165 tonnes of carbon dioxide in 2004, which was less than half of the 199,670 tonnes emitted from the Steel works as a whole.

The charges caused by emissions were a total of 654,631 PLN (~163,658 Euro). Of this 368,509 PLN (~92,127 Euro) or almost half, was caused by the coking plant. The solid waste from steel production was 1,111 tonnes.

Table 2.6 *List of documents used in the environmental management system illustrated by some procedures and operational instructions.*

Identification number	Title of the document
PC 6.1/10	Waste handling procedure in the Coking Plant
PC 6.1/11	Energy management procedure in the Coking Plant
PC 6.2/1	A procedure of controlling, monitoring and process measurement that might have a significant influence on the environment
PC 6.5/1	Identification and evaluation of potential break-down events; prevention of break-downs and acting at the time and after a break-down in the Coking Plant
ICS 0001	Seasonal waste handling manual
ICS 0101	Ash from dust collectors from Coal and Sorting Plants handling manual
ICS 0201	Coke ash from Dust Extraction Plant handling manual
ICS 0301	Total salts handling manual
ICR 0108	Dust extraction of the Coal-milling Plant handling manual
ICR 0123	Dust collection installation of the Sorting Plant operation manual

Cost

The argument often used against implementation of an environmental management system is high cost. However it is not as high as often suspected. The basic cost is the amount of time spent on the establishment and implementation of the system. For a group composed of a few hundreds of people, the full-time work done by one or two people is enough, and from several to a dozen percent of time spent by a group composed of ten up to fifteen people. It is worth making a comparison between these costs and total environmental protection costs in a company, including not only charges and fines, but also investments, repairs and running environmental protection devices, waste and by-products processing costs, energy loss (it is also a waste due to, e.g. carbon dioxide) and others.

The costs for the implementation of an EMS have to be considered as insignificant in comparison with all technical investments. The issue of costs and effects resulting from the implementation of the environmental management system deserves to be handled separately and in more detail.

The above mentioned difficulties should not become an obstacle for effective implementation of the management system. Nonetheless, it is better to be aware of them and prepare oneself properly for them rather than to allow them to appear step by step in the cause of work. The establishment and implementation of the system has to be based on a serious and considerate attitude of the company to this matter.

Figure 2.2 Steel heavy plates. *Technical solutions used in the rolling mill enable manufacturing of many categories of steel plates with various properties and applications. Photo: Stahl-Zentrum.*

Table 2.7 *Environmental fees charged to the Czestochowa Coking Plant in the years 1996-2004 (4 PLN~1 Euro).*

Year	Charge [PLN]
1996	1 342 943
1997	560 000
2001	303 436
2002	283 233
2003	368 223
2004	368 509

Table 2.8 *Emission of pollutants to the atmosphere from the Czestochowa Coking plant in the years 1996-2004.*

	Emission (tonnes/year)							
Year	ash	SO_2	NO_2	Benzene	Aliphatic hydrocarbons	Aromatic hydrocarbons	Benzo(a) Pyrene	CO
1996	107	58	367	7	104	6	0.016	49
1997	72	38	312	2	62	5	0.010	249
2001	72	33	465	1.2	39	3.0	0.006	311
2002	67	42	380	1.2	40	2.4	0.005	261
2003	100	42	435	1.9	59	4.1	0.009	313
2004	90.5	43.6	406	1.8	56	5.6	0.009	455

Recommendations

The EMS in the Coking Plant Department was implemented in a very good fashion. The management of the department was deeply involved and the employees had a rather high environmental awareness.

The advantages of the EMS begin to become more and more visible, especially for the Coking Plant staff. The staff training programme resulted in increased environmental awareness, attention paid to the quality of the work, and its influence (real and potential) on the environment. The procedures and systems established allow a better control both of production and management of the department. Communication is constantly being improved.

The key-point for successful implementation of an EMS is the support of the management of the company. Without the support of the management, the cooperation between workers are unlikely to occur. The management serves to ensure that the project meets the needs of the whole organisation, and not only a part of it.

It is worth summarising some experiences from our work on implementation of the system.

These are in short:

- *The management of the company should be responsible for the project*. It is then more likely that they take an active part. If the project is carried out by specialists, it is easier for the management to neglect the results of the work. When the management takes part in the establishment of the goals of the project, they are better linked to the real circumstances of the company.
- *It is necessary to follow the advice of the management for each stage*. Such a procedure protects the project from deformation, as well as increases the management openness for suggested solutions.

- *One should not allow technical aspects to become a dominating issue*. It is necessary to take into consideration less rational aspects of the problem of the project implementation. It mainly revolves around the influence of people on the suggested changes and solutions and how they affect people.
- *Collection and interpretation of all the data should be processed quickly and efficiently*. A long process of collecting data is not in favour of realizing the project. Quick and efficient collection of information will make the project implementation process shorter and increase its usefulness.
- *One has to be prepared for difficulties when implementing a new system*. If the management is able to foresee the problems and is preparing for them, they will, however, not have a negative impact on the effectiveness of the project. The management should cooperate with employees in the course of establishing ideas and suggestions.
- *It is essential to keep a register of all records connected with the implementation of the EMS*. They are the basis for making proper decisions and serve as an evidence for its proper function. As the project proceeds, assumptions and information initially incorporated might become obsolete. A record of previous measures made will then help in solving such problems in the future.

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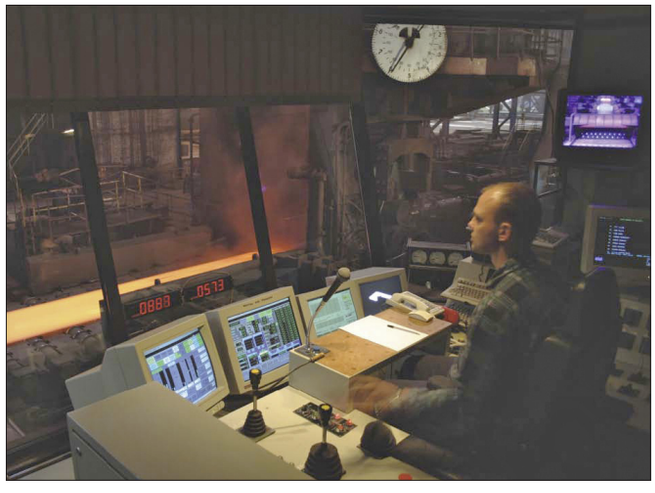
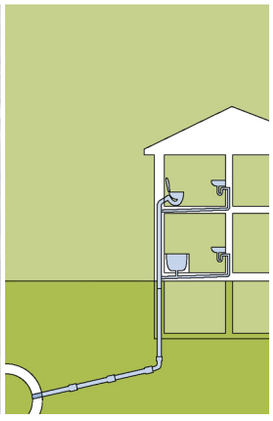


Figure 2.3 The central laboratory. *Examining chemical composition of steel, refractory materials, ferroalloys, slag, alloys, steam and coking coal, effluents and potable water.*





Integrated Management System for the Wastewater Treatment Plants of the City of Cologne, Germany

1 Wastewater Treatment in Cologne

The Cologne Wastewater Company

The one million city of Cologne is the fourth largest city in Germany. The size of the city requires a well-functioning wastewater treatment to protect both people and the environment. The Cologne Wastewater Company *(Stadtentwässerungsbetriebe Köln – StEB)* was established in May 2001 as it took over the previously publicly owned Office for Wastewater Treatment with its five treatment plants, to coordinate wastewater management in an area of 405 km^2, serving close to one million people and several industries (see Figure 3.1).

Wastewater treatment in Cologne is, however, already more than 100 years old. Modern dewatering of the area began at the end of the 19th century, when Carl Steuernagel, the most prominent planner at the time, built sewers, even using some remains of the old Roman cloaks. The first wastewater treatment plant was built in the suburb of Niehl in 1905.

As environmental concerns became more important in the 1970's several more wastewater treatment plants were built. The 1980's saw further changes to a more environmentally friendly system of wastewater treatment and disposal, as the project "Waste Water 2000" was initiated. The innovative character of the project was recognized in an exhibit at the World Exhibition EXPO 2000.

The creation of StEB led to a process of restructuring, deregulation, liberalisation as well as improved economy of wastewater management in Cologne. Environmental and economic sustainability were the guiding principles. Huge investments, made under the "Waste Water 2000" Programme, created a good market position of the new company. Today StEB has a very high standard even in European or international comparisons.

During the period 2001–2004 the company introduced an Integrated Management System (IMS). The IMS consists of three components: an environmental management system (EMS), a Quality Management System (QMS) and a Risk Management and Work Safety System. The introduction of the Management Systems has resulted in clear improvements for the environmental situation in the sewer systems and wastewater treatment plants as will be described below. Further information on Cologne Wastewater Company can be found at http://www.steb-koeln.de.

The Organisation and Activities

The creation of Cologne Wastewater Company StEB in 2001 was followed by a re-organisation, a process completed in 2004. Today Cologne Wastewater StEB is divided into two main departments, Technology and Management (see Figure 3.2). The Management Department is responsible for administration, purchase, legal issues, and finances and controlling as well as IT-tasks. The Technology Department on the other hand is responsible for all planning and construction processes within the sewer system, operation of the sewer system and the

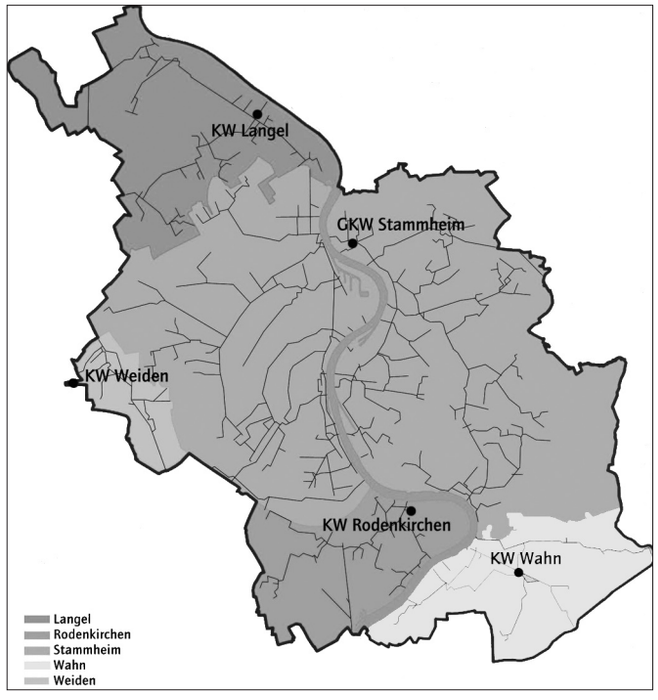


Figure 3.1 Wastewater Treatment area of Cologne StEB.
The area served by the company is about 405 km². The five wastewater treatment plants are, from top, KW Langel, Stammheim, Weiden, Rodenkirchen and Wahn. A special challenge is the high amount of water protection areas (about 46%), which make the treatment of wastewater more difficult.

wastewater treatment plants, the wastewater institute (laboratories), and surveying as well as property drainage. A number of administrative departments support the work. As will be described below, an Environmental Management System Office, working under the Technology Department, is responsible for the entire Integrated Management System, IMS.

Cologne Wastewater Company StEB has today (January 2005) about 550 employees. Since the company offers most services concerning wastewater treatment, employees with all kinds of professional competencies – chemists, engineers, technicians etc. – are found in the organisation. Table 3.1 shows the operational facilities under the responsibility of StEB in 1987 and 2003. The table demonstrates the considerable expansions made during the time period, especially concerning the amount of rainwater basins and pump stations, which had the highest relative increase.

Within the area of Cologne, the company is responsible for all tasks concerning wastewater disposal, both for public and private customers. Annually about 40 million Euro are invested into improvement and renewal of the sewage network. The know-how gained over years is also offered to other organisations and local authorities. This includes consulting tasks as well as implementation measures. In detail the services for the public sector include:

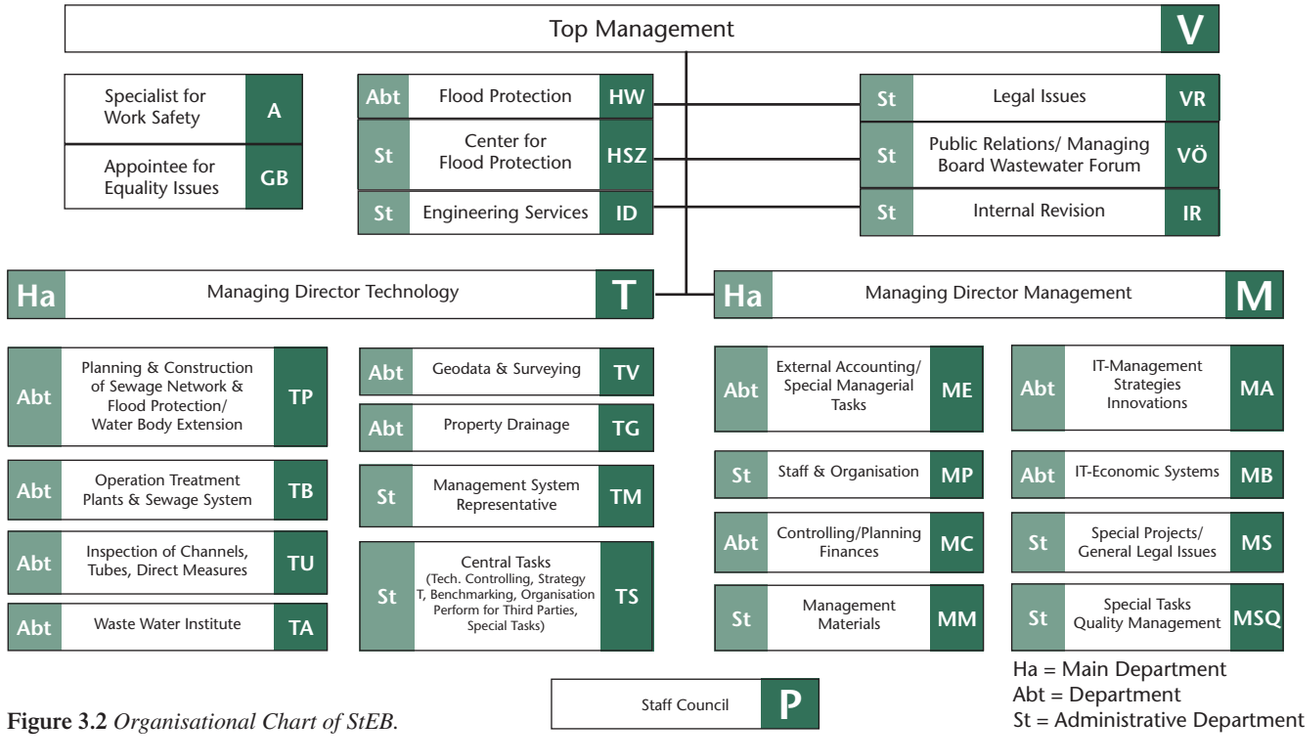


Figure 3.2 *Organisational Chart of StEB.*

- Drainage and collection of wastewater through the sewage network to the wastewater treatment plants.
- Cleaning of wastewater in wastewater treatment plants.
- Re-feeding of cleaned wastewater into water bodies.
- Disposal or recovery of residues from wastewater treatment and cleaning of sewers.
- Differentiated collection, drainage and treatment of rainwater.
- Construction, maintenance and renewal of sewer networks and wastewater treatment plants.
- Optimization of sewer systems with respect to environmental, technical and economic issues.
- Disposal of excrements of all types (e.g. from small treatment plants, pits or chemical toilets).
- Sampling and analysis of wastewater and residues from wastewater cleaning.

And for the private sector:

- Planning and advice of all types concerning wastewater disposal.
- Disposal of fats and fat-containing food residues.
- Management of private dewatering systems (home connections and lines).
- Operation control of private wastewater drainages and wastewater treatment plants.
- Sampling and analysis of wastewater and residues from wastewater cleaning.

These services are offered through the different sections of responsibility presented in Figure 3.2. One of the major objectives of StEB is reductions of the fees that the customers are charged. A series of large investments has made this possible. Figure 3.3 shows that the fees could be lowered and stabilized at about the same level as in 1993.

Table 3.1 *Operational Facilities StEB.*

Type	1987	2003	Unit
Sewer network	2,160	2,400	km
– accessible	565	630	km
– not accessible	1,595	1,770	km
Dewatered area	n. a.	155	km^2
Area of the City of Cologne	405	405	km^2
Share of water protection areas of city area	n. a.	46	%
Share of people connected	n. a.	980,000*	number
Connected plots (estimated)	n. a.	130,000	number
Not yet connected plots	n. a.	550	
Pump stations	91	134	number
Rainwater basins	4	77	number
Flood gate valves	490	570	number
Operating gate valves	140	270	number
Waste water treatment plants	6	4 (5 incl. Wahn)	number

* 99.7% of Colognes population.

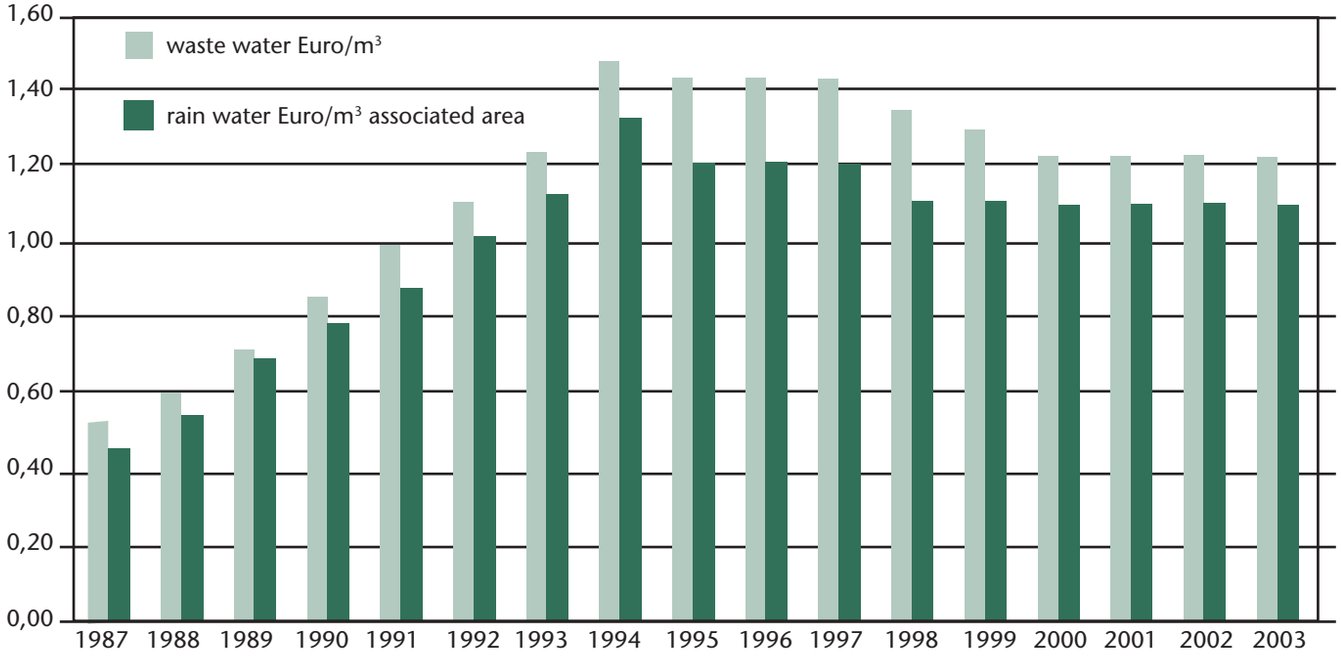


Figure 3.3 *Development of wastewater charges in Cologne.*

2 Environmental Management

The Environmental Management System

For a long time, environmental issues have had an important role in Cologne Wastewater Company. In the end of the 1990's the company decided to introduce an environmental management system to ensure good environmental performance of their activities. In 1999 four of the wastewater treatment plants (Stammheim, Langel, Weiden and Rodenkirchen, see Figure 3.1) were certified according to EMAS. In February 2003 they were re-certified, this time according to EMAS II.

In 2002 a project was initiated to integrate the existing management systems into one, overall system, an Integrated Management System, IMS. This was achieved in 2004 when the organisation was re-registered according to EMAS and certified according to the Quality Management DIN EN ISO 9001:2000 and Environmental Management DIN EN ISO 14001:1996, as well as introduced risk management and work safety. All systems are integral parts of the IMS. This means that all processes within the organisation are designed with respect to environmental, risk, quality and work safety and health requirements.

Three main requirements are pursued for the management system:

1. Proof of a process of continuous improvement has to be shown regularly to ensure the sustainability of the IMS.
2. Compliance with legal requirements, also part of responsibility of the EMS, has to be ensured.
3. Ensure the use of best available techniques, BAT, in environmental protection, if economically viable.

To achieve these goals a range of targets and objectives were implemented. The most important of these are:

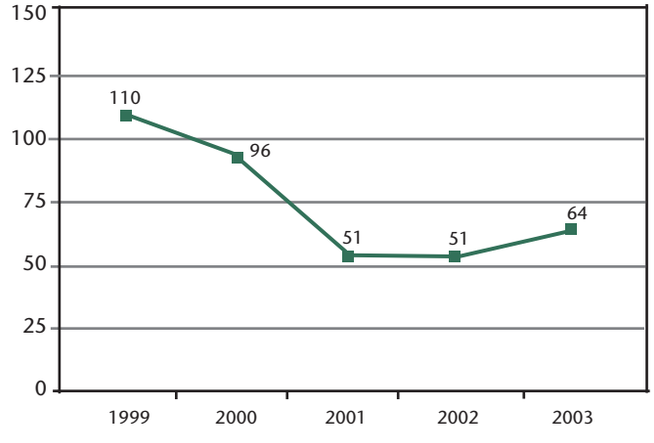


Figure 3.4 *Number of complaints caused by odour emission from the Stammheim waste water treatment plant 1999-2003.*

- Complete documentation of all processes within the company to create a consistent and reproducible work standard in all parts of the organisation.
- Further documentation of a large number of supporting activities within these processes (e.g. work instructions, checklists, training plans, inspection instructions etc.).
- Upgrading of a database on environmental legislation, which makes it easy to identify relevant regulations and to connect these to internal processes.
- Establishment of an extensive environment and quality programme with a number of measurable objectives and measures to eradicate weaknesses and to identify optimization possibilities.
- Further development of a training programme for the employees to inform them better about the IMS.
- Introduction of performance figures to measure environmental and quality performance and to control environmental aspects.
- Introduction of an extensive audit programme to measure target completion and performance within the IMS and to enable corrective measures.

Environmental Policy and Environmental Targets

In 2003 the environmental policy was integrated into the mission statement of the company. Since its first certification, technical and administrative processes have been continuously developed to meet the increasing demands stated in the environmental policy.

The environmental policy of Cologne Wastewater Company StEB sets a series of environmental objectives, such as the commitment to prevent or reduce environmental impacts, and the commitment to comply with the environmental legislation, or over-comply, if economically viable. A large number of objectives and targets set in previous years have already been achieved. These include:

- Validation/certification of the entire company according to EMAS 2, DIN EN ISO 14001, DIN EN ISO 9001:2000.
- Reduction of odour emission in waste water treatment plant Stammheim through new constructions (see Figure 3.4).
- Increase of operating safety in the same treatment plant by installing an extra pump station.
- Waste reduction in treatment plant Weiden.
- Reduction of energy consumption in Stammheim with 7% compared to 1999.

The new objectives and targets were set and reached in 2004. These included decreased energy consumption by installing a new ventilation system at Stammheim WWTP. The

Figure 3.5 *Sewer inspection and rehabilition.*

other environmental goals are still worked on. The operating safety will be increased by optimizing the pump operations and better inspections of the sewer network (see Figure 3.5) as well as the reduction of the emission of hazardous substances. Noise is to be reduced, as this is one of the major nuisances, by using more noise-reduced vehicles and machinery on construction sites. Environmental protection and work safety will be improved further, for instance, by decreasing the amount of hazardous substances used. Furthermore, environmental awareness of new employees needs to be improved. Special training programmes are introduced to solve this problem.

Environmental Work in the Company

The work on improved environmental performance in Cologne Wastewater Company StEB is varied and far reaching. Both direct and indirect aspects are considered in the EMS.

Direct aspects are dominating in the daily activities. They include:

- Emissions into atmosphere.
- Discharge into water bodies.
- Prevention, usage, recycling and disposal of waste, especially hazardous waste.
- Usage and pollution of soil.
- Use of natural resources (including energy).
- Local disturbances (e.g. noise, odour).
- Dangers resulting from accidents and emergencies.

Indirect aspects play a more important roll in the strategic sector and involve mainly administrative and planning decisions within the company and the environmental performance and environmental behaviour of contractors, sub-contractors and suppliers.

The very nature of the activities of StEB – wastewater treatment – of course is positive for the environment: the water which flows into the wastewater treatment plants is being treated and leaves the plants less polluted. However there are some problem areas. One is transport. Even if most wastewater is transported to the treatment plants through the sewer network (see Figure 3.9), in some exceptional cases it is transported with tank cars. Required materials such as spare parts or chemicals are also transported with trucks to the treatment plants. Another issue which has been receiving special attention in past years is disturbance from odour. Constructions were improved and much research on odour prevention has been carried out to reduce bad smell.

Already during planning and constructing, possible environmental problems are considered, mainly energy consumption and resource use. The main resources needed in the wastewater treatment plants and in the sewer network are:

- Energy (electricity, natural gas, sewage gas, heating oil, diesel).
- Operational resources (aid materials, conditioners, chemicals, water hazardous materials, hazardous materials etc.).
- Fresh water.
- Oils, fats, lubricants.
- Cleaning materials.
- Other consumables.

The company has successfully improved its environmental performance on several of the issues mentioned. Figure 3.6 shows the development of sludge treatment. Disposal of sludge on landfills has been completely abolished, as the use for fertilising agricultural land and for fermentation to produce biogas for energy purposes increased.

A negative trend, on the other hand, is the increased specific emission of CO_2 per m^3 waste water (see Figure 3.7). This can be traced back to a number of factors. It is not only the energy sources used, the way of producing energy and the amount of mixed water transported, but also other factors such as pollution load, oxygen need for biological cleaning process, and the amount of sludge. Carbon dioxide emissions is continuously monitored and measures for reduction will be implemented.

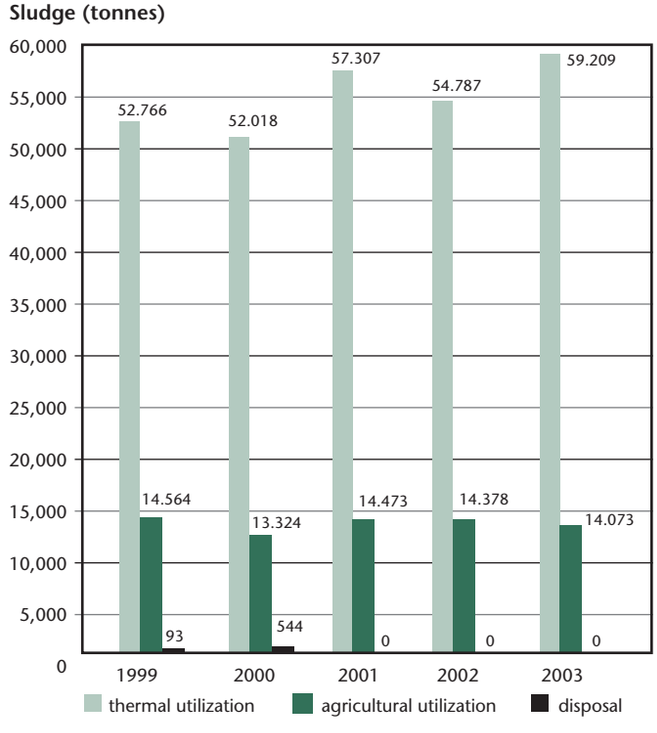


Figure 3.6 Sewage sludge management. *Amount of sludge produced and its end usage.*

The Environmental Management System Office

In Cologne Wastewater, an office for environmental management with one head manager and two personnel is working with both the EMS and the IMS (Risk Management and Work Safety is managed by a different organisation). In addition EMS coordinators are found in each of the individual departments. The office is responsible for maintaining and improving the IMS, and handling the tasks occurring on a regular basis, such as regular internal audits or advice with implementation of improvement. The environmental management office further organizes monthly meetings with the heads of the different departments of the technical branch of the StEB to discuss performance of, and activities within the IMS. The office is also responsible for communicating the management systems within the different departments. They also carry out audits. Four times a year a larger meeting is organised between the management system representative and the coordinators with the aim of updating quality and environmental issues and keeping the IMS functioning.

Communications play an important role in active environmental protection. The monthly meeting are one form of communicating the IMS to the employees, another is the publication of a paper with information on the IMS. Stakeholders have been informed for a number of years, brochures are available in the wastewater treatment plants and visits to the plants can be booked. Other measures include education for school children and adults aimed at increasing environmental awareness.

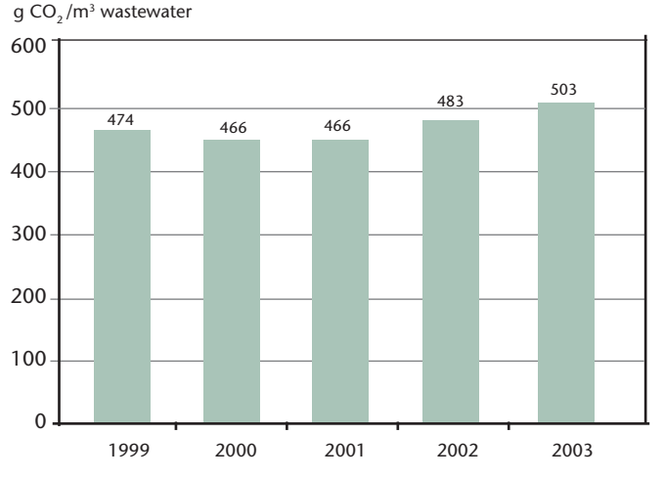


Figure 3.7 *Specific CO_2 emissions from the wastewater treatment plant.*

Training is performed regularly to increase awareness among the employees. A detailed training plan is updated annually, using comments and statements made by the employees during and after the training sessions. Most training relates to health and safety as well as environmental issues that the employees come in contact with, for example how to handle dangerous chemicals, what to do in case of an emergency or how to prevent nuisances for neighbours of the wastewater treatment plants.

The first audit of the waste water treatment plants, carried out in 1999, led to the development of a number of objectives and measures for improvement of the environmental situation. Internal audits were then carried out in 2000 and 2001 to test the EMS. In 2003 an external auditor was again checking the company. The audit showed a great conformity with the requirements of EMAS and a good performance concerning reaching the set targets.

Figure 3.9 *Construction of the sewer network.*

3 Future Plans

Environmental Innovations – energy recovery

In the past years a number of environmental innovations were introduced in the StEB. One of them is the use of biogas, methane, obtained from fermentation of sewage sludge. The biogas is burned in combined heat and power plants (CHP). The heat generated is enough to completely cover the heating needs of the wastewater treatment plants, while the electricity produced covers 50 percent of their electricity demand. The biogas incineration leads to emission of CO_2 and NO_x, although this CO_2 emission does not contribute to global warming since it is not of fossil origin. The nitrogen oxides are mostly eliminated from the flue gases at least in the largest wastewater treatment plant, Stammheim.

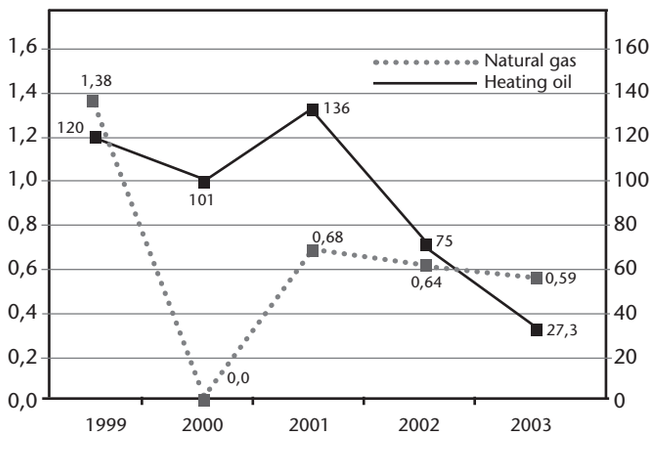


Figure 3.8 *Consumption of natural gas and heating oil.*

The wastewater treatment plant Rodenkirchen on the other hand uses a totally different way of producing energy. A fuel cell has been installed here to produce electricity from hydrogen extracted from the biogas.

As a result from energy recovery from sludge the use of fossil (natural) gas and heating oil has been reduced considerably (see Figure 3.8).

Long-term Improvements

The company plans to improve and optimize its IMS further and to improve the environmental performance. One of the main tasks in the future will be to finish the re-organisation process and adapt the IMS to the new structure. A large number of ambitious objectives and targets promises to further increase the efficiency and usefulness of the IMS. One of the focal points will be faster processing of information and tasks within the organisation and an improved operation safety.

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This case study is based on information found on StEB´s home page as well as material provided by the Management system representative.

The Environmental Management System at the Municipal Bus Company in Uppsala, Sweden

1 The Municipal Bus Company

Public Transport in Uppsala

Public transport in and around Uppsala, today the fourth largest city in Sweden with about 180,000 inhabitants, started in 1906 with tram traffic. Buses appeared in 1923, but trams dominated the scene until 1953, when they were replaced with buses. Gamla Uppsala Buss AB, is the company running municipal transport in the city. It is owned by Uppsala Municipality and its business agency Uppsala City AB. It is one of Sweden's largest municipally owned bus companies. Its premises are located in central Uppsala, and include offices, workshop buildings, garages, and parking for the company's buses.

Since 1996, Gamla Uppsala Buss AB, is the entrepreneur for and operator of public bus transportation within the Uppsala area. However, it is the responsible local government agency (the purchaser) that determines routes, timetables, ticket prices, vehicle disposition, the interior and exterior design (green), etc. The company operates 166 buses, of which 46 are biogas fuelled. The number of staff is about 485 of whom 405 are bus drivers. The economic turnover 2003 was 210 million SEK (~22 million Euro).

Background for the EMS and Certification

Environmental problems have reached such large proportions that it is unlikely that the next generation will be able to live in the same way as we do. New patterns that are ecologically sustainable and economically robust must be developed. We must begin to examine our sphere of activity and actively work towards conserving, recycling and reusing whatever materials we can.

In the mid-1990s, the public transport sector experienced a change. Responsibility for transportation services was divided between a purchaser (the responsible government agency) and an executor. This in turn led to greater competition and more explicit purchase requirements. Purchasers began, amongst other things, to place greater demands on the entrepreneurs' environmental work, and there was an expectation that this would increase in the future.

In light of these circumstances, the management of Gamla Uppsala Buss decided that the company would implement an environmental management system, and that the ambition would be to achieve ISO 14001 certification. Aside from the pure environmental benefit and the gained competitive advantage, they realized that an environmental management system could lead to greater efficiency within the entire operation.

The company's owner (Uppsala Municipality) was also positive towards implementation of an environmental management system as it was in line with the municipality's own environmental work, e.g., with Agenda 21. An important part of this was the simultaneous efforts by the city to establish a biogas production plant in Uppsala. It was based on fermentation of organic waste, mostly from the slaughterhouse (Swedish Meat, Inc.), one of the large industries in the city.

Gamla Uppsala Buss AB

Number of vehicles 2003/2004:
166, of which 46 are biogas fuelled.
Owner: Uppsala City, Inc., and Uppsala Municipality.
Turnover 2003: about 210 million SEK (~22 million Euro).

Activities
Gamla Uppsala Buss AB (GUB), established already in 1906 as Uppsala Trams, is since 1996 the entrepreneur for and operator of public bus transportation within the Uppsala area. The transportation services include:

- Routes within the Uppsala area. The company carries out 100% of Uppsala's public transportation.
- Transportation services for old and disabled persons. GUB carries out most of such transportation within the municipality.
- School and special school transportation.
- Book bus services.
- Contract transportation services for schools and other customers within Uppsala Municipality.

Organisation
Number of staff is 485 of whom 405 are bus drivers. The support functions needed for the company's daily operation include:

Personnel Department: Hiring of employees, education, wages, insurance and ID cards.

Transportation Department: Daily bus transports, traffic management, staff management, ticket sales and planning of services.

Technical Department: Service, maintenance, repairs and acquisition of buses. Property administration.

Financial Department: Economic transactions and financial reports.

The work began in the beginning of 1997 and eventually resulted in certification according to SS-EN ISO 14001:1996 in October 1998.

2 Implementing the EMS

Environmental Review and Training

The first step was to train key personnel in environmental management systems with the help of an external consultant. In conjunction with this, an environmental review was carried out, where a rough check was made of the company's environmental performance.

Some initial information about implementation of an environmental management system and what in general it would mean was given to all staff. Shortly thereafter, basic environmental training for both bus drivers and other staff began.

The next step was to carry out an environmental audit, where the activities within the company that have an environmental impact were identified. The environmental audit presented a description of improvement possibilities and goal areas. In addition routines were identified that would have to be implemented in order to meet the requirements of the ISO 14001 standard.

The management of Gamla Uppsala Buss decided to divide responsibility for their environmental work according to the division of responsibility already in place. The Technical Manager was appointed Environmental Coordinator and Management Representative on environmental issues. He was thereby given overall responsibility for work on the environmental management system. To assist him, he had an environmental coordinator and a group of staff referred to as the environmental group.

Otherwise, each department within the company was responsible for carrying out the environmental work according to the plans, and every individual employee was responsible for their part of the environmental work.

The environmental group consisted of staff from different parts of the operation, including the management group, and their task was to work out policies and routines for the environmental work. When the group was formed, the members received more extensive training in certain important areas.

One of the first tasks was to work out an environmental policy for Gamla Uppsala Buss. The policy is based on the environmental audit, and is the foundation of the company's environmental work.

Audits and Certifications

The environmental group used the established practices in the company, both documented and undocumented, as the start-

Figure 4.1 *The garage of Gamla Uppsala Buss AB.*

ing point for working out the different routines. Later, during implementation of the system, this was one of the strengths, as staff was familiar with several of the practices/routines. As well, the practices/routines dealing with quality and work environment were included in the environmental management system. Thus, an integrated system was established. The governing documents (policies and practices/routines) were collected in a binder, the so-called Golden Binder.

Using the environmental audit as a basis, the important environmental aspects were identified, and based on these and the environmental policy; environmental goals were formulated, both long-term and short-term.

Work to implement the system in the company then followed. The management and environmental group worked on information for bus drivers and other staff. Nine staff members were chosen and trained as internal auditors.

In autumn 1998, the certification audit was carried out by SEMKO-DEKRA Certification Inc., and Gamla Uppsala Buss received ISO 14001 certification on October 28, 1998. Since then, follow-up audits have been carried out every six months to analyse and evaluate the work on continual improvement.

Introducing the Environmental Management System

Environmental review ► Training in environmental management systems ► Basic environmental training start 1997 ►
Environmental review January 1998 ► Division of responsibility Environmental group ► Environmental policy March 1998 ►
Practices/routines ► Environmental goals ► Training of internal auditors ► Implementation ►
ISO 14001 certification October 1998 ► Follow-up audits twice annually ► Certified

Environmental Policy

The Environmental Policy, established in March 1998 has three basic components. These states that Gamla Uppsala Buss, GUB, will:

- In all its operations, continually strive to minimise negative effects on the environment.
- Offer environmentally friendly public transportation.
- Inform customers, clients and staff about environmentally friendly public transportation.

GUB will achieve this by:

- Efficient use of materials, energy and other resources consumed in all operations.
- Viewing active environmental work as a means of competing and a condition for long-term survival in the market.
- Working on preventative initiatives with regards to emissions, waste and other environmental disturbances.
- Training all staff members so that they can participate in the company's environmental work; proposals for measures to improve environmental performance will be actively encouraged and examined.
- Placing demands on our suppliers to introduce and maintain an acceptable environmental standard.
- Actively and positively taking part in experimental activity that our employer wants to carry out in order to reduce the environmental impact of public transit.
- Informing our employer and other interested parties about our commitments and our results in the environmental area, e.g., in the annual report.
- Regarding environmental laws and regulations as a minimum requirement in our environmental work and adapting the environmental management system so that it meets ISO 14001 requirements.

Environmental Goals

The environmental policy was made operational by the formulation of goals. The environmental goals that the company has chosen to work with are based on the activities within the operation that have the greatest environmental impact:

Goal 1: We will reduce emissions of dangerous substances and particles.

Goal 2: We will, through continual training and our own commitment, as well as through cooperation with customers, authorities, the branch and suppliers, actively work to prevent and minimise environmental impact.

The overall goals are broken down into detailed goals, which are measured and subject to continuous follow-up. Every detailed goal has an action programme where the background, purpose, schedule, responsibility and follow-up are clarified.

Detailed goal 1.1:
We will reduce the fuel consumption of our buses.

Detailed goal 1.2:
We will reduce the number of changes of buses during traffic.

Detailed goal 1.3:
We will reduce the number of tire changes due to side damage.

Detailed goal 1.4:
We will implement a water purification system for the vehicle wash water.

Detailed goal 2.1:
We will create internal and external networks for an improved exchange of experiences and improvement possibilities.

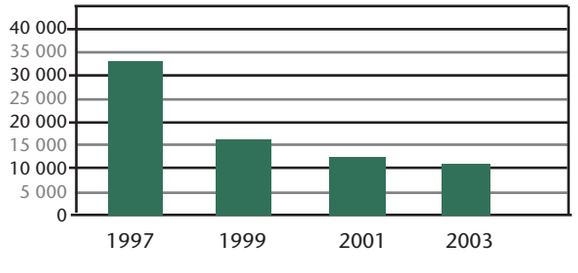

Figure 4.2 *Glycol Consumption in GUB (litres/year).*

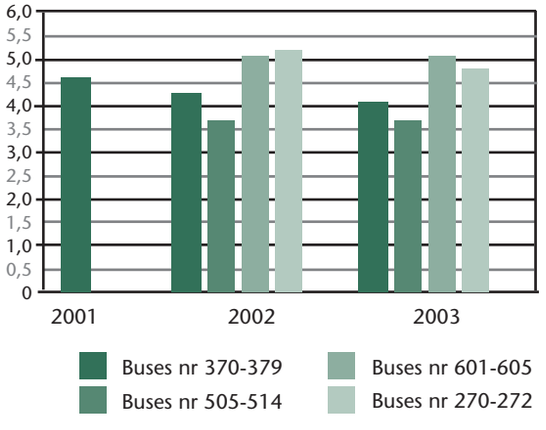

Figure 4.3 *Average consumption of diesel fuel (litres/10km) for buses 370-379 all year, July-December for the other groups of buses.*

Practices – an Organisation for Implementing the Policies

It has been important for the company management to have a vital environmental management system where descriptions from the governing documents are actually applied in the operation. It was realised from the beginning that in order to achieve this, staff had to be involved in development of the environmental work. Therefore, work groups were established that consisted of staff, which represented different parts of the operation. These groups have a more formal responsibility for the company's environmental work and are, together with the company management, responsible for development of the work.

- Environmental group
- Chemicals group
- Internal auditors

The work group method has been very successful and facilitated implementation of the environmental management system. The staff members that make up the groups have acted as ambassadors within the operation for the environmental work and have been able to describe the background to implemented routines for other staff members. In this way, an increased understanding of the environmental work and for everyone's responsibility has been achieved within the organisation.

3 Results of the Environmental Work 1999–2004

Practical Improvements

The following points are some of the improvements that the environmental management system of Gamla Uppsala Buss has led to:

- All staff members have taken a basic environmental training course. This course is now included in the introductory training of new employees.
- A thorough management system with regard to both the environment and the working environment, as well as quality to some degree.
- A functioning deviation reporting with cause analysis and corrective measures.
- Environmental evaluation is carried out for the chemicals used in the operation, and as a result, several products have been replaced with more environmentally friendly alternatives.
- Stocktaking and cataloguing of the chemical products in the operation, as well as safe storage of the products.
- Training of all drivers in "heavy eco driving" (HED, economic driving) was carried out in 2002. HED is now included in the company's internal basic training for newly employed drivers. In cooperation with Anders af Wåhlberg, Dept. of Psychology, Uppsala University, a study of the effects of HED training was done by a follow-up of the fuel consumption of five GUB buses. The effects of a number of other parameters were included in the study. This project took place during the period 2001-01-07 to 2004-06-30 and is documented in several research reports (see References).
- Mounting digital gauges (Econen) for direct reporting of fuel consumption on about 30 buses. This gives drivers direct feedback on how fuel efficient their driving is.
- Separation of waste for recycling was implemented in all parts of the operation in 2001.
- Reduced glycol consumption; a reduction of 68% during 1997-2003 (see Figure 4.2).
- Reduced diesel consumption in certain groups of buses (HED training began in the year 2002), (see Figure 4.3).
- Increased number of kilometres driven using biogas fuel (the year 2001=21% biogas, the year 2003=23% biogas).
- Adaptation of the bus washing detergent dosage to prevailing weather conditions.
- Some water reuse implemented in the washing hall, which contributed to reduced consumption of fresh water.
- Increased emergency preparedness regarding leakage and spills from machines and vehicles.
- Improved environmental performance of the vehicle fleet through purchase of buses with a higher environmental rating, which contributes to reduced carbon dioxide emissions (see Figure 4.4).
- Increased awareness of environmental responsibility and environmental work among all the staff.

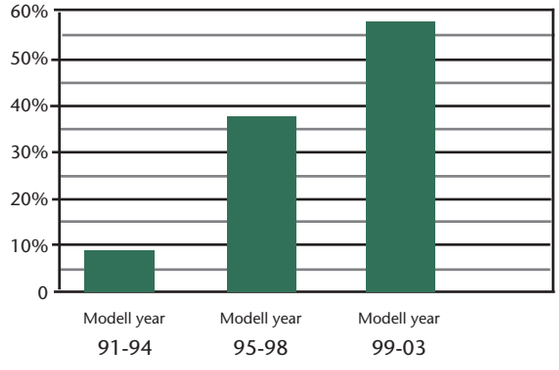

Figure 4.4 *Environmental rating of the GUB vehicle fleet.*

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Implementing and Maintaining an EMS at the University of Applied Sciences Zittau/Görlitz, Germany

1 Introducing EMS in a University

The University of Zittau/Görlitz

The University of Applied Sciences (Fachhochschule) Zittau/Görlitz, was founded in 1992 based on a former well renowned University School of Engineering for Electronics and Information Processing. It is located in the eastern part of the Federal State of Saxony right where the Polish, Czech and German borders meet. The University is resident at two locations, Zittau and Görlitz, with a distance of 35 km between them. The university has some 400 employees and close to 4,000 students. The Zittau campus has a focus on engineering and natural sciences, while the Görlitz campus is dealing with social and computer sciences (see Box 5.1). At present (2004) 5,000 m^2 of new laboratories and lecture halls are being built. The external funding for R&D amounts to ca. 4.2 Mln. Euro p.a; of this some 25% is environmentally related.

Educational institutions in Germany currently suffer several problems such as limited budgets and, in some parts of Germany, the consequences of limited demographic growth. Eastern Germany also experiences a considerable out-migration of young people to the west. The serious threats posed by reduced student numbers after 2007/08 and increasing competition means that universities need to pursue strategies to make themselves more attractive.

One way to fight this negative trend is to develop an individual university profile. The University of Zittau/Görlitz chose to do so by focusing on a policy of sustainability and introduce an environmental management system. The policy, valid over a seven years period, has the following components:

- Improved image.
- Cost and resource efficiency.
- Improved understanding of internal processes.
- Multiplier function of students and staff.
- Social-economical responsibility.
- Authenticity.

Box 5.1 The University of Zittau/Görlitz

Number of Students:	1998	**3,302**
	2003	**3,808**
Number of Employees:	1998	**419**
	2003	**414**

Zittau campus: 28,121 m^2
Departments of Architecture and Infrastructure, Energy and Technical Systems, Process Engineering, Mathematics/Natural Sciences

Görlitz campus: 5,711 m^2
Departments of Social Transformation Processes, Languages, Business and Management Information Computer Sciences

At the same time we have to do our business and daily work – like all institutions of higher education – embedded in a framework of restrictions and legal requirements. This includes e.g. legal health and safety standards, restrictions for the handling of chemical and hazardous substances, and the process of integrating the "Bologna" requirements into curricula.

Introducing and Running the Environmental Management

The EMS was introduced in three steps. The University senate decided on the new environmental policy in 1995. In 1997 an Environmental Management Working Group started to work. The first environmental check (internal and external validation/certification audits) was conducted in 1998. Certification according to EMAS, with the formation and implementation of the EMS was concluded in March 1999. Zittau/Görlitz then became the first university in the world to be certified.

In the following years considerable work has been done to maintain the EMS. A second audit and certification was made in 2001, now according to EMAS II. External Supervisory Audits were carried out in 2002 and 2003. From 1999 on students' work has been an important part of the environmental management at the university (See Table 5.1).

The annual monitoring of specific energy, material and waste flows as well as the determination of specific emissions resulting from individual university processes provided us in the beginning with fix starting points (reference values) in the work. These values have later allowed us to determine where we stand, and where we need to improve our actions, as a group, or conduct research.

The success of environmental management is determined by the inclusion of as many as possible active participants. This has been possible by a variety of actions in the course of introducing our environmental guidelines, and has strengthened and stabilised these guidelines. Periodic audits, inspections and project work have been conducted to test and realise the environmental strategy since we first started the EMS in 1998.

The Validation/Certification Process

Every three years a validation/certification audit has to be carried out by an external environmental verifier. These are supported by annual external supervisory audits. In addition annual internal audits are carried out assisted by students at regular intervals.

The external audit, following the EMAS II requirements, includes:

- The compliance with regulations.
- The EMS and the organisation.
- The eco-audit and results.
- The environmental declaration.
- The dependence, authenticity and accuracy of data and information.

According to the environmental management documentation the EM working group has to coordinate the schedule and the audit procedure. All relevant information for the validation has to be made available to the external verifier. This includes:

- Documentation of the EMS.
- The EMS manual & the university administrative manual.
- Environmental impact data.
- Occupational safety documents.
- Documents of the internal audit.
- The annual environmental declarations.

Table 5.1 *Implementing EMS. Time schedule and individual steps of implementing the EMS at the Fachhochschule (The University of Applied Sciences) Zittau/Görlitz.*

1995	1st Senate decision	
1997	Founding of the Environmental Management working group	
1998	First environmental check 1998 – Formation and implementation of the EMS Validation and registration of the EMS (March 1999)	
1999	Audits at relevant areas	Assisted by student's project works
2000	Audits at relevant areas and buildings inspection	
2001	Second Validation according the new EMAS Requirements (VO EG 761/2001 [EMAS II])	Assisted by student project works Audits by students
2002	Audits in relevant areas External Supervisory Audit	
2003	Audits in relevant areas External Supervisory Audit	
2004	Audits in relevant areas	

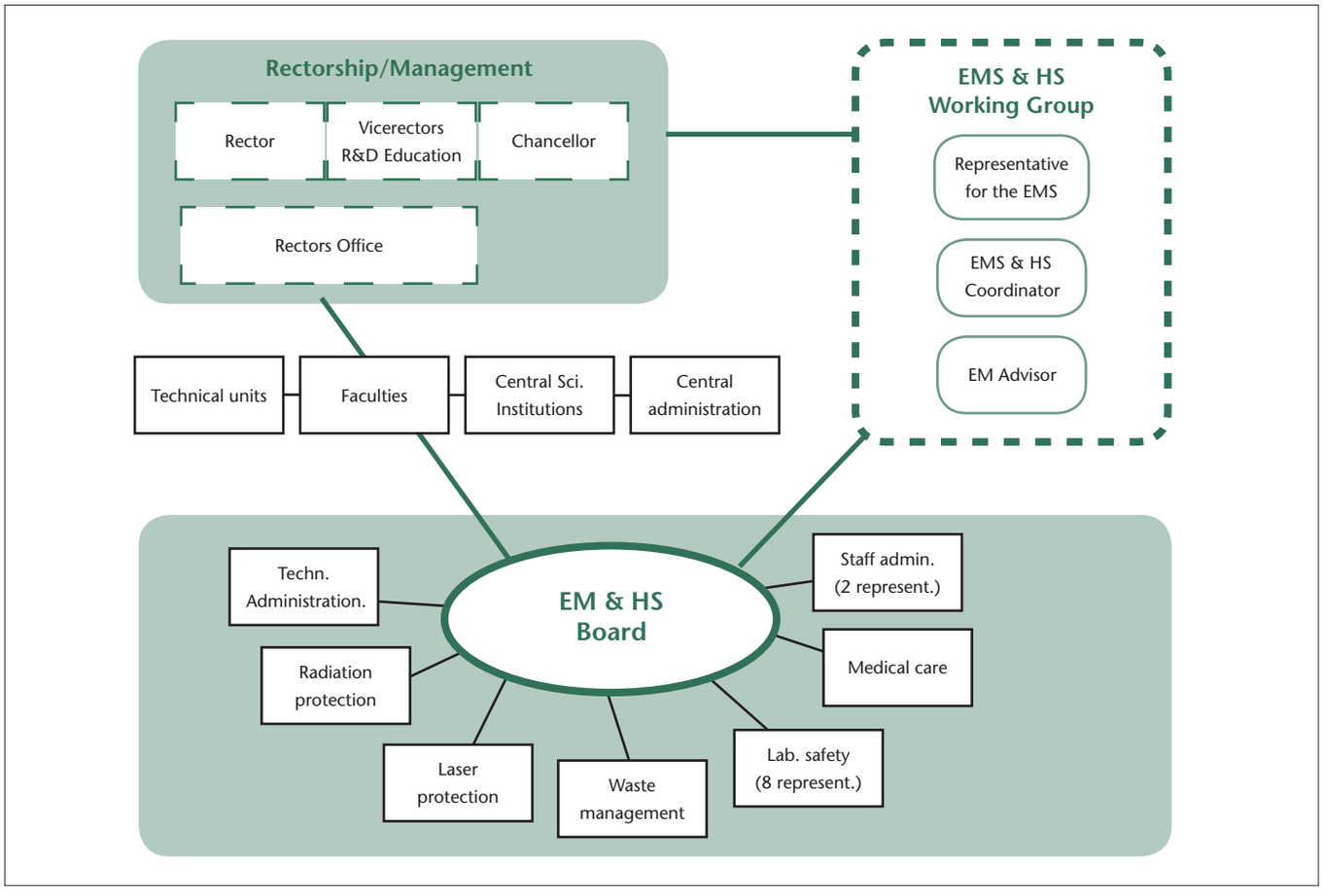

Figure 5.1 *Organisation of the Hochschule Zittau/Goerlitz's EM and health and Safety management.*

As a result of this evaluation process the verifier presents a draft conclusion abstract. In addition to the documentation check an on-site survey has to be organized which includes among other items:

- Inspection of laboratories and other relevant facilities.
- Inspection of buildings and relevant technical equipment.
- Data check.
- Interviews of students and employees (not announced).

Finally the verifier explains the results of all audits and evaluations to the university's management and – if the validation audit was successful – he validates the EMS and the environmental declaration. In case of any serious discrepancies, it is the duty of the university to agree with the verifier on solutions for correction within a given time period.

The following citation from the environmental verifier in 2003 shows that our motivation to implement the EMS was performed in a proper way. "The Hochschule Zittau/Goerlitz regards Environmental Management not simply as positive advertising, but uses it as a guideline for organizing and modelling its commitments in teaching and research ." [The interim report 2003 of the environmental verifier.]

Organisation and Documentation of EMS at the University

The EMS was established at the university by a staff position, a Commissioner for EM. It has proved to be an efficient way to organise and maintain the environmental management system. In addition a number of EM work groups were created. These have been responsible for planning and organisation of the measures and evaluations required according to regulations EC 1836/93 (EMAS I, valid until March 2001) and EC 761/2001 (EMAS II, valid since April 2001). The work groups have been very efficient and will certainly be retained in the future.

A board for Environmental protection and Health & Safety was established in 2002 as part of the University. It consists of the representatives for the EMS, the safety inspectors, and

the radiation protection representative (because the University Zittau/Görlitz is operating a small nuclear reactor for education and research with an engine power of 10 Watt). Also included is the staff council.

The internal documentation, required according to the EMAS regulation, has been integrated in the exiting university administrative manual. This has proved to enable an effective handling of the EMS. We were able to use synergies between older relevant documents and the new environmental process instructions, and other EMS documents. In chapter 6 in the administration manual the EMS manual has been structured in five sections:

0 Edition and Modification of the EMS Manual.
1 Management Tasks in the Environmental Sector.
2 Environmental Protection at the Hochschule Zittau/Görlitz (FH).
3 Preparation and und Handling of Environmental Documents.
4 Internal Environmental Audits/Implementation of the Eco-Audit Scheme.
5 External Survey/Validation/Registration.

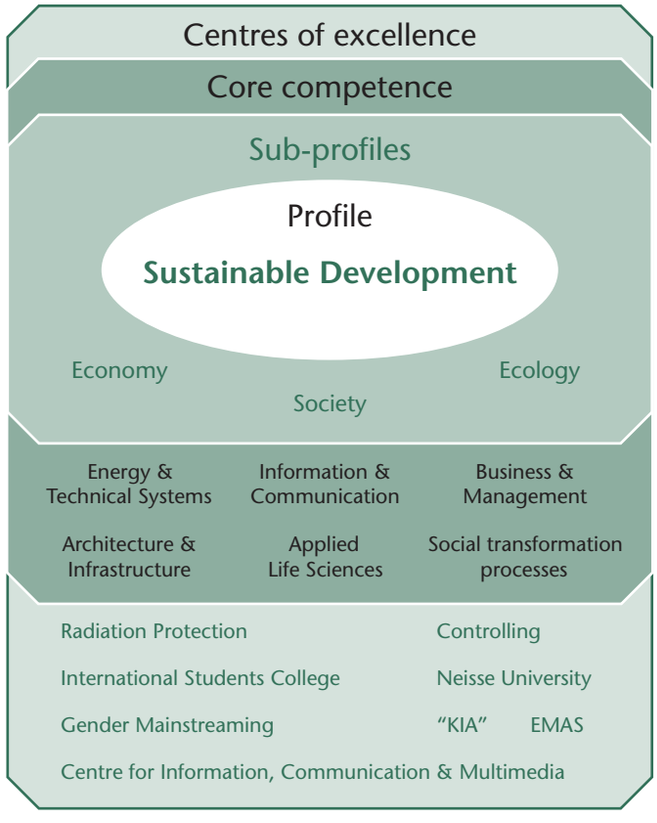

Figure 5.2 *The strategic profile of Sustainable Development of the University of Zittau/Görlitz.*

The external documentation is summarised and integrated in our annually published environmental declaration according to the EMAS requirements.

Sustainable Development Policy of the University

In July 2002 the senate of the Hochschule Zittau/Görlitz passed the "Strategic Profiling Concept" officially declaring "Sustainability" as a dominating guideline in its education and research policy (see Figure 5.2). As a result the university is involved in a variety of initiatives in both social-economic and cultural areas of communal SD. The sustainability profile is based on three sub-profiles (economy, ecology, society) and 6 core competences (which are more or less reflecting the individual faculties) and is completed by centres of excellences. All SD-linked elements are supported by the central management of he university.

2 Environmental Work

Energy and Carbon Dioxide Emissions

The environmental goal within the first category of the EMS is reduced electric energy consumption. This goal combines a high environmental relevance with a large capacity for economizing.

The value of absolute electric energy consumption in 2003 in the University was approximately on the 1998 level. From one side this is not so satisfying; the potential for savings from proper use of illumination in seminar and lecture rooms was perhaps not met. On the other side construction work and addition of new laboratories built in former tank garages (big halls without insulation) should lead to increased consumption. During 1999–2001 part of the heating was provided by direct eclectic energy. Heat consumption showed similar trends.

In 1999 and 2000, a student project work was run to identify measures, particularly construction measures, to improve the heating economy in the former tank garages now turned into laboratories. The project was very successful, and the students reported to the university top management (rector, vice rectors and chancellor). Several of the proposed measures were implemented in 2002, including reconstruction of the roofs and floors, heat isolation, replacing large doors by small ones, etc. The positive results were seen as decreasing heat energy consumption (see Figure 5.3).

The university's specific CO_2 emissions from fossil fuel were calculated, considering the emissions as a result of electric and heat energy consumption, on the basis of the municipal energy mix. The value for 2003 of 1,548 tonnes is larger than the average for Germany; the local energy mix contains about 80% fossils.

Water

Comparison with higher education institutions of similar size as Zittau/Görlitz in Germany proved water consumption values to be good or very good for the period 1998 to 2002. Annual water consumption per student and staff shows an overall decreasing trend. The water included in the report drinking water, used (grey) water and sewage (black water). Deionized water for laboratory purposes was not included. Efforts to identify weak points are made difficult by a lack of sufficient numbers of water meters within particular buildings.

Increasing and decreasing consumption periods were accounted for by the study periods, the spring and fall terms each of which lasts 4 months. Also construction and maintenance of sanitary facilities lead to fluctuating water consumption. The 2003 increase in the all over water consumption was accounted for by high water consuming R&D experiments and additional construction work.

Water consumption data is available at:
http://www.hs-zigr.de/verwaltung/ag-um/index2.htm.

Materials and Waste (Waste Separation and Disposal)

The second environmental category in the EMS deals with material flows within the university, including purchase of materials and waste management. The two issues are, of course, connected to each other.

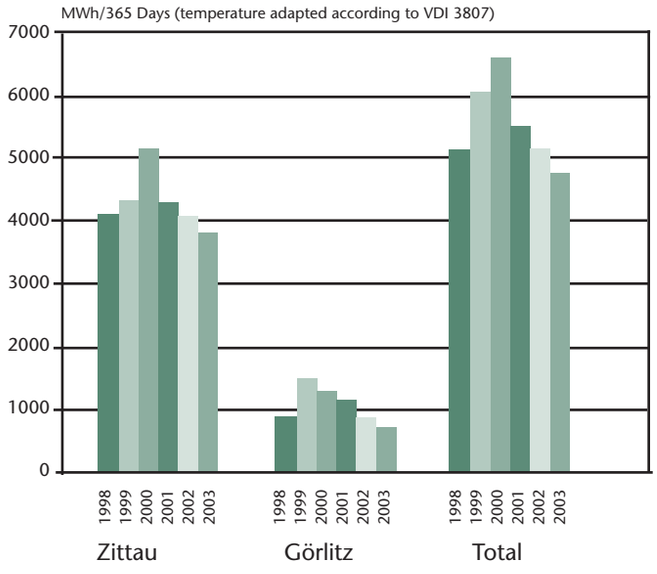

Figure 5.3 Heating consumption values of the Hochschule Zittau/Goerlitz. *The graph shows improvement of energy efficiency as a function of time due to the realisation of technical measures on former highly energy consuming tank garages now used as laboratories. More information can be obtained from: http://www.hs-zigr.de/verwaltung/ag-um/index2.htm*

A collecting system for different fractions of waste, including glass, biological waste, light weight plastics and metals was introduced in all buildings. This is known as "Dual System Waste Removal" in Germany. All waste containers in the lecture halls and seminar rooms were clearly marked to make waste collection and recycling easy (see Figure 5.4).

Since 2002 the university has switched to using recycled (RC) office paper. The new RC office paper was not first accepted everywhere, due to such as expected printer problems, technical difficulties with copy machines, fear of allergies (!), additional costs and so on, but in the end the prejudices were shown to be groundless. We managed to find a contractor offering RC office paper 10% cheaper than conventional chlorine bleached white paper. Amongst other reason the economic benefit caused the Rector to finally implement RC office paper all over the university. The university has received an award (The Office Paper Future Prize) of the German Environmental Protection Agency (Deutsches Umweltbundesamt) for this commitment.

Hazardous and Toxic Materials

Efforts were made to find substitutes for hazardous and toxic materials used. Still many of these substances are necessary in lecturing and demonstration as well as for research, particularly in chemistry and biotechnology courses, and thus remain on campus. With the help of a registration and monitoring system for handling and storage of hazardous materials, backed by occupational operating and safety instruction guidelines, organisational measures for a safe and secure way of dealing with these materials have been met.

All of the university facilities including laboratories, offices and workshops are continuously evaluated and updated for a legally required formal inventory of hazardous and toxic materials. All hazardous and toxic materials which need to be controlled and especially those which require even higher standards of control and surveillance (e.g. materials with cancerogenic properties) are collected according to internal regulations of the university and disposed of in an environmentally correct manner by certified companies.

3 Introducing EMS in the University Everyday World

Information and Communication

Staff and students of the university are continuously invited to become active in the environmental management process. A number of events are used as a platform for information and motivation, e.g. meetings of the university senate, assemblies of personnel and staff and Faculty colloquia. On these

Figure 5.4 *Garbage collecting system for separate waste fractions according to the German Dual System (DSD).*

occasions we inform about the state-of-the-art of the EMS and invite everyone to exchange views on the environmental performance within the university.

We also communicate with comparable institutions outside the university. An important objective is to continuously optimize and adapt the management system to varying external conditions such as legal requirements and stakeholder demands.

Information on the environmental management of the university is made through electronic publications (Internet), workshops and seminars open to the public, newspaper articles and publications in scientific journals. An important channel is the annually published EM declaration of the university.

A special and today well-known event is our annual Environmental Protection Day linked to United Nations Day of the Environment (June 5). We started this in 2001 focusing on (global) energy demand and supply including nuclear energy as well as the disposal of radioactive waste, an issue of highly political importance, but too often discussed emotionally rather than by considering scientific, economic and social facts. The 2001 seminar also featured well-known lecturers, e.g. by Prof. Stefan Rahmstorf, researcher in the field of global climate change. The 2002 seminar focused on biotechnology and bioethics (the university has started a new Bachelor course in biotechnology) and in 2003 we organized an elective short course for students on sustainable development in the framework of the Baltic University Programme, and a colloquium on the prevention of flooding, in the aftermath of the so called "Century Flood" of August 2002. This caused enormous damage particularly in the State of Saxony where the Hochschule Zittau/Goerlitz is located.

Table 5.2 *Environmental oriented studies. Lectures, courses and other areas of study in various faculties of the Hochschule Zittau/Görlitz. The lecture course on Fundamentals of Ecology and Environmental Protection, an integral part of the curricula of all faculties, is marked in the middle column.*

Faculty	Course of Study	Focal point Education	Individual Lectures	Dissertations	Projects
Architecture, Construction Engineering		x	x	x	x
Electrical Engineering		x	x		
Computer Sciences			x		x
Mechanical Engineering	x		x	x	x
Mathematics/ Natural Sciences	x	x	x	x	x
Social Sciences			x		x
Languages			x		
Economics	x		x	x	x

Education and Research – Greening the Curricula

In the education at the University environmental issues are introduced both in special programmes and as parts in all programmes.

According to a decision of the university senate in 1993 all students, no matter what their specific studies are, have to participate in a one semester (2 classroom hours) lecture as an integral part of their individual courses curricula (see Table 5.2). This lecture course, which is quite unique amongst German universities, addresses biological, ecological, technical, social and economical concerns and dynamically refers to current events. During an academic year an average of 500 students of various faculties and courses attend the lectures.

A four years study programme on "Ecology and Environment Protection" leads to an academic degree Diploma in Engineering. The programme includes (1) technical environmental protection, such as waste management and recycling technique, (2) natural conservation and spatial planning, and (3) environmental and sustainable oriented business management with particular consideration of health and safety risk management.

The university arranges open lectures on the fundamentals of ecology, environmental protection and sustainability with both theoretical and practical subjects. The students become more aware of socio-economic and ecological issues and understand better complex interrelations between natural and an-

thropogenic processes. Some of those participating in the lectures may serve as multipliers in their future professions and private lives and may, thus, constructively contribute to environmental protection and sustainable development. Finally all faculties offer projects, which include environmental subjects within the scope of their individual study programmes, and projects for which interdisciplinary work is called for.

The research profile of the university also mirrors an interest for environmentally relevant fields of teaching and research. These include Building construction and the environment, Energy efficiency and the environment, Nuclear safety, and Protection of the natural environment and natural resources.

Students Participation in EM

> *Tell them, and they will forget,*
> *Demonstrate, and they will remember,*
> *Involve them, and they will understand.*
>
> Confucius

This guiding idea has been a key principle for education at the University of Zittau/Görlitz and the implementation and maintenance of the university EMS. The principle of practical learning, and taking over individual responsibility by being actively involved, has been part of the university environmental policy since 1998. This shall be achieved by "qualifying and enabling students to play an active role in a continuous process of improving the environmental performance of the Hochschule Zittau/Goerlitz, thus, to promote their potential of creativity and innovation" .

Between 1997 and 2003 an annual average of 30 to 40 students, mainly of the "Ecology and Environmental Protection" course, were participating in all steps of the university EMS by either assisting in internal audits or performing projects focusing on the improvement of the environmental performance. The student projects have become both an integral part of the curriculum (courses on Life Cycle Assessment and Environmental Management) and part of the annual environmental checks within the EMS of the university. Students have, under supervision of lecturers, been involved with i.a.:

- Acquisition and determination of the university energy and water consumption.
- Managing waste production and emissions using defined environmental measures and codes.
- Participation in preparation, maintenance and application of an administrative disposal guideline.
- Studies on technical measures on specific facilities in order to improve energy efficiency.

Students from the "Ecology and Environmental Protection" programme have since 2003 formed small teams (10 students yearly) carrying out project studies on EM or related issues on both internal university and external industrial (in particular SMEs) related tasks. Thus one team worked in 2003 on a two semester project in cooperation with a regional market garden (SME) to reduce its consumption of heating energy. The students were able to develop an ecological sound and economical favourable solution in designing a new type of wooden chips fuelled heating installation. The company installed this system in the summer of 2004.

Students always have been and still are playing an important role in preparing and assisting internal audits of the university environmental and safety management system. Those exercises aim to enable students to apply theoretical knowledge, from lectures or in the literature, in solving practical problems. Results are presented and discussed in seminars and are integrated into the EM documentation and programme.

4 Results of the Environmental Management Work

Cost Savings and Expenses Related to the EMS

So far the economic consequences of the environmental management has not been systematically monitored. Cost reductions have so far not been the predominant motivation for universities to implement an EMS. Of course, this will be and in parts has already been changed.

We may however estimate savings due to improved energy management. The costs (for both electricity and heating) have up to 2004 stayed on the 1998 level although the number of students have increased since then by approximately 20%, new laboratories and lecture halls with an equivalent of about 15% of the all over university area have started to operate, and the energy price has increased by nearly 15%. The relative cost saving linked to the EMS is then approximately 20%.

The re-organisation and re-contracting of waste disposal as a result of the environmental checks has also lead to substantial cost savings. Higher safety and risk reduction on the handling of hazardous substances and biological materials have also led to lower costs.

Costs for the implementation and the maintenance of the EMS may be summarised as:

- Labour costs for personnel (approximately 50% of an academic position for coordination once the EMS has been implemented, and an additional ca. 0.25% equivalent to various personal involved in the EMS working group).

- Costs for the external environmental inspector (ca. 6,000 Euro every 3 years for the validation audit and ca. 2,000 Euro for the annual audits).
- Costs for public relations (publishing of the annual environmental declaration, events and presentations etc., approximately 5,000 Euro p.a.).
- Costs for technical measures (these have not been specified).

Other Benefits Related to the EMS

Organisations are repeatedly reporting other than economic benefits from implementing an EMS. These include improved understanding of internal processes, improved information and communication, motivation and quality of teaching and research. An organisation, not only a university, which properly applies EM and related management systems such as QM and health & safety management may achieve other advantages. These include the ability for quicker and more flexible reactions towards modified market situations and better conditions to meet stakeholder expectations.

In the case of institutions of higher education competing in a situation of negative demography factors which forces, too, into the race for competition.

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Internet Resources

Eco-campus.net

http://www.eco-campus.net

Copernicus Campus – The University Network for Sustainability

http://www.copernicus-campus.org

Environmental Management at Hochschule Zittau/Goerlitz

http://www.hs-zigr.de/verwaltung/ag-um/index2.htm



An ISO-Certified System for Quality and Environmental Management in the Municipality of Nacka, Sweden

1 The ISO-certified System for Quality and Environmental Management

Intentions of the Management System

A part of the municipal administration in Nacka, situated just east of Stockholm, has since April 2005 implemented an ISO-certified system for quality and environmental management. The system also includes management of the work environment at the administration. The most important intentions with the management system are:

- To fulfil the requests from the customers (mostly the inhabitants in the municipality) and other interested partners to process requests, registrations, enquiries etc., to take decisions, and to execute inspections and control in an efficient and legally correct and service-minded way, and finally to secure a continuous improvement of work.
- To be a tool and inspiration for improvement of work and keep quality and environmental management alive.
- To better coordinate common resources within the administration.
- To simplify and improve the introduction of new personnel.
- To reduce the impact on the environment.
- To give the employees greater satisfaction with their work and give them a possibility to participate in management and influence their own situation.

Quality management (according to ISO 9001:2000) and environmental management (ISO 14001:2004) have been integrated in a total management system, coordinated with management of the work environment.

Departments of Administration Included in the System

The system includes the main processes in the municipality for the areas of 1) urban planning 2) environmental management 3) public health and safety, and 4) technical support. The following six departments at the municipality are responsible for carrying out work in these areas. They are:

1. *Department for authorisation of building sites.* It manages the legal authorisation of new buildings and registration of such buildings and other matters within the law of building and planning.
2. *Department of exploitation.* It manages matters of economy and new projects in the municipality, for development of new residential areas and industrial or office sites. The officers of the department work as project leaders in the implementation phase. Typical questions for the department are agreements and contracts, costs of infrastructure such as streets, and expansion of municipal services, for example waste and water.

3. *The department of infrastructure.* It manages traffic planning and traffic safety, parking permits, parks and areas of nature, running and maintaining water and waste water infrastructure and pumping stations.
4. *Department of land survey.* Main responsibilities are the establishment of new properties, registration of properties and production of maps.
5. *Department of environment, public health and safety.* This department manages authorisation and legal permits in the areas of environment and protection of the public health, food safety and alcohol, as well as special programmes in the area of public health, prevention of crime, prevention of drug abuse, environmental protection, information and strategic environmental issues. The department also manages the Nature School of the municipality.
6. *Department of planning.* It manages the general plan and detailed plans of the municipality, from the initial proposals and reports to the accepted plan. In addition the department provides information and service in all planning issues to property owners, developers, and the general public.

Presently the total number of personnel of these departments is about 90. Almost all of them have their work places on the ground floor in the city hall. The only work place outside the city hall is Nacka Nature School at the Velamsund Nature Reserve.

Important and often occurring tasks of these departments are matters of authorisation, inspection and control as well as coordination meetings with other partners. Much of this work takes place in many other localities in Nacka – at small enterprises, in nature reserves, at traffic sites etc.; the work places are thus varied and found both in the city hall and elsewhere.

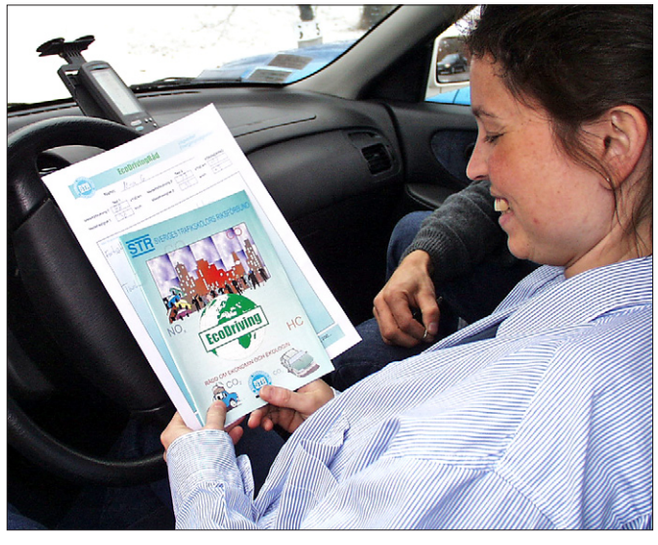

Figure 6.1 Management of the work environment. *A lesson in eco-driving with an employee of the municipal administration.*

The directors of the six departments at the ground floor in the city hall meet regularly to discuss practicalities concerning the work with the management system.

Management of the Municipality – from Policy to Daily Routines

The management and control of the operations of the municipality is complex. Since the municipality is an organisation dependent on political decision the management system needs to be able to show how the work routines in the administration are connected to the goals and decisions made on the political level in the municipality (the city board, city council and several committees).

Many of the tasks of the administration are in addition regulated by law. Some examples of such tasks are inspection and control of food, inspection and control of the environment, public consultation regarding the general and detailed plan, and public participation in decisions regarding the plan as well as decisions regarding building permits.

In a modern administration, it is self-evident that the *customers* – the inhabitants of the municipality, internal customers and others – should be given real possibilities to influence how the work is done.

The city has tried to make clear how the management mechanisms are connected to political decision, by using a series of documents. These are the vision, the policy and the list of goals.

The *vision* describes the general direction of the work. The vision for the management system relies on the vision of the municipality as a whole, and the overriding goals and documents developed and accepted at the political level.

The *policy* shows in which direction the leadership of the administration wants the work with quality, environment and the work environment to be developed. The underlying documents include a survey of requests from the customers, a report on the outer environment, and a report on the work environment. Both the reports and the policy itself were developed with participation of all the employees at the departments.

The *prioritised goals* for quality, outer environment and work environment include common plans of action. These have been divided into action plans for each department.

Policy and Goal Documents

The goals and direction of the work for the certified operations in Nacka are described in a number of documents. The basic texts are the vision, the policy, the common goals, and the plans of action.

The *vision* is to develop a mutual confidence between the employees at the administration – in their professional roles – and the citizens, customers, and partners. It is basic that both sides are willing to take responsibility.

The intention is that the established *policy* should be useful both as an internal document and externally. Both the vision and the policy should be "living documents" to be discussed, debated and perhaps changed from time to time. In spite of the fact that the work with the work environment is not certified, the work environment is included in the policy. This thus embraces the whole area of quality, environment and work environment. The fundamental components of the policy are the following:

1. The departments of urban planning, technical support and environment, public health and safety will develop and care for the life environment in Nacka. They will execute the tasks as authorities within the areas of community development and environment.
2. In a professional and service minded way the employees are responsible for providing the competence and information asked for by the leadership of the municipality and its commissions, by the inhabitants of the municipality and other interested parties.
3. To create conditions for developing health and sustainable development by creative thinking, systems understanding and knowledge about the situation in Nacka. To contribute to the work for a good environment and to prevent pollution though inspection and control, communication and by being a role model.
4. It should be simple to reach the administration and everyone should be met with interest and concern. To express themselves so that the customers understand and have a real possibility to influence. To develop the activities by developing an understanding of the surrounding world, by internal assessments and continuous improvements. To respect the laws and directives which are relevant to the work.

Table 6.1 *Estableshing goals and objectives for each department of the city.*

Quality objectives An increasing number of customers experience that they have been helped to fulfil their objectives and their needs taken care of.					
Common	Department of Building permits	Department of exploitation	Department of land survey	Department of environment, public health and safety	Department of planning
Develop a process short-hand for customers processes.		Street costs on Internet	Develop a check list for customers contacts when producing maps of new areas	Questionnaires coupled to different home pages	Map over ongoing plans; info to the politicians
Environmental objectives An increasing number of politicians in the municipality consider that the information and material for community development shows more clearly the consequences for health, a good life environment and sustainable community development.					
Common	Department of Building permits	Department of exploitation	Department of land survey	Department of environment, public health and safety	Department of planning
Carbon dioxide emissions from the activities should decrease. Everyone working on the ground level in the city hall should know how to drive their cars in an environmentally friendly way. All municipality cars should be environmentally friendly cars. An investigation on the heating of the city hall should be made.	Which material for decision is based on laws and directives	Review short hands and routines for contract of exploitation and for buying land, building etc.	Politicians should have clear and correct material available in GIS format for decision making regarding environment and health consequences.	Health consequences should be developed and included in environmental impact assessments.	

5. The work environment should be characterised by an open and supporting atmosphere stimulating cooperation, and provide for opportunities to learn.

Goals (Objectives) and Measures

The goals are divided between the areas of quality (Q) environment (E) and work environment (W). An important property for the goals are that they have to be measurable (this is not always easy to fulfil). Each goal is connected to a series of measures/plans of actions. Some of these are common to all parts of the system, while others only are specific for some of the departments. To carry out and follow-up these measures is an important part of the work with the goals. How the objectives should be monitored is described in the documentation.

In the certification there are *four common goals of quality, four goals of environment and one goal for the work environment*. The numbers of measures which are coupled to the goals are much larger and increasing. In the area of quality, the certification includes more than 100 measures which should be carried out. Table 6.1 gives a few examples of these goals and measures.

2 Three Years of Work to Build up the System

Conditions for Developing the Project

The project which resulted in the ISO certified management system had strong commitment from the leadership of the city administration, and large engagement from the personnel. Here we will briefly describe this project.

The project, called the KompassN, started in autumn 2002, and continued up to August 2004. Then it gradually transformed into the daily work of the administration. The project was from its beginning divided into a series of stages.

One of the challenges of the project was to stimulate and maintain the interest of all personnel with their different professional backgrounds and work tasks. Originally this includ-

Nacka municipality – Facts

Nacka, situated just east of Stockholm, is a municipality of 78,000 inhabitants. The built environment varies from turn-of-the-century villas to newly built multifamily houses. All parts of the municipality are close to large and untouched nature reserves at the shore of the Baltic Sea, with the archipelago of Stockholm close by.

The municipality, just over 100 km^2, consists of land and water, including some 20 islands and 38 lakes. The landscape is hilly. The highest elevations and moraine areas are dominated by pine forests, while the valleys have fields and deciduous forests. Nacka is bordering the southern parts of Stockholm, and is one of the main sea passages to the capital.

More than hundred years ago the area of Nacka was agricultural and most people lived by producing food for the capital. Already then Nacka had a long local tradition of industry with roots in the mid 18th century, and the city eventually became one of the most typical industrial cities in the country. Several industries moved from Stockholm to a more advantageous location in Nacka. In 1890 the steam powered mill, AB Saltjsökvarn, was built by the sea approach to Stockholm. AB Diesel Motors, later Atlas Copco, opened its factory in Sickla in 1898.

Today industry employs only a smaller part of the workforce in Nacka. Many of the former industrial buildings are still there but are now used for new activities. Trade and service has become the main part of the economy. The closing of factories accelerated in Nacka in the 1980s. Atlas Copco stayed in the area up to the 1990s. Politicians did for a long time not see the environmental damages that industries had caused. The economic benefits they brought were so much more important. Today many of these earlier industrial sites have to be cleaned up.

In 1890 there were some 2000 people, 152 horses, and almost 1000 cows in the area that is today Nacka. About 400 individuals, mostly living in Stockholm, were employed in the factories. Today just over 78,000 persons live in the municipality. The number of horses is back to the same level as during the 1890s, although they are used almost exclusively for recreation. The buildings in Nacka were at the end of the 1940s dominated by single houses. From the 1950s several larger residential areas were built and new companies established themselves in the old industrial buildings.

Nacka has today about 22,000 places of work, of which only some 10% are in the manufacturing industry. Agriculture, forestry and fishing, formerly very important, employ today only about 60 individuals. The population in Nacka is projected to increase with a total of 6,995 individuals during the four coming years and will be 85,710, an increase of 9%. In 2007 about 700 apartments are planned to be build in the municipality. The age group 7-15 will decrease by 2%, while the age group 16-19 will increase by 26% as will the older group of 65-74 years of age.

Edited and abbreviated from the homepage: http://www.nacka.se

ed about 70 persons, but it increased to about 90 individuals through different re-organisations during the period. It was important to keep up the work during the whole period, and develop the issues to a reasonable degree during the different stages.

The organisation of the project contributed to this by the following means:

- The KompassN was directed by the head of the whole unit (later the process owners) together with all heads of departments.
- One person was assigned to be a full-time project leader.
- Personnel from all departments took part in a project group bridging over the traditional borders in the organisation.
- All employees could use 5% of their working hours for the project.
- All employees took part in a training programme on environmental management according to the ISO system.
- All project work was regularly coordinated and discussed with the most important groups of customers.

Consultancy

The project had support from an external consultant. The consultant had the task to train the employees, in particular the project group members, to plan the different stages in the process in cooperation with the project group, and to be a discussion partner through the entire process. In order not to make the normal work and the customers suffer, the departments were given extra resources (some additional personnel) during the most intense period.

The original time plan was postponed since some of the stages took more time than originally planned for. In addition, a reorganisation of the city administration during the project period made several employees and work areas, that were not originally included, to be added to the project.

The project was conducted through a number of stages. Some of these are described below.

Reviewing Customers and Customers Demands

All employees worked in groups to identify which customers they had and which demands these had on the administration. The questions were: Who wanted something from us? With whom did you sign contracts? Who contacted us most often? etc. The answers to these questions were collected and analysed.

In addition, some of the employees listed the most common questions which were asked during a time period. These questions were subdivided according to type of customers, and

Figure 6.2 Nature School in Velamsund. *Citizens in the municipality are invited to the Nature School to get expert advice in the identification of mushrooms found during the day.*

demand. The demands were subdivided into the following categories:

- General political, the goal of the municipality (political requests).
- Demands of a general character, independent of the customers.
- Demands specific for a certain group of customers, independent of the issue.
- Demands specific both for the group of customers and the issues.

The most important, overriding, goals relevant for the work, were the following:

- A strong influence from the citizens.
- A good living environment and a long-term sustainable development.
- A secure and safe municipality.

The general demands, independent of the group of customers, could be summarised as:

- Service
- Legally secured rights
- Competence

The demands from the customers received a central role when goals and action plans regarding quality later were developed. Three of the four common quality goals used were dealing directly with how satisfied the customers were with the administration. The qualities to be monitored became the

Figure 6.3 *Part of the municipality of Nacka seen from the south. In the background the major entrance to Stockholm harbour from the Baltic Sea.*

capacity to *give guidance*, to meet the demands of the customers, to be *accessible* and to be *professional*.

Report on the Environment

All employees were divided into working groups, also for the work with environmental issues. The first task in the groups was to list the environmental aspects caused by the work of the department – how dangerous is a certain factor for the environment (risk, sensitivity, consuming limited resources, etc.) how large is the impact (kg, numbers, etc.). The lists were established, discussed, and finally approved of by the project groups.

The project group assessed the environmental aspects and declared and discussed the results with all employees. A much debated issue was how to assess the environmental impacts caused by a specific project, planning mission etc. In the long-term a project may have a large impact on the flora, fauna, water quality, and much else in the municipality, but the administration and its employees would not be able to control the impacts in the same way, as when one decides on how to sort waste after a lunch in the city hall or how to travel to the work place.

The results finally were that both sides of the environmental impact should be part of the environmental management system. The report concluded that the most important environmental issues of the latter type are *emissions of carbon dioxide*, (through heating, transport and waste management) and *use of non-renewable resources*. In areas where the decision base deals with environmental impact, it is possible to influence the development through *permits, inspections and control, information and education*. The plans of actions and measures which later have been approved for environmental work have their base in these priorities.

Mapping the Processes

All employees drew an outline of their most important work tasks as a flow chart in accordance with a set model. The flow charts were then discussed in the project group, which tried to find similarities between them and formed a picture of how the

different tasks could gear into each other as cogs. The discussions in the group then dealt much with which processes could be described in the same way and which were unique.

Seven *work processes* and ten *management or supporting processes* were identified and are now part of the management system. The final agreement on what to imply by a process and a routine developed as the discussions proceeded.

- Processes show *what* is being done and in *which order*.
- Routines show *how* something is being done.

In addition to the management system there are established examples of how a process should be correctly described when it is fully developed (a link provided on the home page).

Constructing and Implementing the System

All employees worked with the task to establish and modify their own routines. During this stage a computer system for managing all quality documents was installed. It made the work with the routines much more systematic and more concrete for several of the personnel.

In the work with the routines it was requested that a new proposed routine had to be discussed with at least one more person (for those being alone with the routine) or discussed and accepted in the group concerned. The person who introduces a new routine had to appoint a person to be the controller of the routine. The controller had the job to check that the routine was constructed in the "correct" way and that the text was easily comprehensible and well written. The closest head of unit or process owner finally had to approve the routine. These different stages were all managed by the computer system.

The first internal audit both for the auditors and other colleagues became a process of learning. In practice the audits speeded up the work with the routines, introduced corrections and removed inconsequential components and other mishaps.

Creating Commitment and Establishment

The working methods used were designed to create as much participation as possible in the introduction of the management system (as follows).

The project started with a large conference with all employees. Here they could:

- Describe activities which needed improvements; these were later included in the project.
- Influence how the project was shaped.
- Receive an introduction of what a management system is.

Great emphasis was put on group discussions, where personnel from different departments in the administration were mixed.

An additional three conferences with all employees were then carried out.

- *A first conference* was conducted halfway into the project; at this occasion it was obligatory for all employees to participate in the work with common policies and goals.
- *A second conference* was carried out in the end of the project. Here the project was further established and information was given on how it should be finalised. Explanations were also given on how the future management system should be maintained. Great emphasis was put on being playful. The explanations were to a large extent made as a theatre performance, in which the project group members demonstrated what had been done and made jokes with everyone involved.
- *A third conference* finally was a mixture of environmental education and a forum for discussion about the project and experiences from the work.

Each stage was introduced in the project group during a half or a full day together with the *consultants*. Here the project group members learned about the work during that stage and got the opportunity to the try the methods to be used. The project group also planned how the work should be introduced into the different departments. This always began in a grand fashion in order to involve everyone, and then decreased to a more modest scale, to be concluded with a firm establishment of that stage in the entire administration.

A *plan for communication* was made in an early phase of the work. Here it was decided how the information should be given to the different target groups and how the different groups should be involved. It was established that:

- The main information should be channelled from the project group to the various departments during their normal meetings.
- All written information should be distributed by means of a home page on the Intranet, and by electronic newsletters.
- All employees should be involved in working groups during the different stages.

The *steering group* met once every second week in order to together with the project leader evaluate how the work continued and plan for the next step.

Certification

After receiving several offers, a contract was signed with BMG Trada Certification Ltd. as the certifying body. The requirements demanded of the company to be awarded the order, included to be accredited (according to standard norms), to be experienced with both quality management and environmental

Figure 6.4 *Proud recivers of certificats for environmental management ISO 14001 and quality management ISO 9001 in Nacka municipality administration.*

management certification, and be well acquainted with public authorities and their work.

The computer system "the Compass", in which our own documentation as well as links to e.g. all relevant legal documents were collected, was developed specially to suit the work with the system according to ISO standards. It was purchased from AddSystems International Ltd.

3 How the System Works

Work Processes in the Administration

The most important *processes* in the work at the city administration were mapped. These indicate what is being done and in which order.

Examples on *work processes* are:

- Authority processes (work with e.g. inspection and control according to certain legal documents).
- Planning process (the work with the detailed plan).
- Contractual and project related processes.

Examples on the *support and management processes* are:

- Management of the work and economic management.
- Decision-making.
- Competence support.
- Purchase and procurement.

Daily work assignments are most often part of one of the processes. The work processes are described in terms of *routines*, sometimes with checklists and forms (patterns). Routines show how the assignments are being done.

Routines are there to guarantee the quality of work and to be a help:

- When several independent persons have the same assignment; routines then show how to carry out the job, to secure that the job will be done in the same and proper way independent of who is doing it.
- When assignments are done very seldom.
- When the ordinary person is on sick leave or away for some other reason.
- When a new employee is introduced and when the work is reorganised in the administration.

There are several different kinds of routines. Routines may also refer to other checklists and forms.

The Computerised Documentation System – KompassN

All documentation is collected in a computer system. This guarantees that we can use the latest version of the documents,

Figure 6.5 Goals and action plans. *In KompassN all goals (objectives) and action plans (measures) are available. It is possible to get an overview of the goals under each of the main management areas (quality, environment, work environment), as well as the measures action plans belonging to each goal. By clicking on a goal you will get all details, including who is responsible for the goal or measure, how it should be implemented, and monitored.*

as these have to be up-to-date. Figures 6.5-6.7 give some examples on the content and design of the system.

Goals and action plans. In KompassN all goals (objectives) and action plans (measures) are available. It is possible to get an overview of the goals under each of the main management areas (quality, environment, work environment), as well as the measures action plans belonging to each goal. By clicking on a goal you will get all details, including who is responsible for the goal or measure, how it should be implemented, and monitored (see Figure 6.5).

Routines. To make it easier to find your way among the many routines we have sorted them according to who should use them. We also differentiate between "work routines" and "support routines" (see Figure 6.6).

Processes give an overview of which and in which order the routines belonging to an activity are carried out. Figure 6.7 shows one process in the KompassN system. Symbols are as follows:

- A small document shows that there are routines belonging to the activity. The user may click on it and see the routines on the screen.
- A green arrow shows that further flows of activities are available. If the arrow is outside the box – for example for the activity "initiation of a planning commission" – the arrow shows that the activity also belongs to an activity which is part of a different process.

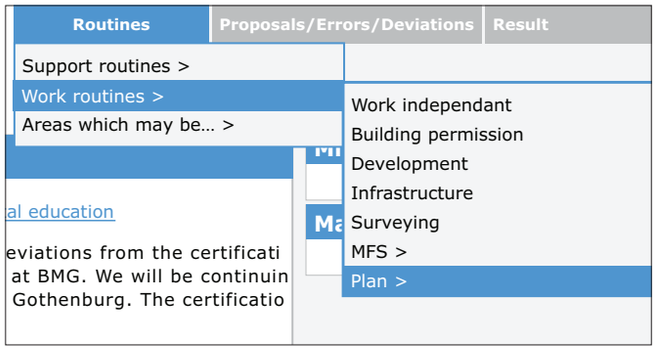

Figure 6.6 Routines. *To make it easier to find your way among the many routines we have sorted them according to who should use them. We also differentiate between "work routines" and "support routines".*

Methods of Improvement

Continuous improvement probably is the most common concept in all management systems of this kind – also in the KompassN. The improvement work is divided into "preventive" and "follow-up".

Preventive. Once a year the results and accounts from the previous year are analysed. The risks observed are assessed and changes which may be needed in the future are outlined. The results are discussed during a meeting with the directory of the unit.

Follow-up. In the KompassN system there are a series of tools to follow the activities, such as inquiries for the customers, inquiries for the personnel, follow-up of environmental aspects etc. These may be used as appropriate. In addition, everyone should report on errors and problems, which are identified as deviations during the work and which need to be corrected. Also all proposals for improvements could be added directly into the KompassN system.

The *recurring audits* offer both possibilities to improve the activities and control the work of the administration from the outside. External audits will to begin with, be made twice a year by the same company, which made the audit for certifica-

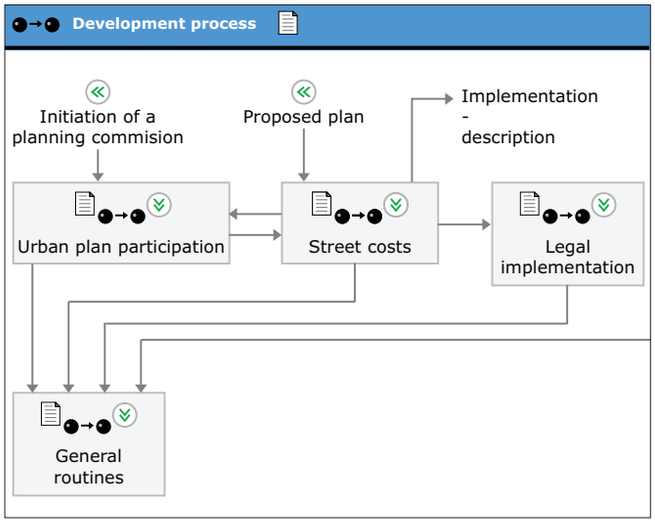

Figure 6.7 Processes. *They give an overview of which and in which order the routines belonging to an activity are carried out. Above, one process in the KompassN system is shown. Symbols are as follows:*
- A small document shows that there are routines belonging to the activity. The user may click on it and see the routines on the screen.
- A green arrow shows that further flows of activities are available. If the arrow is outside the box – for example for the activity "initiation of a planning commission" – the arrow shows that the activity also belongs to an activity which is part of a different process.

tion in January 2005. The audits are based on sampling activities, documents and interviews with the employees.

After an external audit the municipalities´ own auditors make regular internal audits. During one year, the whole management system should have been audited.

The Organisation

The *steering group* for the system consists of the process owners for urban planning, for environment, public health and technical support, and heads of departments of the units which are part of the management system. The group has assigned a "representative for the general management of the administration". This person has a special responsibly to secure that the management system is working in a good and efficient manner. He sees to that the quality and environmental issues are all present in the organisation, and is responsible for that the set standards are implemented and maintained in the management system.

Common quality and environmental coordinator. The common coordinator has several central tasks, which should contribute to that the system is properly used in the entire organisation. She should continuously inform the employees about the quality work, and support the internal auditors and coordinators. The coordinator is also managing the auditing programme. The work time for this task is 25% of full time.

Internal auditors are employees at the administration, who have received special training in how to audit quality and environmental management. They conduct internal audits in other departments than the one where they are working and give advice about improvements needed with those being responsible for the issues in case.

Each department has a *coordinator for the quality and environmental work*. She has the job to see that deviations are corrected and improvement proposals for the department are implemented. She also keeps track of the need to introduce new routines. The coordinator has an important role when it comes to distributing information, and share experiences between the different departments.

Each department also has appointed a person *responsible for environmental matters*. These persons should i.a. organize and lead the work with environmental improvements in the department and keep and update the list of essential environmental aspects in the work.

Exchange of experiences with other companies and authorities is part of the work with recurring improvements.

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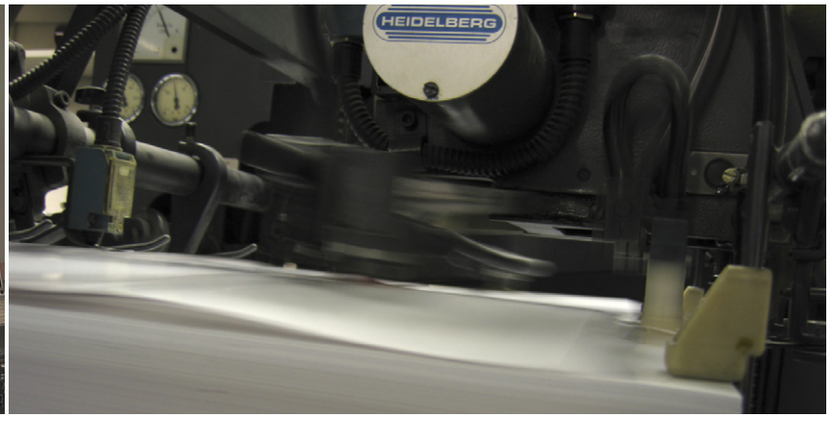

Introducing Environmental Management in a Small Business, Nina Printhouse, Uppsala, Sweden

1 The Printing Business

Nina Printhouse, Uppsala, Sweden

Nina Printhouse is a small printing business in Uppsala, Sweden, with only the two owners and three additional persons employed. The annual turnover is about 3,000,000 SEK (300,000 Euro). The production at Nina Printhouse is basically conventional offset printing with sheet-feed. The products span from business cards, folders, booklets and posters to large books, in black and white or full colour. Orders come from the local market but the printhouse also occupy an important niche as a printhouse for non-european languages. 10% or more of the production are in Arab and Persian languages.

The printhouse has two print machines (two-colour Heidelberg Speedmaster printing 52x72 cm and a four-colour Solna printing 46x64 cm) and machines for ripping, photo-setter, sorting and folding-machine and a machine for glue-binding.

Description of the Production Flow

Jobs are delivered to the printing house as digital layout files, which are printed on film by photo setter, a so-called RIP (Raster Image Processor). The imprints of the films are then transferred to printing plates of aluminium, which are then mounted on the impression cylinder of the printing machines. After that the prints are cut, sorted, folded, and finally wired together to booklets or bound to books by glue-binding.

2 Introducing a Management System

The Environmental Consultant

After a request for environmental certification from customers in early 2005 Nina Printhouse contacted Tomas Hörz and Ove Högman from Euro Quality Consult AB EQC for help with the introduction of an environmental management system. The goal was to receive certification according to ISO 14001:2004.

Developing an environmental management system in a small business is different in many ways from implementation in a large company. One of the problems is that tools and work methods, the routines of the ISO standards, are very much adapted to the big companies. The executive in a small business however is often unfamiliar with the organizational framework for management systems in general, as well as with flowcharts and theoretical tools and other details. The daily work is instead based very much on short-time planning and ad hoc solutions. On the other hand communication is easy, more direct and also more flexible. As a consequence much of the work on certification of a small company is done by the consultant while large corporations can rely more on internal competence. The role of the consultant when working with a small company is quite wide. The consultant is very much like a coach and a guide. The management structure is ”imported” but also adapted together with the staff to the company. Ove Högman says that: *“Many small companies at first*

Figure 7.1 *The management system introduced at Nina Printhouse included ISO 14001:2004 but also addressed work environment and production quality.*

see the certification as something that cost money, but later they often find out that the management system itself can make production more efficient. It can payoff in many ways to work in a more systematic way. Environmental certification is often a good economic investment in the long run."

It is very important that the consultant is able to make the staff committed for the project to be successful. Most of the work is supposed to be carried out by the staff themselves. It is not meant to be only a desktop product with files on a computer.

A Management System of Continuous Improvement

The management system introduced included of course the standards of ISO 14001:2004 but also addressed work environment and production quality. The rules of AFS 2001:1 on working environment and the most important standards of ISO 9000:2000 on quality management were therefore integrated into the management system.

A key task in the process was to produce a *management handbook* for the company. This management handbook was based on a systematic overview of the production process at Nina Printhouse. It included a thorough description of the company, complete with organisational structure, and with instructions in detail for all the work tasks performed in the production process and with clear definitions on areas of responsibility. The handbook describes all the routines within the company, as well as rules for procurement of material such as paper, as well as details of waste management, energy management etc. The handbook was made both as a binder for the office and as a document on one of the computers.

One important aspect of the system is that decisions should be based on facts and collection of data is therefore very important. If the system works as intended the company and the production process will be continuously analysed and improved.

The principles and working methods are of course developed in co-operation with the operative staff and when fully implemented will ensure a higher degree of control over the work flows. The environmental management system developed at Nina Printhouse was based on the Plan-Do-Check-Act Deming model (see Figure 1.3, section 1.4.1). The basic idea is that a systematic way to work, including increased supervision and collection of error reports and other data, will ensure that relevant information becomes available, and increased possibilities of accurate decisions and continuous improvement.

Identifying Environmental Aspects

In the starting phase, the "Plan-phase" all the steps of the printing process are listed and mapped in order to identify and quantify the material flows and to identify processes of the production which may affect the environment. An environmental report is then written to describe the environmental context of the company and list the potential environmental impacts (aspects). For Nina Printhouse the following 20 items were listed:

Material use
- Paper for print
- Other materials for production
- Chemicals & inks
- Purchase of machinery
- Purchase of office material

Resource use
- Energy consumption
- Water consumption
- Heat & ventilation

Transport
- Transports
- Travel to work
- Travel at work
- Customer transports

Waste
- Waste of paper
- Dangerous waste from production
- Dangerous waste from office
- Other waste from production
- Household waste & office
- Outflow to sewer from production
- Outflow to sewer from kitchen

Noise
- Noise

The steps in the production were analysed by a simple comparision-matrix by pairs of different environmental aspects in a so-called difference matrix. Table 7.1 is an example of a implemented matrix.

In the difference-matrix the environmental aspects in the production process are listed both horizontally and vertically. Each one is then compared to each of the others. Thus, A is compared to B, C, D and so on. If A is considered more important than B "+" is entered and if not "- " is entered. The "+" are then added up. The judgments relied mainly on the experiences of the consultants. In future audits they may be based on more objective measures.

In the example matrix (see Table 7.1) the aspects with the most serious environmental consequences are identified as A and D. In the case of Nina Printhouse, 20 items were listed and then compared according to the matrix. The highest number of pluses was attributed to *Paper for print* (see Table 7.2). Some other important aspects were *Chemicals & inks*, *Energy consumption*, and *Transports*.

Identifying Environmental Goals

For two of these environmental aspects, *Paper for print* and *Waste of paper*, action plans were developed. In the future the intention is that when an action goal is met a new one is set up so that new environmental aspects always are addressed.

The analysis of the report should result in an environmental policy and in defining environmental goals and plans of action.

Table 7.2 *Nina Printhouse's 20 aspects listed according to the seriousness of their potentional environmental impact as judged by the difference matrix method.*

Paper for print	19
Chemicals & inks	18
Energy consumtion	15
Transports	15
Customer transports	15
Travels to work	14
Dangerous waste from production	13
Travel at work	12
Heat & ventilation	11
Waste of paper	10
Other materials for production	7
Dangerous waste from office	6
Other waste from production	6
Water consumtion	6
Household waste & office	6
Outflow to sewer from production	4
Outflow to sewer from kitchen	3
Purchase of machinery	2
Purchase of office material	1
Noise	0

Table 7.1 The difference matrix. *In the example below different environmental aspects in the production process are listed both horizontally and vertically. Each one is compared to each of the others. For example A (in the row to the left) is compared to B, C, D and so on. If A is considered more important than B, for example, "+" is entered and if not, "- " is entered. The "+" are then added up. In the matrix below the steps with the highest impacts are identified as A and D.*

	Alternative								
Alternative	**A**	**B**	**C**	**D**	**E**	**F**	**G**	**H**	**Number "+"**
A		+	+	-	+	+	-	+	5
B			-	+	-	-	+	-	2
C				+	-	+	-	+	3
D					+	+	+	+	4
E						-	-	-	0
F							+	-	1
G								-	0
H									0
Number "-"	0	0	1	1	2	2	3	4	

An important element in the action plan is to define routines and instructions and also of course to train and inform the staff so that the plans are fully implemented in the daily work.

A very important routine to be implemented is the so called *error reports*. Every time an error occurs (failure to deliver on time, quality error, machine trouble etc.) the incident must be reported. Every now and then these reports will be analysed by the staff and possible preventive actions should be taken to avoid the problem in the future.

The Environmental Management System

With much help from the consultants a basic environmental management system was developed for Nina Printhouse. The system included improvements also in the general management of the company in order to increase the control of the production.

The discussions on the regular planning of the production of the printhouse was thus the main component of the work on certification. However, in addition a basic full-day general environmental education was held for the staff. This day was based on material from the Natural Step foundation.

Figure 7.2 *Printing inks are an important environmental aspect, and are 2nd on Nina Printhouse's list as "Chemicals & inks" but also occur as "Dangerous waste from production". Empty cans of ink are collected by an environmental service company for destruction.*

The certification process is a considerable investment in both time and money for a small company. The cost of certification is about 10,000 Euro. In the long run Nina Printhouse hope that certification will improve competitiveness and that environmental management, apart from being valuable in itself, eventually also will pay off in economic terms.

Certification and Continuous Improvement

One year after the process started a basic environmental management system exists at Nina Printhouse. In mid autumn 2005 in a third-party pre-audit for certification was performed by Mattias Widmark from BVQI. A recommendation for certification was issued and then sent to BVQI, a world-leading certifying authority for quality and environmental management systems. Within a month Nina Printhouse received a certificate with identification number by ordinary mail.

Nina Printhouse is now certified according to the standards of ISO 14001:2004. It will continue to be so in the future provided that environmental goals are set and met at the audits that will be performed annually as evidence of a continuous process of environmental improvement of the company.

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Internet Resources

BVQI

http://www.bvqi.com/

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The Baltic University Programme

http://www.balticuniv.uu.se

A regional university network

The Baltic University Programme is a network of 180 universities and other institutes of higher learning in the Baltic Sea region. All countries within or partly within the Baltic Sea drainage basin are represented: Belarus, Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia and Sweden and more marginally Czech Republic, Norway, Slovakia, and Ukraine.

A large network of researchers and teachers at the universities has developed. The number of individuals who have contributed at some stage in the Programme are more than 1,500. The network is coordinated by a Secretariat at Uppsala University, Sweden.

Sustainable development and democracy

The Programme focuses on questions of sustainable development, environmental protection, and democracy in the region. The aim is to support the key role that universities play in a democratic, peaceful and sustainable development. This is achieved by developing university courses for students but also to participate in applied projects in cooperation with authorities, municipalities and others.

Many arrangements for students

The Baltic University courses attract more than 8,000 students yearly in more than 150 student groups at close to 100 universities. The courses are run separately by each university but there is much communication between course groups. Video conferencing, audio-telephone conferencing and computer conferencing over Internet allow students from different countries to meet and discuss. During summers many different activities are arranged, including a sailing seminar on the Baltic Sea and other summer courses. Student conferences and a student parliament is organized every year.

A variety of courses

The Programme offers a variety of courses for studies of the region, its environment, social change, and sustainable development and constitute the combined efforts of a large number of scientific experts from all over the Baltic Sea region. The course material, consists of books, booklets, and TV programs. The language is English but some material has been translated into Polish, Russian, and Latvian. Printed material, films and a website contribute to a rich learning environment for the students.

Our courses are multidisciplinary, international, problem oriented, based on ongoing research at the participating universities and they all have an element of regional studies. This book is one in a series of four on environmental management and also the basic material for a Baltic University course.

The Baltic University Centre at Belarusian National Technical University in Minsk (Photo: Lars Rydén).

Lecture on the ship S/Y Fryderyk Chopin while sailing the Baltic Sea (Photo: Agnieszka Trzupek).

Read more about The Baltic University Programme at http://www.balticuniv.uu.se/

The Baltic University
Environmental Management Courses

Environmental Management is a package of four courses on master level for higher education in the Baltic Sea region. The courses convey knowledge of environmental management in all kinds of organisations, particularly in the industrial sector, and describe how environmental issues are addressed by different stakeholders in a society. The courses describe the environmental authorities and the legal and economic tool used for inspection and control, including the directives of the European Union; the formal management systems, such as ISO 14001 and EMAS, applicable to all kinds of organisations; industrial production and how to reduce environmental impact and increase resource efficiency; finally the design of products and how to asses the complete life cycle of products in society.

The courses provide a platform for environmental management education in all parts of society. They are well suited for competence development of professionals.

The four partial courses each have a course book, accompanied by a CD containing films, work tools, databases, material for training, and the textbook in PDF-format.

Each course corresponds to 7.5 ECTS credits, or the whole set to six months full-time studies.

Web support

The web page of the course package features teaching guides for teachers and additional material for students, such as proposed tasks for group work. The links in the books are kept updated on the web page, and new links are added. Figures etc. from the books may be downloaded to be used in PowerPoint or other types of presentations.

You will find the web pages for the EM courses at http://www.balticuniv.uu.se/ under the menu: Courses/ Environmental Management.

1. Environmental Policy

– Legal and Economic Instruments

This course describes legal and economic policy instruments, including environmental impact assessment, environmental legislation permits, and inspections and controls. Special emphasis is made on how companies and organisations can work to improve environmental performance and quality themselves, e.g. by green labelling, certification, and proper management tools. The role of inspections, both for control and in consultation to improve environmental performance in a company, is discussed. Environmental fines and taxes, although mostly of national concern, are described. The EU legislation is treated in some detail as well as the most important national legislation.

Course book:	*Approx. 220 pages; theoretical part and cases.*
Films:	*Cases from Sweden and Lithuania (on CD).*
Data base:	*Central legislative texts (on CD).*
Website:	*Teachers' guide and group work for students.*

2. Cleaner Production

– Technologies and Tools for Resource Efficient Production

Cleaner technologies refer to production processes where pollution is minimized at the source and efficiency of resource use is carefully improved. The course describes a series of production processes and how to improve energy, water and material resource management and improve production technologies. It describes how the implementation of cleaner technologies not only improves environmental performance, but also economic viability and the quality of the production process.

Course book: *Approx. 200 pages; theoretical part and 6 cases.*
Films: *Cases from Sweden and Lithuania (on CD).*
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Website: *Teachers' guide and group work for students.*

3. Product Design and Life Cycle Assessment

The design of products and their use are major concerns to improve environmental performance and resource flow in society. The course treats this by applying environmental management, ecodesign and life cycle assessment techniques. A series of indicators for environmental impact are examined, throughout the life cycles of products. The techniques are illustrated by many cases of eco design, dematerialisation, use of indicators and LCA calculations.

Course book: *Approx. 270 pages; theoretical part and 7 cases.*
Films: *Case from the Netherlands (on CD).*
Data base: *Cases for Life cycle Assessments (on CD).*
Website: *Teachers' guide and group work for students.*

4. Environmental Management Systems and Certification

The basis of environmental management is the systematic review, or audit, of an activity in an organisation, industry, or business to map environmental impact and resource use. The course describes how this is done and gives a series of tools to reduce impact. The practicalities of ISO 14001 and EMAS certification are described.

Course book: *266 pages; theoretical part and 7 cases.*
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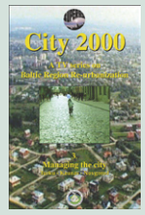

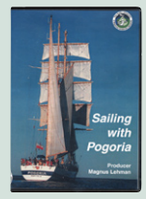

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