

# **Corporate Environmental Management**

*A Blueprint for Categorising Environmental Policies*


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## **ABSTRACT**

Today environmental management is not a question of whether to implement it or not, rather it has become a question of how to implement it. Environmental management has become a systematic cyclical process that spans the entire organisation from top-management to shop floor workers. Environmental strategies are set in order to be the framework of the environmental visions and aims. This framework then sets the boundaries for more tactical and operational goals and measures. In order to achieve these goals a company has a wide range of conceptual environmental management strategies and tools at its disposal. The overall aim of the study is to identify corporate environmental policies and tools, and to categorise them either on a strategic, tactical or operational level. It also clarifies how the decision-making sequence can be described in environmental management, and it develops a sequential model for a hierarchical timeframe in environmental decision-making.

**Keywords:** environmental management systems, sustainable development, planning levels, environmental policies, environmental decision-making, green design, life cycle assessment

## **1 INTRODUCTION**

The relationship between business and the environment is reciprocal: Business has effects on the environment, and the environment has effects on business. Although the individual company may perceive environmental concerns as either a benefit or a cost, it cannot ignore the fact that environment and business cannot fully be decoupled from one another. A number of factors have contributed to the growing need of environmental management policies and tools for implementing it: a growing public awareness of environmental impacts and pollution, the goals set up at the environmental conference in Rio in 1992, in Kyoto in 1997, and in Bonn in 2001, the rising costs of compliance to stricter environmental legislation, and the strive for sustainable development (WATKINS and GUTZWILLER, 1999).

Increasingly, the corporate organisations acknowledge environmental concern as a prominent factor that affects everything from the design of products to strategic decisions. It is not only in the manufacturing process that environmental management is implemented, but also throughout the whole product life cycle and supply chain (WEBB, 1999; WELFORD, 1996). Today, environmental management is not only a tool for adhering to environmental laws and regulation, or even a question of ethics and moral: in many cases it has evolved into an opportunity for companies to enhance the firm's value and to obtain financial gains.

## 1.1 Objectives and limitations

The aim of the paper is to identify corporate environmental company policies and tools, to categorise them either on a strategic, tactical and operational level. As our study takes an corporate environmental management perspective, external pressures are excluded, and the focus is on the industrial enterprise and its business environment. External pressures can be derived from governmental policies, legislation and trade agreements, while internal pressures are mainly economic ones corresponding with the organisation's aims. Other external sources of pressure can be industry associations (SHARMA, 2000), competitors, local communities, and the media.

The excluded systemic level of analysis pertains to societal systems, dealing with e.g. demographic changes, global warming, macroeconomic policy, income distribution and the global competitiveness of nations. These issues are important, but a focus on them and their impact on society seldom yield a basis for action by a firm. Also, analysis of issues at the systemic level often takes the perspective of public policy rather than that of a manager who is responsible for the performance of the firm (BARON, 1999). Another limitation of the study is the perspective of the individual level – although we are talking about managerial policies and tools, we do not take into account the personality of the manager as an individual, his skills, preferences, or values.

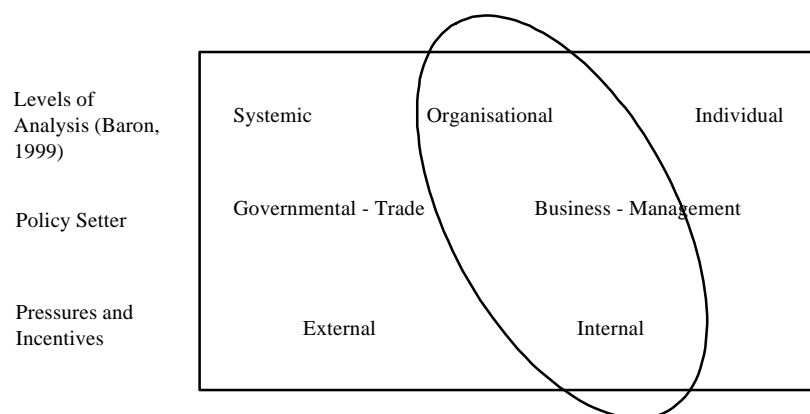


Figure 1: Focus of the study

Depending on the group of individuals initiating sociocultural pressures they can be seen as internal or external policy setters. Sociocultural pressures arise from lifestyle and consumerism as well as from people's attitudes and opinions. Technological pressures and incentives can

come from legislation on different levels or even from industrial competition. Economic pressures are derived from market mechanisms, while political pressure is put on companies via legislative measures (BLAIR and HITCHCOCK, 2001).

Environmental policies can be considered as business strategies and thereby have substantial consequences for the focus of the company. The policies can be seen to constitute the visions and aims of the company, which can then be fragmented into more tactical-operational goals. Environmental policies are not to be confused with the term “company policy”; the first signifies only the overall setting of visions and aims, while the latter includes more specific measures. In order to achieve these goals a company has a wide range of environmental management tools at its disposal.

The overall aim of the study is to identify corporate environmental policies and tools, and to categorise them either on a strategic, tactical or operational level. As we perceive that there exists some uncertainty of how different EMS concepts and methods are defined, the creation of a sequential model and the positioning of environmental policies, concepts, and tools within, is aimed at clarifying their terminological application. In order to achieve this we set the following questions:

1. How can the decision-making sequence be described in environmental management? Can such a sequential model be constructed for the decision-making process?
2. Where should certain environmental concepts, tools and methods be positioned in such a model? Which concepts, methods and tools can be identified in this context? How can they be categorised?

These questions are posed from the perspective of an industrial enterprise, coming from the secondary sector, hence, agricultural production and the sector of services is excluded.

## **1.2 Methods and structure of the study**

In order to study the sequence of decision-making in environmental management, the different approaches of logistics and operations management, and life cycle assessment versus marketing and sales referring to the product life cycle are studied and then incorporated to the theory of planning levels. Also, when coming to planning levels, a comparison of different theories has to

be executed to examine the applicability of the approach and its terminology in environmental management.

The study is entirely conceptual. However, as there is an existing confusion about the possible positioning of different concepts and methods used in the context of environmental management, the positioning of these in a sequential model may help to clarify their applicability in different real, actual situations. The classification and positioning of the concepts, methods and tools identified to be of importance in environmental management is done according to their actual definitions.

The study takes a descriptive approach, in which three propositions are raised and examined in order to answer the research questions stated above. They refer to the decision-making process as well as to the theories and approaches used in the context of the study. Also, they help to increase the understanding and positioning of the concepts, methods and tools described.

As described in Table 1, the following chapter is a description of the studied area of environmental management. This description is itself a literature review, illustrating the historical development of the field and providing basic definitions and a summarising explication of environmental management systems.

Further on, the approaches used in the context and in order to answer the previously defined research questions are described and integrated into the paper. Here, the underlying propositions of the study are introduced and examined. Also, the concepts, methods and tools used in the context of environmental management are positioned in sequential model that we construct.

Table 1: Structure of the paper

Chapter	Content
1.	Introduction and background to the problem area
2.	Area studied: environmental management
3.	Approaches used, propositions raised, classifications and positioning
4.	Summary and conclusions

The conclusions chapter summarises the findings of the study and is an attempt to give incentives for necessary further research to be carried out in the field.

## **2 ENVIRONMENTAL MANAGEMENT POLICIES**

Initially, during the 1970's, when the concept of environmental management was introduced, the corporate actors mostly regarded it as a passing trend, and consequently, most companies chose to ignore it (GREENO and ROBINSON, 1992). A decade later a change in attitudes became apparent: gradually sustainable development became accepted as a realistic and necessary goal for business. But the change in attitudes came slowly; the concept of sustainable development did not become widely accepted until the 1990s. By now, minimising the environmental impacts was not perceived only as a cost, but rather as a mean of achieving cost reductions and raising production efficiency. Today, it can also be considered an essential part of quality management (PEARCE, MARKANDAYA and BARBIER, 1990). More companies have begun to consider environmental management as a direct strategic factor, a tool for achieving competitive advantage (SHRIVASTAVA and SCOTT, 1992).

The creation of environmental management systems (EMS) within companies takes a systematic cyclical approach. A variety of definitions of EMS exist:

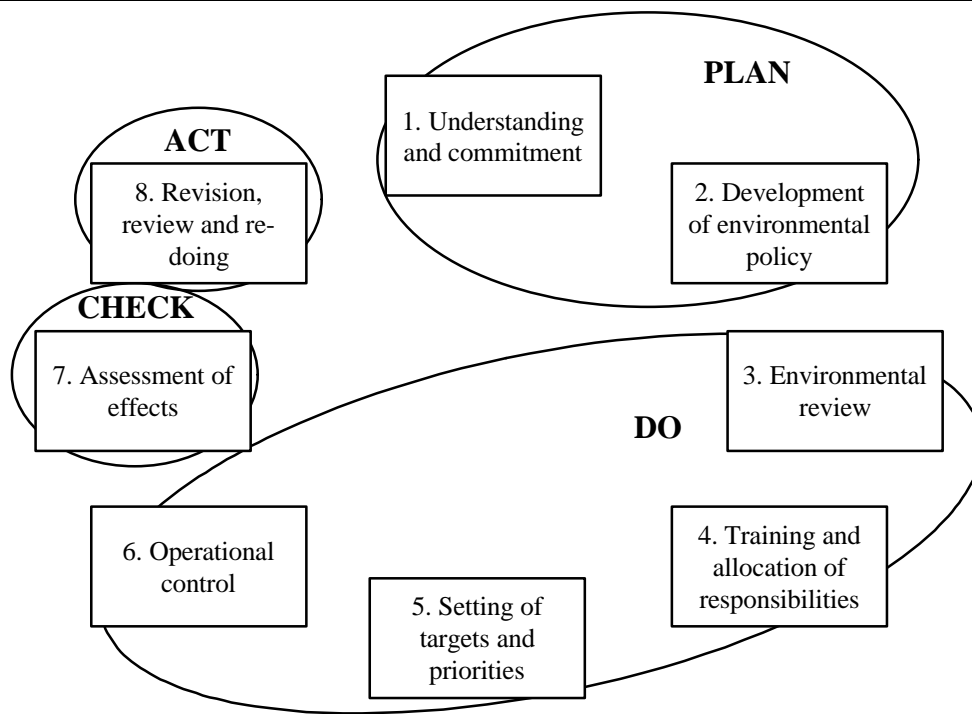
- NETHERWOOD (1996: 36) defines an EMS as a tool for implementing the set environmental policy in a company organisation,
- The Eco-Management and Audit Scheme (EMAS), the European Union's environmental management scheme, defines it as the "part of the overall management system which includes the organisational structure, responsibilities, practices, procedures, processes and resources for determining and implementing the environmental policy" (EMAS, 2001: Article 2).
- KOLK (2000: 103-104) defines it as "the totality of organisational. Administrative and policy provisions to be taken by a firm to control its environmental influence."

EMS can therefore be said to encompass and outline the environmental policies on a strategic, tactical, and operational level.

### **2.1 Phases of EMS**

According to KOLK the phases of an EMS correlate with that of the [Deming's (Pittman and Russell, 1998)] quality management cycle: a phase of planning, doing, checking, and acting.






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Figure 2: Stages of implementing an EMS (modified from WELFORD and GOULDSON, 1993: 6)

As illustrated in Figure 2, an EMS can be divided into a number of different phases. In Figure 2 we have combined EMS stages identified by WELFORD and GOULDSON, with the Deming model. The EMS process is seen as a cyclical string of activities that follow the model of quality management and the Deming cycle: planning, doing, checking and acting. However, the activities do not necessarily have to be performed in this particular order.

In the first phase the company should create an understanding of its environmental task, on a global, national or local level. This phase is individual for each firm, and is therefore perhaps the hardest to achieve. The understanding has to come from within the organisation. Further, the senior company management should comprehend the importance of continuous environmental improvement and make an organisational commitment to environmental management (NETHERWOOD, 1996; WELFORD and GOULDSON, 1993).

The second phase requires the development of an environmental policy. The environmental policy should state the overall scope, vision, and aim of the environmental strategy. The policy should also specify the company's commitment to the environment and the strive for sustainable development, and if the company intends to adhere to a specific EMS standard/scheme (such as EMAS or ISO 14001). The environmental policy should also be compatible with other policies, such as health and safety policies. As the environmental policy

provides important information about the company's aims and commitments in respect to the environment it should be made public for all stakeholders and interested parties, both internal and external (STARKEY, 1998; BROPHY, 1996; NETHERWOOD, 1996).

In the third phase an environmental review is to be carried out. In theory, during this phase all environmental impacts are to be identified and quantified. These assessments are to be carried out on a regular basis and should be made available for all interested parties and stakeholders. However, the depth and scope of the review varies greatly between companies. Some companies review only the most significant direct environmental impacts; others carry out a more comprehensive review. The methodologies and assessment tools also vary, some organisations carry out fairly simple environmental SWOT analysis, while others use more comprehensive environmental impact assessments (EIA). EIA can be defined as a systematic collection and assessment of information on possible environmental effects before the production has actually started. The EIA tries to predict the future environmental effects and risks. The EIA is therefore usually based on pre-made models and assumptions that may not in fact fully correlate with the 'real', future environmental impacts. The environmental review might highlight unexpected impacts, which subsequently may lead to the revision of the environmental policy (WELFORD and GOULDSON, 1993; WALKER and JOHNSTON, 1999).

The fourth phase incorporates the training of personnel and the allocation of environmental responsibility in the organisation. It is of uttermost importance that the staff who are involved in activities that have an environmental impact develop an understanding of their roles and responsibilities. Environmental training programmes may play an important role in heightening this awareness, the training should cover all levels of the organisation, from top-management to shop-floor workers. This phase also includes detailed definitions of competency requirements and job descriptions related to the EMS (NETHERWOOD, 1996; WELFORD and GOULDSON, 1993; STARKEY, 1998).

In the fifth phase more detailed and quantifiable targets and objectives should be set, as well as the environmental priorities, e.g. is the impacts on soil 'more important' for the companies' interested parties than e.g. the impact on water. The priorities may depend on the particular industry the company is involved in, the environmental review, or the particular environmental goals set in the policy (WELFORD and GOULDSON, 1993).

The sixth phase is referred to as operational control. This involves detailed documentation of the practices, procedures and systems within the EMS. This set of documents is usually referred to as the EMS procedures manual, and should encompass environmental procedures on all organisational levels. It also involves the measurement and verification that the system is fulfilling its purpose and achieving its goals (KOLK, 2000; WILSON, 1999).

The final phase is a follow-up and review of the environmental management system's effects. This is usually done by carrying out an environmental audit. The set targets and objectives should be compared to the actual outcomes and results, and the environmental performance should be assessed. Corrective action should be taken where deficiencies and flaws are found. Finally, the environmental performance is to be reported, both internally and externally, and following that, the whole process starts again with necessary revisions, and the setting of new environmental objectives and targets. By repeating and enhancing each stage the improvement process is continuous, and the environmental management system is made generic (WELFORD and GOULDSON, 1993; NETHERWOOD, 1996; KOLK, 2000).

### **3 PLANNING LEVELS AND THE PRODUCT LIFE CYCLE**

#### **3.1 Existing approaches for describing the product life cycle**

Two kinds of perspectives can be taken when examining the product life cycle. From the logistics and from life cycle assessment's (LCA) point of view, a product is examined from the beginning of raw material extraction until the recycling of its material. At the same time, marketing and sales take another perspective, quantifying the volume of the products actually sold, while the amount of materials purchased for its production is a cost factor that implies that the profit curve is delayed to the sales volume while introducing a product on the market. Via this setting of the product life cycle, the total pollution caused by the manufacturing of a product can be financially calculated.

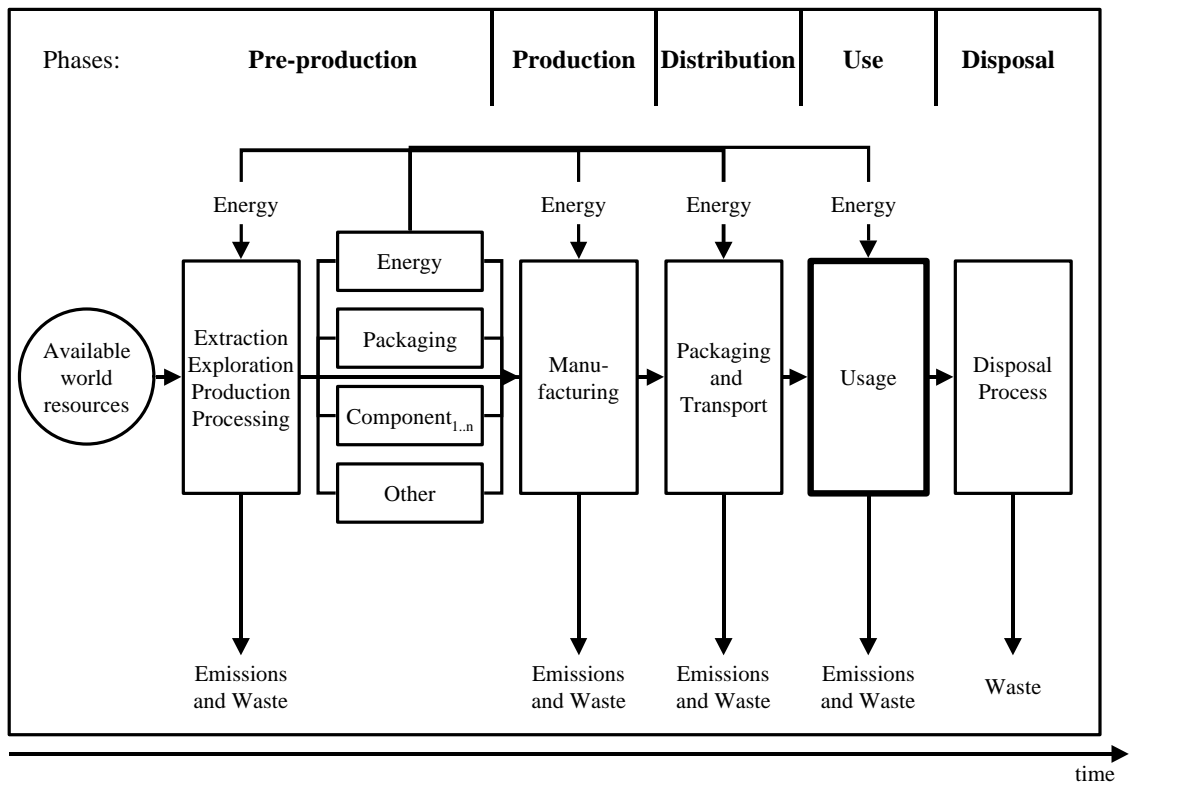


Figure 3: Product life cycle (LCA): adapted from STARKEY (1998)

As illustrated in Figure 3, STARKEY (1998) divides the product life cycle – from the LCA perspective – into the phases of pre-production, production, distribution, use and disposal. Depending on the product concerned, the components can vary in both the pre-production and the production stage. In this approach, energy usage and the measurement of pollution, emissions and waste play a central role. Waste is the only outcome of the disposal phase if a product cannot be disassembled for even partial reuse and recycling.

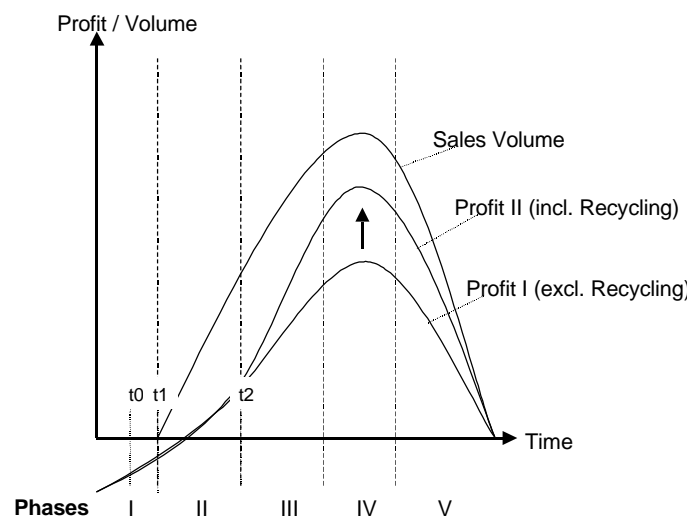


Figure 4: Product life cycle (Sales)

The phases shown in Figure 4 show the perspective of sales and marketing on the product life cycle. The last four stages are pictured according to the product life cycle curves of KOTLER (1967) and KINNEAR et al. (1995). According to both authors, they are commonly called phases of introduction, growth, maturity and decline. In the above figure one more stage is preset, which can be called "product design and development". Obviously, the sales volume of this phase is zero, while there exist costs of design, development and of the testing of manufacturing. Therefore, three moments have been highlighted on the time axis; according to these,  $t_0$  is the starting point of manufacturing,  $t_1$  shows the beginning of sales, as to say, the actual introduction of the product on the market, and  $t_2$  is set to underline the role of product recycling in the sales curve. This is the first point of deviation between the two profit graphs, because product recycling results in cost savings in manufacturing and shifts the profit caused by product sales.

However, both approaches to the product life cycle tend to exclude strategic matters. It can be argued, that the strategic aims of a company are set beforehand, even before any manufacturing or raw material extraction or product sales can be started. As the strategic decisions taken have a strong influence on further planning and implementation on the tactical-operational levels of a company, the strategic planning can be seen as a previously completed phase to the product life cycle. On the other hand, the actual implementations and measures taken in the operational phases of industrial manufacturing and sales have an impact on further strategic planning. This way, the strategic and tactical-operational phases form a loop developing in time, as it is illustrated in the following figure.

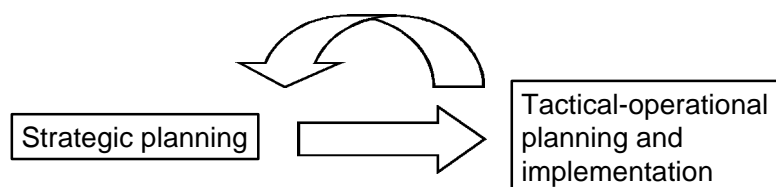


Figure 5: Planning loops

"The term *strategy* or *strategic* is a derivative of [the] Greek word *strategos*, meaning 'the art of the general,' which is indicative of the word's military origins. In fact, strategy and tactics are a part of both the military and the business lexicon, [...] (COYLE et al., 1996: 568)"

Obviously, there is also a link between the two perspectives on the product life cycle. The logistics point of view can be totally integrated in the different phases of the sales curve, with the addition of the financial quantification. Also, certain adaptations of the sales curve should

be made according to the revenue coming from the recycling of the product material. Generally, this will not affect the sales volume, but shifts the profit curve upwards, beginning from the first actual recycling in manufacturing, where fewer raw materials has to be purchased.

At the same time, the strategic planning can be seen as the initial phase 0, and could be also added (according to the loop thinking) after the disappearance of the product off the market.

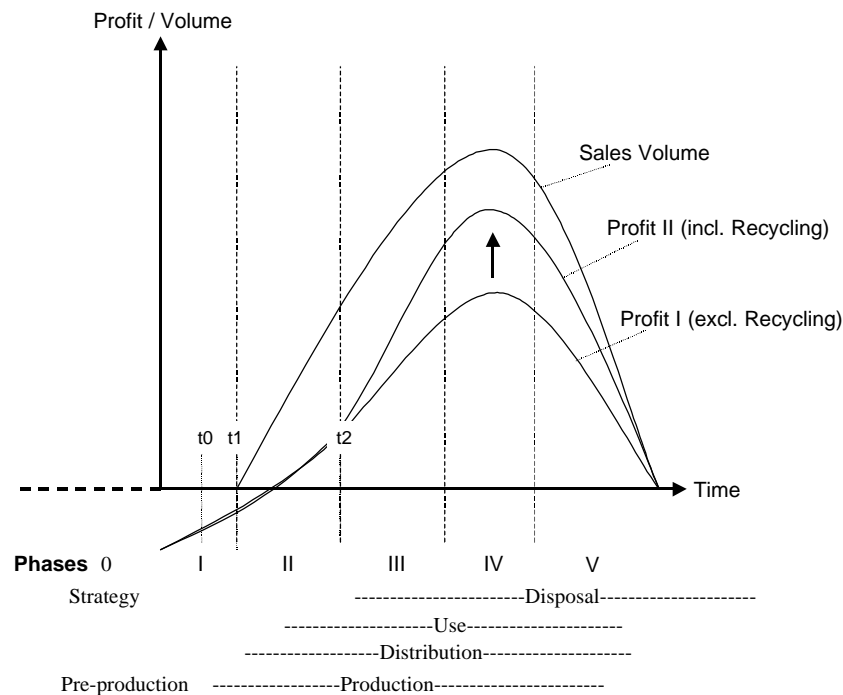


Figure 6: Integrated product life cycle approach

The phases from the LCA perspective correspond in their starting and ending points with the sales curve's description, as described in the integrated product life cycle approach in Figure 6. Accordingly, the production phase is initiated at time  $t_0$ , as  $t_0$  was set in the sales curve as the starting point of manufacturing.  $t_1$  was defined as the beginning of sales, hence, it corresponds with the distribution phase in the LCA model. Further,  $t_2$  indicates the first moment of recycling in the sales curve, when the profit rises according to recycling or reuse of material. Hence, the disposal phase of the LCA product life cycle starts according to this point, when combining the two approaches according to their respective timeframe.

### 3.2 Planning levels

Six basic characteristics of business strategy are considered by DOMÍNGUEZ MACHUCA et al. (1995: 63-64, based on HAYES and WHEELWRIGHT, 1984):

- business strategies refer to activities that imply a long time horizon,
- for being effective, their effects have to be significant, [...],
- they require a concentration of corporative forces and recourses for a tight scale of prioritised objectives,
- they require decision planning and sequential implementation,
- they are present for lifetime on all organisational levels and in every corporate function,
- they encompass a wide spectrum of activities and affect transcendental as well as day-to-day decisions, and
- they direct the energies, capacities and recourses of an organisation in order to achieve a sustainable competitive advantage over the competitors of the corporation [...].<sup>1</sup>

The strategic part of planning levels clearly refers to the "plan" part of MINTZBERG's strategic concept (MINTZBERG, 1989), which consists of the 5P's plan, ploy, position, pattern and perspective. Environmental management strategy refers to ploy, when environmentally responsible product differentiation is carried out as a marketing maneuver, organisation and product positioning follow the same pattern, while research in the area has usually been carried out on the pattern (SHARMA, 2000) or the perspective levels (BJÖRKLUND, 2001).

Planning levels are in the literature roughly divided into strategic, tactical and operational levels. However, the arguments used for this division differ in the literature, this is why the definitions can be divided into two major groups, the *timeframe* and the *decision-maker* group. When argued with the timeframe, the strategic planning level is seen as part of the long-term planning, where decisions are made for and with an extended time horizon. Accordingly, the tactical level is defined as aiming at an intermediate time horizon, while the operational level includes short-term decisions only (BALLOU, 1999; GÜNTHER and TEMPELMEIER, 1995; DOMÍNGUEZ MACHUCA et al., 1995, based on HAYES and WHEELWRIGHT, 1984)

The decision-maker definition group argues for strategic, tactical and operational planning levels from the organisational perspective. Here, strategic plans are agreed on a top management level, while tactical planning is made on a lower management or department level, and operational planning and implementation takes place on the staff level, aiming at activities and operations. The approach of this definitions group is derived from the division of responsibilities for plans and actions taken in the corporation (SHARMA, 2000; MARTIN, 1998).

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<sup>1</sup> Translation by authors

Level	Timeframe	Decision-maker in the hierarchy of the organisation
strategic	long-term	top management
tactical	intermediate time horizon	relevant management
operational	short-term	all staff: activity-based

Table 2: Definitions of planning levels

In the context of positioning environmental management policies, concepts, methods and tools, the two approaches can be combined, and responsibility levels and time horizons can be both attached as in the above table to the notions of strategic, tactical and operational. Correspondingly, the strategic planning level is at the same time aiming at a long-term perspective, and the decision-makers in this level can be localised at the top management level of the organisation. Tactical planning and decisions are carried out with an intermediate time horizon by personnel on lower management positions, and operational decisions are made for short-term purposes by the on staff level, aiming at actual activities and operations.

### 3.3 Analysis and propositions

“An environmental strategy could be defined as the response to the relationship of an organisation’s products, services and activities with its natural environment (LAWRENCE and ANDREWS, 1998: 238).”

#### 3.3.1 Strategy development in environmental management

Environmental strategy is not only a statement, but also a result of a strategy development process. BJÖRKLUND (2001) summarises the stages of this process described in literature in the following figure:

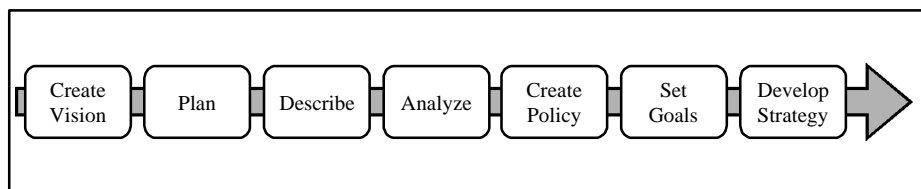


Figure 7: Strategy formulation (BJÖRKLUND, 2001: 5)

Further on, the goals and targets defined by the corporate environmental strategy have to be decomposed into actual measures and actions. For all the identified measures responsibilities in



the organisation have to be assigned in order to achieve the desired outcome when implementing these ideas.

Implementation is a result of strategy deployment; the breaking-down of the strategy into a detailed, analytical, though theoretical level on a tactical planning level is necessary for the implementation process in the operational phase.

### *3.3.2 Propositions of the study*

The study raises the following propositions:

1. There is an existing time frame in environmental management decision-making.

According to this proposition, environmental management decision-making can be described as a sequential process, which consists of different stages. These stages correspond with planning levels that are hierarchical in importance, timeframe and organisational hierarchy. They can generally be set as strategic, tactical and operational levels; decisions taken on the different levels can be assigned to these according to their intentional time horizon, or according to the level in organisational hierarchy they are taken, as set in the previously as timeframe and decision-maker groups of the definitions of planning levels.

2. The planning and decision-making process follows a timeline.

Corporate environmental management decision-making is not only hierarchical following planning levels, but the planning itself follows a clear framework referring to time. It starts on the highest level of hierarchy, the strategic planning, which is later decomposed and implemented on tactical and operational levels.

On the other hand, planning and decision-making does not end on the operational level, but the whole hierarchical planning system evolves over time. This is possible through a link back from the operational to the strategic level, providing hierarchically higher set planning with detailed information. Therefore the system can at the same time be described as following a time-line and be seen as a loop.

In environmental management, environmental reporting can be used as a feedback loop and link back from operations to strategy, as illustrated in Figure 8.

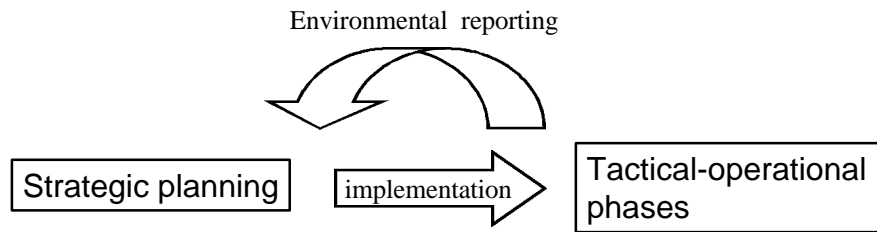


Figure 8: Environmental reporting as feedback loop

3. Policies, concepts, methods and tools can be roughly positioned in the framework of decision-making in time as shown in the following figure:

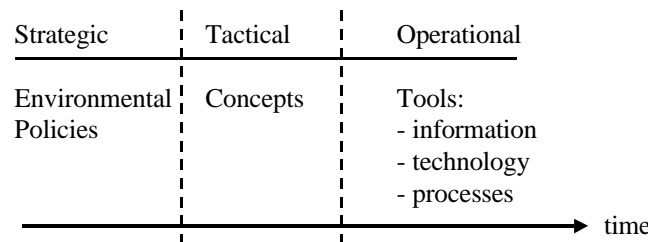


Figure 9: Proposition 3: Decision-making sequence and timeframe

In the proposition, environmental policies are located on a strategic level, because they can be described as all-encompassing, general guidelines and environmental management frameworks aiming at a long time-horizon, and with decisions made on a top management level.

Concepts, as used in this context, are theoretical frameworks, although designed on a more detailed level than strategies. They are deployed strategies, and analyses and assumptions about future possible real occurrences. While decomposing strategies, they attach and define responsibilities and actions for the measures necessary to achieve the strategic goals and targets. They are set here on a tactical level because of their theoretical status, as no actual measures but only assumptions can be made in this stage.

Tools for sustainable development and environmental protection are actual implemented methods. They encompass actual measures and implementations; on this stage, actions are taken. Tools can be technologies, functions and processes as well as information and measurement systems. In the further positioning of environmental concepts, methods and tools the tactical planning level is divided into information, technology and process tools.

### 3.4 Positioning of concepts, methods and tools

Figure 10 summarises our attempt to position the concepts and tools of EMS into the time frame model. The strategic dimension lays the framework for both the tactical and operational measures. Some tools and concepts cannot be clearly classified solely in one. In the following chapter the different phases and their components are assessed more carefully.

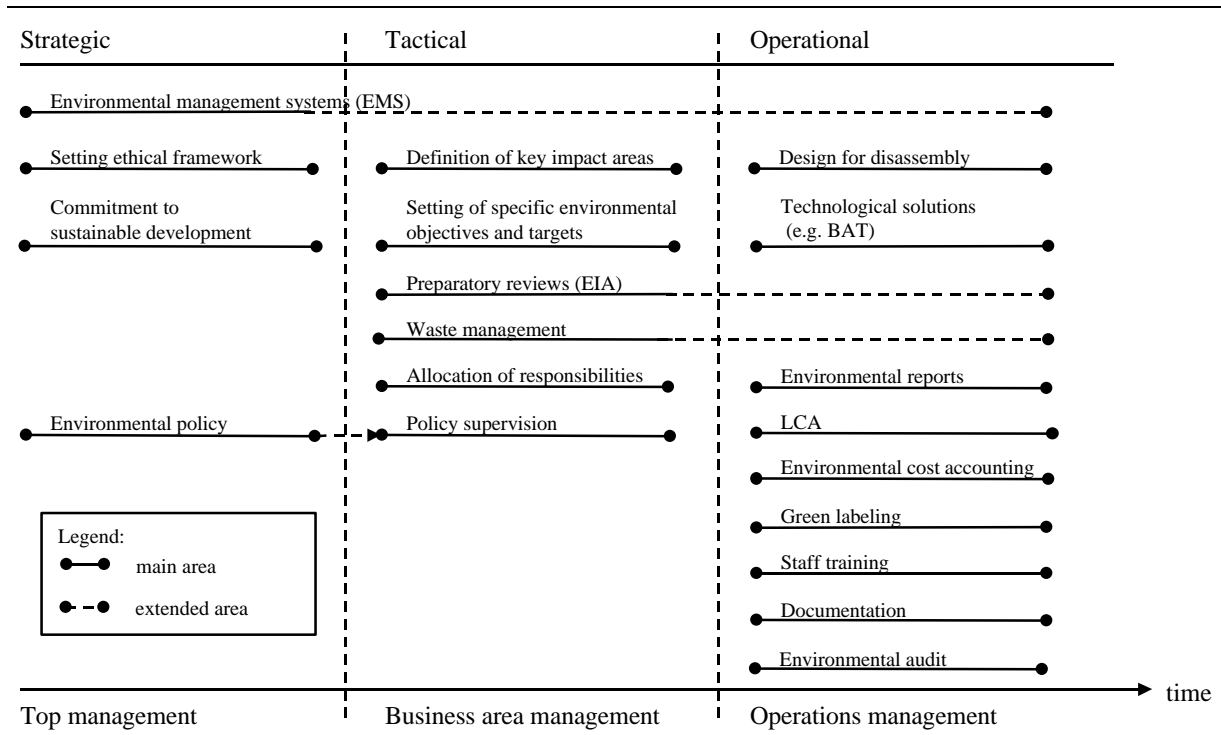


Figure 10: Sequential model

#### 3.4.1 The strategic approach

The first phase of an EMS is creating an understanding and commitment of the environmental task. The understanding has to come from within the firm and initially concerns top-level management. The understanding creates a framework not only for the environmental policy, but also for the whole EMS. It also lays the framework for what the company's ethics are. The environmental policy states the overall scope, vision, and aim of the EMS. We position both the creation of understanding and the environmental policies on the strategic level, as both can be described as all-encompassing, general frameworks for the whole management system. Both the understanding/commitment and policies are created on the top-management level, and with a long-term strategy in mind.

### *3.4.2 Concepts on the tactical level*

We earlier defined concepts as theoretical frameworks, but more specific and detailed than strategic framework. We further stated that concepts are deployed strategies, as well as assumptions about possible future possible impacts and occurrences. As said the tactical dimension further specifies the strategies, as they attach and define responsibilities and actions in order to achieve the all-encompassing goals and targets set on the strategic level.

Positioning the methods and tools on either the tactical level or operational level proved more difficult. Some of the policies, such as EIA or waste management (as a concept), include elements both on a tactical and operational level. But there are also more clean-cut concepts that can be positioned on the tactical level, these include the setting of more detailed environmental (quantifiable) targets and objectives, definition of which environmental areas are prioritised, the supervision of the overall environmental policy, and the allocation of environmental responsibilities within the firm.

### *3.4.3 Tools on the operational level*

The tools used on the operational level, are also the most tangible measures of an EMS. Therefore, this group also displays the widest range of policies/tools of the three levels. We have sub-divided the tools on the operational level into technological solutions, process tools, and information tools.

Technological solutions include e.g. the adoption and development of Best Available Technologies (BAT). In practice, BAT involves the use of proven technologies and production methods in order to prevent or minimise emissions to the environment. Even minor technological developments and/or adjustments can reduce the impact of a company's environmental effect, also in the long-term perspective. But it should also be emphasised that in this embedment, technological tools should not be perceived as seamless solutions for diminishing or eradicating environmental impacts of business activities. Rather, they are often convenient methods to reduce, but not to eliminate environmental problems on a short-term perspective.

The information tools can be divided into information targeted for internal or external use. An instrument for external information is the adoption of environmental labelling (eco-labelling). The aim of the labelling-schemes is to ensure that products meet certain environmental standards, and are hence awarded to products that meet a range of environmental criteria,

covering everything from product ingredients to packaging. The labels are widely used as part of products' environmental marketing, when the manufacturer is trying to convey a green-image to the consumers (WEBB, 2000; ROBERTS, 1995). Another form of labelling is compulsory content labelling that is required by the firm on a legal basis. It can have an environmental dimension if e.g. hazardous materials have been used in the production. The compulsory labelling is aimed at authorities, but also indirectly at the consumer.

The publication of corporate environmental reports is another tool for external communication. KOLK (2000) defines environmental reports as "publicly available publications in which a firm gives an account of its environmental or environmentally related activities and results in a specified period of time". Information tools aimed more for internal use are e.g. life cycle assessment (LCA), and environmental cost accounting.

One of the reoccurring problems for companies when trying to implement an EMS is identifying and prioritising the most important projects and the parts of the production process with the heaviest environmental impact. In many aspects a LCA can solve many parts of this dilemma: it enables the user to quantify the social, economic and environmental impacts that are caused by the production (PARKINSON and BICHARD, 2000). LCA is a systematic process of evaluation of the environmental effects of a product, process or activity. The LCA aims to identify and quantify the energy and materials used, and to assess the impact of energy and material usage, as well as identifying opportunities for environmental improvements. The LCA should cover everything from extraction and processing raw materials, to manufacturing, transportation and distribution, to use, reuse, maintenance, to recycling, and to final disposal (WEBB, 1999; DUDA and SHAW, 1997).

Environmental cost accounting is another form of information tool that is used for internal purposes. But as opposed to LCA, it measures the monetary costs of environmental impacts, and environmental measures (KOLK, 2000).

Examples of process tools are the concepts of design for disassembly, i.e. designing products with the out-set that they can be recycled after having been used, and the concept of waste management, which basically strives for zero waste and a closed-loop waste system. The training of staff can also be considered a process tool.

## 4 SUMMARY AND CONCLUSIONS

The aim of the study was to identify corporate environmental policies and tools, and to categorise them either on a strategic, tactical or operational level. As we perceive that there exists some uncertainty of how different EMS concepts and methods are defined, the creation of a sequential model and the positioning of environmental policies, concepts, and tools within, is aimed at clarifying their terminological application. In order to achieve this we aimed to answer the following questions: How can the decision-making sequence be described in environmental management? Can such a sequential model be constructed for the decision-making process? Where should certain environmental concepts, tools and methods be positioned in such a model? Which concepts, methods and tools can be identified in this context? How can they be categorised?

We concluded that the process of environmental management decision-making could be set on a strategic, tactical and operational level. These hierarchical planning levels are assigned according to the intentional time horizon, or to the level of internal organisational hierarchy. The conclusion being that there is an existing time frame in the EMS decision-making process. Further, we concluded that the environmental management decision-making is not only hierarchical following planning levels, but the planning itself follows a framework of time. It starts on the highest level of hierarchy, the strategic planning-level, which is then further subdivided into tactical and operational levels respectively.

To position some policies, concepts and tools proved more difficult, as some of them could not be positioned clearly in one or the other of the levels. This became especially apparent for some concepts, such as waste management and EIA, which both include a conceptual or tactical element, but also characteristics of tools on the operational level. There is also a fundamental question of what an EMS in fact is; it does in theory cover all levels. But one of the main problems with EMS is that its strength lies in its strategic approach. The EMS approach, and the EMS standards such as EMAS and ISO 14001, does not really state specific instructions of how to achieve sustainable development or less environmental impacts per se. An EMS is defined as the whole “organisational structure, responsibilities, practices, procedures, processes and resources for determining and implementing environmental policy” (BRITISH STANDARD INSTITUTE, 1994, as quoted in WELFORD, 1996). So, it does cover the tactical and operational levels, but the strength of the concept definitely lies on a strategic level. An EMS gives you the forest but not the trees: It is helpful in defining what should be

done, but not how. It is then up to the individual company and its management to decide on and implement the specific tools, in order to achieve the goals and objectives set in the environmental strategy.

#### **4.1 Suggestions for further research**

The field of environmental management is fairly new, and is still in its early stages of development. One area that would need further research is the question of financial incentives for an EMS. What are the financial-economic incentives to implement the chosen concepts, methods and tools, if any? The common assumption today remains that an EMS is implemented because environmental legislation forces companies to cut their emissions and minimize their environmental impact.

Another area for further research could be the technological solutions on the operational level. Technological solutions are the most commonly used method of cutting emissions, and even minor technological developments and adjustments can reduce the impact of a company's environmental effects. However, technological tools are in the danger of being perceived as seamless solutions for diminishing or eradicating environmental impacts of business activities. They are often convenient methods to reduce, but not to eliminate environmental problems on a short-term perspective. So, the question is how to integrate technological fixes can further be embedded into the long-term environmental strategies, and how environmental strategies and policies have to develop in order to shift the aim from trying to fix a environmental problem to eradicating it.

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