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INTERPRETING ENVIRONMENTAL ASPECTS OF ISO 14001
A manual for implementing ISO 14001 in different organisational forms

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SUMMARY
Identifying, controlling and influencing the environmental burden of a company is a complex issue when ISO 14001 has to be interpreted. Starting-up, integrating and continuing the right activities are the key factors to meet the requirements on procedures, roles, responsibilities and authorities. The organisational aspects should be in tailor-made design to make the implementation of ISO 14001 attractive to a company. In this paper the starting up process of the environmental activities is translated into a manual. This manual guides a company towards a blue-print of an effective and efficient management system.

1. Introduction
Environmental management has become something of a common practice in North America and Europe. In companies in those areas there is a palpable sense of progress in environmental management during the 1990s (Angel and Huber, 1996:127). After a few years of diversification nowadays there is a strong trend towards standardisation and certification. The most widely known standard ISO 14001 was first published in 1996. Its intention is to provide organisations with the elements of an effective environmental management system which can be integrated with other management requirements, to assist organisations to achieve environmental and economic goals (ISO, 1996: V). The standard concerns commitment, procedures, documents and information. Unifying these elements stimulates trustworthy information flows. But does this standardisation and certification also shine a bright light on the environmental performance of the company? In this paper we will elaborate this question.
In paragraph 2 we pay some attention to different standards and to the international context in which they appear. In paragraph 3 we go into the activities needed for environmental performance. In paragraph 4 we present a checklist for implementing ISO 14001. It’s a manual about starting-up, integrating and continuing the activities needed. In paragraph 5 we pay attention to the implementation of the activities needed into roles, responsibilities, authorities and procedures. By focusing on a tailor-made approach we hope to contribute to the successful implementation of ISO 14001 in smaller firms.

2. Standards in the international context
The two important standards with respect to standardisation and certification are the Eco-Management and Audit Scheme (EMAS) of the European Union (Council Regulation 1836/93) and ISO 14001. The latter did have a predecessor: BS 7750 (British Standard). We have to be aware of the fact that the relative importance of the two standards varies among countries. In countries that already established a tradition under BS 7750 (British Standard), usually the ISO standard predominates. On one end of the scale we find Britain. Of course here ISO 14001 leads the contest sovereignty. On the other end of the scale we find Germany where EMAS rules. The Netherlands is in between. Some predominance of ISO can be found. In the Netherlands all but one company that are EMAS verified also are ISO certified. And they started with the ISO certification. The normal explanation that is given for these differences is the perception of the external credibility of a standard and their certifiers.

How well are the minimal requirements guaranteed that companies should meet? Implement the involved accredited institutions their work very similar? With a high and stable level of quality? The accreditation system in centralised in the Netherlands where it is decentralised in Germany. In the Netherlands, alike the situation in the United Kingdom, only organisation have been accredited. In the Netherlands only a handful of organisations (five) have been accredited. By contrast, in Germany and France most existing verifiers are individuals. Whereas in Germany the number of accredited individuals is rather large (Spencer-Cooke, 1996). Some prefer the public EMAS, but European, system others prefer the world standard ISO that might suffer credibility by wrongdoing in any part of the world.

ISO 14000 on environmental activities
In general ISO 14001 requires that a company establishes and maintains an environmental management system. ISO leaves a broad range of options open for filling in the environmental aspects, and thus for filling environmental related activities in the firm. The standard gives some specification: Paragraph 4.3.1 states that the organisation 'shall establish and maintain procedures to identify the environmental aspects of its activities, products or services that it can control over and which it can be expected to have an influence, in order to determine those which have or can have significant impacts on the environment'. The next question to address is: what are the environmental aspects of activities we undertake, and products and services we produce and sell. The main text says that the organisation's environmental policy should be 'appropriate to the nature, scale and environmental impacts of its activities, products or services' (4.2.a). That waste and emissions during production should be identified and controlled is a commonplace. This commonplace is also acknowledged in the International Standard ISO 14001.

This quotation suggests however that the extract of raw materials and energy, the use of products and disposal of the product are also issues for the company. The environmental burden in other stages of the environmental life-cycle should also be identified, controlled and influenced. So the use of raw materials and energy as well as the whole environmental profile of the product are indicators for environmental performance. The distinction between the production and the other phases in the environmental life cycle is acknowledged, but the obligations for the company to meet these requirements are not very clear. There is an annex to the ISO 14001 that gives information on the requirements of the environmental management system. This only informative annex A is intended to avoid misinterpretation. And indeed, in this annex some more practical, guiding, information is given: 'The process to identify the significant environmental aspects associated with the activities at operating units, should, where relevant, consider, (a) emissions to air, (b) releases to water, (c) waste management, (d) contamination of land (e) use of raw materials and natural resources, (f) other local environmental and community issues...'. The process is intended to identify significant environmental aspects associated with activities, products or services, and is not intended to require a detailed life cycle assessment. Organisations do not have to evaluate each product component or raw material input. They may select categories of activities, products or services to identify those aspects most likely to have a significant impact.

However, the current standard offers little clarification on which activities are therefore relevant, how it's done and who should carry out these activities. These are the topics to be covered in the next paragraphs.

3. ISO 14001 and the activities needed
The core of an organisation is formed by its primary processes. Through the primary processes the organisation fills a niche in a market. The management of an organisation has to translate external demands in order to ensure the survival of the organisation. This can be visualised in the figure below.
figure 1: A company in its surroundings
All environmental burden is caused by substance and energy flows (mainly in the primary processes). The procedures within the framework of ISO 14001 should therefore relate to identifying, controlling and influencing the substance and energy flows of the firm in question. Waste and emissions during production should be controlled and reduced. Indicators for environmental performances for the production could be emissions to air, emissions to water, emissions to soil, wastes, noise and accidents. In practice, environmental management is often limited to dealing with these emissions into the air, water and soil, noise emissions and waste in the workplace. It is often forgotten that these current problems were caused by decision-making in the past about production. In this decision-making often too little attention was paid to the consequences for the environment. Nonetheless in this stage major environmental results can be achieved. For example, the environmental effects of alternatives may already be considered at the stage of designing the product or when making choices about production technology. Such considerations should not only concern environmental pollution during production, but also the effects of the recovery of raw materials, the use of the product and waste phase.

On the basis of these concepts we may distinguish two sources of environmental burden of a company and subsequently two complementary and necessary approaches within environmental management to be covered by ISO 14001. Firstly, the sources of current environmental pollution are located in the primary processes in the workplace, where people perform activities on substance and energy flows using machines and equipment. Such sources are noise emissions, emissions into air, water and soil, and waste production. The approach needed here is a careful look at the actual production line-up and can be called pollution prevention (lower part of figure 1).
Secondly, the current sources are largely the result of previous business decisions concerning the development, construction and continuation of the production equipment and line-up. Environmental considerations have received insufficient attention in the past, or there was an inability to remove the problem areas that were found. In this early stage the more fundamental changes can be weighed. This second approach is aimed at preventing environmental pollution in actual production line-ups, before there are constructed. This approach is therefore future oriented and can be called decision-supporting (top part of figure 1).

Together the two approaches assure a good environmental performance now and in the future. Below we further work out these two approaches.

I Pollution prevention approach
Over the past years a lot of projects have been carried out that could be labelled as pollution prevention or waste minimisation projects (see: De Bruijn, Coenen and Lulofs, 1996). The activities involved vary per project, but are usually inspired on, and structured by the Prevention Manual issued by the American Environmental Protection Agency (Waste Minimization Opportunity Assessment Manual, 1989). The pollution prevention activities vary as to the exact implementation of this framework. But the concept involves at any rate:
1. Inspection of the firm as to:
   - its substance-, material- and energy flows;
   - the extent of its waste and emission flows;
   - the causes of these inefficiencies.
2. Looking for measures aimed at the reduction of waste and emissions on the basis of:
   - the collected information about waste and emission flows;
   - expertise within the firm and with the team of executors.

The pollution prevention approach is aiming at improving the actual performance of an organisation. By carefully looking at its present performance the organisation learns which activities are environmentally relevant and therefore need to be controlled. Out of these insights adequate roles, responsibilities, authorities and procedures can be designed. As far as pollution prevention is concerned, ISO 14001 requires a full-fledged implementation.

II Decision-supporting approach
ISO 14001 requires more than just a closer look at the actual situation. It also asks for incorporation of environmental concerns into decision-making. Once decisions are made, money will be invested, and the possibilities to take environmental considerations into account decreases strongly. This calls for
decision oriented environmental management. Elements of a life cycle approach, like the use of raw materials and natural resources, aspects of integral chain management and eco-management have to be implemented. To ensure this tasks has to be defined and enhanced to secure environmental considerations in environmental relevant decision-making processes.

In our model of decision-making we make a distinction between strategic and operational decision making (viz. Paine and Anderson, 1983, and Anderson, 1990). In the case of environmentally relevant strategic decision-making the issue is future environmental pollution as a result of decisions regarding:

- the product (i.e. the composition of the product and its use as laid down in the design);
- production technology (i.e. the intended production process, equipment and resources to be used);
- location (i.e. the physical location where the production is taking place).

Operational decision-making concerns the initiation, coordination and control of the primary processes. In the case of environmentally relevant operational decision-making the issue is future environmental pollution due to the starting-up, maintaining and changing of production. Environmentally relevant decisions concern the following in particular:

- the choice of raw materials and resources;
- the choice of equipment, machines and installations;
- the planned use of substances and equipment, including:
  - the purchase, installation, maintenance and exploitation of tools, machines and installations;
  - the ordering and use of raw materials and resources;
- the planned delivery, storage and transport of:
  - raw materials and resources;
  - working supplies of raw materials and resources;
- the planned transport, storage and delivery of:
  - the products;
  - any secondary products;
  - waste matter.

Summarising, incorporation of environmental concerns both into strategic and operational decision-making means that attention is paid to:

1. the systematic collecting of information about environmental consequences in the different lifecycle-stages of alternatives;
2. the search for alternatives that cause less environmental burden;
3. the use of a method to evaluate the environmental consequences amidst other considerations.

So now the activities that need to be carried out are known. On the one hand there is a need for a pollution prevention approach. This is a well-known territory for a lot of companies. On the other hand environmental relevant decision-processes of future production need to pay attention to environmental affairs. This approach needs to be developed further by a lot of companies (De Bruijn, Coenen, Lulofs, 1996).

4. A manual for implementation

In general ISO 14001 requires that a company establishes and maintains an environmental management system. The ISO 14001 standard specifies some core requirements for such a system:

- Environmental policy;
- Planning;
- Implementation and operation
- Checking and corrective action;
- Management review.

Meeting the requirements of ISO 14001 demands starting up the right environmental activities, integrating those activities in the normal management and continuing those activities. That are the three key words to reach for: starting up, integrating and continuing. Brought back to its basics its all about working out a sufficient plan that fits the specific company. Two approaches were distinguished in environmental relevant activities: (I) pollution prevention activities and (II) decision-supporting activities. The first approach typically deals with identifying, controlling and influencing, waste and emissions from actual production. The second approach typically deals with identifying, controlling and influencing environmental aspects of major renewals of products and the production technology used. Of course in the midterm and minor adjustments both approaches touch one another. Let's take a
closer look at the concrete steps needed for the two approaches, while at the same time meeting the requirements of ISO. Our aim is to arrive at one manual that clearly identifies the steps needed for both approaches. This leads us to a manual consisting of five steps:

<table>
<thead>
<tr>
<th>1.</th>
<th>Environmental Policy: Preparing</th>
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<tbody>
<tr>
<td>-</td>
<td>establish the work-forms needed (direct line to top management, information on operational matters and someone to do the homework)</td>
</tr>
<tr>
<td>-</td>
<td>preparing (general) environmental policy-statement</td>
</tr>
<tr>
<td>-</td>
<td>creating support</td>
</tr>
</tbody>
</table>

2.a Planning: Analysing the environmental performance
- making an inventory of environmental demands and standards of authorities, financiers, suppliers, consumers and social groups
- analysing inefficiencies in actual energy- and substance-flows:
  * pollution prevention approach in actual production;
  * minor efforts into a cradle to grave approach
- but also: exploring the decision-making structure: find the places where the environmental relevant decisions are being taken, taking into account:
  * the organisational structure;
  * the decision-making structure;
  * existing information about the choice of products, packages and technology.

2.b Planning: Generating measures and establishing a program of activities
- translating the general environmental, on the basis of a sound analysis, into more specific but realistic environmental policy targets
- developing alternative preventive measures
- choosing measures on the basis of environmental, legal and technical urgency
- developing a blueprint of the management system

3. Implementation and operation
- making drafts of procedures for roles, responsibilities and authorities for integrating and continuing (a) pollution prevention activities and (b) decision supporting activities
- implementing the chosen measures on the basis of (a) the pollution prevention approach (b) the decision supporting
- informing and educating the people involved

4. Checking and corrective action
- measuring and registration
- implementing internal controls
- preparing internal and external reports
- feedback to previous processes (a) concerning pollution prevention activities (b) decision supporting activities

5. Management review
- judging checking and corrective action (judging performance and reporting)
- reviewing roles, responsibilities and authorities
- adjusting procedures

This is a blue-print to start from scratch. That’s why in the first step the work-forms needed have to be established on an ad-hoc basis. It’s about starting up the activities needed. As we stated earlier ISO 14001 is especially about integrating and continuing. And that’s why establishing procedures for roles, responsibilities and authorities is an important item in the blue print.

Organisational aspects of ISO 14001, formally seen
In order to fulfil the requirements of environmental management, as a part of 4.4 'implementation and operation' the 'Structure and responsibility' (4.4.1) is the element to shape the organisations' structure for implementing ISO 14001. Paragraph 4.4.1 says that 'Roles, responsibility and authorities shall be defined, documented and communicated in order to facilitate effective environmental management' and
...ensuring that environmental management system requirements are established, implemented and maintained in accordance with this International Standard. However the element ‘Structure and responsibility’ refers to roles, responsibility and authorities without specifying them. The description still leaves a broad range of options open for filling in the environmental aspects of ISO 14001, and thus for filling environmental related activities in the firm.

In our blue-print a distinction of these aspects was made in two categories (I) pollution prevention activities and (II) decision supporting activities. The practical reasons for this was that the time-horizon is often different and as important, the people involved are usually found at different places in the organisations’ structure. When the starting-up is finished it becomes possible to base decisions about roles, responsibilities and authorities on a sound analysis of the organisational structure and the most suitable places and people to be involved. At that moment tailor-made procedures can be established. But for that the firms’ typical production system, organisational structure and decision-making structure has to be taken into account while defining roles, responsibilities and authorities.

Brought back to its basics it’s all about establishing the right procedures for roles, responsibilities and authorities to get the (a) identifying, (b) controlling and (c) influencing done on the two kinds of relevant activities needed: (I) Pollution prevention activities and (II) Decision supporting approach.

**Starting up:**

<table>
<thead>
<tr>
<th>Approaches</th>
<th>Relevant activities</th>
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<tbody>
<tr>
<td>(I) Pollution prevention approach</td>
<td>a. identify</td>
</tr>
<tr>
<td>(II) Decision supporting approach</td>
<td>b. control</td>
</tr>
<tr>
<td></td>
<td>c. influence</td>
</tr>
</tbody>
</table>

**Figure 2:** the organisational aspects of integrating and continuing after starting up

Essential is that the pollution prevention approach and the decision supporting approach are different activities at different places in the organisation and therefore ask for different roles, responsibilities, authorities and procedures. Below we work this out for these two approaches.

5. Integrating and continuing into roles, responsibilities, authorities and procedures

The most important next step is to identify where the subsequent tasks have to be put within the organisation. The tasks should be allocated at those places and to those people where appropriate, for instance where environmentally relevant decision-making is taking place. After all, the division of tasks is bounced to fail without linking up to the main forms of management in the company. Otherwise the environmental considerations will stay a ‘fremdkörper’ in the organisation. Companies differ from one another in a lot of ways. After all, a company is dependent on its markets and surroundings to be able to operate successfully. Other markets and surroundings lead to different organisational structures that may function differently. Generally speaking, business management has to respond to market dynamics. Dynamic markets require a form of management which can deal with rapidly changing demands from customers. Less dynamic markets mainly call for a form of management that is able to keep the cost price low. The organisational structure and the decision-making structure therefore also generally reflect market features. We distinguish three production systems: continuous, series and piecemeal production.

In the case of little market dynamics a company could opt for *continuous production*. Here the
products are put on the market indirectly in large numbers through importers, wholesalers and trade enterprises. Continuous production is aimed at the standardisation of products. Examples of products are some foods such as bread and basic chemicals, such as chlorine.

In series production we should distinguish between the production of consumer goods and the production of semi-manufactured products for other companies. In the case of series production of consumer goods market sales take place through intermediate trade. However, consumer preferences with regard to the products change more rapidly than in the case of continuous production. Due to changing consumer preferences product innovation takes place regularly. Examples of such products are audio and video equipment, and cars. In the case of series production of semi-manufactured products we see direct interaction between the producer and the customer. This means that the product is tailored to the requirements of the individual customers. Examples are the subcontractors that work in many branches of industry, for instance a firm that supplies synthetic parts for the automobile industry.

In the case of piecemeal production there is direct interaction between the producer and the consumer. The consumer informs the producer directly of his wishes regarding product specifications. Orders precede production. Product sales are determined by the extent to which it is possible to produce the desired product in the desired quality.

It is clear that the organisational and decision-making structure has to fit the production system.

Without elaborating, in figure 3 some major characteristics of the organisational and decision-making structure are described.

<table>
<thead>
<tr>
<th>Production system</th>
<th>Organisational structure</th>
<th>Decision-making structure</th>
</tr>
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<tbody>
<tr>
<td>continuous</td>
<td>- strong, centralised hierarchy</td>
<td>- strongly centralised decision-making power</td>
</tr>
<tr>
<td></td>
<td>- preparatory staff important(^1)</td>
<td>- strongly formalised procedures</td>
</tr>
<tr>
<td></td>
<td>- staff and line strictly separate</td>
<td>- aimed at process improvements</td>
</tr>
<tr>
<td>series finished products</td>
<td>- strong, centralised hierarchy</td>
<td>- centralised decision-making power</td>
</tr>
<tr>
<td></td>
<td>- preparatory staff important, also for product variation</td>
<td>- strongly formalised procedures</td>
</tr>
<tr>
<td></td>
<td>- staff and line separate</td>
<td>- aimed at both process and product improvements</td>
</tr>
<tr>
<td>semi-manufactured products</td>
<td>- centralised hierarchy</td>
<td>- decision-making power lies with the management, preparatory staff and medium-level executives</td>
</tr>
<tr>
<td></td>
<td>- preparatory staff important, particularly in case of product variation</td>
<td>- formalised procedures</td>
</tr>
<tr>
<td></td>
<td>- functional task allocation</td>
<td>- aimed at product improvements</td>
</tr>
<tr>
<td></td>
<td>- staff and line not strictly separate</td>
<td></td>
</tr>
<tr>
<td>piecemeal</td>
<td>- weak, decentralised hierarchy</td>
<td>- strongly decentralised decision-making power</td>
</tr>
<tr>
<td></td>
<td>- workplace central</td>
<td>- few formalised procedures</td>
</tr>
<tr>
<td></td>
<td>- no boundary between staff and line</td>
<td>- aimed at product improvement</td>
</tr>
</tbody>
</table>

Figure 3: Production System, Organisational and Decision-Making Structures

The degrees of freedom for a company to deviate from this typology are limited. For instance, a firm that does piecemeal production using a technology, organisational structure and decision-making structure that fits continuous production, cannot compete or has difficulty competing: flexibility is too low, the distance to the customer too great and the invested capital is too high. This will be reflected in the profitability and can threaten survival of the company in the long run. It should be noted, however, that a firm can consist of elements which have different types of business management. An example is the 'special products' department of a series-production firm.

What is valid for normal management will also be valid for environmental management: The system introduced into the organisation will have to fit the characteristics of this already existing organisation. So when implementing procedures, roles, responsibilities and authorities we have to bear in mind these characteristics. What does this mean for implementing ISO 14001 in the organisational forms distinguished above? We’ll discuss this per production system.

For a company operating on the basis of continuous production it is clear that it is of the utmost importance that environmental management begins at the strategic decision-making phase and also

\(^1\) This preparatory staff consists of planners, controllers and process developers, among others (Mintzberg, 1979).
carries a lot of weight when the final decisions are taken. After all, decisions on products and production technology will establish the situation for a long time to come. There are quite a few links in the decision-making structure which should be covered by environmental management. Thus the incorporation of the environment into the organisational structure, necessary to influence environmentally relevant decision-making, is a major issue in this type of firms. Tasks, powers and responsibilities must be set out within the extensive organisational structure. Given the central role of the preparatory staff, they should also play a central role in decision oriented environmental management, especially in strategic decision-making. In later stages of decision-making production management should bear the responsibilities. In view of the various partial interests which are served from various functions within this preparatory staff and top-level executives, environmental interests have to be introduced from a position of sufficient importance and quality. In most cases formal procedures will be required.

In series production we once again distinguish series production of consumer goods and that of semi-manufactured products. In companies operating on the basis of series production of consumer goods strategic decision-making about the products is often so unspecified, that it is questionable whether much environmental results can be achieved here. This does not apply, however, to decisions on production technology and locations. Also here the preparatory staff should play a dominant role. As regards product design and adjustments in production technology, the introduction of environmental interests will have to take place particularly at the stage of operational decision-making. The preparatory staff may well be charged with the task of initiate and monitoring this. An advantage of this is that the preparatory staff is involved both in strategic decision-making and in operational decision-making.

In companies operating on the basis of series production of semi-manufactured goods the powers of decision on matters of strategic decision-making lie with the top-level executives, preparatory staff and medium-level executives together. The tasks of the preparatory staff with regard to the product are more intensive than in the case of the production of consumer goods. For the organisational structure this means that the tasks of the medium-level executives are partly taken over by the preparatory staff. Since co-operation between the medium-level executives and the preparatory staff is becoming increasingly important, the procedures within ISO 14001 concerning operational decision-making should pay attention to this.

For a company operating on the basis of piecemeal production strategic decision-making with regard to the markets and products to be supplied is usually too general in nature to expect a lot of results here from the introduction of environmental considerations. Environmental considerations should be an extensive part of considerations only in the case of decisions on production technology and a possible choice of location. Since a preparatory staff for the support of strategic decision-making is often lacking, the responsibility for weighing environmental considerations lies exclusively with the firm's executive management. If the required expertise for this is lacking, however, inviting external advice is an obvious step. Since a separate staff department for environmental affairs is not an obvious choice it is essential to give responsibilities, during product development, to 'core functionaries' who can introduce environmental considerations during operational decision-making. If there is a separate environmental official or even department, access to operational decision-making and the workplace will have to be guaranteed.

A last remark on the division of tasks: Besides taking into account the formal positions of people who are eligible for environmental tasks, personal interests and abilities may also be important reasons for the allocation of environmental tasks.

As always when a model is presented: An abstraction from reality is not the full-fledged reality. But it is a tool to design the right 'roles, responsibilities, authorities and procedures' for implementing ISO 14001. It can guide the firm in the process of identifying the environmental relevant decision structure with which it operates. Then it becomes clear where environmental activities are needed and what the design of roles, responsibilities, authorities and procedures should look like in order to implement ISO 14001 properly. Once again we state that ISO 14001 requests environmental considerations in environmental relevant decision-making but does not require a full-fledged life-cycle-analysis. The boundaries reach as far as the firm reasonable can influence the life-cycle.

References
Not included.