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# Supply Chain Management and Knowledge Management

## Integrating Critical Perspectives in Theory and Practice

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# Environmental Management in Product Chains

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## Introduction

The product chain – the chain of interacting suppliers and customers, which together make up the activities from raw material extraction to handling of waste connected to a product – plays an important role in the shaping and management of environmental aspects connected to the production and consumption of a product, for example, a piece of clothing. To illustrate, with lack of environmental focus, a retail chain may only be willing to pay a certain price for the product because their business strategy focuses on price competition with the other retailers. Therefore the retail chain does not care about the environmental protection measures taken by their suppliers and the retail chain procurement persons do not control the environmental aspects of the manufacturing at the suppliers' facilities. In contrast, as an example of proactive environmental management, a manufacturing company may initiate direct supply of organic cotton from a number of small farmers in order to be able to protect their own workers during the manufacturing of T-shirts from the cotton.

Different notions are used for this kind of environmental management in product chains. 'Life cycle management' is a notion where focus is on the environmental aspects in the whole product chain from 'cradle to grave' (see e.g. Garcia-Sanchez, Wenze and Jørgensen 2004), while Kogg (2002) uses the term 'environmental supply chain management' in almost the same way about efforts initiated by companies to improve and/or control environmental performance upstream and/or downstream in their supply chains. However, the term 'supply chain management' is primarily used by some authors to describe demands directed upstream in the supply chain (which means towards the suppliers) (see e.g. Schary and Skjøtt-Larsen 2002).

De Bakker and Nijhof (2002) use the term 'responsible chain management' to describe a continuous alignment of different internal and external expectations in a company. This term signals that today not only are environmental demands in focus in product chains, but sometimes also issues like social

conditions, occupational health and safety, child labour etc. Some companies have started using the term 'sustainability management' and reporting guidelines have been developed. An example is the Global Reporting Initiative (www.globalreporting.org).

In this chapter, 'environmental management in product chains' is used as the general term. Environmental management in a product chain is defined as an attempt to:

- Address environmental problems in a product chain
- Convert the understandings of problems and the management hereof into changed practices in the individual companies in the product chain and/or the product chain as a whole.

The chapter aims at giving background to companies, consultants, governmental regulators, NGOs etc. for the analysis and planning of environmental management in specific product chains through:

- A framework for understanding environmental management in product chains as shaped by the interaction between existing resources, norms and values *and* external pressures for environmental management (second section).
- A model for the types of corporate network relations that need to be mapped and understood in order to analyze and/or develop environmental management in a product chain (third section).
- An overview of examples from our own research and from literature of the type and the role of environmental issues and initiatives in product chains (fourth section).
- A typology for characterizing corporate strategies as part of environmental management in product chains and characterizing those competencies that are developed or need to be developed as part of environmental management in a product chain (fifth and sixth sections).
- A framework for understanding, in particular, environmental management in product chains involving companies from different countries with different regulatory frameworks and some international schemes and standards that may be applied as part of this kind of environmental management (seventh and eighth sections).

## A conceptual framework: a social shaping perspective on environmental management in product chains

Traditionally analyses of changes of corporate practice are based either on a resource-based perspective, with focus on the development of routines and resources inside the company, or on a contingent perspective with focus on the corporate uptake of external demands and discourses. The chapter

combines the two perspectives into a social shaping perspective, where the focus is on the co-shaping of companies and societal discourses during the emergence and stabilization of new issues inside companies and how this changes routines and resources within the involved companies (Forman and Jørgensen 2001a, b).

The focus on the shaping of environmental management practice in product chains implies that the environmental activities in a product chain are seen as shaped by the interaction between existing technical and organizational resources, norms and values within the companies and among the companies in a product chain, *and* the external pressures on the companies to introduce environmental efforts. This pressure may come through environmental requirements from external and internal actors, including governmental regulation.

Also Bowen, Cousins and Lamming (2001) stress the importance of focusing on corporate environmental activities as well as strategic purchasing and supply when analyzing the shaping of what they call 'green supply'.

Existing traditions in a product chain and in the companies include:

- The strategic orientation in the companies
- The division of labour and communication in and among companies
- The methods of control companies use to achieve the fulfilment of the requirements to their suppliers, such as quality, delivery etc.

Analyses from a social-shaping perspective of the environmental management practice focus on:

- The change processes
- The background (the triggers of the changes)
- The interaction with the present business strategy and the product chain
- The outcomes of the change processes.

The outcomes of the change processes are assessed as:

- Environmental changes, which means changes in environmental aspects and the impacts related hereto
- Organizational changes, which means changes in knowledge resources, values, routines and/or organizational structures in one or more of the companies in a product chain.

Changes in environmental aspects and impacts can be described through the following dimensions:

- Extension in space: whether the focus is on environmental impacts in the whole product chain or mainly related to the direct impact of the company that raises demands.

- Prevention: whether an environmental problem is solved as close to its source as possible, for example, by reducing environmental impacts from a production facility through changes in raw materials, routines etc. Other types of environmental initiatives reduce environmental impacts through handling of waste, for example, recycling of waste into new raw materials.
- Time perspective: whether the focus is on management of existing problems or prevention of future problems by integration of environmental concerns in product design.
- Holistic orientation: whether there is focus on the connection between environmental problems and other concerns, such as quality and work environment. With a holistic approach, several problems can be solved during the same process, while ensuring that new problems are not introduced.
- Types of environmental impacts: whether the focus is on resource consumption and the scarcity of resources, including energy consumption, wastes and emissions and their impacts on toxicological impacts, water pollution with nutrients, greenhouse impact and so on, land use etc.

The organizational changes should be seen as offering potential for embedding a new practice as the future practice. Also the organizational changes can have different extension in space in relation to the product chain.

## Network relations in and around product chains

In order to understand environmental management in product chains, a broader network analysis is necessary. The broader societal 'selection environment', which creates the earlier-mentioned pressures on one or more of the companies in a product chain, is not captured with a product chain analysis alone. Other types of networks around a single part of the product chain, or networks addressing the whole product chain, can also contribute to the development of the selection environment. Inspired by Holm, Kjærgård and Pedersen (1997) and Søndergaard, Hansen and Holm (2004), a distinction is made between four types of networks, which companies, consciously or unconsciously, are part of:

- The business network – here called the product chain: the flow of material, capital and information from cradle to grave between suppliers and customers and users.
- The developmental network – sometimes also called the knowledge network: focuses on the development of new processes and products and can include parts of the product chain, universities and other types of knowledge institutions.

- The regulatory network: includes public authorities from the local to the international level, but also civil society organizations that directly or indirectly address how companies should or ought to act.
- The local network: consists of the local supply of natural resources, infrastructure, staff, local governmental regulation, etc.

This combination of focus on innovation, product chain and network approaches contributes to the analysis of the environmental management in a product chain as co-shaped by processes in and among the companies in the product chain and in other types of networks, where the companies are involved. Figure 16.1 shows the combined focus on the four different types of networks related to companies in product chains.

In the analyses of the product chain relations and their interaction with environmental management practice Schary and Skjøtt-Larsen (2002) can be used as background for characterizing customer–supplier relations in product chains. According to Schary and Skjøtt-Larsen, product chain relations can be found on a continuum between market conditions and hierarchies. Market conditions imply that materials, services etc. are bought, from time to time, looking for the best price, and hierarchies imply that a company takes over or integrates a certain competence into its own organization. In between these extremes are a number of so-called hybrid forms with some kind of competence hold by the supplier and some kind of specificity of the materials, services etc. the supplier offers.

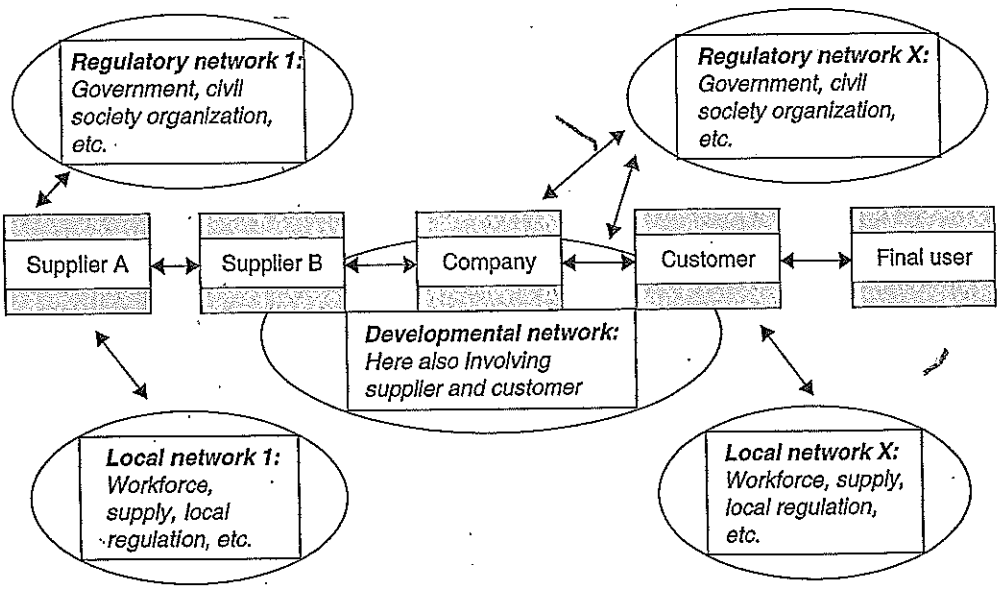


*Figure 16.1* A conceptual model
*Note*: The model is for the network relations in the product chain, the developmental network, the regulatory network and the local networks. The arrows show the complex pattern of flows among the different networks of natural resources, information, capital, etc.

Table 16.1 shows an overview of different relations to suppliers with increasing strategic importance of the relationship when going from top to bottom in the table. The overview is based on Andrew Cox's typology for supply relations and sourcing approaches (Cox 2004).

According to Cox, Schary and Skjøtt-Larsen, it should be expected that the closer a certain competence of a supplier is to the core competence of a company, the more likely it is that this competence becomes integrated into the dominating company in the product chain. A company has often, however, a portfolio of product chain relations at different levels of integration. A number of factors influence the break away from past practice of simple procurement at market conditions: increased outsourcing, global sourcing, JIT purchasing, information technology development and increased focus on environmental supply chain management (Schary and Skjøtt-Larsen 2002).

## The role of environmental issues in product chains

Jørgensen *et al.* (2008) analyze 25 case studies with environmental initiatives in product chains, collected in (Bauer and Ettrup 2002), and conclude that environmental initiatives in product chains can be of very different types. Some initiatives mainly aim at collecting information and may be present for customers, while other initiatives involve development of new products and development of strategic relations between a company and a supplier

*Table 16.1* Typology of relationship to suppliers

| Type of relationship to supplier | Characteristics of the relations to the supplier |
|---|---|
| Ongoing supplier selection | Frequent 'shopping' among potential suppliers based on price comparison between suppliers. Demands multiple potential suppliers and stable market conditions. |
| Preferred suppliers | More long-term contract periods with a limited number of suppliers and some exchange of planning information. |
| Single or parallel sourcing | Supply by a single supplier for a period for a certain good or service. Relevant with goods and services linked directly to the core competencies of the company. If there is more than one supplier within an area the practice is called 'parallel sourcing'. |
| Strategic alliances | Focus on voluntary arrangements with exchange of staff, sharing of information and/or co-development of goods and services. Relevant with high specificity of demands for goods and services or, when suppliers complement the customer's capabilities. |

*Sources*: Schary and Skjøtt-Larsen 2002: 183–93; Cox 2004.

or a customer. The analyses in (Jørgensen *et al.* 2007) show that demands mostly are passed upstream in product chains from a customer towards the suppliers. Demands passed downstream (to customers) are only seen in a few cases. One of these concerns the distribution of chemicals, where a multinational company demands of its customers that they audit their distribution companies. This can be seen as a kind of extended producer responsibility from the chemical manufacturer based on the inherent hazardous properties of the chemical products and an attempt to avoid critique of the products the company manufactures.

Foster and Green (2000) analyze in nine companies how environmental issues influence R&D in companies. Focus includes the role of consumer demand, university research and governmental regulation. According to Foster and Green (2000), English companies seem only to develop so-called greener technologies if they are under regulation or if customers further down the product chain demand them. This is borne out by examples of companies that have Scandinavian customers who demand greener products. Foster and Green (2000) argue that environmental innovation could assume a bigger role if suppliers encouraged their customers to become more involved in dialogue about environmental potential.

In Steward *et al.* (2000) the role of broader societal 'demands' and concerns for technology development and environmental innovation have been analyzed. Broader social concerns are mentioned to be of increasing importance for innovation. Because of their less direct influence, terms such as the 'selection environment' and 'indirect stakeholder influence' have been used in this context. These broader concerns are harder to demonstrate since the concerns are often more complex and involve several technical traits, links are indirect between, for example, NGOs and the company, and the consideration of the concerns is often not traceable in the company. Also Madsen and Ulhøi (2001) see environmental innovation as the result of a very complex process involving not only suppliers and customers, but also a broad group of societal stakeholders or actors.

Hall (2000) refers to small companies as less responsive to general or indirect environmental concerns, whereas large and high-profile companies are more inclined to address their environmental image in public. One reason why it may be more difficult to trace the responses in small firms, is the lack of someone with environmental responsibility or a formulated environment policy etc. Hall also refers to small firms as attracting less criticism, because they are small. He uses the notion of 'channel power' to describe the ability of a company to raise demands to its suppliers or customers.

Stranddorf *et al.* (2002) conclude, in a study of Danish textile companies and their environmental demands to suppliers, that whether a company chooses to address an environmental issue depends on a number of factors, including the present product chain relations and possible ways of integrating the topic into the business strategy. There may be different triggers

for environmental initiatives in the same company. The triggering factors include:

- Governmental regulation of chemicals and materials
- Governmental regulation as public–private sector-based dialogue forum (developing plan for eco-labelled collection of garments)
- Governmental funding, including funding for eco-labelling and for joint development projects with suppliers in developing countries
- Public debate, especially in relation to child labour
- Customer demands
- Expectations of market opportunities.

Stranddorf *et al.* (2002) show how the environmental initiatives involving suppliers may focus on different parts of the product chain and for different reasons. Some companies are concerned about the conditions at the suppliers' facilities, while others are concerned about the conditions at their own facilities. However, the latter type of concern may also imply demands to suppliers in order to prevent problems at their own facilities. Examples of the two types of concerns from the textile sector are:

- Demands regarding conditions at the suppliers' facilities:
  - Pollution from cotton growing (either purchasing organic cotton or restrictions on pesticide residues, a requirement for eco-labelling)
  - Child labour
  - Chemicals for dyeing (requirement for eco-labelling)
- Demands on suppliers in order to improve conditions at their own plants:
  - Buying organic cotton in order to improve occupational health and safety in their own plants
  - Demands for supply with less hazardous chemicals (due to requirement from local environmental authorities about the environmental load of the waste water).

## A typology of corporate environmental management strategies in product chains

This section discusses how environmental initiatives in product chains are organized. Hall (2000) discusses environmental supply chain dynamics and highlights the importance of buyer–supplier relations, including the degree of collaborative buyer–supplier relations and the degree of one actor's ability to control the decisions of the other actors, so-called *channel power*. For the analyses of product chain relations Goldbach (2002) describes two extremes of relations in product chains: one characterized by cooperation, incentives, trust and win-win solutions and another characterized by confrontation, control, power and win-lose solutions. Kogg (2002) identifies two aspects of

environmental supply chain management approaches from two case studies. One aspect concerns whether environmental measures take place through direct interaction with each of the suppliers upstream or by approaching the nearest supplier, whom then is supposed, if necessary, to approach its own suppliers, which could be called a kind of 'mediated environmental management' with the product chain as arena. The other aspect concerns whether the initiatives are taken by a company alone in order to position itself on the market or collaboration is established with competitors in order to increase the pressure on the suppliers.

In a study of environmental management in product chains in the Danish textile sector, three different types of environmental management in relation to suppliers are identified (Stranddorf *et al.* 2002, Forman and Jørgensen 2004). The aspects, which showed the need for differentiating between different practices, were:

- The degree of proactivity in the corporate environmental strategy
- The tradition for short- or long-term relationships and for control and/or cooperation with the suppliers
- The concepts used by the companies to plan and monitor demands to the suppliers
- The organizational impact of environmental initiatives on the product chain in terms of development of the competencies of the company itself and/or the supplier(s).

The three environmental supply chain management practices are:

- *The wake strategy*, where the company does not place requirements on suppliers, but follows in the 'wake' of organizations, which already place these requirements.
- *The asymmetrical partnership*, where a company wants long-term relationships with a supplier. The customer dominates the relationship, builds up a lot of competence itself and controls the fact that the supplier meets the requirements.
- *The symmetrical partnership*, where a company wants long-term relationships with a supplier and enters a mutual partnership with the supplier(s) and builds the strategies in dialogue.

A company might have different supply chain strategies and different environmental management practices in relation to different suppliers, depending on the competence of the supplier. If a supplier is easy to substitute, which, for example, sewing companies in the textile industry in some cases seem to be, the environmental supply chain management practice is an asymmetrical partnership. If the company is more dependent on the competence of a supplier, it is more likely that there will be symmetrical partnerships.

The aspects of stabilization of these three product chain practices can be viewed both from a customer and a supplier perspective (Forman and Jørgensen 2004). The wake strategy can make it easy for a company to switch to new suppliers, when, for example, the market for eco-labelled products has become mature. However, companies might face problems at that stage in finding suppliers due to potential suppliers' agreements about not selling to more customers, because existing customers want to secure their own market position.

The most important reason why suppliers decide to enter agreements to provide environmentally improved products or improve processes is that they can see competitive advantages in participating in these partnerships and a direct link to customer demands. An international retail chain is, for example, a potentially large customer for suppliers. Therefore, it is attractive to suppliers and they are more willing to cooperate with the company. It is, however, not only the size of the company that makes it attractive as customer. A strategic alliance with suppliers of chemicals may be developed, because the customer buying the chemicals is well known for its in-depth testing of new chemicals.

Companies that have outsourced their production activities are likely to need to pay attention to how they ensure their market position, as the essential competence-building is undertaken by the supplier.

With respect to asymmetrical and symmetrical partnerships, the more complex customer–supplier relations are, the more resource saving it might be to develop more long-term and close customer–supplier relations. The focal company will have to expend time and human resources if it frequently has to develop new customer–supplier relations, with implications for aspects of quality, environment and occupational health and safety. Forman and Jørgensen (2004) report the same dilemmas for customers and suppliers connected with these types of relations as Hall (2000) in his literature review of environmental management in product chains. The customer is sure to have qualified suppliers, but might find it difficult to shift suppliers due to the dependency of the supplier being developed, for example, if external conditions like currency rates change and make it more profitable on a short-term basis to find other suppliers. The supplier has more stable planning conditions, but might also be pushed by the customer to take the burden of a number of new activities, like obtaining eco-labelling.

Asymmetrical partnerships are not necessarily capable of disseminating advanced environmental competence along a supply chain and developing a multiplier effect, as a company may make demands that its supplier build up its own environmental competencies, but does not expect the supplier to be able to develop similar competencies. Seen in a long-term perspective, this might make the supplier very dependent on the customer, with the customer taking all of the responsibility for updating knowledge about more environmentally sound opportunities. (Schary and Skjøtt-Larsen 2002) refer to the

fact that, in some cases, multinational companies urge preferred suppliers also to have other customers in order to ensure more dynamic suppliers.

## Competencies in environmental management in product chains

The management of an environmental issue in a product chain demands knowledge resources and structures for the translation and evaluation of the environmental initiatives and their results. Jørgensen *et al.* (2007) show how such knowledge resources and structures can be built by a number of very different stakeholders:

- A company itself
- A product chain (with different types of partnerships between suppliers and customers)
- Business initiatives for sourcing companies like BSCI (Business Social Compliance Initiative – promoting a common monitoring and factory development system)
- NGOs and NGO initiatives, for example Save the Children
- International institutions, for example the ILO
- Multistakeholder initiatives like FSC (Forest Stewardship Council) involving businesses and NGOs.

Organizational structures and routines inside a company might change as part of the development of environmental management in a product chain. Lenox and Ehrenfeld (1997) suggest the following organizational elements as necessary for a company to be able to handle environmental issues:

- *Knowledge resources:* information and expertise residing in individuals, groups and technical artefacts inside or outside the company
- *Communication channels, formal and informal, as well as external and internal:* the channels through which information flows and is exchanged
- *Interpretive structures:* structures that can help create mutual understanding and values among the involved stakeholders, because the stakeholders need to find the information meaningful in the context of their own work.

From the earlier-mentioned case studies about Danish textile companies and their interaction with suppliers, five different competencies involved in the environmental management in product chains were identified (Stranddorf *et al.* 2001, Forman and Jørgensen 2004). These competencies are developed within the companies in the product chains as a part of the planning, the implementation and the monitoring of the initiatives in the environmental supply chain management. Depending on the environmental supply chain management practice, the various competencies are developed and anchored

at (1) the company that sets the requirements, (2) the supplier and/or (3) a third party (e.g. an advisor or a certifying organization):

- *Interpretation competence:* Partly the competence to understand external requirements from, for example, environmental agencies and customers, and partly the competence to translate those requirements into practice within the organization itself – such as converting the requirements into actual practices for purchasers, production workers, designers, suppliers etc.
- *Technical environmental competence:* The insight into technical and chemical processes, etc., which is a prerequisite for the adjustment or reorganization of a production process or a design scheme in order to meet environmental requirements.
- *Documentation competence:* The knowledge about how to build and operate documentation systems and document handling routines etc.
- *Control competence:* Refers to knowledge about monitoring systems, management systems, auditing, etc., and the responsibility or empowerment to maintain control. This competence can reside with the company, the supplier, or a third party – for example, a certification agency.
- *Network competence:* The ability to create changes in a product chain through networking among customers and suppliers, including the ability to motivate the companies in the chain to enter a dialogue, as well as the ability to transfer technology and knowledge in or among product chains.

De Bakker and Nijhof (2002) have developed a capability assessment framework for responsible chain management, where they distinguish between internal and external capabilities and talk about four types of capabilities in a so-called capability cycle: interpretation, integration, monitoring and communication. The circular process, inspired by the 'plan—do—act' cycle, is too sequential, since the processes of interpretation, integration, monitoring and communication often occur in a more interwoven manner, but the four types of capabilities and the focus on internal and external capabilities seem relevant. The four competencies identified by De Bakker and Nijhof (2002) correspond to those presented above, although Stranddorf *et al.* (2002) identify a more detailed range of integration competencies: part of the interpretation competence, technical environmental competence and network competence.

## Environmental management in transnational product chains

More and more product chains are transnational, which in most cases implies that there is a different level of environmental protection in countries along

the product chain. Hansen (1999) argues that transnational environmental management typically will have at least the following elements:

- General principles for the environmental activities of the entire corporation
- More specific policies and programmes applicable throughout the corporation
- A cross-border environmental management system with procedures for monitoring and controlling the practice of the foreign affiliates
- Training, education and information exchange programmes and activities
- A formal organization where responsibilities and functions are delineated and allocated between different entities and persons – for example, between headquarters, affiliates and suppliers.

Hansen (1999) argues that corporate environmental management practice in transnational product chains falls within the range from adaptation to the local regulation and practice in developing countries to global integration where a company is practising the same level of concern and responsibility as in the home country. Hansen (1999) refers to two types of product chains: management of controlled affiliates and management of non-controlled foreign entities (organized through franchising, licensing, subcontracting or strategic alliances). With reference to Bartlett's and Ghoshal's ideal types of cross-border organization in transnational corporations, Hansen (1999) describes four ideal types of cross-border environmental management: decentralized environmental management, international compliance, centralized environmental management and globally integrated environmental management. The most elaborate and environmental ambitious cross-border environmental functions are seen in the centralized and globally integrated types. Table 16.2 gives an overview of the four types of practice.

According to Hansen (1999) the types of forces, which shape the environmental management in transnational product chains between local adaptation and global integration, seem to be:

- *Regulatory forces:* the type of environmental regulation shaping the cross-border practice: international regulation, home country regulation and host country regulation
- *Market forces:* the quality and environmental orientation of the markets and the value chains
- *Industry-specific forces:* collaboration in the specific industry
- *Company-specific forces:* the nature of the production technology, the environmental history from the home country, the international orientation of the company.

*Table 16.2* A typology of corporate environmental management in transnational product chains

| | Decentralized environmental management | International compliance | Centralized environmental management | Globally integrated environmental management |
|---|---|---|---|---|
| Environmental management focus | Local adaptation | Host country legislation (country where facility or subsidiary is localised) | Home country legislation (country of headquarters) and global company standards | Internationally oriented company standards |
| Concept of environmental management | Environmental management the responsibility of local managers. May take advantage of weak implementation of local environmental regulation | Affiliates around the world take the necessary measures to operate in accordance with laws and regulations of the host countries | The environmental regulation of the home country as the basis, regardless of the local requirements. Fear the regulation of the host countries is not sufficient | Initiatives for new measures from different facilities in the company. Networking among local environmental managers. Adaptation to local conditions allowed, within the corporate principles |

*Source*: Adapted from Hansen 1999.

## International schemes and standards in environmental management in product chains

Environmental management may involve the use of national or international schemes and standards for planning and maybe also certification of the environmental management. In their book *Living Corporate Citizenship*, McIntosh *et al.* (2003) analyze a number of initiatives that aim at supporting the development of socially responsible businesses, including environmental management, such as:

- The UN Compact – with focus on nine UN principles within social and environmental problems, and rights and commitment to improve and report
- The Global Reporting Initiative – a scheme for corporate sustainability reporting
- OECD Guidelines for Multinational Enterprises – a broad focus with local practice in a host country, rather than international principles, as norm
- ILO Conventions – a set of core labour standards and a number of more specific conventions on health and safety and child labour
- The ISO 14000 Series – a set of international standards with focus on corporate environmental management and some of the tools within this area, for example, eco-labelling
- AccountAbility 1000 – with a focus on organizational learning in combination with social and ethical accounting
- Social Accountability 8000 – an auditable standard on working conditions.

McIntosh *et al.* (2003) point to a number of gaps and problems in these initiatives:

- Numerous issues are being ignored, such as animal welfare and indigenous rights
- There is a lack of definition and consensus on several major terms, for example, 'the precautionary principle' and how a company should define its potential for influence on suppliers and customers
- The initiatives are voluntary and companies vary dramatically in their levels of commitment
- The schemes seem to favour large companies
- If the various initiatives are to gain legitimacy, societies will also have to benefit through enhanced social and environmental development and better access to information
- There are unintended consequences, such as initiatives trying to curtail child labour leading to children being fired and resorting to begging or prostitution.

The initiatives may be divided into principles and standards, where principles are more overarching values that underpin behaviour (e.g. ILO Conventions)

and can be used as reference in the management of a certain area. Standards, for example ISO 14001: 2004, can be very different, with more or less focus on process, performance and certification.

The ISO 14001:2004 standard contains a number of demands on a company that follows the standard. However, core elements of the standard also demonstrate loopholes allowing a large degree of interpretative flexibility in how it is implemented (Behrndt 2002), here cited from (Jørgensen 2003). These potentially weak elements are:

- The scope or boundaries of the activities covered
- The identification of environmental aspects and impacts of company activities
- The legal requirements to be recognized by the company
- The policy priorities of the company
- The extended focus in relation to suppliers, products and design.

These issues become even more complex when they are part of the dynamics in transnational product chains with very different national cultures, regulatory systems and levels of environmental and social awareness and responsibility.

ISO 14001: 2004, section 4.3.1 (about procedures for identifying environmental aspects), says:

> The organization shall establish, implement and maintain a procedure(s)... to identify the environmental aspects of its activities, products and services within the defined scope of the environmental management system that it can control and those that it can influence taking into account planned and new developments, or new or modified activities, products and services.

This paragraph leaves it more or less up to the company to define its environmental scope, since it may decide to say that it cannot control or influence suppliers' or users' activities.

ISO 14001 2004,section 4.4.6 (about operational control), says:

> The organization shall identify and plan those operations that are associated with identified significant environmental aspects consistent with its environmental policy, objectives and targets, in order to ensure that they are established under specified conditions, by... establishing, implementing and maintaining procedures related to the identified significant environmental aspects of goods and services used by the organization and communicating applicable procedures to suppliers, including contractors.

This paragraph demands that a company focuses on environmental aspects related to the activities of its suppliers. However, through ISO 14001, section

4.3.1, the company may decide that it is not possible to control or influence suppliers and contractors and it may leave out these aspects in its choice of aspects to focus upon. Whether this is accepted depends on the role of the involved certifiers, auditors and stakeholders that may request insight into the practice of the company.

The Ethical Trading Initiative (ETI) is a joint initiative between retailers, trade unions and environmental NGOs in the UK. The report from the ETI members' meeting on 16 November 2006 indicates several problems experienced by companies sourcing in transnational supply chains, but also gives examples of good practice. Some problems seem to be the result of limited auditor skills, whereas others involve cases where fraudulent supplying companies try to hide their real labour practice. Analysis of the background to these issues also points, however, to the practices of the customer companies themselves as part of the problem. If a customer company demands a very short lead time (from the time of ordering products to the time their delivery is requested), it is likely to be more difficult for a supplying company to find the time to adapt to conditions required by the customer, therefore the risk of fraud becomes bigger (ETI Forum 2006).

## Concluding remarks

The chapter has presented a number of frameworks and models for the analysis and development of environmental management in companies and other types of organizations involved in product chains and networks related to product chains, and has shown how the level and the focus in time and space of the environmental management in a product chain is influenced by:

- The strategic interpretations made by the involved companies of the necessary level of environmental protection and the perspective on competence development in the different parts of a product chain.
- The international and national regulation and its enforcement in relation to companies, foreign investments, products and materials etc.
- The pressure for transparency and control in product chains from customers, public debate and NGOs.

Growing globalization of production and consumption is very relevant to environmental management in a company as it considers its role in the direct and indirect product chain relations with suppliers (and their suppliers), with customers and with the final users of products and services. It is also important that companies in product chains consider their responsibility in the shaping and the management of resource consumption and environmental impact related to products, waste and emissions.

There is increasing public focus and increasing focus in business-to-business relations on environmental aspects of the sourcing of materials in

other countries with different social and regulatory frameworks, and the distribution of products to countries with social and regulatory frameworks that differ from those where the products originally were developed for use. This has initiated development of conventions and standards that companies may refer to in their environmental management planning and documentation. However, the complexity and the geographic distances in the product chains also make it difficult to control the actual practice of the involved companies. Reports from companies about their management of environmental issues, and other aspects of sustainability, are often not very transparent and concrete in their actual documentation of corporate initiatives and the results of these initiatives. It is often difficult to differentiate between good intentions and actual efforts and results. It is a future research need and challenge for the public debate to consider the role of companies, especially multinationals, in securing more reliable documentation regarding the shaping and the results of environmental management in product chains.

## References

Bauer, B. and Ettrup, B. 2002 *Miljøledelse i produktkæder – en eksempelsamling* (in Danish) (Environmental Management in Product Chains), Environmental Project No. 41, Danish Environmental Protection Agency.

Behrndt, K. 2002 '"Hot spots" in the interpretation of the ISO 14001 standard to ensure continual improvements', paper for the Greening of Industry Conference, Gothenburg, June.

Bowen, F.E., Cousins, P.D. and Lamming, R.C. 2001 'The role of supply management capabilities in green supply', *Production and Operations Management*, 10(2).; 174–89.

Cox, A. 2004 'The art of the possible relationship management in power regimes and supply chains', *Supply Chain Management – An International Journal*, 9: 346–56.

De Bakker, F. and Nijhof, A. 2002 'Responsible chain management: A capability assessment framework',*Business Strategy and the Environment*, 11: 63–75.

ETI Forum 2006 *Getting Smarter at Auditing: Tackling the Growing Crisis in Ethical Trade Auditing*, Report from ETI members' meeting, 16 November.

Forman, M. and Jørgensen, M.S. 2001a 'The social shaping of the participation of employees in environmental work within enterprises: Experiences from a Danish context', *Technology Analysis and Management*, 13(1): 71–90.

Forman, M. and Jørgensen, M.S. 2001b 'Corporate environmental competence: The effects of networking, organisational learning and preventive strategies', edited version of paper for 5th Nordic Environmental Research Conference, Aarhus, 14–16 June.

Forman, M. and Jørgensen, M.S. 2004 'Organising environmental supply chain management', *Greener Management International*, 45 (Spring): 43–62.

Forman, M., Hansen, A.G. and Jørgensen, M.S. 2003 'The shaping of environmental concern in product chains: Analysing Danish case studies on environmental aspects in product chain relations', paper presented at EGOS (European Group on Organisation Studies) Conference 2003, Copenhagen Business School, 3–5 July.

Foster, C. and Green, K. 2000 'Greening "the Innovation Process"', *Business Strategy and the Environment*, 9: 287–303.

Garcia-Sanchez, I., Wenzel, H. and Jørgensen, M.S. 2004 'Models for defining LCM, monitoring LCM practice and assessing its feasibility', *Greener Management International*, 45(Spring): 9–25.

Goldbach, M. 2002 'Organizational settings in supply chain costing', in S. Seuring and M. Goldbach (eds), *Cost Management in Supply Chains*, Heidelberg: Physica-Verlag: 89–108.

Hall, J. 2000 'Environmental supply chain dynamics', *Journal of Cleaner Production*, 8: 455–71.

Hansen, A.G. 2001 *Regulation: Promoting or Limiting Biotechnology? New Genetics and Society*, Technical University of Denmark.

Hansen, M.W. 1999 'Cross border environmental management in transnational corporations: An analytical framework', Occasional paper no. 5, Copenhagen Business School, Department of Intercultural Communication and Management.

Holm J., Kjærgård, B. and Pedersen, N.K. (eds) 1997 *Miljøregulering – tværfaglige studier* (in Danish) (Environmental Regulation – Cross-Disciplinary Studies), Roskilde: Roskilde Universitetsforlag.

ISO 14001:2004 2004 *Environmental management systems – Requirements with guidance for use*, International Organization for Standardization.

Jørgensen, M.S., Jørgensen, U., Hendriksen, K., Hirsbak, S. and Thorsen, N.N. 2007 'Modes of environmental management in transnational product chains', paper presented at GIN 2007: International Conference of the Greening of Industry Network: Sustainable Ecosystem and Social Stewardship, Wilfrid Laurier University, Waterloo, Ontario, 15–17 June (available on conference CD-rom).

Jørgensen, M., Forman, M. and Hansen, A.G. 2008 *Environmental Management in Product Chains: Theoretical and Regulatory Perspectives Based on 25 Danish Case Studies*, Copenhagen: Danish Environmental Protection Agency.

Jørgensen, U. 2003 'The "hidden" networks of practice in ISO 14001', paper for the Greening of Industry Conference, San Francisco, October.

Kogg, B. 2002 'Power and incentives in environmental supply chain management', in Seuring, S., M., Müller, M., Goldbach, M. and Scheidewind, U. (eds), *Strategy and Organization in Supply Chains*, Heidelberg: Physika-Verlag, 65–81.

Lenox, M. and Ehrenfeld, J. 1997 'Organizing for effective environmental design', *Business Strategy and the Environment*, 6: 187–96.

Madsen, H. and Ulhøi, J.P. 2001 'Integrating environmental and stakeholder management', *Business Strategy and the Environment*, 10: 77–88.

McIntosh, M., Thomas, R., Leipziger, D. and Coleman, G. 2003 *Living Corporate Citizenship: Strategic Routes to Socially Responsible Business*, London: Prentice Hall.

Schary, P.B. and Skjøtt-Larsen, T. 2002 *Managing the Global Supply Chain*, Copenhagen: Copenhagen Business School Press.

Steward, F., Garcia, G., Hansen, A.G., Joly, P.B., Bailey, P. and Yearley, S. 2000 'Environmental networks and societal management of technological innovation in the food sector (EC DGXII Environment programme)', Brunel University, University of Carlos III, Technical University of Denmark, SERD/INRA Grenoble, The Stockholm Environment Institute, University of York.

Stranddorf, H., Forman, M., Nielsen, A. and Søgaard, M. 2002 *Miljø-, etik og arbejdsmiljøkrav i tekstilproduktkæden: En udredning om erfaringer, strategier og handlemuligheder* (in Danish) (Environmental, Ethical and Work Environmental Demands in the Textile Product Chain: A Survey of Experience, Strategies and Possibilities for Action), Danish Environmental Protection Agency, Environmental Project no. 681, <http://www.mst.dk>