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ENVIRONMENTAL BUSINESS ACCOUNTING IN FOUR FINNISH  
CASE COMPANIES

FOLLOW-UP STUDY BETWEEN 1996 AND 2005

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Science in Engineering

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HELSINKI UNIVERSITY OF TECHNOLOGY  
 ABSTRACT OF THE MASTER'S THESIS

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<p>Corporate strategic decision-making on environmental issues requires a systematic method to deal with both physical and financial environmental information. Environmental Business Accounting (EBA) is a tool which includes calculations of environmental loads generated, environmental impacts, as well as corporate internal environmental costs. In Finland, one of the first attempts for defining EBA systems was the doctoral dissertation of Tuula Pohjola (1999). Her research included ten pilot projects which were run in six Finnish companies between 1995 and 1996. Now, in the beginning of 2005, four of these companies participated in a follow-up study. Company representatives were interviewed and corporate reports studied to record the utilization of the pilot EBA systems, the present state of the case companies' environmental management and EBA, as well as the motives behind the possible developments. In addition, a literature review on the progression of EBA research, available guidelines and stakeholder requirements was conducted.</p> <p>This research shows that management support and resources allocated for EBA are often lacking because of its mainly voluntary nature. Even in the cases in which physical EBA is exemplary, monetary EBA is still rare. Anticipation of future requirements is surprisingly low although stakeholder requirements are continuously increasing and environmental legislation tightening. Challenges for EBA have been derived from the changes of responsible personnel, information systems and organizational structures, as well as from globalization.</p> <p>The scientific value of this research is comparably high because no other longitudinal EBA research with this long time scope is known so far. The results are beneficial also for planning future research and EBA activities in companies.</p>		
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<p>Yritysten ympäristöasioista päätettäessä tarvitaan systemaattista työkalua, jonka avulla voidaan käsitellä sekä fyysistä että rahamääräistä ympäristöinformaatiota. Ympäristölaskenta (Environmental Business Accounting, EBA) sisältää sekä ympäristökuomitusten ja -vaikutusten että yrityksen sisäisten ympäristökustannusten mittaamisen. Tuula Pohjolan (1999) väitöskirja oli yksi ensimmäisistä suomalaisista tutkimuksista yritysten ympäristölaskentajärjestelmien määrittelemiseksi. Tutkimukseen kuului kymmenen pilottiprojektia kuudessa case-yrityksessä vuosina 1995-1996. Vuoden 2005 alussa neljä näistä alkuperäisistä yrityksistä osallistui seurantatutkimukseen, jossa haastateltiin ympäristölaskennan vastuuhenkilöitä sekä tutustuttiin yritysten ympäristöraportointiin. Tavoitteena oli selvittää Pohjolan suunnitteleminen pilottijärjestelmien hyödynnys, yritysten ympäristöjohtamisessa ja –laskennassa tapahtunut kehitys sekä tämän taustalla olleet syyt. Lisäksi kirjallisuustutkimuksella selvitettiin tutkimuksen kehitystä alalla, aiheesta julkaistuja ohjeita yrityksille sekä sidosryhmien vaatimuksia.</p> <p>Tämä tutkimus osoittaa, että ympäristölaskennan vapaaehtoisuuden vuoksi johdon tuki ja ympäristölaskennalle budjetoidut resurssit ovat usein puutteellisia. Vaikka yrityksen fyysinen ympäristölaskenta olisi esimerkillistä, rahamääräinen ympäristölaskenta voi puuttua kokonaan. Tulevaisuutta ennakoita yllättävän vähän huolimatta jatkuvasti lisääntyvistä sidosryhmävaatimuksista sekä kiristyvistä ympäristölainsäädännöstä. Haasteita ympäristölaskennalle lisäävät vastuuhenkilöiden ja tietojärjestelmien muutokset, nopeasti muuttuvat organisaatio-rakenteet sekä yritysten kansainvälistyminen.</p> <p>Tämän tutkimuksen tieteellinen arvo on verrattain suuri, koska muita näin pitkän aikavälin seurantatutkimuksia ympäristölaskennasta ei vielä tunneta. Tuloksista on myös hyötyä suunniteltaessa tulevaa tutkimusta sekä toimenpiteitä yrityksissä.</p>		
Avainsanat: Ympäristölaskenta, ympäristömittarit ja -indikaattorit, ympäristöjohtaminen, ympäristöraportointi		Julkaisukieli: englanti

## Preface

I am still a little surprised how easy it was to find the subject for my master's thesis. I just dropped by Tuula Pohjola's office after one of her lectures, discussed with her for about ten minutes – and there it was! The need for a research on environmental business accounting which perfectly suited my interest in environmental management and my background as a course assistant of accounting. So Tuula, I really want to thank you for the opportunity to make this follow-up study for your doctoral dissertation, your excellent guidance through the whole research process, and the possibility to get to know and work with the EMU team in Otaniemi and Lahti. Besides, I learned a lot from those conferences in which I was allowed to participate and present my own research findings there. I saw there that this field of research indeed is of great concern.

Other people who greatly contributed to my thesis and graduation and deserve my hearty thanks are the contact persons of all the case companies; Jouko Karjalainen who patiently answered all my questions about accounting during my assistant career and also instructed my thesis; and my colleagues in the EMU team who helped me with all practical questions and created a pleasant working atmosphere. The greatest thanks of all, however, belong to my dear parents and my little sister Maija because of the support they have always been ready to provide me. Despite – or maybe thanks to – the various debates with my dad I found my own field! My friends also deserve lots of hugs for sharing all the ups and downs with me. And finally, Jussi and Ryan, I want to thank you for checking my English spelling.

Anna Kumpulainen

Espoo, August 2005

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# 1 Introduction

## ***1.1 Background of the Research***

Corporate Social Responsibility (CSR) includes environmental and social viewpoints in the strategic decision-making of companies in addition to the economic perspective. Environmental impacts of businesses cannot be ignored anymore when a wide array of previous studies have shown how many unwanted ecological changes are taking place. Corporate stakeholders are becoming increasingly aware on ecological issues and the environmental legislation is tightening. Fortunately, continuous inventions in science and technology also provide opportunities to make business processes more ecological. Thus, rather than asking the reason for environmental aspects being relevant, today's crucial questions are when and how ecological threats and possibilities of businesses should be taken into account.

Decision-making on environmental issues needs a systematic method to deal with all the factors causing environmental loads or costs. Environmental Business Accounting (EBA)<sup>1</sup> is a tool which includes physical accounting of environmental loads generated, evaluation of environmental impacts, and monetary accounting of internal environmental costs of companies or other organizations (Pohjola 1999). In Finland, one of the first attempts for defining EBA systems was the doctoral dissertation research of Tuula Pohjola (1999) who designed EBA models for energy consumption, transportation and logistics chains. These models were tested in altogether ten pilot projects that were run in six Finnish companies between 1995 and 1996. Now, the purpose of this master's thesis is to record the developments in the environmental management and EBA practices in four of the initial case companies. The follow-up research is conducted by reviewing related literature, interviewing company representatives, studying corporate reports and finally qualitatively analyzing the gathered data.

So far this follow-up research seems to be unique because the research field of environmental business accounting is comparably young and no other studies with

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<sup>1</sup> See the discussion of the concepts of Environmental Business Accounting (EBA) and Environmental Management Accounting (EMA), which has been popularized in the 2000's, in Chapter 2.3.1.



this long of a follow-up period are known. The significance of this research lies, in addition to recording the developments in companies and the importance of Pohjola's pilot studies, also with clarifying the reasons why some case companies successfully continued environmental business accounting and some did not. This information is useful when planning future research in the field, and when designing and implementing EBA methods and tools in companies.

## **1.2 Research Questions**

This research aims at answering the following research questions:

1. How has the environmental management of the case companies been developed between the years 1996 and 2005?
2. How has the environmental business accounting of the case companies been developed between the years 1996 and 2005? What have been the motivational drivers for this development?
3. How is environmental business accounting utilized in the environmental reporting of the case companies in 2005?

The main interest lies with the second research question about environmental business accounting. Information about environmental management practices is needed for understanding each company's prerequisites for EBA. In turn, the question about environmental reporting mirrors how the companies are utilizing and communicating their EBA information.

## **1.3 Research Objectives**

This research aims at recording the developments in the environmental management and environmental business accounting practices in four of the same case companies that participated in the doctoral dissertation research of Tuula Pohjola between 1995 and 1996. The present state of each company's practices is compared to its situation in the end of the pilot studies. The comprehensiveness of the case companies' present EBA practices is evaluated by comparing them to the findings from literature and existing EBA guidelines. Also the utilization of EBA information in corporate reporting is observed.

This follow-up research also shows the significance of Pohjola's doctoral dissertation research as regards to the four case companies. In principle, all of them would have had comparably similar prerequisites for improving their EBA practices after the pilot studies, and thus it is especially interesting to see how the companies have taken this opportunity and why. Finally, also ideas for further research are suggested.

#### ***1.4 Scope of the Research***

The scope of this follow-up research copies that of Tuula Pohjola's (1999) doctoral dissertation as exactly as possible and reasonable to enable comparisons with the situation of 1996. However, because the research in the field has progressed a lot, the terminology was needed to be updated: So the literature review of this thesis uses the recently popularized concept of Environmental Management Accounting (EMA) in parallel with the concept of Environmental Business Accounting (EBA), which was defined and used by Pohjola. Secondly, the scope has changed as regards to the number of the case companies: One of the initial case companies refused to give interviews because they did not consider EBA issues interesting anymore, and the representative of another company was afraid that their competitors would benefit from their EBA information and therefore refused. So now the scope is limited to four case companies: Elisa Corporation (former HPY), Fujitsu Services Oy (former ICL Data Ltd.), Kesko Food Ltd. and VR Group. There have also been significant changes in the organizational structures and business environments of these companies, and their current situations are therefore not directly comparable to those of 1996. In addition, as regards to Kesko Food, the group coordination on environmental management issues has been intensified significantly after 1996, and thus some environmental information is available only concerning the whole group. Some of this information has been introduced and utilized also in this thesis although the unit under examination is still Kesko Food.

Although the scope of the corporate responsibility thinking has been recently widened from environmental management towards corporate social responsibility, this research still concentrates only on environmental management and EBA because social issues were not included in Pohjola's research either. Besides, in Finland most of the corporate social issues, e.g. child labor and equality between men and women, are already enacted in the law, which means that the remaining drawbacks cannot be

fixed by better social accounting alone – as is sometimes the case with environmental issues and EBA. Finally, because all the case companies are Finnish, the referred regulations and guidelines are those that are considered the most relevant from the viewpoint of a Finnish company.

### **1.5 Research Methodology**

This is a case study based follow-up research for Tuula Pohjola's (1999) doctoral dissertation. The research consists basically of two parts: a literature review and four case studies. In the literature review, Pohjola's dissertation and related unpublished case reports are studied. Also the latest scientific literature and the regulations and guidelines for EBA/EMA published by national or international bodies are read and referred. In turn, the empirical research data are collected from the case companies by interviewing their personnel responsible for EBA and studying their annual and environmental reports. The research methodology is qualitative and thus the analysis methods are formed alongside as the research process progresses.

Simplified, the research process followed these steps:

1. Familiarization with Tuula Pohjola's doctoral dissertation and the related case reports. Discussions with Pohjola.
2. Review on other relevant environmental management and EBA/EMA literature. (Continued until topic 6.)
3. Preparation of a research plan.
4. Preparation of a questionnaire for interviews.
5. Interviews in companies. Writing out the recorded data from the interviews and categorizing it in Excel tables.
6. Choosing the qualitative analysis methods suitable for the data gathered. Analysis of the empirical data. Making conclusions on the grounds of the literature review and the empirical results.
7. Writing the master's thesis.

The chosen research approach, data collection methods and analysis methods are presented in detail in Chapter 3. Their reliability is assessed in Chapter 7.

## **1.6 Structure of This Thesis**

The rest of this thesis is organized as follows.

Chapter 2 includes a literature review. First, an introduction to environmental management and most common tools of it is given. Then environmental business accounting is introduced in detail including definitions of important concepts, a summary of research done in the field, and an introduction to existing EBA regulations and guidelines. Finally, Tuula Pohjola's doctoral dissertation research and the included case studies are introduced.

Chapter 3 presents the chosen research methodology: the research approach, data collection methods and analysis methods.

Chapter 4 contains the empirical results. First, the case companies are introduced. Thereafter, their developments in environmental management, EBA and environmental reporting practices between 1996 and 2005 are presented.

Chapter 5 summarizes the most significant developments company by company, and analyzes the motives behind them. Also a figure illustrating the present state of the case companies' EBA practices is presented.

Chapter 6 concludes the empirical research results on the basis what was learned in the literature review.

Chapter 7 assesses the reliability of the chosen research methodology and discusses the alternatives for it. Also the reliability and significance of the research results are assessed, and suggestions for further research given.

## 2 Literature Review

### ***2.1 Motivation and Tools for Environmental Management***

The concept of sustainable development was popularized by the World Commission on Environment and Development (WCED) in its 1987 report entitled 'Our Common Future'. Sustainable development was defined as: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED 1987:43). Companies can contribute to sustainable development by managing their operations in such a way as to enhance economic growth, increase competitiveness and, at the same time, ensuring environmental protection and promoting social rights. Corporate Social Responsibility (CSR) is a concept whereby companies integrate social and environmental concerns in their business activities and in interaction with their stakeholders on a voluntary basis. (DG Trade 2002)

Nowadays, many unwanted ecological changes are taking place and even strengthening despite the growing concern of environmental issues. A well-known example of this is the greenhouse effect. (Sitra 2005) Environmental impacts and incidents are leading to larger monetary consequences for organizations that need to be managed, promotion by international governments and bodies, and voluntary acceptance by management of the need to address corporate environmental issues in order to maintain corporate legitimacy (Burritt 2004). In addition, the environmental performance will increasingly impact companies' competitiveness, directly or indirectly, since the awareness of their stakeholders has recently risen (Green and Hunton-Clarke 2003, Emblemståg and Bras 2001). Consequently, Tekes, the National Technology Agency of Finland, has defined the main motivational drivers for corporate environmental management in Finland to be: 1) legislation, 2) prices of resources, 3) shareholder requirements and 4) customer requirements (Äijälä 2005).

However, since all organizations face various resource and capacity constraints, all activities they perform have to be justified by adding value. This applies naturally also to environmental management activities. (Bennett *et al.* 2003) If a company does not perceive environmental management as important, it does not allocate enough resources for it. In consequence, it does not get more information about the

possible benefits from well-run environmental management and does not anticipate future needs for more action. Again the scope of environmental management stays short-term and no more resources are allocated – and thus the vicious cycle is ready. (Maijala and Pohjola 2005) However, determining the value-added of environmental management activities is very difficult, and a general positive relation between environmental and economic performance has not been shown. Instead, Hassel *et al.* (2005) found a negative relationship between corporate environmental performance and the market value of equity. The reasons for this are e.g. the short-term orientation of the market, the costs of environmental activities, and the suspected window dressing of companies – that is publishing nice CSR reports but in reality caring only about profits (Hassel *et al.* 2005, The Economist 2005).

A wide variety of different tools and methods for corporate environmental management have been developed. Table 1 describes briefly some of the most commonly used of them.

**Table 1: Common tools and methods for environmental management**

Tool / method	Description
Environmental strategy	A statement which outlines the environmental vision and values, and the general principles, objectives and aims to manage environmental issues in a company (Welford <i>et al.</i> 1996).
Environmental policy	A document that defines a company's commitment to improve environmental issues in business (Brophy 1996).
Environmental program	A detailed definition of environmental performance factors of a company and detailed aims for continuous improvement (Pohjola 2003).
Environmental Management System (EMS)	A systematic framework to achieve the environmental aims and targets defined by the environmental strategy and policy (Sunderland 1996). An EMS needs to be comprehensive, understandable to everybody involved and open to review and there must be a commitment to continuous improvement (Welford 1995).
Environmental audit	A systematic and documented verification process to objectively obtain and evaluate evidence to determine whether an organization's environmental management system conforms to the environmental management system audit criteria and communication of the results of this process to management (Sturm 2005).
Environmental Business Accounting (EBA) / Environmental Management Accounting (EMA)	Physical accounting of environmental loads generated, evaluation of environmental impacts and monetary accounting of internal environmental costs (Pohjola 1999). (See more information in Chapter 2.3.)
Life-Cycle Assessment (LCA)	An approach to identify, compare and value the environmental burdens of products and services based on the life-cycle concept (Öko-Institut 2005).
Environmental Impact Assessment (EIA)	The process of examining the environmental consequences of development projects in advance for decision-making (Therivel 2005).
Material Flow Analysis (MFA)	A method based on life-cycle analyses to determine the environmental effects of life-cycles, but the data are more general and refer not only to a specific products or service, but to groups of products or goods, or need areas (Öko-Institut 2005).
Design for Environment (DfE) / Ecodesign	A principle to support product developers in reducing the environmental impact through enhancing the product design. This includes reducing resource consumption, both in material and energy terms, and pollution prevention. (DANTES 2005)
Environmental risk management	Management of environmental risks. Environmental risks are measures of probabilities that damage to life, health, property or the environment will occur due to exposure to a given hazard (Callan and Thomas 1996).

## **2.2 Environmental Management in Finland**

In Finland, the environmental protection work of companies and other organizations has been changing rapidly in recent years. Voluntary commitments and measures have become important alongside the need to comply with regulations and environmental permit conditions. (Finland's environmental administration 2005b) Environmental impacts are largely controlled through the compulsory environmental permits that cover all kinds of potentially harmful activities. Other environmental legislation has been enacted to prohibit the use of certain harmful substances, to set limits on emissions, to enforce certain technical standards, to make producers responsible for their products as waste, to limit certain activities in special areas, and to control land use planning. Also many economic and informational environmental policy instruments are widely used in Finland. (Finland's environmental administration 2005c)

In addition, companies and other organizations may voluntarily adopt a variety of market-based measures to highlight their own contributions towards improving the environment. Various business sectors have made energy-saving agreements with the ministries and MOTIVA Oy, a special independent organization set up to promote energy savings. Many companies are also committed to continuous environmental improvements through their active involvement in the EMAS or ISO 14001 environmental management systems (see more information in Table 2 in Chapter 2.3.5). (Finland's environmental administration 2005c). By the end of 2003, there were altogether 1,059 ISO 14001 certificates in Finland, and 39 EMAS certificates by February 2004 (Statistics Finland 2004). Companies and other organizations are provided with practical advice about environmental management methods and systems by the Finnish Environment Institute (SYKE) (Finland's environmental administration 2005b).

## **2.3 Environmental Business Accounting**

### **2.3.1 Framework of EBA**

The strategic decision-making on environmental issues calls for a systematic method to deal with all the factors causing environmental loads and costs (Pohjola 1999). The concept of Environmental Business Accounting (EBA) covers the aspects of financial and management accounting of the environmental accounting framework defined by the U.S. Environmental Protection Agency (USEPA) in 1995 as follows: environmental accounting in the context of national income accounting, financial accounting and management accounting. These three viewpoints refer consecutively to the natural resource accounting, preparation of corporate financial reports for external audiences using generally accepted accounting principles, and accounting for corporate internal decision-making. (USEPA 1995) Thus, EBA includes physical accounting of environmental loads generated, evaluation of environmental impacts and monetary accounting of internal environmental costs (Pohjola 1999).

During the 2000's, an almost similar concept of Environmental Management Accounting (EMA) has become popular in literature. According to the United Nations expert working group, EMA is broadly defined to be the identification, collection, analysis and use of two types of information for internal decision-making: physical information on the use, flows and fates of energy, water and materials including wastes, and monetary information on environment-related costs, earnings and savings (UNSD 2001). In this literature review both these concepts, EBA and EMA, are used in parallel according to how they were used in the referred literature. However, in other parts of this thesis only the concept of EBA is used to avoid confusions.

Figure 1 illustrates the framework of EBA. It should be noticed that 'environmental management accounting' in the figure should be considered according to USEPA's definition from 1995, and not equated to the new concept of EMA, which was presented above.



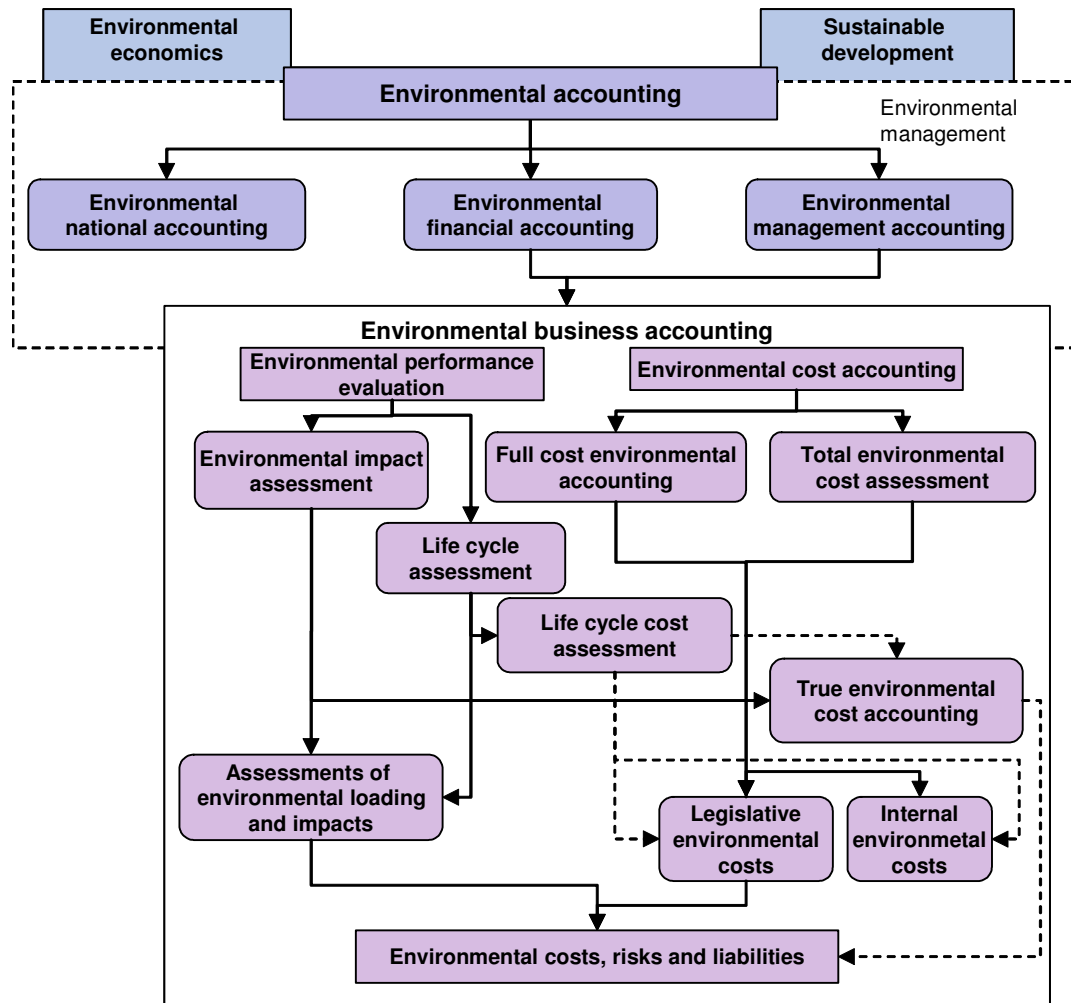


Figure 1: Framework of environmental business accounting (Pohjola 1999:21)

### 2.3.2 Development of EBA Practices in Companies

Developing a system to recognize and improve environmental aspects entails many challenges to a company's existing management and accounting systems. A significant topic is to identify and analyze the environmental factors of business operations, and manage them by using an environmental management system integrated into other management systems of the company (Epstein 1996, Welford and Gouldson 1993). In addition, internal environmental cost factors in relation to environmental performance should be defined and analyzed (Bennet and James 1997, Schroeder and Winter 1997, Parker 1995). Finally, environmental aspects with their financial factors should be reported in order to develop the decision-making processes of companies (Heiskanen *et al.* 1997, Spengler *et al.* 1997). The focus of

environmental management accounting should not be on environmental management issues only but also on better management decisions in general (UNSD 2003).

In a company, environmental business accounting can be implemented in basically three different ways: 1) by extending the conventional economic information with environmental costs and profits, 2) by introducing separate environmental indicators, or 3) by introducing a parallel environmental accounting system (Finland's environmental administration 2005d). Which approach is the most appropriate depends on the nature and strategically relevant environmental aspects of the business unit in question (Figge *et al.* 2002). Anyway, an essential prerequisite for successful EBA is to implement the right measurement tools. Criteria for good environmental metrics and indicators, that is metrics proportioned to comparable factors, are:

- Availability of the data,
- objectivity and reliability,
- right timing, repeatability and comparability,
- balance between challenges and opportunities, and
- clarity and intelligibility (Finland's environmental administration 2005d, Mätäsaho *et al.* 1999).

All successful environmental management, as well as EBA, requires clearly defined objectives, effective actions and continuous monitoring, as well as resources and commitment (Qualitas Fennica 2004). Keeble *et al.* (2003) recognized three key lessons for companies developing sustainable development indicators: 1) A company should encourage debate on EBA across the organization so that every employee's expertise could be benefited from. 2) A company should also involve its external stakeholders in the development process, but at the same time ensure that the employees understand how they can influence the measuring results. 3) EBA guidelines function well as benchmarks, but a company needs to ensure that the chosen indicators reflect its own values and business environment. Finally, it is essential that data held by different business functions is combined – that is the knowledge of both environmental managers and accountants should be included in EBA (ICAEW 2004, Bartolomeo *et al.* 2000, Bennett and James 1998).

### 2.3.3 Benefits and Challenges of EBA

Within a company, the principal beneficiaries of EMA are the functions of accounting, finance, control and strategic planning (Schaltegger *et al.* 2002). EMA is becoming increasingly important also for all types of routine management activities such as product and process design, cost control and allocation, capital budgeting, purchasing, supply chain management, product pricing and company performance evaluation. With the help of EMA, more accurate tracking and managing of energy and material flows becomes possible. At its best, EMA also helps with identifying, managing and reducing costs. (EMARIC 2005) Finally, environmental accounting creates a basis for a company's reliable environmental reporting (Yakhou and Dorweiler 2004, Sjöblom and Niskala 1999).

However, a big challenge is that a generally agreed upon and comprehensive framework does not exist. EMA is usually voluntary and different countries and organizations can adopt those concepts and practices that suit their own national and organizational goals the best. (IFAC 2004, Burritt *et al.* 2002, Papeh 2002) The terminology varies and the managers do not have a clear picture of all the available tools. In addition, several environmental issues are outside the direct control of the organization, difficult to characterize and often based on value judgments rather than hard data (Keeble *et al.* 2003). Challenges are still increasing because of the expanding business networks, globalization and the increasing requirements from Non-Governmental Organizations (NGOs), customers and other stakeholders (Halme 2005, Burritt 2004, Schaltegger *et al.* 2003). Therefore, to encourage broad dissemination of environmental accounting systems, they need to be relevant to the issues at hand, available at low cost, provide simple integration with other existing accounting or environmental management systems and be reliable (Burritt 2004). Other factors which may determine the quality of corporate environmental accounting are information costs, public pressures, industry membership, imitation and routine. At least, these were found to be the determinants of the quality of corporate environmental disclosures in the research of Cormier *et al.* (2005).

### 2.3.4 Research on EBA

Environmental management research became a separate field of research of business economics in the turn of 1980's and 1990's (Ketola and Kallio 2004). The requirements for forms that can be used to systematize the collection of environmental data, increased in the 1990's and the term environmental accounting came into view in publications. 'Accounting for the Environment' published in 1993 by Grey *et al.* in the UK and the research reports published shortly afterwards by the U.S. Environmental Protection Agency and Tellus Institute in the USA are considered as the leading publications in EMA research (Bennett and James 1997). Starting from physical accounting of environmental loads, EMA was first improved to also include financial factors (Schaltegger *et al.* 2003). During the 2000's the scope of enviro-economic research has been further widened towards the whole of corporate social responsibility that is combining environmental, economic and social concerns of business.

In Finland, environmental management research has been conducted in most universities of economic sciences and technology, and the first publications are from the beginning of the 1990's (Ketola and Kallio 2004). However, there have not been many researches in the field of environmental accounting. Hannu Kurki's doctoral dissertation on environmental balance sheets in 1998 was the first Finnish dissertation on environmental accounting. Tuula Pohjola's dissertation was next in 1999, and she was the first researcher to concentrate on the microeconomic level of firms (see more information in Chapter 2.4). Thereafter, Pohjola has continued with developing EBA methods for different Finnish industries, e.g. the graphic industry and the transportation operations of small and medium-sized enterprises (SMEs). Also Mikael Niskala can be considered as an expert in EMA research in Finland although he has lately concentrated more on consulting work and writing educational materials.

In the last ten years environmental accounting research has developed rapidly. Now a range of EMA tools is available and regular discussion of EMA developments at conferences and workshops is the norm. (Burritt 2004) Also e.g. the United Nations Division for Sustainable Development (UNSD) has had their own expert working group for EMA since 1999, and the Environmental Management Accounting

Research and Information Center (EMARIC) was founded in 2002 in the USA for coordinating EMA activities and research, and disseminating EMA information. However, more research is still needed to provide relevant information for practical decisions, incorporate long-term strategic considerations in corporate decision-making, build a framework that incorporates information about environmental stocks as well as environmental flows, avoid arbitrary cost allocation mechanisms, and integrate environmental indicators in the performance of each level of business units and in all aspects of value chains (Burritt 2004).

### **2.3.5 Regulations and Guidelines on EBA**

In Finland, EBA is usually not required by legislation. However, some international legislative acts are now pressuring companies to follow their environmental loads and impacts. These are e.g. the EU directive on Waste Electrical and Electronic Equipment (WEEE)<sup>2</sup> and other waste legislations, the EU directive on the energy performance of buildings<sup>3</sup> and the EU greenhouse gas emission trading scheme<sup>4</sup>, the latter of these pressuring companies even towards calculating environmental costs. In addition, environmental permits may obligate companies to keep track of their environmental loads or impacts.

However, several organizations and bodies have published voluntary guidelines for EBA and environmental reporting. The existing documents have typically focused on guidance for different national audiences supplemented by national case studies and pilot projects, or specific environmental management initiatives supported by environmental accounting and differing levels of emphasis on particular methodologies and approaches (IFAC 2004). In 2001, the European Commission (EC) adopted a recommendation on the recognition, measurement and disclosure of environmental issues in annual accounts and annual reports (EC 2001/453). In consequence, the Finnish Accounting Board (KILA) has published a guideline on presenting EBA information as a part of corporate financial statements. KILA's guideline is based on the EC recommendation and concentrates on the information

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<sup>2</sup> [http://europa.eu.int/comm/environment/waste/weee\\_index.htm](http://europa.eu.int/comm/environment/waste/weee_index.htm) [accessed 23rd August 2005]

<sup>3</sup> <http://europa.eu.int/scadplus/leg/en/lvb/l27042.htm> [accessed 23rd August 2005]

<sup>4</sup> <http://europa.eu.int/comm/environment/climat/emission.htm> [accessed 23rd August 2005]

required by the Finnish accounting legislation that is “true and sufficient information on the reporting entity’s result and on its financial position”. So only the significant environmental protection costs and liabilities of corporate environmental information are now regulated to be reported. (KILA 2003)

KILA’s guideline and other most pertinent standardization schemes for EBA from the viewpoint of a Finnish company are introduced in Table 2 on the following page. The GRI guideline concentrates on the environmental performance and only indirectly on its impacts on economic performance. GRI has been very popular lately. According to SustainAbility’s global reporting competition even 47 out of the fifty best companies reporting on sustainability issues utilized GRI in 2003 (SustainAbility 2004), and it is widely used in Finland too (Finland’s environmental administration 2005e). In turn, ISO 14000 series and EMAS are standardization schemes for environmental management, and they also include some guidance for environmental performance evaluation. Finally, International Federation of Accountants (IFAC) and Finnish Accounting Board (KILA) are accountant bodies and thus give guidance for monetary accounting – however, IFAC giving it also for physical environmental accounting. Therefore, the IFAC document seems to be one of the most comprehensive EBA guidelines published so far, due to the fact that it is very recent and it summarizes other existing guidelines.

**Table 2: Guidelines for environmental business accounting**

Name of the guideline	General information	EMA
Global Reporting Initiative (GRI): Sustainability Reporting Guidelines (2002)	GRI is a multi-stakeholder process whose mission is to develop and disseminate globally applicable Sustainability Reporting Guidelines. GRI was founded in 1997 and became independent in 2002. The guidelines are for voluntary use by organizations for reporting on the economic, environmental, and social dimensions of their activities, products and services. (GRI 2005) Also integrated indicators can be used for expressing the interactions between the three areas of sustainability (GRI 2002).	2002 guidelines lists 35 environmental performance indicators, but accounting formulas are not given. GRI recommends presenting both the absolute metrics and normalized indicators. (GRI 2002) Its next version (3rd), 2006 guidelines, will be more detailed. For quantitative indicators relevant coefficients, calculation procedures, instructions on what to include/exclude, standard assumptions that could be applied etc. will be presented. Also the accountability of qualitative indicators will be considered in more detail. The aim is to reach better clarity, comparability and auditability. (GRI 2005)
ISO 14031 on Environmental Performance Evaluation (1999)	International Organization for Standardization (ISO) is a network of the national standardization institutes of 151 countries. ISO 14000 is a series of voluntary standards and guidelines for environmental management, and ISO 14031 is the standard on environmental performance evaluation. (ISO 2005)	The standard gives guidance on the design and use of environmental performance evaluation, and on identification and selection of environmental performance indicators. The annex of the standard includes detailed environmental indicators for management performance, operational performance and environmental condition accounting. (ISO 14031:1999(en))
EU Eco-Management and Audit Scheme (EMAS) (2001)	The Eco-Management and Audit Scheme (EMAS) is the EU voluntary scheme for organizations willing to commit themselves to evaluate, improve and report on their environmental performances. It is based on the ISO 14001 standard on environmental management system but adds external reporting and verification to it. (Finland's environmental administration 2005a)	EMAS requires a company to report on the development of its emissions and other relevant environmental aspects. It does not include detailed indicators. (EC 2003/532, EC 2001/761)
International Federation of Accountants (IFAC): International Guidelines for Environmental Management Accounting (2004)	IFAC is the global organization for the accountancy profession. Its guideline aims at decreasing the confusion on EMA by bringing together some of the best existing information. The guidelines are to be updated as necessary. So far there is available only the exposure draft of the guidelines (published in November 2004), but the final version will be published soon (IFAC 2004)	The document lists different categories of environmental indicators but formulas for accounting are not given. The types of physical materials tracked include: material inputs (materials, water, energy), product outputs (products, by-products, packaging) and non-product outputs (solid waste, hazardous waste, wastewater, air emissions). Environment-related costs are classified in 6 categories: material costs of product outputs, material costs of non-product outputs, waste and emission control costs, prevention and other environmental management costs, research and development costs, and less tangible costs. (IFAC 2004)
Finnish Accounting Board (KILA): Guideline for bookkeeping, accounting and presentation of environmental issues (2003)	The Accounting Board operating under the auspices of the Finnish Ministry of Trade and Industry. The guideline aims at showing how an accountable can include environmental issues in its statutory financial statements. The guideline concerns the accountables whose profit and economic position are significantly affected by environmental issues. (KILA 2003)	The guideline concentrates only on environmental protection costs and liabilities, and shows how they can be accounted and presented together with other bookkeeping data. (KILA 2003)

Each of the above mentioned approaches has different strengths and weaknesses with regard to several criteria such as performance measurement or management, applicability within an environmental management system or the reliability of data collection. Some of the initiatives are aimed more towards internally oriented

performance management, whereas others are focused on external reporting. With regard to applicability within an environmental management system, EMAS and ISO-based environmental indicators are best-suited, since they originate either directly from the standard (EMAS) or from a linked standard (ISO 140001, which is linked to ISO 14031). For indicators based on these initiatives, reliable firm-level data are often readily available, but guidelines regarding the suggested use of indicators are mainly voluntarily and rather general. The initiatives which are concerned with externally oriented performance measurement and more homogeneous use of environmental performance indicators point to the need for 1) more standardization, 2) better measurement of sustainability and eco-efficiency, 3) life-cycle thinking, and 4) a narrower but deeper analysis of core areas of environmental performance (Olsthoorn *et al.* 2001).

## **2.4 Introduction to Tuula Pohjola's Doctoral Dissertation Research**

Tuula Pohjola started her doctoral dissertation research on environmental business accounting in fall 1994 after investigating logistics problems of service companies and witnessing the amount of resources wasted in them. At that time, environmental issues were often categorized using only the term 'environmental protection' and environmental management was seen as equivalent to compliance with environmental laws. The aim of Pohjola's dissertation was to provide a new method for considering the interrelations of environmental, process and financial factors that belong to business decision-making. (Pohjola 1999)

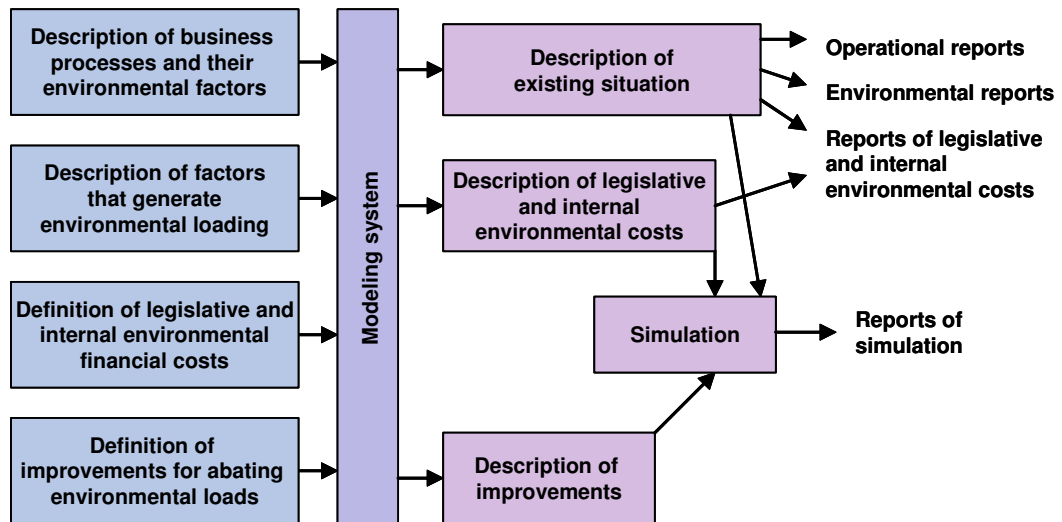
According to Pohjola the modeling of environmental aspects requires two elements: a system to analyze current environmental performance, legislative and internal environmental costs and alternatives for improving environmental issues, and a system to analyze and manage environmental decision-making processes. The first phase of Pohjola's environmental modeling framework was to identify, analyze, manage and report factors for defining the current environmental performance of business processes and the financial impacts of environmental aspects in a company. The second phase included the determination of the current environmental performance in relation to outputs of operational processes and the financial performance of environmental aspects as measured by legislative and internal



environmental costs. The financial performance of environmental aspects was defined as the relation between the legislative and internal environmental costs and the outputs of process and environmental factors in relation to the pollution generated. The costs of environmental liabilities were not taken into account in the generic environmental model, but they were estimated on the basis of the environmental risks assessed, the environmental loads generated and the financial factors defined. (Pohjola 1999)

Pohjola also designed a simulation module, which was based on the description of business processes in the generic environmental model. The accounting rules of environmental loads and costs in the simulation module were similar to the rules for accounting current environmental loads and costs. The accounting of investment costs was done using general accounting methods, such as payback periods, net present value or annuity. The environmental risks related to the alternatives were estimated on the basis of the amount and type of environmental loads, the assessments of environmental impacts generated by emissions, effluents and waste, and the environmental and process factors. Case companies assessed environmental liabilities and their costs on the basis of environmental risks and the financial performance of environmental aspects. Consequently, the simulation module offered a method of managing decision-making processes concerning environmental improvements to business processes. (Pohjola 1999)

Figure 2 presents the basic idea of Pohjola's generic environmental model.



**Figure 2: Framework of the environmental business accounting systems designed in Pohjola's doctoral dissertation (modified from Pohjola 1997:10)**

Pohjola also developed three basic environmental models based on the generic framework which was introduced above. These were models for energy consumption, transportation and logistics chains (see the contents of these models in Appendix A), and they were tested in ten case studies as follows. (Pohjola 1999)

- Energy consumption in buildings (2 cases) ICL Data Ltd.<sup>5</sup>, HPY<sup>6</sup>
- Transportation
  - Road haulage (2 cases) ICL Data Ltd., HPY
  - Distance work (1 case) HPY
  - Railway traffic (1 case) VR
- Logistics chains
  - Purchasing, distribution and waste management (3 cases) VR/Pieksämäki, Lomaliitto/Hotel Korpilampi, Kesko
  - Environmental reporting (1 case) UPM-Kymmene Corporation

<sup>5</sup> Now Fujitsu Services Oy.

<sup>6</sup> Helsinki Telephone Corporation, now Elisa Corporation.

All the case teams included company representatives who knew the processes of the organization in question. This way also the know-how to continue EBA development in the companies was created. The success of all pilot modeling systems in terms of modeling prerequisites and outcomes is summarized in Table 3. The simulation modules were found very difficult to implement already during the pilot projects and thus not taken into use in any of the case companies. (Pohjola 1999)

**Table 3: Evaluated success of Pohjola's case studies in 1996 (Pohjola 1999:103)**

	Process description	Environmental loading	Environmental performance	Internal environmental costs	Simulation module	Computer-aided model	Comprehensiveness of the model	Model realization
HPY's energy model	Excellent	All	Defined	Defined	Defined	Very good	2	Excellent
HPY's transportation model	Good	All	Defined	Defined	Partial	Good	2	Excellent
HPY's distance work model (transport model)	Good	All	Defined	Defined	Partial	Good	2	Good
ICL's energy model	Good	All	Defined	Defined	Defined	Very good	2	Good
ICL's transportation model	Average	All	Defined	Defined	Partial	Good	2	Good
Kesko Food's logistics chain model	Excellent	All	Defined	Defined	Partial	Very good	3	Excellent
VR's transportation model	Average	All	Defined	Not defined	Partial	Average	3	Average
VR's logistics chain model	Good	All	Defined	Partial	Partial	Good	3	Good
UPM's reporting model (logistics chain model)	Excellent	All	Defined	Partial	Non-existent	Average	1	Average
Korpilampi's logistics chain model	Good	All	Defined	Defined	Partial	Good	3	Good

## **2.5 Conclusion on the Literature Review**

Environmental business accounting, or environmental management accounting as it has been started to be called recently, is a young and continuously developing field. Several EBA guidelines are already provided for companies, but there does not exist one unified and comprehensive guiding principle. EBA is usually voluntary and companies can adopt whichever EBA practices they want to. However, at its best EBA can be utilized not only for environmental management but also for better management decisions in general.

There are several different elements of EBA according to which company's environmental accounting practices can be evaluated. On the basis of this literature review and the author's opinions on the most important viewpoints, the following

fourteen elements can be separated. These EBA elements are later in this thesis used for the data analysis. These elements, in form of questions, are:

- 1) Is EBA based on realistic and comprehensive process descriptions?
- 2) How comprehensive is the measurement of the resource usage?
- 3) How comprehensive is the assessment of the environmental impacts?
- 4) How comprehensive is the measurement of the environmental costs?
- 5) How accurate are the EBA results?
- 6) Does EBA enable comparisons to different years and organizational entities (e.g. other business units or companies)?
- 7) Are the EBA results clear and easy to understand?
- 8) Is life-cycle thinking included in EBA?
- 9) Is EBA integrated to other corporate accounting practices?
- 10) How are the EBA results utilized?
- 11) Are the corporate personnel committed to EBA?
- 12) Is the knowledge of the different corporate personnel utilized when creating environmental metrics and indicators?
- 13) Is EBA linked to corporate stakeholder needs?
- 14) Are guidelines utilized when creating EBA practices?

### 3 Research Methodology

This research started with a literature review (Chapter 2) which created the basis for the methodology of the empirical research. The chosen methodology is presented in this chapter and its reliability is assessed in the end of the thesis together with the reliability of the research results (Chapter 0).

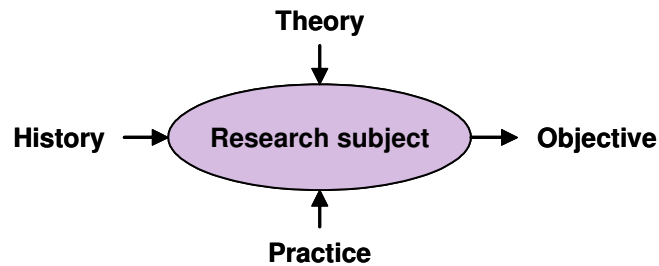
#### 3.1 Research Approach

The basic classification by the philosophy of science is to divide scientific research in positivistic and hermeneutic research. The positivistic approach relies only on scientifically proven facts while the hermeneutic approach emphasizes interpretation and understanding based on history. One of the hermeneutic research approaches is the action-oriented research approach, which is also chosen for this research. (Olkkonen 1993) In turn, Kasanen *et al.* (1991) have classified the established accounting research approaches as to axes of descriptive-normative and theoretical-empirical. Descriptive research concentrates on describing the phenomenon studied while normative research aims at finding results that can be used as directions when developing existing or new operations. In turn, the classification of theoretical-empirical relies on the use of theoretical or empirical research methods. (Olkkonen 1993) According to Kasanen *et al.* (1991) the action-oriented research approach mixes both descriptive and normative methods and is clearly empirical.

The explanatory model of the action-oriented research approach is often teleological, which is based on the purpose of the subject of explanation, and the historical background of the phenomenon is examined carefully. The emphasis is usually placed on gaining a thorough understanding of the studied subjects, but the purpose may also include an active participation in change processes. (Kasanen *et al.* 1991) The problem usually concerns the functions related to companies' operations where people and their actions are part of the problem. The data and its processing are empirical, typically qualitative. (Olkkonen 1993) Qualitative research clarifies the reasons for the present state of the studied subject and the ways that it can be impacted (Solatie 2004). However, the empiricism is usually represented by only a few target entities which can create generalization problems. Therefore the results

are often only recommendations and the contribution of them needs to be tested in further studies. (Olkkonen 1993)

In business economics, hermeneutic researches are often called case studies. This research utilizes the case study methodology because the aim is to make a follow-up research for the case studies conducted as a part of Tuula Pohjola's (1999) doctoral dissertation research. Also the theoretical background copies that of Pohjola's with a few updates to make comparisons possible. Figure 3 presents the simplified idea behind the action-oriented research approach. If compared to the figure, Tuula Pohjola's (1999) dissertation represents the 'history' of this research, the literature review represents the 'theory' and the empirical case studies represent the 'practice'. With help of these three viewpoints, the 'objective' is to answer the research questions which were presented in Chapter 1.2.



**Figure 3: Viewpoint of the action-oriented research approach (Olkkonen 1993:75)**

### **3.2 Data Collection Methods**

The secondary research data, that is data for the literature review, was gathered firstly by studying Tuula Pohjola's doctoral dissertation and the related unpublished case reports, and secondly by reading scientific literature, governmental regulations and voluntary guidelines related to environmental business accounting. The literature referred includes textbooks, articles in scientific journals, conference papers and a few presentations held in environmental management seminars in Finland. Most of the articles as well regulations and guidelines were gathered through Internet.

The primary data for the case studies was gathered by visiting the case companies between February and April 2005, and interviewing there the personnel responsible for environmental management. The interviews were semi-structured, and the questionnaire used is presented in Appendix B. The questions were sent to the interviewees beforehand by email so that they had time to prepare themselves for the

interviews. Each of the interviews lasted for about 1.5 hours. The interviews were recorded and later written out. When some additional data was needed the interviewees were contacted again by telephone or email.

There were cases where information about some developments of environmental management or EBA practices was lost between the years 1996 and 2005 when the responsible individuals had been changed. In these cases, the former responsible persons were contacted by telephone and interviewed briefly using open questions. One individual was also interviewed personally because of his own will and big interest in this research project, and another was contacted only by email because of her busy schedule.

The following list presents the titles of the interviewees in each company. The additional interviews are marked with an asterisk (\*).

- **Elisa Corporation:** Head of Safety and Environment, Logistics Development Manager (retired)\*, Environmental Manager (retired)\*
- **Fujitsu Services Oy:** Quality Coordinator (logistics and configuration centre), Warehouse Manager (logistics and configuration centre), Property Manager, Quality Manager\*, Service Manager (former Quality Manager)\*
- **Kesko Group:** Development Manager (Kesko Food, Logistics), Senior Manager (Corporate Responsibility / Corporate Communications), Environmental Specialist (Kesko Food, Logistics)\*
- **VR Group:** Head of Environmental Affairs, Kouvola Depot Manager (former Pieksämäki Depot Manager)\*

Primary data was also gathered by studying annual and environmental reports of the case companies and their websites. Finally, in August 2005, the interviewees were contacted again to check if any significant changes had taken place between the time of interviews and the time when this thesis was ready.

### **3.3 Analysis Methods**

The research data was analyzed using only qualitative methods. There does not exist a comprehensive toolkit for qualitative analysis but the analysis process is flexible. Basically, qualitative analysis consists of two parts: simplification of observations and solving the research problem. (Järvenpää and Kosonen 2000)

The empirical research data was categorized in Excel tables according to the interview questions. The environmental management, accounting and reporting practices were described separately as regards to each case company. The other two topics were described briefly but EBA more in detail because the main emphasis was on it. Environmental metrics and indicators used in the case companies were also listed in tables. The present state of the case companies' environmental management and environmental business accounting practices was compared to the situation of 1996 and the findings from the literature. Environmental reporting was not yet done in any of the case companies in 1996 but its present state was now introduced to show how the companies utilize their accounting data.

The concept of EBA was divided into fourteen elements according to the literature review and the author's opinions on the most important viewpoints (see Chapter 2.5). These elements were: 1) process descriptions as a basis of EBA, 2) measurement of resource usage, 3) assessment of environmental impacts, 4) measurement of environmental costs, 5) accuracy of values, 6) comparability, 7) clarity, 8) life-cycle thinking, 9) integration to other accounting practices, 10) exploitation of results, 11) personnel commitment, 12) debate across organization when creating environmental metrics and indicators, 13) links to stakeholder needs, and 14) utilization of EBA guidelines. Each case company was assessed separately as regards to each of these elements. If a company had done nothing as regards to a specific element, it received value 0. On the contrary, if the company is excellent as regards to a specific element, it received value 3. The excellence (level 3) is evaluated as regards to the currently best available EBA practices and not the absolute excellence because the field of EBA is continuously developing, and thus also the EBA practices can be expected to develop significantly. Also values 0.5, 1 and 2 were given if a company had done 'very little but something', 'something' or 'quite much but not everything it could' as



regards to a specific element. This evaluation scale is not interval despite of its numerical values but rather ordinal because the variables are not quantifiable. Finally, a diagram illustrating the state of the companies' present EBA practices was drawn according to these evaluations (Figure 4 in Chapter 5).

In addition to the developments between the years 1996 and 2005, the research results show the existing gaps between the existing theoretical knowledge and the practices of the case companies. Also the reasons for this are briefly considered. However, generalization of the results with this small case sample is not possible.

## 4 Research Results

This chapter first introduces the four case companies and their environmental impacts. Thereafter, the current environmental management, environmental business accounting and environmental reporting practices of the case companies are presented in separate sub-chapters.

### ***4.1 Introduction to the Case Companies and Their Environmental Impacts***

The **Elisa Corporation** is a provider of telecommunication services and solutions both for companies and consumers (Elisa 2005a). Since 1996, the Elisa Corporation, then known as Helsinki Telephone Corporation (HPY), has gone through drastic changes: It has expanded from Southern Finland to all of the country, and in addition to telecommunication services it now provides Information Technology (IT) services (Uotila 2005). Elisa's international expansion started through corporate acquisitions in 1997, and now Elisa provides international operations in Estonia and worldwide mediator solutions (Elisa 2005c). In 2004, the group's turnover amounted to EUR 1,356 million, and in the end of the year it employed 5,376 persons (Elisa 2005a). In 1996, the corresponding figures were EUR 288 million and 3,400 employees (Pohjola 1999). Recently big organizational changes have taken place at Elisa when its subsidiaries have been merged into the parent company, and consequently excess personnel have been dismissed (Elisa 2005a).

**Fujitsu Services Oy** is part of the global Fujitsu Limited, the world's third largest IT services provider. The origin and the headquarters of Fujitsu Limited are in Japan, but today the group employs nearly 160,000 persons in altogether over sixty countries. (Fujitsu Services 2005a) In Finland, Fujitsu Services' business includes integrating software applications into hardware systems, warehousing, delivering the systems to its business customers, and managing the systems' life cycles. Over 40,000 computers are installed yearly and the company cooperates with the world's leading equipment and software producers. (Fujitsu Services 2005b) In its financial year, April 2003 – March 2004, Fujitsu Services' turnover was EUR 256 million, and

in the end of the period the number of staff 1,544<sup>7</sup>. (Fujitsu Services 2005a) In 1996, these figures of the predecessor ICL Data Ltd. were EUR 317 million and 1,784 employees (Pohjola 1999). Continual mergers and incorporations of the business units have been typical for the company (Aaltonen and Tepponen 2005).

In 2004, **Kesko Food Ltd.** was one of the two leading retail groceries providers in Finland with its 35.3 per cent market share (A.C. Nielsen 2005). In addition, its subsidiary Kespro Ltd. produces wholesale services for business customers. Kesko Food has operations in Finland and the Baltic countries. In 2004, Kesko Food's turnover amounted to EUR 3,812 million, nine per cent of it coming from the Baltic market. The number of personnel was 7,768. Kesko Food belongs to the Kesko Group and accounted for about half of its total turnover. The group's other divisions are Rautakesko (ironmongery), Kesko Agro (animal feed, grain, chemicals and machinery), Keswell (home and speciality goods), Kaukomarkkinat (international technical trading, import and wholesale of branded products) and VV-Auto (import and marketing of passenger cars and commercial vehicles). (Kesko 2005a)

In 1996, the groceries trade was not yet incorporated but constituted one of Kesko's three business lines, the others being the specialty goods trade and international operations. That time the whole company's turnover was EUR 4,924 million, of which the groceries trade constituted 38 per cent, and the average number of personnel was 6,500. (Pohjola 1999) In recent years, the major changes in Kesko Food's business have been the concentration of trade, centralized warehousing, and the increased amount of company's own brands and thus also imports (Jäske 2005).

Finally, the **VR Group** is a Finnish transport company that provides rail transport and supplementary road transport services. The group also offers track construction and maintenance services through competitive tendering for the Finnish Rail Administration, which is responsible for the renovation, development and maintenance of lines. The VR Group is a limited liability company owned entirely by the Finnish state. In turn, the Finnish Ministry of Transport and Communications is responsible for rail transport legislation and railway licensing. In 2004, the VR Group generated a net turnover of EUR 1,179 million and employed a total of 13,264

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<sup>7</sup> Information from the financial year 2004-2005 was not available in public by 23rd August 2005.

persons. The group's freight services amounted to 52 million tons and passenger services to 70 million journeys. Rail services accounted for about 55 per cent of the group's total turnover and road services for roughly 17 per cent. (VR 2005) In 1996, the turnover was EUR 894 million, and the company employed 14,820 persons (Pohjola 1999). In 1997, the freight traffic was 45 million tons and passenger traffic 59 million journeys<sup>8</sup> (VR 1999). VR's basic business, rail services, has remained mainly the same since the 1970's when electric trains were taken into use. Only the environmental legislation has tightened (Lehtipuu 2005).

As regards to the environmental issues, the impacts of the Elisa Corporation and Kesko Food have grown significantly along the expansion of the companies' businesses: hauls are longer, more resources are needed and more waste is produced. In turn, at Fujitsu Services the direct environmental impacts have decreased because of the outsourced transport and maintenance services. At VR, the energy consumption has changed along the increased use of electric locomotives instead of diesel ones. All the companies have benefited from the upgrading of their real estate facilities, which has led to lower energy use. However, the tightened waste regulation has pushed all the case companies to consider environmental issues in more detail. This has for example involved developing recycling systems and joining voluntary environmental agreements (see more information in Chapter 4.2).

The major sources for the case companies' direct environmental impacts in 2004 are listed in Table 4. In addition to them, indirect environmental impacts are caused e.g. by manufacture of the company's purchased inputs, outsourced operations, and use and disposal of company's products.

**Table 4: Major sources for the case companies' direct environmental impacts in 2005**

Elisa Corporation	Fujitsu Services Oy	Kesko Food Ltd.	VR Group
Use of real estates	Use of real estates	Construction and use of real estates	Construction and use of real estates
Use of electronic devices	Use of electronic devices	Warehousing of goods	Rail transport
Construction and maintenance of networks	Transport	Handling of goods	Road transport
Transport	Waste management	Transport	Construction and maintenance of railways
Waste management		Waste management	Maintenance of trains
			Use of chemicals
			Waste management

<sup>8</sup> Information from 1996 is not available in public.

## **4.2 Developments in Environmental Management**

Almost all of the environmental management practices the case companies follow today have been developed after the year 1996. At that time, only Kesko Food and VR had already defined their environmental management systems, but they were not yet implemented. In turn, Elisa (former HPY) had defined a general level environmental strategy, and Fujitsu Services (former ICL Data) had defined its environmental policy. None of the companies was practicing any environmental accounting yet. However, even though the starting level for all the companies was pretty much the same, their progress in environmental management varies a lot.

**Elisa Corporation** started to develop its environmental management practices after the pilot projects. An environmental working group was founded in 1999. It consisted of management level individuals from all Elisa's business units. Environmental campaigns were launched with emphasis on more ecological driving style, improved waste management and energy saving as well at work as in the employees' free time. In 1999, Elisa also started cooperation in environmental issues with other large Nordic telephone operators. Later in the same year the cooperation was widened to include more operators from Western Europe, and thus the European Telecommunications Network Operators' Association (ETNO) was founded<sup>9</sup>. (Kanerva 2005)

However, the management support and budgeted resources for environmental management remained low at Elisa. The environmental work has been done largely on the responsible individual's own time. (Kanerva 2005) There was even a short period when no environmental management was conducted before a new environmental manager was chosen in 2001. With this new responsible person, Elisa's environmental management work continued with building of a tighter environmental working group and defining an environmental policy. (Uotila 2005) In 2001, also a mapping of the environmental loadings in all of Elisa's subsidiaries was carried out, and an ISO 14001 certificated environmental management system was reported to be the company's goal (Tahvanainen 2003).

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<sup>9</sup> <http://www.etno.be/> [accessed 23rd August 2005]

In 2004, the environmental management responsible was changed again and Elisa's environmental objectives were revised. Elisa's customers are not pressuring the company towards better environmental management, and also the legal obligations are comparably low. Therefore only 15-20 per cent of the working hours of Elisa's 'Head of Safety and Environment' are budgeted for environmental management tasks. In addition, Elisa still has an environmental working group, which now consists of twelve members from Elisa's different subsidiaries. The group meets about seven times a year and defines the corporation's environmental objectives which are then integrated in the quality systems of Elisa's different business units. Lately, The main environmental management activities have been starting the collection of customers' electronic waste and joining the voluntary Environmental Register of Packaging PYR Ltd<sup>10</sup> that assists companies with packaging recovery obligations. However, a certified EMS is nowadays considered as a too heavy tool for Elisa's needs. Elisa believes that the company is anyway doing pretty well because its major subcontractor has assessed Elisa to comply with the ISO 14001 requirements to about seventy per cent. (Tamminen 2005)

**Fujitsu Services Oy** continued developing its energy and waste management practices after the pilot projects (Moilanen 2005). In 1999, after requirements from an important customer, Fujitsu Services applied for the ISO 14001 certification and became the first European IT company to hold it. This first certificated EMS included all of Fujitsu Services' operations. However, when the functions of sales and logistics were outsourced in 2001, the company receded from the certificate. In 2002, the certificate was applied again, but this time only for Fujitsu Services' logistics and configuration centre that had been remerged to the company. Elsewhere at Fujitsu Services these kinds of heavy environmental management tools are not anymore considered as value-adding. (Mäkinen 2005) Only some energy saving and waste management principles have been derived from the logistics and configuration centre to the company-wide real estate management (Aaltonen and Tepponen 2005).

The person in charge of environmental management at Fujitsu Services is the 'Quality Coordinator' of the logistics and configuration centre besides his other

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<sup>10</sup> <http://www.pyr.fi/en/index.htm> [accessed 23rd August 2005]

duties. The logistics and configuration centre also has an environmental working group of three persons. The group meets two or three times yearly for updating the environmental policy and annual objectives of the logistics and configuration centre. Recently, the main environmental aims have been decreasing the amount of unsorted waste and increasing recycling. (Fujitsu Services 2005b) Fujitsu Services also has joined PYR Ltd. and a voluntary energy saving agreement KRESS<sup>11</sup> (Aaltonen and Tepponen 2005). However, the know-how on environmental issues still seems to be lacking. For instance, when the company representatives were asked about Fujitsu Services' environment impacts, their first reaction was that the company does not have such.

**Kesko Food Ltd.** started considering environmental management issues already a little before Pohjola's research, and since then the company has continuously invested in them. Nowadays, the Kesko Group's sustainability thinking is derived from the corporate strategy to all its subsidiaries and operations, and a wide variety of environmental management tools is utilized. All of Kesko's Finnish operations that have major impacts on the environment are certified by ISO 14001. In the end of 2004, the certificates covered some fifty per cent of the total business volume. Kesko also belongs to the PYR and KRESS agreements. Kesko's goal is to improve quality and decrease costs by efficient environmental management. (Kesko 2005b)

Individuals responsible for environmental management work at all levels of the organization (Kesko 2005b). At Kesko Food, all of its main processes have personnel named for environmental responsibility. In addition, environmental issues belong to each employee's day-to-day work through recycling, saving energy etc. (Jäske 2005) Kesko Group also participates actively in the work of several cooperation bodies. For example, the group's representatives take part in developing standards such as Global Reporting Initiative (GRI), and they have also been consulted by Finnish authorities in environmental issues. (Rehell 2005) Other stakeholder cooperation has also been diversified: the group has defined the CSR expectations of each of its stakeholder groups, listed the activities the company has taken as to each group, and designed indicators how the success of these activities can be monitored. (Kesko

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<sup>11</sup> <http://www.rakli.fi/kehitys/kress/> [accessed 23rd August 2005]

2005b) In January 2005, Kesko was ranked in the world's top hundred in sustainability issues because of its success in several sustainability indexes (Global 100 2005).

In turn, the **VR Group's** environmental management work started already in 1992 when an environmental working group was established. After 1996, the environmental management has developed significantly. Today, the environmental friendliness of the railway transport is defined as one of VR's key success factors, and the corporate values include prevention of environmental risks and responsibility to the environment (VR 2005). An environmentally friendly image is important for instance in lobbying railway services. VR got its first ISO 14001 certificate in 1998, and now all business units serving mainly external customers have certified environmental management systems and also the other units act according to the same requirements. Several VR units also need environmental permits. (Lehtipuu 2005) In addition, VR's commuter traffic belongs to the public transport energy saving agreement (VR 2004).

The environmental organization at VR comprises altogether about sixty persons: the group's full-time environmental manager, environmental coordinators at each of the group's companies, and responsible officers at specific sites. VR has also taken the opinions of its stakeholders into account by conducting surveys among its customers and residents close to railways, and cooperating in environmental issues with the Finnish Railway Administration. (VR 2004)

Table 5 summarizes the environmental management tools used in all of the case companies in the beginning of 2005. The information presented in the table is gathered from the interviews of the company representatives and corporate reports.



**Table 5: Summary of the case companies' environmental management tools in 2005**

	Elisa Corporation	Fujitsu Services Oy	Kesko Food Ltd.	VR Group
Environmental strategy	Only goals defined	Goals defined for each financial year (only the logistics and configuration centre)	Defined	Defined (group and subsidiaries)
Environmental policy	Defined	Defined (only the logistics and configuration centre)	Defined	Defined
Environmental management system	-	ISO 14001 certificate (only the logistics and configuration centre)	ISO 14001 certificate (logistics, transportation, real estate management), corresponding system at K-environmental stores (100% of K-citymarkets, 97.5% of K-supermarkets, 14.4% of K-markets)	ISO 14001 certificate (units with mainly external customers)
Environmental auditing	Once a year external (only Tampere unit)	Once a year external	Twice a year internal and external, K-environmental stores have their own auditing program, supplier audits of all producers of Kesko Food's own brands and in all risk countries	Internal min. every 3 years, external according to certificate, some supplier and customer audits
Environmental risk management	-	-	Included in corporate safety plan as a part of overall risk mapping	Included in corporate safety plan
Environmental value chain management	Environmental issues taken into account in purchases, outlets act as collection points of WEEE (1)	Environmental issues taken into account in purchases, customers' WEEE and packaging waste managed	Impacts of the products whole life cycle considered	Environmental issues taken into account in purchases, a procurement manual used
Waste management	PYR membership (2)	PYR membership	PYR membership, advanced return logistics	Common and unit-specified waste management plans, efficient use of chemicals and materials, soil decontamination
Energy saving programs	-	KRESS (3)	KRESS, the theme year 2004 for energy savings in real estate operations	Public transport energy saving agreement (VR commuter traffic)
Environmental training	Training day organized for environmental team yearly, some instructions available in intranet	Instructions for new employees or in case of changes, some instructions available in intranet	Environmental manual available for everyone, environmental themes twice a year, environmental issues included in training of new employees, specific training organized in case of significant changes	Environmental manual available for everyone, environmental issues included in training of new employees, a specific training day organized for the environmental team yearly
Other	ETNO membership (4)	-	Environmental manual, eco-efficiency in construction, LCAs (5) for a few products, environmental office work program, participation in various environmental bodies, stakeholder cooperation	Environmental manual, LCA required in large equipment purchases, MIPS pilot (6), some stakeholder cooperation

(1) Waste Electronic and Electrical Equipment

(2) The Environmental Register of Packaging PYR Ltd.

(3) The energy saving agreement of The Finnish Association of Building Owners and Construction Clients

(4) The European Telecommunications Network Operators' Association

(5) Life Cycle Assessment

(6) Material Intensity Per Service Unit

### **4.3 Developments in Environmental Business Accounting**

At the **Elisa Corporation**, three environmental business accounting models were defined in 1996: An energy model was designed for an office building in Helsinki. A road traffic model was designed including the company's own vehicles, leased cars and staff's cars. Finally, another transport model was designed for the decentralized office working of the call center sales team. (Pohjola 1999) Afterwards, Elisa widened its energy model to include the whole corporation. In turn, the transportation model was planned to be supplemented by a vehicle-specific measuring system for petrol consumption and personal compensation would have been paid to drivers based on the saved petrol costs. This idea was, however, abandoned by the corporate management because of the difficulties to realize the system equally. Finally, the decentralized office working model was abandoned.

Thanks to the experience gained from the pilot projects, Elisa got a major role in developing environmental accounting for the European Telecommunications Network Operators' Association. ETNO took in use an energy indicator consisting of two parts, the total energy consumption and the petrol consumption of vehicles. The indicator was calculated per a thousand telephone subscriptions the operator had. In addition, some pilot calculations were made about nitrogen emissions, but they were discovered to be too challenging. Elisa had the responsibility for collecting the information also from the other local Finnish operators belonging to Finnet Group, the same umbrella organization to which Elisa belonged. (Kanerva 2005)

Gradually Elisa's EBA enthusiasm decreased. Lately, the company has again put emphasis on it as the environmental metrics of another Finnish company have been benchmarked and suitable ones have been adapted to Elisa's operations. These environmental metrics were calculated for the first time for the year 2004. They include energy and water consumption, fuel consumption and waste (see Table 6). However, so far Elisa's environmental business accounting comprises only of the environmental load data and domestic operations. Some of Elisa's subsidiaries have been excluded because of the rapid changes in the organizational structure. (Tamminen 2005)

Elisa's energy and water consumption are monitored through a facilities maintenance management tool. Other data is collected in Excel tables. The data is provided by the responsible individuals of Elisa's different business units, the car leasing company from which all of Elisa's cars are leased, and Elisa's real estate maintenance and waste management subcontractors. Some values still remain as estimates. The accounting is done by the same company representative who takes care of all the other environmental management work. Elisa's aim is to use the accounting results later for monitoring the progress of its environmental objectives and for environmental communication. Elisa is not planning to change its environmental metrics in the near future, but the objectives are to reach better accuracy and comparability. (Tamminen 2005)

**Table 6: Environmental metrics of Elisa Corporation in 2004 (Elisa 2005b)**

Energy and water consumption	Transport	Waste
<i>Owned real estates:</i> Total area (m2, m3) Water (m3) Heat, district heating (MWh) Heat, oil (MWh) (*) Electricity (MWh) Total (MWh)	Production cars, gasoline (km, litres of fuel) Production cars, diesel (km, l) Other cars, gasoline (km, l) Other cars, diesel (km, l) Other transport (km, l) (*) Total (km, l)	Unsorted waste (tn)  <i>Hazardous waste:</i> Poles (tn) Batteries (tn) Liquids (m3) (*) Fluorescent lamps (*) Other hazardous waste (tn) Total (tn)
<i>Leased real estates:</i> Total area (m2, m3) Water (m3) Heat, district heating (MWh) Heat, oil (MWh) (*) Electricity, users (MWh) Electricity, real estate (MWh) Total (MWh)		<i>Recyclable waste:</i> Biowaste (tn) Paper (tn) Cardboard (tn) Cable waste (tn) Electrical and electronic waste (tn) Plate and iron (tn) Aluminium (tn) Plastic, energy waste (tn) Wood (tn) Glass (tn) Dry residue (tn) Construction waste (tn) Total recyclable waste (tn)
		Total waste (tn)

(\*) Value is not available from the year 2004 or the value is 0.

Two EBA models were defined for **Fujitsu Services Oy** in 1996: an energy accounting model was defined for an office building in Helsinki and a transport model for the leasing and the staff's cars at the maintenance department. After it, Fujitsu Services continued to monitor its energy consumption (Pohjola 1999). Monitoring practices were also developed for waste management and a waste sorting system was implemented (Moilanen 2005). However, the pilot modeling system was abandoned in 2001 because it was not anymore considered value-adding (Mäkinen 2005). In addition, the pilot modeling system was incomplete because it did not

include the logistics. This had been the management's decision. In addition, today the maintenance and long-distance deliveries are outsourced and the company has only two cars for local deliveries so the transportation model would anyway be out-of-date. (Aaltonen and Tepponen 2005)

Fujitsu Services monitors its energy and water consumption in each real estate on a monthly basis. The values are gathered through a monitoring and reporting service provided by an energy consultation company. These values are compared with the corresponding figures from the previous year. Some energy values are also monitored separately because all the energy is not bought from the same provider. The waste management values, in turn, are entered into Excel tables by the 'Property Manager' according to the invoices received from the waste and metal recycling subcontractors. (Lainio 2005) At the logistics and configuration centre, the progress of its annual environmental objectives is monitored through a few simple metrics. In the financial year April 2004 – March 2005, these metrics were the percentage value of electronic documents proportioned to all documents and the amount of energy waste proportioned to all unsorted waste. In addition, some data about outsourced deliveries is collected. (See Table 7 for all the metrics.) The EBA results are used for monitoring the operations and for reporting. (Aaltonen and Tepponen 2005)

**Table 7: Environmental metrics of Fujitsu Services Oy in 2004-2005 (Lainio 2005, Fujitsu Services 2004)**

Energy and water consumption	Other
Heat, district heating (MWh)	Waste (tn)
Heat, district heating (m3)	Electronic documents / all documents (%)
Water (m3)	Energy waste / unsorted waste (%)
Electricity (kWh)	Deliveries (km, tn)

In 1996, a logistics accounting model was designed for the main warehouse of **Kesko Food Ltd.** in Vantaa. The model included the processes of purchasing, storing, packing, office working, distributing and waste management. (Pohjola 1999) Since then the model, which is known as the KELO<sup>12</sup> model, has been continuously developed. In 1999, the first completed part of the model was applied to waste management, and the energy consumption and emissions in the groceries logistics chain were evaluated for the first time. In 2000, the regional distribution centers adopted the waste management calculation, which then covered Kesko Food's entire

<sup>12</sup> Abbreviation of sustainable logistics ('kestävä logistiikka' in Finnish).

logistics. In 2001, Kesko Food started to use the system to monitor transportation (purchasing and distribution transport, and truck costs), transportation fleet, return logistics and packaging. (Kesko 2005b) However, the simulation module was considered as unreliable and thus was not taken into use. Later changes in Kesko Food's information systems slowed down the development of KELO. For instance, links between KELO and information systems were ready for transportation and packaging accounting, but they have not been successfully transferred to the new systems implemented. Therefore, only the waste management part of the KELO model is in use today. (Jäske 2005)

Kesko Food's present environmental metrics and indicators include the energy and water consumption, environmental profile of energy, transport and its emissions, waste and recycling rates, and packing materials (see Table 8). In addition to them, Kesko Food has internal reports with site-specific values (Pelin 2005). The values are compared to those of the two preceding years (Kesko 2005b) and the metrics are updated monthly (Jäske 2005). Since the beginning of 2003, the waste management operator at the Vantaa logistics warehouse has automatically transferred data into the KELO model and monitoring has become significantly easier (Kesko 2005b). The data of the waste managed by other operators is still entered manually according to the bills of freight (Jäske 2005). Kesko's energy profile is based on the information gained from the energy companies. The emissions of transport are calculated according to the kilometers driven as no fuel consumption data is available. The calculation is based on the emission factors of the road traffic emissions model developed by the Technical Research Centre of Finland. (Kesko 2005b)

The scope of the environmental business accounting at Kesko Food is limited to that part of the supply chain which is under Kesko's direct control. Kesko has also conducted some environmental cost accounting by assessing the savings from its environmental activities such as improved waste management and real estate investments. (Jäske 2005)

**Table 8: Environmental metrics and indicators of Kesko Group in 2004 (Kesko 2005c)**

Energy and water consumption	Transport	Waste (5)	Other
<i>Specific consumption (1):</i> Electricity (kWh/m <sup>2</sup> ) Heat (kWh/m <sup>2</sup> ) Water (l/m <sup>2</sup> )  <i>Environmental profile of energy (2):</i> Volume (GWh) Primary energy (PJ) - Non-renewable (PJ) - Renewable (PJ) - Nuclear waste (PJ) Environmental impacts - Climate change (tn CO <sub>2</sub> eq) - Acidification (tn SO <sub>2</sub> eq) - Ozone in lower atmosphere (tn C <sub>2</sub> H <sub>4</sub> eq) - Radioactive waste (tn)	<i>Kesped's distribution (3):</i> Amounts (t/load, km/load, m <sup>3</sup> /load) CO <sub>2</sub> emissions (kg/m <sup>3</sup> , kg/tn delivered)  <i>Primary emissions (4):</i> Total kilometres (1000 km) Energy consumption (MWh) CO <sub>2</sub> (tn) CO (tn) HC (tn) NO <sub>x</sub> (tn) Particles (tn)	<i>Waste for recovery (tn):</i> Energy waste Wood waste Metal Film plastic Corrugated Board Paper  <i>Landfill waste (tn):</i> Organic waste Mixed waste  Hazardous waste (tn)  Total waste (tn) Recovery (%)	<i>Packing materials (6):</i> Fibre (tn) Plastic (tn) Metal (tn) Glass (tn) Wood (tn) Total (tn) Share of total weight of products (%)  Number of K-environmental stores Number of organic food products Number of eco-labeled products

(1) Includes only the real estates owned or leased by Kesko in Finland.

(2) Accounted separately for the heat and electricity consumed in the real estates owned or leased by Kesko in Finland, and in the Baltics and Sweden. Foreign operations do not include the metric for ozone in the lower atmosphere.

(3) Kesped is Kesko's transportation subsidiary. Separate figures are calculated for Helsinki, Tampere, Turku, Oulu, Kuopio, Jyväskylä and Mikkeli.

(4) Separately Kesped, outsourced transport, Anttila department stores and Kesko Food Estonia.

(5) Finnish data based on warehouses. Estonian data based on retail shops. Data from other countries not available externally.

(6) Includes packing materials in products imported by Kesko to the Finnish market.

During 2005, a unified corporate responsibility accounting system is to be built for Kesko Group. The new system is planned to consist of three parts: 1) the consolidation module which gives as output a defined set of metrics for the corporate sustainability report, for business unit managers or for the corporate management, 2) existing information systems such as KELO, and 3) integration module that transfers the data from the information systems to the consolidation module and does the required redefinition and recalculation. Integration between ecological and economic data is planned to take place at the second phase of the project during the year 2006. Also EBA systems for the foreign operations in Sweden, Norway and in the Baltic countries are under construction, and will utilize the same accounting system as in Finland. At Kesko, EBA is used firstly for rationalizing the processes and secondly for reporting purposes. (Rehell 2005)

Finally, at **VR Group** two models were designed in 1996: a transport model for the railway freight services and a logistics model for the maintenance works. The transportation model was limited to the freight traffic because it was considered more complicated than the passenger traffic, and the model could be later widened if wanted. In turn, the logistics model included the maintenance operations for the locomotives and goods wagons. The maintenance data was gathered from the engineering workshop in Pieksämäki. (Pohjola 1999) However, VR did not continue

the development of these environmental modeling systems. The freight transport model was not considered value-adding when compared to the systems VR already had in use. The model developed was considered too complicated and the data collection was estimated problematical in practice. (Lehtipuu 2005) The logistics model for maintenance services was also considered too laborious (Parviainen 2005). Anyway, VR has had to develop their environmental accounting because of the obligations of reporting the railway business. The group also needs EBA for management decisions and monitoring the progress and for providing information about rail transport emissions for the business customers to be further used in their environmental reporting. (Lehtipuu 2005)

VR's metrics and indicators include the energy and water consumption, environmental profile of energy, rail transport and its emissions, road transport, waste and recycling rates and packing materials (see Table 9). The values are compared with four preceding years. (VR Group 2004) The numerical data is collected from the environmental management systems and financial accounts of the VR companies. All VR's sites have a named individual for environmental data collection. The site-specific data is sent by email, fax or mail to the environmental manager of the group who sums them up. (Lehtipuu 2005) The calculations of emissions are based on the model developed by the Technical Research Centre of Finland (VR Group 2004). The Union of International Railways has also determined metrics and indicators suitable for railway traffic. They were otherwise the same as VR has defined, the only addition being the proportion of renewable energy. (Lehtipuu 2005)

**Table 9: Environmental metrics and indicators of VR Group in 2002-2003 (VR 2004)**

Energy and water consumption	Rail services	Road services	Waste
<i>Energy consumption:</i> Whole group (PJ) Rail services, electricity (GWh) Other electricity consumption (GWh) District heating (GWh) Rail services fuel consumption (million l)  Road services fuel consumption (million l) Other fuels (million l)  <i>Electric traction's share of train-kilometres (%):</i> All train traffic Passenger services Freight services  <i>Specific energy consumption:</i> Rail Services (MJ/(tkm+pkm)), MJ/tkm, MJ/pkm) Road Services (MJ/tkm)  <i>Water consumption (m3):</i> For servicing railway rolling stock Other consumption  Total	Passenger and freight traffic (journeys, carryings)  <i>Emissions from Finnish rail traffic 2002 (1) (CO,HC,NOx, Particles,SO2,CO2 tons)</i> Electric locomotives Diesel locomotives Total  <i>Passenger traffic:</i> Electric locomotives Diesel locomotives Shunting/diesel locomotives Local traffic Total  <i>Freight traffic:</i> Electric locomotives Diesel locomotives Shunting/ diesel locomotives Total  <i>Rail transportation of hazardous substances by class of substance (1,000 tn):</i> Total volumes carried Flammable liquids Corrosive substances Gases Other	<i>Transpoint (2):</i> Average capacity utilization (kg) Fuel consumption (l/100km)  <i>Combitrans (3):</i> Average capacity utilization (kg) Fuel consumption (l/100km)	<i>Waste materials (tn):</i> Contaminated soil Hazardous waste, other Municipal waste  Recyclable waste  <i>Procurement of chemicals (tn):</i> Lubricants Creosote Weedkilling agents  Costs for decontamination of polluted soil (EUR million)

(1) RAILI is a calculation system developed by the Technical Research Centre of Finland (VTT) for calculating emissions from rail traffic. Further information from: <http://lipasto.vtt.fi> [accessed 23rd August 2005].

(2) (3) Transpoint and Combitrans are VR's road transportation subsidiaries.

#### 4.4 Environmental Reporting

In addition to the environmental reporting required by the authorities or the voluntary agreements which the case companies have joined (KRESS, PYR, ETNO), only Kesko and VR utilize environmental business accounting in their external reporting.

The **Elisa Corporation** had for the first time a separate chapter for environmental issues in its 2004 annual report. It was a quarter page long. Because Elisa's environmental business accounting values do not yet have comparability, they are reported only internally. Elisa's customers can receive a short environmental management summary by request. (Tamminen 2005) In addition, some environmental information about Elisa has also been published in ETNO's annual reports since 1999. However, lately the environmental business accounting information has not been considered accurate because of the various organizational changes. (Uotila 2005) According to the current person in charge for environmental management, the corporation is not considering a separate environmental report in the near future but it could publish more information on the Internet. (Tamminen



2005) Already in April 2005, Elisa updated its website to include a short summary of environmental issues.

Instead, because of not being a listed company, **Fujitsu Services Oy** does not publish either annual reports or environmental reports. Even the company's website does not include environmental information but the customers can receive a short environmental management summary by request. The EBA results are reported only internally. Fujitsu Services' parent company in the UK has not required any environmental reports from Finland. The individuals responsible for environmental issues in Finland do not even know about the environmental activities of the global Fujitsu Group. (Aaltonen and Tepponen 2005) In spite of this, the global group has been successful in sustainability reporting competitions. According to the group's 2004 sustainability report, it has earned a position as the "leading sustainability company" in the Dow Jones Sustainability Indexes and the group aims at establishing ISO 14001 certified environmental management systems throughout the group. (Fujitsu Group 2004)

The **Kesko Group** has published environmental reports since 1998 and corporate sustainability reports since 2001 (Kesko 2005b). Kesko's externally reported environmental metrics and indicators were presented in the previous chapter, and it also reports on social indicators. Kesko uses the indicators proposed by the Global Reporting Initiative (GRI) for sustainable development, and the reports are verified by an external auditor (Kesko 2004). The reporting has been exemplary: Kesko's 2003 corporate responsibility report was ranked number fourteen in the SustainAbility's global comparison of the CSR reporting. Kesko's report was the best in the trading sector. (SustainAbility 2005) Also in the corresponding Finnish competition, Kesko reached the first place of all the companies (Finland's environmental administration 2005e).

Also the **VR Group** has a long history in environmental reporting. Its first environmental report included information from years 1996 and 1997, and since then the group has kept the two years cycle in environmental reporting. The metrics in the 2003 environmental report were presented in the previous chapter. In addition, VR publishes a summary of environmental information in its annual report. VR combines the reporting principles of the GRI and the guidelines for environmental

reporting published by the Finnish Ministry of the Environment. In addition to the EBA metrics, the reports also include diagrams illustrating the development of the values. VR's environmental reports are not verified externally. (VR 2004)

## 5 Analysis of the Research Results

In 1996, when Tuula Pohjola's pilot EBA studies were finished, all the case companies started to develop their environmental management as well as environmental business accounting practices from approximately the same level. Before the pilot projects none of the companies had more than a definition for an environmental management system ready, and afterwards they had EBA systems which were defined according to their own processes and included also computer-aided accounting applications. This chapter summarizes the significant developments between 1996 and this day as to environmental management and EBA practices of the four case companies, and the motives behind these developments. In addition, in the end of this chapter, the present state of the case companies' EBA practices is evaluated by comparing them to the information available from literature and EBA guidelines.

The **Elisa Corporation** can be assessed to be a slow gradualist with several declines in its progress when considering its developments in environmental management or EBA. Elisa's enthusiasm for EBA was big after the pilot projects: the company widened two of its three pilot EBA models and contributed greatly to the development of environmental indicators of the European Telecommunications Network Operators' Association. However, basically all of Elisa's EBA work was done by a single individual, and the progress was largely dependent on his own interests. Therefore the company suffered from a significant extinction of EBA know-how when this individual was retired. Also the lessons learnt from the pilot EBA projects were forgotten shortly after it.

Now in 2005, Elisa has an environmental policy and environmental objectives. Instead, a certified environmental management system is considered as a too heavy tool for Elisa's needs. New EBA metrics were defined in 2004 but missing accuracy is still problematic. Elisa's biggest challenge as to all environmental management activities seems to be the lacking management support. Environmental issues are not considered as significant in Elisa's business, and its customers or owners do not require more environmental management activities. Therefore the group of over 5,000 employees is having only one part-time environmental manager. The company

also has an environmental working group, but its work consists mainly of defining principles for environmental management and not that much of practical work. Currently, complying with environmental legislation seems to be enough for Elisa and no anticipation of future requirements is done. Finally, Elisa will be unable to publish reliable environmental reports as long as its environmental accounting is unreliable. Elisa's environmental reporting has been limited to short mentions about environmental policy and objectives so far.

In turn, the environmental management and accounting practices of **Fujitsu Services Oy** are insufficient because the company does not consider its operations to cause significant environmental impacts. Despite the initial investments in EBA, along the continuous changes in the organizational structure the company became a drop-out. Corporate co-ordination on environmental management issues is missing and each business unit can adopt their own practices. Now only the logistics and configuration centre of Fujitsu Services has a certified environmental management system because the certification was considered to be important for customers.

Fujitsu Services' EBA practices remain rather elementary. Only the basic real estate management data, that is water and energy consumption, are calculated company-wide. In addition, the logistics and configuration centre estimates a couple of simple environmental metrics for monitoring its annual environmental objectives. The environmental management scope of Fujitsu Services remains very short-sighted and no future anticipation is done. Environmental reporting nor annual reporting is done because Fujitsu Services is not a listed company and thus reporting is voluntary. It is actually quite surprising that Fujitsu Services has never received any environmental management directions from the global Fujitsu Group which, according to its own sustainability report, is very ambitious in sustainability management issues.

Fortunately there also exist contrary examples to the companies discussed above. Namely, the **Kesko Group** has been a forerunner in environmental management, EBA, as well as environmental reporting in Finland, and it has also reached a lot of international publicity for its activities. Corporate social responsibility issues are included in Kesko's corporate strategy, and a comparably big amount of resources is allocated for environmental management. Kesko believes that better environmental management makes operations more efficient and thereby reduces costs. In addition,

especially Kesko's business customers appreciate well-run and certified environmental management. Kesko is also anticipating future environmental legislation and other stakeholder requirements, participating in several co-operation bodies and benchmarking existing guidelines.

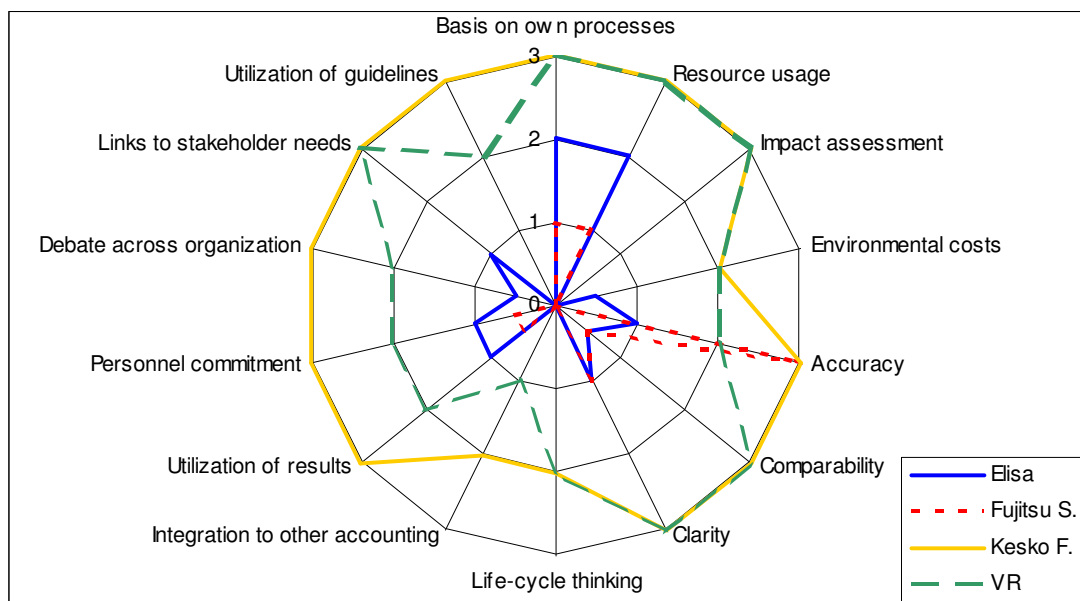
Kesko Food's logistics accounting model, which has been derived from the initial pilot model, is exemplary now. However, although Kesko Food's physical EBA is diversified, environmental costs are rarely separated from other costs. The possible monetary savings from environmental actions are still known, namely, the initial boost for Kesko Food's EBA enthusiasm originates from the waste management savings in the 1990's. Other EBA challenges, which Kesko Food has faced, have been caused by changes in information systems, expansion abroad and limitations set by its external stakeholders. During 2005, a new group-wide EBA system will be designed and implemented at Kesko. The aim is to unify the CSR reporting practices of Kesko's subsidiaries, but hopefully the system will also bring solutions to some of the above mentioned challenges.

Finally, the **VR Group** abandoned both its two pilot EBA models immediately when it realized how much work they would have required. However, the company has been obligated to manage its environmental impacts by the legislation, and some of its large business customers have required VR to provide environmental accounting data that can be further used in their own environmental reports. The environmentally friendly image is also important in lobbying railway services, and therefore all of VR's units act according to ISO 14001 certification requirements.

VR conducts diversified environmental load and emissions accounting. However, no environmental cost accounting is done. Environmental reports are published in every two years, and some reporting guidelines are benchmarked even though VR does not strictly stick to any specific format. Some future anticipation is done by preparations to the possible inclusion of transportation into the EU emissions trading scheme. Thus, VR can be assessed to be a kind of gradualist pressured by its external stakeholders, especially by Finnish authorities and VR's large customers, as regards to developments in environmental management and EBA practices.

On the basis of the research results, it seems to be the case that the comprehensiveness of and attitudes to corporate environmental management

correlate directly to the comprehensiveness of a company's EBA practices. In Figure 4, the present state of the EBA practices of the four case companies is evaluated based on the current best practices (see Chapters 2.5 and 3.3). The polygons in the figure indicate the comprehensiveness of each company's practices. According to the figure, Kesko Food is exemplary but also it can still improve. However, it should be born in mind that the field of EBA is still young and developing, and thus the outermost circle (value 3) in the figure is not the absolute best level of EBA. In the future, but in the future even better practices can be expected to be available.



**Figure 4: Evaluated state of the case companies' EBA practices in 2005**

## 6 Conclusions

This research was a follow-up study for Tuula Pohjola's (1999) doctoral dissertation. The objective was to record the developments in the environmental management and environmental business accounting of the same case companies that participated in Pohjola's research between the years 1995 and 1996. The scientific value of this study is comparably high because research on environmental accounting started only in the beginning of the 1990's, and no other longitudinal studies with this long follow-up scope are known so far. In addition, the gathered awareness of today's situation provides a basis for further research on the field, and for improving environmental management practices in organizations.

The research results show that the importance of Pohjola's pilot EBA systems has not laid that much on their practical utilization, but more on creating the basic know-how for considering environmental issues in the case companies. Three of the four companies had lost detailed information about their pilot systems, but later designed their own environmental metrics and indicators. However, there exists a significant gap between the existing body of knowledge (e.g. environmental accounting and reporting guidelines) and the current practices of the case companies. For example, even the two case companies, which already were comparably good in physical environmental accounting, consider monetary EBA as too challenging to be practiced. Only one of the companies tries to anticipate the environmental management requirements of the future extensively, while another company does not yet even know the environmental impacts of its operations. The challenges for successful EBA have been derived from the changes of responsible personnel, information systems and organizational structures, missing management support and environmental management resources, and limitations set by corporate external stakeholders. In addition, environmental management and EBA are now becoming even more challenging due to the globalization and widening business networks.

In view of the case companies' international orientation, their comparably similar size and the coming environmental legislation of the EU, it is surprising how dissimilar attitudes they have to environmental management and EBA. Even though the research results cannot be generalized with this small sample of companies, it

seems to be the case that the progress of environmental management or EBA practices depends largely on the awareness and motivation of the responsible individuals. The research results show that a well-motivated company can develop an exemplary EBA system by studying its processes, learning from suitable guidelines and the experiences of other organizations, and investing enough resources and commitment in the development and implementation of EBA. However, most of the companies (three of the four companies in this research) do not voluntarily put effort in environmental management issues, but only react to the pressure arising from legislation, resource prices or stakeholder requirements.

Consequently, the voluntary nature seems to be the biggest challenge of EBA. Sometimes even promising environmental accounting initiatives are abandoned as soon as the first setbacks are faced, and the lessons learnt do not accumulate in companies. Therefore, more obligations would be needed for wide distribution of EBA. Preferably, these would be related to the already existing accounting legislation and the systematic accounting methods. The first real life example of these regulations is the EU emissions trading scheme, the first phase of which came into force in the beginning of 2005, and which is heavily pushing companies to account environmental costs in form of emission rights' prices. However, changes in environmental legislation do not happen suddenly, and therefore voluntary guidance on the benefits of environmental management and EBA remain essential.



## Research Assessment and Further Research

### *6.1 Reliability of the Data Collection*

The reliability of the data collection can be considered as good. There was a lot of secondary information available, and the most suitable of it was chosen and referred in the literature review. The secondary information sources were reliable because they were published by a reliable body or individual. Also the primary data can be considered as reliable because the interviewed individuals know the environmental accounting practices of the case companies the best. The subjective interpretations of the interviewees and the interviewer were eliminated as well as possible by checking the critical facts with several questions and from several persons. Also Tuula Pohjola's supervision helped with gaining better objectivity because she was familiar with the case companies' practices until the year 1999 and also with some of the later developments. Finally, in the end of this research project, the case study part of this thesis (Chapter 4) was reviewed by the interviewees for updating possible last-moment changes into it, and eliminating the author's possible false interpretations.

The problems encountered during the data collection were related to the too detailed interview questionnaire, the internal communications of the case companies and the scare of the competitors' possible benefits from the research information. Firstly, the questionnaire was very detailed because it was based on the best practices found from the literature. The questionnaire was sent to the interviewees in advance and thus they read it first alone. Therefore many of them considered the questions to be too complicated when compared to the simple practices in use. However, the purpose of the questionnaire was to function rather as a manuscript for the interviews and the questions that were not relevant to a company were to be passed. This could have been explained better for the interviewees or only more general discussion topics could have been sent to them beforehand. In the interview situation, the detailed questionnaire helped anyway with gaining better comparable data.

The second problem of the companies' internal communication was encountered when some information about the development of the environmental management practices between 1996 and 2005 had been lost along the changed responsible individuals. This was solved by utilizing the contacts of Tuula Pohjola, and

contacting also the former responsible persons and interviewing them. In addition, there were some misunderstandings about permissions to give interviews and therefore one interview was almost cancelled at the last moment.

Finally, the third problem of the scare of giving too much information led to the refusal of one company to participate in the research. In addition, in Kesko's case, only some very general information about their becoming system for environmental accounting and reporting was given so that outsiders could not benefit from these plans. However, the information gathered was still comprehensive enough for the needs of this research.

## **6.2 Reliability of the Analysis Methods and the Results**

In a qualitative research the reliability of the chosen analysis methods depends on how easily another individual can follow the argumentation chain of a researcher. The same conclusions should be possible to be derived from the same research data if the same unambiguously explained argumentation principles were used. (Uusitalo 1991)

The simplification of observations was done classifying the primary data carefully in Excel tables so there should not be mistakes with this phase. In addition, all the conclusions were presented with argumentations and also discussed with Tuula Pohjola so that they can be considered to be right at least as to the data available. Also the breakdown of fourteen different elements of EBA and the evaluation of the case companies as regards to these elements (see Figure 4 in Chapter 5) were discussed together with Pohjola. Thus, they can be considered at least as well indicative although all the subjectivity cannot be eliminated.

## **6.3 Significance of the Research**

The results of this follow-up research were the first time presented in public in the EMAN-EU<sup>13</sup> conference in Rotterdam in May 2005. There it was discussed that no other longitudinal environmental accounting research projects with this long time scope are known, and therefore the scientific significance of this research is

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<sup>13</sup> <http://www.eman-eu.net/> [accessed 23rd August 2005]

comparably high. Usually longitudinal researches in this field have been conducted as doctoral dissertations and thus had a scope of only about five years. In addition, this research showed that the reasons for abandoning EBA, which may sound obsolete for researchers, are still real in companies.

Finally, although the scope of the research was limited to four companies instead of the initial six, the amount of them was still enough to meet the objectives of this research. It should be noticed, that with this small case sample the results are valid only for the four case companies and they should not be generalized. Anyway, they provide a good basis for further considerations.

#### ***6.4 Suggestions for Further Research***

This research showed the existing gap between the existing EBA knowledge among the researchers and the practices of the companies. Therefore, in further research the applicability of EBA methods and tools should be more critically evaluated. Practical benefits should be shown to companies and their EBA implementation process should be supported. Instead of new tools and methods, companies would rather need a comprehensive and easily applicable guideline on which tools they should implement and why, and whom they should involve in their EBA activities. The adequate level of EBA investments in different companies should also be studied – for a specific company it may be enough to concentrate only on a couple of EBA elements while another company may require more comprehensive EBA. Finally, the new challenges arising from widening business networks, globalization and tightening legislation should be anticipated.

Long-term environmental thinking and environmental cost accounting are specific issues to be introduced or improved in companies. Especially small and medium-sized enterprises should be supported in EBA because they do not often have enough of their own resources and know-how for environmental management. Companies should understand better that all the benefits of environmental management and EBA are not seen immediately and therefore they lose good know-how if they do not let their lessons learned to accumulate.

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## Appendix A: Environmental Business Accounting Models Developed in Pohjola's Doctoral Dissertation

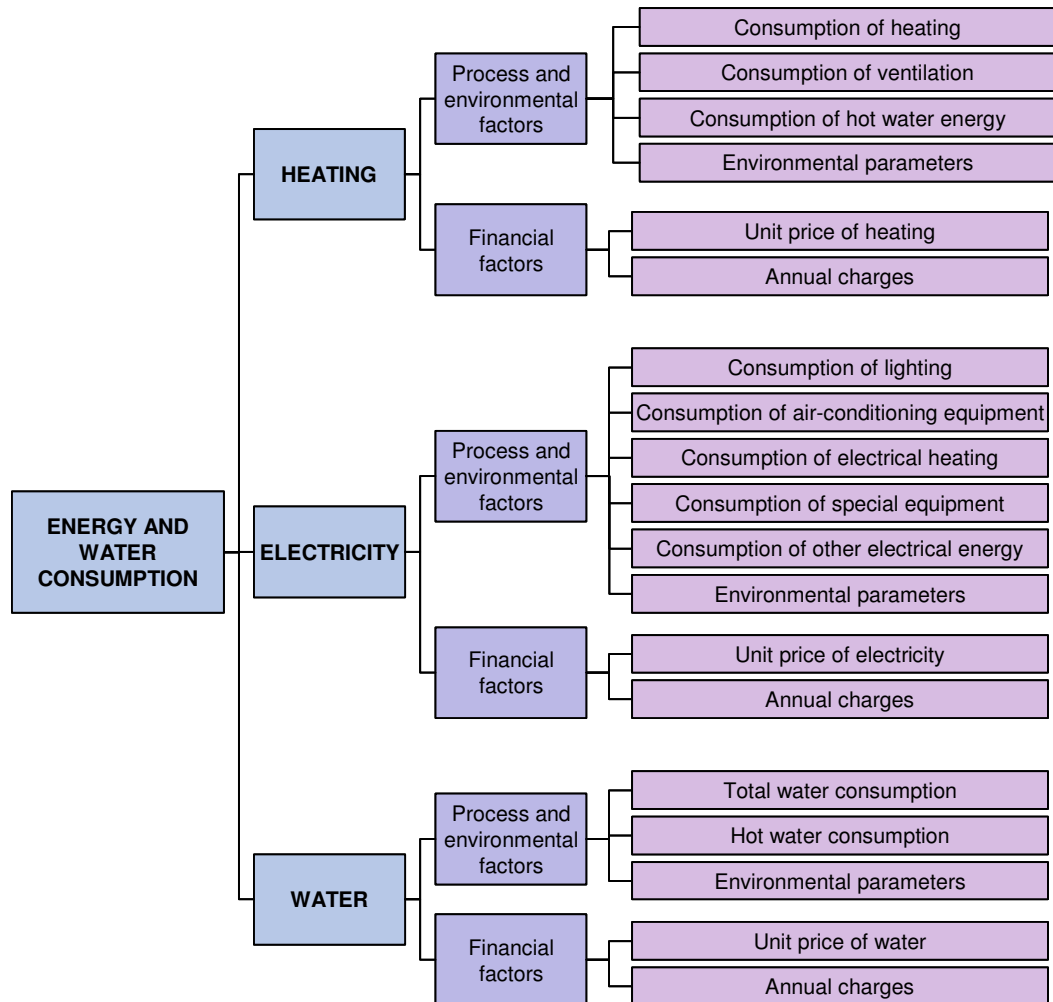


Figure 5: Basic structure of Pohjola's energy model (Pohjola 1999:136)

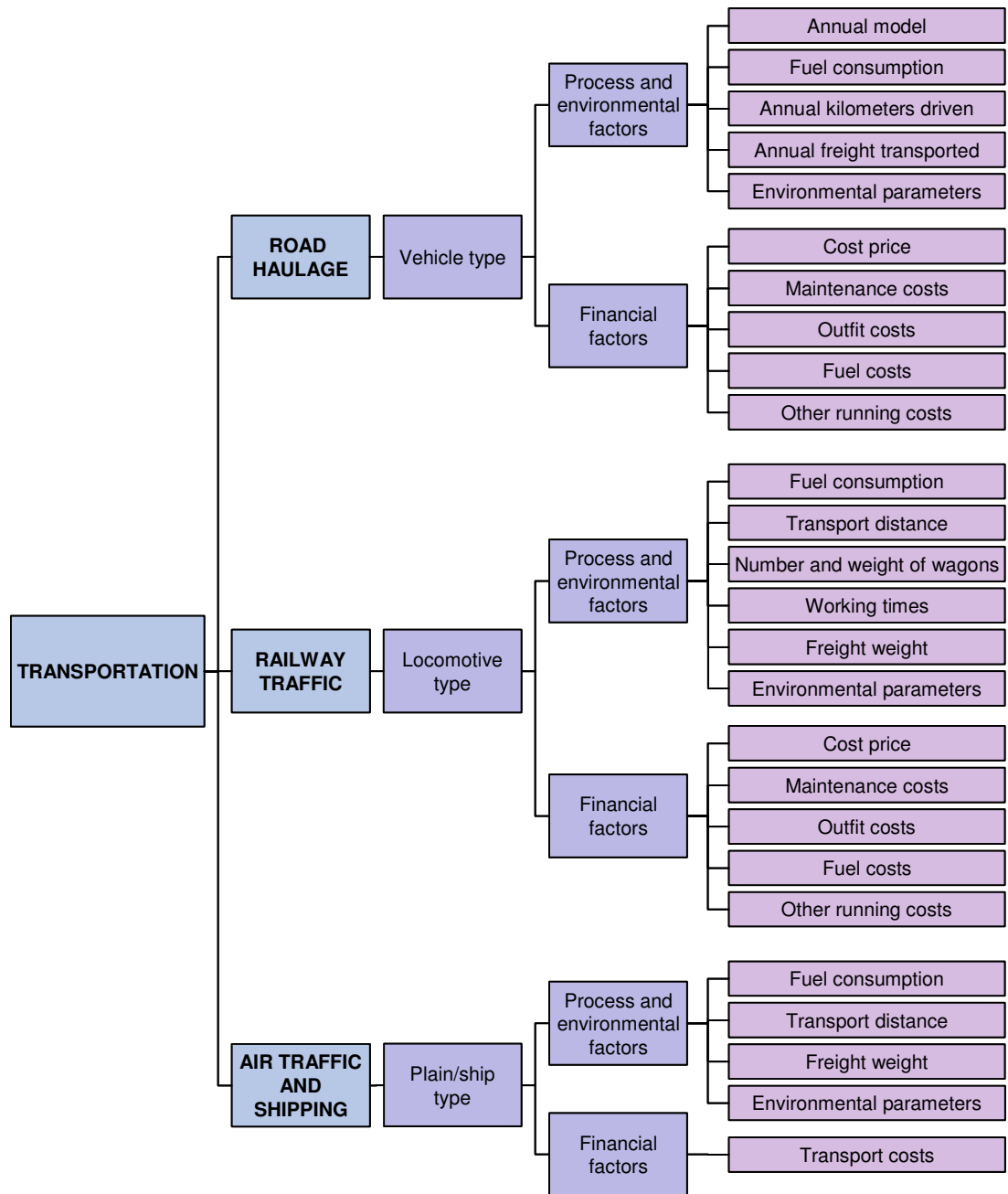


Figure 6: Basic structure of Pohjola's transportation model (Pohjola 1999:143)

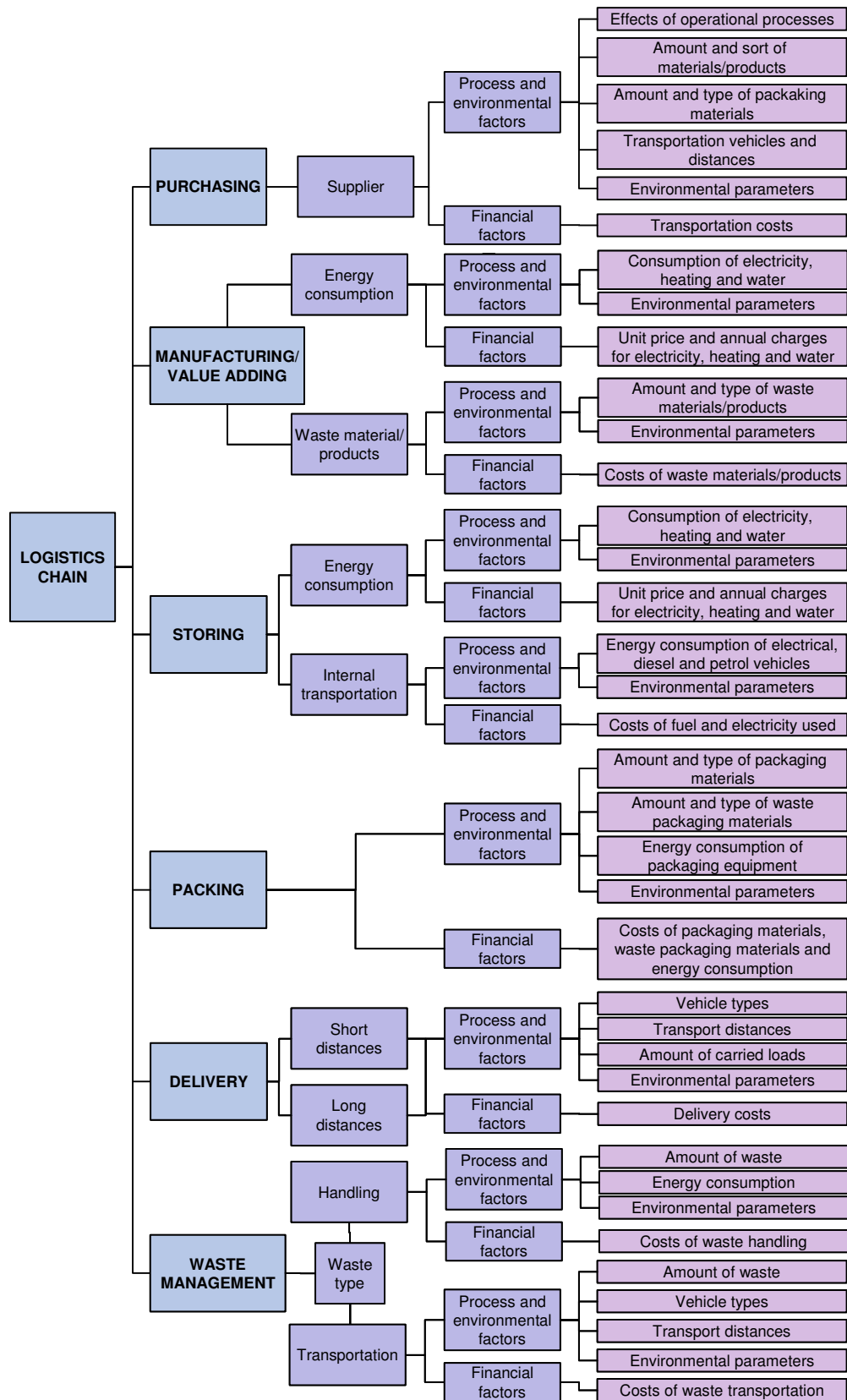


Figure 7: Basic structure of Pohjola’s logistics chain model (Pohjola 1999:159)



## Appendix B: Questionnaire for Interviews

### I BACKGROUND INFORMATION

1. Background information about the company and its business processes in 2005 (comparable data from 1996 is found from Tuula Pohjola's doctoral dissertation):
  - a. Name of the company
  - b. Business field
  - c. Number of personnel
  - d. Turnover
  - e. Profit
  - f. Business processes
2. What have been the most significant changes in the business environment between 1996 and 2005?

### II ENVIRONMENTAL MANAGEMENT

1. Which environmental management tools are used in the company:
  - a. Environmental strategy
  - b. Environmental policy
  - c. Environmental program
  - d. Environmental Management System (EMS)
  - e. Environmental auditing
  - f. Environmental business accounting (EBA)
  - g. Environmental risk management
  - h. Life-Cycle Assessment (LCA)
  - i. Environmental Impact Assessment (EIA)
  - j. Design for Environment (DfE) / Eco-design
  - k. Material Flow Analysis (MFA)
  - l. Energy saving activities
  - m. Eco-efficiency calculations
  - n. Environmental reporting / corporate social responsibility reporting
  - o. Other
2. Organization of environmental management
  - a. Does the company have a separate environmental management function?

- b. Who makes the plans concerning environmental management?
  - c. Who makes the decisions concerning environmental management?
  - d. Who makes the practical work concerning environmental management?
  - e. How the corporate management participates in environmental management?
3. Environmental management system (EMS)
- a. Implementation of EMS
    - i. When was the EMS implemented?
    - ii. Why was the EMS implemented?
  - b. Is the EMS certified or will it be (e.g. ISO 14001, EMAS)? When?
  - c. Contents of EMS
    - i. What did the EMS contain in the beginning?
    - ii. When and how has it been updated?
    - iii. How have the special characteristics of the company been taken into account?
    - iv. How have the environmental management and EMS been integrated into other management and corporate strategy?
    - v. What is the value-added from the EMS?
4. Does the company have any plans for improving its environmental management / EMS? What?

### III ENVIRONMENTAL BUSINESS ACCOUNTING (EBA)

1. EBA system
- a. Implementation of EBA
    - i. When have the present system / practices been implemented?
    - ii. What has happened to the pilot system from 1996?
    - iii. When and how has EBA been updated?
  - b. How is EBA information utilized?
  - c. Who is responsible for EBA?
  - d. What is the basis for EBA?
  - e. Business processes included in EBA
    - i. Which business processes are included in EBA?
    - ii. How have the processes been described?
    - iii. How have the (possible) foreign activities been taken into account?

- iv. How have the external parts of the value chain been taken into account?
  - v. How are the data collected?
  - f. Environmental metrics and indicators
    - i. Environmental loads and impacts (physical data)
      - 1. Which environmental loads and impacts are taken into account?
      - 2. How are the environmental loads and impacts calculated?
      - 3. Where are the emission factors and other needed constants taken from?
      - 4. How are the changes in environmental loads and impacts taken into account?
    - ii. Environmental costs (monetary data)
      - 1. How are the internal / external environmental costs taken into account?
      - 2. How are the environmental costs allocated?
      - 3. How are the changes in environmental costs taken into account?
      - 4. How are the (possible) environmental revenues taken into account?
      - 5. How are the (possible) environmental investments taken into account?
    - iii. Does the company have other environmental metrics and indicators?
    - iv. How are the qualitative / quantitative data taken into account?
    - v. How are the data about the past / present / future taken into account?
    - vi. How are the direct / indirect impacts taken into account?
    - vii. How are the metrics and indicators integrated with each other?
  - g. Technical implementation
    - i. How has the EBA been implemented technically?
    - ii. How is the data input?
    - iii. How is the data output?
    - iv. Does there exist a simulation module?
2. Does the company have any needs or plans for improving its EBA? What?

#### IV ENVIRONMENTAL REPORTING

1. What kind of environmental communication does the company have?
2. Does the company have a separate environmental / corporate social responsibility report?
  - a. Implementation of reporting
    - i. When was separate reporting started?
    - ii. How were environmental issues reported before it?
    - iii. Why was separate reporting started?
  - b. Contents of environmental reports
    - i. What did the environmental reports contain in the beginning?
    - ii. When and how has the environmental reporting been updated?
    - iii. What has been the basis for choosing the contents of environmental reports?
    - iv. Have any environmental reporting guidelines been utilized (e.g. GRI)?
    - v. How is EBA utilized in reporting? Which environmental metrics and indicators are reported?
    - vi. When and how are the environmental reports updated?
  - c. Who is responsible for environmental reporting?
  - d. In which forms are the environmental reports available (e.g. printed, pdf, online)?
  - e. Do the different stakeholder groups receive different environmental reports? Why?
  - f. How is the (possible) feedback about environmental reporting taken into account?
3. Does the company have any needs or plans for improving its environmental reporting? What?