

Perspectives in the Development and Application of Environmental Management Accounting

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Contents

1	INTRODUCTION	5
2	INTRODUCTION TO EMA	7
3	DEVELOPMENTS IN EMA RESEARCH	8
3.1	METHOD	8
3.2	ENVIRONMENTAL COSTS	9
3.2.1	<i>Definition of environmental costs</i>	10
3.2.2	<i>Recording environmental costs</i>	11
3.3	CASES AND PRACTICAL PROBLEMS	12
3.4	DEVELOPMENT OF EMA SYSTEMS IN PRACTICE	13
3.5	SUSTAINABILITY MANAGEMENT ACCOUNTING	14
3.6	STANDARDS AND INITIATIVES BY THE AUTHORITIES	16
3.7	SUMMARY	16
4	BEST PRACTICE EXPERIENCE	18
4.1	METHODS	18
4.2	ERICSSON - SWEDEN	19
4.2.1	<i>Use of EMA</i>	19
4.2.2	<i>Implementation of EMA</i>	20
4.2.3	<i>Results</i>	20
4.3	EUROBODALLA SHIRE COUNCIL - AUSTRALIA	20
4.3.1	<i>Use of EMA</i>	20
4.3.2	<i>Implementation of EMA</i>	21
4.3.3	<i>Results</i>	22
4.4	BAA, HEATHROW - UK	22
4.4.1	<i>Use of EMA</i>	22
4.4.2	<i>Implementation of EMA</i>	23
4.4.3	<i>Results</i>	23
4.5	WESSEX WATER - UK	23
4.5.1	<i>Use of EMA</i>	24
4.5.2	<i>Implementation of EMA</i>	24
4.5.3	<i>Results</i>	25
4.6	AWG PLC. - UK	25
4.6.1	<i>Use of EMA</i>	25
4.6.2	<i>Implementation of EMA</i>	26
4.6.3	<i>Results</i>	26
4.7	SCHOTT - GERMANY	26
4.7.1	<i>Use of EMA</i>	27
4.7.2	<i>Implementation of EMA</i>	27
4.7.3	<i>Results</i>	28
4.8	BASF - GERMANY	28
4.8.1	<i>Use of EMA</i>	28
4.8.2	<i>Implementation of EMA</i>	29
4.8.3	<i>Results</i>	29
4.9	SUMMARY	29
4.9.1	<i>Application of EMA</i>	30
4.9.2	<i>Implementation of EMA</i>	30
4.9.3	<i>Results</i>	31
4.9.4	<i>Best practice at enterprises regarding research</i>	31

5	THE RELATIONSHIP BETWEEN EMA AND THE ANNUAL REPORT	32
5.1	INTRODUCTION TO THE ANNUAL REPORT	32
5.2	THE PURPOSE OF THE ANNUAL REPORT	32
5.3	THE PARTS OF THE ANNUAL REPORT	34
5.4	REQUIREMENTS FOR ENVIRONMENTAL INFORMATION IN THE ANNUAL REPORT	35
5.4.1	<i>Reporting in accordance with section 99(2)</i>	37
5.4.2	<i>Reporting in accordance with section 99(1), no. 4</i>	39
5.4.3	<i>Other aspects regarding users of accounts</i>	41
5.5	RELATIONSHIP BETWEEN EMA AND THE ANNUAL REPORT	42
5.6	EMA AND THE ANNUAL REPORT'S CONTROL FUNCTION	42
5.7	EMA AND THE ANNUAL REPORT'S FORECAST FUNCTION	43
5.7.1	<i>Investments and EMA</i>	43
5.7.2	<i>EMA and risks of impacting the financial position</i>	45
5.7.3	<i>Summary</i>	46
6	BIBLIOGRAPHY	47

1 Introduction

This report gathers together a number of perspectives on the development and application of Environmental Management Accounting (EMA).

The objective of the report is to supplement the EMA Guide on the Danish EPA website (www.mst.dk), which provides an introduction to working with EMA. Therefore, readers without prior knowledge of EMA are recommended to read the EMA Guide before reading this report.

The report is also a supplement to Danish experience gathered from the pilot project supported by the Danish EPA Cleaner Products Programme in nine Danish enterprises (Melchiorsen & Mogensen, 2004).

Three overall perspectives have been chosen, and these comprise the three parts of the report: 1) Developments in EMA research, 2) Best-practice experience and 3) The relationship between EMA and the environment in the annual report.

All three parts of the report aim at explaining what EMA can be used for, and how EMA can be built up and exploited in very different organisations and situations. The report also provides an insight into the barriers and problems encountered in applying EMA in given situations.

The three parts of the report are described below:

1) Developments in EMA research

This part of the report describes the development trends within EMA research internationally. The chapter provides an overview of the main research themes within both methodology and practical application of EMA. The chapter can be perceived as a status report of the progress of international research to date within EMA, and the developments on the way.

2) Best Practice for EMA in an international perspective

This part of the report includes a number of examples of international experience with EMA, based on interviews with foreign enterprises who have been working with EMA for some years.

The chapter can be used as inspiration for how EMA can be applied in practice as it includes an overview of many different types of organisation which use EMA in very different ways.

The chapter also includes a description of the barriers that can be expected in implementing EMA, as well as some examples of the ultimate results of EMA work.

3) The relationship between EMA and the environment in the annual report

This part of the report provides an insight into the Danish Financial Statements Act, and it analyses how EMA can be applied to meet the requirements of the Financial Statements Act to make visible the interplay between environmental conditions and the results, development and financial position of the enterprise.

The chapter shows how EMA data can be included in the annual report of enterprises already working with EMA. It also shows how an EMA process can be initiated for enterprises that want to illustrate the value of their environment work in their annual report.

The three parts are independent references for readers interested in EMA, whether it be a specialist insight into developments in research, or simply inspiration from others' experience from their own work with EMA. The reader may also need more insight into the Financial Statements Act and its requirements for environmental information, or descriptions of how EMA can supplement the information in the annual report.

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2 Introduction to EMA

EMA has been defined by the UN as (2001, p. 8) thus: *'EMA represents a combined approach which provides for the transition of data from financial accounting and cost accounting to increase material efficiency, reduce environmental impact and risk and reduce costs of environmental protection'*. Another definition is in Bennett et al (2002, p. 1): *"the generation, analysis and use of financial and non-financial information in order to optimise corporate environmental and economic performance and to achieve sustainable business"*. Together, these two definitions highlight some key words as to what EMA is and what it is not:

- EMA provides a more realistic picture of the costs structure by allocating environmental costs to the activities and products which give rise to such costs.
- EMA focuses on the financial costs related to waste and consumption of water and energy.
- EMA focuses on decisions. The whole point of EMA is to supply decision-relevant information for management so that they can make better decisions and thereby improve the financial and environmental performance of the enterprise.
- EMA deals with management accounting. Management accounting is about recording, analysing and reporting costs, revenues, investments and debt. Therefore EMA concentrates on how these are calculated.
- EMA involves focus on financial data. The key element of EMA is 'translation' of 'environmental language' to 'financial language', and vice-versa.
- EMA is a means to an end, not an end in itself. Therefore, EMA is a tool, which is primarily for use by management to make more informed decisions.
- EMA is not primarily about external reporting in green accounts etc. Therefore, there is no requirement to standardise terminology, ensure comparability between enterprises over time etc. However, this does not mean that EMA cannot supply information which can be used in external reporting.

3 Developments in EMA research

This part of the report is a description of the development trends within EMA research.

The chapter is based on the knowledge gathered in the international research network EMAN (Environmental Management Accounting Network). The first section on methodology will briefly describe why this approach was chosen.

The rest of the chapter is divided into the research areas identified in the analysis. They include both methodology research and more applied research.

Firstly, much research has focused on the environmental costs and the methodological apparatus associated with EMA. In particular, research has focused on defining environmental costs as well as methods to calculate them. This is described in section 3.2 Environmental Costs.

Secondly, much research has focused on specific applications of EMA, exemplified in a number of case studies which are described in section 3.3. Focus on the use of EMA in practice is continued in the description of research into the development of EMA systems themselves in section 3.4.

Finally, in section 3.5 Sustainability Management Accounting, the chapter describes the further development of EMA towards focus on sustainability, and section 3.6, Standards and Initiatives by the Authorities, describes initiatives to promote EMA.

3.1 Method

The method used builds on a review of the literature presented at the four most recent EMAN conferences at Aarhus School of Business, the University of Gloucestershire in England, Erasmus University in Rotterdam, Holland and the Wuppertal Institute in Wuppertal, Austria. This literature has been published in four books by SIM and Kluwer Academic Publications. The review of the literature has aimed at revealing development trends and the current status of research within EMA.

The following publications were reviewed:

- 1) Pall Rikhardsson, Martin Bennett, Jan Jaap Bouma, Stefan Schaltegger (2005). *Implementing Environmental Management Accounting: Status and Challenges*. Dordrecht (NL): Kluwer Academic Publications. ISBN: To be announced.
- 2) Martin Bennett, Pall Rikhardsson, Stefan Schaltegger (2003). *Environmental Management Accounting: Purpose and Progress*.

Dordrecht (NL): Kluwer Academic Publications. ISBN: 1-4020-1365-5.

- 3) Martin Bennett, Jan Jaap Bouma, Teun Wolters (ed.) 2002. Environmental Management Accounting: Informational and Institutional Developments. Dordrecht (NL): Kluwer Academic Publications. ISBN: 1-4020-0553-9.
- 4) Jan Jaap Bouma, Teun Wolters (ed.) (1999). Developing Eco-Management Accounting: An International Perspective. Zoetermeer (NL): EIM. ISBN 90-371-0738-9.

The text and bibliography in chapter 6 refer to individual contributions to these publications.

The reasons for choosing these publications to identify the research trends within EMA are:

1. EMAN has a special status within research into EMA. EMAN is an international network of researchers, consultants and business people interested in EMA as a tool for environmental management. The objectives of EMAN are to bring together people interested in EMA and to organise conferences at which new ideas and developments within EMA can be disseminated and debated. EMAN was established as part of a research project funded by the EU in 1997. Since its establishment, membership of EMAN has grown to the current about 250 in Europe. Similar EMAN networks have been established in Asia, the US and South America. Since 1997, EMAN Europe has held conferences on EMA and since 1999 it has issued publications with selected articles from the conferences.
2. The individual contributions to EMAN publications have been written on specific subjects by leading researchers and business people with extensive experience in management accounting and/or environmental management.
3. The individual contributions to EMAN publications have been through a stringent selection and review process by an editing panel in order to ensure their quality.

Together, these mean that EMAN publications provide the necessary overview of the most important research within EMA in a relatively brief format.

3.2 Environmental costs

An important issue with EMA is environmental costs - how these can be defined, calculated and allocated, and how they behave in relation to other cost categories. Many contributions have therefore focused on this issue.

There are usually two primary problems with environmental costs. The first is how to define them. Are they only the costs incurred by the enterprise to limit pollution, i.e. remediation technology, waste disposal etc.? Which costs arising from environmental investments should be included? What about the costs of operating environmental management systems etc.? Here, it cannot be said

that we are approaching an unequivocal definition of what environmental costs are. Generally, the definitions of environmental costs are determined by the decisions to be made on the basis of the information (Rikhardsson et al 2004). As EMA is an internal decision-making tool, this is logical, but it will not be possible to use this in external reporting of these costs, where uniformity and standardisation are required.

The second problem is about how to record and use these costs. Should data capture, collation and reporting be integrated in one information system? What about recording fixed costs? How should these be allocated to cost centres?

3.2.1 Definition of environmental costs

Even though we neither can (nor should) elaborate an unequivocal definition of environmental costs, on the basis of the literature we can set up some categories in which environmental costs can be classified (Willequert et al 1999, Bouma et al 1999, Jasch 1999, Giraldi 1999, Kim 2002, Loew 2002; Burritt 2004; Wendisch & Heupel 2004):

- Costs recorded in the financial system:
 - Costs which are clearly incurred in connection with environmental protection, such as operating and capital costs of remediation equipment, waste disposal etc. These costs are recorded in the enterprise's financial system and can be calculated without further ado.
 - Expenditure which can be related to environmental work, but which must be separated from other costs before it can be identified, i.e. it is in some way hidden in the financial system.
- Costs not recorded in the financial system:
 - Intangible costs such as lost sales because of a bad image, reductions in other costs because of effective environmental work (e.g. costs of permits or packaging) etc.
 - External costs such as losses in social welfare because of environmental impacts by the enterprise.

For costs which are recorded in the financial system, focus is on cost categories which can ideally be identified by both the environment department and the finance department (Jasch 2004). Cooperation between these two departments is important with regard to EMA, as EMA cannot be carried out by the departments independently. The environment department has the environmental perspective and understanding of the environmental impacts of the enterprise, while the finance department has the financial perspective and understanding of the financial systems and procedures. The cost categories suggested as possibilities to unite these two perspectives are (Jasch 1999; 2004; Kokubu & Nashioka 2004):

- 1) Treatment and disposal of waste
- 2) The material value of waste disposed of
- 3) Depreciation and financial costs of environment-related investments
- 4) Salaries and other staff costs
- 5) Education and training
- 6) Environmental taxes
- 7) Advertising and PR

- 8) Purchases of external services
- 9) Other costs.

3.2.2 Recording environmental costs

One development trend is that focus is shifting from the definition issue to the recording problem and financial systems. This is because the overall definitions of various types of environmental costs have now been established. With regard to calculation and recording in the individual enterprise, on the other hand, it can be difficult to establish generic definitions and cost categories. This is because different enterprises can have different types of environmental costs and maintenance costs etc. For environmental accounts available to the public, it is clearly important that there are unequivocal definitions, but for management accounting it is important that the information collected is relevant to decision-making and the management of the enterprise.

Therefore, the literature increasingly focuses on:

1. Developing recording procedures and techniques for environmental costs. E.g. methods for recording and calculating costs of waste (Giraldi 1999), general guidelines for calculating environmental costs (Kokubu & Nashioko 2004; Lee et al 2004) and links with other types of accounting system (Cerin & Laestadius 2004).
2. Integrating environmental costs into financial systems and other systems to support decision-making in enterprises (Jürgens 2002; Rikhardsson & Vedsø 2002; Lang et al 2004; Pohjola 2004).
3. Cost allocation and calculation (Giraldi 1999; Schram 2003; Seuring 2003).

With regard to costs which are not recorded in the financial system, Howes (1999) for example has described how production companies can calculate the costs of their environmental externalities – i.e. the social costs caused by their environmental impacts. It has always been a matter for debate as to how externalities can be valued, and methods such as ‘willingness to pay’ and ‘willingness to accept’ have been applied. However, there is great methodological uncertainty in using these concepts. For example, how do you answer the question: “What must enterprise X pay you to discharge XX tonnes of substance Y?”

On the other hand, Howes uses another method, which builds on calculating the costs an enterprise would have incurred if it had to remediate or avoid environmental impacts – e.g. total cleaning of waste water, or changing to renewable energy sources to minimise flue-gas emissions. All else being equal, this method is preferable as there are fewer methodological uncertainties and it could be a method to calculate externalities relevant for management. The problem with many of the experiments in calculating externalities (in physical or monetary terms), e.g. in connection with ISO 14031 work on performance indicators, is that the relevance for decision-making often disappears. Managers who have to take decisions immediately within a narrow financial framework can often not allow themselves the luxury of taking this information into account, if the environmental impacts of the enterprise are within legal limits and if such considerations cannot be used competitively.

3.3 Cases and practical problems

In many studies questionnaires have been distributed to enterprises in order to find out their assessment of whether EMA creates value-added, the proportion of environmental costs, the relationship between production processes and environmental costs etc. (Bouma et al 1999). This type of study is good for providing an overview of the problem, but they often suffer from low response rates and uncertainty regarding the validity of replies. Questionnaires often reflect the 'opinions', 'understanding', or 'perceptions' of the respondents, but there are not many specific examples of calculations of environmental costs, value assessments or recommendations for enterprises in relation to specific problems.

In practice, case studies have played a central role in studies aiming to dig deeper than is possible in the other studies. Giraldi (1999) describes a project at an enterprise where monetary values were assigned to the waste streams. The project could, for example, document the relationship between the enterprise's production costs and costs of waste as well as lead focus towards initiatives in the supply chain at the enterprise in order to reduce generation of waste in different production stages. Thurm (2002) describes how Siemens introduced EMA in connection with their 'Zero Waste' project, and how EMA has been integrated into the company's SAP R/3 application. Rikhardsson & Vedsø (2002) describe how EMA has been implemented at Post Danmark and DONG A/S. Montel (2002) describes the use of EMA at a pig farm in France in connection with implementing an environmental management system. Pohjola (2004) describes how EMA has been used at a transport company in Finland in connection with a software system.

There has also been focus on small and medium-sized enterprises (SMEs), and a number of case studies describe the special problems in implementing EMA at SMEs. All else being equal, SMEs have fewer resources than larger enterprises, both financial and personnel. The case studies focussing on these enterprises conclude that implementing EMA at SMEs requires other techniques than at larger enterprises (Heupel & Wendisch 2003; Wendisch & Heupel 2004; Pilisi & Venturelli 2003; Venturelli & Pilisi 2003; 2004). Amongst other things, there was little initial motivation at many SMEs to start EMA projects, as the usefulness of such projects was considered limited. However, it became apparent that the SMEs that took the plunge with EMA witnessed many advantages as the project progressed. For example they could calculate their costs of waste more accurately, and this led to changes in the production processes. The 'softer' advantages included that management could communicate more easily with environmental personnel on environment-related costs and investments, for example.

However, there are still no larger empirical studies which document the effects of EMA – i.e. the benefits for enterprises, whether decision-making processes have changed, whether systems have changed, how many use EMA and to what extent etc. That is, larger studies from which it is possible to draw some general conclusions, e.g. with regard to sector, size of enterprise, geographical area etc. However, some older publications, i.e. from 1999 do cover some empirical studies which attempt to draw some general conclusions on the use of EMA. The more recent EMAN publications from 2002, 2003 and 2004 mostly contain case studies and conceptual reports.

3.4 Development of EMA systems in practice

A topic in increasing focus is how an EMA system looks and how it can (or whether it should) be integrated into the enterprise's other management systems. Moreover there is much debate on how EMA is supported by information technology, and not least systems at enterprises (ERP systems).

Bennett & James 1999 sets up figure 1 to describe the different types of EMA system.

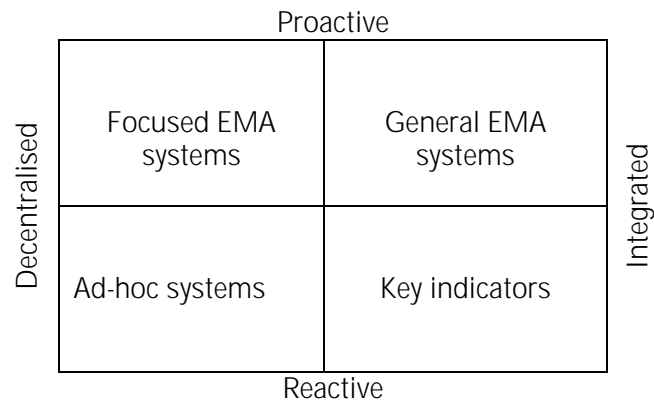


Figure 1: Types of EMA system (Based on Bennett & James 1999 p. 61)

The difference between the systems is partly based on whether they are decentralised, i.e. a system for each installation, or whether they are integrated, i.e. the same system covers the entire organisation. The other dimension is whether there is a proactive environment strategy, i.e. where the environment can be expected to play an important role in the activities of the enterprise and its competitiveness, or whether there is a reactive strategy, where the environment is not a particularly important decision parameter for the enterprise, other than, for example, upholding statutory environmental requirements.

From a development perspective, two waves of EMA systems have been built up and implemented by enterprises in recent years (Bennett & James 1999; Loew 2003; Burritt 2004). These waves are not independent of each other, as the second wave builds extensively on the first. Neither will enterprises automatically implement the second wave of EMA systems. This depends on whether the environment is an important parameter, cf. table 1.

	First wave	Second wave
Drivers	External demands Costs	Value added Sustainable development Stakeholder dialogue
Purpose	Risk management	Support decisions Productivity Reduce inefficiency Data validity
Target groups	Environment department	Management Employees Cooperation partners Financial stakeholders
Key indicators	Mass flow Fines	Environmental costs Environmental investments

	Operating costs	Eco-efficiency ROI
Tools	Mass balance sheets Environmental reviews	Activity-Based Costing Scorecards Key performance indicators
Data capture	Ad hoc	Integration in IT systems Special applications

Table 1: First and second wave EMA systems

Many authors have focussed on how EMA systems combine physical and monetary flows with a view to producing financial information which has not previously been visible (Burrirt et al 2002; Jasch 2002; Strobel & Redman 2002). There is also focus on what EMA fundamentally involves, i.e. whether it is primarily physical or monetary indicators (Bennett et al 2002). Basically this is the same as the debate taking place within traditional management accounting, where in recent years focus has been moving away from exclusively financial performance indicators to include physical indicators. This means that management accounting is about enhancing the enterprise's performance using both physical and financial information.

The debate within EMA on physical flows has usually focussed on flow cost accounting (FCA). FCA deals with calculating the enterprise's mass flows as both physical units and in monetary terms. FCA usually operates with the underlying value in the materials which 'flow' through the enterprise, the costs involved in processing these materials, as well as the other costs arising from, for example, transporting materials and administration. The point of FCA is that, for example, the material thrown out does not merely involve costs of disposal, but also losses because the material has a value. In addition, the material also absorbs costs on its way through the production process, for example machine hours, salaries, transport etc., and these should also be included in the total value of the material being thrown away (Strobel & Redman 2002).

Most recently, the debate on EMA systems has extended to include the supply chain rather than just focusing on an individual site. This perspective focuses on material flows throughout the supply chain and financial statements in connection with these (Orbach & Liedtke 2002). Seuring (2003) looks at the stakeholder chain in the lifecycle of textiles; not only with regard to material flows, but also with regard to the information flows up and down a supply chain. Wolters & Danse (1999) looks at the possible performance indicators in the supply chain for supplying coffee from the Third World to Europe. This study is interesting as it focuses on sustainable development from the perspective of the supply chain – a sort of sustainable Supply Chain Management.

To a certain extent, the supply chain perspective can be compared with the lifecycle perspective. The difference is that the lifecycle perspective focuses on a product, whereas the supply chain perspective focuses on a chain of enterprises and the material and information flows between these (Krasowski 2002).

3.5 Sustainability management accounting

Sustainability broadly includes much more than just the environmental aspect. It also covers economic sustainability and social sustainability.

As EMA becomes more extensive and integrated, focus turns towards other aspects of sustainability, and how this can be integrated in EMA as a sort of sustainability management accounting.

Van Heeren (1999), for example, focuses on this aspect in a supply chain supplying coffee from Costa Rica to the Dutch market. The coffee is sold as being cultivated sustainably and in this regard the Dutch importer needs management information about various parameters relating to the coffee quality, the farmers, intermediaries, composition of the workforce etc. in order to be able to document that the coffee meets the criteria for sustainable cultivation.

The environment part of sustainability management accounting could be referred to as the 'easy' part. Modern EMA has a number of well developed concepts and guidelines showing how this part can be managed. The more difficult part, however, is the social part. How can this be managed? With regard to the non-financial indicators, the Global Reporting Initiative (GRI 2002) for example, can provide help as this guideline contains a section on social indicators as part of Triple Bottom Line reporting. However, GRI primarily focuses on external stakeholders, and it is not certain that internal management has the same interests or needs. If the GRI framework is used as a basis, the financial effects will be related to the enterprise's social impacts. Table 2 shows the elements involved in GRI with regard to social performance areas:

Employee conditions	Employment Relationship between staff and management Health and safety Training Equality and opportunities
Human rights	Strategy and management Prevention of discrimination Free unions and collective agreement negotiations Child labour Forced labour Disciplinary practices Safety practices Rights of indigenous populations
Society	Local community Bribery and corruption Political donations Competitiveness and price fixing
Product liability	Consumer health and safety Products and services Advertising practices Sanctity of private life

Table 2: GRI framework and social impacts

Traditional management accounting would focus on questions such as:

1. What will it cost the enterprise to initiate social initiatives?
2. What will it cost the enterprise *not* to initiate these initiatives?
3. What is the added value of these initiatives?
4. How does the enterprise stand in relation to various indicators?

A criticism shared by all the approaches so far in efforts to incorporate social sustainability in EMA, is that there is a lack of focus on the decisions of the enterprise (e.g. Rubenstein 1999; Howes 1999; van Heeren 1999; Wolters & Danse 2002). Specifically, this means identifying which decisions are expected to require information on sustainability issues such as equality, cooperation with staff in the Third World, training etc. If reports on these aspects are merely to see whether there is something interesting which may be useful at some stage, there is a risk that they will not lead to much integration of these aspects in decision-making. There is a risk that they will often become one-off studies.

An interesting tool that has been suggested is the Sustainability Balanced Scorecard (Figge et al 2002), where all aspects of sustainability are addressed using a scorecard model. The social effects are incorporated using a stakeholder perspective, where these are divided into direct and indirect stakeholders who the enterprise can influence. Next, these are divided into stakeholders in the enterprise's supply chain, in the local community, and in society as a whole. The logic is that the dependence of the enterprise on these stakeholders should form the basis for the indicators to be used in the final scorecard.

3.6 Standards and initiatives by the authorities

There has been a lot of focus on developing standards and guidelines for EMA, and this is exemplified in three of the books reviewed in this report about initiatives by authorities in relation to EMA. Over the years, many guidelines for EMA have been developed by researchers, enterprises and consultants. The significance of these standards and initiatives depends on the type of organisation issuing them. Lately, standards and guidelines from international organisations and authorities in different countries have been issued, and all else being equal, these are deemed to have greater significance than those issued by individual organisations or researchers. Examples of international standards are from the United Nations (Environmental Management Accounting: Procedures and Principles 2002) and the International Federation of Accountants (International Guidance Document on Environmental Management Accounting 2005). These guidelines contain recommendations on how environmental costs can be classified and calculated, examples of application, procedures for implementation and suggestions for integration with traditional accounting systems.

Furthermore, a number of national authorities and organisations have published guidelines on EMA such as the US EPA, the Ministry of the Environment of Japan (Kokubu & Kurasaka 2002, Kokubu et al 2003, Kokubu & Nashioka 2004), the Institute of Chartered Accountants in Australia and its Philippine equivalent (Reyes 2002) and the Korean environmental authorities (Lee et al 2004). The Danish environmental authorities have also put focus on EMA by supporting the development of Danish guidelines and by gathering experience with the application of the UN guidelines in practice.

3.7 Summary

Overall, the review of developments in international research into the EMA area shows that there is now an established concept for defining

environmental costs, as well as describing records and EMA systems. Furthermore, research and case studies have shown that enterprises benefit from applying the EMA concept, and it is used extensively.

EMA is therefore maturing and being developed in several contexts. Organisational development of EMA can be seen in that there is no longer only focus on the individual enterprise, but EMA is also included in the whole supply chain. The topic as a whole is also seeing a development from only focusing on environmental aspects to looking more broadly at the concept of sustainability and developing definitions of 'social costs'.

4 Best practice experience

This part of the report gives a number of examples of international experience with EMA based on interviews with selected foreign enterprises that have worked with EMA for a number of years.

For each enterprise the following is described:

- How EMA is used in the enterprise
- How EMA has been implemented and any barriers during implementation
- The results of the work with EMA

This chapter is intended for inspiration for the use of EMA as it provides an overview of very different types of enterprise and organisation that use EMA in very different manners.

The chapter also provides an insight into some of the barriers enterprises may meet when implementing EMA as well as examples of results of EMA work.

This chapter can also be seen as a status of how far enterprises have come in the use of EMA in practice as a comparison with the research described in the last chapter.

4.1 Methods

Seven enterprises have been selected as examples of best practice within EMA. This identification was carried out on the basis of a poll among the Environmental Management Accounting Network (EMAN) in 2004. Members were asked to identify those enterprises they viewed as representative of best practice within EMA. Among these enterprises, the final selection was carried out on the basis of a criterion of being able to gather as wide a range of experience as possible. Different countries and different business sectors were thus included, ranging from a local authority in Australia to a chemicals company in Germany. This also shows how many different types of enterprise work with EMA.

The concept 'best practice' has not been defined as such and the members of EMAN were given the task of selecting the enterprises they thought fit the designation 'best practice'. We assumed that because of their knowledge and commitment within EMA, EMAN members were able to point out the enterprises that use EMA and have a certain amount of experience with it. Thus, we cannot expect these enterprises to be representative for their business sector nor for their country. However, together they do provide an indication of what EMA can be used for.

The enterprises selected and interviewed were:

	<i>Name</i>	<i>Sector</i>	<i>Country</i>
1.	Ericsson	Telecommunications and equipment	Sweden
2.	Eurobodalla Shire Council	Local authority	Australia
3.	BAA	Airports	UK
4.	Wessex Water	Water management/sewerage services	UK
5.	AWG plc.	Retail/utility services	UK
6.	Schott	Production: Glass	Germany
7.	BASF	Production: Chemicals	Germany

The relevant contact persons (normally the head of environment) in the enterprises were interviewed over the telephone during the period December 2004 - January 2005 on the basis of a question guide that contained questions related to e.g. the use of EMA, which departments were involved in the implementation, the use of IT systems and the significance of EMA for the enterprise's financial and environmental performance.

All interviews were recorded on tape and a summary of the content was subsequently transcribed and used as a basis for the descriptions in the following sections of this report.

4.2 Ericsson - Sweden

Ericsson is the world's largest supplier of mobile systems and delivers complete solutions within mobile telephony, the Internet and multimedia as well as services within these areas. Other areas include defence systems and network technology, which represent a smaller part of the turnover. Through a joint venture with Sony established in 2001, the enterprise sells mobile telephones and other personal communications articles. Ericsson has around 50,000 employees throughout the world, but the majority work in Sweden. Ericsson's main markets are North America and China. Please go to www.ericsson.com for more information about Ericsson.

4.2.1 Use of EMA

As early as in 1992, Ericsson presented an environmental report and has done so ever since. In recent years, EMA has been placed on the agenda as a tool in the enterprise's environmental management on the same level as e.g. lifecycle analyses (LCA).

For Ericsson the work with EMA involves collection of environmental and financial data as well as a presentation of these to the relevant decision makers. This information is mainly used in the enterprise's production facilities, particularly in relation to waste management. Especially as regards waste management, Ericsson sees EMA as a powerful tool since it shows clear financial benefits from minimising waste.

Moreover, 'Ecology Management' is mentioned in relation to financial calculations where the enterprise takes back used equipment (e.g. office equipment, industrial measuring apparatus, etc.) and recycles it. In addition to recycling benefiting the environment, the enterprise also saves administration and transport costs.

Benchmarking is another area where EMA is used and here different departments and facilities are being measured and compared both environmentally and financially. In this connection EMA is deemed to contribute to a number of improvements in relation to the enterprise's environment-related strategy and create motivation for improvement.

4.2.2 Implementation of EMA

Ericsson has not experienced any specific barriers in relation to the implementation and use of EMA. However, there were some areas where it was difficult to gather data, but this has not prevented the EMA initiatives.

Mainly engineers and employees with an environmental background work with EMA at Ericsson.

No changes have been made in relation to Ericsson's IT systems in connection with environmental management in general or EMA in particular. However Ericsson does use a tailored Stand-Alone Application for the preparation of LCA.

4.2.3 Results

Since 1992, when the first environmental report was published, Ericsson has improved its environmental performance, but it is hard to assess causal relations between the various initiatives and these improvements. It is thus also hard to assess the correlation between financial performance and the use of tools like EMA, since many variables are involved.

Ericsson believe that it is important to carry out measurements on the basis of the philosophy: 'What gets measured gets done'. In this way, specific targets can be set and the measurements can be compared with these targets, and this helps the enterprise improve and develop. This may be one of the most important aspects of the use of EMA at Ericsson since EMA places the environment in a financial context.

4.3 Eurobodalla Shire Council - Australia

Eurobodalla Shire Council (ESC) has about 400 employees and is situated on the southern coast of New South Wales, close to Sydney and Canberra. It is a large tourist area with about 34,000 permanent residents and about 100,000 residents during the high season. The area has one of the highest population growth rates in New South Wales. Eurobodalla Shire has extensive industry that includes cheese factories and flower exports as well as tourism. Besides tourism, both the retail and the service industries are growing rapidly. Agriculture and fisheries are also important, but they are declining. Please go to www.esc.nsw.gov.au for further information about the shire.

4.3.1 Use of EMA

In Eurobodalla Shire Council, EMA is defined as an element of the Shire's Triple Bottom Line statements. Triple Bottom Line (TBL) entails a statement of environmental, social and financial conditions in connection with the assessment of ESC's sustainability strategy. Furthermore, EMA is part of ESC's overall 'Management Plan' which contains a plan for the next four years for local authority areas such as conservation of nature, business

development, transport, education, etc. Environmental protection plays an important role in the plan, especially in relation to water management, one of the Shire's main focus areas.

On the basis of the three dimensions of the sustainability concept, ESC wishes to improve its methods of valuing social and environmental resources in order to make better decisions. In addition to procuring information for internal decision-making, the Shire also wishes to provide its residents with credible information and to encourage and facilitate effective participation by the local community in the decision-making process. This was one of the contributing factors when ESC started using TBL.

An important concept in ESC's TBL method is the concept of capital. The concept is divided into human or infrastructural capital, natural capital and social capital. Within these types of capital, ESC defines a number of assets they have at their disposal or assets they influence through their actions/activities. Then the TBL method is applied to calculate the costs related to carrying out or not carrying out an action or activity. A separate report accounting for these costs is published together with ESC's annual report.

Today ESC prepares a 'State of the Environment Report' (SoER), a Condition of Public Works Report (CoPW) and a Social Plan (SP). These reports describe the status of the natural, infrastructural and social capital and contain recommendations for actions to be carried out by the Shire.

The Shire's strategic goals are also based on TBL. Any report received by senior officials and politicians usually contains an assessment of the political, legislative, environmental, social and economic effects.

Every quarter, an Executive Information Report (EIR) is prepared for ESC analysing the organisation's performance and trends regarding customers, employees, the environment, assets and finance including proposals for continuing positive, or stopping negative, developments.

Special reporting forms are used on which expenses and income related to the different asset types as well as changes in asset values are to be registered. These forms are based on the classification proposed by the UN System of Integrated Environmental and Economic Accounting (SEEA)¹ and the Australian Bureau of Statistics (ABS). For example, the forms are used in connection with approval of expenses or investments in projects or activities.

4.3.2 Implementation of EMA

In connection with the implementation of EMA, the Shire encountered a few barriers which primarily originated in the political and administrative employees' insecurities about what EMA actually was. However, these insecurities have slowly diminished through, for example, the Management Plan.

Internally in ESC, the highest management levels, both administratively and politically, usually make use of the EMA information, but the information is also used by the general public through the environmental reporting which is also a part of the Shire's TBL accounting.

¹ <http://unstats.un.org/unsd/envAccounting/seea.htm>

The implementation of EMA has resulted in a change as regards the data warehouse system with a view to making data easily accessible. Moreover, the implementation has caused the development of more in-house databases to support a number of areas. However, the implementation has not resulted in actual integration of systems or databases.

4.3.3 Results

According to ESC, EMA has meant that the Shire's environmental performance has improved, e.g. in connection with water treatment and waste management. According to the Shire, this has created a better reputation with both citizens and state authorities

Moreover ESC believes that EMA has had a positive influence on the general appreciation of the environment because the value of the environmental protection is measured in monetary terms. Recycling has also become more widespread in Australian society where previously it was limited to the smaller communities which had to recycle for financial reasons arising from the large distances to towns.

Furthermore EMA has led to a more formal registration and control of activities, budgets and expenses and thus acknowledgement of environmental policies and their related financial factors in relation to decision-making.

4.4 BAA, Heathrow - UK

BAA manages seven British airports: Heathrow, Gatwick, Stanstead, Glasgow, Edinburgh, Aberdeen and Southampton. In addition they have management contracts for a number of airports outside the UK. Management of the airports includes anything from passenger service and cargo to runways and security for aircraft and passengers.

There is also a number of subsidiary companies which manage restaurants and shops at the airports and are responsible for the development of airport buildings including offices, check-in desks, hangars, etc. as well as consultancy within airport activities. Please go to www.baa.com for more information about BAA.

Heathrow is the most important of all the airports. It is the world's busiest airport, serving approx. 64 million passengers every year, and it is the second most busy cargo airport, handling approx. 1.2 million tonnes cargo per year. Please go to www.baa.com/main/airports/heathrow for further information about Heathrow.

4.4.1 Use of EMA

EMA information is mainly used for external reporting and is only used to a limited extent internally, although there is focus on the internal aspect as a possible future area of special interest. BAA, Heathrow generally reports about environmental expenses, which are published in the annual report. There is a special focus on new areas and investments in new technology where EMA is used to make environmental costs visible, but this only includes direct costs. Investments have been made in flow meters to map where the largest energy consumption is so that the efforts to reduce energy consumption can be targeted. BAA expects to save between 10 and 20 per

cent of the approximately GBP 1 million spent annually on electricity. Attempts are also made on a regular basis to increase the amount of waste being recycled. The amount of waste being recycled has increased substantially from 12 per cent in 2003 to 18 per cent in 2004.

For about 10 years, BAA has had an environmental management system and for the past three years the enterprise has participated in the so-called SIGMA project. SIGMA stands for Sustainability - Integrated Guidelines for Management and comprises guidelines for sustainability management developed by the British Standards Institute, the Forum for the Future, and AccountAbility and supported by the UK Department of Trade and Industry. Further information about the SIGMA project can be found at www.projectsigma.com. The SIGMA guidelines also include the financial aspect as they operate with different definitions of capital – i.e. economic capital, manufactured capital, environmental capital and social capital.

BAA has been using EMA for about three years. The use of EMA was started at the initiative of the managers of the environment department. The EMA process is mainly used to procure data for external reporting. However, part of the process deals with benchmarking of the enterprise against a number of indexes and standards within the environment and sustainability such as the Corporate Responsibility Index, the Environment Index, the Dow Jones Sustainability Indexes, the FTSE4Good Indices, the Global Reporters Survey, the PerCent Club Ethibel Investment Register and Sustainability Indices and the E. Capital Partners Ethical Index Euro.

4.4.2 Implementation of EMA

EMA has not resulted in changes to IT systems, stand-alone programs or in Enterprise Resource Planning (ERP) integration.

BAA would like to use EMA to a greater extent than today, but there are barriers to this in the form of time consumption in connection with developing the system and the need for expertise to understand the external costs and how the different types of cost are to be treated.

4.4.3 Results

EMA has had limited influence on financial performance, attitude/motivation and the environmental management system, since it is primarily used for external reporting. EMA has, however, helped systematise the enterprise's environmental costs and has thus made it easier to work with these costs. There is more focus on reducing environmental effects through the environmental management system, since environmental developments in the enterprise are mainly driven by stakeholders such as local authorities and the government.

4.5 Wessex Water - UK

Wessex Water is a water and sewerage enterprise in south-west UK. It is owned by YTL Power International from Kuala Lumpur. The enterprise treats and supplies drinking water for 1.2 million people from 95 water works and 11,000 km water pipelines and it provides sewerage services to 2.5 million people with nearly 15,000 km of sewers, 1,314 pumping stations and 392

wastewater treatment plants. Please go to www.wessexwater.co.uk for more information.

4.5.1 Use of EMA

Wessex Water has worked with environmental management in different forms during the past 30 years, but at a more detailed level for the past 15 years (after the enterprise was privatised). The enterprise has published annual environmental reports for the past four years. The work with EMA was initiated by the environment department in cooperation with the UK Environment Agency. The motivation for the introduction of EMA arose from the authorities' tightened requirements and a wish to examine the costs incurred by the enterprise because of these requirements.

EMA consists of several dimensions at Wessex Water. EMA is included in a supplementary environmental report in the annual report and it contains an overview of the social costs related to the pollution emitted and how much it would cost the enterprise to neutralise this. Moreover, EMA information is included in internal decision-making. Expenses, income and investments within environment are registered, and these items are monitored in the daily environmental work, since environmental costs represent a large part of the enterprise's total costs. This includes, for example, expenses for wastewater treatment plants and new environment-related projects.

A current project focuses on removing phosphates from the water discharged from wastewater treatment plants. This discharge represents a major extra cost and must be included in the EMA process. Moreover, a lot of money is spent on complying with authority requirements as regards pollution abatement, improvement of water quality, reduction of discharges into rivers and the sea as well as the occurrence of different substances in drinking water.

Top management and mid-level managers use EMA information in connection with assessments of environment-related projects such as improvement of sewers so they can live up to water quality requirements in rivers. In this connection, an analysis of the 'life cost' or lifecycle costs is prepared in order to assess which type of filter should be used. This means that the costs related to the acquisition, exchange and maintenance of different filter types are calculated over the total life of the filter. Then the filters with the lowest total lifecycle costs are chosen. Another initiative concerns wastewater treatment plants where different chemicals are used, some of which are harmful to the environment. Wessex Water is trying to replace these with other chemicals that do not affect the environment to the same extent. A new initiative is to replace some chemicals with ultraviolet light and this includes a financial analysis of alternatives.

As mentioned, EMA is also used to certain extent in connection with reporting for external stakeholders. The enterprise's annual report contains a separate section about e.g. environment-related expenses and investments in the current year. The assessment is that this information does not have a great effect on external decision-making but helps maintain the enterprise's environmental profile.

4.5.2 Implementation of EMA

There were no great barriers to the implementation of EMA, but there was some concern that it would merely be an academic exercise and extra expense

that would not yield any benefits. After EMA has been implemented, these concerns have been proved unfounded, however.

The educational background of those having worked with EMA is primarily engineering and economics. The environment department was the driving force for the introduction of EMA and the finance department became involved later on in the process.

The implementation of EMA has not caused changes to IT systems or integration of different systems.

4.5.3 Results

Wessex Water assesses that the EMA process itself has had limited influence on financial performance, environmental effects and the attitude towards the environment. The reason for this is that the enterprise would still achieve good results because of the existing focus on the environment. EMA is thus an important tool, but the effect of it cannot be separated from the other environment-related tools used at Wessex Water. The enterprise does, however, believe that EMA will be significant as an internal decision-making tool.

4.6 AWG Plc. – UK

AWG is a FTSE listed company with almost 10,000 employees throughout the UK. Through its subsidiary companies, which include Anglian Water and Morrison, the group provides a wide range of services. For example, the enterprise supplies water to almost 6 million customers in eastern UK, it has retail stores, maintains roads and buildings, performs construction tasks and supplies gas, electricity and telephone services. Please go to www.awg.com for more information about AWG.

4.6.1 Use of EMA

AWG uses an EMA method developed by Forum for the Future (www.forumforthefuture.org.uk), which calculates how much it would cost to avoid or restore the environmental impacts the enterprise causes and shows what would happen if these costs were internalised. In order to do this, income and cost accounts are made for the environment. This helps support investments and initiatives within the environment and creates a better understanding of how the environment and finances are related.

Anglian Water is the largest division in AWG and has worked with this method since 1999, and the AWG group as a whole began to use the method in 2003. The initiative to introduce EMA came from the sustainable development manager, with support from the head of the environment department. The project was initiated because AWG needed a better understanding of the financial aspects in environmental work and the financial effects of environmental impacts.

Top and middle managers use EMA information in the long-term planning process. To start with, managers assume that the future costs of the enterprise's environmental impacts will be internalised when they are realised, i.e. that they are no longer society's costs but that the enterprise has to pay for the environmental impacts it causes. Future internalisation of these costs is a direct financial incentive for the enterprise to reduce its environmental

impacts. In this way, middle managers at AWG use EMA information in connection with preventive initiatives to reduce the costs for the enterprise of possible future internalisation.

EMA information is also used for internal evaluation where divisions and managers are benchmarked each year for their own results and performance. To some extent it is also used in communication with stakeholders to show these that the enterprise is taking account of future environmental risks.

4.6.2 Implementation of EMA

When EMA was to be implemented, primarily staff with a background in chemistry or natural sciences were responsible for the work. At this time the enterprise worked mainly with water management, and this was reflected in the choice of personnel to introduce EMA. However, economists were to be responsible for preparing the accounting part of EMA and therefore collaboration was established across the two groups. At the start there was some resistance to EMA work in the finance department. The department could not see the point of EMA and it involved a lot of extra work on data collection and processing. It took some persuasion to get them on board. Today the finance department have changed their perception and they are now more positive towards EMA. This is especially because the department has been able to use the EMA information in risk management, for example in assessing future risks and any financial liabilities.

EMA is not an integrated part of the IT systems at the enterprise. Excel is used to record environmental data and results for EMA.

4.6.3 Results

As it is still very new in the enterprise, EMA has not yet had any tangible effect on the financial results, but it is expected that these will come in time, especially because there is now focus on new, future financial risks. It has afforded greater awareness and understanding of the financial aspects in the environment. As management are focusing on what they can do today to reduce costs in the future, EMA is also helping improve the environmental results. At the same time EMA has helped internal control and it has provided opportunities to benchmark and compare performances. Apart from this, EMA has not affected the environmental management system at AWG, which concentrates on meeting requirements from the authorities. AWG has carried out analyses of stakeholders, for example of the authorities and NGOs, and these show great satisfaction that AWG has commenced the EMA work.

AWG is currently restructuring the organisation and there will be many changes. EMA has not been used for very long and therefore it does not yet cover all areas. In addition to water management, last year EMA focussed on energy. Once the restructuring has been completed EMA will be extended to more areas.

4.7 Schott - Germany

Schott manufacture a number of products such as fibre optics, flat-screen displays, light components, solar panels, windows, gas-burner systems, laboratory equipment, optical lenses and electronic gaskets. The group has production facilities and sales departments in 37 countries, and 18,500

employees with about 13,000 in Europe, of whom 8,450 work in Germany. Europe and North America are the largest markets, accounting for more than 80 per cent of revenues, and Germany alone accounts for about 25 per cent. More information is available at www.schott.com.

4.7.1 Use of EMA

A project supported by the German environment authorities in collaboration with the Fraunhofer Institute for Industrial Engineering (IAO) and the glass manufacturer Schott has developed a method of using the company's enterprise resource planning (ERP) system to collect and evaluate environment information, including EMA information. Environment information is often spread around different information systems and can often be difficult to trace to specific sources. As the ERP systems are integrated systems, where data is recorded in one database, this can ease collection and processing of environment-related data.

Previously, Schott had EMA data spread around different departments in different software databases, e.g. prepared in Excel and Access. Today they have gathered environment information in their ERP system, where it is built up in a common data structure and data-collection routines.

The project was originally initiated to provide homogenous information for the preparation of Environmental Performance Indicators (EPI). It was important that these were comparable and easily accessible from the system. This had not previously been the case and a lot of time was spent collecting and processing this data. Integrating this in the ERP system meant that the existing environment information had to be restructured and ordered, for example it had to be structured hierarchically by subject and geographic location before it could be recorded in the ERP system. The environment part was designed and implemented in the ERP system's Management Information System (MIS), where the necessary data structures for Key Performance Indicators (KPI) could be defined. Moreover, in the MIS it was possible to design reports across data, subject and function, and this was considered very important for internal environmental reporting. Experience shows that, because of data integration, the ERP system provides managers with better accessibility to precisely the right information in the system. The old systems and databases in Excel and Access are now redundant and have been phased out.

The environment-related reports taken out of the ERP system are used by top management, middle managers and senior staff responsible for environment and safety. The system allows reports to be adapted for the individual user, and this is a great advantage, especially compared with Excel, where reports are usually statistical and require a lot of work to change. EMA information is primarily used for internal evaluation of the results of the various cost centres, which include environmental costs. The system can also be used to support planning and decision-making processes in operational environmental protection, and in connection with industrial hygiene and safety when assessing investments and analysing costs.

4.7.2 Implementation of EMA

The greatest barrier to implementation or combination of the various databases in the ERP system was time. A lot of time was spent on structuring the data and reaching agreement with the different departments on the design

of this structure. As such, this is no different from other implementation processes in ERP systems where much of the time consumed is spent on data definition, standardisation and systematisation. Particularly time consuming were structuring imported data and discussions with staff. Also, many resources were required to adjust the ERP system to manage environmental data. This adjustment meant exploiting the possibilities already built into the system. No new functionalities were programmed into the ERP system.

4.7.3 Results

It is easier to meet the requirements of the environmental management system, as the environmental data has now been gathered in one system. It seems that the more visible environmental results also provide more staff motivation and a better image for society. In the longer term, the project should also result in more efficient utilisation of raw materials, a reduction in pollution, and so less environmental impacts.

4.8 BASF - Germany

BASF is one of the world's leading chemical companies and comprises a number of business areas such as chemicals, plastics, agricultural and nutrition products, oil and gas. It has about 87,000 employees throughout the world, of which almost 49,000 work in Germany. Four years ago, BASF was listed on the Dow Jones Sustainability Indexes (www.dowjones.com). There is more information at www.basf.com.

4.8.1 Use of EMA

EMA at BASF is very much considered in relation to the company's products, as these give rise to most of the company's environmental impacts. In the mid 1990s BASF developed what they call Eco-Efficiency Analysis (EEA). EEA integrates a financial and environmental assessment of, for example, processes and products in a lifecycle perspective. Today, EEA is part of the company's environmental management system.

EEA work is centred in the company's eco-efficiency department under BASF's environment safety and energy division. The department carries out work for BASF's own production, marketing and sales divisions, which purchase services internally from the eco-efficiency department in order to meet their own obligations under the BASF vision on sustainable development. These divisions can also purchase services for their own customers to help them make the right decisions in their own product ranges or development. Finally, external organisations and enterprises can also buy services directly from the eco-efficiency department. In practice, however, most of the department's work is for internal customers.

The overall purpose of EEA is to compare similar products and processes and assess these in an environmental perspective throughout the product's lifecycle. So, a sort of financial LCA. Since 1995 about 250 analyses have been completed and at the moment about 35-40 analyses are being completed each year.

An EEA can be ordered by top managers and middle managers down to production supervisor level. At top management level EEA is often used as part of strategic planning. For example it is frequently used as part of market analysis when launching new products and for analysing products in a

potential acquisition target enterprise. Middle managers use EEA most often in research and development projects into future products as well as in communication with the authorities. EEA is also deemed to be important for marketing and sales. The analyses create value-added for customers in that they can document that a product is more environmentally friendly than a competing product, and yet it costs the same.

4.8.2 Implementation of EMA

At the start there was a great deal of resistance to EMA from middle management. In order to overcome this resistance some pilot projects were completed in the business units which viewed the project positively. Today it has been accepted in more or less the entire group, but there are still some pockets of resistance. Staff knowledge about the company's environment work has increased significantly over recent years and it has been estimated that 20-30 per cent of all employees are aware of EEA. The eco-efficiency department has also experienced rising demand for consultancy and advice.

When the tool was being developed it was mostly used by chemists, biologists, toxicologists and engineers. At the moment, when the analyses are to be sold to the individual business units, the most important aspects are sales and marketing.

A stand-alone system is used to record and process data. The data is retrieved from BASF's own IT systems such as the financial system and production management. Furthermore, a database has been built up with information about processes and products. Data has also been retrieved from public databases.

4.8.3 Results

It seems that the financial results of the company have been improved, as environmentally friendly products perform better on the market than other products. In addition there are improvements resulting from a better company strategy via EEA, such as acquisitions of other companies. The total environmental impact of products has been reduced, but as the tool does not aim specifically at environmental impacts from the company's own production there have been no significant effects on energy consumption, air pollution etc. There is great focus on reducing the company's total environmental impacts, of which impacts from the products are important from a lifecycle perspective.

The eco-efficiency department is currently working on extending EEA to include social aspects so that all three columns in sustainable development (the environment, the economy and social conditions) can be analysed and compared.

4.9 Summary

On the basis of the best-practice descriptions, this section summarises a number of general trends in the application, implementation and results of EMA.

4.9.1 Application of EMA

As is apparent from the best-practice descriptions, EMA is not one single method or one single tool. EMA can be applied in many different ways by enterprises. For example, EMA is used by the enterprises described above as part of Triple Bottom Line statements, in lifecycle analyses, and as a process for setting priorities for different investments. Therefore, EMA can be considered as a generic term for different tools and a term for a specific philosophy.

EMA cannot stand alone. It is part of a collection of efforts in the environmental area and should be included in a package of tools and initiatives for environmental management in the enterprise. EMA is therefore a tool on an equal footing in both environmental management and management accounting.

EMA is used specifically to, for example assess environmental costs in connection with replacing a chemical, waste management and investment assessment. As a rule there are no general calculations of, for example, the enterprise's total environmental costs, but instead EMA produces assessments which can be used in specific situations. However, EMA draws on the same data as is used in connection with external reporting of environmental costs and environment-related investments. These two topics cannot, therefore, be entirely separated.

An area where EMA has an especially important function is waste management. One of the advantages of EMA techniques in this regard is that they reveal the waste-related costs. These are not just the costs of disposal and the costs of materials lost; EMA also reveals the various costs incurred by the waste on its journey through the enterprise such as machine hours, internal transport and administration. In this way EMA can be used to make visible the full costs of the enterprise's waste streams and these can be reported to both internal and external stakeholders.

Another interesting area of application for EMA is as part of lifecycle analyses (LCA). By using EMA in an LCA perspective, the enterprise can calculate environmental costs, for example, over the lifecycle of a product or a component and thereby attain a better overview of the costs which arise and must be minimised or managed.

4.9.2 Implementation of EMA

Separate IT systems to use EMA are not always necessary. For example, most use Excel or functionalities in their existing systems. However, Schott, who completed an ERP project focussing on environmental data management, which included EMA data, believe that the very use of IT and data integration has given rise to a number of advantages such as customised, flexible reports, the possibility of reporting indicators, uniform data structure and less overlapping work in recording, processing, converting and transferring data. However, there should be cohesion between the costs of these activities and the costs of developing a solution within the ERP system. If the enterprise makes many measurements and records a lot of data for different facilities and different processes, it will become more likely that there will be benefits in integrating and streamlining environmental data management.

Implementation and application of EMA involve cooperation between different departments and people with different educational backgrounds such as engineers, environmental specialists, and financial experts. This is often mentioned as one of the challenges of EMA, as environment experts have to learn the language of finance and financial experts must learn the language of the environment. However, when this happens both departments benefit from EMA.

In some cases there has been resistance to implementing EMA. In particular finance departments have not always been able to see the purpose of introducing EMA. However, this resistance usually disappears once EMA has been implemented.

4.9.3 Results

Naturally enough, the results of applying EMA depend on the focus of the application. For example BAA saw no internal results from using EMA, as their focus was directed externally.

Most enterprises believe that EMA has had a beneficial effect on their environmental and/or financial performance. On the other hand, all enterprises agree that it is difficult to separate the effects of EMA work from the effects of other environmental management. With this background it seems EMA methodology would benefit from further development with more focus on measurement of results.

4.9.4 Best practice at enterprises regarding research

As is apparent in the examples of best practice in this chapter, many enterprises are in the process of the same development and research. Several enterprises are already working on a more integrated type of EMA, based on the concept of sustainability rather than the environment alone, and at BASF, EMA has been integrated into the development of new products with a lifecycle perspective.

5 The relationship between EMA and the annual report

This part of the report analyses how EMA can be used in meeting the requirements of the Danish Financial Statements Act on illustrating the interplay between environmental conditions and the results of the enterprise, its development and financial position.

The chapter starts with a brief introduction to the legislation on an annual report. After this it describes the actual purpose of an annual report. The parts of the annual report are listed and after this there is a description of how the specific requirements for environmental information could be incorporated in the annual report. Next there is an analysis of the relationship between EMA and the annual report.

5.1 Introduction to the annual report

The annual report includes the financial statements published each year by the enterprises and organisations subject to the Financial Statements Act. This Act identifies who is subject to the duty to file accounts and the regulations to be met in the preparation and publication of the annual report.

The Danish Financial Statements Act is Denmark's implementation of the accounting directives issued by the EU, including the 4th and 7th Accounting Directives.

The Danish Financial Statements Act was extensively revised with the Danish Act on Commercial Enterprises' Presentation of Financial Statements, etc. (the Financial Statements Act) of 7 June 2001. Subsequently there have been minor adjustments which have entered into force for accounting years commencing 1 January 2005 or later (Act no. 99 of 18 February 2004).

The 2001 Act brings environmental conditions explicitly into legislation, and the adjustments from 2005 incorporate the environment to an even greater extent.

5.2 The purpose of the annual report

The purpose of the annual report is to support users of accounts in their financial decisions.

There is no all-embracing definition of users of accounts, but the Act defines them as: 'private individuals, enterprises, organisations and public authorities, etc., whose financial decisions must normally be expected to be affected by an annual report, including present and possible members of the undertaking, creditors, employees, customers, alliance partners, the local community, authorities providing government grants, and fiscal authorities'.

The decisions of the users of accounts can be based on three general conditions:

- *Investment of the user's own resources*

The annual report has a *forecast function* for users seeking support for decisions regarding investment of their own resources. This may be directly as investors or lenders, or indirectly as suppliers, employees etc.

- *The management's administration of the resources of the enterprise*

Here, the annual report has a *control function*. Users can monitor the financial development of the enterprise through the accounts and thus observe and decide whether management is administering the assets of the enterprise appropriately etc.

- *Distribution of the resources of the enterprise*

The third function of the annual report is the *distribution function*. This is how the enterprises profits are to be appropriated.

The *forecast function* aims at the future and is based on the fact that users of accounts allocate their resources on the basis of expectations of the enterprise's future revenues, liquidity, survivability, employment etc.

In this connection users are looking for information in the annual report which can improve their ability to judge the future prospects of the enterprise in these areas.

The forecast function for the environment is related to the enterprise's general measures to prevent environmental damage.

The *control function* is retrospective. Users of accounts look for information in the annual report to assess how responsibly management have administered the resources tied up in the enterprise and flowing into the enterprise.

The Act mentions decisions regarding management's administration of the resources of the enterprise. This may be profitable administration of funds by management, administration of resources in an environmentally appropriate manner, size of management remuneration etc.

The *distribution function* includes decisions made within the enterprise by management, including appropriation of profits as commissions, bonuses etc.

The Act uses the expression distribution of the enterprises' resources to express the relative distribution between the owners of the enterprise and the enterprise.

Environmental issues are not relevant with regard to the distribution function.

5.3 The parts of the annual report

The parts of the annual report are:

- Management endorsement
- Audit report
- Management review, including review of key figures
- Annual financial statements (and consolidated accounts for groups)
 - Accounting policies
 - Income statement
 - Balance sheet
 - Statement of changes in equity
 - Cash-flow analysis²
 - Notes
- Supplementary reports (voluntary).

The *management endorsement* contains a statement by the management of their responsibilities for the annual report.

The *audit report* is the auditor's report on the annual report.

The *management review* is a narrative description of a number of aspects of the enterprise. Through this, users of the annual report can get an impression of the enterprise, its business, and the conditions to which it is subject. Environmental information is now an explicit new requirement in the management review.

The annual report also contains a separate section called *accounting policies*. This section describes the methods of recognition and measurement applied by the enterprise for its revenues, costs, assets and liabilities; for example when costs are recognised in the income statement, how the value of liabilities is measured etc. The descriptions in the accounting policies are a set of user guidelines for the annual report.

The *income statement* starts at the top with the net turnover of the enterprise, followed by operating costs. This gives the *operating profit*, i.e. the net turnover less operating costs. Next come interest and financial items as well as the results of subsidiaries etc. The next sub-total, after deducting or adding these items is the *profit on ordinary activities before taxation*. Tax on the profit for the year is deducted and the resulting bottom line is the *profit for the year*.

The *balance sheet* is divided into assets and liabilities. Assets are divided so that the least liquid assets, such as patents and goodwill, are shown first. The most liquid assets, such as cash at bank, are shown last. Liabilities are divided into external liabilities and the enterprise's equity capital. External liabilities include ordinary debt such as trade creditors etc. as well as provisions. Provisions are made when the enterprise probably, but not definitely, will have to pay money. Remediating damage to the environment is often included in the annual report as a provision because of the uncertainty as to when the remediation will be necessary, or the uncertainty as to the amount that will

² Not a requirement for reporting classes B and A (see table 3 for an explanation of reporting classes)

have to be paid. Equity capital is an expression of the net wealth of the enterprise and corresponds to the enterprise's assets less its external liabilities.

The *statement of changes in equity* explains the changes in the equity capital. However, there are some items which do not go through the income statement and which are posted directly to equity capital. This is the reason for a statement of changes in equity, which describes the changes in the net wealth of the enterprise from the start to the end of the year.

The *cash-flow statement* shows the amounts of the enterprise's cash inflows and outflows during the year. The cash-flow statement is divided into cash flows from the operating activities of the enterprise, investment activities, and financing activities. The income statement shows when income is 'earned' and the associated costs incurred, without distinguishing whether or not they have been paid. The object of the cash-flow statement is to show when cash flows occur physically.

The *notes* are a supplementary tool for the users of accounts with further break-downs of the individual items in the income statement and in the balance sheet.

In addition to the statutory part of the annual report, the enterprise can voluntarily add a *supplementary report*. A supplementary report is a report from the enterprise on non-financial aspects which are significant for the operation and profits of the enterprise. These may include environmental matters, knowledge and social aspects, or ethical issues etc. The enterprise itself chooses the target group for this supplementary report.

This report on EMA does not deal with the supplementary report in the annual report, but only the statutory requirements of the Financial Statements Act.

5.4 Requirements for environmental information in the annual report

Section 99 of the Financial Statements Act includes requirements for information on environmental aspects in the management review:

Section 99(1), no. 4 states:

- *'describe the enterprise's impact on the external environment and measures to prevent, reduce or remedy any damage to the environment.'*

Section 99(2) states:

- *'to the extent necessary to understand the development of the enterprise, its result and financial position, large enterprises shall also supplement the report pursuant to section 77, no. 4, with information on non-financial aspects which are relevant for the specific activities, including information regarding environment and personnel issues.'*

Section 99 is linked to section 77, which deals with more general requirements for information in a management review.

The Financial Statements Act divides enterprises into different reporting classes, each subject to different accounting requirements. The enterprises for

which the environmental requirements are relevant are listed in the table below.

Report- ing class	Type of enterprise	Size requirements*	99(1), no. 4	99(2)
D	Listed and governmental limited companies	None	Requirements	Requirements for accounting years beginning 1 Jan 2005 or later
C large	All other enterprises than class A and B, which are not listed or governmental limited companies	Net turnover > DKK 238 mill. (EUR 31.73 mill.) Balance sheet total > DKK 119 mill. (EUR 15.87 mill.) No. of employees > 250	Requirements	Requirements for accounting years beginning 1 Jan 2005 or later
C small	All other enterprises than class A and B, which are not listed or governmental limited companies	Net turnover > DKK 58 mill. (EUR 7.73 mill.) Balance sheet total > DKK 29 mill. (EUR 3.87 mill.) No. of employees > 50	Requirements	No requirements
B	Limited companies, partnerships and commercial funds as well as enterprises covered by the Danish Act on Certain Commercial Enterprises	Net turnover ≤ DKK 58 mill. (EUR 7.73 mill.) Balance sheet total ≤ DKK 29 mill. (EUR 3.87 mill.) No. of employees ≤ 50	No requirements	No requirements
A	Enterprises with personal liability, irrespective of size and enterprises covered by the Danish Act on Certain Commercial Enterprises, and which meet the size requirements	Net turnover ≤ DKK 12 mill. (EUR 1.6 mill.) Balance sheet total ≤ DKK 6 mill. (EUR 0.8 mill.) No. of employees ≤ 10	No requirements	No requirements

Table 3: Enterprises subject to the duty to include the environment in the management review in their annual report.

* The criteria used in the Financial Statements Act relate to the number of employees, the balance sheet and net turnover. An enterprise is covered if the size limits in the table are exceeded in two consecutive accounting years at the balance sheet date and for two of the size limits. The figures in the table apply for accounting years commencing 1 April 2004 or later.

From the accounting year 2005, the management review for large enterprises and listed/governmental limited companies also supplements the traditional and well-known report on the developments in the activities and financial situation of the enterprise with information on all non-financial aspects relevant to the specific activities of the enterprise.

From 1 January 2005, the Financial Statements Act therefore contains two different reporting requirements on environmental aspects. Table 4 shows how the two requirements differ from each other:

	Section 99(1), no. 4	Section 99(2)
Linked to	Section 77 - extension	Section 77, no. 4 – detailing
Significant non-financial aspects	Environment	All non-financial aspects, including environment
Organisation	The enterprise	The activities of the enterprise
Contents of management review	Primarily environmental description; can be connected to financial aspects	Connection between environment and financial aspects
Contents/information	Qualitative and can be quantitative	Qualitative and recommended quantitative

Table 4: Comparison between section 99(1), no. 4 and subsection (2) requirements

Section 77 of the Financial Statements Act has the fundamental requirements for the content of the management review. The requirements are listed under five numbers; 1. describe the principal activities of the enterprise, 2. describe any uncertainty connected with recognition or measurement, stating amounts where possible, 3. describe any unusual matters affecting the recognition or measurement, stating amounts where possible, 4. account for the development in the activities and financial affairs of the enterprise and 5. mention any significant events occurring after the end of the financial year.

5.4.1 Reporting in accordance with section 99(2)

In order to meet the reporting requirement in section 99(2), the enterprise must *describe* the environmental aspects which are *relevant for understanding* the earned or expected *results* from each of the enterprise's *activities*.

The *description* must contain information on the *connection* between the enterprise's *results* and current and expected actions.

The description may be narrative or in figures. The enterprise itself can decide which is the most meaningful. If quantitative data is most beneficial for the user's understanding of the accounts, then this is recommended.

That environmental information must be *relevant for understanding* means that the information must be necessary for the user to understand the development, results and financial position of the enterprise. If environmental information has no significance for these aspects, it should not be included in the annual report.

The aspects to be described will depend on the enterprise, as the information is linked to the enterprise's specific *activities* so that it supplements the current causality explanations regarding the activities of the enterprise.

The Financial Statements Act does not contain a clear definition of *activities*. It is up to the individual enterprise to decide how its activities should be reported. The objective of the Financial Statements Act in including activities

is to give the user insight into what the enterprise is doing and thus a basis on which to assess the operational risks.

For some enterprises, the most natural division will be at product level; what types of products are produced and sold? For other enterprises, division by functions such as research, sales and production will be more relevant. Some will consider geographic division as the best. The division of activities should be seen in the context of the overall account of the enterprise in the management review. The table below gives some examples of how environmental aspects can be relevant in describing different divisions of activities.

Activity level	Examples of relevant environmental aspects
Product level	Environmental impacts of products, development of environmentally friendly products, environmentally friendly disposal or recycling of products and information about using products.
Functions	Environmental impacts of production processes, including the environment in research, environmental considerations in logistics and transport, procurement and contracts with suppliers/customers.
Geography	Environmental impacts and initiatives divided geographically, compliance with national environment legislation in various areas etc.

Table 5: Environmental information in relation to activities

The *relationship* between the financial development of the enterprise and the environment must be described according to section 99(2) to the extent that it helps the user's understanding of the accounts. Therefore, it is not an objective in itself to describe generally known relationships. The basis for disclosure could be formed by addressing the following questions:

- What *external* conditions have influenced the current or expected environmental impacts of the enterprise? (New regional limit values for emissions, new national take-back requirements after products have been used, energy-savings regulations etc.)
 - Can the enterprise influence these external conditions? (Through negotiation, through closing or moving certain activities, through changing products or production processes etc.)
 - What are the results of this influence and can they affect the enterprise's assumptions behind its expected development? (Changes in costs structure for logistics, production or need for innovative development etc.)
 - Are there uncertainties which should be included in the management review, so that the reader of the accounts can understand the underlying assumptions and their variability for the expected developments? (Technical or temporal realisation of product development, useful lives of fixed assets and their useful values, access to new CO₂ allowances, users and user-behaviour following new laws, new knowledge etc.)

- What *internal* conditions influence the current or expected environmental impacts of the enterprise? (Technology applied, age of plant, use of materials and substances, processes and management systems etc.)
 - Can the enterprise influence these internal conditions? (Changes in plant, processes or staff know-how etc.)
 - What are the results and is the enterprise willing and able to influence these internal conditions? (Replacements, reduction in activity, adjustments in previous financial expectations, changes in product range, mergers horizontally and vertically in the supply chain etc.)
- What changes are necessary, including investment or change projects, and what is the time horizon?
- What assumptions and uncertainties must be included in the description of the changes in the management review?
- In order to aid understanding is it advisable to indicate the financial size of the specific changes mentioned?
- If so, could it be appropriate to incorporate EMA as a method of indicating the cost-benefit amounts involved in the change?

5.4.2 Reporting in accordance with section 99(1), no. 4

In order to meet the reporting requirement in section 99(1), no. 4, the enterprise must *describe* the enterprise's *impact on the external environment* and *measures to prevent, reduce or remedy any damage to the environment*.

In this context, *external environment* means natural, physical surroundings such as air, water, flora, fauna and non-renewable resources such as fossil fuels and minerals. This requirement is narrower than the subsection (2) requirement as it does not deal with health and safety, for example.

The description does not have to be divided into activities, as in the subsection (2) requirement.

However, the description must cover *two parts*. In the first part the enterprise must describe its environmental impacts, and in the second part the enterprise must describe what it is doing to reduce, prevent or remedy these impacts. The environmental aspects relevant to include in the description are solely those aspects which are significant for the operation and financial development of the enterprise.

There is no positive duty to disclose. This means that the enterprise has no duty to state that it does not consider it has any environmental impacts of significance for its operation and financial development.

The subsection (1) requirement is more narrative in nature than the subsection (2) requirement. There is no direct requirement in subsection (1) to describe the relationship between the environment and the enterprise's financial performance as there is in subsection (2). However, in some cases it

may be necessary in order to aid a true and fair view of the enterprise's assets, liabilities and equity, financial position and results for the year.

There is no requirement for quantitative data, only a narrative description.

The information required should enhance the transparency of how environmental aspects are managed by the enterprise and how the enterprise's management administers its environmental responsibilities.

Traditionally there is a certain transitional period when new qualitative conditions are included in legislation on the presentation of annual financial statements. The Financial Statements Act is a framework law and therefore the enterprise has a large degree of independence in deciding whether conditions are significant enough to be included in the management review. This also applies to the subsection (1) requirement where best practice (2005) is being prepared.

Table 6 below suggests how the process of collating environmental information for the management review could be organised.

1. Start by preparing an environmental analysis of the enterprise's environmental impacts

2. Next prepare a financial analysis to identify the following:

Which of the specific environmental impacts identified which the enterprise

- (i) is causing
- (ii) could be expected to cause, or
- (iii) has caused
- (iv) could have a not insignificant influence on the operation and financial development of the enterprise.

Divide these into three categories:

Influence on the existence of the enterprise and its right to function, produce, distribute etc.

Influence on the way the enterprise works, including financially efficient production etc.

Influence on the opportunities of the enterprise to grow, increase production etc.

3. Next answer these questions:

What activities have been initiated to remediate any environmental damage caused by the environmental impacts, which are significant for operation and financial development?

How are reductions in environmental impacts taken into account in daily operations and how does this affect operations?

What initiatives and investments are being carried out to prevent the future effects of environmental impacts and what are their expected effects?

4. Incorporate the answers to points 2. and 3. in the management review.
5. If the enterprise has environmental impacts which influence one or more of the three categories under point 2., but which the enterprise has not taken initiatives to remedy, reduce or prevent, this must be stated. This situation should be assessed by the management for possible reassessment of the initiatives decided.
6. Incorporate any initiatives decided in the management review.

Table 6: Aid for the process of the subsection (1), no. 4 requirement

5.4.3 Other aspects regarding users of accounts

Many users of accounts have no prior knowledge of the link between the environmental impacts mentioned by the enterprise and the actual or potential influence of these impacts on the commercial development of the enterprise.

For example, if an enterprise describes its environmental impacts such as emissions into the air, the user of the accounts will have no immediate understanding of the consequences of these for the development of the enterprise. These should be explained.

Users of accounts can be divided into three categories; those interested in the environment, those interested in the enterprise, and those interested in both the enterprise and the environment. In preparing the annual report it is advisable for the enterprise to consider which type of user is most important for the enterprise. Below is a brief description of the characteristics of these users in relation to environment information.

- Those interested in the environment focus on the enterprise taking most possible account of environmental aspects and this group has little or no interest in the financial development of the enterprise. As users of accounts, when examining the annual report, this group is looking for information about how the enterprise manages the control function. This group is often disappointed because the annual report is not prepared primarily with this type of user in mind.
- Those interested in the enterprise do not focus on the environment, but solely on the financial development of the enterprise. This group is looking in particular for accounting information about the future of the enterprise and how it manages the forecast function. They are only interested in environmental aspects and the requirements in subsection (1) and (2) if these will have a direct effect on the development of the enterprise, its risks and opportunities.
- The final group is the mixed group, interested both in how the enterprise tackles its environmental responsibilities and its financial development. The most important thing for this group is probably more a description of the environment which includes both the forecast function and the control function. This means that the description under subsection (1) is based on the environmental effects caused by the enterprise's environmental impacts, together with associated explanations about the possibilities of remedy, reduction or prevention. Next, this group wants to see a description providing

insight and understanding of the initiatives decided by the enterprise, including possibly a description of the monetary amounts spent in the accounting year and expected to be required in the future.

5.5 Relationship between EMA and the annual report

The two most prominent similarities between EMA and the annual report are:

1. Both EMA and the annual report focus on information which can support decisions.
2. Both EMA and the annual report (management review) highlight the relationship between financial matters and the environment.

However, despite these similarities there are also important differences.

One difference is that EMA takes its point of departure in internal users in the enterprise, while the annual report addresses external users. Before EMA information can be included in the annual report, therefore, it is important to consider whether it is significant for external users.

Another difference could be the interpretation of when information is considered significant. For example it may well be relevant for an individual division to work with EMA and achieve a saving of EUR 70,000, but in a very large enterprise the financial criterion for when an item is considered significant enough to be included in the annual report may well be EUR 1 million.

The following section reviews a number of examples of how EMA can be used to inform about the requirements in section 99(1) and (2), as well as the interface between the control and forecast functions of the annual report, and EMA.

5.6 EMA and the annual report's control function

The control function for environmental information will primarily include that the management of the enterprise report on how it has managed the environmental impacts which are significant for the enterprise's financial position and result.

In this connection, EMA information can be used to provide a quantitative statement of how the enterprise's resources have been managed in an environmentally appropriate manner and how this has affected the income statement and the result for the year. This information could be used to describe an initiative to reduce the enterprise's environmental impacts in accordance with section 99(1), and it could demonstrate the financial relationship required under section 99(2).

The table below provides an example of how an EMA project can be relevant in reporting in the management review.

'In 2005 we implemented environmental management accounting for waste. The result of this has contributed to a 10 per cent reduction in waste generated. The value of this reduction is estimated at EUR 130,000, corresponding to an increase in the profit for the year of 3 per cent.'

Table 7: Example of a statement on environmental management accounting for waste in the management review

So, EMA can be used to quantify the influence of environmental work on the financial results.

Of course, the costs highlighted by EMA have already been reported as part of the operating costs in the income statement part of the annual report. The income statement discloses the operating costs, either divided into production costs, distribution costs etc., or divided by the nature of the costs to raw materials, salaries, etc. Therefore, the income statement does not show specific information on environmental costs allocated to activities. Therefore, it is not apparent from the income statement whether costs of waste, for example, have been calculated in accordance with EMA principles, where the value of all the activities and processes which become waste are included in the price of waste, or whether the waste has been measured merely using a traditional method. Therefore, it is not enough merely to repeat information from the income statement when incorporating EMA data in the management review.

5.7 EMA and the annual report's forecast function

The forecast function in relation to the environment is associated with the enterprise's measures to prevent environmental damage in general and thus manage risk. Prevention of environmental damage is typically linked to financial development through investments in cleaner technology etc. Similarly, management of environmental risks can demand the development of new production methods, if future legislation means that the enterprise can no longer use certain chemical substances.

The following two sections describe the relationship between investments in EMA as well as between EMA and the risks of impacts on the financial position.

5.7.1 Investments and EMA

Prevention of environmental damage is often through investments in cleaner technology etc. In accounting terms, when these investments are made they are called tangible fixed assets. This also applies in cases where an earlier investment is improved.

The basis for measuring an enterprise's tangible fixed assets (property, plant and equipment) is the cost price of such assets, most often the costs of acquisition. In some cases, EMA can play an important role in relation to subsequent improvements to fixed assets such as factory plant, machinery etc.

Subsequent expenditure relating to a tangible fixed asset that has already been recognised should be added to the carrying amount of the asset when it is

probable that future economic benefits, in excess of the originally assessed standard of performance of the existing asset, will flow to the enterprise. This means expenditure on an asset which improves the condition of the asset beyond its originally assessed standard of performance. Examples of improvements which result in increased future economic benefits include:

- Modification of an item of plant to extend its useful life, including an increase in its capacity.
- Upgrading machine parts to achieve a substantial improvement in the quality of output.
- Adoption of new production processes enabling a substantial reduction in previously assessed operating costs.

Future economic benefits are savings, increased revenues, better performance etc. realised in the year of improvement.

When using EMA for investment decisions, cost-benefit scenarios are set up incorporating the financial effects derived from variable environmental measures. That is, financial savings or changes which can be attributed to the future use of the asset are made visible.

EMA can be used to highlight more values than are traditionally considered in connection with measurement of the improvement value of tangible fixed assets.

An example:

A production line is acquired at a historical cost price of EUR 10 mill. The expected useful life is 10 years, corresponding to annual depreciation of EUR 1 mill.

After five years an improvement is made which means that the production line can be used without the use of a specific additive which is considered harmful to human health. The improvement costs are EUR 2 mill. After the improvement, it is estimated that the production line can be used for four more years than was originally estimated.

Without EMA the effect on the enterprise's annual report would look like this:

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Depreciation for the year (EUR mill.)	1	1	1	1	1	0.8*	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	12
Cost in the income statement (EUR mill.)	1	1	1	1	1	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	12

* Residual value EUR 5 mill. and improvements EUR 2 mill. depreciated over 9 years = EUR 0.8 mill.

Table 8: Illustration without EMA

Using EMA makes it likely in the following that the value of the improvement is EUR 8.3 mill. Future operation of the line can now save an annual EUR 0.2 mill. on cleaning wastewater, and the change in production can save operating costs of EUR 50,000 per shift because the additive is no longer necessary. With a normal ten shifts per year, the total reduction in the estimated annual operating costs is therefore EUR 0.7 mill. (0.2 + (10 x EUR 0.05 mill.)). The useful life of the improved production line is 9 years over which the

improvement value, including the future likely benefits is EUR 8.3 mill. (2 + (9 x EUR 0.7 mill.)).

Including EMA gives an effect on the financial development of the enterprise

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Depreciation for the year (EUR mill.)	1	1	1	1	1	1.5*	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	18.3
Costs in income statement (EUR mill.)	1	1	1	1	1	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	18.3

of:

* Residual value EUR 5 mill. as well as improvement of EUR 8.3 mill. depreciated over 9 years = EUR 1.5 mill.

Table 9: Illustration with EMA

It is clear that the actual useful value for the enterprise of the improvement is greater than the external costs incurred. This is made visible by EMA. Under normal accounting rules only the EUR 2 mill. invested will appear in the accounts, but as can be seen above, the investment has an actual added value of EUR 6.3 mill. (EUR 8.3 mill. – 2 mill.). According to the Financial Statements Act this effect cannot be recognised in the enterprise's balance sheet. The visible value of EUR 6.3 mill. can therefore not be seen directly from the published balance sheet.

However, the enterprise can decide to include the information in the management review so that with quantitative data it can show the influence of the improvement on its financial development. This statement could be in the form of table 10 below. This shows added value of EUR 6.3 mill. depreciated over 9 years.

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total
Visible value of the improved asset carried forward	-	-	-	-	-	5.6**	4.9	4.2	3.5	2.8	2.1	1.4	0.7	0	-
Increase in equity capital carried forward	-	-	-	-	-	5.6	4.9	4.2	3.5	2.8	2.1	1.4	0.7	0	-

** (6.3 mill. – 0.7 mill.) = 5.6

Table 10: Illustration of the visible added value with EMA

The enterprise could also decide to include the supplementary calculations and statement shown in the table in a supplementary report.

The special role which can be played by EMA in the annual report is therefore supplementary. This means that EMA provides the enterprise with an opportunity to calculate and report the added value accruing to the enterprise from the improvement.

5.7.2 EMA and risks of impacting the financial position

The annual report also has a forecast function to help users of accounts to understand the financial position of the enterprise.

The financial position of the enterprise means the quality of the enterprise's ability to pay. Understanding the relationship between an enterprise's financial position and its environmental situation is especially important regarding such environmental factors as can enhance the enterprise's financial position.

Two examples are described below:

- An external factor could be a requirement to remediate damage to the environment, typically soil contamination. Such costs will typically be included in the annual report as a note on contingent liabilities in the years when the enterprise's responsibility is undergoing legal consideration. If the likelihood that the enterprise will have to pay for the remediation increases, then the contingent liability will be included in the balance sheet as a provision with a corresponding reduction in equity capital. EMA could be included at this point as a supplementary element. In connection with estimated measurement of any pollution liabilities, the EMA method could be a constructive way of including several derived future financial amounts for the consequences of different clean-up strategies.
- Another external factor could be new statutory requirements. For example a ban on using certain pollutants, including the use of lead in the enterprise's products and production. Another example is the producer's obligation to take back products after use. Both changes mean the enterprise must take a position regarding their financial effects at the time the new rules become likely and thus can be expected by the enterprise. EMA could be used as a methodology to disclose the overall financial significance of the change.

5.7.3 Summary

As demonstrated in this chapter, EMA can be used to illustrate the value of environmental work and environmental investments in the annual report. However, the Financial Statements Act does not require quantitative environment-financial figures, so including EMA is voluntary.

If an enterprise wants to use EMA data in its annual report, it is important to consider whether such data is financially material for the annual report, and how the information is relevant for users of the annual report. EMA information is often calculated for internal use and therefore it is rarely designed for external use as well.

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