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**An Overview and Guide to the Literature of Environmental Accounting
Issues, Methods and Models**

**For the Masters Program in Environmental Management and Policy
Advanced Block
Environmental Management Course**

August 1996

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1 Why this paper?

1.1 Why Environmental Accounting?

From a corporate perspective, there seem to be two underlying forces driving corporate interest in various kinds of environmental performance data that might be considered varieties of accounting. The first is a growing demand from company stakeholders, based on an increased interest in environmental issues. Interested stakeholders are not only the public, and thus consumers, but also industrial customers, financial institutions and others. For this reason, more and more companies are producing environmental reports,¹ but these are often low on data content, which adversely affects company credibility on environmental issues.

The second reason for environmental accounting is for internal information purposes. This in turn has two parts. One is information on environmental issues to management. As information becomes increasingly accessible in modern society, the form the information is imparted in becomes essential. Assembling information relevant to environmental issues in a system, where various performance indicators would be readily available, would enable management to better encompass environmental concerns in the decision making process. For data processing, it is requirement that as much information as possible is expressed as quantified data. Another important incentive is the possibility of quantitative expression of objectives in environmental issues, which also implies the possibility of expressing achievements in percent of objectives and goals.

Of course, environmental issues should also be reflected in existing financial accounting systems. Today, environmental costs, revenues, assets and liabilities are often incorrectly assessed or allocated resulting in a risk for suboptimisation. The quantities involved have proved to be substantial in case studies. Some attempts to correct financial accounting systems have been made. Other modifications are also necessary. It is for instance debatable whether

¹ Deloitte and Touche, *Bšrsfšretagens miljšrapportering 1993* and *Bšrsfšretagens miljšrapportering 1994*
KPMG, *UK Survey of Environmental Reporting*, 1993, 1994
(1995 study in progress at the IIIIEE)

Deloitte Touche Tohmatsu International, IISD and SustainAbility, *Coming Clean Corporate Environmental Reporting*, 1993

companies today reflect their contingent liabilities and other such issues correctly on their balance sheets.

1.1.1 Green Ledgers

Green Ledgers² is one of the more convincing arguments for environmental management accounting that has been published. It is a report based on nine American case studies, including Amoco, Ciba-Geigy, Dow Chemical, Du Pont and Johnson Wax. The focus is on the internal reporting process and its use for monitoring and management. The authors refer especially to two accounting problems, the first being that environmental costs and benefits are intermingled with others and not readily distinguishable. The second problem is that environmental costs and benefits are often incorrectly allocated, thus leading to suboptimal management. Several comparisons with so-called ABC (activity based costing) are made. Those conversant with the terminology of "Total Cost Assessment" (see below) will recognise this focus.

Green Ledgers specifies five recommendations for managing environmental costs. They are:

- Inform decision-makers of the environmental costs they generate
- Increase accountability of managers for environmental costs and benefits
- Develop proxies that anticipate future costs and other measures of performance
- Create incentives to address the causes of current and future costs
- Incorporate environmental accounting into ongoing business processes

and then identifies three uses for environmental cost information

Σ Decision support

Σ Monitoring and directing attention

Σ Motivation and managerial control

By the word *proxies* in the recommendations, the authors mean indicators that can be used instead of monetary accounts, when these are insufficient as management tools. The proxies are necessary for evaluation of performance because, among other reasons, costs can be related to historical environmental performance. These indicators, according to the authors, can be based on the environmental data of the company, which they call "materials accounting". Much of

² Ditz, D., Ranganathan, J. & Darryl Banks, R, *Green Ledgers Case Studies in Corporate Environmental Accounting*, World Resources Institute, USA, 1995

this data is already available within the company, though not in a manageable form. The authors also point out that "There is a great need for practical work" in this field.

Interestingly, one of the problems found in the case studies is that companies with an integrated SHE management system had accounting systems that because of this made it difficult to extract environmental costs.

Crossover between environmental and accounting personnel is shown to be an important benefit of the process of implementing environmental accounts.

In the Amoco Case Study, 22 percent of non-crude (i.e. excluding the cost of buying crude oil) operating costs at the refinery in the study were deemed to be environmental. Maintenance costs were 15 percent of the environmental costs, which was more than for wastewater treatment, which was previously thought to be the main environmental cost. The study also considered environmental cost information in complex product mix situations. The Du Pont case studied the production of a certain pesticide. Over 19% of manufacturing costs were deemed to be environmental. Many environmental costs are fixed, but of these some have a variable component. The Johnson Wax Case Study also concerned a pesticide. 17% of marketing administration and 21% of personnel expenses for the product were attributed to the environment. These case studies show that environmentally related costs are substantial.

The state of Washington requires companies to prepare Pollution Prevention Plans and, as part of that work, to report environmental costs. Because of this, Washington was chosen as the site for a study of environmental accounting in smaller companies. In these companies, the cost of extensive accounting systems may be excessive. However, the case studies show that even smaller companies can gain from an inventory of environmentally related costs and benefits.

1.2 Purpose and scope of this paper

The interest in various areas of environmental accounting has grown substantially in the nineties and with it has come quite a large number of publications. This has more or less gone unnoticed at a good deal of business schools, however, and students have in my experience had difficulty in finding the literature which has resulted in a large amount of boring telephone calls from

management students who wish to do "something on the environment" and have, after three or four years at the university, not come across a single thing that leads them into environmental issues. Hopefully, this paper can alleviate that and save me some tedious repetition.

More importantly, the Masters Program of the IIIIEE, now about to embark on its second year holds two courses in environmental management, the second of which will go into environmental accounting issues to some extent, and this paper is meant to complement the available management literature, which treats environmental accounting rather lightly (and rather over-emphasis environmental management systems in my, biased, opinion). It is also intended to serve as a stepping stone to the "real" literature on the subject, and thus be of help in thesis writing.

The ambition is thus only an overview of the subject and a guide to the literature, rather than in depth analysis. For that, readers are referred to the sources mentioned here, as a start, and then to their own devices. Of course, I should also refer to my own upcoming thesis, but the reader is recommended not to idly wait for it.

This paper contains nothing about why the environment is important in the first place and is guaranteed to be free of reference to the Rio Conference. Instead it launches straight in to an overview of literature of environmental accounting. Perhaps more controversially, I have left out the issue of environmental auditing, which is a broad enough subject area in itself and is only partially an accounting issue. The same can be said of LCA which, however, I have included briefly, as this has been done by a good deal of the authors who's works I refer to here. Personally, I am hesitant to include LCA under environmental accounting, mostly because to me the core competency required in LCA is not accountancy but engineering and natural sciences, but this will be taken up in more detail in that section.

1.3 Structure of the report

The following section, "What is accounting, is a brief introduction to accounting intended for those who have other backgrounds. The IIIIEE is a multidisciplinary institution, and some readers will have backgrounds in law or engineering. For those who already are familiar with the field of accounting in general, I beg you not to read it but go on to "What is Environmental

Accounting”, which is meant as a general introduction to the subject area, and is followed by sections which more specifically refer to various types of or approaches to environmental accounting, including TCA, FCA, LCA, EPE and environmental reporting. Each section contains references that are relevant to the issues brought up. Naturally, not all authors have had the kindness to follow the classification of the subject that I have chosen and have written on several subjects. To the extent that there is any theoretical analysis in this paper, it is mostly concentrated in the section called “Environmental Accounting - A Contradiction in Terms?”, which is to a certain extent a criticism relevant to LCA.

2What is Accounting?

According to the American Institute of Certified Public Accountant in 1961 “Accounting is the art of recording, classifying and summarising in a significant manner and in terms of money, transactions and events which are, in part at least, of a financial character, and interpreting the result thereof.” In other words, accounting was then seen as being about keeping track of money and interpreting the results. More recently the interpretation has changed to “information about the financial position, performance and changes in financial position of an enterprise that is useful to a wide range of potential user in making economic decisions”.³ Here the concept of decision-usefulness is central. The decisions to be made are still economic, but the information used can be in other forms than money. Thus there is a trend towards broadening the issues within the sphere of accounting.

In general, accounting is divided into financial accounting, which is regulated by laws, standards and guidelines and is intended for external users such as shareholders and tax authorities, and management accounting, which is intended to help decision makers within the company, is not public, and can basically be anything they happen to find useful.

2.1Financial Accounting

Financial accounting is basically composed of the income statement, showing how much the company has earned and the balance sheet, showing how much it owns and owes. These can be complemented by a cash flow analysis and, together with prolific notes and descriptions in text,

³ IASC, 1989

are what are printed in the annual reports. Naturally, there is an entire corporate function devoted to the daily work of getting the information together, but those in need of further information on that and other aspects should refer to one of the many available textbooks on the matter. For reference, some basic ingredients in the statements are listed below. Terms and structure vary somewhat, despite standardisation attempts.

Profit and Loss Statement

(Income statement)

Turnover
- Operating expenses
= Operating profit
+/- Financial income and expenses
= Profit after financial items
+/- Extraordinary income and expenses
= Profit after extraordinary items
- Allocations (profit adjusting entries)
- Taxes
= Net profit

Balance sheet

Assets

Long term assets (property, buildings, machinery and equipment, intangible assets, shares)
Inventories and current assets (Materials and supplies, finished goods, receivables, bank and cash)

Shareholders equity and liabilities

Shareholders equity (nominal value of stocks, legal reserves, retained earnings, net profit for the year)
Liabilities (various loans, pensions, other)

Cash Flow Statement

Funds provided from operations

Operating profit (turnover-expenses)
+ Depreciation (added, because it should be subtracted from expenses as it is not cash)
+ Financial income and expenses
+ Extraordinary items
- Taxes
+/- Change in working capital
Inventories, increase-, decrease +
Current liabilities, increase-, decrease +
= Cash flow from operations
+/- Investments
- Capital expenditure
+ Decrease of fixed assets and other changes
= Cash flow before financing
+ Financing
= Change in liquid funds according to balance sheet

Provisions: Provisions in the balance sheet can be made for expenses which the company is committed to covering, but which are not yet realised. These may include pension liabilities, termination and restructuring costs, guarantee liability and claim compensation.

Contingent liabilities: Contingent liabilities are liabilities that are liabilities

that are known to exist, but that the amount of which is uncertain, or liabilities of substantial amount that probably, but not certainly, exist.

2.2 Management Accounting

2.2.1 Interest

The concept of interest⁴ is fundamental to management accounting concepts like the net present value. Interest reflects the idea that if you are to receive some money, you would usually prefer to have it right away, whereas if you on the contrary owe, it is often expedient to put off paying until, say, after your next pay check. This would be fine if everybody else wasn't of the same opinion, except that all else being equal they would rather that they themselves made use of the money.

In an enterprise, external funds are often necessary to get the business going but, not surprisingly, people are hesitant to part with their money, without some compensation. They also usually want something for the risk they are taking that they won't get their cash back. Another complicating factor is that the value of money actually decreases over time, which we call inflation, referring to rising prices.

2.2.2 Capital Budgeting

Capital budgeting is a process with which companies decide how to use their funds. Money is always in short supply and capital budgeting is an attempt to answer the question of where money is best spent. The term investment appraisal is virtually synonymous, when applied within a company.

⁴ The charging of interest was forbidden in medieval Christianity and still is by some interpreters of the bible. The same is true of Islam. As the need to borrow money existed even in medieval times, the job of lending was left to Jews, who in the Christian mind weren't going to heaven anyway. Many other occupations were simultaneously forbidden, so that the word Jew became more or less synonymous with money-lender. The lending of money is also what led to a need for accounting, which was also started off during the middle ages, so it must be a good idea.

In the classic schoolbook case, two or more possible investments are compared on the basis of their respective pay-back times or internal rates of return, figures that are computed based on the initial investment and expected gains from it. Figures included in the analysis are thus:

Σ initial outlay

Σ expected cash inflows and outflows

Σ discount rate

or else an investment is compared to the alternative of not making the investment using a required rate of return and the net-present-value (NPV) of the investment.

3What is Environmental Accounting?

3.1The Definitive Introduction to Environmental Accounting

Probably the most well-known book, at least in Europe, on environmental accounting is "Accounting for the Environment" by Rob Gray⁶. Rob Gray is a professor at the University of Dundee, leads the Centre for Social and Environmental Accounting Research, CSEAR and is perhaps Europe's leading authority on environmental accounting.

The book, published in association with the Chartered Association of Certified Accountants, ACCA, takes an accountant's perspective to environmental issues and discusses how accountancy can and should contribute to sustainable development, and the limitations to what can be done within a system of monetary accountancy. The book is written for the non-expert and starts with a fairly substantial introduction to the issues. This probably has contributed to it becoming the standard introductory book to environmental accounting, at least in Europe. After the introduction, the book views environmentally accounting from three perspectives, discussed separately. They are:

Σ environmental accounting for management purposes

Σ environmental accounting for external relations

Σ accounting for sustainability

Thus the subject of environmental accounting is very broad encompassing environmental reporting, environmental performance evaluation and indicators, environmentally related capital

⁵ Horngren, Charles T. *Introduction to Management Accounting*, ninth edition, Prentice Hall, 1993

⁶ Gray, Rob, *Accounting for the Environment*, Paul Chapman Publishing Limited, 1993

budgeting (though this receives relatively little attention in the book), elements of environmental auditing and management, life cycle analysis and issues of sustainability.

In the beginning of the book, Gray shows through survey data the unsurprising result that accountants are not innovative, but instead are a barrier force to environmental accounting. This result is largely supported by experience in action research at the IIIIEE, where the experience is that accounting departments in the businesses where research is conducted often are the most resistant to change for environmental improvement. Gray goes on to point out that business has not done much in the way of accounting for environmental issues and emphasises that budgeting and investment and performance appraisal, today largely unchanged, must be affected for organisation to improve its environmental performance, as they are processes at the heart of decision making. The process should not be embarked on lightly. Gray points out that adopting an environmental policy is a major step for an organisation and potentially contentious. If serious, the implications are far reaching, if not, the repercussions can be severe. There is no panacea. Each company may choose different ways of developing its policy.

Other important points in the book are the need for care in auditing terminology, a point that has been commented on extensively by Mikael Backman at the IIIIEE.⁷ In his analysis of LCA Gray concludes that it cannot fulfil its aims, and that principal benefit of LCA is in the process (and in this sense it is like budgeting and cost-benefit analysis). This conclusion is also borne out by research at the IIIIEE.⁸ Gray also points out that the use for environmental accounting is more obvious when accounting for waste and energy than in the general case, as it then is relatively easy to show how it can be of help for business and environment - a conclusion which would seem to be supported by the relative success of Total Cost Accounting schemes.⁹

In respect to environmental financial accounting, for external purposes, Gray maintains that it is the providers of funds that must show interest in environmental financial information. He recommends that external financial reporting should include disclosure of accounting policies, and identification of income, expenditure, investment and actual and contingent liabilities related to environmental matters, tax effects, energy, waste, compliance, packaging costs and

⁷ *Miljörevision som ledningsverktyg*, Published by Nordiska Ministerrådet

⁸ Especially by Thomas Lindhqvist

⁹ Such as *MILA* by Mats Magnell, IIIIEE

environmentally related fines and damages. In the end, however, his conclusion is that "reporting and accounting for the environment cannot be entirely satisfactory within a conventional financial accounting framework - other forms of non-financial accounting become necessary". This follows from fundamental scientific theory. A multidimensional reality can not be correctly portrayed in fewer dimensions, information is lost. Of course, financial accounting systems do not even provide a completely accurate description of the financial state of a company, but they are more fundamentally flawed when attempting to reflect non-financial issues.

As for non-financial environmental information, Gray denotes current practice as more advertising than information, with no best practice worth mentioning and deems regulation necessary. The book does not, however, bring up the dangers of poor legislation.¹⁰ He also refers to the ACCA awards for environmental reporting, a European reward scheme he is involved in and an excellent reference on the evaluation of environmental reports.

The overall conclusion is that accounting for sustainability is a long way off. As a first step, sustainability reporting would require accounting for through-flow of renewable and non-renewable resources. This is a step that we now, only three years after the book was published, see several companies and at least one country's legislators moving towards. In the end, however, Gray is of the opinion that incremental change can never be enough and a change of paradigm is necessary to achieve sustainability. As he pointed out at lectures at the IIIIEE, the interpretation of sustainability is political, which must mean that so are the means to achieve it.

An earlier report by Rob Gray was influential in another way, in that it came early (1990) in the European debate on environmental accounting and had the added weight of being a Certified Research Report from The Chartered Association of Certified Accountants. It is called The Greening of Accountancy, The Profession After Pearce in reference to an influential report by David Pearce (Blueprint for a Green Economy also called the Pearce Report) commissioned and endorsed by the Department for the Environment under Secretary of State Chris Patten. The Pearce Report concentrates on market-based rather than regulatory mechanisms and talks about identifying both man made and environmental capital. Gray's report contains more theory than

¹⁰ I have commented extensively on legislation and environmental reporting in a separate paper, available from the IIIIEE.

his later book, introducing systems theory, and shows how traditional accounting is tied to an economic view of the world, together with some failures of that view, referring to the work of Herman Daly (Daly, H.E. (ed.) *Economy, Ecology, Ethics: Essays toward a steady state economy*, W.H. Freeman, San Francisco, 1980). An example of the criticism is the following paragraph from Gray's report:

Thus we reflect in accounting (a) the notion that property rights bestow upon the holder the right to destroy the thing owned. We reflect the principle that ownership does not have a concept of stewardship tied to it; and (b) only those things over which property rights exists can generate price and thus the commons (air, sea etc.) and those aspects of the thing owned not reflected in the price (e.g. land's ability to support animal life) cannot be part of accounting's pictures.

and further

Economic reasoning is founded upon a particular form of consequentialism [ethical reasoning based on the value of an action being in its consequences] - utilitarianism. At its simplest all actions are evaluated by reference to the net benefit deriving from the action. Benefit and detriment are analysed in terms of the utility and dis-utility generated. Utility, however, is a very general term which, in the work of [John Stuart] Mill had important philosophical, psychic and spiritual connotations. It cannot be measured. In modern economics (and thus in accounting) utility has become reduced to financial flows and thus the actions which generate the greatest financial wealth (i.e. the greatest GNP ...) become, by implication, the most ethical.

3.2 Others on Environmental Accounting in General

A group of researchers and consultants have recently put together a report on environmental accounting for British Telecom¹¹. It is a combination of an overview of a number of cases with the intent of assessing the potential for establishing a comprehensive set of accounts for BT and

¹¹ Tuppen, C. (ed.), *Environmental Accounting in Industry A practical review*, BT Corporate Relations Environmental Issues Unite, Room A245 BT Centre, 81 Newgate Street, London EC1A 7AJ, tel. 0171 356 6696, fax. 0171 356 6915

current trends and practice in environment-related management accounting by leading companies in North America. Some of the main conclusions include a need for standardised definitions and for improved identification and allocation of significant environment-related costs, such as waste disposal.

Martin Bennet, from the University of Wolverhampton, who was involved in the study says¹² that most of the work done on accountability to outside world. He sees the following main accounting issues:

- liabilities
- expenditure (aggregate environmental)
- tracking/costing
- capital expenditure appraisal
- externalities

He pointed out that the environmental expenditure figure is required by the SEC (US Securities and Exchange Commission), but even they can't say what it can be used for. Bennet also pointed to two variables in the delimitation of environmental cost accounting, differentiating between *scale*, which is the level of detail, and *scope*, denoting the types of costs included, such as direct, hidden, product-chain or externalities.

*Business and Environmental Accountability An Overview and Guide to the Literature*¹³ in the Stanley Thornes Business and the Environment Practitioner Series contains 235 references with short descriptions as well as addresses and telephone and facsimile numbers for orders. The work is divided into the sections The Green Challenge to Business, Legislation and Policy, Stewardship and Accountability Today, Stewardship and Accountability Tomorrow and American Experience. It does not contain much own material, but sticks to being a guide to what has been done written for the practitioner who is just starting and needs information

¹² Expert seminar on decision models held by the IIIIEE in cooperation with UNEP and VTT, Finland

¹³ Grayson, L., Woolston, H. & Tanega, J. *Business and Environmental Accountability An Overview and Guide to the Literature*, Stanley Thornes Business and the Environment - Practitioner Series, Customer Services Department, Stanley Thornes Limited, Ellenborough House, Wellington Street, Cheltenham, Glos. GL50 1YD, tel 0242 228586, fax. 0242 221914

The highly normative *Business, Accountancy and the Environment: A Policy and Research Agenda*,¹⁴ from ACCA, gives an no-nonsense impression, comprised of 123 pages, packed with text, no pictures. It is about what should be disclosed in the authors' opinion. The authors identify two challenges, integrating scientific and technical information with financial and extension of accounting to encompass externalities. They consider that environmental disclosure should include policy, identity of persons responsible, measurable objectives, action taken, expenditure incurred, impacts on the environment, extent of compliance with regulations and guidelines, adherence to standards, significant risks and results of audits. If the information is not in annual report, the authors are of the opinion that a reference in the annual report should be made to the document were the information is.

Some of the major conclusions in the Agenda are a need for:

- Σ better management in companies,
- Σ use of fiscal instruments in government policy,
- Σ improved audit procedures and
- Σ standards set by Stock Exchange, Standards Board etc.
- Σ more research.

In general there seems to be a concentration on TCA and LCA in the USA, whereas in Europe (especially GB), there is more discussion on the fundamentals of accounting, accountancy and accountability.

One variable in the general discussion is whether, or to what extent, environmental accounting should be monetary. To some extent, this must of course be dependant on the nature and purpose of the accounts. Most seem to agree that there is an overlap, as in the figure below, but the question is how large.

¹⁴ Macve, R. & Carey, A. (ed.) *Business, Accountancy and the Environment: A Policy and Research Agenda*, The Institute of Chartered Accountants in England and Wales, Chartered Accountants' Hall, Moorgate Place, London EC2P 2BJ, 1992

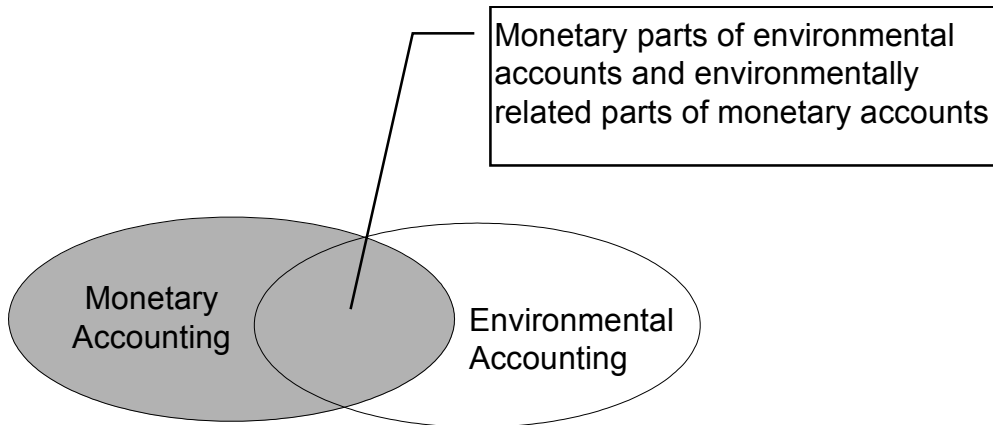


Figure 1: Overlap between monetary and environmental accounting systems.

Obviously, an overview of this type can never be complete, or else it is no longer an overview. Some other "big names" to look out for in the search for sources on environmental accounting are for example David Owen, Roger Adams (ACCA) and Stefan Schaltegger.

3.3 More Uses for Environmental Accounting

3.3.1 Benchmarking

Benchmarking has been called "a continual and systematic process to compare your own efficiency in the form of productivity, quality and process with those companies that represent the best".¹⁵

The process of benchmarking can be described as follows¹⁶

1. Decide a performance indicator that measures how well an organisation performs in an area.
2. Find out who is the best in this area
3. Find out how good they are and analyse why
4. Try to achieve their value of the performance indicator.

¹⁵ Karlšf, B. & ...stblom, S. *Benchmarking, VŠgvisare till mŠsterskap i produktivitet och kvalitet*, Svenska Dagbladets Fšrlags AB, 1993

¹⁶ Spendolini, Michael J. *The Benchmarking Book*, Amacom, 1992

If this is true, then the problem with environmental benchmarking will arise at point one, finding a comparable environmental performance indicator (see below under problems with indicators). This would explain why successful cases of environmental benchmarking are hard to find.

One of the few things written on environmental benchmarking and is GEMIs *Benchmarking: The Primer*,¹⁷ which has the added advantage of being short and distributed free to students.

3.3.2 Motivation

An important aspect of performance measurement is its effect on motivation of personnel. The well known book *In Search of Excellence*¹⁸ emphasises small groups and performance measurement that is communicated often as key success factors. A few illustrative quotes:

- *Bringing financial information down to the shop floor is a major step in bridging the gap between management and labor; more than any other single act, it makes the goals explicit and the nature of the partnership concrete* - Fortune (on GM)
- *Nothing is worse for morale than a lack of information down in the ranks. I call it NETMA - Nobody tells Me Anything- and I have tried hard to minimize that problem.* - Ed Carlsson (President, United Airlines)
- *A man wouldn't sell his life to you, but he will give it to you for a piece of colored ribbon* - William Manchester (on W.W.II)

The challenge is to break down indicators to a small group or (if it is culturally acceptable) to the individual. The Swedish transport company ASG is working on indicators that would evaluate down to the level of the individual trucker on environmental performance (fuel consumption, wear on vehicle). These indicators, if implemented, would then be used in a competition with substantial prizes for the winners. This constitutes a powerful cultural

¹⁷ Global Environmental Management Initiative (GEMI) *Benchmarking: The Primer Benchmarking for continuous Environmental Improvement*, 1994, GEMI, 2000 L Street, N.W., Suite 710, Washington, D.C. 20036, tel. 202-296-7449, fax. 202-296-7442

¹⁸ Peters, Thomas J. and Waterman, Robert H. Jr. *In Search of Excellence*, HarperCollins, 1982

instrument and could bring environmental issues and corporate goals into the daily thoughts of individual workers.¹⁹

An interesting aspect of indicators designed for motivation and personal or group performance evaluation is that they do not need to be scientific or have the ambition of being objective measures of anything at all. They need to reflect management goals and need to be accepted by the individuals being evaluated.

3.4 Environmental Accounting - A Contradiction in Terms?

The issues around environmental accounting have not yet been sufficiently penetrated for a theoretical framework to be established. Indeed, it is unclear whether environmental accounting is necessarily a separate subject area (a question which well can be raised for accounting in general). Many aspects require multidisciplinary knowledge, having elements of sociology, behavioural science, engineering, biology. Voices have also been raised to the effect of environmental issues being far too important to allow accountants to have a major role.

Key terms are accountability and legitimacy. The environmental debate seems to indicate a growing sentiment that firms are accountable to society for their impact on the environment. Another question is whether the environment is accountable. One approach is to attempt a comparison of economic value added with ecological value lost. This assumes all kinds of things, most fundamentally that economic value added is good and ecological value lost is bad, i.e. a moral assumption which by no means is uncontroversial. It also assumes that the term "ecological value" makes sense, is unambiguous and is measurable, which I personally hold is absolute nonsense. Of course, one can get around the theoretical difficulties by attaching a value by political decision.

The idea of accounting for the environment often implies some type of evaluation. Total Cost Assessment deals only with corporate costs and does not include externalities, thus the evaluation is simply (present value of) effect on cash flow, though this can be tricky enough to

¹⁹ Swahn, Mats, Environmental Manager ASG AB, lecture, 1995

establish. Most other methods of monetary accounting attempt to include externalities, which can be evaluated by at least three different types of methodologies:

- Σ socio-political
- Σ socio-economic
- Σ natural science

The socio-political are such that are derived from political goals and policies. The natural science approach is instead based on estimations of the environmental impact on the environment. Socio-economic tools evaluate how people value various assets in nature, such as a lake where you can swim or fish. The evaluation, commonly done with the help of a questionnaire or reference group, can be by direct question or indirect, for example by asking how far a person is prepared to travel to swim in a clean lake and by evaluating the cost of travel arrive at the value of the lake.

Nature is what natural sciences sometimes describe as a chaos system. Basically, we can never exactly know the full consequences of our actions in nature, for the same reasons that we cannot accurately predict weather for more than a rather limited time horizon (and often not even then). The natural sciences can give us some clue on effects, but can not make the moral evaluation of what is most important. For example, the effects of Chernobyl may be compared to ozone depletion on the basis of number of deaths in cancer with some degree of accuracy, but can we ignore all other effects? Are all lives of equal value? The questions become even more difficult, if you compare with acid rain or climate change. How much dead forest is equivalent to wiping out Bangladesh (or the Netherlands)?

Accounting systems are based on linear relationships. An asset of the value 2 is twice as much as one of the value 1. Environmental accounting often attempts to mirror values, but these are not linear functions of emissions or any other available data. For example, one model uses an LCA methodology to assess all the emissions that a product leads to and adds them together on the basis of human toxicity. But a human does not react in a linear manner to toxins. Ten doses of one tenth the size, do not necessarily lead to the same effect as on big dose. But this is just part of the problem. Giving ten people a dose of a toxin that would be lethal at ten times the dose is not in most peoples minds morally equivalent to poisoning one person, who dies. One of

the nice things about nature is that it varies, but for accounting, this has the drawback, that an emission at one site is not equivalent to the same emission at another, except perhaps for carbon dioxide, which has only global effects.

Environmental accounting can thus at times be positivist descriptions of value judgements, describing changing social values with quantitative indicators that imitate indicators measuring out of pocket costs, where positive measurement is possible and appropriate. Even in management applications, questions of culture and innovation are often ignored.

A key concept in management accounting is decision usefulness. Perhaps in answer to this, environmental accounting efforts are sometimes described as decision models, of which there are by now a large number in circulation. These use data on emissions, energy, raw material etc. as input to models which ostensibly help in business decisions. The problem is that since the evaluation of various environmental effects is an ethical decision, the decision models have moral implications, are normative, and thus imply an ethical decision already made. The valuation of environmental effects can also be seen as strategic business decision, meaning that the decision to use decision models is more strategic than the result. Decision models can therefore instead be viewed as power instruments conveying a certain position in a convincing fashion. It is also not surprising that models like LCA often are used in the political arena. The state of the art of LCA is such that it is based on political valuation of impacts and the results are therefore most relevant when presented to the politicians who's values the LCA intends to reflect.

In the light of the above discussion, it is questionable whether "environmental accounting" belongs in the realms of accounting at all. Many of the current efforts are perhaps more appropriately analysed in the field of marketing. This brings us back to the concept of legitimacy. The reverse side of the notion that firms are accountable is the need felt by a growing number of business leaders to seek a new legitimacy for their actions from an environmental perspective. This need can perhaps better explain many of recent efforts in environmental accounting and management than the economic concepts of rationality. A relatively early reference in this debate is Georg Winter, *Business and the Environment*, McGraw-Hill, 1988 (original German title: *Das umweltbewusste Unternehmen*, C.H. Beck'sche

Verlagsbuchhandlung (Oscar Beck), München, 1987). A very interesting paper, available from the IIIEE, is *The Alpha Case* by Ralph Meima.

The debate on what environmental accounting is, if anything, will in all probability go on for some time. Professor Hans Blokdiik, of the Limperg Instituut, equates environmental accounting with records of inputs and outputs of environmentally harmful material²⁰, thus completely avoiding issues of valuation and coming close to environmental performance data as described below. An outspoken group of British researchers (including Rob Gray) see environmental accounting as a development of social accounting. David Owen²¹ has pointed out that the lessons of social accounting are being forgotten and that much good research of the 1970s is quite usable, but ignored. Fundamental for the social accountant's view seems to be that eco-balance type efforts lead to eco-efficiency but not sustainability, as sustainability also contains social elements.

3.5 Some General Environmental Accounting References

Bergström, Sören, *Naturekonomi*, Carlssons, 1995 (Also translated to English)

Magnell, Mats, *Miljörelaterad Investerings- & Lössamhetsanalys* (Lic avhandling), Internationell Institutet för Industriell Miljöekonomi, Lunds universitet, 1993

Gray, Rob, *Environmental Accounting*, ACCA, Paul Chapman Publishing, London, 1993

Daryl Ditz, Janet Ranganathan, R. Darryl Banks, *Green Ledgers*, World Resources Institute, 1995

Grayson, L. Woolston, H. *Business and Environmental Accountability An Overview and Guide to the Literature*, Business and the Environment - Practitioner Series, Stanley Thornes, 1994

US EPA, An Introduction to Environmental Accounting As A Business Management Tool: key Concepts And Terms, EPA 742-R-95-001, June 1995

3.5.1 Periodical Publications

Business Strategy and the Environment

Tomorrow

²⁰ Lecture at EMAA Conference 951130

²¹ David Owen, at EMAA Conference 951130

3.5.2 WWW Sites

Lund Environmental Data Base,

<gopher://gopher.ub2.lu.se:70/7waissrc%3A/WAIS/envir/miljodatabas>

US EPA, <http://www.epa.gov/>

Nortel, <http://www.nortel.com/english/environ/habitat.html>

ICI, <http://www.demon.co.uk/ici/she/>

CSEAR, <http://www.dundee.ac.uk/Accountancy/csear.htm>

CICA

Tellus Institute, Boston, <http://www.tellus.com/tel2.html>

National Pollution Prevention Center for Higher Education

University of Michigan, Dana Building, 430 East University, Ann Arbor MI 48109-1115

tel) 313-764-1412, fax) 313-936-2195, E-mail nppc@umich.edu

<http://www.snre.umich.edu/nppc/nppc.html>

CNN - Environment News Main Page, <http://www.cnn.com/EARTH/index.html>

4 Models for Environmental Accounting

4.1 Total Cost Assessment

The term Total Cost Assessment is attributed to Allen White at the Tellus Institute and the US EPA, who in the so called EPA Purple Book²² originally made the Hierarchy of Environmental Costs known to the world. The hierarchy is comprised of four tiers:

Tier 0: Direct costs associated with capital expenditures, raw materials, other operating and maintenance costs, etc.

Tier 1: Hidden regulatory costs from activities such as monitoring and reporting, etc.

Tier 2: Contingent liabilities arising from remediation of contaminated sites, fines and penalties for non-compliance, etc.

Tier 3: Less tangible costs and benefits from consumer perceptions, employee and community relations, etc.

It is important to recognise that a TCA does not include externalities. Effects on others are only included to the extent that they somehow are brought back to the company in the form of effects

²² US EPA *Pollution Prevention Benefits Manual* (October 1989)

on image and goodwill and thus have an economic effect on the company in terms of sales, employee motivation, marketing etc. Life cycle costs, such as the cost of product disposal or costs for use of the product are thus not included in a TCA, unless they actually affect the company.

An easily available source on TCA is the GEMI (Global Environmental Management Initiative) *Finding Cost-Effective Pollution Prevention Initiatives: Incorporating Environmental Costs Into Business Decision Making a primer.*

The aim of the primer is to help companies find cost-effective pollution prevention initiatives by using TCA. This is quite rightly the advantage of TCA. One can say that TCA is Cleaner Production in terms of money. Preventive initiatives, analysed with TCA, look much better in comparison with end-of-pipe approaches, and indeed in comparison with no pollution control at all, than is the case in comparison using conventional investment appraisal. It is therefore important to realise that TCA is not fudging the numbers, but deals with real corporate costs. It is merely a more in depth analysis of environmental costs in particular.

The Primer presents and explains the four tiers and gives examples. It is short and easy to follow. It also contains a section on Full Cost Accounting, which is interpreted as an institutionalised TCA, so that the type of costs in a TCA are incorporated in an accounting system, making TCAs almost automatic, once the accounting system is in place. Experience at the IIIIEE shows that a TCA is a demanding process, and is not feasible for each individual investment. Thus an accounting system including and allocating these costs is necessary if total cost assessment is to become standard procedure.

The use of the term FCA to denote an accounting system involving the four tiers is, however, not entirely uncontroversial, as the same term is used to describe accounting systems that go beyond company costs and involve externalities. Such accounting systems are described below under the heading Full Cost Accounting.

Most of the work done on TCA is American, and references are mainly available through the US EPA and the Tellus Institute. The IIIIEE has presented a model called MILA, for Swedish

applications, which has been applied in a number of case studies, but they are currently only available in Swedish. A major difference between Europe and the United States is that liability costs in Europe are usually far lower, even negligible. Compliance costs can, on the contrary be fairly substantial. The experience of application of MILA is that tier 0 is the most important for two reasons. Firstly, the costs involved are often most substantial at this level. Secondly, they are the most tangible, thus strengthening the cleaner production argument. A useful tool is the mass and energy balance. By attempting to establish all material and energy inputs and outputs in a process, many previously unaccounted for costs can be found. The higher tiers become successively less tangible. One of the weaknesses of TCA is the extreme difficulty of evaluating tier 3 costs. The Table below, from Green Ledgers, gives some sources of information on costs, mostly of the type which would be found under Tier 0 and Tier 1 in the TCA system.

Environmental Costs	Information Sources
Permitting Fees and Fines	Regulatory Documents Management Estimates
Maintaining Environmental Equipment	Maintenance logs Service Contracts
Non-Product Output	Emissions estimates Production Logs
Process Penalties/Shut-downs	Operating Records
Depreciation	Capital Asset Ledger
Monitoring	Engineering Estimates Management Estimates
Environmental Auditing	Management Estimates
Training	Personnel, EHS Record Management Estimates

4.2 Full Cost Accounting

At least one book exists on Full Cost Accounting, by the Canadian Daniel Blake Rubenstein entitled *Environmental*

Table 1: Sources of information on costs (source: Green Ledgers, see above)

*Accounting for the Sustainable Corporation, Strategies and Techniques.*²³ The view of FCA expressed in the book is a system of accounts based on society's costs and benefits, rather than only the company's, in other words including externalities. Look here for definitions of terms like 'intergenerational equity' and 'invisible stakeholder' and other sustainable development related concepts. Look also for different valuation methods and information on forestry. The book is based on a case study on Canadian forest industry. The accounts are thus developed for an industry very closely based on a living natural resource, meaning that many environmental costs may actually be company costs in the long run. However, it is not very clear how the

²³ Blake Rubenstein, Daniel, *Environmental Accounting for the Sustainable Corporation, Strategies and Techniques*, Quorum books, 1994

proposed accounting system would be implemented on a company in a less obvious relation to the environment.

The argument for full cost accounting seems to be that the full costs for society are relevant to the company, since society sooner or later will be wanting to make the company pay for its full costs, in some cases even for today's activities. One example cited is Love Canal, a site where a chemical company buried huge amounts of chemical wastes in the 1950s. In such cases the current owner can be considered liable. (Another example would be extended producer responsibility, if it were applied to products already produced.) [To me, there are problems with this argument, because it seems that though some such full costs might become liabilities, others (perhaps most) probably will not.]

4.3 Life Cycle Analysis, Inventory and Costing

The concept of product life cycles and the producers responsibility for environmental effects both before raw materials and energy enter the factory and after the product is sold has become widespread. This is an important step, as many products, such as cars and washing machines, have their largest environmental impact in use, rather than production. For other products, it is the disposal that is environmentally hazardous. In the beginning of the life cycle, it is not uncommon for a factory to have quite low impact, if for instance the factory mostly assembles finished parts, whereas the environmental effects of the goods and services (such as transportation) that the factory orders can be quite large.

Life Cycle Analysis is an attempt to quantify the effects of a product from the cradle to the grave, or preferably, in a sustainable society, from cradle to rebirth. This means that the LCA of, for example, a chair, takes in account not only the environmental impact from the factory that bends the metal and shapes the wood, but all the way to the mining of the metal, the making of the paint and the forestry that produced the wood. But even this is not enough. The machines used in the forestry and mining are large emitters of NO_x, CO, VOC and CO₂ and must be included. One might then ask who produced these machines.

Obviously then, no LCA can be complete. One must choose limitations so that major effects are included, a problem which is not insurmountable, but opens up for criticism and bias. This first

step of the LCA is called a life cycle inventory (LCI). Some companies choose to stop at the LCI and not go on to the next step of an LCA which is the evaluation of the various impacts. This is where some kind of weighting is added so that the various impacts can be added together. Weighting has been discussed above under the heading "Environment and Accounting - A Contradiction in Terms?". An additional evaluation can also be done to convert the LCA to monetary terms. It is then usually termed LCC for life cycle costing, but other terms exist. As one researcher, Jan-Jaap Bouma, put it, one would expect to have to attach different costs for different purposes. The purpose of an LCA, however, is far from always clear and can range from product design to marketing and lobbying.

An attempt at standardisation is underway by the International Standards Organisation, better known as ISO. The effort is a part of the ISO 14000 - series pertaining to various issues around environmental management (management, audits, performance evaluation and LCA). The parts about LCA are have numbers in the 14040s. The following elements are currently under study:

- Σ ISO 14040 General Principles DIS version
- Σ ISO 14041 Inventory
- Σ ISO 14042 Impact Assessment

Enthusiast and critics of LCA abound. Lester B Lave, of Carnegie-Mellon University, argues that "LCA can be useful. It cannot be accurate. It is a tool for decision help. If it doesn't help don't use it."²⁴ At the same time, he pointed to the effect of an LCA of an electric car done by GM, that shows total emissions of lead being 5-60 times greater than for gas cars, which has been very important for political decisions in California. Lave also pointed out how LCA can be very useful for lobbying (though he did not use the term). Interestingly, he also, in answer to a question of whether LCA hinders innovation by being biased for established products asserted that this was the case, but that he regarded that bias as acceptable in accordance to the precautionary principle.

Some available, largely LCA based so-called decision models are:

- Σ DESC, TME, The Netherlands
- Σ MUST, ViSolution, Finland
- Σ MARKAL, ECN, The Netherlands

²⁴ Expert Seminar on Decision Models held by the IIIIEE in cooperation with UNEP and VTT, Finland

- Σ NAM, NAM, The Netherlands
- Σ EBSE, EBSE, Austria
- Σ Input-Output Analysis, Carnegie-Mellon University, Pittsburgh, USA
- Σ REIM, TNO, The Netherlands

4.4 Environmental Disclosure in Annual Reports

Environmental issues can be addressed in a number of places in an annual report, in separate pages, in a description of activities or organisation, in the director's remarks or in the actual income statement and balance sheet. Rules for bringing up environmental issues in the annual reports are being discussed in a number of fora, the Swedish government committee mentioned above is one of them. Another, and potentially more influential is the Accounting Advisory Forum of the European Union, which has published an advisory document for the European Commission²⁵ regarding "Environmental Issues in Financial Reporting". The document has no legal status but may heavily influence future legislation in EU countries.

The ambition of the Forum was not to present a new standard but to give guidance as to how current practice for annual reports should be applied with respect to the environment.

The Forum define environmental expenditure as costs of preventing damage but not fines and other costs of non-compliance with legislation and refer to EUROSTAT, the European Bureau of Statistics. For environmental expenditures, the Forum recommends separate disclosure, both for those expensed and those capitalised.

In previous research for the Swedish Bureau of Statistics²⁶ staff of the IIIIEE and the Department of Business Administration have expressed hesitancy towards the definitions currently used for environmental expenditure. It is virtually impossible to differentiate integrated pollution prevention measures from other investment in improved production processes. Almost all modernisation of production equipment leads to environmental improvement in some respect. Various definitions of environmental investments used for statistics define environmental

²⁵ Accounting Advisory Forum, *Environmental Issues in Financial Reporting*, December 1995, Doc. XV/6004/94 cl rev4 EN.

²⁶ Ljungdahl, Parker, Magnell, *Industrins miljöskyddskostnader (Environmental Expenditure in Industry)*, IIIIEE, 1994

investments as not profitable. One of the main reasons for more carefully tracking environmental expenditure is on the contrary to show that environmental investment can be profitable. Thus the EUROSTAT definition is at best unhelpful to pollution prevention.

If the definition used by the Forum to delimit environmental expenditure is unclear to the point of uselessness, the advice is very clear that companies should disclose environmental expenditure. A more relevant requirement would perhaps be that if environmental expenditure is disclosed, the method of calculating it should be clearly explained.

On liabilities, the Forum states that in general provision for liabilities and charges should cover losses or debts that are likely to be incurred, or are certain to, but the amount is uncertain. [Certain loss of a certain amount is a liability and would already be covered directly in the balance sheet, not in the provisions. Uncertain loss of an uncertain amount is thus not brought up in provisions.] Environmental liabilities or risks, which result from past transactions or events, qualify for recognition as a provision in the balance sheet, if:

1. the company has a legal or contractual obligation to prevent, reduce or repair environmental damage; or
2. the company's management is committed to prevent, reduce or repair environmental damage by
 - Σ policy statement
 - Σ industry practice
 - Σ public expectations

In summary, according to the EU Accounting Advisory Forum, disclosure in the annual reports should occur if the amounts are material to financial performance and should include:

- Σ provisions under "other provision" in balance sheet, separately if they are material
- Σ an explanation of the valuation methods used
- Σ contingent liabilities including narrative information in sufficient detail
- Σ amount of environmental expenditure charged to profit and loss account
- Σ amount of environmental expenditure capitalised
- Σ costs of non-compliance and compensation to third parties

5 Environmental Performance Indicators

Performance indicators can be defined as a finite set of quantities chosen to reflect certain aspects in an organisation. One definition of an indicator is "A number, absolute or relative, that facilitates management, communication and follow-up of an organisation's performance"²⁷. In the financial field, performance indicators (ratios) are well established. They have been used in financial markets to describe for example the value of stocks in relationship to price in various ways. Today, performance indicators are used to describe productivity, quality and other important factors for an enterprise. In the same way, performance indicators could be, and in some cases already have been, developed for various objectives that may be relevant to the environmental management of a company. See figure, below.

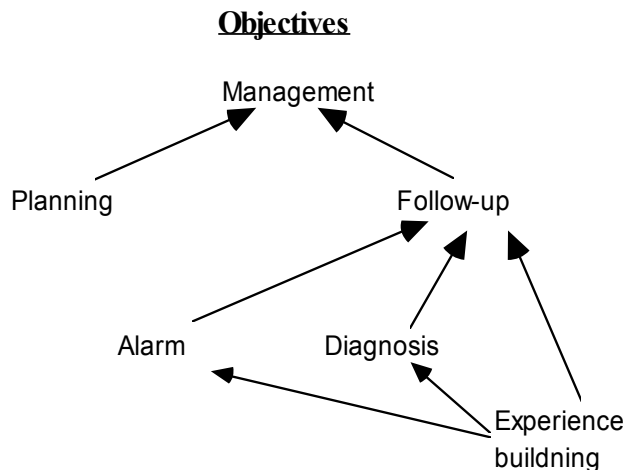


Figure 2: Break down of objectives for environmental performance indicators (Source: Mossberg)

Performance evaluation is, like LCA, the subject for a standardisation attempt by the International Standardisation Organisation, ISO. The Guidelines on Environmental Performance Evaluation are called ISO 14031. A "Draft International Standard (DIS-version) is expected in 1997, the finished standard in 1998, but this standard is only guidelines for how to go about measuring and what terms to use. No 14032 is planned. A few terms and acronyms seem to have already more or less established themselves, but not much else has come out of the process so far:

²⁷ Howard Ross, Den Norske Veritas, lecture, *Developing Environmental Performance Indicators for Business*, 1996

- Σ EPE - Environmental Performance Evaluation
- Σ EPI - Environmental Performance Indicators
- Σ EMI - Environmental Management Indicators
- Σ EI - Environmental Indicators²⁸

The terms have been visualised in a figure(below) over the evaluation areas of Management System, Operational System and Environment.

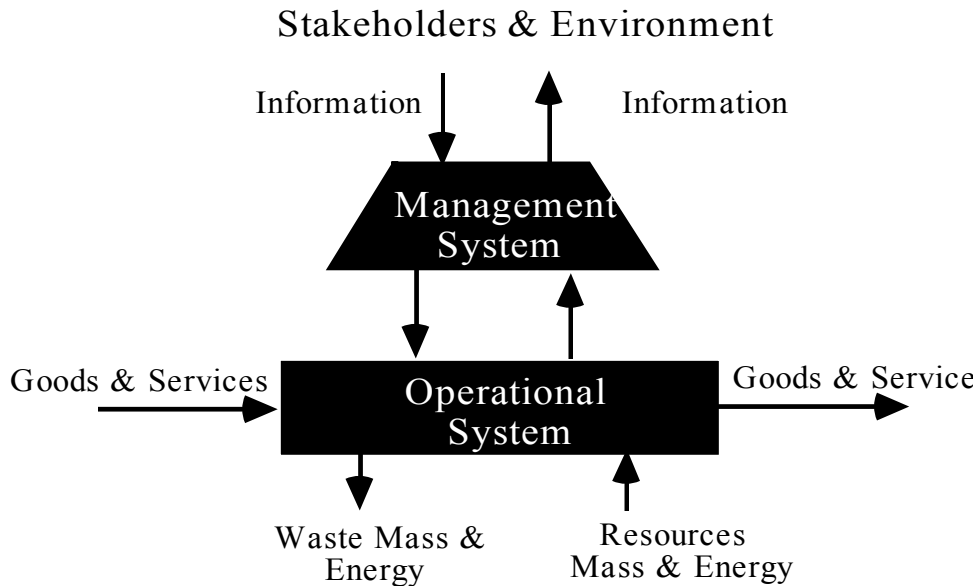


Figure 3 : The evaluation areas for environmental performance²⁹

5.1 Where and what to measure

The saying "What gets measured gets managed" is appropriate to environmental performance indicators. Regardless if indicators are developed primarily for internal or external use, they will tend to direct management attention to the issues they reflect. In part, this is simply human, an effect of our limited capacity of attention. It is of course also an effect of how stakeholders affect a company. An indicator for reporting purposes becomes an indicator for internal management if it is of interest to influential company stakeholders.

²⁸ Ryding, Sven-Olof and Rönnfors, Barbro, *ISO 14000 Lägesrapport 4 juli 1996*, Allmänna Standardiseringsgruppen, STG och Material och Mekanstandardiseringen, MMS

²⁹ ANSI - American National Standards Institute, *ISO/TC 207/SC 4 N57*, June 14, 1994

What then should the indicators reflect? The answer depends of course on who you ask. Economic arguments point to cleaner production approaches as preferable, which is discussed below. The political issue of sustainability is difficult to define in terms of indicators, but would also seem to stress conservation of non-renewable input rather than maximising output in relation to waste, which is a way of seeing eco-efficiency. An environmental perspective would also seem to necessitate a life-cycle approach, including upstream and downstream effects (e.g. the impacts of suppliers, use and disposal of product). This of course means an infinitely more complex indicator and opens up the quagmire into which LCA appears to be sinking. Regardless of what the constructor of an indicator wishes to measure, the problem of measurability (see below) will in any case force compromises.

Figure 4: Various entities that can be measured in an environmental indicator

Ashford and Meima³⁰ give the following categories of performance measurement and use the term envirometrics for numeric descriptions of environmental performance.

- Cost-efficiency
- Productivity
- Envirometrics
 - Consequence
 - Performance
 - Sustainability
- Strategic advantages
- Social legitimacy

The issue of cleaner production versus eco-efficiency (if indeed these actually are different) would seem to come under the headings of cost-efficiency, productivity and strategic advantage, whereas for instance sustainability would also have bearing on social legitimacy. It seems nearly impossible to come up with well defined categories of indicators.

³⁰ Ashford, N. and Meima, R. *Designing the Sustainable Enterprise - Summary Report of the Second International Research Conference of The Greening of Industry Network, Cambridge, MA, November 1993*. Shipley West Yorkshire, UK : ERP Environment, 1994

5.2 Problems with indicators

Research says that financial indicators don't work!³¹. This statement, though blunt, is actually more a reflection of the obvious fact that a simple indicator can not accurately and completely describe a complex reality. Mathematically, it is axiomatic that a multi-dimensional reality can not be completely described in fewer dimensions. Information is lost. This should of course be no surprise. It is, after all, the whole idea of an indicator that it should be concise and give an idea or indication of what is going on, not describe it completely.

An active financial analyst³², rather than a researcher, paints a rosier picture, when he points out that

1. *Everything is relative - the relative winners are the important thing*
2. *Help is needed - the analysts do not have the competence, just as in other fields (technology for example)*

This would mean that you don't have to give a perfect picture with your indicator, you just have to add significant information. In the field of finance, people might know very little and just about any information could help.

There are any number of things that an indicator should be in the literature, but three concepts that might be useful are:

- relevancy
- measurability
- comparability

Relevancy would seem to be obvious, but is not. The problem of measuring cleaner production, or indeed sustainability, and the difficulties of deciding where and what to measure are described below.

Measurability is an immense practical problem, which is rather under-researched as it lies in the border between technology and management. What one would like to measure in theory is

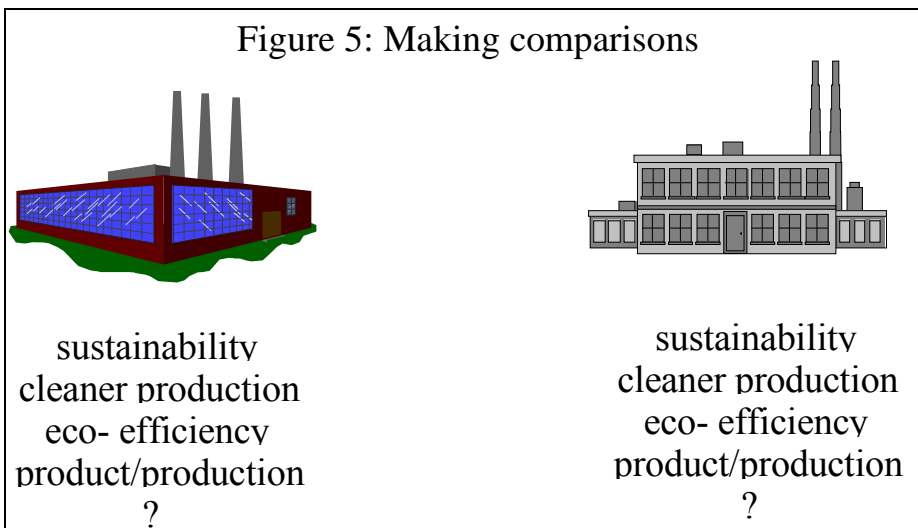
³¹ Rolf Wolff, Professor of Business Administration, Gothenburg Research Institute, lecture, *Completeness and Management is More Important than Certification and Systems*, 1996

³² Peter Malmquist, Aragon Fondkommission AB, lecture, *Does the Market Have Any Use for Environmental Reporting?*, March 7, 1996

often very different from what is measurable with the equipment at hand. Monitoring systems can be prohibitively expensive if they even exist for the desired application. In the simpler case, the information simply does not seem worth the investment. A common example is indicators for energy use, where a company might have one electricity meter for an entire building, which contains a number of different activities. It thus becomes difficult to construct an indicator for energy efficiency.

Comparability is the central issue. There are several levels of comparability:

- Σ comparability with an earlier time period
- Σ comparability with other sites in the same company
- Σ comparability with other companies in the same line of business
- Σ comparability with all other companies



It is often of interest to construct an indicator in the form of a measurement of total environmental performance in relation to a measure of operations, such as the amount of a certain effluent in

relation to production volume. This allows better comparability with varying volume of operations, but has other problems. One central problem is that of how to account for suppliers. A company who uses a supplier for an environmentally hazardous process, would have a better value for its indicator than a company that did not. In a case studied at the Swedish Postal Service, a problem arose with a division that had recently contracted another company to supply some of there long distance transportation.³³ This meant that the value of an indicator under discussion suddenly changed for the better from one year to another. At the same time, the feeling was that the fleet of the supplier was older, and thus less eco-efficient, than their own

³³ Parker, T. *Nyckeltal i Postens miljöledning*, IIIIEE, 1995

fleet, meaning that the change was actually not an improvement from an environmental perspective.

If comparing from one year to another is not trivial, then the step to comparisons between companies seems forbidding. Any system of comparisons will also have winners and losers, which means that the losers can be expected to put up a fight against any system that is suggested. They will always have ammunition for that battle, since an indicator never can be an accurate reflection or reality.

The problems with indicators are thus forbidding. In that context it is helpful to lower ambitions so that the goal of an indicator is to be useful, not to be absolutely correct. This would seem to imply that they need not be long lived. An indicator could be very useful for a limited time period.

Sören Bergström³⁴ lists a number of principles for developing performance indicators. Two of these are especially interesting and concern the way indicators describe performance. They are the on-the-board principle and the cluster principle.

On the board principle: Approximate and usable is better than exact and impracticable.

Cluster principle: Several indicators that approximately describe a phenomenon can, if the indicators are independent, together give a more exact picture.

Environmental performance measurement is not an objective process but a communication tool. The system boundaries and the basis for comparison are arbitrary. A few successful cases exist of performance measurement for employee motivation in medium sized industry.³⁵ This use, to affect decisions by workers in operations, show how performance measurement can be seen as a power instrument. It is then up to the user to put the instrument to use for good or for ill.

³⁴ Bergström, S. *Naturekonomi - manšverutrymmet mellan resursförbrukning och kvalitetsanspråk*, Carlsson Bokförlag, 1994, s.132

³⁵ Parker, Thomas, *Environmental Indicators and Case Study at Lund Energy* Paper for Invitational Expert Seminar Challenges and Approaches to Incorporating the Environment into Business Decisions, Opio, Provence, France, June 3-5, 1996, IIIIEE

5.3 Environmental Performance Measurement references

European Green Table, *Environmental Performance Indicators in Industry*, 1993 (European Green Table, Box 2639 Solli, N-0203 Oslo, Norway)

Business and the Environment, KPMG Peat Marwick, *A Measure of Commitment*, 1992 (BiE tel 071-321 6430, fax 071-321 6410)

ISO 14030

Hanssen, Förde & Thoresen, *Environmental Indicator and Index Systems An Overview and Test of Different Approaches A Pilot Study for Statoil*, Stiftelsen Östfoldforskning, Norway, 1994

6 Environmental Reporting

6.1 Why do companies publish environmental reports?³⁶

In the process of analysing corporate environmental reporting, it seems natural to ask why companies bother to report at all, for certainly this is not self evident. Corporate environmental reporting is after all a fairly recent phenomenon and still by no means universal. A prime mover for disclosure has been and still is government regulation. An example of this is the American Toxic Release Inventory (TRI), requiring quantified data on wide range of environmentally harmful emissions. However, leading environmental reports go well beyond the requirements of legislation. A common response from industry to the question of why they report is that it is in answer to customer demand, which certainly at first glance seems plausible enough, but few consumers are reached by the environmental reports published by companies and the scope and detail of corporate environmental reports is far more ambitious than one usually associates with corporate messages to consumer markets. There has also been a noticeable increase in environmentally oriented advertising, but environmental reports are rarely mentioned in that advertising. If there is a customer demand for environmental reporting, it must be from other customers than consumers, or from proxies that are seen to represent large groups of consumers. The perhaps most important group is organisations like Greenpeace and the media. An environmental report can be seen as a way of showing good faith and thus avoiding painful media exposure, which then could affect consumer markets. The corporate goal for environmental reporting could thus be more accurately image building to buttress corporate credibility in the

³⁶ Taken from Parker, Thomas, *Environmental Reporting Discussion Paper*, IIIIEE, July 1995

environmental field. The increased credibility is then used in contacts with government and others who place environmental demands on the business.

Financial markets have also begun to make environmental demands for reasons of security in their investments. Insurance companies often have a direct stake in companies compliance to regulation and environmental liabilities, including the environmental problems of the products themselves. Various stakeholders naturally wish to be informed of environmental performance, but each has separate demands on the form and content of that information. KPMG Peat Marwick lists³⁷ several groups that may exert pressure on companies to report environmental performance. These are shareholders, banks, local communities, corporate customers, employees and business analysts.

Kjell  ren, a representative of Norsk Hydro, has pointed out³⁸ that their perception was that Hydro was getting little credit for its extensive work on reporting. In fact, reporting sometimes led to higher demands on performance from stakeholders. Two main reasons for continuing the reporting work were mentioned. The first was that the reporting process demanded the gathering and structuring of information on environmental performance, that Hydro would not have done otherwise. Their experience was that this information in itself was of sufficient value to management to motivate the reporting process.

The second and probably more important reason cited was the reaction of personnel at Norsk Hydro, who had become important recipients of the reports and presumably felt more informed and thus less defensive about their jobs, leading to greater job satisfaction. There seems to be some consensus among industries with some experience of environmental reporting that the internal effects of the reporting process, including the information gathering process, are often greater than the external beneficial effects. Of course there are also numerous examples of companies who have had direct market effects. Ericsson did not consider itself in need of

³⁷ KPMG, *International Survey of Environmental Reporting*, KPMG, 1993

KPMG also note that individual customers care more about the environmental impact of products.

³⁸ ICC conference on environmental reporting, Stockholm, 01.11.94

environmental management until some of its industrial customers started to demand an environmental policy from them as an absolute condition for further orders.

An often overlooked reason for the increase in environmental reporting is the role of management, who are also affected by growing environmental consciousness and are not totally immune to the demands of society. One cannot disregard the collegial and institutional pressure on management either. Whereas the role of branch organisations earlier was to lobby against environmental regulation and in general fight growing demands on industry, today most branch organisations have developed some kind of environmental policy. The best known example of this is the "Responsible Care" program developed in the chemical industry. These programs are voluntary for member companies, but the pressure is now to adhere to the minimum standards so that the reputation of the industry is preserved or enhanced. This facilitates the argument against binding legislation, if credible progress is being made without it.

The World Industry Council for the Environment (WICE) discuss environmental reporting in a guide³⁹. Reasons for reporting cited there include business benefits such as new sales to environmentally concerned customers, but the stress is really on internal effects. The information gathered for external reporting is said to result in greater process efficiency and a more manageable company.

The role of standards of environmental conduct, reporting etc. in industry becomes more apparent when viewed in the light of increased pressure on management to report, but standards also provide help for management to know what is expected of them. Thus from a management point of view, standards accentuate the problem but also point towards a solution. It would therefore likely that standards may play an important role in how companies manage environmental questions.

Manfred Wirth, Dow Europe specifies the following advantages of reporting:⁴⁰

- Excellent management tool
- Information on impact

³⁹ World Industry Council for the Environment (WICE), *Environmental Reporting - A Managers Guide*, 1994
WICE is an initiative of the International Chamber of Commerce, ICC

⁴⁰ Lecture at EMAA Conference 951130

- Improved credibility with stakeholders
- Awareness and achievements by employees
- Prioritise capital investment

and these disadvantages:

- Exposes weaknesses
- Misinterpretation
- Wrong conclusions by financial community
- Cost/benefit of annual report as opposed to bi- or triannual (250 thousand Swiss Fr. for editing publication, etc.)

6.2 UNEP

The most influential document on environmental reporting is doubtless an report written by the British consultancy SustainAbility (with John Elkington) and published by the United Nations Environment Program.⁴¹ Though not an official opinion, the reports publication and distribution by UNEP (and the high quality of the report) has given it a special status. The report contains an analysis of how far companies in various countries have come in their reporting ambitions, much like the yearly studies done by the international consultancy KPMG. The influential part of the UNEP/SustainAbility report is more normative and contains a list that specifies no less than 50 possible reporting ingredients, divided into five clusters:

1. management policies and systems
2. an input/output inventory of environmental impacts of production processes and products
3. the financial implications of environmental actions
4. relationships with environmental stakeholders
5. the sustainable development agenda

In an earlier report, the UN Economic and Social Council, Commission on Transnational Corporations recommends that the report of the Board of directors/management should include:

⁴².

- 1) The type of environmental issues that are pertinent to the enterprise

⁴¹ UNEP, Op. cit..

⁴² UN, (1990). *Accounting for Environmental Protection Measures*, UN, Commission on Transnational Corporations (E/C.10/AC.3/1991/5).

- 2) The formal policy and programmes
 - environmental audits - main results
- 3) Improvements in key areas
- 4) Emissions targets and performance in relation to targets
- 5) Financial or operational effects (present and future) on
 - capital expenditure
 - earnings
 - competitive position

6.3 EMAS

The European Community's Eco-Management and Audit Scheme (EMAS) requires that participating companies provide an Environmental Statement for each participating site every one to three years. This statement is to be designed for the general public and include such information as⁴³:

- description of activities
- assessment of all issues relevant to activities
- summary of emission figures, waste generation,
- consumption of energy, water, raw material
- environmental policy, program and management system
- and more

6.3.1 WICE

The WICE guide⁴⁴ suggests a checklist of 15 points that a company may choose to include in an environmental report. These are listed in a table, below, together with a comment on what communicative role the various parts are expected to fill.

	Contents	Purpose
1.	Foreword by senior officer	Demonstrates commitment
2.	Profile	Context for report
3.	Policy	Basis for reporting
4.	Targets and objectives	Driving force behind improvement
5.	Views on issues	Contribute to debate
6.	Community relations	Evidence of good citizenship

⁴³ Official Journal of the European Communities, No L 168/4, Article 5

⁴⁴ WICE, Op. cit.

7.	Environmental Management System	Translation of policy to action
8.	Risk Management	Describe action taken
9.	Practices in office and on site	Describe good habits
10.	Indicators and targets	Data presentation
11.	Energy and resource use	Describe conservation measures
12.	Compliance	Action taken, incidents, etc.
13.	Financial indicators	Indicators relevant to environment
14.	Products, Processes, Services	Information on what is done to improve performance of products etc.
15.	Additional information	Names so readers can make comments or ask questions

Table 2: WICE Guide checklist ⁴⁵

6.3.2 PERI

The Public Environmental Reporting Initiative (PERI) has published guidelines for environmental reporting⁴⁶ which have become a widely used source. The guidelines cover ten components, which are listed in the table below:

⁴⁵ WICE (now WBCSD), *Environmental Reporting - A Managers Guide*, (Fax +33 1 49 53 28 89, tel +33 1 49 53 28 91).

⁴⁶ Public Environmental Reporting Initiative, PERI Guidelines

Organizational Profile
Environmental Policy
Environmental Management
Environmental Releases
Resource Conservation
Environmental Risk
Management
Environmental Compliance
Product Stewardship
Employee Recognition
Stakeholder Involvement

Table 3: PERI Guideline components

6.4 Environmental reporting references

UNEP (United Nations Environment Programme), *Company Environmental Reporting, A Measure of the Progress of Business & Industry Towards Sustainable Development* (technical report No 24), 1994

PERI Guidelines (available on WWW)

Deloitte, Touch, Tohmatsu (consulting company, surveys)

KPMG (consulting company, surveys)

European Federation of Financial Analysts Societies (EFFA), *Environmental Reporting and Disclosures, the Financial Analysts' View*, (Kaspar Mller et al)

The Canadian Institute of Chartered Accountants (CA), *Reporting on Environmental Performance* (summary report exists also), 277 Wellington St. West, Toronto, Ontario, M5V 3H2

CEFIC *Guidelines on Environmental Reporting for the European Chemical Industry* (Brussels), tel 32/2/676 72 11, fax 32/2/676 73 00

Chemical Industries Association, *Environmental Reporting*, 1992, Kings Buildings, Smith Square, London SW1P 3JJ, Phone: 071-834 3399 Fax: 071-834 4469

GEMI, *Environmental Reporting in a Total Quality Management Framework a primer*, GEMI, 1994

Deloitte Touche Tohmatsu International, International Institute for Sustainable Development, SustainAbility, *Coming Clean Corporate Environmental Reporting Opening Up for Sustainable Development*, Deloitte Touch Tohmatsu, 1993

Caroll, Lewis, *Alice in Wonderland*

7 Environmental Accounting, Management and Strategy

Surprisingly little has been done on accounting and environmental management systems (EMS) such as ISO 14000, BS 7750 and EMAS. It would almost seem that Total Quality Environmental Management (TQEM) approach, which underlies EMS, and accounting rarely are studied by the same people. Nonetheless, the overlap is substantial, as goals, fulfilment of goals and continual improvement all imply some sort of measurement. It is perhaps also too early for analysis of different environmental strategies. Most of the work done seems to center around whether environmental should be part of business strategy (The answer is always yes, but I am personally looking forward to a good ÓnoÓ book.), not on different approaches, but this is fundamental for management accounting. What to measure in accounting is dependent on why one is measuring.

7.1 Environmental Accounting and in the context of EMS

An important international development is the emergence of the European Eco-Management and Audit Scheme, EMAS and the ISO 14001. These have already been met with great interest from industry and will in all probability have a substantial impact on how industrial environmental management is carried on.

In the figure below, links between the implementation of EMAS and a system of industrial environmental accounting are shown. Each step in EMAS could be facilitated by an accounting system. Environmental accounting is therefore not an alternative to EMAS but an important tool towards reaching environmental goals regardless of what kind of management system is implemented.

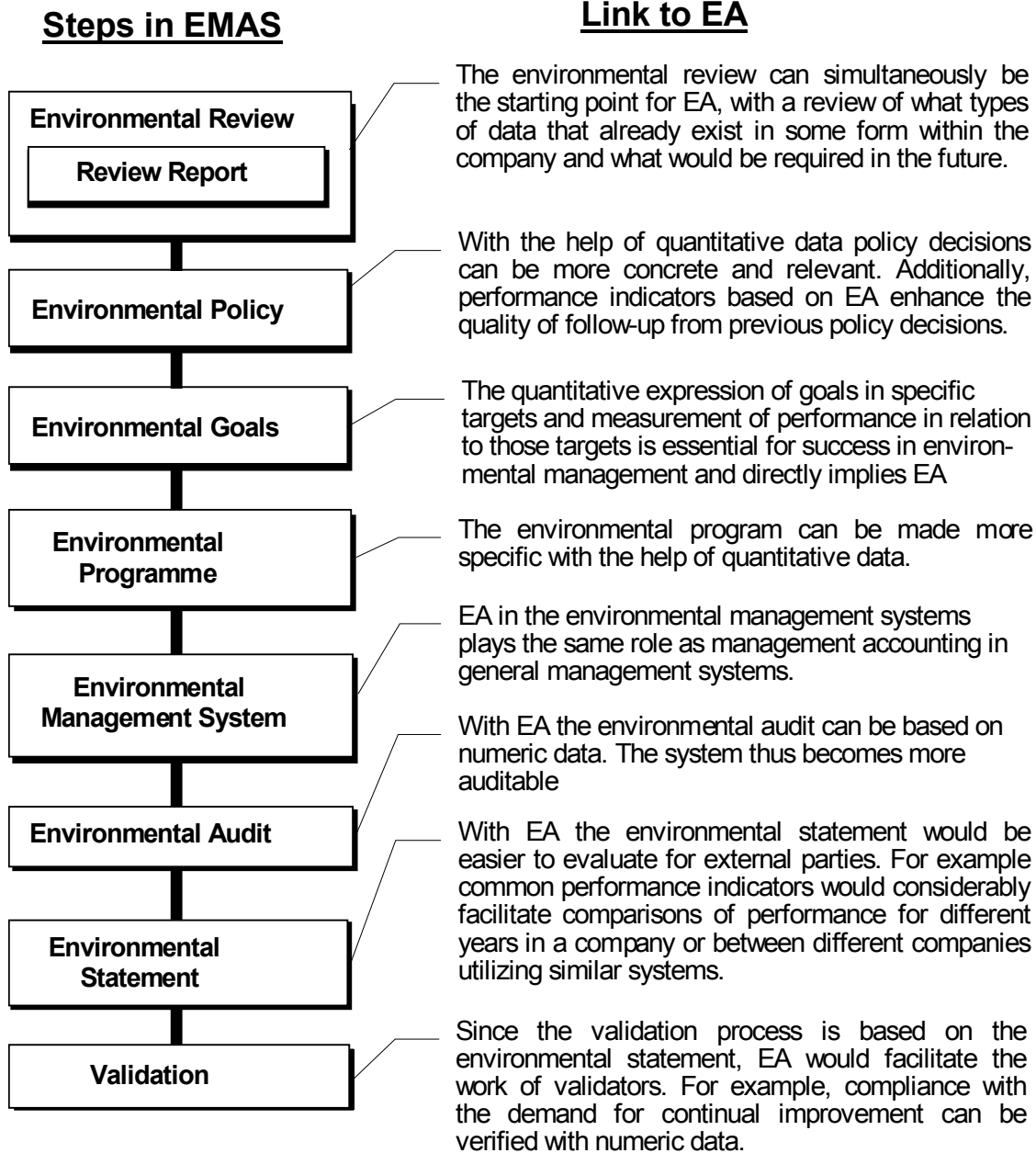


Figure 7: Links between an environmental accounting system (EA) and the Eco-Management and Audit Scheme, EMAS.

Of particular interest from an environmental accounting perspective are two fundamental parts of EMAS, the formulation of goals and the measurement of continual improvement. EMAS demands continual improvement, not just improvement of a management system but of its results. This directly implies some kind of measurement of environmental loads. In a similar manner, specific goals and measurement of performance in relation to those goals also seems to demand an organised system of environmental performance data collection.

Estimating costs in environmental audits can also be an important input to for accounting systems, and an effective way of pinpointing shortcomings in the existing financial and management accounting from an environmental perspective.

7.2 The cleaner production strategy

A *preventive environmental strategy* means one where environmental problems are addressed before they arise. This means dealing with the problem at its source, when choices are made concerning processes, raw materials, design, transportation, services and more. The *cleaner production approach* can be defined as the continuous application of an integrated preventive environmental strategy to processes, products, services and practices in order to reduce risks to humans and the environment.

Case studies at the International Institute for Industrial Environmental Economics and elsewhere⁴⁷ have shown that the cleaner production approach most effectively addresses the wasting of natural resources and thus adverse environmental impacts. A number of cases have also shown that such an approach also often leads to economic improvement in the company due to among other things reduced waste, reduced costs for control and legal issues and better stakeholder relations.

It can therefore be important that environmental accounting not only reflects changes in environmental impact from a company, but also the strategy used to obtain improvement. For

⁴⁷ IIIIEE projects include the so-called Landskrona project or see Magnell, M. *Mera MILA Fallstudie pCE ABB Motors i VSsterCEs*, IIIIEE, 1994

Material is also available from the Norwegian and Danish EPAs (Statens fšrorensningstilsyn and Miljšstyrelsen) The European Round Table on Cleaner Production is also an excellent source. (Professor Donald Huisingh)

example, a reduction of emissions by use of a filter is not equivalent to the same reduction by good housekeeping or change of raw material. The filter will result in solid waste, that must be disposed of and costs money. A cleaner production approach may solve the problem and may even save money (though of course the opposite can also be true). For both external and internal users of information, it may be of some importance to gain insight into how, not just how much, reduction is achieved.

One way of reflecting cleaner production, and indeed sustainability, better is to also measure inputs as opposed to just outputs. In an input-output model of a process or an organisation, one might establish a mass balance (figure).

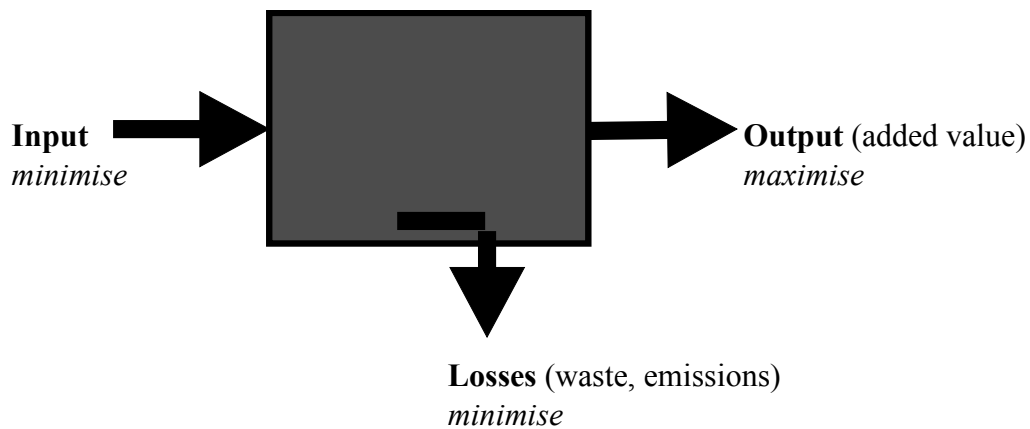


Figure 6: Black box description of a process or organisation.

In the final analysis, environmental accounting should be seen as a tool for implementing policy decisions and subjecting performance to numeric analysis. No accounting model can ever be a perfect mirror of the system it is meant to reflect, but the perhaps most fundamental problem with environmental accounting is best reflected in a famous quote from Lewis Carrol's *Alice in Wonderland*:

"Cheshire Puss ... Would you tell me please which way I should walk from here?Ó

"That depends a good deal on where you want to get to", said the Cat.

"I don't much care where -" said Alice.

"Then it doesn't matter which way you walk," said the cat.

ÓSo long as I get *somewhere*.Ó Alice added, as an explanation

“Oh, you’re sure to do that,” said the Cat, “if you only walk long enough.”