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Integrating Environmental and Financial Performance at the Enterprise Level

A Methodology for Standardizing Eco-efficiency Indicators

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NOTE

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Preface

The United Nations' work on transparency and accountability originated in 1975 when the former UN Commission on Transnational Corporations (TNCs) became concerned about the lack of meaningful disclosure by transnational corporations in their financial statements. It found that the financial information provided by transnational corporations was neither reliable, transparent nor comparable. In order to promote the harmonization of financial information and meaningful disclosure to all users of financial statements, ECOSOC created the Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR).

In 1989 ISAR took up the topic of corporate environmental accounting. The Group soon discovered in its first survey that there were no national accounting standards specific to environmental information disclosure. Furthermore, some CEOs believed that environmental information was not necessary for a true and fair view of the enterprise's performance or that it was too difficult to obtain. To meet this obvious need for guidance, ISAR issued its first recommendations for environmental disclosure in the financial statements in 1991.

This guidance was soon followed by intense study and analysis by national standard-setters. However, only two countries have issued comprehensive rules covering environmental accounting and reporting. In 1998 ISAR revisited the issue of environmental disclosure and expanded its recommendations based on emerging best practices. Its objective in issuing a new *guideline - Accounting and Financial Reporting for Environmental Costs and Liabilities*- was to ensure that different standard-setters did not adopt different solutions for the same problems.

However, it is clear that the conventional accounting model is not able to assess an enterprise's environmental performance and its

impact on financial performance to the degree desired by all stakeholders. This is because the conventional model was developed to provide information only on the financial position and performance. Since Rio the business community has become committed to the concept of sustainable development and to improving its environmental performance. On the other hand, various stakeholders are demanding that enterprises report on these improvements. In particular the financial community is concerned about how environmental performance affects the financial results of an enterprise.

This report presents the results of ISAR's work to extend the conventional accounting model and to link environmental performance with financial performance. The precise correlation between improved environmental performance of an enterprise and its bottom line is extremely difficult to prove because of the many other factors, which can affect profits. However, the concept of eco-efficiency where increased profits are achieved under conditions of declining environmental impact demonstrate such a link. Despite the theoretical usefulness of eco-efficiency indicators, their construction and use are highly problematic. This report presents a method by which environmental and financial performance indicators can be used together to measure an enterprise's progress in attaining eco-efficiency or sustainability. It is hoped that by developing a method for producing internally consistent environmental and financial information, the quality of environmental reporting and stakeholder satisfaction with it will improve.

Rubens Ricupero
Secretary General of UNCTAD

CONTENTS

CHAPTER ONE

Introduction

Enterprises and the concept of sustainable development

The most widely accepted definition of sustainable development was given by the Bruntland Commission over thirteen years ago as development which "meets the needs of the present without compromising the ability of future generations to meet their own needs." Sustainability then and now is not just an environmental issue, it is also a social as well as an economic issue. The first refers to the issues of the physical environment and mankind's use of it, the second to the issues of inter and intra-generational equity which are essentially social issues. Today many accept that sustainable development is built on three pillars: economic prosperity, environmental quality, and social equity. While the definition of sustainable development has been agreed, what has not emerged is a recognized consensus on what a sustainable global economy might look like and what path might get us there. In fact, it seems that the global economy is farther from a sustainable development path than ever before. The UNDP *Human Development Report 1999* makes it very clear that economic growth is still being achieved at the expense of ecological balance and social progress. It is obvious that the gap between current practice and the desired state of sustainability has never been wider. One reason is because many enterprises see sustainable development and commercial activity as mutually exclusive. Of those few enterprises committed to sustainable development most have yet to operationalize the concept.

Indeed, it is very unclear what enterprises are doing, should do, or, could do, to re-direct their operations towards more sustainable development.

Some business groups claim that industry has made extensive progress since the UN Conference on Environment and Development held in Rio in 1992 addressing the sustainable development agenda. Closer investigation shows that only a few enterprises see their environmental performance as a competitive and/or strategic issue. The World Business Council for Sustainable Development, established in 1991, has 128 members from a potential pool of some 50,000 TNCs; there are equally few signatories to various corporate environmental charters of good practice such as the Valdez Principles. Industry associations for environmental friendliness such as the Chemical Industries Association Responsible Care Programme and the UNEP Financial Sector/Insurance Industry initiatives remain in the minority. Whilst the ICC Business Charter has attracted a significant number of adherents it is not capable of being verified and there is no monitoring of compliance with the principles. Less than 5 per cent of the world's TNCs issue environmental reports, the quality of which leaves much to be desired in terms of relevance and comparability. The leaders that have emerged are to be encouraged as vanguard enterprises that have recognized that wider issues than short-term financial return must be taken into account in managing their businesses for the long term.

While a number of enterprises may wish to operate in a more environmentally friendly manner, financial pressure, competitive markets and the traditional accounting model based upon historical costs are some of the factors

which inhibit substantial changes in TNCs' behaviour. The lack of understanding and formal guidance contributes significantly to an enterprise's inability to operationalize the concept of sustainable development.[1] A 1996 UN survey revealed that enterprise executives were not fully aware of the implications of environmental sustainability in the broader context. Interestingly, industry associations such as the ICC and WBCSD either do not mention sustainability or offer no diagnosis of what sustainability actually might mean for business or any assessment of how it might be achieved. What is offered in their documents is a programme of actions which business can take which will be broadly sound economically and reduce the environmental impact of business activity. These actions can be effectively categorized as "pollution prevention pays" (PPP).

The UN survey revealed that the business community did not hold a single, clear interpretation of sustainability. A number of enterprises believed that either sustainability does not involve the needs of future generations (59 per cent); or that their organization had already achieved sustainability (37 per cent). Such beliefs seem completely at variance with the most basic and commonly accepted parameters of sustainability. The 1999 KPMG International Survey of Environmental Reporting noted that whilst sustainable development was covered by 18 per cent of corporations (it was 2 per cent in 1996) it appeared that some confusion still

[1] "Incentives and Disincentives for the Adoption of Sustainable Development by Transnational Corporations," in *International Accounting and Reporting Issues: 1995 Review*: Environmental Accounting, UNCTAD, Geneva, 1996, pp.1-39.

exists between the use of this term and the term "environment" as there was no distinction in the reports.[2]

The concept of sustainable development may not be easily reconcilable with that of profit/shareholder wealth maximization. Some portion of the environmental impact is under the control of the enterprise while some impact is outside the control of the business (for example, supplier, customer and disposal aspects). Taken from this perspective, it is unreasonable for society to expect business to become truly sustainable under its own initiatives. If enterprises are to move towards sustainability by internalizing costs from cradle to the grave then the rules of the game will have to change. Until they do, the most that can be expected is that enterprises move towards sustainability by reducing their un-sustainability or by improving their environmental performance, which is under their control.

Drivers for environmental reporting[3]

Despite industry's inability to take on board fully the concept of sustainable development there are currently some very powerful drivers for improved environmental

2 KPMG, International Survey of Environmental Reporting 1999 (De Meern, The Netherlands) 1999. The KPMG Survey covered the top 100 companies in each of 11 countries and had a 98 per cent response rate.

3 R. Adams, "Linking Environmental and Financial Performance: A Survey of Best Practice Techniques," in *International Accounting and Reporting Issues: 1998 Review*, UNCTAD, Geneva, 1999, pp. 75-116.

performance and external reporting at the enterprise level. Various stakeholders-shareholders, creditors, financial analysts, customers, employees and activist groups- want an airing of the enterprise's environmental performance just like the constant flow of financial data which is available to shareholders. For example, *financial sector stakeholders* are beginning to request improved levels of environmental data. They use such data for various purposes: to reduce their own exposure to lending or credit risk; to judge the entities' own exposure to risk; to interpret corporate management's ability to manage environmental issues and to integrate environmental issues into general long-term strategic issues; and to compare progress between companies over time. A number of studies have recently shown that stock markets will reward good corporate behaviour. A 1997 study by Klassen and McLaughlin found that when companies win environmental awards, their share prices tend to rise by, on average, 0.82 per cent. But prices will tend to fall by about 1.5 per cent following an environmental disaster such as an oil spill.[4]

A more recent study (1999) undertaken on behalf of the UK Institute of Chartered Management Accountants shows an association between corporate environmental responsibility and enterprise profitability.[5] Comparative

4 Hancock, J. The colour of your money-it's turning green, Financial Times, 17 July 1999, p.5.

5 J. S. Toms, Enlightenment vs. Self interest: Financial Performance Differentials of "Ethically" Managed Companies, Discussion Paper, School of Management & Finance, The University of Nottingham, 1996 and 1999.

returns on capital employed were 5 per cent higher for green companies than for not-so-green companies. Superior profits for green companies are probably driven by marketing as well as productive efficiency. Greenness and other forms of environmental responsibility can be marketing weapons. For example, Shell scored 7th before Brent Spar, but plummeted to 146th afterward.

Other drivers for improved environmental performance and reporting include international and regional requirements for environmental performance evaluation. The International Organization for Standardization has developed ISO 14000 series, which provides specifications, guidance and advice on environmental issues including labelling, documentation, evaluation, auditing and reviews. International Standard ISO 14031 on environmental performance evaluation includes operational performance indicators, management performance indicators and environmental condition indicators. However, these are being developed for internal management purposes, not for external reporting. And the European Union Eco-Management and Audit Scheme (EMAS), a voluntary scheme for all member States, has provided incentives for small and medium-sized enterprises to become involved in environmental reporting.

Financially sophisticated stakeholders want to see the link between environmental performance and financial performance in the environmental report. An enterprise which recognizes its environmental responsibilities, as defined by law, and which institutes appropriate and effective systems of environmental management and adopts

environmentally friendly technologies will minimize its exposure to future financial risk/loss arising from environmental incidents. At the same time,

- such an enterprise should be able to secure lower insurance premiums, reflecting the reduced risk
- a favourable risk rating may secure the enterprise better borrowing terms when issuing corporate debt or equity
- additional benefits include lower "green" taxes, levies, fines; lower operating costs and waste disposal costs
- a "green" image could increase sales revenues.

While all these will have a positive impact on the bottom line, it is quite a different thing to assert that environmentally derived financial benefits will automatically flow through into superior share price performance or increased shareholder value.

Despite the fact that there are many influences on profitability and shareholder value, there is growing acceptance of eco-efficiency indicators to measure the relation between environmental performance and financial performance. An eco-efficiency enterprise is one which uses fewer resources, causes fewer emissions to soil, water and air and thus enjoys an increase in the operating margin due to lower costs/higher product prices. Eco-efficiency indicators compare changes in environmental performance indicators with financial performance indicators such as return on capital employed, value added, etc. However, the

state of the art of reporting environmental performance indicators leaves much to be desired and eco-efficiency indicators are in their infancy. *The purpose of this report is to provide guidance on the identification, selection, and construction of the most useful environmental performance indicators and eco-efficiency indicators. Such indicators must, as a minimum, be globally recognized, internally consistent, and comparable.* The lack of consensus on reporting corporate environmental activity, impacts and performance.

Pressure is increasing on enterprises to report environmental performance. Enterprises themselves see it as a way to demonstrate corporate commitment, gain competitive advantages, position themselves on environmental issues, raise staff awareness, demonstrate progress against targets and performance and go beyond compliance. UNCTAD monitored the environmental reporting practices of larger enterprises in 1992 and 1994. Both surveys revealed that environmental disclosures remained qualitative, descriptive, partial and difficult to compare. No relation was usually drawn between environmental targets, the amounts spent to achieve these targets and the results achieved either in environmental terms or financial terms. Again in 1996, KPMG surveyed the leading 100 companies in each of 12 developed countries and found that 23 per cent of them produced corporate environmental reports. A 1997 survey found that

> *Environmental disclosures in annual reports vary widely in scope and quality, as do stand alone reports: there is little consistency and not much scope for inter-enterprise comparison or benchmarking.*

According to the ACCA, only *some 2000* of the world's 50,000 TNCs produce environmental reports- or less than 5 per cent. UNEP's project "Engaging Stakeholders" (1996) recently looked into the reasons non-reporting enterprises give for not reporting:

> *We have doubts about the advantages that it would bring to our enterprise.*
>
> *We already have a good reputation for our environmental performance.*
>
> *It is too expensive.*
>
> *It could damage our enterprise reputation.*
>
> *It would not increase our sales.*
>
> *It is our policy not to interact with the public.*
>
> *We have political reasons for not reporting.*[6]

Concrete obstacles to reporting include lack of management interest, lack of resources, difficulties in gathering data, and lack of Standardized indicators. The World Business Council for Sustainable Development (WBCSD) noted in its 1997 annual report that, *While eco-efficiency is becoming an increasingly widely accepted idea, there is no universally agreed system for measuring and*

6 UNEP and Sustainability, International progress report on enterprise environmental reporting, The Benchmark Survey: Engaging Stakeholders, London, 1996.

reporting on it. Individual companies and business sectors have tended to derive their own metrics.[7] The researchers conclude that the ultimate answer to non-reporting or inconsistent reporting may well rest in legislation.

Lack of consensus on environmental performance indicators

A 1998 UNCTAD report identified key environmental performance indicators currently in use by leading-edge enterprises to measure and communicate environmental performance. [8] They included:

[7] World Business Council on Sustainable Development, *Annual Review: 1997*, Geneva, 1998.

[8] R. Adams, "Linking Environmental and Financial Performance: A Survey of Best Practice Techniques," in *International Accounting and Reporting Issues: 1998 Review*, UNCTAD, Geneva, 1999, pp. 79-80.

Table 1: Key environmental performance indicators

Categories of EPIs	Examples of EPIs
1. measures of ultimate environmental impact	• species diversity around plant • noise levels at specified points • ratio of actual to sustainable discharges
2. risk measures of potential impact	• usage of high-risk chemicals/materials • risk of fatalities to exposed populations • risk of damage to ecosystems
3. emissions/waste measures (of mass and volume of emissions and wastes)	• emissions to air: TRI toxins, sulphur dioxides, nitrogen oxides, CO_2 etc. • waste to landfill: hazardous, non-hazardous • waste water discharges
4. input measures (of the effectiveness of business process)	• measures covering people, equipment, materials, physical setting, internal support
5. measures of resource consumption	• measures of energy, materials, water, natural resource consumption
6. efficiency measures (of energy and material utilization)	• energy: ratio energy used/wasted • ratio actual/theoretical energy used • materials: percentage utilization • equipment: percentage utilization
7. customer measures (of satisfaction and behaviour)	• level of customer approval • number of complaints • product related environmental awareness • per cent adopting desired behaviour
8. financial measures	• cost of environmentally related capital expenditure • direct environmentally related operating costs • regulatory compliance, fines and penalties • costs of energy/materials • avoided costs plus measurable benefits

But to date there is no international consensus on how corporate environmental activity and impact should be reported. In contrast, financial performance indicators are calculated on the basis of national and international accounting standards. Therefore, when financial analysts calculate these ratios for various enterprises they have reliable measures for comparing performance.

This is not the case with regard to environmental performance since there is no consensus on the use of Standardized environmental performance indicators. Each enterprise within an industry can report its performance using different environmental indicators, not necessarily using the same indicators from year to year. As a result, it is difficult to compare the environmental performance of different companies, and to determine whether the enterprise is improving over time, and if so what strategy it adopted to achieve any improvements and whether it was the most cost-efficient.

The diversity in terms of environmental performance indicators has rendered most environmental reports useless. Environmental reporting currently lacks credibility in the eyes of certain external stakeholder groups because certain "qualitative characteristics" which exist in the financial reporting domain are absent.

These include

- a guarantee of completeness,
- comparability,
- consistency of measurement,

- credible external verification.

The European Federation of Financial Analysts' Societies (EFFAS) and the Swiss Bankers' Association have both specified their demands for useful eco-efficiency indicators through which a enterprise's progress towards sustainable modes of operation may be judged.[9] Both sets of recommendations point toward the growing need for the identification and standardization of both generic and industry-specific environmental performance indicators. Standardized indicators could be used both to monitor and to compare the performance of enterprises or to engage in benchmarking.

Purpose and structure of this report

The purpose of this report is to provide guidance on the identification, selection, and construction of the most useful environmental performance indicators and eco-efficiency indicators. Such indicators must, as a minimum, be globally recognized, internally consistent and comparable. There is a necessity to ensure that all environmental variables are calculated on the same basis and are consistent with the financial variables.

9 EFFAS, Environmental Reporting Requirements: Integrating enterprise-specific environmental information into investment business, Paris 1996; and EFFAS, Eco-efficiency and financial analysis, the financial analyst's view, Paris 1994.

As will be explained in subsequent, chapters performance indicators can either be generic, that is, applicable to all enterprises, or industry-specific. Since a number of industries are already working on industry-specific indicators, the Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) has chosen to work on generic indicators. However, the general principles for their construction and use with financial indicators are also applicable to the industry-specific indicators.

Chapters one and two introduce basic material for those readers not conversant with environmental performance indicators or the concept of eco-efficiency and the link between financial and environmental performance. Chapter three identifies five generic environmental indicators and a financial performance indicator, which meet the test of global recognition. Chapter four introduces a method for building environmental performance indicators, which is consistent with that used for financial performance indicators. It resolves the frequent problem that the reporting entity for financial data differs from that for environmental data. Chapter five reviews examples of such indicators which are already in use by leading edge enterprises, thus demonstrating the feasibility of the approach.

This report is part of a longer-term project of the Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR). The first part of this project developed specific guidance on how environmental costs and liabilities should be reported

in the financial statements. The Group agreed on the guideline in February 1998: *Accounting and Financial Reporting for Environmental Costs and Liabilities*. Since that time, the UNCTAD secretariat and a group of experts have been working on methodologies for standardizing environmental performance indicators by applying the rules used for financial performance indicators. This report is the first in the series on that topic and it gives a general overview of the problem and solution. It is to be followed by a users manual and preparers manual. This work was funded in part by the World Bank.

It should be mentioned that other groups are working on the development of eco-efficiency indicators, such as the World Business Council for Sustainable Development (WBSCD), the International Organization for Standardization (ISO) and the Global Reporting Initiative (GRI) (see appendix 2 for a more detailed description). The WBCSD has created a working group on Eco-efficiency Metrics and Reporting, which began analysing current practices and drawing up recommendations for Standardizing measurement and reporting procedures. The group developed metrics principles and defined key terms for evaluating eco-efficiency and sustainability performance. It also selected indicators which it felt were universally measurable and comparable across all businesses. Member companies are testing the new system to measure their own eco-efficiency performance. It has not addressed the specific methodology required to link financial and environmental indicators.

The ISO 14000 series of environmental management standards was initiated in 1992 as part of the response to the

Rio summit and the primary standard is ISO 14001 which covers environmental management systems. ISO 14031/2 relates to environmental performance evaluation and was issued in 1999. ISO has defined the term "environmental performance" as "the results of an organization's management of its environmental aspects". This means that the performance may be measured against the enterprises' policy, objectives and targets. The guidance covers the "local environment" as well as the global, and outlines some generic "input" and "output" indicators such as energy and waste. Crucially it omits the value added or any other financial parameter and leaves the selection of indicators to the individual enterprise.

The GRI is a long-term project launched by the Coalition for Environmentally Responsible Economies (CERES) to establish, through a global, voluntary and multi-stakeholder process, a uniform framework for corporate sustainability reporting. The framework incorporates not only environmental indicators but also social and economic ones. Thus, it is a much broader exercise than the current one. Concerning the selection of generic indicators, there is a direct link between the results of ISAR's current project contained in this report and GRI's work. However, GRI is also producing sector-specific environmental performance indicators as well as generic ones.

CHAPTER TWO

Environmental performance indicators

Definition and classification of environmental performance indicators

Environmental performance indicators (EPIs) measure the enterprise's effectiveness and efficiency in the consumption of resources. Management has long used indicators to assess performance and EPIs assess the environmental performance of an enterprise. EPIs can be classified into various types:

- process indicators
- system indicators
- eco-financial indicators.

EPIs can also be characterized as

- simple, i.e., measuring one variable such as energy used or tons of solid waste
- complex, i.e., measuring two or more variables such as energy used per unit of output, solid waste produced per unit of output, or per unit of sales.

The advantage of using complex indicators is that it allows the environmental performance of an enterprise to be measured relative to its productive or financial performance for the same period. This allows an enterprise to measure its

operational improvements. Such indicators are useful when comparing enterprises in terms of the environmental impact of their operations. Indicators are most useful and meaningful to users if they are

- disclosed over time
- consist of two variables
- are comparable across enterprises.

There are three types of combinations of possible two-variable indicators that can be used to describe environmental performance:

- an environmental variable relative to another environmental variable in physical terms (waste produced relative to resources used)
- an environmental variable in physical or value terms relative to a financial variable (e.g., CO_2 emissions per unit of sales or environmental costs/total costs).

There are no requirements that enterprises make public the environmental management data that they use for internal control purposes. However, in their stand-alone corporate environmental reports, many enterprises have chosen to publish one or more EPIs.

Need for standardization of environmental variables

In order to enable the users of environmental reports to evaluate an enterprise's environmental performance, it is essential to have comparable and reliable EPIs. This can be achieved by the standardization of relevant environmental

and financial variables. First, the same method should be used to construct EPIs across enterprises. Second, the method for constructing EPIs should be consistent with the method used for financial variables.

The Adams' survey (1998) found that there is no consensus on the use of EPIs or on their standardization. The lack of comparability makes it impossible to either measure progress over time or to compare the performance of one enterprise with another (benchmarking). Non-comparable information can result in misleading assessments of an enterprise's own environmental performance. With non-comparable information, a enterprise can only assess whether its performance is meeting targets set by its management. However, if the information allows performance to be compared across enterprises in general and within the same industry in particular, then the EPI has a higher value.

An enterprise's environmental performance is important to a number of stakeholders including financial markets, because improved environmental performance generally leads to higher, more sustainable financial value. Many stakeholders, and in particular the financial services sector, want standardized environmental performance indicators (EPIs) that can be linked to financial performance. Such indicators could improve the quality of decision-making of enterprise owners, investors and financial analysts.

A number of guidelines for measuring and disclosing EPIs already exist or are under development. They are of limited benefit because

- there is no agreement on which indicators to use within an enterprise;
- the indicator and information disclosed may change from year to year;
- the methodology for the construction of indicators varies across enterprises;
- the methodology for combining environmental and financial data varies, resulting in variables that are not internally consistent.

In the few areas where a consistent methodology has been created this has not been widely communicated, leading to a very low level of implementation. Elsewhere the lack of consistency with financial indicators and the lack of a generally accepted methodology has further detracted from the use of EPIs.

Concept of eco-efficiency

Enterprises can pursue different environmental strategies. Investors increasingly require that companies pursue eco-efficient strategies that reduce the damage caused to the environment while increasing, or at least not decreasing, shareholder value. The World Business Council for Sustainable Development describes the objective of eco-efficiency as "maximizing value while minimizing resource use and adverse environmental impacts." Directors and investors need indicators that measure eco-efficiency in order to assess the outcome of various strategies. Eco-efficient indicators can be used both for monitoring an individual company's performance as well as for comparing it across the industry (benchmarking). Environmentally

conscious managers can increase eco-efficiency by decreasing environmental impacts while increasing the value added by the enterprise. Strategies can increase value-added in a number of ways.

Eco-efficient enterprises use fewer resources, and they cause fewer emissions to soil, water and air while producing the same output as their competitors. This higher productivity leads to an increase in the operating margin due to lower costs. Moreover, in many cases, it also leads to higher sales due to an enhanced value of the products to the customer or due to an improved public image. In addition, the risks of environmental liability decreases, resulting in a lower discount factor (the price for taking risks) and lower (contingent) liabilities. Wise environmental investment programmes also focus on a reduction of working capital. A lower use of resources leads to lower stocks of materials and energy. Focusing on integrated solutions and avoiding end of the pipe investments can decrease incremental investments in fixed assets. Finally, tax relief may be obtained.

Eco-efficiency

An eco-efficiency indicator is the ratio between an environmental and a financial performance variable. The aim of environmentally sound management is to increase eco-efficiency by reducing the environmental impact added (EIA) while increasing the value added (VA) of an enterprise (Schaltegger and Sturm 1989). The World Business Council for Sustainable Development describes how eco-efficiency is achieved: "Eco-efficiency is reached by the delivery of competitively priced goods and services that satisfy human needs and bring quality of life, while progressively reducing ecological impacts and resource intensity throughout the life cycle..." The WBCSD goes one step further by including a clear target level: an eco-efficient state is reached when economic activities are at a level "at least in line with the earth's estimated carrying capacity." (WBCSD 1996).

The problem with this concept is that there are no agreed rules or standards for calculating the ecological variable either within the same industry or across industries. Most importantly, there are no rules for consolidating ecological data for the entire enterprise so that such indicators can be used together with the enterprise's financial performance indicators.

There has been interest in linking environmental performance with financial performance. Given the many variables which affect financial performance, such a relationship would be hard to calculate with precision. Therefore, eco-efficiency is seen by a growing number of experts as one way of establishing this link.

Linking environmental performance to financial performance

EPIs linking the environmental and financial performance can be used to forecast the impact of environmental issues on future financial performance. Such EPIs will allow better investment decisions. It can be said that an above average environmental performance by a enterprise means that, in all probability, this enterprise has a higher and more sustainable margin. In addition, the need for future investments will decrease (compared to competitors with a worse performance). Lower future investments and higher margins are important value drivers, substantially influencing future free cash flows, and thus positively contributing to shareholder value.

Eco-efficiency is relevant to the financial valuation of a enterprise because it could lead to or result in:

- higher margins
- lower incremental investments in current and fixed assets
- lower discount factors
- lower tax burden

These results will create higher free cash flows and thus generate greater financial corporate value. Eco-efficiency could lead to lower liabilities and in turn to more of the free cash flows being available for distribution to shareholders. The market capitalization, which is a sign of its attractiveness to investors, is assessed in part by measuring future cash flows and so can reflect the enhanced investment profile. By adopting the shareholder value approach, the environmental implications are translated directly into financial consequences.

Shareholder value approach

The shareholder value approach allows for the financial quantification of a business strategy (Rappaport 1986). The basic logic behind the financial quantification of a business strategy is that every strategy leads to specific plans and actions. These include an investment programme or an increase in recurring costs for environment and safety. These actions lead to future cash outflows. Yet plans also lead to future cash inflows, e.g. from sales or avoided cash outflows. The balance of out- and inflows is called "free cash flows". They represent the financial value of the strategy. The free cash flow of a period is calculated as follows:

Earnings before Interest and Taxes (EBIT)	
+	Depreciation on Fixed Assets
–	Taxes on Operating Profit
=	Cash Flow from Operations
+/–	Incremental Working Capital
+/–	Investments in Fixed Assets
=	Free Cash Flow

The total of all future free cash flows is equal to the corporate value. In order to add free cash flows from different periods, the annual free cash flows are discounted by a discount factor. The shareholder value approach additionally deducts total debt from the corporate value and thus arrives at the shareholder value, which is the dynamic value of the shareholders' equity. It is proven that there exists a high correlation between the stock market valuation and the financial value of a business strategy (based on future free cash flows). Thus, discounted free cash flows are a valuable indicator for the valuation of a enterprise on stock markets and for owners of unlisted companies. Moreover, it is a future-oriented approach which emphasizes the importance of a long-term view. It is repeatedly asserted that financial markets focus on the short-term performance, but the shareholder value approach shows that approximately 80 per cent of the financial value of an enterprise stems from long-term free cash flows.

CHAPTER THREE

Selecting and standardizing generic environmental performance indicators

Case for generic EPIs and for sector-specific EPIs

Given the desire to link financial and environmental performance through the concept of eco-efficiency, there is a need to *first* select the environmental components of the eco-efficiency indicators. This chapter deals with the approach for identifying generic EPIs. Generic indicators are not necessarily more important than industry-specific indicators but they merely have wider applicability. Thus, the generic indicators should be seen in conjunction with industry-specific EPIs that take the diversity of specific sectors into account. Some enterprises might find it useful to construct both generic and specific EPIs. In accordance with the objectives of this report, five generic indicators are identified. Generic indicators are indicators that can be applied

- world-wide
- by all enterprises
- across all sectors.

Standardized generic EPIs would fulfil the following criteria:

- address world-wide environmental problems (world-wide means global and common for all countries/regions),

- link an environmental problem that is relevant for all industries at the macro level to activities of enterprises at the micro level (macro-micro link means a link of an environmental problem (e.g. global warming) at the macro economic level to enterprise activities (e.g. use of energy) at the micro economic level),
- have a direct impact on both the environmental and financial performance.

In other words the environmental indicator should be of world-wide concern, be related directly to the enterprise's production processes, products or services and have a positive or negative impact on free cash flows of the enterprise.

Generic EPIs are best developed by a process which includes both preparers and users and which is marked by political and technical consensus. In this context, political and technical acceptances are of importance. First, there should be a political consensus or acceptance that the EPIs reflect a significant environmental problem. Second, there must be a technical consensus or acceptance that includes agreement on the procedure to be used to calculate the indicator.

This chapter proposes five generic EPIs which link environmental to financial performance. As mentioned earlier, a number of experts see the concept of eco-efficiency as establishing a link or at least measuring environmental performance relative to the economic activity of the enterprise. This is particularly important when one

wants to compare the environmental performance between enterprises.

Eco-efficiency indicators (EPI) consist of a combination of two independent indicators. Thus, standardizing an eco-efficiency indicator requires the standardization of two single variables (environmental and financial):

$$\text{eco-efficiency} = \frac{\text{environmental performance indicator}}{\text{financial performance indicator}}$$

This ratio measures the environmental impact per unit of value, for example emissions or consumption per dollar of sales or per dollar of value-added. This is similar to measuring the energy intensity per unit of output or GDP. In this case, it would be the environmental intensity (impact) per unit of output or GDP. Others calculate the ratio in reverse as the ratio of a unit of value added for each unit of environmental burden (GRI, WBCSD). All of the international groups working on EPIs use a similar methodology and calculate a similar set of ratios, energy, consumption of physical materials and waste against a financial variable being the most common. The use of the financial variable as the denominator is consistent with the use of more traditional financial measures such as the price earnings ratio used in the assessment of an enterprise's financial performance as well as the macroeconomic assessments made at the intergovernmental level. However, both approaches are equally valid mathematically and the choice of numerator/denominator is based on past custom and process.

Reaching a precise definition of eco-efficiency indicators requires selecting and defining the environmental and the financial indicators. The following section describes how environmental indicators can be selected and defined.

Identification of the most useful/relevant EPIs

The ideal way to reach politically and technically accepted generic EPIs is to base the indicators on international agreements as far as possible. The basic idea behind this proposal is that all stakeholders (e.g. governments, business associations, financial community, NGOs), directly or indirectly, influence the development of international agreements. This also means that the underlying environmental issues have been accepted as being significant problems which require a solution.

Generic indicators can thus be designed for issues/problems which have already been debated and for which there is an international agreement or consensus. Currently, the following four agreements seek to remedy universally recognized environmental problems:

- Agenda 21[10] covering economic and social development that is consistent with the needs of future generations;
- Montreal Protocol covering ozone-depleting substances;

[10] Earth Summit, United Nations Programme of Action for the Environment, Rio de Janeiro, 1992; New York, 1992.

- Kyoto Protocol covering global warming gas emissions;[11]
- Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal.

Agenda 21

Agenda 21 is the most comprehensive agreement to date, which was adopted by more than 178 governments at the United Nations Conference on Environment and Development (UNCED), known as the "Earth Summit", held in Rio de Janeiro, Brazil, in June 1992.

Of the issues contained in Agenda 21, section two - "Conservation and Management of Resources for Development", chapters 9 to 22 - are relevant.[12] Table 2 analyses the various environmental issues according to whether they address a world-wide environmental problem, link the macro with the microeconomic level and have a direct impact on both the environmental and financial performance of an enterprise (see grey-shaded fields in table). Of the 14 issues treated therein, there are three

[11] The text of the Protocol to the UNFCCC was adopted at the third session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) in Kyoto, Japan, on 11 December 1997; as at 13 January 2000, 84 Parties have signed the Kyoto Protocol.

[12] Earth Summit, the United Nations Programme of Action: Rio de Janeiro, 1992; New York, 1992.

global actions that lend themselves to generic indicators. These are:

- protection of the atmosphere (chapter 9)
- protection of the quality and supply of freshwater resources (chapter 18)
- environmentally sound management of solid wastes (including hazardous waste) and sewage related issues (chapter 21)

The other issues that were reviewed do not fulfil the requirements for generic EPIs. They were found to be industry-specific (e.g. number 22: radioactive waste). They cannot be directly linked to an enterprise's production processes, products or services (e.g. number 15: biological diversity). While they dealt with global problems, the impacts depended heavily on local environmental conditions (e.g. number 12: desertification) or on a regional or country-specific definition of the problem (e.g. number 16: environmentally sound management of biotechnology).

Table 2: Agenda 21 (Chapters 9 to 22): Conservation and management of resources for development

Agenda 21		Criteria			
				impact on industry's	
Chapter	Section 2: Conservation and Management of Resources for Development	world-wide problem (1)	macro-micro link (2)	environmental performance	financial performance
9.	Protection of the atmosphere	yes(3)	yes	yes	yes
10.	Integrated approach to the planning and management of land resources	yes	n. p. (4)	no (5)	no
11.	Combating deforestation	yes	n. p.	No	no
12.	Managing fragile ecosystems: Combating desertification and drought	yes	n. p.	no	no
13.	Managing fragile ecosystems: Sustainable mountain development	no	n. p.	no	no
14.	Promoting sustainable agriculture and rural development	yes	n. p.	no	no
15.	Conservation of biological diversity	yes	n. p.	no	no
16.	Environmentally sound management of biotechnology	yes	n. p.	no	no
17.	Protection of the oceans, all kinds of seas,	no	n. p.	no	no

	including enclosed and semi-enclosed seas, and coastal areas and the protection, rational use and development of their living resources				
18.	Protection of the quality and supply of freshwater resources	yes	yes	yes	yes
19.	Environmentally sound management of toxic chemicals, including prevention of illegal international traffic in toxic and dangerous products	yes	n. p.	yes	yes
20.	Environmentally sound management of hazardous wastes including prevention of illegal international traffic in hazardous wastes	yes	n. p.	yes	yes
21.	Environmentally sound management of solid wastes and sewage related issues	yes	yes	yes	yes
22.	Environmentally sound management of radioactive wastes	yes	n. p.	yes	yes

(1) World-wide means global and common for all countries/regions.
(2) Macro-micro link means a link of an environmental problem from the macro level to enterprise activities at the micro level. For generic indicators the problem must be relevant for ALL industries
(3) yes = criterion fulfilled.
(4) n. p. = not possible.
(5) no = criterion not fulfilled.

Kyoto Protocol and Montreal Protocol

Looking at the other agreements can give further guidance within the chosen categories, especially on the issue of "Protection of the atmosphere". The Montreal Protocol covers ozone-depleting substances. The Kyoto Protocol covers industrial and energy-linked global warming gas emissions.

Basing the generic EPIs on these conventions, the following nine environmental problems have been selected:

- depletion of non-renewable energy resources
- depletion of fresh water resources
- global warming
- energy and energy-linked global warming gas emissions
- other industrial emissions contributing to global warming
- depletion of the ozone layer
- use of ozone depleting substances
- emissions of ozone depleting substances
- solid and liquid waste disposal (including hazardous waste).

After the selection of the environmental problems, the corresponding EPIs have to be defined. EPIs can be divided into two groups: effluent-based and financial.

Effluent-based EPIs

The table in this section gives an overview of the proposed effluent-based EPIs based on the selection of environmental problems. All items are measured in physical units in terms of mass (kg, t) or energy (MJ, kWh).

Table 3: Effluent-Based EPIs

Environmental problem	EPI Measured in physical units in terms of mass (kg, t) or energy (MJ, kWh)
Depletion of non-renewable energy resources	Energy purchased
Depletion of fresh water resources	Water use
global warming	Global warming emissions
Depletion of the ozone layer	Ozone depleting emissions
solid and liquid waste	Solid and liquid waste

To account for the specific financial impact in different companies the following composite indicators can be constructed for three of the five global problems. All financial indicators are measured in terms of value units.

Table 4: Financial impacts

Problem	Financial impact of environmental variable Measured in financial units
Depletion of non-renewable energy resources	Energy costs
Depletion of fresh water resources	Water costs
solid and liquid waste disposal	Solid and liquid waste costs

Quantifying an enterprise's contribution to environmental problems

Besides specifying the EPIs most representative of environmental problems, a methodology is needed to calculate a figure indicating the enterprise's contribution to the depletion of non-renewable energy resources, the depletion of fresh water resources, global warming, depletion of the ozone layer and solid and liquid waste.

Conversion factors for non-renewable energy resources

The key question is whether or not one kWh of electricity used by an enterprise corresponds to one kWh of non-renewable energy extracted (primary energy input). The answer is no. The second question is whether an adjustment should be made. The answer is yes, because of substantial differences between the energy purchased by an enterprise and the primary energy input and because of the feasibility of the adjustment.

The fossil energy needed (primary energy input) to generate a certain amount of energy purchased by an enterprise can be assessed with the help of Life-Cycle-Assessment (LCA) data. These data are country- or region-specific because they depend heavily on the energy-mix and technology for electricity generation. The conversion factors for the corresponding non-renewable primary energy input for Europe are listed in the second column in table 5 below.

Table 5: Conversion factors: Preliminary results: Primary energy requirements for Europe.

Energy purchased (1 kWh)	Corresponding non renewable primary energy input (kWh)	CO_2 emissions based on primary energy input (kg)
Oil	1.30	0.095
Oil (low sulphur)	1.30	0.0895
Fuel (unleaded)	1.30	0.103
Fuel (leaded)	1.34	0.105
Diesel	1.21	0.1
Diesel (low sulphur)	1.21	0.1
Propane	1.22	0.069
Natural gas	1.27	0.069
Wood/biomass	0.07	0.0033
Coal	1.20	0.133
Brown coal	1.40	0.133
District heat (60% waste incineration)	0.55	0.0365
Electricity	3.07	0.14
Solar energy (heat)	0.14	0.06
Solar energy (electricity)	0.65	0.0030

ELLIPSON 1997, preliminary results.

Conversion tables must be specified for each region. Based on the data sets available and their high quality, this task is easily done. What is needed on a country specific basis is the energy mix by which electricity is generated. Knowing these relations, the available data for fossil, nuclear and hydropower electricity generation can be used to

calculate the specific primary energy input (and the corresponding CO_2 -emissions for electricity generation).

Global warming

The Intergovernmental Panel on Climate Change (IPCC) has highlighted a number of chemicals that contribute to global warming and six have been specifically selected for measurement in calculating national reduction targets. Substantial differences in potential exist and an adjustment has to be made to take this into account.

The calculation can be done using the widely accepted concept of "global warming potential" as defined by the IPCC. By standardizing global warming emissions in relation to a reference substance (CO_2) by their potential to contribute to global warming, different emissions can be multiplied by their respective global warming potential and then summed up to a single figure. Table 5 illustrates this approach with global warming. A list of the global warming potential of substances is contained in the Kyoto Protocol (see annex 3).

Table 6: Conversion factors, global warming gas emissions

Problem: Reference substance:	Global warming carbon dioxide (CO_2)		
Emission	amount (kg)	Global warming potential (kg CO_2 equivalent/kg)	total global warming potential (kg CO_2 equivalent)
Carbon dioxide	100,000	1	100,000
Methane	1,000	21	21,000
Nitrous oxide	100	270	27,000
Total			148,000

The advantage of this approach is that it focuses attention on high problem contributions rather than high emission figures. This could lead to more efficient and effective decisions that minimize impacts while increasing (or at least not decreasing) financial values. Energy linked CO_2 -emissions depend heavily on the technology and energy source used for electricity generation. Therefore, the primary energy input is relevant to calculate an appropriate figure for energy-linked global CO_2 -emissions on an enterprise level. The conversion factors for the CO_2 -emissions based on the primary energy input for Europe are listed in the third column of Table 6.

Depletion of the ozone layer

The key question is whether or not the contribution to the depletion of the ozone layer of e.g. one kg CFC 11

emitted by an enterprise corresponds to one kg of CFC 113 emitted by an enterprise. The answer is no. The second question is whether or not an adjustment should be made. The answer is yes, because substantial differences exist between different substances and because conversion factors are widely accepted.

The calculation can be done using the widely accepted concept of ozone depletion potential of different substances as defined by the Montreal Protocol (Montreal 1987) and IPCC (IPCC 1996). By standardizing the ozone depleting emissions in relation to a reference substance (CFC-11) by their potential to contribute to the depletion of the ozone layer, different ozone depleting emissions can be multiplied by their respective ozone depletion potential and then summed up to a single figure. A chart of the ozone depletion potential of substances contained in the Montreal Protocol can be found in appendix 3.

Waste disposal

The key question is whether or not the disposal of one kg of clinical waste by an enterprise corresponds to one kg of waste resulting from surface treatment of metals and plastics. The answer is no. The second question is whether or not an adjustment should be made. The answer is no, because the substantial differences in quality of waste (such as toxicity, contents of defined critical substances) can only be described in general terms. A list of the categories of waste contained in the Basle Convention can be found in the appendices.

Depletion of fresh water resources

The key question is whether or not one litre of water used by an enterprise corresponds to one litre water extracted from nature. The answer is no. However, in most cases the differences can be ignored. Thus, the calculation of primary water use is not required.

Overview of effluent-based EPIs

The table below gives an overview of the proposed effluent-based EPIs based on the selection of environmental problems and the analysis of available and accepted assessment approaches.

Table 7: Effluent-Based EPIs

Environ-mental problem	Environmental Item measured in physical units in terms of mass (kg, t) or energy (MJ, kWh)	Assessment/ conversion	Sub-items	
depletion of non-renewable energy resources	energy purchased	primary energy requirements	purchased energy	Oil, gasoline, coal, natural gas, liquid gas electricity
depletion of fresh water resources	water use	–	altered water	chemically altered water - physically altered water
			other water involved	
global warming	global warming emissions	global warming potential	Energy-linked global warming gas emissions (1)	carbon dioxide
			other industrial emissions contributing to global warming	...
depletion of the ozone layer	ozone depleting emissions	ozone depleting potential	ozone depleting substances purchased and in use in closed systems (2)	CFC-11
				...
			emissions of ozone depleting substances	CFC-11
				...
solid and liquid waste	solid and liquid waste	–	solid, non mineral and liquid waste (3)	...

Financial impacts

The following table gives an overview of the financial impacts of EPIs.

Table 8: Financial impacts of EPIs

Environmental problem	Financial impact of environmental variable measured in financial units	sub-items	
depletion of non-renewable energy resources	energy costs	cost of purchased energy	Oil, gasoline, coal, natural gas, liquid gas ... electricity
depletion of fresh water resources	water costs	cost of water purchased	
		costs of water treatment	treatment (on site, off site)
		cost of water discharge	to waterways
solid and liquid waste disposal	solid and liquid waste costs	waste costs for solid, non-mineral and liquid waste	

CHAPTER FOUR

Selecting the financial performance indicator

Two different approaches are currently being used to define the denominator of the environmental performance indicator. The denominator is either in physical or financial terms. That is, the activity or performance is given in units of physical activity (i.e. production in tons) or in units of value (i.e. sales in units of currency).

Value added

Looking at the different industries and enterprises, it is almost impossible to standardize (as a reference item) a common physical unit of activity or output such as "tons of production", "volume of production" or "amount of service units sold". Even if it were possible to aggregate the units these indicators will not take into account the concept of eco-efficiency which adds value by minimizing resource use and environmental impacts.

EPIs linking environmental and financial performance should use a financial variable as the denominator (e.g.. energy used in kWh per unit of value added). Thus, eco-efficiency indicators consist of two variables. The first is measured in physical units and the other in value units. The variables that could be used are

1. Value added (sales minus costs of goods and services purchased);
2. Sales

3. Operating profit;
4. Net income (net profit after tax).

Value added (sales minus costs for purchased goods and services) appears to be the most appropriate choice because it covers only that part of the life cycle where the respective enterprise transforms the economic inputs into products and services while using environmental resources and producing emissions and waste. A more precise correlation between resource use, environmental impact caused and economic output is contained in value added and not in sales or operating profit. This is because enterprises account in their books only for resources, emissions and waste stemming from their own production. The enterprise's environmental and financial performance relates only to that part of the production process the enterprise actually controls. The resources used, the emissions caused and the waste produced by their suppliers are not counted. Only value added can isolate the enterprise's exact contribution to the product or service. For example, the recently introduced "guidelines for enterprise reporting on greenhouse gas emissions", launched by the United Kingdom and based on the UNEP publication "Creating a standard CO_2 indicator" recognizes this and advises enterprises accordingly. It states that "you need to set boundaries for your report to ensure that as a minimum that all the significant activities your enterprise controls are within the scope of your environmental and greenhouse gas reporting, just as they should be within the scope of your financial reporting". This position is being adopted by other governments which are developing similar reporting protocols.

On the other hand, the use of sales and operating profits could lead to misleading indicators. Sales and operating profits add up in the whole life cycle of a product or service up to the point where the last enterprise transfers it to the customer. The following example illustrates different results obtained when using sales or value added.

Sales or value added

Three enterprises (A, B and C) sell the same kind of goods, windows and doors. All enterprises sell 20 windows for $25 each and 50 doors for $10 each giving, total sales of $1,000 (50 per cent doors and 50 per cent windows). The in-house use (input) of energy of the enterprises ranges from 600 kWh p.a. to 1,000 kWh p.a.

Enterprise A produces only doors. The windows are purchased from a supplier. This means that A outsources 50 per cent of its production ($500 in costs for purchased windows compared to sales of $1,000). Enterprise B outsources 25 per cent ($250 in costs for purchased windows compared to sales of $1,000) and Enterprise C produces all windows and doors in-house (no cost of purchased goods compared to sales of $1,000).

The effect of outsourcing is that part of the sales (in this case windows) is not produced in-house. As a consequence no energy has to be used for the production of the purchased goods. In the following section the enterprises are compared and commented upon based on an EPI using sales and value added as reference items.

Sales as reference item

Table 9: EPIs using sales as a denominator.

Variables	Enterprise A	Enterprise B	Enterprise C
Energy used kWh p.a.	600	850	1,100
Sales in $ p. a.	1,000	1,000	1,000
EPI: Energy used in kWh p.a./ sales in $ p.a.	0.6	0.85	1.10

Ranking

1. Enterprise A: 0.60
2. Enterprise B: 0.85
3. Enterprise C: 1.10

Using the EPI "energy used per unit of sales", Enterprise A appears to be the most eco-efficient but this is because it is outsourcing some of its production. If we use value-added, a different ranking will appear.

Value added as reference item

The second example uses value added as the reference item. In order to do this the profit and loss accounts are reviewed and the items comprising "purchased goods and services" are deducted from gross sales to arrive at value added. All of the figures required are published as part of the statutory financial statements and are readily available. No additional figures are required to be collected

or external research undertaken in order to calculate value added.

Table 10: EPIs using value added as a reference item.

Variable	Enterprise A	Enterprise B	Enterprise C
Energy used in kWh p.a.	600	850	1,100
Sales in $ p. a.	1,000	1,000	1,000
Cost of purchased goods & services in $ p.a.	–500	–250	0
Value Added in $ p.a.	500	750	1,000
EPI: Energy used in kWh p.a./ value added in $ p.a.	1.2	1.13	1.10

Enterprise A has produced in-house 50 doors for $10 each and purchased 20 windows for $25 each. This means that the value added is $500. This figure must be compared to the energy used by enterprise A. For its in-house production (value added), enterprise A has used 600 kWh. The EPI energy used/value added is 1.2. The energy used by their suppliers for producing the 25 windows is not accounted for in the books of enterprise A but in the books of their suppliers.

Enterprise B has produced in-house 50 doors for $10 each and 10 windows for $25 each and purchased 10

windows for $20 each, for a value added of $750. This means that its EPI, energy used per unit of value added, is 1.13. Enterprise C produces 100 per cent in-house or 50 doors and 20 windows using 1,100 kWh. Its value added is $1,000. Its EPI, energy used per unit of value added, is 1.10.

The enterprises are ranked as follows in terms of their eco-efficiency:

Ranking

1. Enterprise C: 1.10 (best performer)
2. Enterprise B: 1.13
3. Enterprise A: 1.20

It will be recalled that in the case of sales as a reference item, the enterprises have the reverse ranking. If value added is chosen, enterprise A ranks lowest and enterprise C is the best performer. Value added reduces some of the distortions in the indicator caused by outsourcing which the enterprise might do to improve its environmental performance. Enterprise directors are responsible for their in-house production and they can directly influence it by appropriate measures. Value added is directly linked with in-house production: the more in-house production, the higher the value added. By using as an EPI energy used per unit of value added two enterprises can reliably be compared. The focus on value added does not mean that life cycle analysis of the entire supply-consumption-disposal chain is not important. However, cost-efficient measures have not yet been developed to detect full impacts over the life of a product. Therefore, for the purpose of constructing useful and meaningful eco-

efficiency indicators it is necessary to draw boundaries and for this, value-added is more precise than sales.

Outsourcing

Many enterprises contract out major parts of their operations, such as freight transport (in the United Kingdom this accounts for 7 per cent of national emissions), which may produce substantial environmental impacts and which are integral to their business. There are also other reasons for outsourcing. Enterprises can take advantage of economies of scale available, or avoid the investment needed for costly research and development programmes. When activities are outsourced, enterprises often exercise considerable control and influence over these activities, although they do not have to account for resources used, the emissions caused and the waste produced by the supplier.

In the example above where sales are used there is no indication of the extent of outsourcing and no reliable conclusion can be reached about in-house eco-efficiency. Where value added is used, the improvement achieved via outsourcing is reduced and a more reliable conclusion is reached about eco-efficiency of the entity being analysed.

Using value-added the eco-efficiency indicator is in line with one of the most important principles of financial accounting-the matching principle. That is, an enterprise should report what is within its control, i.e. what it actually does rather than what is outside its control. Value-added reduces the distortions from outsourcing, but it does not completely eliminate the chance that those enterprises

which outsource their activities might have better EPIs as will be demonstrated in the next example.

However, outsourcing can also impact on financial ratio analysis where outsourcing can improve financial ratios by reducing low-margin activities. This, however, does not invalidate the usefulness of the financial ratios but requires increased disclosure if they are to be used intelligently. Therefore, when one is comparing enterprise data one wants details on outsourcing.

Outsourcing and the link between financial and environmental performance

Investors use consolidated group accounts in order to assess the financial performance of enterprises and therefore have a reasonable expectation that environmental reporting will include all the significant activities that are within the control of an enterprise. The indicators proposed in this report are generic indicators which allow comparison among different enterprises and across different industries. They are not by themselves capable of delivering a comprehensive analysis of the environmental and financial performance of an enterprise or of being able to be used to benchmark particular enterprises or industries. Apparent differences in performance may be due to differences in operating circumstances or enterprise structure as well as differences in the level of contracted out or bought in services. This set of generic EPIs do serve as a suitable starting point for qualitative analysis. A qualitative description of a group with additional information in the notes is important to users who want to reliably compare two groups (see UNCTAD 1994). This includes management discussions where analysts have

to address the question of outsourcing and life cycle issues. Based on the received answers the analyst will be better placed to appropriately interpret the quantitative indicators and the ranking between different enterprises.

The following example (see table below) describes four outsourcing scenarios that could be adopted by an enterprise. It is assumed that a group EPI "energy used per unit of value added" is one (10,000kWH/10,000$). The group EPI of one results from four different segments with different EU scores. There are segments with high energy use and high value added activities (A, EPI = 1)), segments with low energy use and low value added activities (B, EPI 1), segments with high energy use and low value added activities (C, EPI = 4) and segments with low energy use and high value added activities (D, EPI = 0.25).

Table 11: Outsourcing scenarios

	Segment A	Segment B	Segment C	Segment D	Total Group
Energy used p.a.	4,000	1,000	4,000	1,000	10,000
Value added p.a.	4,000	1,000	1,000	4,000	10,000
EPI (energy used per cent of value added)	1	1	4	0.25	1

The management has the following four options for outsourcing and each will have a different impact on the group performance:

1. Outsourcing of activities with high environmental impact /high value added (segment A) would result in 6,000 units of energy compared to a value added of 6,000 which also equals one.
2. Outsourcing of activities with low environmental impact added/low value added (segment B). This would not affect the consolidated group EPI. The consolidated EPI would be 9,000 units of energy compared to a value added of 9,000 which also equals one.
3. Outsourcing of activities with high environmental impact /low value added (segment C). This would affect the consolidated group EPI. The consolidated EPI would now be 6,000 units of energy compared to a value added of 9,000 which equals 0.67.
4. Outsourcing of activities with low environmental impact added/high value added (segment D). This would affect the consolidated group EPI. The consolidated EPI would now be 9,000 units of energy compared to a value added of 6,000 which equals 1.5.

Thus, scenarios one and two would not affect the EPIs whereas three and four can lead to distortions. To avoid the wrong interpretation of EPIs users should discuss the possible effects of different outsourcing options with the enterprises.

Environmentalists rather than financial analysts are concerned about outsourcing. They fear that outsourcing will be used to artificially improve environmental performance. It has to be noted that outsourcing is not merely an environmental issue. Enterprises also outsource low margin activities. Analysts do not reject the financial indicators just because an enterprise is heavily outsourcing. Rather, analysts use the financial indicators as a starting point for the qualitative analysis. It has to be viewed in relation to outsourcing which is additional information. The management of an enterprise achieving an operating profit margin of 25 per cent or more has to be asked about the profitability of their suppliers and customers. Michael Porter has demonstrated that the distribution of power along a value chain (from supplier to enterprise to customer) decides which enterprise on the value chain can achieve the highest margin. Yet, he has also demonstrated that, under a long-term perspective, the success of each enterprise remains linked to the value chain of the respective industry. This also means that outsourcing of highly polluting activities remains detrimental to both the polluting and the outsourcing enterprise. Sooner or later, the environmental problems related to such an activity will fall back on the outsourcing enterprise because the enterprise is still involved in the life cycle through its suppliers.

Outsourcing and the feasibility of life cycle analysis for investors

Life cycle analysis would require a substantial amount of data that would need to be collected from myriad suppliers and customers along the full value chain. The cost of such data collection would be extremely high. It might be

of low quality. The boundaries of life cycle analysis are not yet universally agreed and the standardization of data to be aggregated has not yet been considered. At the current time, the costs far outweigh the benefits and for these reasons the value added approach, capturing those activities within the control of the enterprise, is recommended.

The proposed set of EPI's

Based on the five universally recognized environmental problems and their corresponding EPIs and combining them with the most suitable financial indicator, the following five eco-efficiency indicators are recommended for linking an enterprise's environmental performance with its financial performance.

Table 12: Proposed set of EPIs

Environmental Problem	Environmental Performance Indicators
Depletion of non-renewable energy resources	primary fossil energy use/value added
Depletion of fresh water resources	water use/value added
global warming	global warming emissions/value added
Depletion of the ozone layer	ozone depleting emissions/value added
Disposal of solid and liquid waste	solid and liquid waste/value added

Three of the five selected problems can also be financially assessed:

Table 13: Proposed set of EPIs

Problem	Environmental Performance Indicators financially assessed
Depletion of non-renewable energy resources	energy costs/value added
Depletion of fresh water resources	water costs/value added
Disposal of solid and liquid waste	solid and liquid waste costs/value added

These EPIs forecast the impact of environmental issues on future financial performance. It can be said that an above average environmental performance of an enterprise means that, in all probability, this enterprise has a higher and more sustainable operating margin. All EPIs relate to an important environmental problem which results in production costs (such as energy costs, water costs, waste costs). Therefore, there is a direct link to the profit-margin. In addition, the pressure on future investments is lower (compared to competitors with a worse performance). Lower future investments and higher margins are important value drivers, substantially influencing future free cash flows, and thus positively contributing to shareholder value.

CHAPTER FIVE

Accounting issues in standardization

Based on the proposed set of five generic EPIs, two accounting issues in standardization are of importance. First, the identified environmental items/variables have to be standardized. Consensus has to be reached on the construction of the following environmental items/variables:

- purchased energy (MJ)
- water use/altered water (kg)
- water use/other water involved (kg)
- energy-linked global warming gas emissions (kg)
- other industrial emissions contributing to global warming (kg)
- ozone layer depleting substances purchased and in use in closed systems (kg)
- emissions of ozone layer depleting substances (kg)
- solid and non-mineral liquid wastes (kg)

Second, once the environmental variables have been calculated in the same way across companies, they must be brought into line with enterprise financial data that is they must be consolidated.

EPI financial data must possess certain characteristics if they are to be useful for financial accounting. A

conceptual framework is followed in recording financial transactions to ensure data are consistent and therefore reliable. A number of international and national financial conceptual frameworks have been developed to guide the preparers of financial statements so that accounting data are useful. For the time being, it is suggested that the financial conceptual framework be used to produce environmental and financial data on a consistent basis. Rather than lay out the entire financial conceptual framework, this chapter concentrates on those financial assumptions and characteristics most relevant in producing eco-efficiency indicators.[13]

The financial accounting conceptual framework is based on two important assumptions: the accruals principle and going concern. The accruals principle requires that transactions are recognized, measured and recorded when they occur rather than when payment occurs (cash basis). Going concern assumes that the reporting entity is expected to continue in business. It is also the practice in financial accounting to precisely define the boundaries of the reporting entity or enterprise. The financial data which appear in the annual financial report are for group-that is the parent and its subsidiaries. The following sections go into detail on the conceptual framework and the methods of

[13] The discussion of the financial accounting conceptual framework was taken from, ISAR, *Objectives and Concepts Underlying Financial Statements*, United Nations, New York, 1989. The ISAR conceptual framework is consistent with that developed by other international organizations such as the IASC.

consolidation for the environmental and financial data for the group.

Relevance, reliability and comparability

For financial and environmental data to be useful, they must be relevant, reliable and comparable. For data to be relevant to users it must be material.

Materiality

The concept of materiality requires that financial statements should disclose all items that are material enough to affect evaluations or decisions of users. The criterion of materiality refers not only to the size of an item in quantitative terms, but also to the role that such an item may play. If the omission of an item of information would affect the decisions made by users on the basis of financial statements, such an item is material. If an item is immaterial, however, its inclusion in financial statements may impair their understandability. There is a discussion underway about how to apply the concept of materiality to environmental accounting and reporting. While an economic transaction might not be material enough to be reported under financial rules, it might be significant in relation to environmental performance.

Substance over form

For data to be reliable, it should respect the substance of a transaction over its form. According to IASC[14]

> *If information is to represent faithfully the transactions and other events that it purports to represent, it is necessary that they are accounted for and presented in accordance with their substance and economic reality and not merely their legal form. The substance of transactions or other events is not always consistent with that which is apparent from their legal or contrived form. For example, an enterprise may dispose of an asset to another party in such a way that the documentation purports to pass legal ownership to that party; nevertheless, agreements may exist that ensure that the enterprise continues to enjoy the future economic benefits embodied in the asset. In such circumstances, the reporting of a sale would not represent faithfully the transaction entered into (if indeed there was a transaction).*

Prudence

Prudence is perhaps the most difficult accounting concept to deal with in environmental accounting.

14 IASC, *International Accounting Standards*, January 1999, Par. 50.

Uncertainties play a crucial role in the reliability of information. Although financial statements are based on events that have occurred in the past, many of the events become meaningful only when viewed in the context of their future outcomes. Those outcomes cannot be determined with precision when the statements are being prepared. It becomes necessary, therefore, for preparers of financial statements to exercise judgement in their estimation of future outcomes. Traditionally, prudence refers to the practice of recognizing potential losses more readily than potential gains or assets. The tendency in some countries was for accountants to exercise excessive prudence and to create hidden reserves in order to cover uncertain negative outcomes. However, in environmental accounting the situation is the opposite in that accountants do not comply with the prudence principle and are reluctant to recognize environmental liabilities until they are forced to. This is the result of the legal environment in which third parties might start a lawsuit when the liability was recognized. Therefore, if the prudence principle is not adhered to in a manner to produce a true and fair view of the enterprise and its liabilities are underreported this reaction could affect the environmental data as well.

Verifiability

If data are to be reliable, they must be verifiable. Verifiability is concerned with the correct application of measurement methods. If these are applied correctly, the transaction or event in the financial statement is calculated with a reasonable degree of precision so that knowledgeable and independent observers would agree that it corresponds

to the underlying transaction or event. For financial and environmental data to be reliable, they must be verifiable.

Comparability

Comparability enables users to undertake, in a meaningful way, both intertemporal and cross-sectional analysis. If financial and environmental data are prepared in a comparable way, the performance of different enterprises, or the same enterprise over time, can be examined. Comparability across enterprises requires that a consistent set of definitions, units of measurement, assumptions, measurement techniques and reporting periods be applied. Comparability demands that consistent procedures are used in summing up financial and environmental data. This requires that the same definition of the "reporting entity" be used for both the financial and environmental data. Given the fact that there are well-established accounting rules for collecting the financial data, it is necessary to use the definition of "reporting entity"□as required by financial accounting if there is to be consistency and comparability between the environmental and financial data. In particular, the same procedures must be used for the consolidation of data for the enterprise as a group or the segmentation of data on the basis of product line or geographical origin.

All proposed EPIs use value added as the denominator. There is no need for new standards for financial variables because they have already been formulated at the international and national levels. However, new guidelines are required in two instances as mentioned earlier. First, the selected environmental variables have to be standardized. Second, environmental

data must be consolidated for the enterprise as a whole and must be consolidated on the same basis as the financial data. That is, the environmental data must correspond to those of the financial reporting entity. The next section explains and illustrates the rules for consolidation and how such a correspondence could be reached.

Consolidation

Consolidated environmental data

The IASC has noted that "users of financial statements of a parent are usually concerned with, and need to be informed about, (financial information relating to) the group as a whole. This need is served by consolidated financial statements...." (IAS 27 par. 9). Consolidated financial data are particularly relevant because investors value an enterprise on the basis of the earning power and risk structure of the whole group.

Consolidation of environmental data is equally important, so that users can be provided with information to help them assess the degree to which groups of related enterprises, such as transnational corporations with subsidiaries and associated companies operating in different countries, are meeting their environmental objectives and implementing their environmental policies.

Main issues in financial consolidation

There are two main issues in financial consolidation.

1. What is the appropriate scope of consolidation in terms of the completeness of the coverage for the group? The

scope of consolidation indicates which companies are and which are not integrated into the consolidated group figures. It is impossible to correctly interpret group figures without knowing the scope of consolidation.

2. How can data from different enterprises (subsidiaries) be aggregated (consolidated) to produce group figures? There are three methods of reflecting the results of the parent enterprise and a group of related enterprises in a set of group accounts: full consolidation, equity method and proportionate consolidation. To produce useful information the method of consolidation must be known. Moreover, as the IASC and other standards-setting bodies have noted, it must be clear that all enterprises included in the group have applied uniform accounting policies for like transactions and other events in similar circumstances (IAS 27, par. 21).

The choice of the method and the scope of consolidation can influence materially the consolidated financial figures. Depending on the method used, certain data appear or do not appear in the consolidated group accounts. To demonstrate this, the three methods are, first, briefly described and, then, illustrated by a simple example.

Full consolidation

Under full consolidation, the financial statements of the enterprises in the group are combined on a line by line basis by adding together like items of assets, liabilities, equity, income and expenses. Inter-enterprise balances and inter-enterprise transactions are totally eliminated. Any unrealized profits resulting from inter-enterprise transactions

are eliminated, and any unrealized losses would also be eliminated unless cost cannot be recovered. The carrying amounts of any inter-enterprise investments (in particular, those of the parent enterprise[15]) and the related portion of the equity of each of the group's enterprises are eliminated.

Full consolidation is normally applied to all enterprises that are controlled by a parent enterprise. This means that, in practice, the parent enterprise owns or controls, directly or indirectly, 50 per cent or more of voting rights. These enterprises are referred to as subsidiaries.

Equity method

Under the equity method, the investor's investment in an investee enterprise is initially recorded at cost and is adjusted thereafter for changes in the net assets of that enterprise (IAS 28, para. 3). As is the case in full consolidation, inter-enterprise balances and inter-enterprise transactions are eliminated, together with any unrealized profits and losses relating thereto (IAS 28, par. 16, and SIC – 3). The equity method is normally applied for investments in "associates." An "associate" is an enterprise which is neither a subsidiary nor a joint venture and in which the investor has a significant influence (normally, between 20 per cent and 49 per cent).

Standards issued by the IASC indicate that "an investment in an associate should be accounted for in consolidated financial statements under the equity method

15 "Parent" is defined by the IASC as "an enterprise that has one or more subsidiaries". (IAS 27, par 6).

except when the investment is acquired and held exclusively with a view to its disposal in the near future in which case it should be accounted for under the cost method"[16] (IAS 28, par. 8). Significant influence is described by the IASC as "the power to participate in the financial and operating policy decisions of the investee but is not control over those policies" (IAS 28, par. 3).

The Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) has indicated that, "under the equity method, an initial investment by a transnational corporation in another enterprise is so adjusted in the consolidated financial statements of the transnational corporation as to reflect its share of the net assets of the other enterprise. The consolidated income statements reflect the transnational corporation's share of the operating results of the other enterprise" (UNCTAD, 1994, par. 50).

Proportionate consolidation

Under proportionate consolidation, the parent's/investor's share of each of the assets, liabilities, income and expenses of the other group enterprises is combined on a line by line basis with similar items in the parent's/investor's financial statements. Again, inter-

16 Under the cost method, the investment is recorded at its initial cost. The income statement reflects income from the investment only to the extent that the investor receives distributions from the accumulated net profits of the investee arising subsequent to the time of making the investment.

enterprise balances and inter-enterprise transactions are eliminated, together with any unrealized profits and losses relating thereto.

Proportionate consolidation is normally only used in accounting for the interests in a joint venture (which has been defined by the IASC as "a contractual arrangement whereby two or more parties undertake an economic activity so as to obtain benefits from it." (IAS 31, par. 2)). Even in this situation, the method is not permitted in some jurisdictions. Theoretically, however, it could be applied in situations involving group accounts other than joint ventures.

Example

The purpose of this simple example is to illustrate the calculation of an environmental performance indicator, that of water use per value added, under these three consolidation methods, and to comment on how meaningful the indicator will be in each of the three situations. First, we indicate what the EPI would be if the two companies were not related. Then in the next table we take into account the fact that Enterprise A has acquired 50 per cent of the shares of Enterprise B.

Table 14: Purchases, services and water use of Enterprises A and B:

	Enterprise A	Enterprise B
Sales	$10,000	$18,000
Purchases and services	4,000	10,000
Value added	$6,000	$8,000

It is assumed that there are no opening or closing inventories.

Water usage	2,000 units	10,000 units
EPI indicator	2,000/6,000	10,000/8,000
Water usage per dollar value added	0.33	1.25

The following table indicates what the situation would be under full consolidation (that is, by purchasing 50 per cent of the shares of Enterprise B, Enterprise A obtains control over Enterprise B, and Enterprise B is therefore a subsidiary), the equity method (that is, 50 per cent ownership does not give Enterprise A control of Enterprise B; Enterprise B is merely an associated enterprise over which Enterprise A has significant influence) and proportionate consolidation (for example, Enterprise A has entered into a joint venture with another enterprise each of which owns 50 per cent of Enterprise B). Note that in line with international accounting standards more than a 50 per cent share ownership would require full consolidation but 20 per cent to 50 per cent share ownership would require the equity method.

Table 15. Consolidation when Enterprise A acquires 50% of Enterprise B

		Full Consolidation		Equity Method		Proportionate Consol.	
Sales	A	$10,000		$10,000		$10,000	
	B	18,000	$28,000	____	$10,000	9,000	$19,000
Purchases and services	A	4,000		4,000		4,000	
	B	10,000	14,000				
					4,000	5,000	9,000
Value added			$14,000		$6,000		$10,000

Note that the inter-enterprise transaction has been eliminated in all the methods.

	Full Consolidation		Equity Method		Proportionate Consolidation	
Water usage	2,000		2,000		2,000	
A's own						
B's own	10,000	12,000	____	2,000	5,000	7,000

Note that, with respect to Enterprise A, only its own water usage is included, and not that relating to purchases from Enterprise B. Such inclusion would result in duplication.

EPI	12,000/14,000	2,000/6,000	7,000/10,000
Water usage per dollar value added	0.86	0.33	0.70

The EPIs in Table 15 differ depending on the method chosen for financial consolidation. The EPI under full consolidation relates to the combined operations of Enterprises A and B. With respect to consolidated financial results, the IASC states that "minority interests in the income of the group should be separately presented." (IAS 27, para. 26). Net

income therefore represents the amount attributable to the controlling interest, which in this case would be Enterprise A. Some would therefore maintain that the EPI should be similarly adjusted. Others, however, maintain that since Enterprise A controls Enterprise B, it has complete responsibility for its operations, and there should be no adjustment.

The EPI obtained under the equity method is a meaningless figure because it gives no consideration to the fact that the shareholders/owners of Enterprise A have responsibility for 50 per cent of the operations of Enterprise B. The value added and water usage amounts need to be adjusted to take into account Enterprise A's equity in Enterprise B.

With respect to proportionate consolidation, the adjustments to reflect Enterprise A's 50 per cent ownership of Enterprise B have already been included on a line by line basis and no further adjustment is required.

The adjusted amounts under the various methods will be as in table 16.

Table 16: Adjusted EPI's

	Full Consolidation (not adjusted)	Full consolidation (adjusted)	Equity Method	Proportionate Consolidation
Value added (per above)	$14,000	$14,000	$ 6,000	$10,000
Less minority interest (50% $18,000-$10,000)		(4,000)		
A's equity in B's value added (50% $18,000 – $10,000)			4,000	
Adjusted value added	$14,000	$10,000	$10,000	$10,000
Water usage	12,000	12,000	2,000	7,000
Less portion relating to B's minority shareholders (50% of 10,000 units)		(5,000)		
Add A's portion of B's water usage (50% of 10,000 units)			5,000	
Adjusted water usage from perspective of A	12,000	7,000	7,000	7,000
Adjusted EPI indicator	12,000/14,000	7,000/10,000	7,000/10,000	7,000/10,000
Water usage dollar per Value added (from perspective of A)	0.86	0.70	0.70	0.70

It will be noted that, except for the first situation, where there is no adjustment for minority interest, the EPI from the perspective of the shareholders/owners of Enterprise A is now the same, irrespective of the method of consolidation used.

Segmentation

The last issue to be considered in standardization is segmentation. A professional analysis has to take into consideration a set of indicators best suited to interpret the results of an enterprise. This mainly refers to enterprises that are strongly diversified. In considering such segmentation, the industry will be relevant as well as the specific products or services being produced. In some extremely diversified enterprises, it may be appropriate to provide a separate report for specific products or services. The disclosure of generic EPIs per segment can support the interpretation of a group's performance. It can be assumed that the future development in ecological accounting will require group and segment information (as in financial accounting).

The data given in the Health, Safety, and Environment Report 1998 of Novartis provide an example on how different EPIs can depend on the field of activity. The EPI water consumption (in mio. cubic metres per production in metric tons) indicates that the group achieves an average EPI of 71 in 1998 compared to the healthcare division with 553 (7 times as much as the group average), the agribusiness with 37 and consumer health with 17 (EPIs calculated by authors based on data published in the Novartis report.

However, investors invest in companies which are listed on stock markets. The annual reports to shareholders of listed enterprises contain consolidated results for the groups. Thus, while segmental EPIs are important, they do not override the disclosure of EPIs for the group.

Conclusion

This report has discussed standardization from various perspectives. First, it has discussed the various EPIs which are being constructed and asserted that two variable EPIs are more meaningful than one variable EPIs. Second, it has discussed in the light of global environmental problems which are the most important EPIs for every enterprise regardless of sector, although some sectors should develop additional EPIs. Third, it has discussed which financial variables are the most appropriate to combine with environmental indicators in order to link financial and environmental performance. Lastly, it has introduced accounting concepts and standards necessary to produce environmental and financial data on a consistent basis which are relevant, reliable and comparable. There are three methods for the consolidation of financial data. Environmentalists should be aware of what method has been chosen so that the environmental data are produced on a consistent basis.

Appendix 1: Definitions

Environmental performance indicators

There are numerous definitions of environmental performance indicators. Some of the more important are listed below.

Bartolomeo describes EPIs as:

"... quantitative and qualitative information that allow the evaluation, from an environmental point of view, of enterprise effectiveness and efficiency in the consumption of resources. EPIs consist of process, system and eco-financial indicators" (Bartolomeo 1995).

According to the Tellus Institute, environmental performance indicators "... provide a metric by which environmental performance may be tracked. Standardized EPIs allow a comparison of an enterprise's current performance with its earlier performance, with other enterprises in the same sector, or with industry overall." EPIs quantify resource use and environmental impacts and serve to bridge the gap between environmental stewardship and the bottom line. (White and Zinkel 1997a).

The International Organization for Standardization ISO 14031.5 working draft defines environmental performance indicators as follows:

"Specific expression that is used to provide information about environmental performance"(ISO 1996).

Analogous to the objectives of IASC (IASC framework 1983) it can be said that the objective of EPIs is to provide information about the environmental performance and changes in the environmental performance of an enterprise that is useful to a wide range of users in making economic and environmental decisions. This information is only useful to users if it is comparable, reliable and understandable.

Definitions of environmental performance indicators

Adams identified six approaches to environmental performance measurement (Adams 1998). They include

- Toxic release inventory (TRI)
- Enterprise-specific approaches
- Self-selected emission targets
- Compliance with regulations/permits
- Environmental performance indicators (EPIs) and eco-efficiency measures
- CML method (Centre of Environmental Science, University of Leiden)
- Environmental burden

It can be said that the concept of eco-efficiency is one of the most important in the context of communicating environmental performance. Eco-efficiency has proven to be useful and meaningful for internal management as well as for external communication to investors. Therefore, this report focuses on quantitative EPIs relating to eco-efficiency measures.

The relevant environmental items do not necessarily originate within the same accounting system. For example, environmental liabilities originate within the financial accounting system while tons of CO_2 -emissions originate within the ecological accounting system.

If the environmental performance is to be disclosed in more useful and meaningful terms for users it should be disclosed in the form of two-item indicators (ratios). Basically, there are three combinations:

- Financial indicator in relation to another financial indicator

  (e.g. environmental liabilities/shareholders equity)

- Financial indicator in relation to environmental indicator

  (e.g. tons of CO_2 -emissions per USD of sales)

- Environmental indicator in relation to another environmental indicator

  (e.g. waste in relation to resources used)

Today, while many companies publish information about their environmental performance "...it is entirely up to the enterprise" (Adams 1998) which indicators they want to report on:

Discretionary use of indicators.

In the case of financial/environmental indicators there is no indication of how an indicator is recognized, measured and disclosed. There is no indication of how the financial or

environmental indicators were derived (underlying assumptions, qualitative characteristics, scope and method of consolidation).

According to Adams, the solution to these problems depends on various factors (UNCTAD 1998; Adams 1998) "...Various factors will determine the pace of development of EPIs (both financial and non-financial) as regularly used tools for inter-enterprise comparison"

These factors include:

- the speed of take-up of EMAS (the Environmental Management and Audit Scheme by the European Union), ISO 14000 and related environmental standards
- the willingness of companies to voluntarily enter into a sector-wide public reporting of (potentially substandard or legally embarrassing) environmental performance results
- the extent to which the financial sector increases pressure on companies to make such disclosures (UNCTAD 1998; Adams 1998).

Appendix 2: Other initiatives to develop EPIs

In the introduction to this report there are at least three other major initiatives involving the development of EPIs either at the international level, the NGO level or the business association level. The activities of the following key organizations which have major initiatives in this area are highlighted:

- The International Organization for Standardization (ISO)
- The Global Reporting Initiative (GRI)
- The World Business Council for Sustainable Development (WBCSD)

Global Reporting Initiative

The most comprehensive project is the NGO-led Global Reporting Initiative (GRI). The GRI was established in 1997 to develop a framework (or guideline) for enterprise-level reporting on sustainable development, including environmental, social and economic aspects.

The framework will serve as:

- An internal vehicle for checking consistency of sustainability policy with performance;
- A logical structure for applying sustainability concepts to enterprise operations;
- A framework for dialogue between internal and external stakeholders.

The GRI is convened by CERES (Coalition for Environmentally Responsible Economies) and incorporates the active participation of corporations, non-governmental organizations (NGOs), consultants, accountancy organizations, business associations, universities, and other stakeholders from around the world.

The GRI Sustainability Reporting Guidelines comprise three sections:

1. the preamble describes the rationale, value, applicability and general reporting principles of the Guideline;
2. the Guidelines are divided into nine parts: CEO statement; key indicators; profile of reporting entity; policies, organization and management systems; stakeholder relationships; management performance; operational performance; product performance; and sustainability overview.
3. the Appendices provide additional explanation and illustrations pertaining to various parts of the Guidelines.

These guidelines aim to provide guidance to enterprises preparing sustainability reports. The guidelines do not provide guidance for data collection, information and reporting systems. Nor do they give guidance on the methods to be used for calculating the indicators. The generic indicators identified by GRI correspond to those identified in this report and WBCSD. This report should be viewed a "complementary" to GRI in that it fills a methodological gap.

Among the indicators recommended by GRI are

- Total energy use
- Total electricity use
- Total fuel use
- Other energy use

- Total materials use other than fuel
- Total water use
- Non-product output (NPO) defined as waste
- Quantity to NPO to land by material type
- Emissions to air by type
- Discharges to water by type

The guidelines are applicable to any size and any type of enterprise that chooses to prepare a sustainability report. The Guidelines are not specific to any industry or business sector. That is, they are designed to incorporate information common to most enterprises regardless of business sector.

International Organization of Standardization (ISO)

The ISO has 133 member bodies which set technical standards for manufacturing and goods processing in their countries. It has developed ISO 14000, which is a series of international, voluntary environmental management standards. Developed under ISO Technical Committee 207, the 14000 series of standards address the following aspects of environmental management: Environmental Auditing and Related Investigations, Environmental Labels and Declarations, Environmental Performance Evaluation, Life Cycle Assessment and terms and definitions.

ISO (TC 207 subcommittee 4) published ISO 14031.5: on Environmental Management – Environmental Performance Evaluation in 1999. It emphasizes the management process in terms of environmental performance evaluation (EPE). ISO defines EPE as ...*a management process which can*

provide an organization with reliable and verifiable information on an ongoing basis to determine if its performance is meeting the criteria set by its management. The information generated by EPE may also assist an organization to:

- achieve continual improvement of its environmental performance;
- report and communicate its environmental performance;
- identify opportunities for prevention of pollution;
- increase efficiency and effectiveness; and
- identify strategic business opportunities. (ISO 1996)

The standard prescribes the process for evaluating if an enterprise has adopted an environmental management system. It is important to note that working group TC 207 has also identified environmental indicators which could be used for international environmental management purposes. They were not intended to communicate performance to external stakeholders.

It is important to note for environmental management systems (EMS) in general and ISO in particular, that EMS-standards are process, not performance standards (Sturm 1997). In other words, these standards do not tell organizations what environmental performance they must achieve (besides compliance with environmental regulations). "Instead, the standards describe a system that will help an organization to achieve its own objectives and targets. The assumption is that better environmental

management will lead indirectly to a better environmental performance." (Feldmann 1996)

"Indicators help to condense relevant environmental data into compact and useful information about management's efforts, the organization's environmental performance, or the condition of the environment. An organization should select and develop a sufficient number of relevant and understandable indicators to evaluate its environmental performance."

ISO/WD 14031.5 lists environmental loads, quantitative information on emissions, discharges, climate change and others. The WD lists many types of environmental indicators

- absolute: (e.g. total tons of SO_2 emitted per year)
- relative: information scaled to, or relative to, another parameter such as production (e.g. tons of SO_2 emitted per ton of primary product)
- Indexed: various indices constructed for either absolute or relative information, such as baseline year at 100 per cent; or weighting of equivalents to consolidate data (e.g. total green housegases emitted expressed as carbon dioxide equivalents).
- Qualitative: data that cannot be quantified by scientific measures, but are placed on a value scale decided by the organization.
- Financial: costs or benefits associated with environmental performance (e.g. waste handling

costs, environmental performance improvement investments per ton of release reduction, reduced costs of purchased materials resulting from recycling or reuse)

World Business Council for Sustainable Development

The WBCSD is a coalition of some 150 transnational corporations united by a shared commitment to the environment and to the principles of economic growth and sustainable development. One essential consequence of this commitment is that most enterprises strive towards more sustainability by increasing their eco-efficiency. The progress achieved is, in many cases, communicated by annual environmental reports. Sometimes, these reports are known as "eco-efficiency reports".

The WBSCD has developed a set of eco-efficiency indicators to help measure progress towards economic and environmental sustainability in business. According to WBSCD, eco-efficiency indicators primarily serve as a decision-making tool for internal management to evaluate performance, set targets and initiate improvement measures. They are also an important tool for communicating to internal and external stakeholders. The objective of eco-efficiency is to maximize value while minimizing resource use and adverse environmental impacts. In order to calculate eco-efficiency, the WBCSD uses the following equation:

$$\text{Eco-efficiency} = \frac{\text{Product or service value}}{\text{Environmental influence}}$$

So far, WBSCD has identified the following core indicators to be tested in a pilot application:

Product/service value

- Mass or number of products or services produced or sold
- Net sales

Product/service creation environmental influence

- Energy consumption
- Materials consumption
- Net water consumption
- Greenhouse gas emissions
- Ozone depleting substance emissions

As in the case of GRI, these are largely consistent with what is recommended in this report. WBCSD is developing core indicators, which are internationally agreed upon. Although these generic indicators are valid for virtually all businesses, they are not of equal value or importance for a given enterprise nor are they necessarily comparable between different businesses. WBCSD recommends that ISO 14031 Environmental Performance Evaluation be used to guide the selection of relevant supplemental indicators for a specific enterprise or sector. (WBCSD, *Executive Brief,* August 1999).

Given the initiatives of all the above-mentioned organizations, it can be said that there is much support for standardizing EPIs for external communication:

A substantial number of industrial associations in general and companies in particular have created EPIs, publish them periodically in environmental reports and regard their development as being among the most important issues for the next five years (see also the findings of the UNEP Consultative Meeting with Industry and Trade Associations in Paris in October 1997). Thus, many groups use and want EPIs. All, however, suffer from the lack of standardization of EPIs and should therefore support a standardization of EPIs. Moreover, the knowledge of how to Standardize is well established (ISO and IASC). It is much less complicated than it appears.

Appendix 3: Global warming and ozone depletion potentials

The tables below give an overview of all substances that are either part of the Kyoto Protocol (Table 18) or the Montreal Protocol.

How to use the tables:

Step1: Assigning (= classification) the emissions of a enterprise to one of the two categories of environmental problems (global warming or ozone depletion).

Step 2:Multiplying the amount of emission by the factors in table 18 or results in weighted emissions according to the respective contribution to a problem (characterization). These weighted emissions are so called global warming or ozone depletion potentials.

Step 3:Adding up all weighted emissions within the two categories leads to the environmental items "global warming emission" and "ozone depletion emission" respectively expressed in "kg CO_2 -equivalent" or "kg CFC-11-equivalent".

Note:

Some of the ozone depleting substances listed in table 18 have a global warming potential too, but are not part of the Kyoto Protocol. The decision whether or not to include these substances in the environmental item for the global warming contribution needs further discussion. Besides having a global warming potential nitrous oxide has a

significant ozone depleting potential. The exact factor has not been determined yet.

Global Warming Potential

Table 16: Characterization factors for global warming emissions (Kyoto Protocol).

Substance	GWP (1) (time horizon 100 years) (kg CO_2 equivalent per kg substance)
Kyoto Protocol	
Carbon Dioxide	1
Methane	21
Nitrous oxide	270
Sulphur hexafluoride	23,900
Perfluorocarbons (2)	7000-9200
Hydrofluorocarbons (3)	140 - 9800

(1) GWP: Global Warming Potential. For a list of GWPs see IPCC 1996.

(2) Depending on the kind of PFCs. The various PFCs and their respective GWPs are listed in in IPCC 1996.

(3) Depending on the kind of HFC. The various HFCs and their respective GWPs are listed in IPCC 1996.

According to the Kyoto Protocol, emissions from the following sources/categories have to be included:

- Energy
- Fuel combustion
- Energy industries
- Manufacturing industries and construction

- Transport
- Other sectors
- Other

Fugitive emissions from fuels

- Solid fuels
- Oil and natural gas
- Other

Industrial processes

- Mineral products
- Chemical industry
- Metal production
- Other production
- Production of halocarbons and sulphur hexafluoride
- Consumption of halocarbons and sulphur hexafluoride
- Other

Solvent and other product use

- Agriculture
- Enteric fermentation
- Manure management
- Rice cultivation
- Agricultural soils
- Prescribed burning of savannas
- Field burning of agricultural residues
- Other

Waste

- Solid waste disposal on land
- Wastewater handling
- Waste incineration
- Other

Table 17: Conversion factors calculating the contribution for ozone depleting emissions (Montreal Protocol)

Substance	ODP (1) (kg CFC-11 equivalent per kg substance)
Montreal Protocol	
CFCl3 (CFC-11)	1.0
CF2Cl2 (CFC-12)	1.0
C2F3Cl3 (CFC-113)	0.8
C2F4Cl2 (CFC-114)	1.0
C2F5Cl (CFC-115)	0.6
CF2BrCl (halon-1211)	3.0
CF3Br (halon-1301)	10.0
C2F4Br2 (halon-2402)	6.0
CF3Cl (CFC-13)	1.0
C2FCl5 (CFC-111)	1.0
C2F2Cl4 (CFC-112)	1.0
C3FCl7 (CFC-211)	1.0
C3F2Cl6 (CFC-212)	1.0
C3F3Cl5 (CFC-213)	1.0
C3F4Cl4 (CFC-214)	1.0
C3F5Cl3 (CFC-215)	1.0
C3F6Cl2 (CFC-216)	1.0
C3F7Cl (CFC-217)	1.0
CCl4 carbon tetrachloride	1.1
C2H3Cl3 1,1,1-trichloroethane (2)	0.1
	Isomer Potential (3)
CHFCl2 (HCFC-21) 1 (4)	0.04
CHF2Cl2 (HCFC-22) 1	0.055
CH2FCl (HCFC-31) 1	0.02
C2HFCl4 (HCFC-121) 2	0.01-0.04
C2HF2Cl3 (HCFC-122) 3	0.02-0.08
C2HF3Cl2 (HCFC-123) 3	0.02-0.06
CHCl2CF3 (HCFC-123)	0-0.02

Table 17 Continued: conversion factors calculating the contribution for ozone depleting emissions (Montreal Protocol)

Substance	ODP (kg CFC-11 equivalent per kg substance)
C2HF4Cl (HCFC-124) 2	0.02-0.04
CHFClCF3 (HCFC-124)[i]	0-0.022
C2H2FCl3 (HCFC-131) 3	0.007-0.05
C2H2F2Cl2	0.02
C2HFCl4 (HCFC-121) 2	0.01-0.04
C2HF2Cl3 (HCFC-122) 3	0.02-0.08
C2HF3Cl2 (HCGroup IICHFBr2) 1	1.00
CHF2Br (HBFC-22B1) 1	0.74
CH2FBr 1	0.73
C2HFBr4 2	0.3-0.8
C2HF2Br3 3	0.5-1.8
C2HF3Br2 3	0.4-1.6
C2HF4Br 2	0.7-1.2
C2H2FBr3 3	0.1-1.1
C2H2F2Br2 4	0.2-1.5
C2H2F3Br 3	0.7-1.6
C2H3FBr2 3	0.1-1.7
C2H3F2Br 3	0.2-1.1
C2H4FBr 2	0.07-0.1
C3HFBr6 5	0.3-1.5
C3HF2Br5 9	0.2-1.9
C3HF3Br4 12	0.3-1.8
C3HF4Br3 12	0.5-2.2
C3HF5Br2 9	0.9-2.0
C3HF6Br 5	0.7-3.3
C3H2FBr5 9	0.1-1.9
C3H2F2Br4 16	0.2-2.1

C3H2F3Br3 18	0.2-5.6
C3H2F4Br2 16	0.3-7.5
C3H2F5Br 8	0.9-1.4
C3H3FBr4 12	0.08-1.9
C3H3F2Br3 18	0.1-3.1
C3H3F4Br 12	0.3-4.4
C3H3F3Br2 18	0.1-2.5
C3H4FBr3 12	0.03-0.3
C3H4F2Br2 16	0.1-1.0
C3H4F3Br 12	0.07-0.8
C3H5FBr2 9	0.04-0.4
C3H5F2Br 9	0.07-0.8
C3H6FBr 5	0.02-0.7

(1) ODP: Ozone Depleting Potential. These ozone depleting potentials are estimates based on existing knowledge and will be reviewed and revised periodically (Montreal 1987).

(2) Methyl chloroform. This formula does not refer to 1,1,2-trichloroethane.

(3) Where a range of ODPs is indicated, the highest value in that range shall be used for the purposes of the Protocol. The ODPs listed as a single value have been determined from calculations based on laboratory measurements. Those listed as a range are based on estimates and are less certain. The range pertains to an isomeric group. The upper value is the estimate of the ODP of the isomer with the highest ODP, and the lower value is the estimate of the ODP of the isomer with the lowest ODP.

(4) Identifies the most commercially viable substances with ODP values listed against them to be used for the purposes of the Protocol.

Appendix 4: Hazardous and other wastes

According to the Basel Convention (Basel 1986) the categories of waste in the table below have to be controlled (Annex I, categories Y1-45) or require special consideration (Annex II, category Y47-46).

Table 18: Categories of waste (Basel Convention)

Category	Definition
Basel Convention	
Y1	Clinical wastes from medical care in hospitals, medical centres and clinics
Y2	Wastes from the production and preparation of pharmaceutical products
Y3	Waste pharmaceuticals, drugs and medicines
Y4	Wastes from the production, formulation and use of biocides and phytopharmaceuticals
Y5	Wastes from the manufacture, formulation and use of wood preserving chemicals
Y6	Wastes from the production, formulation and use of organic solvents
Y7	Wastes from heat treatment and tempering operations containing cyanides
Y8	Waste mineral oils unfit for their originally intended use
Y9	Waste oils/water, hydrocarbons/water mixtures, emulsions
Y10	Waste substances and articles containing or contaminated with polychlorinated biphenyls (PCBs) and/or polychlorinated terphenyls (PCTs) and/or polybrominated biphenyls (PBBs)
Y11	Waste tarry residues arising from refining, distillation and any pyrolytic treatment

Y12	Wastes from production, formulation and use of inks, dyes, pigments, paints, lacquers, varnish
Y13	Wastes from production, formulation and use of resins, latex, plasticizers, glues/adhesives
Y14	Waste chemical substances arising from research and development or teaching activities which are not identified and/or are new and whose effects on man and/or the environment are not known
Y15	Wastes of an explosive nature not subject to other legislation
Y16	Wastes from production, formulation and use of photographic chemicals and processing materials
Y17	Wastes resulting from surface treatment of metals and plastics
Y18	Residues arising from industrial waste disposal operations
Y19	Metal carbonyls
Y20	Beryllium; beryllium compounds
Y21	Hexavalent chromium compounds
Y22	Copper compounds
Y23	Zinc compounds
Y24	Arsenic; arsenic compounds
Y25	Selenium; selenium compounds
Y26	Cadmium; cadmium compounds
Y27	Antimony; antimony compounds
Y28	Tellurium; tellurium compounds
Y29	Mercury; mercury compounds
Y30	Thallium; thallium compounds
Y31	Lead; lead compounds
Y32	Inorganic fluorine compounds, excluding calcium fluoride
Y33	Inorganic cyanides
Y34	Acidic solutions or acids in solid form
Y35	Basic solutions or bases in solid form

Table 18 continued: Categories of waste (Basel Convention)

	=>
Category	Definition
Y36	Asbestos (dust and fibres)
Y37	Organic phosphorous compounds
Y38	Organic cyanides
Y39	Phenols; phenol compounds, including chlorophenols
Y40	Ethers
Y41	Halogenated organic solvents
Y42	Organic solvents, excluding halogenated solvents
Y43	Any congener of polychlorinated dibenzo-furan
Y44	Any congener of polychlorinated dibenzo-p-dioxin
Y45	Organohalogen compounds other than substances referred to in this Annex (e.g. Y39, Y41, Y42, Y43, Y44)
Y46	Wastes collected from households
Y47	Residues arising from the incineration of household waste

Appendix 5: The environmental performance indicator matrix

The EPI-Matrix

The objective was to identify EPIs that were meaningful and should be applied to most if not all enterprises. However, this does not mean that other EPIs are inappropriate. Depending on the objective of the user other EPIs can be used.

Generic indicators should always be seen in conjunction with other possible indicators in general and in particular with industry-specific EPIs that take into account the specific problems and challenges of that industry. Moreover, every enterprise should try to define EPIs for environmental problems of local or regional concerns. Industry-specific EPIs already exist for many industries or will be identified in a next step.

In order to show the range of possible generic and industry-specific EPIs, an EPI-matrix is constructed (see below). The EPI-matrix can be used as a tool to support the identification of possible EPIs. The following EPI-matrix combines different focuses of performance assessment approaches (column 2) with different approaches for reference items (columns 3 and 4). Within this matrix 20 types of different EPIs can be defined (fields A 1.1 – B 5.2). Assessment indicators 3, 4, and 5 follow the widely accepted concepts and terminology developed for Life Cycle Assessment (LCA) under the umbrella of SETAC (SETAC 1993).

Table 19: The EPI-Matrix

EPI Matrix					
				Reference Item A	B
	Environmental Performance Assessment Approach		Focus of Assessment	physical unit	financial unit
1	Qualitative	1.1	management	A 1.1	B 1.1
		1.2	compliance	A 1.2	B 1.2
2	Financial	2.1	costs	A 2.1	B 2.1
		2.2	benefits	A 2.2	B 2.2
3	Physical classification *(1)*	3.1	input	A 3.1	B 3.1
		3.2	output	A 3.2	B 3.2
4	Environmental	4.1	resource depletion	A 4.1	B 4.1
	Characterization *(2)*	4.2	environmental impact	A 4.2	B 4.2
5	Environmental	5.1	scarcity of resources	A 5.1	B 5.1
	Valuation *(3)*	5.2	carrying capacity	A 5.2	B 5.2

(1) Classification: The process of assignment and initial aggregation of data from inventory to relatively homogeneous stressor categories (e.g. greenhouse gases, ozone depleting components), within the larger categories like resource depletion or environmental impacts.

(2) Characterization: The analysis and estimation of the magnitude of potential impacts on the environment for each of the stressor categories, derived through application of specific impact tools (e.g. global warming potentials or ozone depletion potentials, see e.g. annex 3, page 86).

(3) Valuation: The assignment of relative values or weights to different impacts and their aggregation across impact categories. This step is largely based on social and political values, goals and targets.

All EPIs proposed by ISAR refer to column B because a financial variable is used as the denominator.

Table 20: Identification of Proposed EPIs

Environmental Performance Indicators	Column in EPI-matrix
primary fossil energy use/value added	B 3.2
water use/value added	B 3.1
global warming emissions/value added	B 4.2
ozone depleting emissions/value added	B 4.2
solid and liquid waste/value added	B 3.2

Selected examples from environmental reports

B 4.2: Roche (Group Report for Safety and Environment 1998; p. 30) uses an EPI CO_2 -equivalents per Mio. CHF of sales.

Table 21: Example EPI Roche

	1995	1996	1997	1998
Total CO_2 -equivalents in tons	1,211.000	1,347.000	1,277.000	1,308.400
Sales (in Mio. CHF)	14,426	15,966	18,767	24,662
CO_2 -equivalents in tons per 1 Mio. CHF of sales	83.9	84.4	68.0	53.0

This EPI would refer to B 4.2 in the EPI-matrix because the environmental performance is assessed by the characterization of environmental impact (contribution to global warming in CO_2 -equivalents). As a reference, Roche uses a financial indicator (sales).

A 3.1 + B 3.1: Sulzer (Environmental Report 1997 /1998; page 8) uses EPIs that consist of EPI water per value added and water per employee.

The first EPIs (m3/employee) would refer in the EPI-matrix to A 3.1 because the environmental performance is assessed by the physical classification in terms of input of water impact. As reference, Sulzer uses a physical unit (employee).

The second EPIs (m3/value added in CHF) would refer in the EPI-matrix to B 3.1 because the environmental performance is assessed by the physical classification in terms of input of water. As reference, Sulzer uses a financial unit (value added).

Sulzer: Environmental Report 1998/1999

Environmental Performance Indicators (p.9)

Energy consumption	1993	1994	1995	1996	1997	1998
kWh/employee	20,800	20,100	21,800	18,600	21,500	21,800
kWh/ CHF value added	234,000	234,000	265,000	225,000	230,000	232,000
CO_2 emissions	1993	1994	1995	1996	1997	1998
tonnes/employee	5.6	5.2	4.5	5.1	6.3	6.5
kg /CHF value added	63,100	60,000	55,000	61,000	67,000	70,000
Water consumption	1993	1994	1995	1996	1997	1998
m^3/employee	68	74	60	56	63	59
liters/CHF value added	720,000	858,000	727,000	679,000	668,000	633,000
Waste + recycled materials	1993	1994	1995	1996	1997	1998
kg/ employee	1390	1510	1380	910	1180	1140
kg/CHF value added	15,700	17,500	16,800	11,000	12,500	12,000

Appendix 6: Abbreviations and Acronyms

ACCA	Association of Chartered Certified Accountants
CBI	Confederation of British Industry
CER	Council on Economic Priorities
CERES	Coalition for Environmentally Responsible Economies
CICA	Canadian Institute of Chartered Accountants
CML	Centre of Environmental Science, University of Leiden
cf.	compare
e.g.	example given
ECOSOC	Economic and Social Council
EFFAS	European Federation of Financial Analysts' Societies
EIA	Environmental impact asseesment
EMS	Environmental management systems
EPE	Environmental performance evaluation
EPI	Eco-productivity index (Novo Nordisk)
EPI (EPIs)	Environmental performance indicators
EPS	Earnings per share
FASB	Financial Accounting Standards Board
ff.	following
GEMI	Global Environmental Management Initiative
GWP	Global warming potential
IAS	International Accounting Standard
IASC	International Accounting Standards Committee
IPCC	Intergovernmental Panel on Climate Change
IRRC	Investors Responsibility Research Center

ISAR	Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting
ISO	International Organization for Standardization
LCA	Life cycle assessment
m.	Millions
MJ	megajoules
NRTEE	National Roundtable on the Environment and Economy
ODP	Ozone Depliting Potential
P/E	Price earnings ratio
RER	Roche energy rate
SETAC	Society of Environmental Toxicology and Chemistry
TC	Technical committees
TNC	Transnational corporations
TRI	Toxic release inventory
UN	United Nations
U.S.-GAAP	United States Generally Accepted Accounting Principles
UNCTAD	United Nations Conference on Trade and Development
USD	US dollar
VA	Value added
WBCSD	World Business Council for Sustainable Development
WD	Working Draft
WEF	World Economic Forum
WRI	World Resource Institute

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