

COMMISSION

COMMISSION RECOMMENDATION

of 10 July 2003

on guidance for the implementation of Regulation (EC) No 761/2001 of the European Parliament and of the Council allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) concerning the selection and use of environmental performance indicators

(notified under document number C(2003) 2253)

(Text with EEA relevance)

(2003/532/EC)

THE COMMISSION OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Community, and in particular Article 211, second indent, thereof,

Whereas:

- (1) Regulation (EC) No 761/2001 of the European Parliament and of the Council of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) ⁽¹⁾ defines the essential requirements for participation by organisations in EMAS.
- (2) Regulation (EC) No 761/2001 calls on the Commission to promote consistency in the application of EMAS.
- (3) This consistency can be enhanced by providing guidance on producing an environmental statement as referred to in Article 3(2)(c) of Regulation (EC) No 761/2001, both to organisations and environmental verifiers.
- (4) Pursuant to Annex III 3.3 to Regulation (EC) No 761/2001, organisations implementing EMAS may use environmental performance indicators to increase clarity, transparency and comparability of the information provided by an organisation.
- (5) The selection and use of environmental performance indicators may also help organisations in better understanding and improving their environmental management and performance.

- (6) The guidance on the EMAS environmental statement contained in Annex I.3 to Recommendation No 2001/680/EC ⁽²⁾ announces that the Commission will develop guidance on the selection and use of environmental performance indicators in due course.
- (7) The selection and use of environmental performance indicators should be cost-effective and appropriate to the size and type of organisation and its needs and priorities.
- (8) The guidance provided for in this Recommendation is in accordance with the opinion of the Committee established pursuant to Article 14 of Regulation (EC) No 761/2001,

HEREBY RECOMMENDS:

1. For the purpose of producing the EMAS environmental statement organisations may use the environmental performance indicators contained in Annex I.
2. This Recommendation is addressed to the Member States.

Done at Brussels, 10 July 2003.

For the Commission
Margot WALLSTRÖM
Member of the Commission

⁽¹⁾ OJ L 114, 24.4.2001, p. 1.

⁽²⁾ OJ L 247, 17.9.2001, p. 1.

ANNEX I

GUIDANCE ON THE SELECTION AND USE OF ENVIRONMENTAL PERFORMANCE INDICATORS FOR THE EMAS REGULATION**1. Introduction**

In Annex III 3.3 of the EMAS Regulation participating organisations are encouraged to use environmental performance indicators where appropriate.

The use of such indicators will enhance the reporting of environmental performance by converting raw data into information that can be easily understood by the intended audience. Environmental performance indicators summarise extensive environmental data to a limited number of significant key information sets. This will assist organisations in quantifying and reporting environmental performance. Another important function of environmental indicators is to assist organisations in the management of their environmental aspects and impacts. Besides that, organisations such as ranking agencies and financial advisory firms are becoming increasingly interested in environmental performance.

Creating environmental information can be expensive and time consuming. Environmental performance indicators should therefore be cost-effective and appropriate to the size and type of organisation and its needs and priorities. They should address primarily those environmental impacts that are most significant and which the company can influence by its operations, management, activities, products and services. They should also be sensitive enough to reflect significant changes in environmental impacts. In addition, organisations should make the optimum use of the environmental information they collect. To this end the indicators should fulfil the dual purpose of assisting the management of the organisation and providing information to stakeholders. Depending on an organisation's capabilities and resources, the use of environmental performance indicators may initially be limited to those aspects considered most relevant, with the initial scope being gradually widened over time. The indicators and measurement units provided in this guidance are given by way of example.

Several publications and standards which may assist organisations already exist and are referenced in the literature Annex II of this Recommendation.

The basic principles of environmental indicator systems are:

- comparability: indicators should enable a comparison and show changes in the environmental performance,
- balance between problematic (bad) and prospective (good) areas,
- continuity: indicators should be based on the same criteria and should be taken over comparable time sections or units,
- timeliness: indicators should be updated frequently enough to allow action to be taken,
- clarity: indicators should be clear and understandable.

2. Categories of environmental performance indicators

Usually, three categories of environmental indicators are defined for evaluating and reporting the environmental performance of an organisation ⁽¹⁾:

Operational Performance Indicators (OPIs)			Management Performance Indicators (MPIs)		Environmental Condition Indicators (ECIs)	
Input indicators	Physical facilities and equipment indicators	Output indicators	System indicators	Functional area indicators	Environmental media indicators	Bio- and anthroposphere indicators
Materials	Design	Products provided by the organisation	Implementation of policies, and programs	Administration and planning	Air	Flora
Energy	Installation	Services provided by the organisation	Conformance	Purchasing and investments	Water	Fauna

⁽¹⁾ The major categories OPIs, MPIs, and ECIs as well as most subcategories correspond directly to relevant indicator categories used in EN/ISO 14031:1999 'Environmental management — Environmental performance evaluation — Guidelines'. The subcategories 'products supporting the organisation's operation', 'transport', 'employee involvement', 'administration and planning', 'purchasing and investments' and 'health and safety' are specific for EMAS.

Operational Performance Indicators (OPIs)			Management Performance Indicators (MPIs)		Environmental Condition Indicators (ECIs)	
Input indicators	Physical facilities and equipment indicators	Output indicators	System indicators	Functional area indicators	Environmental media indicators	Bio- and anthroposphere indicators
Services supporting the organisation's operation	Operation	Wastes	Financial performance	Health and safety	Land	Humans
Products supporting the organisation's operation	Maintenance	Emissions	Employee involvement	Community relations		Aesthetics, heritage and culture
	Land use					
	Transport					

Operational performance indicators (OPIs): These concentrate on the aspects associated with an organisation's operations including activities, products or services and can cover such topics as emissions, product and raw material recycling, fuel consumption of vehicle fleet, or energy usage.

Operational performance indicators can be subdivided into input indicators, physical facilities and equipment indicators and output indicators. They concentrate on planning, controlling and monitoring the environmental impacts of the organisation's operations. Operational performance indicators are also a tool for communicating environmental data through environmental reports or environmental statements, in accordance with the EMAS Regulation. By integrating cost aspects into them, they furthermore represent a basis for environmental cost management.

Management Performance Indicators (MPIs): These concentrate on the efforts of management to provide the infrastructure for environmental management to succeed and can, among others, cover environmental programmes, objectives and targets, training, incentive schemes, audit frequency, site inspections, administration and community relations.

These indicators serve primarily as internal control and information measurements, but do not by themselves provide sufficient information to give an accurate picture of the organisation's environmental performance.

Environmental Condition Indicators (ECIs): These give information on the quality of the environment surrounding the organisation or the local, regional or global state of the environment. Examples include the water quality of a nearby lake, the regional air quality, concentrations of greenhouse gases or the concentration of certain pollutants in the soil. While they may be quite wide-ranging they can be used to focus the attention of the organisation on the management of the environmental aspects associated with significant environmental impacts.

The condition of environmental media (air, water, land) and the environmental problems that arise from it depend often on a variety of influences. Examples are emissions from different organisations, private households or transport. Data about the condition of environmental media are usually measured and recorded by governmental institutions. These data are used to derive specific environmental indicator systems for the main environmental problems. In connection with environmental policy goals, public environmental indicators can be used by organisations as an orientation for setting priorities in determining their own indicators and objectives. This is especially the case when the organisation is one of the main sources of an environmental problem, for example the impact of an airport on its surroundings in respect of noise or the impact of a direct effluent discharge on local water quality. In particular in these cases, ECIs enable the measurement of environmental impacts of the organisation.

These three categories of environmental indicators have become widely accepted and organisations should consider a combination of these indicators in order to be able to demonstrate, that:

- they understand the environmental impacts associated with their activities, products and services (ECIs);
- they are taking appropriate measures to ensure the management of environmental aspects associated with the environmental impacts (MPIs); and
- the results of the management of environmental aspects is improved environmental performance of their operations (OPIs).

It is recognised however that for organisations with less significant environmental impacts and a less complex environmental management system the most important indicators will be those relating to operational performance.

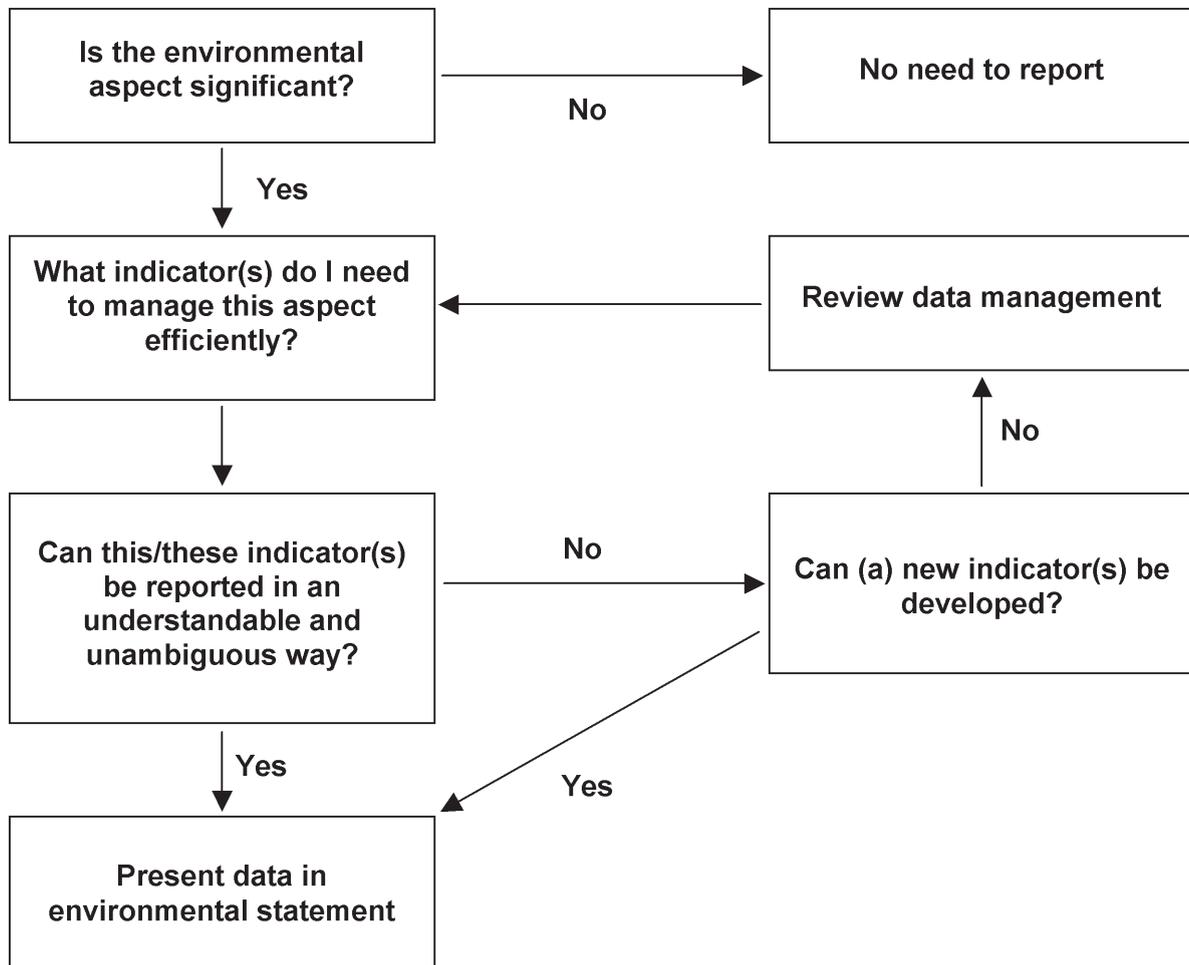
3. Guidance

In selecting environmental performance indicators for a particular environmental aspect an organisation should ask itself the following questions:

- What are the organisation's main environmental aspects and impacts?
- Where can most improvements be achieved?
- Where can environmental improvements also lead to cost reduction?

The selected environmental indicators should comply with environmental policy priorities:

- How does the organisation affect the local or regional environmental situation in relation to important local or regional environmental policy issues?
- What environmental problems dominate the current political discussions?
- What external requirements, for example from interested parties, affect the organisation?



Figure

Flowchart about decision processes when selecting environmental performance indicators

In addition, organisations should select indicators which enhance their management. Indicators which do not contribute to the management of the organisation will ultimately not be incorporated in day-to-day management and hence will have little effect in improving performance. In short, only those indicators which enable the employees and management to perform their tasks better are the ones which are most appropriate to the organisation.

The sections (a) to (e) below consider each of the criteria detailed in Annex III 3.3 to the EMAS Regulation and assist organisations in the selection of appropriate indicators

(a) *Indicators should give an accurate appraisal of the organisation's performance*

It is important that the organisation can have a correct assessment of its environmental performance. The indicators should represent environmental performance as accurately as possible, providing a balanced illustration of environmental aspects and impacts.

For instance, if an organisation reduces emissions to air or water but as a result produces more solid waste to landfill, then the organisation should consider and report the overall environmental benefit. This will also have financial implications since the cost of disposal will also have to be included to enable management to estimate the costs and benefits of such action.

In the following, examples of indicators and measurement units for use in the EMAS environmental statement are given. They relate to the different indicator categories and subcategories as mentioned in the table of section 2 on categories of environmental performance indicators above.

In addition to absolute values of environmental impacts, measurement units may also address the environmental impact per unit of product or service, per turnover, gross sales or gross value added ('eco-efficiency' indicators) or the environmental impact per employee ⁽¹⁾.

OPERATIONAL PERFORMANCE: INPUT INDICATORS		
Indicator category	Examples of indicators	Examples of measurement units
Materials	Raw materials, operating and auxiliary materials, ground water, surface water, fossil fuels, wood, etc.	tonnes per year tonnes per tonnes of product per year tonnes of hazardous/harmful substances per year tonnes of hazardous/harmful substances per tonnes of product per year cubic metres per year cubic metres per tonnes of product
Energy	Electricity, gas, oil, renewables, etc.	megawatt hours per year kilowatt hours per tonnes of product
Products (to be co-ordinated with functional area 'purchasing and investments')	Preliminary products, auxiliary and office products, etc.	tonnes per year kilograms of hazardous/harmful material per tonnes of product number/percentage of products with eco-labels (per year)
Services (to be co-ordinated with functional area 'purchasing and investments')	Cleaning, waste disposal, horticulture, catering, communication, office services, transport, travel, education, administration planning, financial services, etc.	tonnes per year kilograms of hazardous/harmful material per service unit (and year) number/percentage of services with eco-labels (per year)

OPERATIONAL PERFORMANCE: PHYSICAL FACILITIES AND EQUIPMENT INDICATORS		
Indicator category	Examples of indicators	Examples of measurement units
Design	Buildings, machinery, equipment, etc.	heat loss of buildings in Watts per square metres and Kelvin percentage of equipment with reusable parts (per year)
Installation	Buildings, machinery, equipment, etc.	percentage of machinery parts designed for reuse (per year) percentage or number of equipment with eco-labels or environmental declarations (per year)

⁽¹⁾ The use of employee related indicators should be treated with caution as this measure depends in some cases heavily on the capital-labour mix employed by the company.

OPERATIONAL PERFORMANCE: PHYSICAL FACILITIES AND EQUIPMENT INDICATORS

Indicator category	Examples of indicators	Examples of measurement units
Operation	Buildings, machinery, equipment, etc.	hours per year specific machinery or equipment is in operation tonnes of substances, materials or products per year used for operation
Maintenance	Buildings, machinery, equipment, transport vehicles, etc.	hours per year specific machinery or equipment needs maintenance tonnes of substances, materials or products per year used for maintenance
Land use	Natural habitats, green area, paved area, etc.	square kilometres (per year)
Transport	Fuel consumption, emissions from vehicles, business travels by type of transport (plane, car, bus, train), etc.	fuel consumption in tonnes per year by vehicle fleet greenhouse gas emissions emitted in tonnes per year by vehicle fleet mass or number of fine and ultrafine particles emitted per year by vehicle fleet person kilometres per year

OPERATIONAL PERFORMANCE: OUTPUT INDICATORS

Indicator category	Examples of indicators	Examples of measurement units
Emissions	Air emissions such as greenhouse gases, volatile organic compounds, fine and ultrafine particles, etc. Effluents such as discharge of specific hazardous substances, process water or cooling water, etc. Waste such as hazardous wastes (¹), non-hazardous waste, sludge, heat, noise, etc.	tonnes per year kilograms per tonnes of product cubic metres per year cubic metres per tonnes of product kilograms of substances per cubic metre of waste water percentage of waste recyclable (per year) megajoules per year megajoules per tonnes of product decibels (at specific location)
Products (design, development, packaging, use, recovery, disposal)	Substances in products, packaging material, energy consumption of appliances, etc.	tonnes of hazardous/harmful material per year (and product unit) mass percentage of product parts designed for reuse per year number and percentage of products with eco-labels (²) (per year) tonnes of packaging material per year
Services (design, development, operation)	Cleaning, waste disposal, horticultural, catering, communication, office services, transport, travel, education, administration planning, financial services etc.	tonnes or kilograms of hazardous/harmful substances used per service unit and year fuel consumption in litres per service unit and year number and percentage of services with eco-labels (per year)

MANAGEMENT PERFORMANCE: SYSTEM INDICATORS		
Indicator category	Examples of indicators	Examples of measurement units
Implementation of policies and programmes	Environmental objectives and targets, workplace conditions, data management, etc.	percentage of objectives and targets reached per year percentage of units/workplaces with environmental requirements (per year) percentage of units/workplaces integrated into environmental measurement and data management systems (per year)
Conformance	Auditing, conformance with voluntary environmental agreements, etc.	percentage of units/workplaces audited per year number of targets of voluntary agreements achieved (per year)
Financial performance	Resource savings, etc.	euro per year
Employee involvement	Environmental training, employee consultation, suggestions by employees for improvements, etc.	days of training per employee and year percentage of total training per year number of meetings with employee/employee representatives per year number of suggestions per employee and year number/percentage of suggestions implemented per year
MANAGEMENT PERFORMANCE: FUNCTIONAL AREA INDICATORS		
Indicator category	Examples of indicators	Examples of measurement units
Administration and planning	Direct and indirect environmental aspects and impacts of planning decisions, policies, land-use planning, engagement in green markets, etc.	number of policy developments for which an environmental impact analysis was made (per year) percentage of land planned to remain or become natural habitats or green areas (per year) total value in euro or percentage of products sold on green markets
Purchasing and investments (to be co-ordinated with input indicators related to products and services)	Environmental performance of suppliers and contractors, etc. Investments in environmental projects, etc.	number/percentage of suppliers and contractors with environmental policies or management systems total value in euro or percentage of capital investments into environmental projects per year
Health and safety of workplaces	Environmental accidents, illnesses, indoor air quality, water quality at workplaces, noise, etc.	number of employee accidents per year sick days per employee and year concentration of harmful substances in milligram per litre or parts per million level of noise in decibels at location
Community relations	Discussions with stakeholders groups (meetings, active participation in events), etc. External requests for the environmental statement, etc.	number of discussions in person days per year number of external request per year number of external website downloads per year

ENVIRONMENTAL CONDITIONS: ENVIRONMENTAL MEDIA INDICATORS		
Indicator category	Examples of indicators	Examples of measurement units
Air	Specific substances in the air such as sulphur and nitrogen oxides, ozone, volatile organic compounds, fine and ultra-fine particles, etc.	milligrams per litre parts per million
Water	Specific substances in rivers, lakes, groundwater such as nutrients, heavy metals, organic compounds, etc.	milligrams per litre
Land	Natural habitats, protected areas Soil contaminated by heavy metals, pesticides, nutrients, etc.	percentage of area (per year) change in square kilometres per year square metres/cubic metres of contaminated soil per cubic metre (per year)

ENVIRONMENTAL CONDITIONS: BIO- AND ANTHROPOSPHERE INDICATORS		
Indicator category	Examples of indicators	Examples of measurement units
Flora	Extinct and endangered species	number/percentage compared with natural habitats
Fauna	Extinct and endangered species	number/percentage compared with natural habitats
Humans	Life expectancy of local population, environmental diseases of local population, concentration of contaminants in blood of local population (lead, etc.)	life expectancy in years percentage of local population with specific (chronic) diseases milligrams of contaminant per litre
Aesthetics, heritage and culture	Natural monuments	square kilometres

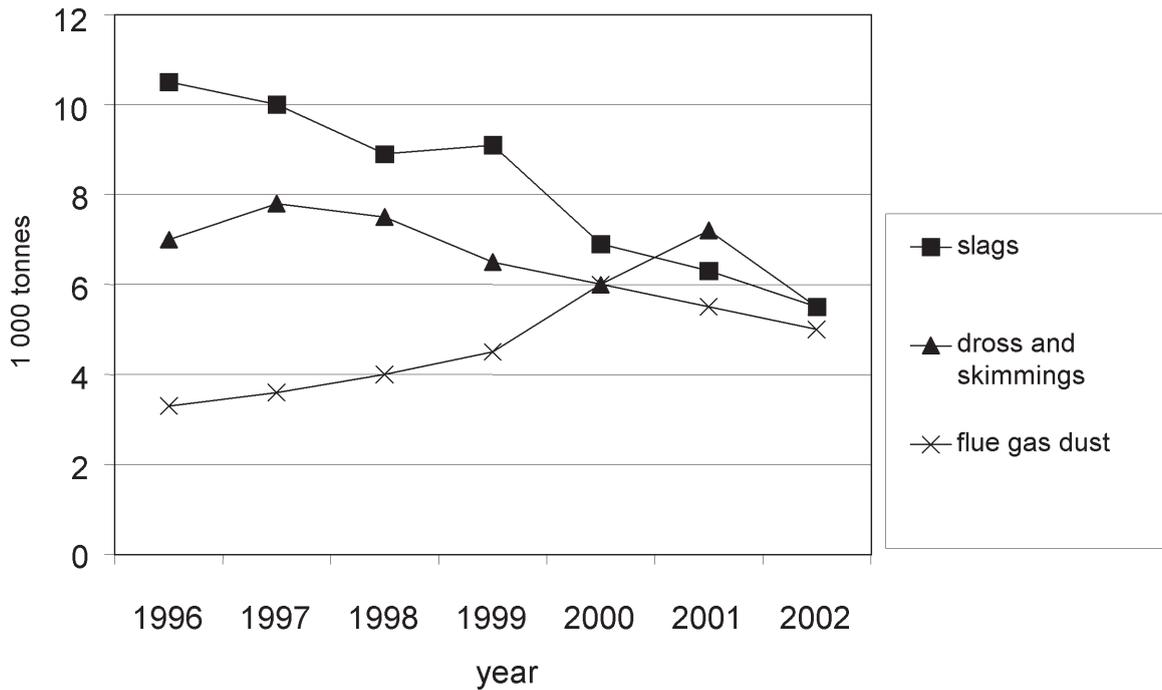
(¹) Different types of wastes with significant environmental impacts should be reported separately, in particular in the case of hazardous wastes. They should be accompanied, if appropriate, by the description and code of the relevant entry in the European waste list (Commission Decision 2000/532/EC of 3 May 2000).

(²) Throughout this document and in relation to EMAS it is recommended that the European Union eco-label or national eco-labels of the EU Member States are used.

See <http://www.europa.eu.int/comm/environment/ecolabel> for further information.

N.B.: Often the local environmental media and ecosystems are most relevant for environmental condition indicators (ECIs). However, in some cases — such as greenhouse gas emissions — the state of the global environmental might also be of relevance. If ECIs do not primarily reflect the environmental impact of the registered organisation itself but rather the impact of other organisations or unknown sources this should be clearly mentioned in the communication with stakeholders.

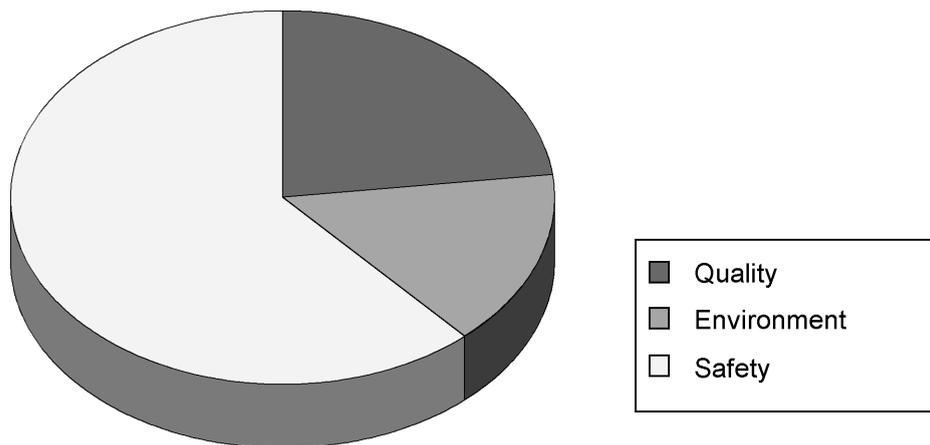
In the following a few examples of presenting environmental performance indicators in diagrams are given. In many cases it is beneficial to give not only information on the past year but trends over several years.



Figure

Development of three different types of hazardous waste in 1 000 tonnes per year between 1996 and 2002: Slags (10 04 01), dross and skimmings (10 04 02) and flue gas dust (10 04 04) (1)

If organisations are reporting management indicators such as training then it can be beneficial to know that part of the overall training dedicated to environmental subjects or alternatively the proportion of auditing which is dedicated to environment. This will better allow an organisation to estimate the costs of its environmental management.



Figure

Proportions of training hours per employee in safety, environment and quality in 2002

In the case where organisations wish to report their performance in relation to the condition of the environment it will be beneficial to know the relative contribution of the organisation to the environmental impact. Thus if an organisation is reporting on the condition of a local river it would be beneficial to estimate its contribution to the overall river condition in order to target its efforts efficiently.

(1) The codes in brackets relate to the codes of the different entries in the European waste list.

(b) *Indicators should be understandable and unambiguous*

For reasons of both credibility and management control it is important that indicators do not create a false impression or mislead the intended audience. The indicators should be clear and understandable to the user and correspond to the users' information requirements. Indicators should be coherent and concentrate on essential data.

For reporting purposes data is often aggregated or normalised. Whilst this may allow for a succinct presentation it is important that the end result is easily understood. For instance reporting against an internal index for in-house recycling may not be understandable if the method for generation of that index is not explained in simple terms.

Normalising data against a base year may allow for year on year comparison but may not reflect all aspects of environmental performance. For example, it is important that the effects of acquisitions and divestments are clearly explained and the audience should be able to understand the absolute magnitude of the aspect being reported.

(c) *Indicators should allow for year on year comparison*

This aspect ensures that it is easy to follow the development of environmental performance of an organisation. The importance of the correct selection of indicators at the beginning of the reporting process can be demonstrated in the requirement for year on year comparison. If the parameters for reporting a particular environmental aspect and impact change then it is often difficult to see if improvement is made.

For instance, if energy is reported in year 1 as total consumption but in year 2 as energy usage per tonne of product the year on year comparison cannot be made. Therefore organisations should ensure that continuity over time is considered when selecting indicators. For avoiding confusion, indicators should always be accompanied by the absolute values, for example as presented in the following table.

Table

Example of a table that allows for year on year comparison ⁽¹⁾

Indicator	Unit	1993	1994	1995
Employees	persons	548	520	409
Turnover	million	87,6	78,5	74,2
Production	tonnes	4 075	3 639	2 933
Energy consumption	MWh	89 285	82 422	73 865
Energy consumption/cotton	kWh/kg	21,9	22,2	23,7
Water consumption	m ³	249 670	241 450	219 010
Water consumption/cotton	l/kg	—	62,9	64,7
MST/Ökotex ⁽²⁾ 100 tested	%	50	90	99
Dying without heavy metals	%	35,2	35,3	40
Waste	kg	158 014	102 598	81 658

⁽¹⁾ Rauberger (1998).

⁽²⁾ M.S.T. stands for "Markenzeichen schadstoffgeprüfter Textilien (label for textiles checked for harmful substances)" of the "Verein für verbraucher- und umweltfreundliche Textilien (VvuT, association of consumer and environmental friendly textiles)". "Ökotex" is a reference to the "Öko-Tex Standard 100" (see website <http://www.oeko-tex.com>).

Organisations should also be aware that for giving an accurate picture of annual performance development absolute annual averages and, if necessary, their variances should be reported. If this is not appropriate an average year or a long-term average should be chosen as baseline. Exceptional peak years are not suitable as reference years.

It is occasionally necessary to change the method by which an environmental aspect is reported. In this instance an organisation should strive to ensure that comparisons with previous years can be made, for example by recalculating the previous years data in accordance with the new reporting method.

(d) Indicators should allow for comparison with sector, national or regional benchmarks

One of the essential requirements for comparison of indicators is that they are generated the same way for avoiding the comparison of 'apples and pears'. In the area of energy consumption, for example, the question could be whether to report on primary or secondary energy consumption. The organisation should take care to apply the 'common standard' when creating their indicators. These 'common standards' are set in certain cases by research, trade associations, non-governmental organisations, local, national or regional governments. Organisations should ensure that they are aware of these benchmarks and that if reporting against these aspects then the indicators they choose should allow for direct comparison with these benchmarks. To avoid over reporting — if several different benchmarks have been produced — organisations should choose the most relevant for their sector.

Table

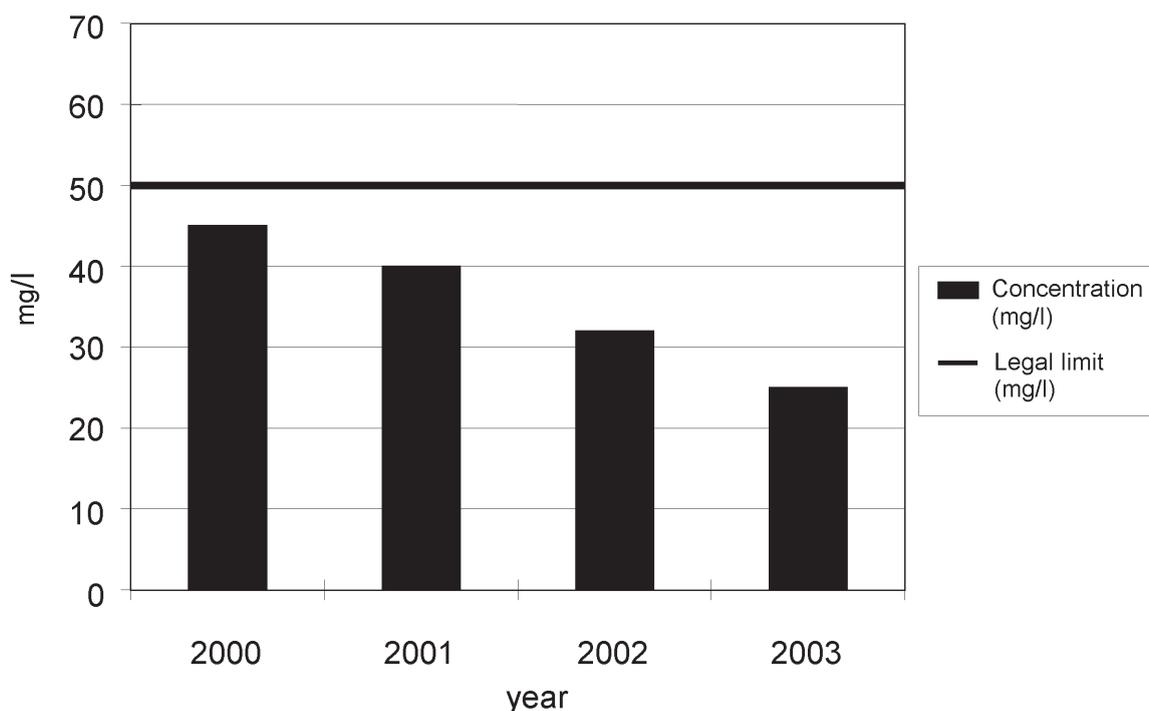
Example of a table that allows for comparison with benchmark (1)

Indicator Unit	Minimum	Average	Maximum	Bank of Köln
Electricity [mWh]/employee	4,3	5	6,8	6,8
Heating energy [GJ]/employee	18,2	24,6	29,8	26,3
Water consumption [l]/employee and day	40	83	171	117
Paper consumption [kg]/employee	116	138	209	209
Copying paper consumption [sheet]/employee	9	18	23	19
Travels [km]/employee	410	880	1 100	600

(1) Rauberger (1998).

(e) Indicators should allow for comparison with regulatory requirements

For both internal management and external credibility, organisations should be able to demonstrate how they are performing in relation to regulatory requirements. Where regulatory requirements exist for the aspect to be reported, organisations should include these requirements in the same table or graphical representation as the performance.



Figure

Example of a graph that allows for comparison with a regulatory requirement

4. Summary

Before deciding on the indicator to be used for tracking an environmental aspect an organisation should ask itself the following questions:

- (a) Can the data represent the environmental impact of the organisation?
- (b) Can the indicators enable the quantification of environmental targets?
- (c) Does the data support the management process of the organisation?
- (d) Is the data understandable without complicated explanation?
- (e) Will data in this format be usable year on year?
- (f) Are any existing legal limits for this aspect incorporated?
- (g) Can the data be compared with relevant benchmarks for this aspect?

If the answer to any of the above is NO then an organisation should give further consideration to the design of that environmental indicator. Indicators should however be regularly reviewed to ensure their relevance and to take account of new information or developments.

ANNEX II

A SELECTION OF NATIONAL, REGIONAL AND GLOBAL PUBLICATIONS CONCERNING ENVIRONMENTAL INDICATORS

ANPA — National Agency for the Protection of the Environment (1998): 'Manuale per l'attuazione del Sistema Comunitario di Ecogestione ed Audit (Manual for the Implementation of the European Eco-Management and Audit Scheme) (EMAS)', CD-ROM Sezione Banca Dati Indicatori (Section — Database of Environmental Indicators), Roma, Internet: www.anpa.it/emas.

Association for Environmental Management in Banks; Savings Banks and Insurance Companies (VfU) and German Federal Environment Ministry (1997): 'Time to act — environmental management in financial institutions — A survey of recent developments including principles and guidelines for in-house eco-balances of financial service providers', Bonn, Internet: www.vfu.de.

Business in the Community (2000): 'Winning With Integrity', London, Internet: www.bitc.org.uk.

Business in the Community (2001): 'A Measure of Progress', London, Internet: www.bitc.org.uk.

FORGE Group (2000): 'Guidelines on Environmental Management and Reporting for the Financial Services Sector', Internet: www.bba.org.uk.

German Federal Environment Ministry and Federal Environmental Agency (ed.) (1997): 'A Guide to Corporate Environmental Indicators', Bonn/Berlin, Internet: www.umweltbundesamt.de.

German Federal Environmental Agency (1999): 'Leitfaden betriebliche Umweltauswirkungen — Ihre Erfassung und Bewertung im Rahmen des Umweltmanagements. (Guideline of Operational Environmental Impacts — Collection and Evaluation in the Framework of Environmental Management)', Berlin, Internet: www.umweltbundesamt.de.

Global reporting initiative (2002): 'Sustainability reporting guidelines', Boston, USA, Internet: www.globalreporting.org.

EN/ISO 14031:1999 'Environmental management — Environmental performance evaluation — Guidelines', Geneva, Internet: www.iso.ch.

ISO/TR 14032:1999 'Environmental management — Examples of environmental performance evaluation (EPE)', Geneva, Internet: www.iso.ch.

Jasch, C. and Rauberger, R. (1998): 'Leitfaden Kennzahlen zur Messung der betrieblichen Umweltleistung (Guideline Indicators for the Measurement of Operational Environmental Performance)' edited by the Austrian Federal Ministry for the Environment, Youth and Family Affairs, Vienna, IÖW Wien Publications No 25/1998, Internet: www.ioew.at/ioew/index.html.

Rauberger, R. (1998): 'Erweitertes betriebliches Umweltcontrolling (Extended Operational Environmental Controlling)', in 'Praxishandbuch Umweltschutz — Management', edited by Hans-Peter Wruk and Horst Ellringmann, Cologne, Deutscher Wirtschaftsdienst, Internet: www.dvd-verlag.com.

UK Association of Certified and Chartered Accountants and Certified Accountants Educational Trust (2001): 'An Introduction to Environmental Reporting', London, Internet: www.accaglobal.com.

UK Department for the Environment, Food and Rural Affairs (2000): 'Environmental Reporting — Guidelines for Company Reporting on Waste', London, DEFRA Publications, Internet: www.defra.gov.uk/environment/envrpf/index.htm.

UK Department for the Environment, Food and Rural Affairs (2000): 'Environmental Reporting Guidelines for Company Reporting on Water', London, DEFRA Publications, Internet: www.defra.gov.uk/environment/envrpf/index.htm.

UK Department for the Environment, Food and Rural Affairs (2001): 'Environmental Reporting — General Guidelines', London, DEFRA Publications, Internet: www.defra.gov.uk/environment/envrpf/index.htm.

UK Department for the Environment, Food and Rural Affairs (2001): 'Guidelines for Company Reporting on Greenhouse Gas Emissions', London, DEFRA Publications, Internet: www.defra.gov.uk/environment/envrpf/index.htm.

United Nations Division for Sustainable Development (2001): 'Environmental Management Accounting, Procedures and Principles', United Nations publication, Economic and Social Affairs Series, Internet: www.un.org/esa/sustdev/estema1.htm.

VDI Verein Deutscher Ingenieure (ed.) (2001): 'Betriebliche Kennzahlen für das Umweltmanagement — Leitfaden zu Aufbau, Einführung und Nutzung (Operational Indicators for Environmental Management — Guideline for Setup, Introduction and Use)', VDI Richtline Nr. 4050, Duesseldorf, Internet: www.vdi.de.

World Business Council for Sustainable Development (2000): 'Measuring eco-efficiency — a guide to reporting company performance', Geneva, Internet: www.wbcsd.org/newscenter/reports/2000/MeasuringEE.pdf.
