

# Environmental performance indicators: key features of some recent proposals

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## Abstract

This paper identifies some key features of thinking by the United Nations Conference on Trade and Development, “A Manual for Preparers and Users of Eco-efficiency Indicators” (2004). The UN approach is compared with that of the Global Reporting Initiative (GRI) in the third generation of its Sustainability Reporting Guidelines (G3) issued in October 2006 and that set out in “Environmental Key Performance Indicators – Reporting Guidelines for UK Business” (2006). Reference is also made to some of the performance indicators given as examples in the international standard on management evaluation of environmental performance issued in 1999 by the International Organization for Standardization (ISO 14031).

The paper looks at the extent to which the proposals under review are based on a conceptual framework and the guidance provided as regards definition and compilation of environmental performance indicators within the potential impact groups:

- emissions to air and contribution to global warming;
- water use and discharge;
- waste and emissions to land;
- energy use;
- materials, use of resources and recycling.

The paper is intended to provide an overview rather than a detailed analysis.

The differing approaches adopted in the proposals give rise to the following questions.

- Do any of the proposals assist organisations in identifying key environmental performance indicators?
- Is there a prospect of convergence amongst “standard setters” on the key environmental performance indicators?
- How can internal and external users be confident that the environmental performance indicators reported are reliable?

*Keywords: indicators, environmental performance, conceptual framework, eco-efficiency, emissions, waste, energy.*



## 1 Conceptual underpinning

The UN Manual, 2004 [1] sets out a range of eco-efficiency indicators, defined as the ratio between an environmental and a financial variable. The aim of environmentally sound management is to increase eco-efficiency by reducing the environmental impact while increasing the value of an enterprise [2]. Accounting principles in the UN Manual are based on the IASB Framework for the Preparation and Presentation of Financial Statements, particularly understandability, relevance, reliability and comparability.

The GRI Guidelines, 2006 [3] include principles on report content and quality of reported information about an organisation's environmental, social and economic performance. Report content is governed by materiality, stakeholder inclusiveness, sustainability context and completeness. Quality of reported information is determined by balance, comparability, accuracy, timeliness, clarity and reliability. There is no specific reference to the IASB Framework or to any other conceptual framework. Each category of indicators is expected to be accompanied by a disclosure on the Management Approach, in which matters such as overall policy, responsibility and performance are described.

The UK Reporting Guidelines, 2006 [4] are intended to apply to large businesses and state that: "where possible, the Government has sought to ensure that the Guidelines are consistent with other standards and reporting guidance". Reference is made to the GRI framework as well as the Guidelines on Environmental Management Accounting issued by the International Federation of Accountants, 2005 [5] and the Corporate Accounting and Reporting Standard issued by the World Business Council for Sustainable Development and the World Resources Institute, 2004 [6]. The UK Guidelines identify three general reporting principles: transparency, accountability and credibility.

ISO 14031, 1999 [7] is designed to provide management with information to assist in evaluating environmental performance. It is not an external reporting standard, nor does it establish minimum levels of performance or identify core indicators. The guidance provided is intended to support existing ISO standards on environmental management systems and makes no reference to other international frameworks. Two types of performance indicators are identified: *management performance indicators*, which measure management efforts to influence environmental performance; and *operational performance indicators*, which measure the environmental performance of an organisation's operations. Both of these are distinguished from *environmental condition indicators*, which provide context by measuring the condition of the external environment and are not directly concerned with an organisation's impacts. The standard provides high-level guidance without explaining how any of the environmental performance indicators given as examples should be calculated.

The various proposals differ substantially as regards their conceptual basis and the principles on which performance indicators should be prepared and presented. Only the UN Manual states that the accounting principles are based on the IASB Framework for the Preparation and Presentation of Financial Statements. A paper issued by the Federation des Experts Comptables

Europeans, 2000 [8] showed that a conceptual framework is clearly relevant to environmental issues. No other conceptual frameworks are cited by the proposals although there are references to documents such as the WBCSD Accounting and Reporting Standard and the IFAC Guidelines on Environmental Management Accounting.

There is also considerable variation between the principles adopted for preparing and presenting performance indicators. ISO 14031 does not identify any principles. In the other three proposals, the only common principle is reliability (or credibility). Comparability and clarity (or understandability) appear in the UN Manual and the GRI Guidelines but not in the UK Reporting Guidelines. Relevance is only cited in the UN Manual although the GRI believes that it is covered by the principle of materiality. Strictly, the two are not identical as an item may be relevant but not material. The UK Reporting Guidelines include the principles of accountability and transparency, neither of which are specifically listed in the UN Manual or the GRI Guidelines, although it might be argued that such qualities are collectively covered by the GRI principles: shareholder inclusiveness, sustainability context, completeness, balance, accuracy and timeliness.

Clearly, the concepts and principles underlying the proposals are different in several important respects. Whilst there may be some merit in considering different approaches, this is unlikely to encourage adoption on a broad scale.

## **2 Key features of environmental performance indicators**

In addition to the conceptual divergence, there is substantial variation between the different proposals as regards the range of environmental indicators advocated and the impacts covered. In this paper, it is convenient to discuss the way in which indicators address:

- emissions to air and contribution to global warming;
- water use and discharge;
- waste and emissions to land;
- energy use;
- materials, use of resources and recycling.

### **2.1 Emissions to air and contribution to global warming**

Greenhouse gases are the main cause of climate change and several indicators are designed to measure emissions or to demonstrate the effectiveness of an organisation's initiatives to combat climate change.

The UN Manual is concerned with the emissions of energy users rather than energy-producing companies, the agricultural sector or forestry. Global warming gases are defined as the six gases listed under the Kyoto Protocol. An enterprise's global warming contribution over a 100 year time frame is expressed in kilograms or tonnes of carbon dioxide equivalent per year. Renewable energy is assumed to have no global warming contribution and "for the time being" other global warming gases (e.g. methane) from the use of



energy and transport services are not considered. The eco-efficiency indicator “global warming contribution per unit of net value added” is disclosed, with the contributions for each category of global warming gas and management policy on energy use, objectives and measures to achieve targets.

GRI has five indicators that concern emissions to air and contribution to global warming:

- EN 16 Total direct and indirect greenhouse gas emissions by weight;
- EN 17 Other relevant indirect greenhouse gas emissions by weight;
- EN 18 Initiatives to reduce greenhouse gas emissions and reductions achieved;
- EN 19 Emission of ozone-depleting substances by weight;
- EN 20 NO, SO and other significant air emissions by type and weight.

EN 16 calls for the total greenhouse gas emissions from the six gases listed under the Kyoto Protocol, in tonnes of carbon dioxide equivalent. The indicator includes direct emissions and indirect emissions resulting from the generation of purchased electricity, heat or steam. EN 17 deals with other relevant indirect greenhouse gas emissions. Organisations are expected to disclose the total weight of emissions in tonnes of carbon dioxide equivalent, including those arising from the organisation’s activities, such as employee commuting and business travel. Emissions resulting from imported electricity, heat or steam are excluded.

As well as identifying initiatives to reduce greenhouse gas emissions, EN 18 requires reductions achieved to be quantified in tonnes of carbon dioxide equivalent. EN 19 calls for disclosure of emissions of ozone-depleting substances in tonnes, excluding emissions from products during their use or disposal. Other regulated air emissions are addressed by EN 20, which requires their identification and quantification, including disclosure of the measurement method used.

The UK Guidelines include five indicators that concern emissions to air and contribution to global warming:

- KPI 1 Greenhouse gases;
- KPI 2 Acid rain and smog precursors;
- KPI 3 Dust and particles;
- KPI 4 Ozone-depleting substances;
- KPI 5 Volatile organic compounds;
- KPI 6 Metal emissions to air.

The guidelines emphasise that indirect greenhouse gas emissions should be reported separately from direct emissions. Reference is made to the UK and European Trading Schemes, although there is no suggestion that key performance indicators should include information about the impacts of emissions trading.

ISO 14031 suggests the use of indicators covering the quantity of specific emissions per year and per unit of output, the quantity of waste energy released to air and the quantity of air emissions having ozone-depletion potential or global climate change potential.

It seems unsatisfactory that the UN Manual excludes the emissions of energy-producing companies. There is no agreement as to whether emissions should be reported on an absolute basis or per unit of output (as in ISO 14031) or per unit of net value added (as in the UN Manual). As regards providing separate

emissions data for each of the six greenhouse gases listed in the Kyoto Protocol, as required by the WBCSD Standard, this is clearly dependent on the nature of the reporting organisation and its emissions. Some of the indicators proposed in the UK Guidelines, such as the emissions to air of dust, particles and metal, would only be relevant to a small number of reporting organisations but their measurement in such cases may be a problem. Only the GRI Guidelines focus on initiatives to reduce harmful emissions, providing an opportunity to focus on the positive aspects and to demonstrate improvement.

## 2.2 Water use and discharge

The scarcity of water supplies in certain regions and the potential ecological impacts of water discharge are of increasing concern. Efficient use of water and control of discharges is critical to operational performance and the avoidance of reputation risk. Measurements of water withdrawal, recycling or reuse, discharge and consequent impacts on habitats are therefore of wide importance.

The UN Manual specifically excludes water suppliers and distinguishes between off-stream use (most commercial, industrial, agricultural and domestic applications) and in-stream water use, such as power generation. The eco-efficiency indicator derived is “water consumption per unit of net value added” and associated disclosures cover the amounts of water received from each source, return flow, wastewater treatment and management policy.

The GRI Guidelines include indicators:

- EN 8 Total water withdrawal by source;
- EN 9 Water sources significantly affected by withdrawal of water;
- EN 10 Percentage and total volume of water recycled and reused;
- EN 21 Total water discharge by quality and destination;
- EN 25 Identity, size, protected status and biodiversity value of water bodies and habitats affected by the organisation’s discharges of water and runoff.

EN 8 requires the total water withdrawal from all sources during the reporting period in cubic metres per year. Water suppliers are not specifically excluded, nor is any adjustment proposed for cooling water returned to a water source. EN 9 is concerned with impacts on the ecosystem caused by lowering the water table due to water withdrawal. EN 10 calls for total volume of water recycled and reused per year and as a percentage of total water withdrawal under EN 8.

The UK Guidelines deal separately with water abstractions and emissions to water:

- KPI 14 Water use and abstraction;
- KPI 7 Emissions of nutrients and organic pollutants;
- KPI 8 Metal emissions to water.

KPI 14 is concerned with water abstraction for public water supply and for direct use by industrial or agricultural processes, rather than supplied water, which is reported as a supply chain impact. Reuse or recycling is expected to be discussed but not quantified. KPI 7 addresses emissions to water that can cause pollution and disruption to habitats. In the case of metal emissions to water, KPI 8



identifies a number of sectors and processes that may give rise to pollutants and requires disclosure of the emissions in kilograms per year, together with details of the sampling and monitoring technique used.

ISO 14031 proposes the use of indicators quantifying the water used per unit of product, the quantity of water reused, specific materials discharged to water per unit of product and the quantity of waste energy released to water.

The exclusion of water suppliers (as in the UN Manual and in ISO 14031) is a marked contrast with the focus of the UK Guidelines, which are only concerned with public water supply and suggest reporting water use impacts separately as a supply chain impact. The release of cooling water, treated as a deduction from water received in the UN Manual but not giving rise to any adjustment in the GRI Guidelines, is another area of difference. Emissions of metals, nutrients and organic pollutants, as proposed in the UK Guidelines, are only likely to be relevant to a small number of reporting organisations.

### 2.3 Waste and emissions to land

Disposal of waste, particularly hazardous waste and accidental spills affects the environment and is increasingly the subject of regulation, fines and penalties. On a more positive note, reduction of waste usually has financial benefits for an organisation through improved process efficiency and reduced transport costs. Indicators are designed to measure the effectiveness of policies and controls.

The UN Manual identifies waste as a non-product output with a negative or zero market value, distinguishing between mineral and non-mineral waste. Disclosure comprises the weight or volume of waste generated per unit of net value added and includes waste treatment by incineration, landfill and temporary on-site storage. The management policy is disclosed, together with information about any schemes for energy recovery from the conversion of waste.

The GRI Guidelines include indicators:

- EN 22 Total weight of waste by type (hazardous and non-hazardous) and disposal method;
- EN 23 Total number and volume of significant spills;
- EN 24 Weight of transported, imported, exported or treated hazardous waste and percentage of transported waste shipped internationally.

The UK Guidelines include:

- KPI 9 Pesticides and fertilisers;
- KPI 10 Metal emissions to land;
- KPI 11 Acids and organic pollutant emissions to land;
- KPI 12 Waste (Recycling, recovery and landfill);
- KPI 13 Radioactive waste.

A distinction is made between landfill, recovery (including waste incineration as a source of renewable energy), recycling and reuse. Disclosures include the total amount in metric tonnes per year, the proportion disposed of in each way and whether an estimation method has been used. KPI 12 deals with non-hazardous waste whereas the other KPIs concern hazardous waste.

ISO 14031 suggests possible indicators regarding waste and emissions to land. These include the total quantity of waste for disposal per year and per unit of product, the quantity of material sent to landfill per unit of product, the quantity of hazardous, recyclable or reusable waste produced per year and the amount or type of wastes generated by contracted service providers.

Disclosure of separate performance information relating to hazardous waste, which is not proposed in the UN Manual, is likely to be considered important by some stakeholders. The manual distinguishes between mineral and non-mineral waste, which seems less significant and may cause difficulty in compiling the data. Accidental spills, normally an important aspect of performance, are specifically addressed in the GRI Guidelines and the UK Guidelines but are not dealt with in the UN Manual or in ISO 14031.

## 2.4 Energy use

Organisations normally use energy directly, from sources such as coal, natural gas or diesel, and/or indirectly, from the purchase of electricity or other forms of imported energy. Efficient use of energy and the minimisation of environmental impacts can be monitored using information about consumption of energy from different energy sources and reductions achieved. Initiatives to provide energy-efficient products and services may offer a competitive advantage.

The UN Manual is concerned with energy users rather than energy producers. Impacts of energy use are dealt with in the context of greenhouse gases and contribution to global warming. Different forms and sources of energy are considered and tables of calorific values for a wide range of fuels in different countries are provided. Energy is valued by its capacity to perform work and the resulting indicator, after application of a factor to convert to thermal energy, measures the energy requirement per unit of net value added. The total energy requirement for the period and the amounts for each energy source are disclosed.

The GRI Guidelines include:

- EN 3 Direct energy consumption by primary energy source;
- EN 4 Indirect energy consumption by primary source;
- EN 5 Energy saved by conservation and efficiency improvements, excluding savings due to reduced production capacity or outsourcing;
- EN 6 Initiatives to provide energy-efficient or renewable energy based products and services, and reductions in energy requirements as a result of these initiatives;
- EN 7 Initiatives to reduce indirect energy consumption and reductions achieved.

Under EN 3, primary sources include direct non-renewable sources such as coal, natural gas, and fuel distilled from crude oil, whereas direct renewable sources include biomass, solar, wind, geothermal and hydro energy. Total energy consumed is derived from direct primary energy purchased, plus direct primary energy produced less direct primary energy sold. Total energy consumption is stated by primary source in joules and a table is provided to convert volumes of primary energy sources to gigajoules. EN 4 concerns indirect energy



consumption, i.e. energy used indirectly through the purchase of electricity, heat (or cooling), distilled fuel (e.g. diesel, LPG), steam or other forms of imported energy, using data from providers.

The UK Guidelines deal with resource use, including extraction from energy sources such as natural gas, oil and coal, but do not propose any specific disclosures from the viewpoint of energy consumption or conservation.

ISO 14031 suggests indicators covering the total quantity of energy used per year or per unit of output, the quantity of each type of energy used, the quantity of energy used per service or customer, and the quantity of energy units saved due to energy conservation programmes. For organisations with a vehicle fleet, examples include the average fuel consumption. For energy producers, the key indicators are the quantity of energy generated and the land area used to produce a unit of energy.

Of the proposals examined, only ISO 14031 extends the application of energy use indicators to the energy generated by producers. This is useful in monitoring total energy demand and trends, although transmission from one region to another may distort the analysis. In the case of the UK Guidelines, energy use is only measured from the viewpoint of consumption of resources but there is no requirement to convert to energy units such as gigajoules. Only the GRI Guidelines specify performance indicators that focus on positive aspects such as savings in an organisation's energy consumption and initiatives to provide energy-efficient or renewable energy based products and services.

## 2.5 Materials, use of resources and recycling

Conservation of resources through reduced raw material consumption and the use of recycled materials is a prerequisite for sustainable development and may also contribute to lower operating costs. As consumption increases, restraint over resource use becomes critical. Indicators are designed to assist in monitoring the efficiency of material flows and ability to use recycled input materials.

The UN Manual does not include any specific eco-efficiency indicators dealing with materials use and recycling.

The GRI Guidelines include:

- EN 1 Materials used by weight or volume;
- EN 2 Percentage of materials used that comprise recycled input materials.

The total disclosed under EN 1 includes materials purchased from external suppliers and those obtained from internal sources. Non-renewable materials used (such as minerals, metals, oil, gas and coal) are reported separately.

The UK Guidelines cover the extraction, use or harvesting of resources:

- KPI 15 Natural gas;
- KPI 16 Oil;
- KPI 17 Metals, by type;
- KPI 18 Coal, by type and method of extraction (deep mine or opencast);
- KPI 19 Minerals, by type;
- KPI 20 Aggregates, by type;





- KPI 21 Forestry, by type of wood, source area and whether from sustainably managed forests;
- KPI 22 Agricultural produce, including foodstuffs such as meat and fish, tobacco, rubber and other crops.

Resources used are stated per annum in metric tonnes, cubic metres or barrels of oil equivalent, as appropriate.

ISO 14031 includes examples of performance indicators covering materials, the use of resources and recycling. Amongst the management performance indicators listed are the number of products designed for disassembly, recycling or reuse and financial savings through reductions in resource use, prevention of pollution or waste recycling. Operational performance indicators include the quantity of materials used per unit of product, the quantity of processed, recycled or reused material used, hazardous materials used in the production process and packaging materials discarded or reused. Other indicators deal with the use of material by contracted service providers. ISO 14031 also suggests measuring the quantity of materials used during after sales servicing of products.

It may not always be meaningful or practicable to disclose the total weight of all direct materials used, as required by the GRI Guidelines. The UK Guidelines propose separate indicators, by weight or volume, for the use of non-renewable materials, such as natural gas, oil, metals, coal and minerals, whereas the GRI Guidelines require this information as a single figure. Aggregates, forestry and agricultural produce, covered by the UK Guidelines, are not mentioned by the GRI Guidelines. For all the indicators on material use, there may be uncertainty as regards whether measurement should take account of material inventories at the beginning and end of the reporting period. Recycling and reuse of materials is only addressed in the GRI Guidelines and in ISO 14031.

### 3 Conclusions

Comparison of the proposals reviewed in this paper reveals a marked divergence and some overriding conclusions.

- Standardisation of environmental performance indicators in the foreseeable future is unlikely in view of the different approaches adopted by “standard-setting” parties.
- The GRI Guidelines incorporate a comprehensive set of performance indicators for most environmental aspects and offer a reasonable prospect of global acceptance in the medium term by “interested” organisations.
- Coverage of the impact groups varies significantly between the different proposals, revealing gaps in some areas and substantial detail in others
- Convergence on the underlying concepts and principles and on some key environmental performance indicators will be difficult to achieve without an increased degree of coordination and cooperation.
- Key performance indicators are identified (as core indicators) in the GRI Guidelines, whereas other proposals do not offer any equivalent differentiation. The GRI distinction between core indicators and



additional indicators may be helpful to organisations in identifying key performance indicators.

- The needs of different groups of users, both internal and external users, are likely to differ significantly but are unlikely to be served in either case by information that is not reliable.
- It is important to support quantitative information about environmental performance with appropriate narrative explanation. The GRI requirement for disclosure of an organisation's management approach is particularly helpful in this regard.
- A large number of detailed issues, such as the treatment of environmental performance by water and energy suppliers (excluded in the UN Manual), adjustment for opening and closing inventories in measuring material usage and the use of absolute numbers rather than ratios, will need to be resolved if convergence is to be achieved.

## References

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