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Environmental Key Performance Indicators

Reporting Guidelines for UK Business



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Department for Environment
Food and Rural Affairs

Environmental Key Performance Indicators

Reporting Guidelines for UK Business



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Executive Summary

There is an increasing recognition that good environmental performance makes good business sense. Environmental risks and uncertainties impact to some extent on all companies, and affect investment decisions, consumer behaviour and Government policy. Management of energy, natural resources or waste will affect current performance; failure to plan for a future in which environmental factors are likely to be increasingly significant may risk the long-term future of a business.

Companies that measure, manage and communicate their environmental performance are inherently well placed. They understand how to improve their processes, seize market opportunities, reduce their costs, and comply with regulatory requirements and stakeholder expectations. This is why 140 of the top 250 UK companies now report on their environmental performance. Nevertheless, the landscape of environmental, sustainability and corporate responsibility reporting can be complex. These Guidelines seek to clarify some of the reporting frameworks and best practice which currently exist.

There is an increasing demand for company reporting that is sharper and more focused on the key impacts on the business and on the environment. The new Operating and Financial Review and the EU Accounts Modernisation Directive are designed to improve company reporting, and require companies to consider their environmental impacts. The use of Key Performance Indicators (KPIs) will help manage and communicate links between the environmental and financial performance.

These Guidelines seek to make this process easier for businesses by setting out 25 KPIs, and how to handle environmental impacts in the supply chain and products. But no one company is expected to report on all of these. An analysis of business sectors suggests that 80% of companies are likely to have 5 or less significant KPIs. Whilst some companies already have sophisticated reporting systems in place, these Guidelines aim to help many more companies reach a level where they understand their environmental performance and can improve it.

Chapter 1: Overview

1.1 The Purpose of the Guidelines

The purpose of these Guidelines is to:

- Give clear guidance to companies on how to report on their environmental performance using environmental Key Performance Indicators (KPIs);
- Define which KPIs are most relevant to which sectors; and,
- Set out the business rationale for managing environmental performance using KPIs.

The Government is seeking to stimulate the provision of comparable, comprehensive and quantitative data, whilst avoiding the problem of over-prescriptive guidance leading to 'boilerplate' or 'cut and paste' responses.

The recent growth in reporting of environmental performance has led to a number of different approaches and this has resulted in reports which are of varying quality, depth and rigour. These Guidelines seek to set a minimum standard which will give businesses some assurance that it has reported its environmental performance to an appropriate level of accuracy and detail.

These Guidelines aim to help businesses address their most significant environmental impacts, and report on these impacts in a way that meets the needs of stakeholders. The Guidelines set out 25 KPIs that the Government believes to be significant to UK businesses and which KPIs are most significant to which business sectors. The majority of sectors (79%) have five or less relevant KPIs and no sector needs to report on more than ten. In most cases Greenhouse Gas emissions is the *most* significant KPI and the Government expects all of business to help address the impact we are having on climate change.

1.2 Policy Background

The Government recently published the UK Sustainable Development Strategy *Securing the Future*¹ which sets out a vision through to 2020. It recognises that the Government, "has a key role to play in developing the business case for sustainable consumption and production – for example through standards, economic incentives, regulation, voluntary agreements, business support programmes, communications and consumer policy." This vision will be developed through measures to promote:

- Better products and services, which reduce the environmental impacts from the use of energy, resources, or hazardous substances;
- Cleaner, more efficient production processes, which strengthen competitiveness; and,
- Shifts in consumption towards goods and services with lower impacts.

¹ Securing the Future - The UK Government Sustainable Development Strategy. March 2005

As part of the Company Law Review, the Government has implemented an enabling framework - called the *Operating and Financial Review (OFR)*² - so that listed companies are required to consider environmental, employee and social issues alongside financial information. This regulation applies to companies whose financial year begins on or after 1 April 2005. The regulations state that OFRs should provide information on policies and performance to the extent necessary for shareholders to assess the company's strategies and their potential to succeed. The Government expects companies that face significant environmental risks and uncertainties to report on them in their OFRs. So, for example, Directors will need to consider whether their companies are adequately prepared to operate in a world where carbon emissions will be required to be 60% lower than 1990 levels³, and if this is likely to affect future shareholder value.

In parallel, the *EU Accounts Modernisation Directive* introduces requirements for large private companies to include "an analysis of environmental and social aspects necessary for an understanding of the company's development, performance or position", in an 'enhanced Directors' Report'. The analysis should, "include both financial and, where appropriate, non-financial key performance indicators relevant to the particular business, including information relating to environmental and employee matters." This part of the EU Accounts Modernisation Directive applies to financial years beginning on or after 1st April 2005.

The OFR applies to over 1,200 GB registered listed companies and the EU Accounts Modernisation Directive to over 12,000 large unquoted GB businesses.

The disclosure of environmental impacts, policies and performance benefits business, shareholders, wider stakeholders and society as a whole. For a number of years, the Government has sought to encourage companies to report on their environmental impacts, for example, through the Defra Environmental Reporting Guidelines on Waste, Water and Greenhouse Gases.

² The Companies Act 1985 (Operating and Financial Review and Directors' Report etc.) Regulations 2005

³ The Government has set a carbon dioxide emission target of a 60% reduction from 1990 levels by 2050.

1.3 Benefits of managing and reporting environmental performance

Managing and reporting on environmental performance can lead to significant business benefits as well as benefits for the environment.

Cost Savings and Productivity Gains

Business can save costs and increase efficiency through reducing and managing resource use. Typical areas where cost savings are identified include the use of raw materials and supplies, reductions in waste, water and energy use and transport, travel, and packaging. By reducing environmental impacts, such as waste to landfill, businesses can significantly reduce any associated taxes or levies, or avoid the cost of compliance altogether. Responsible management of risks and liabilities can lead to reduced insurance costs.

The Environment Agency estimates British manufacturing would save £2-3 billion each year, equivalent to 7% of profits by adopting best practice waste minimisation techniques, often with little or no investment.

Improved sales

Businesses can benefit from improved reputation amongst their customers (and potential customers) by reporting on relevant environmental issues in a clear and transparent way. Good reporting improves customer confidence. Informing customers of your efforts to improve your organisation's environmental performance can lead to increased confidence in your products and services.

74% of the British population say more information on a company's social and ethical behaviour would influence their purchasing decisions. MORI CSR Study, 2003.

Preferred Supplier Status

Large organisations are increasingly requiring suppliers and contractors to submit environmental performance information to satisfy the expectations of their own shareholders. Reporting on environmental information can make you a more attractive supplier than your competitors.

In Spring 2005, the Government will appoint a business-led Sustainable Procurement Task Force to develop a national action plan for Sustainable Procurement across the public sector by April 2006.

Increased attractiveness to the investment community

Investors, financial analysts and brokers are now asking questions about the sustainability of business operations. Reporting on environmental matter provides a good indication of what measures an organisation is taking to reduce risks and develop opportunities. For example, the UNEP Finance Initiative (UNEP FI)⁴ works closely with over 200 financial institutions who are signatories to the UNEP FI Statements, and a range of partners organizations to develop and promote linkages between the environment, sustainability and financial performance.

⁴ <http://www.unepfi.org>

Product and Service Innovation

Measuring and managing environmental impacts drives and supports innovation in product and service development, helping to secure new markets and customers or safeguard existing ones.

Fact 1:

GE's research-and-development investments in eco-friendlier technologies will rise from \$700 million in 2004 to \$1.5 billion in 2010.

Fact 2:

The Carbon Trust estimates there has been over £1 billion of investment in UK clean technology companies since 2000.

Employee Recruitment

Clear reporting of an organisation's efforts to manage its environmental performance helps to attract high calibre employees as good environmental reputation and performance can be an important factor in an employee's choice of employer.

Three in five people want to work for a company whose values are consistent with their own.
Source: A survey of 1,200 undergraduates across the 20 largest economies in the world by Environics' Global Campus Monitor (2003).

Licence to operate

Managing environmental impacts and minimising the organisation's impact on the environment can reduce the exposure to fines. It can improve relations with regulators and help ensure licence to operate by providing assurances about compliance with environmental legislation and conformity with other relevant laws and regulations.

1.4 The business benefits of reporting using Key Performance Indicators

Environmental Key Performance Indicators provide businesses with a tool for measurement. They are quantifiable metrics that reflect the performance of a business in achieving its wider goals and objectives. KPIs help businesses to implement strategies by linking various levels of an organisation (business units, departments and individuals) with clearly defined targets and benchmarks.

The impact of environmental matters on business performance is increasing and will continue to do so. For example, poor management of energy, natural resources or waste can affect current performance; failure to plan for a future in which environmental factors are likely to be significant may risk the long-term value and future of a business. Therefore, the Government expects that businesses will need to use environmental KPIs to adequately capture the link between environmental and financial performance.

There are additional reasons why KPIs are important:

- They focus on ‘key’ measures – i.e. those most important to an understanding of a business and avoiding the tendency for lengthy reports on a wide range of measures, of which many may be less relevant; and
- New regulations such as the Operating and Financial Review and the Enhanced Directors Report required by the EU Modernisation Directive require significant environmental issues to be reported using KPIs.

Many companies are already collecting the data required to report on environmental KPIs, either because they can be calculated from standard business data, such as energy bills, or because it has to be reported to a regulator.

1.5 Current Reporting Situation

There is an increasing trend for companies, especially larger companies, to report on their environmental impacts. The latest study by corporateregister.com⁵ notes that over 1,500 companies worldwide now produce a separate Corporate Social Responsibility (CSR) Report, compared with less than 100 reports in 1993. The quality and scope of reporting has also increased, and communications are increasingly targeted to specific stakeholder needs. With the onset of new reporting regulations, such as the OFR and EU Accounts Modernisation Directive, it is likely that the reporting of environmental impacts will only increase as markets seek greater transparency and accountability.

However, there is still a lack of quantification in most reporting. The Environment Agency study of Annual Reports and Accounts of the FTSE All Share companies⁶, noted that the majority of reports lack depth, rigour or quantification. The report concluded that environmental disclosure levels in Annual Reports and Accounts were found to be low. Only 10% of FTSE All Share companies report quantitatively on climate change, water and waste.

Evidence suggests that this is mirrored in smaller, non-listed companies. Over 99% of the 3.7 million businesses in the UK are small and medium-sized enterprises (SMEs). The Environment Agency estimates that SMEs generate approximately 60% of commercial waste and as much as 80% of pollution incidents in England and Wales alone.

On the basis of this evidence, there appears to be scope for the business community to continue to improve both quantity and quality of management and disclosure on environmental matters.

1.6 Guidelines and Frameworks

The increasing demand for transparency and disclosure by businesses on environmental issues, and other corporate responsibility issues, has meant that a number of reporting guidelines and frameworks have evolved. The Government

⁵ Towards transparency: progress on global sustainability reporting 2004, corporateregister.com, ACCA

⁶ Environmental Disclosures in the Annual Report & Accounts of companies in FTSE All-Share, The Environment Agency, 2004

believes that there is an emerging consensus on what should be included in a set of environmental KPIs and has sought to ensure that these Guidelines are broadly compatible with other reporting frameworks and standards.

There are a number of frameworks that businesses can use to help report on environmental performance including the Global Reporting Initiative (GRI)⁷ and the United Nations Conference on Trade and Development's (UNCTAD's) Guidance on accounting for environmental impacts⁸. The World Business Council for Sustainable Development and the World Resources Institute have also produced comprehensive guidance on how to report greenhouse gases in their Greenhouse Gas Protocol⁹. Companies that have to comply with the new Operating and Financial Review may also refer to the Implementation Guidance that accompanies the Accounting Standards Board's OFR Standard¹⁰ and Guidance for Directors and Auditors issued by the DTI¹¹.

In addition to reporting guidelines and frameworks, there are also voluntary environmental management systems (EMSs), which can be used by companies of all sizes as a means to help improve their overall environmental performance. EMSs such as the global standard ISO 14001 (and related ISO standards such as 14063 on Environmental Communications) and the European Regulation EMAS (the EU Eco Management and Audit Scheme) can help organisations identify and manage their key environmental impacts, demonstrate compliance with legislation, show that they are managing their risks responsibly, and achieve significant cost savings. Businesses that wish to take a phased approach to implementing an EMS can follow the BS 8555 process¹².

1.7 Types of Report

Organisations that currently report on their environmental performance do so in many different styles and formats. A few organisations report on environmental issues in their Annual Report and Accounts. Some will now have to produce an Operating and Financial Review or an enhanced Directors' Reports that include discussion of environmental matters as defined by the new reporting regulations. Some organisations produce standalone environmental reports. Others produce Corporate Social Responsibility reports (CSR), Corporate Responsibility (CR) reports, or Sustainability reports. The Government does not believe that one type of report is necessarily better than another; what *is* important is that organisations reduce the harmful environmental and social impacts of their activities, products and services and are transparent in their efforts to do so.

1.8 Principles of Reporting

⁷ <http://www.globalreporting.org/>

⁸ United Nations Conference on Trade and Development: A Manual for the Preparers of Eco-Efficiency Indicators. <http://www.unctad.org>

⁹ The Greenhouse Gas Protocol: a corporate accounting and reporting standard. World Business Council for Sustainable Development <http://wbcsd.org>, World Resources Institute <http://www.wri.org>

¹⁰ Accounting Standards Board: <http://www.asb.org.uk/>

¹¹ <http://www.dti.gov.uk/cld/financialreview.htm>

¹² <http://www.theacorntrust.org> and <http://www.bsi-global.com>

There are some common principles and processes which companies can follow when reporting on environmental issues and using Key Performance Indicators:

Criterion	Description
Planned and transparent	The reporting process should be carefully planned, with clearly assigned responsibilities and clear timeframes. It should be transparent, with the process communicated to all involved in compiling the report.
Consultation	The process should provide for consultation within the business, with shareholders and other stakeholders.
Relevant and comparable information	All relevant information and comparators should be taken into account, looking within the business and also externally, using government and trade body guidance, best practice models, benchmarks, and other companies' reports. In addition the report should provide a description of the process undergone, and describe the calculation methods and any assumptions where relevant.
Scope	The process, and the resulting reported data, should cover the whole business unless there are sound documented reasons for not doing so. Where only limited data is available, such as that for a particular business unit, this should be clearly described so that the reader understands what proportion of the business' operations is being reported on.
Consistent	The reporting process should be applied in the same way across the business from year to year.
Subject to review	The process should be reviewed both internally and externally where appropriate. Use of a third party verifier will provide assurance for the business and its stakeholders.
Quantitative	KPIs should be measured, and should therefore be quantitative in nature. This also means that they can be acted upon; for example, targets can be set to reduce a particular emission if it is expressed in a quantitative term. In this way the effectiveness of environmental policies and management systems can be substantiated.
Comparable	KPIs should be expressed in absolute terms that cover the entire business for each period of reporting (most commonly annually), and also related to a normalising factor, such as to turnover. This allows stakeholders to know how much environmental impact companies have relative to a given amount of goods and/or services produced. Normalised data can be particularly helpful in demonstrating environmental improvements in a growing business. For companies with significant overseas operations it is useful to report environmental impacts by country or region.

Criterion	Description
Standard methods of calculation	The measurement of environmental impacts often requires some form of conversion methodology or estimation, such as the estimation of carbon dioxide emissions resulting from the consumption of heating oil. There are many ways of estimating environmental impacts, and it is important that businesses report on the estimation methods used.
Underlying sources of data readily available	Sources of underlying data should be as readily available as possible to help ensure reporting transparency.

Chapter 2: Key Performance Indicators

2.1 Which Key Performance Indicators are relevant?

Chapter 2 provides guidance on how to measure and report on each Key Performance Indicator.

The first step in reporting environmental KPIs is to determine which environmental issues are relevant to your business. These Guidelines make use of an extensive analysis of the impact of UK businesses on the natural environment. The analysis takes into account the value of a number of different ecosystem services¹³. Ecosystems, and the biological diversity contained within them, provide goods and services essential to our economic and social welfare. Ecosystems tend to be significantly undervalued by society and in many cases no formal market exists for the services that ecosystems provide; we have allocated a value to these services in order to determine the most important environmental impacts.

Over 700 different types of environmental impacts have been examined in detail, from uses of a natural resource, such as the extraction of coal, to the services the environment provides, such as the ability of trees to absorb carbon dioxide. These impacts have been mapped to 56 business sectors. A profile for each sector was determined, taking into account a wide array of information including national pollution and emission registries, and also data disclosed by over 2,500 companies. Each sector profile estimated the type (e.g. carbon dioxide) and quantity (e.g. tonnes) of environmental impact for that sector. The most significant environmental impacts of each business sector were then determined by analysing the cost to society associated with resource use and polluting emissions.

The social, or “damage”, costs are those costs that are borne by society as a consequence of degradation of the environment but which are not borne by the businesses that use the resource or emit the pollutants. Placing a financial value on environmental impacts allows companies, shareholders and regulatory authorities to determine the potential relevance of their interactions with the environment in a clear and transparent way. By determining the cost of a particular environmental impact it is possible to determine the relevance of each impact to business. The analysis assessed which environmental impacts are significant to a given sector by comparing the damage cost of an environmental impact with the total economic value (turnover) of that sector.

This indicates that there are 25 direct¹⁴ Key Performance Indicators that are significant to UK businesses. Businesses engaged in extremely specific activities may well have environmental impacts that are not on this list. The analysis presented here accounts for the major environmental impacts caused by UK businesses.

¹³ For further information on the value of ecosystem services please refer to the recently published United Nations Millennium Ecosystem Assessment, a 4 year study involving 1,360 experts worldwide. This can be found at <http://www.millenniumassessment.org>

¹⁴ The differences between direct impacts and indirect impacts, such as those derived from the supply chain, are described in detail in Section 0.

There are three main areas against which business should consider reporting their environmental performance:

- **Direct KPIs**
- **Supply Chains**
- **Products**

The 25 direct Key Performance Indicators¹⁵ considered to be significant to UK businesses are:

Emissions to air

1. Greenhouse Gases
2. Acid Rain, Eutrophication & Smog Precursors
3. Dust and Particles
4. Ozone Depleting Substances
5. Volatile Organic Compounds
6. Metal emissions to air

Emissions to water

7. Nutrients and Organic Pollutants
8. Acid emissions to water
9. Metal emissions to water

Emissions to land

10. Pesticides and Fertilisers
11. Metal emissions to land
12. Acids and Organic Pollutants
13. Waste (Landfill, Incinerated and Recycled)
14. Nuclear Waste

Resource Use

15. Water Use and Abstraction
16. Natural Gas
17. Oil
18. Metals
19. Coal
20. Minerals
21. Aggregates

15 There is no single, universally accepted KPI for biodiversity. However, many of the other KPIs will provide a contribution to the assessment of the ecosystem services whose degradation can result in biodiversity loss (i.e. emissions to water), allowing for a more strategic assessment of impacts to be made. The Convention on Biological Diversity (CBD) has developed trial indicators for measuring biodiversity loss which may also be useful in an evaluation of the indirect and direct effects of business activities on biodiversity: <http://www.biodiv.org/doc/publications/cbd-2010-brochure-en.pdf>

- 22. Forestry
- 23. Agriculture

Financial

- 24. Environmental Fines
- 25. Environmental Expenditures

These KPIs have been designed with company reporting in mind. Where possible recommendations as to how to measure these KPIs make use of information that is routinely collected by companies. Accordingly, many of the KPIs described can be calculated from information such as quantity of fuel consumed per annum, business mileage, and how much electricity has been purchased.

2.2 How to determine Reporting Boundaries

Some companies choose to report on a wide range of different environmental issues. Those that do report face a dilemma: where does their responsibility begin and end?

The *polluter pays* principle is a good way of clarifying reporting boundaries. The polluter pays principle assigns responsibility to those parties that directly cause the pollution or use a natural resource. Using this model, emissions caused or resources used directly by the company fall under its direct responsibility; all other impacts are indirect. Examples of direct impacts include extraction of raw materials, emissions of greenhouse gases to air from burning fuel for heating purposes, and emissions of mercury to land from mining activities.

The purchase of finished products, such as electricity and outsourced logistics, results in upstream indirect (supply chain) impacts that are embedded in the products and services supplied. Thus, the purchase of electricity, any form of transport where a company does not pay for the fuel, and supplied water are all indirect supply chain impacts as the actual emissions or use of natural resources are caused by the supplier company.

Figure 1 describes the relationship between direct and indirect impacts.

Figure 1 Direct versus Indirect Impacts

	Impacts of Reporting Company's suppliers (Indirect Upstream Impacts)	Reporting Company's direct impacts (Direct Impacts)	Impacts from Reporting Company's products when used (Indirect Downstream Impacts)
Definition	Supplied goods and services that have an environmental impact as a result of the production of the good or service.	Business operations or activities that result in an environmental impact or pollution directly.	Environmental impacts caused by the use of a product after it has been sold.
Examples	Raw materials such as food, wood, water, metals, and minerals. Purchased fossil fuel. (Fossil fuels may have significant environmental impact as a result of their extraction.) Indirect Greenhouse Gas emissions e.g. from outsourced logistics and electricity supply. Supplied water.	Greenhouse gases emissions resulting from fossil fuel consumption e.g. consumption of oil in boilers used to heat buildings, consumption of petrol in vehicle fleets. Landfill waste. Effluent.	Sold Vehicles, (which generate emissions in their use). Sold pesticides: impacts from supplied pesticides when used (as distinct from when manufactured) Disposal of packaging

Reporting boundaries can be difficult to determine when considering joint ventures and associates, subsidiary entities and other such entities where the reporting business does not have 100% ownership. There are two methods generally used to determine the extent of reporting accountability in these instances: *control / influence* and *equity share*. It is recommended that businesses follow the same convention as applied to their accounts. In most circumstances the equity method, whereby the organisation reports on the proportion of environmental impact that correlates with its ownership of the entity, will be appropriate. More information on boundaries can be found in the Greenhouse Gas Protocol¹⁶.

2.3 Reporting on Direct and Indirect KPIs

The Government expects business to report on their significant environmental impacts regardless of whether they are direct or indirect.

Businesses need to have an understanding of the environmental issues arising in their supply-chains for at least three reasons:

- The issues may be significant in terms of the organisation’s overall environmental impact;

¹⁶ The Greenhouse Gas Protocol: a corporate accounting and reporting standard. Published by the World Business Council for Sustainable Development <http://wbcsd.org> and the World Resources Institute <http://www.wri.org>

- Organisations need to be able to demonstrate that reducing their direct impacts is not at the expense of increased impacts elsewhere in the supply-chain; and,
- Some stakeholders may deem them accountable for supply-chain impacts, particularly where they have significant purchasing power in the marketplace.

The Government believes these issues are best tackled by adopting a strategic approach to environmental purchasing and supply-chain management that is set within the wider context of an organisation’s purchasing and environmental management activities. There is a wide range of support and guidance available to organisations from the relevant professional bodies including the “Strategic Supply-Chain Group”¹⁷ and the handbook “Environmental Purchasing in Practice”¹⁸.

To avoid confusion, companies may find it helpful to report on direct and indirect impacts separately, and avoid aggregation of the data.

2.4 How to use these Guidelines

Figure 3 shows which KPIs are significant for each business sectors. Broad sector classifications have been chosen in order to avoid complexity. These sector classifications follow the International Standard of Industrial Classification of All Economic Activities (ISIC) code. This classification was developed by the United Nations as a standard way of classifying economic activities, and at a 2 digit level describes 56 sector types. The ISIC method groups together enterprises if they produce the same type of goods or service or if they use similar processes (i.e. the same raw materials, process of production, skills or technology).

Figure 3 will allow a business to identify the industry category that most closely describes their type of activity in order to determine the typical direct KPIs for their sector. It recommends that the majority of businesses only need to measure and report against 5 or less KPIs. Other significant direct KPIs are described in the next column. All businesses should consider reporting on **Environmental Fines** (KPI 24) and **Environmental Expenditures** (KPI 25) and also on how they seek to influence the environmental performance of their **Supply Chains** and **Products**.

Many sectors will have significant supply chain impacts in addition to their direct KPIs. In these cases, the top 3 supplier sectors with the most significant impacts have been identified in the framework. These sectors have been selected on the basis that they are a significant supplier sector from both a financial and environmental perspective. Significant KPIs for these supplier sectors can be determined by referring to the direct impacts of the supplier sector in the table. This will allow each sector to realise what the most significant impacts in its supply chain is.

The recommended way to use this document is described in Figure 2, below.

¹⁷ <http://www.sscf.info>

¹⁸ Environmental Purchasing in Practice – guidance for organisations, 2002, Institute for Environmental Management and Assessment, Chartered Institute for Purchasing and Supply, NHS Purchasing and Supply Agency.

Figure 2 How to use these Guidelines

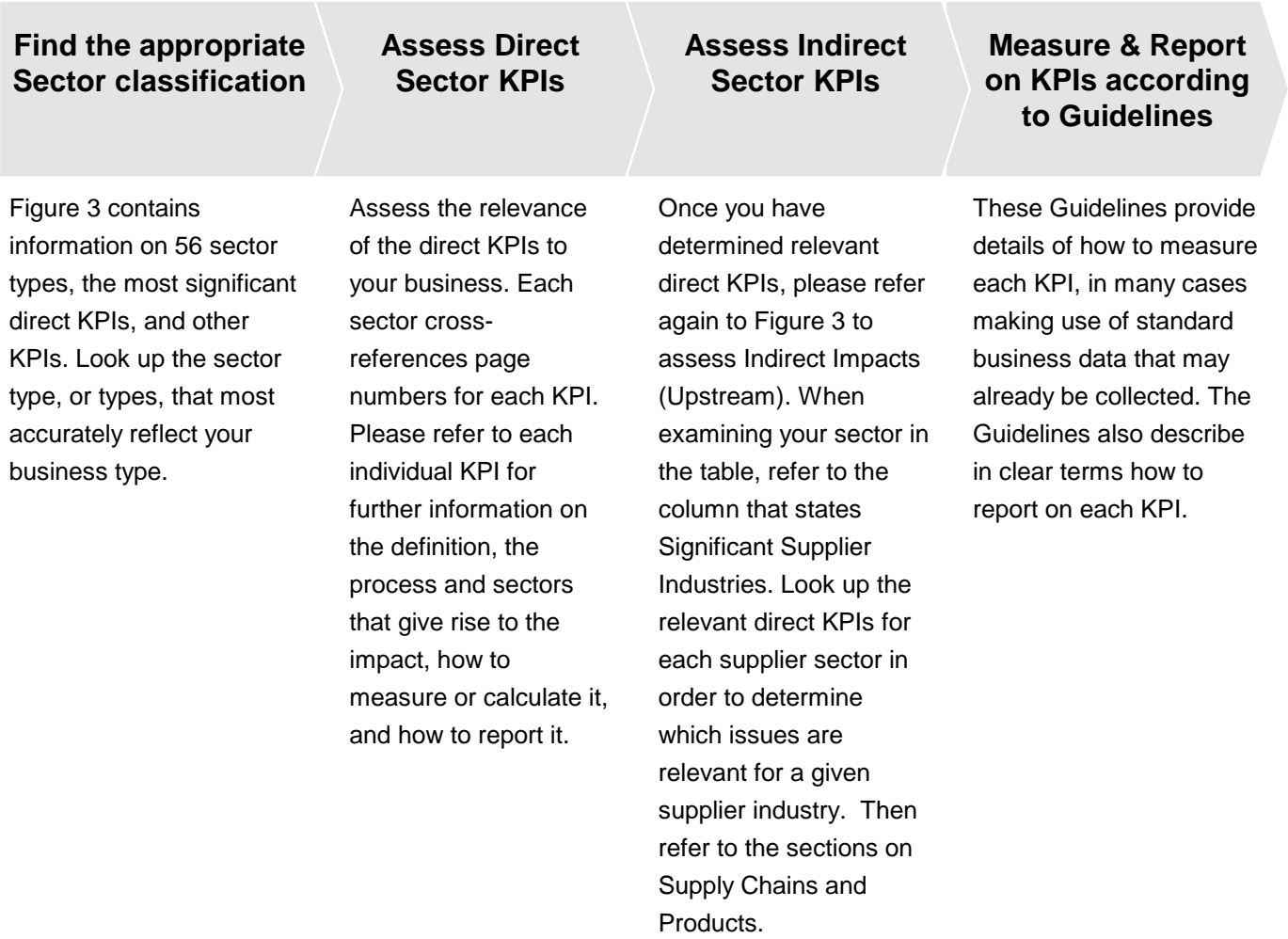


Figure 3 Direct Key Performance Indicators by Sector type

ISIC Sector ¹⁹	Significant Direct Key Performance Indicators ²⁰					Other Direct Key Performance Indicators	Significant Supplier Industries	Page Number(s)
	1	2	3	4	5			
Activities auxiliary to financial intermediation	Greenhouse Gases				5		Electricity, gas, steam and hot water supply; Air transport; Collection, purification and distribution of water	25
Activities of membership organizations	Greenhouse Gases						Electricity, gas, steam and hot water supply; Publishing, printing and reproduction of recorded media; Sewage and refuse disposal, sanitation and similar activities	25
Agricultural and animal husbandry service activities, except veterinary activities	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors					Farming of Animals; Manufacture of chemicals and chemical products; Growing of crops, market gardening & horticulture	25, 30
Air transport	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Manufacture of coke, refined petroleum products and nuclear fuel; Electricity, gas, steam and hot water supply; Supporting and auxiliary transport activities; activities of travel agencies	25, 30, 47
Collection, purification and distribution of water	Water Use & Abstraction	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Nutrients & Organic Pollutants			Electricity, gas, steam and hot water supply; Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of chemicals and chemical products	51, 25, 30, 36
Computer and related activities	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors					Electricity, gas, steam and hot water supply; Air transport; Publishing, printing and reproduction of recorded media	25, 30
Construction	Greenhouse Gases	Water Use & Abstraction	Acid Rain, Eutrophication & Smog Precursors	Waste			Manufacture of coke, refined petroleum products and nuclear fuel; Electricity, gas, steam and hot water supply; Manufacture of other non-metallic mineral products	25, 51, 30, 47
Education	Greenhouse Gases	Waste	Acid Rain, Eutrophication & Smog Precursors				Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Air transport	25, 47, 30
Electricity, gas, steam and hot water supply	Greenhouse Gases	Waste	Acid Rain, Eutrophication & Smog Precursors	Nuclear Waste	Water Use and Abstraction	Metal Emissions to Land Metal Emissions to Air Metal Emissions to Water	Mining of coal and lignite; extraction of peat; Extraction of crude petroleum and natural gas; Manufacture of coke, refined petroleum products and nuclear fuel	25, 47, 30, 49, 51, 44, 35, 39

¹⁹ International Standard Industrial Classification Code.

²⁰ Top five direct Key Performance Indicators.

ISIC Sector ¹⁹	Significant Direct Key Performance Indicators ²⁰					Other Direct Key Performance Indicators	Significant Supplier Industries	Page Number(s)
	1	2	3	4	5			
Extraction of crude petroleum and natural gas	Greenhouse Gases	Water Use & Abstraction	Acid Rain, Eutrophication & Smog Precursors	Oil	Natural Gas	Waste	Electricity, gas, steam and hot water supply; Manufacture of coke, refined petroleum products and nuclear fuel; Construction	25, 51, 30, 54, 53, 47
Farming of Animals	Water Use & Abstraction	Pesticides & Fertilisers	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Agriculture		Growing of crops, market gardening & horticulture; Electricity, gas, steam and hot water supply; Manufacture of food products and beverages	51, 42, 25, 30, 60
Financial intermediation, except insurance and pension funding	Greenhouse Gases	Waste					Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Publishing, printing and reproduction of recorded media	25, 47
Fishing, aquaculture and service activities incidental to fishing	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Agriculture				Farming of Animals; Agricultural and animal husbandry service activities, except veterinary activities; Growing of crops, market gardening & horticulture	25, 30, 60
Forestry, logging and related service activities	Forestry	Greenhouse Gases					Farming of Animals; Growing of crops, market gardening & horticulture; Agricultural and animal husbandry service activities, except veterinary activities	59, 25
Growing of crops, market gardening and horticulture	Water Use & Abstraction	Greenhouse Gases	Pesticides & Fertilisers	Agriculture	Acid Rain, Eutrophication & Smog Precursors		Manufacture of chemicals and chemical products; Collection, purification and distribution of water; Electricity, gas, steam and hot water supply	51, 25, 42, 60, 30
Health and social work	Greenhouse Gases	Waste					Electricity, gas, steam and hot water supply; Manufacture of chemicals and chemical products; Publishing, printing and reproduction of recorded media	25, 47
Hotels and restaurants	Greenhouse Gases	Waste					Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Growing of crops, market gardening & horticulture	25, 47
Insurance and pension funding, except compulsory social security	Greenhouse Gases						Air transport; Publishing, printing and reproduction of recorded media; Electricity, gas, steam and hot water supply	25
Land transport and transport via pipelines	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Manufacture of coke, refined petroleum products and nuclear fuel; Extraction of crude petroleum and natural gas; Electricity, gas, steam and hot water supply	25, 30, 47

ISIC Sector ¹⁹	Significant Direct Key Performance Indicators ²⁰					Other Direct Key Performance Indicators	Significant Supplier Industries	Page Number(s)
	1	2	3	4	5			
Manufacture of basic metals	Water Use & Abstraction	Metal Emissions to Land	Greenhouse Gases	Waste	Metal Emissions to Air	Acid Rain, Eutrophication & Smog Precursors	Electricity, gas, steam and hot water supply; Mining of metal ores; Manufacture of coke, refined petroleum products and nuclear fuel	51, 44, 25, 47, 35, 30
Manufacture of chemicals and chemical products	Water Use & Abstraction	Greenhouse Gases	Metal Emissions to Land	Waste	Volatile Organic Compounds	Metal Emissions to Air Ozone Depleting Substances Acids & Organic Pollutants Acid Rain, Eutrophication & Smog Precursors Nutrients & Organic Pollutants	Electricity, gas, steam and hot water supply; Manufacture of coke, refined petroleum products and nuclear fuel; Land transport & transport via pipelines	51, 25, 44, 47, 34, 35, 33, 46, 30, 36
Manufacture of coke, refined petroleum products and nuclear fuel	Greenhouse Gases	Water Use & Abstraction	Metal Emissions to Land	Acid Rain, Eutrophication & Smog Precursors	Waste	Metal Emissions to Air Nuclear Waste	Manufacture of basic metals; Electricity, gas, steam and hot water supply; Manufacture of chemicals and chemical products	25, 51, 44, 30, 47, 35, 49
Manufacture of electrical machinery and apparatus	Water Use & Abstraction	Greenhouse Gases	Metal Emissions to Land	Waste			Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of basic metals; Electricity, gas, steam and hot water supply	51, 25, 44
Manufacture of fabricated metal products, except machinery and equipment	Greenhouse Gases	Water Use & Abstraction	Waste	Acid Rain, Eutrophication & Smog Precursors			Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of basic metals; Electricity, gas, steam and hot water supply	25, 51, 47, 30
Manufacture of food products and beverages	Water Use & Abstraction	Greenhouse Gases	Waste	Acid Rain, Eutrophication & Smog Precursors	Nutrients & Organic Pollutants		Farming of Animals; Growing of crops, market gardening & horticulture; Electricity, gas, steam and hot water supply	51, 25, 47, 30, 36
Manufacture of furniture; manufacturing	Greenhouse Gases	Waste	Water Use & Abstraction	Acid Rain, Eutrophication & Smog Precursors			Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of textiles; Electricity, gas, steam and hot water supply	25, 47, 51, 30
Manufacture of machinery and equipment	Greenhouse Gases	Water Use & Abstraction	Waste	Metal Emissions to Land			Manufacture of coke, refined petroleum products and nuclear fuel; Electricity, gas, steam and hot water supply; Manufacture of chemicals and chemical products	25, 51, 47, 44
Manufacture of medical, precision and optical instruments, watches and clocks	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Water Use & Abstraction	Waste			Electricity, gas, steam and hot water supply; Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of basic metals	25, 30, 51, 47

ISIC Sector ¹⁹	Significant Direct Key Performance Indicators ²⁰					Other Direct Key Performance Indicators	Significant Supplier Industries	Page Number(s)
	1	2	3	4	5			
Manufacture of motor vehicles, trailers and semi-trailers	Greenhouse Gases	Water Use & Abstraction	Waste				Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of basic metals; Electricity, gas, steam and hot water supply	25, 51, 47
Manufacture of office, accounting and computing machinery	Greenhouse Gases	Water Use & Abstraction	Waste	Metal Emissions to Land			Manufacture of coke, refined petroleum products and nuclear fuel; Electricity, gas, steam and hot water supply; Manufacture of other non-metallic mineral products	25, 51, 47, 44
Manufacture of other non-metallic mineral products	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste	Metal Emissions to Air	Metal Emissions to Land	Water Use & Abstraction	Electricity, gas, steam and hot water supply; Mining of coal and lignite; extraction of peat; Other mining and quarrying	25, 30, 47, 35, 44, 51
Manufacture of other transport equipment	Greenhouse Gases	Water Use & Abstraction	Waste				Manufacture of coke, refined petroleum products and nuclear fuel; Electricity, gas, steam and hot water supply; Manufacture of basic metals	25, 51, 47
Manufacture of paper and paper products	Water Use & Abstraction	Greenhouse Gases	Waste	Volatile Organic Compounds	Acid Rain, Eutrophication & Smog Precursors	Metal Emissions to Land Metal Emissions to Water Nutrients & Organic Pollutants	Electricity, gas, steam and hot water supply; Mining of coal and lignite; extraction of peat; Manufacture of chemicals and chemical products	51, 25, 47, 34, 30, 44, 39, 36
Manufacture of radio, television and communication equipment and apparatus	Greenhouse Gases	Water Use & Abstraction	Metal Emissions to Land	Waste			Electricity, gas, steam and hot water supply; Manufacture of chemicals and chemical products; Manufacture of basic metals	25, 51, 44, 47
Manufacture of textiles	Water Use & Abstraction	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste	Nutrients & Organic Pollutants		Electricity, gas, steam and hot water supply; Growing of crops, market gardening & horticulture; Farming of Animals	51, 25, 30, 47, 36
Manufacture of tobacco products	Water Use & Abstraction	Waste	Greenhouse Gases				Growing of crops, market gardening & horticulture; Mining of coal and lignite; extraction of peat; Electricity, gas, steam and hot water supply	51, 47, 25
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	Greenhouse Gases	Waste	Acid Rain, Eutrophication & Smog Precursors	Volatile Organic Compounds			Electricity, gas, steam and hot water supply; Forestry, logging and related service activities; Land transport & transport via pipelines	25, 47, 30, 34
Mining of coal and lignite; extraction of peat	Coal	Greenhouse Gases	Water Use & Abstraction	Metal Emissions to Land	Acid Rain, Eutrophication & Smog Precursors	Waste	Electricity, gas, steam and hot water supply; Other mining and quarrying; Manufacture of coke, refined petroleum products and nuclear fuel	56, 25, 51, 44, 30, 47

ISIC Sector ¹⁹	Significant Direct Key Performance Indicators ²⁰					Other Direct Key Performance Indicators	Significant Supplier Industries	Page Number(s)
	1	2	3	4	5			
Mining of metal ores	Metals	Water Use & Abstraction	Metal Emissions to Air	Greenhouse Gases	Metal Emissions to Water	Acid Rain, Eutrophication & Smog Precursors Waste Pesticides & Fertilisers	Electricity, gas, steam and hot water supply; Manufacture of coke, refined petroleum products and nuclear fuel; Manufacture of coke, refined petroleum products and nuclear fuel	55, 51, 35, 25, 39, 30, 44, 47, 42
Other business activities (legal, accounting, management consulting, administrative etc)	Greenhouse Gases	Waste					Electricity, gas, steam and hot water supply; Air transport; Collection, purification and distribution of water	25, 47
Other mining and quarrying	Aggregates	Water Use & Abstraction	Minerals	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Dust and Particles Waste	Electricity, gas, steam and hot water supply; Mining of coal and lignite; extraction of peat; Manufacture of coke, refined petroleum products and nuclear fuel	58, 51, 57, 25, 30, 32
Other service activities (laundry, hairdressing funeral services etc)	Greenhouse Gases						Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Farming of Animals	25
Post and courier activities	Greenhouse Gases	Waste					Manufacture of coke, refined petroleum products and nuclear fuel; Sewage and refuse disposal, sanitation and similar activities; Land transport & transport via pipelines	25, 47
Public administration and defence; compulsory social security	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors					Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Air transport	25, 30
Publishing, printing and reproduction of recorded media	Greenhouse Gases	Waste	Water Use & Abstraction	Metal Emissions to Land	Acid Rain, Eutrophication & Smog Precursors	Volatile Organic Compounds	Manufacture of paper and paper products; Electricity, gas, steam and hot water supply; Manufacture of chemicals and chemical products	25, 47, 51, 44, 30, 34
Real estate activities	Greenhouse Gases	Waste					Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Sewage and refuse disposal, sanitation and similar activities	25, 47
Recreational, cultural and sporting activities	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Farming of Animals	25, 30, 47
Renting of machinery and equipment without operator and of personal and household goods	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Manufacture of coke, refined petroleum products and nuclear fuel; Electricity, gas, steam and hot water supply; Collection, purification and distribution of water	25, 30, 47

ISIC Sector ¹⁹	Significant Direct Key Performance Indicators ²⁰					Other Direct Key Performance Indicators	Significant Supplier Industries	Page Number(s)
	1	2	3	4	5			
Research and development	Greenhouse Gases	Waste			5		Electricity, gas, steam and hot water supply; Manufacture of other non-metallic mineral products; Manufacture of chemicals and chemical products	25, 47
Retail trade, except of motor vehicles and motorcycles; repair of personal and household goods	Greenhouse Gases	Waste					Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Sewage and refuse disposal, sanitation and similar activities	25, 47
Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel	Greenhouse Gases	Waste	Acid Rain, Eutrophication & Smog Precursors				Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Manufacture of motor vehicles, trailers and semi-trailers	25, 47, 30
Sewage and refuse disposal, sanitation and similar activities	Greenhouse Gases	Metal Emissions to Land	Water Use & Abstraction	Acid Rain, Eutrophication & Smog Precursors	Acids & Organic Pollutants	Metal Emissions to Air Waste Nutrients and Organic Pollutants	Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Manufacture of chemicals and chemical products	25, 44, 51, 30, 46, 35, 57, 36
Supporting and auxiliary transport activities; activities of travel agencies	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Publishing, printing and reproduction of recorded media	25, 30, 47
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	Greenhouse Gases	Waste	Acid Rain, Eutrophication & Smog Precursors	Nutrients & Organic Pollutants			Manufacture of textiles; Electricity, gas, steam and hot water supply; Manufacture of food products and beverages	25, 47, 30, 36
Telecommunications	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Electricity, gas, steam and hot water supply; Collection, purification and distribution of water; Publishing, printing and reproduction of recorded media	25, 30, 47
Water transport	Greenhouse Gases	Acid Rain, Eutrophication & Smog Precursors	Waste				Manufacture of coke, refined petroleum products and nuclear fuel; Land transport & transport via pipelines; Electricity, gas, steam and hot water supply	25, 30, 47

2.5 Emissions to air

KPI 1 Greenhouse Gases

Definition

There are six main Greenhouse gases (GHGs), as outlined in the box below. They are so termed because they contribute towards the *Greenhouse effect*.

The Greenhouse Gases

Carbon Dioxide - CO₂

Emitted mainly from the burning of fossil fuels and accounts for some 80% of UK Greenhouse gas emissions.

Methane - CH₄

Nitrous Oxide - N₂O

Hydro fluorocarbons – HFCs

Per fluorocarbons - PFCs

Sulphur Hexafluoride - SF₆

Emitted mainly from waste disposal, air conditioning and refrigeration, and specific industrial processes.

The Greenhouse effect is a natural phenomenon. The balance between energy radiating from the sun, sunlight, and energy emitted from the surface of the earth to space determines the temperature of the earth. Radiation from the sun passes through the atmosphere almost unchanged, warming the Earth's surface. Infrared radiation emanates from the Earth's surface. Some of this radiation is partly absorbed by gases in the atmosphere and is reflected back to the surface. This further warms the surface of the earth and the lower atmosphere. The gases that do this naturally are mainly water vapour and carbon dioxide. Without this natural greenhouse effect, the earth would be over 30°C cooler and would be too cold to be habitable.

There is considerable scientific evidence that the increase in man-made (anthropogenic) greenhouse gas emissions is having a noticeable effect on climate. The Intergovernmental Panel on Climate Change (IPCC) was set up in 1988 to assess the science of climate change²¹. Reports are prepared by thousands of scientists from around the world and agreed at intergovernmental meetings of the IPCC. The IPCC's Third Assessment Report, issued in 2001, makes the following observations: "The Earth's climate system has demonstrably changed on both global and regional scales since the pre-industrial era, with some of these changes attributable to human activities. Human activities have increased the atmospheric concentrations of greenhouse gases and aerosols since the pre-industrial era. The atmospheric concentrations of key anthropogenic greenhouse gases (i.e. carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), and tropospheric ozone (O₃)) reached their highest recorded levels in the 1990s,

²¹ <http://www.ipcc.ch>

primarily due to the combustion of fossil fuels, agriculture, and land-use changes.” The increase in the natural process of the greenhouse effect caused by human activities is known as the *enhanced greenhouse effect* and leads to *global warming*. Globally, the ten hottest years on record have all occurred since the beginning of the 1990s. Current climate models predict that global temperatures could increase from between 1.4 to 5.8°C over the next 100 years, depending on the amounts of greenhouse gases emitted and the sensitivity of the climate system²². The social, environmental and economic costs associated with this could be considerable.

The contributing role of man-made greenhouse gases to climate change has been accepted by many countries and corporations and a large number of global, national and local initiatives are developing that will limit the number of greenhouse gases emitted by corporations. At an international level, the United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol have established a framework within which many countries are taking action to reduce GHG emissions. The Kyoto Protocol is now legally binding and imposes a UK greenhouse gas emission reduction target of 12.5%²³ between 2008 and 2012. The Government has also committed to a domestic goal of a 20% reduction in CO₂ emissions by 2010. At a UK and EU level, this has led to initiatives which include the UK Climate Change Programme, the European Climate Change Programme, the Greenhouse Gas Emissions Trading Scheme Regulations, and the EU Emissions Trading Scheme.

EU ETS, UK ETS and CCAs

The EU Emissions Trading Scheme (EU ETS) is one of the policies being introduced across Europe to tackle emissions of carbon dioxide. It is one of the main components in the fight against climate change. Participants in the Scheme are allocated allowances, each allowance representing a tonne of the relevant emission, in this case carbon dioxide equivalent. Emissions trading gives companies the flexibility to meet emission reduction targets according to their own strategy; for example by reducing emissions on site or by buying allowances from other companies who have excess allowances. The EU ETS will become one of the main ways to cut carbon dioxide emissions, while maintaining economic growth. Phase 1 of the EU Emission Trading Scheme (2005 to 2007) involves around 1,100 installations in the UK and regulates approximately 45% of EU CO₂ emissions.

The UK Emissions Trading Scheme (UK ETS) is the world's first economy-wide greenhouse gas emissions trading scheme, which began in March 2002. Thirty-one organisations ('direct participants' in the scheme) have voluntarily taken on emission reduction targets to reduce their emissions against 1998-2000 levels, delivering 11.88 million tonnes of additional carbon dioxide equivalent emission reductions over the life of the scheme (2002-2006). In the first year (2002), the Direct Participants achieved emission reductions of 4.64 million tonnes CO₂e (carbon dioxide equivalent) against their baselines and in the second year (2003) they achieved emission reductions of nearly 5.2 million tonnes CO₂e against their

²² <http://www.defra.gov.uk/environment/climatechange/>

²³ Reduction of UK carbon dioxide emissions from 1990 levels as apportioned under the Burden Sharing Agreement.

baselines. A reduction of 5.9 million tonnes CO₂e was achieved by direct participants against their baselines in the 2004 compliance period.

The trading facility of the scheme is also open to the 6000 companies with Climate Change Agreements. These negotiated agreements between business and Government set energy-related targets. Companies meeting their targets will receive an 80% discount from the Climate Change Levy, a tax on the business use of energy. These companies can use the scheme either to buy allowances to meet their targets, or to sell any over-achievement of these targets. Anyone can open an account on the registry to buy and sell allowances.

Processes

The most significant activity that contributes to GHG production is the combustion of fossil fuels; mostly for the generation of energy for businesses and homes, but also and increasingly for transportation. In addition to fossil fuel combustion, other significant human induced sources of GHG include agriculture (enteric fermentation, manure management and others), industrial processes (particularly the production of cement, glass chemicals, steel, and food and drink), land-use change and forestry, waste management (landfill and incineration), and others. Significant GHG intensive activities are cement production (resulting in process CO₂) and Chlorofluorocarbons (CFC) production or use.

Sectors

Every business sector is responsible for GHG emissions. Companies could be affected by present or future regulation due to either direct impacts as a result of their own operations or indirect impacts arising from their supply chain.

Direct Impacts

The most significant contributor to GHG production is the combustion of fossil fuels, so any business that burns large amounts of fuel will have significant direct GHG emissions.

Indirect Impacts (Electricity supply)

Indirect impacts arise largely from electricity production. Over 70% of UK electricity is generated from fossil fuels²⁴. Businesses that consume a large amount of electricity will be indirectly responsible for significant GHG emissions.

For more information regarding which sectors should consider refer to Figure 3.

Calculation or measurement procedures

GHGs can be measured by recording emissions at source or by estimating the amount emitted by using activity data (such as the amount of fuel used) and conversion factors. For instance, factors can be used to calculate the amount of CO₂ emitted as a result of burning a particular quantity of oil in a heating boiler. Conversion factors are published by a number of agencies. It is recommended that UK companies use Defra's conversion protocols. These can be found on Defra's website, in the annex sections of Defra's Guidelines for Company

²⁴ http://www.dti.gov.uk/energy/inform/energy_stats/electricity/index.shtml

Reporting on Greenhouse Gas Emissions, at:
<http://www.defra.gov.uk/environment/envrp/gas/>

These factors are categorised as follows:

Category	Explanation
Fuel	For example, conversion of tonnes of oil used in heating boilers to tonnes of CO ₂ emitted.
Combined Heat and Power	Conversion of kWh to tonnes of CO ₂ emitted.
Electricity conversion factors	For example, conversion of kWh to tonnes of CO ₂ emitted.
Typical process emissions	Identification of emissions derived from certain processes. For example, cement production results in CO ₂ emissions.
Greenhouse gas conversion protocols	Conversion of individual GHGs to CO ₂ equivalents.
Transport: Road, Rail, Air, Road Freight and Other Freight	For example, conversion of miles travelled in medium sized petrol car to tonnes of CO ₂ emitted.

The National Atmospheric Emissions Inventory is also a useful source of information: <http://www.naei.org.uk/>

Many of the initiatives mentioned in the definition of this KPI, such as the EU and UK Emissions Trading Schemes, have specific monitoring and reporting requirements that must be used by the installations involved^{25,26}. For example, the monitoring requirements for installations in the EU ETS are specified in their Greenhouse Gas permit conditions. Failure to meet these permit conditions could lead to prosecution. However, there may be other sources or types of Greenhouse gases that are emitted from the site that are not part of the Scheme and are not included on the permit (for example CO₂ from transport emissions on a site). Non-CO₂ gases are included in the UK ETS but not included in the EU ETS at this stage. To calculate the total CO₂ and CO₂ equivalents from the site as a whole, installations can use these Guidelines. It should be therefore be recognised that businesses will report different emissions under the UK ETS and EU ETS because of their different scope and coverage. Where emissions are reported there should be a clear statement about what sources they cover and a clear explanation for any variation in total annual emissions figures (including due to the different nature of the UK ETS and EU ETS).

Reporting Guidance

Greenhouse gases should be reported in metric tonnes emitted per annum. If an estimation method has been used this should also be reported.

²⁵ See: <http://www.defra.gov.uk/environment/climatechange/trading/eu/permits/index.htm> for EU ETS monitoring and reporting Guidance

²⁶ See: <http://www.defra.gov.uk/environment/climatechange/trading/uk/index.htm> for UK ETS reporting.

Greenhouse gases should always be reported in this way. For normalising purposes, GHGs can also be reported as CO₂ equivalents. Companies wishing to normalise their emissions to the size of their business should report in metric tonnes compared to total turnover of the company per annum.

KPI 2 Acid Rain, Eutrophication, and Smog Precursors

Definition

Acid rain and eutrophication precursors are emissions to air which, with dispersion, can be transported in the atmosphere over distances of hundreds to thousands of miles, and eventually deposited through precipitation or by direct “dry” processes. The term *acid rain* refers to all types of precipitation (rain, snow, fog, dew) or dry deposition (fly ash, sulphates, nitrates) that are acidic in nature. *Eutrophication* is the process by which excess nutrient is added to an ecosystem. Significant inputs of nutrients to water can stimulate the growth of plant life, subsequently affecting other aquatic life by depleting oxygen levels.

The most significant acidification precursors are sulphur dioxide (SO₂), nitrous oxides (NO_x) and ammonia (NH₃). Nitrous oxides (NO_x) and ammonia are also the most common eutrophication precursors. Both acid rain and eutrophication precursors can have adverse effects on biodiversity. Emissions from industrial activities of these pollutants are heavily regulated, including the Integrated Pollution Prevention and Control Directive (IPPC) at the EU level, the Clear Skies Initiative in the US and the Pollution Prevention and Control Act in the UK.

Smog precursors can be a variety of pollutants, including nitrogen oxides, carbon monoxide and a huge range of Volatile Organic Compounds (note that VOC emissions are covered by the KPI 5, VOC emissions to air). When combined with sunlight, these precursors interact in a complex reaction to produce ground level ozone and peroxyacetic nitric anhydride (PAN) which, along with particulate matter, are the main components of photochemical smog. Photochemical smog is a health hazard and, as sunlight is a factor in smog formation, it is usually more severe in summer when light levels are higher. Ground level ozone is also damaging to plant life and can destroy synthetic material if long-term exposure occurs.

Processes

Smog precursors are primarily formed as a result of the combustion of coal or oil, or from processes with a high Volatile Organic Compound (VOC) use. Smog precursors are emitted when oil or coal is used as a fuel source for boilers and when petrol or diesel is used in vehicles. Nitrogen oxides are also used in the Ostwald process, an industrial process that produces nitric acid from ammonia. Nitric acid is commonly used in the production of ammonium nitrate fertilisers. The heavy use of nitrogen based fertilisers and the intensive farming of animals leads to heavy releases of ammonia from these activities – 80-85% of UK ammonia emissions come from agriculture, with the great majority resulting from the collection, storage and disposal of animal wastes.

Pollutant	Impact	Source
Nitrogen Oxides	Precursor to ozone formation, secondary particulate matter formation, acid deposition (including acid rain), and eutrophication. Also toxic.	Fuel combustion, the Ostwald process
Sulphur Dioxide	Precursor to acid deposition (including acid rain) and secondary particulate matter formation. Also toxic.	Fuel combustion (especially coal)
Ammonia	Precursor to eutrophication, acid rain and secondary particulate matter formation.	Animal wastes and fertilisers
Volatile Organic Compounds, Hydrocarbons and Carbon Monoxide	Carbon monoxide - toxic, binds to haemoglobin in blood, ozone (smog) precursors.	Fuel combustion, paints and finishes, solvent based cleaners and de-greasing agents.

Sectors

Sectors that rely heavily on the combustion of fuel will contribute towards acid rain, eutrophication and smog. For more information please refer to Figure 3.

Calculation or measurement procedures

Although ozone is one of the primary components of smog, it is produced through secondary processes that occur naturally rather than directly from industrial processes or fuel consumption. However, the precursors (see table) are primary emissions and can be measured, as can the other primary component of smog - particulate matter (note that particulate matter is covered by a separate KPI). These emissions arise from the consumption of fossil fuels and can be calculated using standard emissions factors, provided the quantity and type of fuel combusted is known, along with the type of boiler or engine.

Producers of nitric acid who utilise the Ostwald process should be able to calculate their emissions of nitrogen oxide based on the efficiency of their process (which can be calculated by comparing the mass of products compared to the mass of reactants). In a 100% efficient process, no nitrogen oxides would be emitted, however it is unlikely that the process would be 100% efficient.

Reporting Guidance

SO₂, NO_x, NH₃ and CO should be reported in metric tonnes emitted per annum. If an estimation method has been used this should also be reported.

KPI 3 Dust and Particles

Definition

Dust and particulate matter, alternatively referred to as particulates, aerosols or fine particles, are tiny particles ranging from 10 nanometres to 100 micrometres in diameter. Exposure to particulate matter (PM) is associated with a number of health outcomes including shortened life expectancy, cardiovascular and lung disease. Particles smaller than 10 micrometres (PM₁₀) are small enough to enter the airways and lungs.

From 2005 onwards, the EU has set strict limits on the level of airborne PM₁₀. PM₁₀ emissions are expected to fall as improved vehicle engine technologies are adopted and stationary fuel combustion emissions are controlled through abatement or the use of low sulphur fuels such as natural gas. Despite this, it is expected that concentrations of PM₁₀ will remain well above the acceptable threshold in most of the urban areas of the UK for the near future. This is partly due to increased use of diesel vehicles in car fleets and also due to high background levels of PM resulting from regional and transboundary emissions of secondary PM precursor gases such as NO_x and SO₂.

Processes

Combustion of fossil fuels is the primary source of ambient particulate matter. There are two types of emissions: primary emissions, where particles are emitted directly to the atmosphere and secondary emissions, where gases react to form particles in the atmosphere. Primary emissions from combustion are chiefly composed of unburned hydrocarbons, carbon, sulphur, salts and toxic metals. Secondary emissions arise when ammonia interacts with acidic species in the atmosphere.

Sectors

The main sectors contributing to particulate emissions are the energy industry (fossil fuel burning electricity generators) and road transport. The sectors directly contributing to particulate emissions are the power generation sector and any company that owns petrol/diesel powered vehicles. All sectors indirectly contribute to particulate emissions as a result of electricity consumption. For more information please refer to Figure 3.

Calculation or measurement procedures

Particulate emissions arise from the consumption of fossil fuels and can be calculated using estimation methods²⁷, provided the quantity and type of fuel combusted is known, along with the type of boiler or engine.

Reporting Guidance

Particulates should be reported in metric tonnes emitted per annum. If an estimation method has been used this should also be reported.

²⁷For further guidance please refer to the US Environmental Protection Agency's website. Oil fired boilers: <http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s03.pdf> table 1.3-4 in the Tables section. Gas fired boilers: <http://www.epa.gov/ttn/chief/ap42/ch01/final/c01s04.pdf>

KPI 4 Ozone Depleting Substances

Definition

Ozone Depleting Substances (ODS) catalyse the destruction of ozone in the upper atmosphere (the ozone layer).

The most important Ozone Depleting Substances are Chlorofluorocarbons (CFCs and Freons), Hydrochlorofluorocarbons (HCFCs), Halons, Methyl Chloroform, Carbon Tetrachloride (the main precursor of Freons) and Methyl Bromide. There are a wide range of Ozone Depleting Substances, but the majority of uses of them have been phased out following the 1987 Montreal Protocol. CFCs were used as refrigerants, propellants in aerosol cans, cleaning solvents for circuit boards and blowing agents for making expanded plastics. They have been replaced with HCFCs, which still contribute to ozone destruction but are less harmful, and other non-ozone depleting substances. HCFCs are also being phased out of use. Currently in the EU HCFCs can only be used to refill existing air conditioning and refrigeration systems; Halons can only be used for specific critical uses; and methyl bromide can only be used for agreed critical uses and for quarantine and pre-shipment purposes.

Processes

HCFCs emissions are caused largely by leakage from air conditioning and refrigeration systems. Halons are used in fire-extinguisher systems on aeroplanes and other highly specialised uses, where fires must be extinguished as quickly as possible, and are emitted when these systems are used.

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

Ozone Depleting Substances are often only emitted to the environment by accident. Companies should record the ODS currently in use (which can be estimated based on the type of refrigeration, air conditioning or fire extinguisher system containing the ODS) and the amount emitted if leakage occurs, or fire extinguishers are used. The manufacturer of the system should be able to provide data on the quantity of ODS used in the system and the likely amount emitted in the case of a fault.

Global Warming Potentials can be used to compare ODS²⁸ substances.

Reporting Guidance

ODS should be reported in metric tonnes by type emitted per annum. If an estimation method has been used this should also be reported.

²⁸ <http://www.epa.gov/docs/ozone/ods.html>

KPI 5 Volatile Organic Compounds

Definition

Volatile Organic Compounds (VOC) are a group of commonly used chemicals that evaporate when exposed to air. VOCs are able to act as a solvent, or carrier, for many substances and as such are widely used as cleaning and liquefying agents in fuels, degreasers, solvents, polishes, cosmetics, drugs, and dry cleaning solutions. Some common VOCs are trichloroethylene (TCE), tetrachloroethylene (which is a dry cleaning fluid), trichloroethane, benzene, toluene, and xylenes. VOCs are either emitted to air as gases from certain substances or as a by-product of fossil fuel combustion. There are thousands of different substances which emit VOCs, such as paints, lacquers, paint strippers, cleaning supplies, pesticides, building materials, office equipment and materials, adhesives, photographic solutions and many more.

Processes

Industrial processes that emit VOCs include manufacturing, mining, textiles and paper production. VOCs also arise from fuel consumption. However, given the broad range of VOCs and their multitude of uses, it is often impractical to give an exhaustive list of the processes that produce them

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

VOC emissions from fuel consumption can be calculated using the appropriate fuel conversion protocols which convert fuel used to VOC emitted, provided the amount and type of fuel and the type of boiler or engine is known. VOC emissions from specific industrial processes can be estimated based on the specific type of chemical known, its volatility / vapour pressure and the amount used. Solvent mass inventories can also be used to measure VOC emissions (amount of solvent used subtracted from the amount of solvent recovered).

Reporting Guidance

VOCs should be reported in metric tonnes emitted per annum. If an estimation method has been used this should also be reported.

The combustion of fuel gives rise to many different types of VOC, so it is impractical to record them individually, in which case the masses of individual VOCs should be totalled together. This approach should also be taken where the amount of any individual VOC emitted is negligible (i.e. in kilograms per annum). In cases where a large quantity of an easily identifiable VOC is emitted (e.g. formaldehyde) the specific name and amount of that VOC should be reported.

KPI 6 Metal emissions to air

Definition

Metals that can have significant environmental impacts include lead, mercury, cadmium, arsenic and nickel. Certain heavy metals that are in common usage are often emitted to air as particulates or dust. Metals emitted to air are eventually deposited on land or water and accumulate in soil, water, sediments and sludge, depending on the atmospheric conditions and type of metal. From here they can then accumulate in flora and fauna and, as they are often toxic, this can have highly deleterious effect on the environment. The relative mobility of metals differs, and consequently their environmental effects can also be varied. For example, once lead has fixed into soil it takes a very long time to migrate out, and as such lead can have long-term effects on soil quality. Mercury (and to a lesser extent Cadmium) quickly leaches out of soil and into watercourses; once there it is rapidly taken up by fish and subsequently accumulates in the food chain.

Processes

Heavy metals can be emitted from the burning of coal or oil and are also emitted from a variety of industrial processes. Metal ore mining causes metal based dust formation, as does manufacturing processes that involve working with large amounts of metal (in particular foundries, auto-manufacturers and heavy manufacturing). Smaller amounts of metal will be emitted from light manufacturing (for example, electronics) and power generation will have high emission rates if the combustion of coal or oil is involved.

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

The amounts of metal emitted as a result of fuel combustion can be estimated using standard fuel emission factors, based on both the type of fuel used and the type of boiler / engine it is combusted in. The quantity of fuel used can often be estimated from fuel bills.

In the case of industrial processes, emissions are likely to be highly localised and can be estimated by sampling and analysing the local air quality. The best way of doing this varies between industrial practices but generally involves the analysis of dust samples to determine metal content and particle size and an estimation of how much dust is produced.

Reporting Guidance

Metal emissions to air should be reported in metric tonnes emitted per annum. If an estimation method has been used this should also be reported.

As metals vary in toxicity, reporting should involve a discussion of the type of metal, the mass emitted (kilograms or tonnes), particle size (which has a large effect on potential toxicity) and the means by which it is emitted - i.e. from a point or dispersed source.

2.6 Emissions to water

KPI 7 Organic Pollutants

Definition

Organic matter is commonly found in groundwater and inland waters, and can cause significant pollution and disruption to aquatic habitats. Significant discharges of organic waste into bodies of water can cause river/lake *eutrophication* (where the growth of plant life is stimulated by excess nutrients, subsequently affecting other aquatic life by depleting oxygen levels).

Organic effluent includes contaminants such as Polychlorinated Biphenyls (PCBs), Polycyclic Aromatic Hydrocarbons (PAHs), Hexachlorocyclohexanes (HCH), Benzene, Toluene, Xylenes, Ethylbenzene and Phenols, as well as general brewing waste and sewage.

Processes

Sources of eutrophication drivers commonly include human sewage, crops and animal production, food processing, pulp and paper manufacturing, detergents manufacturing and obviously chemical, pesticide and fertiliser manufacturing. The table below describes some sources of organic waste, although it is not intended to be an exhaustive list. All the contaminants listed lead to the death of animals and fish as well as changes in appearance, reproductive patterns or behaviour. These pollutants can be found in influent and effluent of wastewater treatment, drinking water, and boiler feed water, cooling water and storm water.

Type ²⁹	Processes – Sectors
Benzene	Industrial and chemical processes Gas storage Landfill
Dichloroethane	Industrial and chemical processes
Ethylbenzene	Petroleum refineries
Hexachlorobenzene (HCB)	Metal refineries Chemical factories Wood products
Polycyclic Aromatic Hydrocarbons (PAHs) e.g. anthracene	Asphalts Combustion from fuels and oils Automobiles and airplanes factories
Pentachlorophenol	Wood products
Phenols	Industrial and chemical processes Cleansing products

²⁹ Main source: United States Environmental Protection Authority

Type ²⁹	Processes – Sectors
Polychlorinated Biphenyls (PCBs)	Landfills Industrial and chemical processes
Toluene	Petroleum refineries
Xylene	Petroleum refineries Chemicals processes

Sectors

Many sectors are responsible for emitting organic pollutants to water. The processes that commonly result in these emissions are described above. For more information please refer to Figure 3.

Calculation or measurement procedures

Discharged organic substances are commonly measured in one of two ways: by determining the concentration of the emitted substances where it is known that specific substances have been emitted (where few of them are emitted or when they are easy to identify in processes) or by assessing the overall quality of the effluent when specific assessments are difficult to make due to the diverse nature of the components of the discharge. For specific measures, standard laboratory tests can be performed to determine the concentration of the contaminant in the water. Water quality measures are more varied. Combined parameters to assess potential eutrophication in water include:

- *Biochemical Oxygen Demand (BOD)*, which refers to the amount of oxygen that would be used if all the organic components in water were consumed by bacteria.
- *Total Suspended Solids (TSS or SS)* are solids in water, which constitute an indication of high concentrations of bacteria, nutrients or pesticides and can harm the aquatic life / cause problems for the industrial use of water.

General organic matter concentration can be defined by the following measures:

- *Total Organic Carbon (TOC)*, which measures the organic content of a sample that can be oxidised to Carbon Dioxide.
- *Chemical Oxygen Demand (COD)*, which reflects the efficiency of a treatment process to remove organic matter.

Materials and data collection processes are particular to each one of the methods stated and require more or less costly investments in resources and equipment depending on the technique used.

Reporting Guidance

Total discharge of effluents should be recorded in absolute cubic meters per annum, and the content of effluent described. In addition, specific or general water quality measures should be undertaken to assess the impact of these emissions to water.

KPI 8 Acid emissions to water

Definition

Acids commonly found in water include Nitric Acid (HNO₃), Hydrochloric Acid (HCl) and Sulphuric Acid (H₂SO₄). Acidification adversely changes the balance of the aquatic ecosystem and affects biodiversity predominantly as a result of induced calcium deficiency, which weakens bones and eggs. Increased amounts of acids in water also enhance the mobility of metals such as aluminium, which is toxic to fish.

Processes

Sources of acid emissions to water include iron and steel manufacturing as well as mining.

Acid	Processes — Sectors
Nitric Acid	Fertilisers and chemicals manufacturing Refrigerant
Hydrochloric Acid	Industrial inorganic chemicals manufacturers Electricity production Missiles and aerospace manufacturing Combustion of fuels Smelting of metal Pyrolysis of polyvinyl chloride, chlorinated acrylics, and retardant treated materials By-product in dehalogenation processes.
Sulphuric Acid	Fertilisers and chemicals manufacturing Petroleum refineries Iron and steel production

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

Acid discharges can be measured by sampling and testing techniques to determine the acidity or acid concentration in the water.

Reporting Guidance

Total discharge of acidic effluents should be recorded in absolute cubic meters or kg of acid emitted per annum. If an estimation method has been used this should also be reported.

KPI 9 Metal emissions to water

Definition

Metals and metal compounds can be found in effluent, drinking water, cooling water and run-off water. Metal emissions to water include: Arsenic (As), Cadmium (Cd), Chromium (Cr), Copper (Cu), Mercury (Hg), Nickel (Ni), Lead (Pb) and Zinc (Zn). Other metals that are regularly detected in waters comprise Antimony (Sb), Barium (Ba), Beryllium (Be), Boron (B), Cobalt (Co), Manganese (Mn), Selenium (Se), Silver (Ag) and Vanadium (V).

Metal can affect the aquatic environment in a number of different ways, and for some metals their concentration can increase in the food chain at each trophic level, a process called *biological magnification*. In addition, drinking water can be contaminated.

Processes

Many sectors can cause metal emissions, by a variety of different processes.

Pollutants ³⁰	Processes & Sectors
Antimony	Petroleum refineries Fire retardants Electronic production Ceramic production Steel production (solder)
Arsenic	Glass production Electronic production Fruit production
Barium	Metal refineries Mining
Beryllium	Metal refineries Electronic and electrical production Aerospace and defence industries
Boron	Pyrotechnic flares Insulation fibreglass Sodium bleach and disinfectants Manufacture of borosilicate glasses Boron filaments in aerospace structures

³⁰ Main source: United States Environmental Protection Authority

Pollutants³⁰	Processes & Sectors
Cadmium	Corrosion of pipes Stabilisers for PVC Alloys and electronic compounds Metal refineries Refined petroleum products Batteries Paint Coatings (marine - aerospace applications)
Chromium	Steel production (metal alloys) Pigments for paper, paints, cement and rubber
Cobalt	Cobalt-bearing portables Rechargeable batteries
Copper	Corrosion of pipes Additives to control algal growth
Lead	Corrosion of pipes Batteries Petrol additives (forbidden in the EU) Pigments Cable sheathing Ammunition
Manganese	Used in quantitative analysis and medicine Paints Glass colorant Alloys
Mercury	Refineries Crop production Landfill Batteries Lamps Thermometers Fillings (dentistry)
Nickel	Stainless steel and related alloys Coins Electronic devices' batteries

Pollutants³⁰	Processes & Sectors
Selenium	Petroleum refineries Mining
Silver	Photographic material and processes Mirrors Electric conductors Batteries Table cutlery Dental and medical
Vanadium	Aerospace titanium alloys Chemical catalyst for glass and ceramics Dyes Target material for X-rays

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

Metal emissions to water arise from various processes as described in the table above. These emissions can be calculated using emission estimation techniques and manuals. Sampling and source monitoring procedures for analyses vary from country to country and requirements for direct measurement methods depend on the reporting requirements and methods established by pollution inventories. In the EU various tools have been developed to quantify emissions of metal to water.

Reporting Guidance

Substances should be reported as absolute kilograms emitted per annum. Where discharges are made to surrounding controlled waters discharge consents are required which may provide useful data. If an estimation method has been used this should also be reported.

2.7 Emissions to land

KPI 10 Pesticides and Fertilisers

Definition

Fertilisers and pesticides are distributed predominantly on farmland, and can have a significant impact on the natural environment.

Fertilisers

The primary nutrients in fertilisers are nitrogen, phosphorus and potassium. Secondary nutrients include sulphur, magnesium and calcium. The use of fertilisers can have an adverse effect on the environment. They can lead to poor drainage of soil and excessive use of fertilisers leads to micronutrient deficiency in soil. The organic matter of British soils has decreased by approximately 50% in the past 20 years. Surplus fertiliser discharged into bodies of water can cause river/lake *eutrophication* (where the growth of plant life is stimulated by excess nutrients, subsequently affecting other aquatic life by depleting oxygen levels).

Pesticides

A pesticide is any agent used to kill or limit damaging effects by any of the following: insects, rodents, birds, unwanted plants (weeds), fungi, or microorganisms such as bacteria and viruses. The term pesticide is a general one which encompasses individual product types i.e. herbicides (including plant growth regulators), fungicides, microbiocides, rodenticides and various other substances used to control pests. Agriculture has become both more productive and intensive. High-yielding crop varieties are often more prone to diseases and pest attack and the manner in which they are grown (e.g. large areas of monocultures) can exacerbate this. In addition greater productivity also requires weed control to prevent yield losses. This has led to the extensive use of pesticides. All approved pesticides are tested using a stringent risk assessment process which includes independent scientific scrutiny to determine safe thresholds of application. The effect of pesticides on the environment can be through long-term persistence in the soil or by affecting aquatic systems if the pesticide is highly mobile. For some pesticides their concentration in the food chain is magnified at each trophic level: a process called *biological magnification*.

Processes

Pesticide and fertiliser emissions to land are produced by deposition of these substances on farmland.

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

The amount of pesticides and fertilisers applied to land in a given accounting year should be measured.

Reporting Guidance

Pesticide and fertiliser emissions to land should be measured in terms of the total weight applied (kilograms). Companies could also report the total area treated (hectares). If an estimation method has been used this should also be reported.

KPI 11 Metal emissions to land

Definition

Emissions of metals to land by business processes can have a serious impact on the local environment. All metals can have adverse effects on natural habitats depending on the amount emitted. In particular, heavy metals such as Mercury, Cadmium, Arsenic, Chromium, Copper, Zinc and Lead, can be extremely toxic. Elevated concentrations of heavy metals in soil impede, for example, the ability of microorganisms to break down plant matter, hindering the release of nutrients. Heavy metals are fairly mobile in soil especially at low pH levels. Continuing soil acidification therefore increases the likelihood of metal emissions to water (see KPI 9).

Processes

Metals are emitted directly to land by a number of industrial processes or by heavy metal leaching from mineral wastes at mining facilities. Metals can also be found in sewage sludge used as fertiliser.

Metal ³¹	Sources of Emissions to Land
Mercury	Disposal of batteries, thermometers and other mercury containing products. Precious metal mining operations may emit to land.
Arsenic	The use of pesticides, fungicides, weed killers and wood treatment products all release arsenic to land.
Cadmium	Cadmium is emitted to land from waste - Cadmium is found in many domestic products, such as tobacco products, phosphate fertilisers, tyres, electronic components, heating elements in electric kettles and hot water systems, batteries and ceramic glazes. Zinc minerals contain cadmium as a common impurity which will be released when zinc is refined.
Chromium	Emissions to land may result from mining and primary extraction processes.
Copper	Emissions to land may result from mining and primary extraction processes (mineral processing, smelting, electrolytic processing, leaching and solvent extraction), and from manufacturing of products using and/or containing copper (electrical goods, pipes, alloys, etc.) Diffuse sources are agricultural and gardening applications such as fungicides, catalysts for organic reactions, pigments for ceramics, and insecticides.
Zinc	Emissions to land can occur at all stages of production and processing of zinc, particularly from mining and refining of zinc ores and from galvanising plants. Sewage treatment plants and waste sites for industrial and household wastes can be sources of zinc. Corrosion of galvanised structures can release zinc to land. Uncontrolled release from application of fertilisers or herbicides may be possible.

³¹ Adapted from National Pollutant Inventory of Australia

Metal ³¹	Sources of Emissions to Land
Lead	Contaminated soil near lead refineries and waste sites. Releases to land occur from use of lead-containing rodenticides and insecticides. Lead pellets from spent ammunition can also result in emissions of lead to land.

Sectors

Any sectors involved in activities listed in the exhibit above should report on this KPI. For more information please refer to Figure 3.

Calculation or measurement procedures

Metal emissions to land can be determined with emissions estimation methods, ranging from sampling or direct measurement and mass balance calculations to conversions using emissions factors. Procedures for analyses vary from country to country and requirements for direct measurement methods depend on the reporting requirements and methods established by pollution inventories. In the EU various tools have been developed to quantify emissions of metal to land.

Reporting Guidance

Metal emissions to land should be reported as absolute quantities in metric tonnes or kilograms emitted to land. The list of metal emissions that are reported on should include, but not be restricted to, the substances in the exhibit above. Additional metal emissions should be reported if their disclosure to a pollutant inventory, such as the European Pollutant Emission Register³², requires it. If an estimation method has been used this should also be reported.

³² <http://www.eper.cec.eu.int/>

KPI 12 Acids and Organic Pollutant emissions to land

Definition

There is a wide range of organic chemicals that can be emitted to land – for example, long chain hydrocarbons (from oil, petrol or diesel) and organic chemicals from industrial processes (e.g. solvents such as formaldehyde and alcohols). Organic and inorganic acids are also used in many industrial processes and can be emitted to land. These emissions are usually caused by accidental spillage. The effects are varied: some chemicals bind to soil and act as long term contaminants, whilst others will leach into local water sources and contaminate water supplies. Acids can concentrate in soil (and bodies of water) and can have highly detrimental effects on the local flora and fauna, as they are often highly sensitive to changes in pH.

Processes

Any process using either oil based fuels or lubricants can give rise to these emissions, as can accidental spillages. Similarly any process using large amounts of industrial acids or organic chemicals may also give rise to this impact.

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

Spillages can often be estimated by comparing the volume / mass of a substance before and after a production process. If the spillage occurs at the end of a pipe or hose then the emission can be estimated by monitoring the flow rate and duration of spill.

Reporting Guidance

This KPI should be reported by type of emission and total mass of product spilled. The total amount emitted in tonnes per annum of each type of chemical should be reported. Individual spills should be reported if they are significant. If an estimation method has been used this should also be reported.

KPI 13 Waste (Landfill, Incinerated and Recycled)

Definition

Waste is broadly split into three categories: hazardous, non-hazardous and inert. Hazardous waste is covered in greater detail by other KPIs. Inert waste includes construction waste, such as rubble, and is normally co-disposed into landfill with municipal non-hazardous waste. Non-hazardous waste includes municipal (e.g. household) waste and office waste such as paper, cardboard, plastic & metal packaging and organic materials.

There are three main disposal routes for non-hazardous waste:

Landfill

Waste is placed in a large pit, which is eventually covered. Large amounts of organic-based matter (including paper) will slowly decompose in landfill sites and release methane, which is a potent Greenhouse gas. Methane released at landfill sites should be captured and flared off, or fed into biogas engines to generate power. There is also the potential for pollutants to leach out of landfill sites and into local water supplies (although landfill sites should be designed to prevent this from happening). Finally, landfill sites emit odours and are visually unappealing and so are unpleasant to live near.

Incineration

Waste is combusted at very high temperatures. Incineration will predominantly release large amounts of Carbon Dioxide and other emissions such as Nitrogen Oxides (NO_x), Sulphur Dioxide (SO₂) and ash. Ash often contains concentrated amounts of heavy metals and can be difficult to dispose of. Incinerated waste is regulated by the Waste Incineration Directive.

Recycling

Waste is sent to a recycling facility and reused. In energy terms, this is of varying efficiency – recycling aluminium is 95% more energy efficient than producing virgin aluminium, recycling glass is 50% more energy efficient than producing virgin glass and recycling paper is 60% more energy efficient than producing virgin paper. Recycling also uses far less raw materials and usually has less impact on the environment than using virgin materials. For waste to be recycled it must be sorted and the necessary infrastructure of recycling facilities must exist.

Regulations within the EU are based on a hierarchical approach that aims to prevent waste generation, encourage reuse and recycling, regulate treatment processes such as incineration and discourage any final disposal to landfill.

Processes

Non-hazardous waste arises from day to day activities in all businesses. Any office will generate waste paper, packaging, glass (light bulbs and bottles) and other waste. Increased amounts of organic waste will be generated by businesses that produce foodstuffs (or even just have a canteen). Many businesses have recycling bins in their offices, which mean that some sorting can be carried out prior to the waste leaving company premises.

Sectors

For more information please refer to Figure 3.

Calculation or measurement procedures

Waste can be measured by estimating the number and weight of rubbish bags that leave the business over a set period of time. If the waste is sorted prior to disposal, then more detailed measurement of specific waste (e.g. tonnes of glass) can be made or waste can be treated as a general category. Whether it is incinerated, sent to landfill or recycled will depend on whether the company disposes of waste itself or uses a waste management company. In either case the information as to how the waste was disposed of should be easily obtained.

Reporting Guidance

Waste should be reported in metric tonnes per annum (in the UK many companies will already be recording this data as the UK landfill tax is charged per tonne). Where possible, waste should be broken down into separate categories (e.g. paper, glass, aluminium) and the final route of disposal reported (e.g. 50% to landfill, 30% incinerated, 20% recycled). If an estimation method has been used this should also be reported.

KPI 14 Radioactive Waste

Definition

Radioactive waste is a by-product of the manufacture of nuclear fuel and also results from the production of electricity and from the use of radioactive materials. Radioactive waste can be classified into three main categories:

- High Level Waste (HLW) is heat-generating waste produced by the reprocessing of spent nuclear fuel.
- Intermediate Level Waste (ILW) arises from the dismantling and reprocessing of spent fuel and from the general operation of nuclear plants.
- Low Level Waste (LLW) contains radioactive materials, other than those acceptable for disposal with ordinary refuse, but which do not exceed certain defined activity levels.

Radioactive waste in the UK is highly regulated. Companies must have authorisation from the environmental regulators under the Radioactive Substances Act 1993 (RSA93) to accumulate or dispose of radioactive waste and strict limits are imposed. There are also various EU Directives and international conventions covering the safety of nuclear facilities and disposal of radioactive waste. In 2006 the Committee on Radioactive Waste Management (CoRWM)³³, a Government appointed body, will make recommendations to Ministers on the long term management of radioactive waste.

Processes

Radioactive waste is produced by a number of industrial and medical processes. The majority of such waste, however, arises from the production of nuclear fuel, the use of nuclear fuel to generate electricity and the reprocessing of spent fuel from both UK and foreign electricity generators.

Sectors

The two sectors from which the majority of radioactive waste arises are the “Electricity, gas, steam, and hot water supply” sector, and the “Manufacture of coke, refined petroleum and nuclear fuel” sector. Many other industries, such as the medical sector and research establishments, also produce radioactive waste but in much lower quantities. For more information please refer to Figure 3.

Calculation or measurement procedures

Companies measuring radioactive waste should follow guidelines from the environmental regulators. More information can be found at <http://www.defra.gov.uk/environment/radioactivity/waste/index.htm>

Companies that produce electricity from nuclear power should measure spent fuel. The weight of spent rods should be recorded by the company’s management system and then totalled for the year in order to report in metric tonnes per annum.

Reporting Guidance

³³ <http://www.corwm.org.uk/>

Solid radioactive waste should be reported at the company level on an annual basis in cubic metres of HLW, ILW and LLW.

Nuclear power generators should measure and report on spent fuel used in power stations, in metric tonnes per annum. In addition, electricity producers should report the number of total watts produced each year using nuclear energy. If an estimation method has been used this should also be reported.

2.8 Resource Use

KPI 15 Water Use and Abstraction

Definition

Water is an essential resource that is required for survival of plants and animals and is used in the production and provision of numerous goods and services, such as electricity. In the UK approximately a third of drinking water is abstracted from the ground.

Abstraction of water can have significant local, or more widespread, impacts on the environment. The threat of climate change, resulting in severe droughts, floods, storms, also constitutes a challenge for water resources management. Countries around the world are aware of the need to reduce their level of water abstraction and leakage to ensure availability of the resource in the long-term. To achieve this goal various market and financial instruments have been put in place, such as abstraction charges, effluent consents or pricing mechanisms.

Processes

Water can be abstracted and supplied as drinking or wastewater to businesses and consumers. It can also be abstracted and used for industrial cooling processes.

Sectors

Water is used by all businesses, either directly (abstraction) or indirectly (consumption). Water-intensive industries include water and sewerage companies, industrial and chemical processes, and power plants. Many sectors rely heavily on supplied water. For more information please refer to Figure 3.

Calculation or measurement procedures

Water use (consumption)

Metering water consumption is the best way to determine consumption. Measurements can be obtained by automatic meter readings or by periodically reviewing bills provided by water suppliers.

Water abstraction (withdrawal)

For abstracted water, the majority of charges are levied according to the licensed volume, but actual volumes are reported to the Environment Agency. It is the actual volume that should be measured.

The most appropriate way of reporting abstracted or consumed water should be in absolute cubic metres.

Reporting Guidance

The table below illustrates the scope of measures that should be reported. In most cases reporting will be much simpler, as most companies either abstract or consume water rather than perform both functions.

Water abstraction constitutes a direct impact for the company abstracting that water. Consuming supplied water or reusing water previously used is classified as

an indirect impact, as the company that supplies the water is directly responsible for the environmental impact of abstracting or collecting the water. Further guidance on the distinction between direct and indirect impacts can be found in Figure 3.

If an estimation method has been used this should also be reported.

	Abstracted water		Collected water	Re-injected water	Distributed water	Reused water
	Surface water (ocean, lake, river, reservoir)	Groundwater	Rainwater	Cooling water	Water supply	Waste-water
Withdrawn (m3/year)				(Input only)	N/A	N/A
Consumed (m3/year)	N/A	N/A	N/A	(Input subtracted from Output)		

KPI 16 Natural Gas

Definition

Natural gas is a fossil fuel resource that is necessary for many economic activities, including electricity production. Natural gas is a combustible mixture of hydrocarbon gases. While natural gas is primarily comprised of methane, it can also include ethane, propane, butane and pentane. Found in reservoirs underneath the earth, natural gas is commonly associated with oil deposits. After refining, the clean natural gas is transported through a network of pipelines or compressed into Liquid Natural Gas (LNG).

Natural gas is a finite resource and as such its continued extraction and use will eventually lead to depletion. In addition, every mining aspect of gas extraction has associated environmental impacts: the natural habitat is usually disrupted, and other extraction processes and by-products can have serious environmental consequences. Storage of natural gas is an environmental issue as leakages and explosions may occur.

Substitution of natural gas with renewable energy sources (such as wind energy or solar power) where technically and economically feasible can also reduce the demand for the planet's resources.

Emissions caused by the combustion of natural gas, such as Greenhouse gases, are covered by other KPIs.

Processes

Resource depletion of natural gas arises as a result of extraction of natural gas.

Sectors

Every mining operation that extracts natural gas (the primary ISIC sector type is "Extraction of crude petroleum and natural gas"). For more information please refer to Figure 3.

Calculation or measurement procedures

Extraction of natural gas is commonly measured at source.

Reporting Guidance

Reporting of natural gas quantities should be in cubic metres or barrels of oil equivalent extracted per annum.

KPI 17 Oil

Definition

Oil is a fossil fuel resource that is a necessary energy provider for many economic activities, including a significant proportion of the UK's energy needs.

Crude oil mainly consists of hydrocarbons. A comparatively volatile liquid, bitumen is composed principally of hydrocarbon with traces of sulphur, nitrogen or oxygen compounds and can be removed from the earth in a liquid state.

Oil is a finite resource and as such its continued extraction and use will eventually lead to depletion. In addition, every aspect of oil extraction has associated environmental impacts: the natural habitat is usually disrupted, and extraction processes and by-products can have serious environmental consequences.

Spills that occur during transport are covered by Acids and Organic Pollutant emissions to land (KPI 12) and Water KPIs (KPI 15). Emissions caused by the combustion of oil, such as Greenhouse gases (KPI 1) and Dust and Particles (KPI 3), are also covered by other KPIs.

Substitution of oil with renewable energy sources (such as wind energy or solar power) where technically and economically feasible can also reduce the demand for the planet's resources.

Processes

Resource depletion of oil arises as a result of extraction of oil.

Sectors

Every mining operation that extracts oil (the primary ISIC sector type is "Extraction of crude petroleum and natural gas"). For more information please refer to Figure 3.

Calculation or measurement procedures

Extraction of crude oil is commonly measured at source.

Reporting Guidance

Crude oil should be reported in cubic metres or barrels of oil equivalent extracted per annum.

KPI 18 Metals

Definition

Metals are non-renewable resources and are necessary raw materials for many economic activities. The most commonly used metallic resources are Iron, Aluminium (Bauxite), Copper, Lead, Nickel, Zinc, Gold and Silver.

Metal resources are non-renewable resources and as such their continued extraction and use will eventually lead to their depletion. Higher-grade metal deposits are being increasingly depleted, requiring the mining companies to move towards less economical deposits, such as lower grade deposits or deposits that are harder to exploit. In addition, every aspect of mining has environmental impacts: the natural habitat is usually disrupted, and mining processes and by-products can have serious environmental consequences.

Recycling can extend the availability of metals, however, and this is covered by a separate KPI (see KPI 13). Substitution of metals with renewable resources, where technically and economically feasible, or improving the efficiency of use may also alleviate the demand for the planet's metal resources.

Processes

Metals are extracted through mining (surface or underground). This indicator only includes metal commodities that are extracted rather than those that are recovered through recycling.

Sectors

Every mining operation that mines metals (the primary ISIC sector type is "Mining of metal ores"). For more information please refer to Figure 3.

Calculation or measurement procedures

Extraction of metals is commonly measured at source.

Reporting Guidance

Metals extracted should be reported in metric tonnes extracted per annum, broken down by type of metal.

KPI 19 Coal

Definition

Coal is a fossil fuel resource that is a necessary energy provider for many economic activities, including a significant proportion of the UK's energy needs.

Coal resources are non-renewable resources and as such their continued extraction and use will eventually lead to their depletion. Better quality coal deposits are being increasingly depleted, requiring mining companies to move towards less economical deposits, such as lower quality deposits or deposits that are harder to exploit. In addition, every aspect of mining has environmental impacts: the natural habitat is usually disrupted, and mining processes and by-products can have serious environmental consequences.

Substitution of coal with renewable energy sources (such as wind energy or solar power) where technically and economically feasible can reduce the demand for the planet's coal resources.

Emissions caused by the combustion of coal, such as Greenhouse gases and Dust and Particles, are covered by other KPIs.

Processes

Coal is extracted by quarrying and mining operations (surface or underground).

Sectors

Every mining operation that mines coal (the primary ISIC sector type is "Mining of coal and lignite; extraction of peat"). For more information please refer to Figure 3.

Calculation or measurement procedures

Extraction of coal is commonly measured at source.

Reporting Guidance

Coal should be reported in metric tonnes extracted per annum, broken down by type of coal (such as lignite or hard coal) and extraction (deep or open cast).

KPI 20 Minerals

Definition

Minerals are naturally occurring inorganic substances which have a characteristic and homogeneous chemical composition, definite physical properties and, usually, a definite crystalline form. Minerals include Asbestos, Barite, Boron, Diamonds, Diatomite, Feldspar, Fluorspar, Graphite, Gypsum, Guano, Magnesite, Perlite, Phosphate, Potash, Salt Sulphur, Talc, Vermiculite and Zirconium. Metal extraction is covered by the Metal KPI. Aggregates are covered by the Aggregates KPI.

Mineral resources are considered non-renewable resources and as such their continued extraction and use will eventually lead to their depletion. In addition, every mining activity has environmental impacts: the natural habitat is usually disrupted, and other mining processes and by-products can have serious environmental consequences. Some minerals are often not destroyed in use and therefore can be recycled. However, other minerals are non-recyclable and thus their finite nature becomes even more important. Recycling of minerals is covered by a separate KPI (see KPI 13).

There are many different uses of minerals. For example gypsum is one of the most widely used minerals in the world and has a multitude of uses. The most recognised use of gypsum is for the wallboard found in most homes and buildings. A typical new home contains more than seven metric tonnes of gypsum alone.

Processes

Minerals are extracted by quarrying and mining operations. This indicator includes only minerals that are extracted rather than those that are recovered through recycling.

Sectors

Every mining operation that extracts minerals (the primary ISIC sector type is "Other mining and quarrying"). For more information please refer to Figure 3.

Calculation or measurement procedures

Extraction of mineral material is commonly measured at source. Companies should measure the quantity of mineral (not ore) that is extracted.

Reporting Guidance

Minerals extracted should be reported in metric tonnes extracted per annum, broken down by type of mineral.

KPI 21 Aggregates

Definition

Natural aggregates, which consist of crushed stone, sand and gravel, are natural resources used as a basic raw material by many industries including construction, agriculture and industries employing complex chemical and metallurgical processes. Despite the low value of the basic products, aggregates mining is one of the most important mining industries in the world in terms of production volume (15,000 Mtpa), second only to fossil fuels in terms of production value (US\$62,000 Mtpa)³⁴.

Natural aggregates are finite resources and as such their continued extraction and use will eventually lead to their depletion. In addition, every mining activity has environmental impacts: the natural habitat is usually disrupted, and other mining processes and by-products can have serious environmental consequences.

Alternative materials are available, such as secondary and recycled aggregates, including inert construction and demolition waste, which reduces the impact on natural resources. Recycling of minerals is covered by a separate KPI (see KPI 13).

Processes

Aggregates are extracted by quarrying and mining operations. This indicator only includes aggregates that are extracted rather than those that are recovered through recycling.

Sectors

Every mining operation that extracts aggregates (the primary ISIC sector type is "Other mining and quarrying"). For more information please refer to Figure 3.

Calculation or measurement procedures

Extraction of aggregate material is commonly measured at source.

Reporting Guidance

Aggregates should be reported in metric tonnes extracted per annum, broken down by type of aggregate.

³⁴ http://www.eurogeosurveys.org/foregs/groups/group_2_raport_2001_a1.htm

KPI 22 Forestry

Definition

This KPI focuses on timber and the harvesting of various wood products. Although forestry and wood are often considered renewable resources over-exploitation of these resources, especially from plantations which are not sustainably managed, threatens the environment as a whole and in particular biodiversity. Although many governments have taken measures to encourage sustainable forest management, including supporting certification schemes and reducing the exploitation of forests, illegal logging continues to be a problem in many timber producing countries particularly in the developing world. The ecological functions of forests are highly valuable (genetic, species and ecosystem diversity) and should be maintained. Harvesting and appropriate use of timber from sustainably managed forests may be a positive indicator of environmental performance.

Processes

Resource depletion of forestry arises as a result of the unsustainable harvesting of forests.

Sectors

Every operation that harvests wood (the primary ISIC sector type is “Forestry, logging and related activities”). For more information please refer to Figure 3.

Calculation or measurement procedures

Forest management operations should monitor the environmental impacts of their operations on a regular basis and should measure the volume of wood harvested, including waste and residues. The frequency and intensity of monitoring will depend on the scale and intensity of the operation.

Reporting Guidance

Harvested timbers and other wood products, as well as residues of harvesting, should be reported in absolute cubic metres per annum by type of wood (prior to any drying process). The geographical area that the wood was sourced from, and any evidence of whether the wood was sourced from sustainably managed forests, should also be reported.

KPI 23 Agriculture

Definition

Agricultural produce³⁵ includes a wide variety of products including foodstuffs such as meat and fish, tobacco, rubber and other crops that form the raw materials of many products. Harvesting of wood is not addressed here as it is covered by the Forestry KPI.

Agriculture is often considered a sustainable activity; however over-exploitation of environmental resources can have a negative environmental impact and can lead to depletion of resources in the long term. For example, open access fishing zones, where property rights are not specifically assigned to any organisation, often result in a race to harvest the resource, which can significantly reduce the fishing stock. As a result, many fish stocks in EU waters are severely depleted and appear to be outside safe biological limits³⁶. When a property right is exercised on animal or fish farms, however, the owner's preference is usually to extract the resource with restraint. Companies that harvest crops, botanical and zoological resources are encouraged to report on their use of the natural resources and often do so. Consuming resources at a sustainable rate ensures that stocks do not decline, and therefore continue to provide food and other amenities.

Processes

There are many types of fishing carried out on a large scale, harvesting a huge variety of fish and aquatic mammals. On land, there are many different ways of growing and harvesting agricultural and animal produce, from intensive farming techniques to free range and organic methods.

Sectors

Every operation that harvests agricultural produce (the primary ISIC sector types are "Fishing, aquaculture and service activities incidental to fishing, Growing of crops, market gardening and horticulture, Farming of Animals"). For more information please refer to Figure 3.

Calculation or measurement procedures

Sellers of agricultural resources are likely to collect data on the types and amounts of resources its company produces or extracts and should therefore be able to measure the overall quantities produced on a yearly basis. Crops, botanical and zoological resources should be regularly weighed as this will provide clear and reliable data on agricultural resource use.

Reporting Guidance

Extracted or sold agricultural resources should be reported in metric tonnes extracted per annum, and broken down into type of resource or species. The wet weight of the resource should be reported, prior to any drying process.

³⁵ For the purposes of these Guidelines, agricultural produce includes any product harvested from land or water, excluding wood which is captured by a separate Forestry KPI.

³⁶ Please refer to the European Environment Agency website for further information:
http://themes.eea.eu.int/Sectors_and_activities/fishery/

2.9 Financial

KPI 24 Environmental Fines

Definition

All businesses must comply with environmental legislation that applies to them. Failing to do so can lead to costly fines and even the prosecution of directors for the worst offending companies. The Environment Agency has launched a free website³⁷ designed to help small and medium businesses understand and comply with their environmental obligations. Clean-up costs determined in courts could increase following the introduction of the new Environmental Liability Directive (2004/35/CE). Under this Directive operators in high-risk sectors who cause environmental damage by fault or negligence will be held responsible for restoring the damage caused or made to pay for the restoration. Bad publicity from non-compliance can significantly damage an organisation's reputation and sometimes affect its licence to operate. As such, shareholders and other stakeholders are increasingly calling for more transparent reporting of environmental liabilities and prosecutions.

Processes

Any process that involves interaction with an environmental media (i.e. air, water and land) and is regulated under a permit or licence to operate can lead to prosecution in situations where malpractices or incidents occur. Processes involving noise, odour and noxious emissions, including those of the construction, road transport, animal production and aviation industries, may be susceptible to litigation. Companies responsible for exceptional pollution, such as large toxic spillages, are at risk from prosecution and should report on fines and costs associated with these incidents.

Sectors

All sectors could be exposed to environmental fines.

Calculation or measurement procedures

Environmental fines should be reported in monetary terms related to the financial accounting year.

Reporting Guidance

Description of fine	Incident date	Court date	Fine(s)	Associated Costs (including remediation and clean-up, lawyers fees etc.)	Other sanctions (e.g. loss of license)
Offence(s)	Date	Date	GBP	GBP	

For each financial accounting year, a summary of fines and associated costs should be reported, regardless of actual size. Incident locations could also be reported if deemed relevant.

³⁷ <http://www.environment-agency.gov.uk/netregs/>

KPI 25 Environmental Expenditures

Definition

All sectors can incur environmental expenditures, even if they only relate to sewerage and waste charges. Environmental expenditures are classified as types of costs aimed at directly preventing, reducing or ceasing pollution and nuisances created by a company's activities, including accumulated liabilities, provisions, public funding or other grants, and capital expenditures related to environmental issues.

Investment in clean technologies may be justified as environmental expenditure only in cases where a more environmentally beneficial option than the minimum available option has been chosen. If new machinery is purchased where there are no less-environmentally friendly versions available on the market, such as new cars without catalytic converters, environmental expenditure is deemed to be zero. Investments which save running costs, such as more energy-efficient appliances, are only classed as environmental expenditure if they are more environmentally beneficial than other investments of a similar type (e.g. a better energy-rated washing machine).

Processes

There are many situations that could give rise to environmental expenditures. Examples of expenditures for water include wastewater treatment, combating pollution of the aquatic environment (ocean, rivers, lakes etc.), controlling and monitoring groundwater pollution, and reducing thermal pollution of water. Control measures that can be considered as environmental expenditures include monitoring of atmospheric pollution, reduction of air pollution arising from various processes, investments in non-polluting technologies and installation of filters. Noise mitigation and odour reduction expenditures (e.g. sewage treatment works) should also be counted as environmental expenditures.

Sectors

All sectors could incur environmental expenditures. However, some companies may not incur any costs, for example if they have cesspits or if their offices are rented (in which case the environmental expenditure is indirect and is incurred by the supplier). For more information please refer to Figure 3.

Calculation or measurement procedures

For end-of-pipe technologies attached to pollution abatements of specific processes a company should look at its initial investments, additional expenditures (e.g. extensions) and operational costs (e.g. training, maintenance and energy costs). When calculating its expenditures in integrated technologies (i.e. change of processes) a company should record the cost difference between the cleaner technology in which they decided to invest and the cheaper version. This differentiation technique is widely used following the recent developments in environmental policies favouring preventive approaches to end-of-pipe solutions.

Reporting Guidance

For each financial accounting year, a summary of the environmental expenditures should be reported in the following categories:

- Accumulated liabilities
- Provisions
- Public funding or other grants
- Capital Expenditures including:
 - End-of-pipe equipment
 - Additional cost of integrated processes
- Other Expenses including:
 - Current expenditure on in-house operating costs
 - Current expenditure to external organisations

A discussion of the rationale for rises or reduction in expenditure over the financial year should also be provided.

2.10 Supply Chains

Indirect Upstream Impacts

There is no single, quantifiable measure that companies can use as a KPI for the effect of their upstream supply chain on the environment. However, there is a (strategic) process that companies can use to determine the impacts of their upstream supply chain. This is:

1. Determine which companies your business spends its money with. This information should be contained within the company's purchase ledger.
2. Categorise your expenditure into sector groupings by ISIC code where possible (see Figure 3).
3. Assess the typical environmental impacts and risks each supplier sector has. Refer to Figure 3 for a list of KPIs by sector.
4. Determine where to focus your efforts. Clearly some suppliers, even suppliers in the same sector, have more significant environmental impacts than others. It is important to prioritise your suppliers in a way that takes into account both the amount of money you spend with them *and* the relative environmental impact they have. This is especially important for companies with a significant number of suppliers.
5. Engage with your suppliers. Encourage your suppliers to report on the relevant environmental KPIs relevant to their sector.
6. Influence purchasing decisions with the information gathered. Improvements in your suppliers' environmental performance will be more likely if they know that their environmental performance is a factor in your company's buying decisions.

These Guidelines highlight which supplier sectors have the most significant environmental impact for a given buyer sector. This provides valuable information to inform a strategic assessment of environmentally significant areas of expenditure where the effects are not easily quantifiable. (See Figure 3, Significant Supplier Industries column).

These supplier sectors have been determined by assessing which supplier industries typically have a significant environmental impact given the typical amount of product or service bought by a given sector³⁸. Organisations should look to environmentally significant suppliers to also measure and report on the relevant KPIs (where available) and other forms of environmental assessments, to help ensure the environmental performance of the supply-chain as a whole is improved and that impacts are not simply displaced elsewhere.

Accreditation to the national standard for phased implementation of an environmental management system, BS 8555, can help customers specify environmental requirements in supplier contracts, identify stages they want suppliers to achieve, set differentiated targets and priorities in the supply chain and monitor suppliers progress through an on line register.

³⁸ This analysis makes use of Government Input-Output tables, and enabled an assessment of the typical purchases a given sector makes.

2.11 Products & Downstream Impacts

For some companies, the environmental impacts of their products after sale may be as great as, or much greater than, the impacts from the materials and the production processes used in creating the products. This is particularly true of products which consume energy in their use phase, or which pose problems through their volume or toxicity if they enter the waste stream after use.

The process for reducing the downstream impacts of products falls into two parts:

- Assessing the impact of a particular product through its life-cycle, and the priority areas for impact reduction; and the application of design practices to make those changes happen as they would in most other areas of business improvement; and,
- Strengthening the regulatory frameworks and market incentives to stimulate and support these improvements.

An increasing amount of Governmental effort is being applied in this latter area of frameworks and incentives, so the expectations for a business response are bound to rise. Examples of the growing pressures on companies to address the downstream issues of their products include:

Example 1:

The buyers of your products may be businesses which use the product in their own production processes or in other aspects of their business; or they may be private consumers who are the final user of the product. Either way, buyers in these markets are becoming more demanding about the 'whole-life' performance of the goods and services they are choosing. Corporate buyers are increasingly applying standards for their own procurement which take account of product performance both upstream and downstream. And household purchasers are increasingly exposed to publicity campaigns, taxes and incentives to make more sustainable choices in the purchase, use and disposal of products.

Example 2:

An increasing number of formal regimes are requiring various types of 'producer responsibility' for the product after use - for example in areas like packaging, vehicles, electrical and electronic equipment. These regimes place the responsibility for recovering and recycling materials with the producers, putting a premium on design for sustainable use of materials and for easier disassembly and recycling. More recent developments like the Energy-Using Products Framework Directive could make it a formal requirement for some types of product to have gone through a process of eco-design and management, and / or to meet certain minimum standards of 'downstream' environmental performance, for example in terms of their material use, energy use or recyclability.

These Guidelines do not attempt to suggest KPIs for the downstream impacts of products - the individual product streams are too numerous and the impacts too diverse to offer solutions that can sensibly fit all these different circumstances. And the techniques of environmental impact assessment for products and of eco-

design for more sustainable products are not as well established as in other disciplines of environmental performance - though the Government will be consulting later in 2005 and in 2006 on way in which these product-related disciplines could be embedded more strongly in business, professions and policy-making.

Meanwhile, however, there is a great deal which individual sectors or businesses can do to identify the key performance issues for their downstream impacts.

1. First, the assessment of relevant impacts need not involve complicated life-cycle analyses of a particular product. Often there is much that can be done by a common-sense look at key phases of the product's 'downstream' life, with the estimate of impacts per unit being multiplied up by the number of units sold:
 - The distribution phase. Is there a significant amount of energy involved in getting the product to its markets - either because of its volume, or weight or distances covered?
 - The use phase. Does the product consume energy or water when operated by the consumer? Does the product (or materials that may be used with it) give rise to emissions to land, air or water?
 - The disposal phase. Is the product able to be routinely recovered and recycled? If it enters the normal waste stream (which generally means going to landfill) are there issues about its biodegradability or about any pollution hazards?
2. Secondly, in the light of the indicators suggested by this kind of assessment, performance measures can be developed as goals for future product design. For example:
 - Can the product be further 'light-weighted', to reduce both the input of materials used and the impacts of distribution?
 - Can the product be designed to use less energy or water? Can any other impacts associated with the product's use by the consumer be reduced, through design features or better information?
 - Can the product be readily recovered and recycled as things stand, or are there infrastructure or design changes which would enable easier disassembly, or higher rates of recycling, or lower hazards in the waste stream?

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