



Department
for Environment
Food & Rural Affairs

Environmental Reporting Guidelines:

Including mandatory greenhouse gas emissions reporting guidance

June 2013

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PB 13944

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Introduction

Who is this document for?

This document is designed to help:

- companies in complying with the greenhouse gas (GHG) reporting regulation, a requirement from the Climate Change Act 2008; and
- all organisations with voluntary reporting on a range of environmental matters, including voluntary GHG reporting and through the use of key performance indicators (KPIs).

Benefits of reporting

There are direct benefits to your organisation in the measuring and reporting of environmental performance as it will benefit from lower energy and resource costs,¹ gain a better understanding of exposure to the risks of climate change and demonstrate leadership, which will help strengthen your green credentials in the marketplace. You should find it helpful to use environmental KPIs to capture the link between environmental and financial performance.

Investors, shareholders and other stakeholders are increasingly requesting better environmental disclosures in annual reports and accounts. The number of organisations that are seeking information from their suppliers on environmental performance is increasing too. Organisations of all sizes are increasingly expected to measure and report on their environmental performance or risk losing out to competitors who do record their environmental performance. A [Defra sponsored study](#)² provided robust evidence that environmental management systems generally delivered cost savings and new business sales for the majority of the study's small and medium sized enterprises.

¹ 2011 report for Defra by Oakdene Hollins. The study estimated that the UK savings opportunities associated with no cost / low cost from resource efficiency activities were estimated at a total of around £23billion in 2009. [Resource Efficiency Study](#)

² An evidence based study (EV0440) into the benefit of EMSs for SMEs.

Many businesses are finding that their environmental risks are material to their operations and supply chains, or are likely to become so. This may take the form of physical risks from climate change, or business risk from volatile energy and commodity prices. Equally some are finding that early action to address such risks can generate new business opportunities.

This guidance has links with the work of the [Natural Capital Committee](#) (NCC). Natural capital refers to the elements of nature that produce value (directly and indirectly) to people, such as the stock of forests, rivers, land, minerals and oceans. It includes both living and non-living aspects of nature. The NCC is working with businesses (including land owners and managers) to explore the development of corporate natural capital accounting. As part of that work, the NCC is considering the scope for corporate natural capital accounting guidance which would relate to the guidance contained here.

Legal framework for reporting

The Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 requires quoted companies to report on greenhouse gas (GHG) emissions for which they are responsible. Quoted companies, as defined by the Companies Act 2006³, are also required to report on environmental matters to the extent it is necessary for an understanding of the company's business within their Annual Report⁴, including where appropriate the use of key performance indicators (KPIs).⁵ If the Annual Report does not contain this information, then it must point out the omissions.

Some public bodies are required or may need to consider reporting GHG or environmental issues under other legislation or commitments, for example:

³ A quoted company is defined in section 385(2) of the Companies Act 2006 as a company that is UK incorporated and whose equity share capital is listed on the Main Market of the London Stock Exchange UK or in an EEA State, or admitted to trading on the New York Stock Exchange or Nasdaq.

⁴ The Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013 will create a new structure for annual reports. Companies will be required to report on the impact of the company on the environment within a new section - the strategic report.

⁵ Environmental Key Performance Indicators (KPIs) are quantifiable measures that reflect the environmental performance of an organisation in the context of achieving its wider goals and objectives. The focus is on 'key' measures i.e. those most important to an understanding of an organisation. You probably already collect a lot of data required to report on environmental KPIs, either because it is calculated from standard organisational data, such as utility bills, or because of existing regulatory requirements.

- Government departments, non-ministerial departments, agencies and Non-Departmental Public Bodies must report as a minimum certain GHG emissions in their Annual Reports as part of their statements on sustainability performance.⁶
- Local authorities in England have been requested by Government to measure and report their GHG emissions from their own estate and operations.⁷

The Environment Agency and the Institute of Chartered Accountants in England & Wales have published [guidance for company directors](#) and those preparing and auditing annual financial statements to help them in understanding what is required to be reported and how this relates to the latest statutory financial accounting and reporting standards⁸.

You can use this guidance to report your environmental impacts alongside social impacts and community involvement in an integrated report. Integrated reporting communicates material information about how your organisation's strategy, governance, performance and prospects, in the context of its external environment, lead to the creation of value over the short, medium and long term. Further detail on integrated reporting can be found at <http://www.theiirc.org/>

Principles for accounting & reporting environmental impacts

The following principles should be applied when collecting and reporting on environmental impacts⁹:

⁶ HM Treasury, Public Sector Annual Reports: Sustainability Reporting Guidance For 2011-12 Reporting

⁷ Via a letter to local authorities, see: <https://www.gov.uk/sharing-information-on-greenhouse-gas-emissions-from-local-authority-own-estate-and-operations-previously-ni-185>

⁸ Environmental reporting and annual financial reports – www.environment-agency.gov.uk/environmentalfinance

⁹ Drawn from accounting principles and the internationally-recognised Greenhouse Gas Protocol Corporate Accounting and Reporting Standard from the World Resources Institute and World Business Council for Sustainable Development, known as the "[GHG Protocol Corporate Standard](#)".

Relevant: Ensure the data collected and reported appropriately reflects the environmental impacts of your organisation and serves the decision-making needs of users—both internal and external to your organisation.

Quantitative: KPIs need to be measurable. Targets can be set to reduce a particular impact. In this way the effectiveness of environmental policies and management systems can be evaluated and validated. Each chapter provides the details for that subject area. Quantitative information should be accompanied by a narrative, explaining its purpose, impacts, and giving comparators where appropriate.

Accuracy: Seek to reduce uncertainties in your reported figures where practical. Achieve sufficient accuracy to enable users to make decisions with reasonable confidence as to the integrity of the reported information.¹⁰

Completeness: Quantify and report on all sources of environmental impact within the reporting boundary that you have defined. Disclose and justify any specific exclusions.

Consistent: Use consistent methodologies to allow for meaningful comparisons of environmental impact data over time. Document any changes to the data, changes in your organisational boundary, methods, or any other relevant factors.

Comparable: Companies should report data using accepted KPIs rather than organisations inventing their own versions of potentially standard indicators. The narrative part of a report provides the opportunity for a company to discuss any tensions which exist between providing comparable data and reporting company-specific KPIs. Use of accepted KPIs will aid you in benchmarking your organization and will aid users of your report to judge your performance against that of your peers.

Transparent: This is essential to producing a credible report. Address all relevant issues in a factual and coherent manner, keeping a record of all assumptions, calculations, and methodologies used. Internal processes, systems and procedures are important and the quantitative data will be greatly enhanced if accompanied by a description of how and why the data are collected. Report on any relevant assumptions and make appropriate references to methodologies and data sources used. There is more on transparency in Step 5 on reporting.

¹⁰ The National Physical Laboratory has produced an [introductory guide to uncertainty](#).

Chapter 1: Steps in reporting your environmental impacts

This section covers the steps to take when considering your environmental impacts and which KPIs to report on. For simplicity we have laid this out into 5 key steps and 7 supporting actions.

As a starting point you should work through steps 1 – 5 in order to report on your key environmental impacts.

Step 1 Determine the boundaries of your organisation.

Step 2 Determine the period for which you should collect data

Step 3 Determine the key environmental impacts for your organisation

Step 4 Measure

Step 5 Report

We recommend you develop and report at least 3 KPIs associated with your key environmental impacts.

You should then consider actions i – vii (below) which provide you with information to help you develop your environmental strategy.

Action i Intensity ratios

Action ii Setting a base year

Action iii Setting a target

Action iv Verification & assurance

Action v Your upstream supply chain

Action vi Downstream impacts

Action vii Business continuity and environmental risks

Working through these steps will enable you to present a summary of your environmental findings in relation to your organisation's activities and what you did to improve your performance. You should be clear how any targets reflect regulations or international standards. Provision of a narrative description of your actions, highlighting any key developments for the year and giving specific case studies relevant to your organisation will help provide a more comprehensive view of your organisation's environmental performance and strategy.

Step 1: Determine the boundaries of your organisation. Do you need to report on all parts of your organisation?

Define the operations on which you are going to report, i.e. set your organisational boundary. If you have a simple organisational structure and own 100% of the assets that you operate, it is straight-forward: you would report on the impacts from everything that you own and operate. However, for organisations with more complex structures in which some entities may be part-owned, or owned but not operated and vice versa, a different approach is needed that should be applied consistently throughout the organisation.

Boundaries are described below with more detail given in [Annex A](#).

Financial control boundary

Your organisation reports on all sources of environmental impact over which it has financial control. Your organisation has financial control over an operation if your organisation has the ability to direct the financial and operating policies of the operation with a view to gaining economic benefits from its activities.

Operational control boundary

Your organisation reports on all sources of environmental impact over which it has operational control. Your organisation has operational control over an operation if your organisation or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation.

Equity share boundary

Your organisation accounts for GHG emissions from operations according to its share of equity in the operation.

Climate Change Reporting Framework

The [Climate Disclosure Standards Board](#) 's Climate Change Reporting Framework (CCRF) sets out an approach to boundary setting that seeks to align with the boundaries used for financial reporting. Although it has been written for reporting climate impacts, it can be used for reporting other impacts. GHG emissions from entities that you operate but are not included in the consolidated financial statement are reported separately according to the CCRF. This approach has the advantages of providing a comprehensive set of data that aligns with other reporting practices.

The next step is to identify all of the reporting units that are within the boundary. A reporting unit can be all or part of a subsidiary company, joint venture, investment, facility, etc. Reporting units should be selected to represent the smallest practical building blocks to allow data to be reported.

Other impacts associated with your organisation's activities lie outside of the boundary e.g. your supply chain. Further information regarding this can be found under actions v and vi in this chapter.

Step 2: Determine the period you should collect data

Your reporting period should be for 12 months and should ideally correspond with your financial year because this allows for easier comparison of your financial performance with other aspects of your performance. Where they are different though, the majority of your environmental reporting year should fall within your financial year.

Step 3: What are the key environmental impacts for your organisation

The next step is to understand which environmental issues are key and to do this you need to understand the extent of the impacts of your organisation. 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 your organisation fall under your direct responsibility; all other impacts are indirect (see Actions v and vi).

Your Key Performance Indicators

Through understanding your own organisation's operations you should have a clear understanding of where your main environmental impacts occur. These are likely to fall into one or more of six categories:

- Greenhouse gases
- Water
- Waste
- Materials and resource efficiency
- Biodiversity/ecosystem services
- Emissions to air, land and water

Not all six will be relevant (material) to your organisation. You should identify which are and explain why they are relevant and how they are defined. There are UK and EU regulations covering these issues and, in general, for any KPI of interest to your organisation you need to ensure that you are also complying with any relevant legislation.

Step 4: Measuring

There are a number of ways to collect and manage data at a corporate level. This could include direct entry of data by operational staff onto secure internet or intranet databases; or standard spreadsheet templates completed and emailed to a central point where data can be processed. Using a standardised reporting format is recommended to ensure that data received from different business units and operations is comparable. Ideally, environmental reporting should be integrated into your existing reporting processes.

Your efforts to collect the best quality data should be focused on the most important sources. This assessment might be based on:

- Magnitude or size
- Financial significance

- Potential ability to influence impacts
- Importance to your business
- Importance to stakeholders

Where possible, it is better to use primary data to calculate your KPIs. However, in some cases data may not be available or of sufficient quality in which case secondary data, such as industry-average figures, proxy data and extrapolation, may need to be used. This is acceptable where:

- you are transparent about your approach; and
- the data used is adequate to support the objectives for which you are measuring and reporting.

You should establish a quality management system to provide a systematic process for preventing and correcting errors in your organisation's environmental data¹¹.

If you do estimate data, we recommend that you are transparent about the estimation technique used and apply quality measures such as comparing your estimated data to historical data to ensure that it falls within a reasonable range.

The six environmental impact categories (above) form the subject chapters of this guidance and provide specific guidance on measuring and reporting.

Environmental Management Systems

The most widely used form of ensuring good data management is by the use of an Environmental Management System (EMS). EMSs help all types and sizes of organisations to meet their own environmental and sustainability targets. If you have an accredited EMS, you should state the type and whether it covers your entire organisation or just part in your reporting.

Three types of formal environmental management systems are recognised in the UK:

[ISO 14001](#)¹²

¹¹ For further practical advice on data collection at a corporate level, please refer to Chapter 6 of the [GHG Protocol: A Corporate Accounting and Reporting Standard](#) (Revised Edition) or Section 3 of the Institute of Environmental Management and Assessment (2005) [Environmental Data Management: for emissions trading and other purposes](#).

[EMAS](#)

[BS 8555](#)

Some of the other step-by-step systems that exist are the Green Dragon Environmental Standard, Steps to EMS (STEM), IEMA's Acorn Scheme and Eco Campus.

EMS objectives and targets can be used to show a company's progress against stated plans and goals, including:

- quantitative targets based on outcomes, such as reduction of emissions or incidents;
- quantitative or qualitative objectives in terms of inputs, such as completion of management system initiatives by a planned date;
- annual progress measured against a commitment to continuous improvement; or
- case studies providing evidence of programmes planned across a specified period.

Alternative approaches to undertaking a structured assessment of an organisation's environmental performance are available from the [Global Reporting Initiative / UNEP](#) or from the World Business Council for Sustainable Development [Corporate Ecosystem Valuations](#).

Step 5: Reporting

Transparency is essential to producing a credible report. You should present your information in a balanced and transparent fashion. Celebrate success but also avoid glossing over negative environmental impacts or poor performance against targets.

1. Your report should summarise how you have carried out each of the steps listed above and the outcome from each.

Be clear about:

¹² <http://www.iema.net/ems> for information on ISO 14001, EMAS and BS 8555

- why you have collected the data;
- how you have gone about it, such as the assumptions, methodologies, and reference data used;
- to which parts of your organisation the data relates.

You should explain if you are not reporting data for some sources of environmental impacts within your chosen reporting boundary, whether they are from a geographical area, type of equipment or activity.

Trends in impacts should be clear to the reader. Use units consistently.

Give:

- progress against targets, whether improvements or set-backs have occurred and how these are being tackled;
 - information relating environmental performance to financial performance. This should include environmental expenditures, e.g. more efficient production processes, recycling facilities, the reclamation/ rehabilitation of land to a more natural state, or investment in projects in the local community.
2. Explain how you are managing your impacts i.e. EMAS, ISO 14001 and who has responsibility for this.
 3. Identify the risks and opportunities that arise from your impact on the environment and from the environment's impact on you through, for example, climate change. Be clear whether your organisation has been subject to any environmental fines. The date, location, reason and amount of fine should be stated.
 4. Explain internal processes to manage and report risk. Develop a plan or strategy that addresses these risks and opportunities and fits with your business strategy or is integrated with it and report on this plan. Explain how the information you have gathered is used to support corporate decision making. Use case histories to illustrate your actions and approach.

Action i: Intensity ratios/normalisation factors

When presenting the detail of your KPIs, they should be expressed in absolute terms but it is also helpful if you use a normalising factor in reporting your data. Environmental impacts data can be normalised by dividing the impact you are reporting on (whether tonnes of waste or emissions) by an appropriate activity metric (e.g. units produced, Full Time Equivalent staff) or financial metric (£ million turnover). The resulting normalised data is called an intensity ratio. Two commonly used normalising factors are turnover and production output; but there are others which may be relevant, for example companies with offices or retail operations may normalise to floor space.

Normalising your data is useful because it facilitates:

- Comparison over time
- Comparison across different organisation sectors and products

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 organisation.

An activity ratio is suitable when aggregating or comparing across organisations that have similar products. A financial ratio is suitable when aggregating or comparing across organisations that produce different products. We recommend you use the intensity ratio that is most relevant to your organisation and will provide the most context to users of this information. If your organisation has many varied organisational operations e.g. a travel company which owns its own planes and also owns its hotels you should consider calculating separate activity ratios for each activity i.e. one for the planes and one for the hotels.

When reporting, the simplest method is to present data on a clear and transparent like-for-like basis. So if the product lines are much the same and output has increased, then a normalised approach, with the factor in number of units or weight, as appropriate, will be sufficient especially if backed up with absolute figures in order to understand the scale of the impact as well as the direction of change. If a 'value of output' measure has to be used, then it should be a volume measure (i.e. adjusted for relevant price changes).

Action ii: Setting a base year

To maintain meaningful and consistent comparison of your data and KPIs over time, you will need to set targets and choose and report on a base year. A base year gives you a point against which you can compare your current data and you should choose the earliest year for which you have data. Your base year may be¹³:

- a fixed or single base year
- an average of a range of years in order to smooth out year-on-year fluctuations
- a rolling base year

A base year is an important benchmark and you should explain the reasons behind your choice. It is recommended that if you set a fixed base year, you also determine your base year recalculation policy. The following are instances when you might need to recalculate a single base year:

Structural changes that have a significant impact on the organisation's base year figures, such as the transfer of ownership or control of relevant activities or operations from your organisation to another. While a single structural change might not have a significant impact on the base year figure, the cumulative effect of a number of minor structural changes can result in a significant impact. Structural changes include:

- Mergers, acquisitions, and divestments
- Outsourcing and insourcing of relevant activities
- Changes in calculation methods or improvements in the accuracy of factors, such as emission factors, or activity data that result in a significant impact on the base year figures.
- Discovery of significant errors, or a number of cumulative errors that are collectively significant.

Develop a base year recalculation policy

¹³ The implications of these different options are discussed in chapters 5 and 11 of the [GHG Protocol Corporate Standard](#) and are applicable to other environmental impacts other than GHG emissions.

You will probably not want to recalculate your fixed base year to take account of every change in circumstances. So you will need to determine your policy and set a threshold over which a recalculation is triggered under different scenarios. In determining your threshold for the different scenarios, you should take into account the cumulative effect on your base year figure of different changes. You may wish to recalculate data for all years between the base year and the reporting year or just the prior year and the reporting year following a base year recalculation.

In some circumstances, it may be simpler to roll your base year forward to your current reporting year following very large structural changes or mergers.

Once your organisation has developed its policy on how it will recalculate base year figures for your KPIs, you should apply this policy in a consistent manner.

Determine whether the base year needs to be recalculated

Update your base year in line with the criteria below and when the changes meet your significance threshold.

If you acquire a facility which existed in your base year, recalculate your base year if the emissions were not included in your base year figures and will be included in your current year's figures. For outsourcing, recalculate your base year if the figures from the outsourced activity were included in your base year figures and will not be included anywhere in your current year's figures. If you acquire/dispose of a facility from another company, you recalculate your base year to include/exclude respectively the figures from the new facility at the level they were in your base year.

You should not recalculate your base year where you acquire (or insource) and divest (or outsource) operations that did not exist in your base year.

Transfer of ownership/ control of relevant activities, including changes in leased status, should be treated in the same way as acquisitions and disposals.

You do not need to recalculate base year to take account of economic growth or decline, changes in production output or product mix, and closures and openings of operating units owned or controlled by your organisation.

Changes in methodologies, improvements in the accuracy, or discovery of previous errors would trigger a recalculation.

If a recalculation of the base year is required for a structural change which occurred in the middle of the reporting year, it is recommended that base year figures are recalculated for the entire year not just the period from the structural change onwards. If it is not possible to recalculate in that reporting year due to lack of data, recalculation can be carried out in the following year.

Action iii: Setting a target

Once you have your data, set a target. There are a number of good business reasons to do this such as improving cost and resource efficiency. It is important to obtain senior management commitment to the target as this will establish internal accountability for your targets; create an incentive system, and provide resources to meet your target. You should set a target date that will drive strategic change within your business.

There are two types of target:

- an absolute reduction target which compares absolute figures in the target year to the base year;
- an intensity target based on an appropriate normalising factor (e.g. water consumption per tonne of product, CO₂e emissions per Full Time Equivalent staff member).

An absolute target is designed to achieve actual reductions in environmental impact. Organisational growth has to be decoupled from the environmental impact in order to achieve an absolute target. In contrast, an intensity target can drive resource efficiency and relative environmental impact, but the total resource use/impact may actually increase even if an intensity target has been reached due to increases in organisational activity e.g. production.

Action iv: Assurance and verification

Assurance and verification of reported sustainability and environmental data is a component of a responsible reporting approach. There is a reputational risk in disclosing misleading data and assurance provides a check on the value and authenticity of the data in the public domain. While there are many methodological approaches to sustainability/ environmental assurance, the key components of a robust assurance statement, are that it should:

- Clearly reflect the scope of matter material to both your company and your stakeholders

- Transparently review the quality of your disclosures
- Provide clear conclusions on data quality and processes
- Be conducted by a qualified, independent third party reviewer
- Meet the requirements of a recognised standard
- Be easily understood and jargon free.

There are two internationally-recognised standards for the verification of sustainability reports that are ideally used together as they complement one another.

- International Audit and Assurance Standards Board's ISAE3000 'Assurance engagements other than audits or reviews of historical financial information'.
- AA1000AS¹⁴ from AccountAbility (the Institute of Social and Ethical AccountAbility). AA1000AS is a free, open source set of principles which addresses sustainability and CSR aspects of reports.

[ISO14064-3](#) and ISAE 3410 are widely-used standards for the verification of GHG emissions reports CDP also has a [document](#) that explains more about the verification process.

There is no statutory requirement to have your environmental information audited. The statutory auditor of the financial statements is not required to verify environmental information in the strategic or directors' reports within the annual report, but an auditor will be required to consider:

- whether the information is consistent with the financial statements¹⁵; and
- whether the information is materially incorrect or materially inconsistent with the financial statements based on the knowledge acquired by the auditor in the course of performing the audit¹⁶; and

¹⁵ S496 Companies Act 2006 and ISA (UK and Ireland) 720 Section B.

¹⁶ ISA (UK and Ireland) 720 Section A (Revised October 2012).

- the need to qualify their report if they become aware of such an inconsistency or apparent misstatement, and that matter is unresolved. In addition, whilst they are not required to consider whether the strategic and directors' reports comply with the relevant laws and regulations, if they become aware of any material non-compliance (which might include becoming aware of failure to provide material environmental data), then they would need to discuss the matter with management and those charged with governance.¹⁷

Where your company publishes a separate environmental or sustainability report, your auditor is not required to read it although they may consider it as contributing to a knowledge of the business¹⁸.

Action v: Your upstream supply chain

The indirect environmental impact of your supply chain may be greater than your own impact. Engaging with your supply chain can provide you with valuable information to inform a strategic assessment of where, in your supply chain, the most significant environmental impacts are occurring.

There is no single, quantifiable measure that you can use as a KPI for the effect of your upstream supply chain on the environment but you can use the environmental information that your suppliers' report in order to make better procurement decisions. The following is an example of a process that can be used to determine the impacts upstream in the supply chain:

- Identify companies from which goods and services are purchased.
- Categorise your expenditure into sector groupings.
- Assess the typical environmental impacts and risks for each sector.
- 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 relative environmental impact.

¹⁷ ISA (UK and Ireland) 250 Section A.

¹⁸ ICAEW & Environment Agency (2009) Turning questions into answers: Environmental Issues and Annual Financial Reporting

- Engage with your suppliers. Encourage your suppliers to report on the key impacts.
- 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 organisation's buying decisions.
- Consider post-contract supplier development to focus on engaging suppliers in continuous improvement in environmental management.

Action vi: Your downstream impacts

Whilst identifying key performance indicators for downstream environmental impacts is beyond the direct scope of this guidance, there are some issues that you should consider, for example, water use in washing machines, electricity use of TVs, etc. In some cases there are specific legal requirements associated with managing the end-of-life phase of products e.g. batteries, electrical equipment and cars. You should consider disclosing information on both the financial risks represented by any liabilities associated with managing end-of-life disposal, and narrative disclosures on level of engagement with those organisations involved in the recycling or reuse of the particular products.

Action vii: Business continuity & environmental risks

The compelling and growing evidence on climate change points to the need for drastic and urgent action to reduce emissions of greenhouse gases. But this alone will not suffice: substantial changes to our climate are already unavoidable. Even with urgent greenhouse gas emissions reductions, scientists expect that the world will face rising temperatures and, in many places, increasingly frequent and severe weather impacts due to climate change.

These changes will have profound effects on many aspects of our lives in the UK. For example, there is a greater threat of droughts, floods and heatwaves, with extreme weather events becoming more frequent. Sea levels are rising and, in the future, the rate of rise will accelerate; some familiar species will disappear and new alien species will arrive—for better or worse. The

international impacts are likely to affect food security, migration patterns, natural ecosystems, production and supply.

These changes will only emerge erratically over the coming years and decades, but they require action now. For the business sector, this means managing those risks and discovering new opportunities, to maintain a competitive edge. Forward planning rather than reacting to extreme weather events as they occur is essential. This process of adjusting to the changes in our climate is called adaptation and should be part of any strategy on climate change.

There are three elements of adaptation:

- to reduce exposure to the risk of damage;
- to develop the capacity to cope with unavoidable damages;
- to take advantage of new opportunities.

Effective adaptation to climate change requires sound risk management and strengthening business resilience.

Recommendations

1. Include an evaluation of climate risks in your company's overall assessment of business risks.
2. Cover the following areas in your climate risk evaluation:
 - supply chains;
 - assets;
 - operations;
 - markets;
 - regulatory compliance
3. Focus your climate adaptation strategies on actions that fit within broader sustainability strategies and that deliver savings (in resource use and running costs) in their own right.

4. Include actions you have taken on climate change adaptation in your annual report.

The level and type of response will depend largely on the exposure of your business: whether responding to direct risks to core operations, or indirect risks via supply chain or other dependencies. You will need to utilise expertise across your organisation—among sustainability, procurement, business continuity and environment managers - to develop your adaptation strategy.

The impacts of climate change will be widespread and affect networks on which you rely. Explore how you can work with external partners to contribute to increased climate resilience. Partners with a mutual interest in ensuring climate security could include suppliers, customers, other local businesses, local authorities, and others in your sector.

Being ready for climate change is also about making sure you identify new ways and better ways to do business. There will be demands for new products and services; the demand for some existing products will grow. Customers will want to be confident that you will be able to deliver whatever the weather. Taking a lead in the development of new climate adaptation technologies and expertise could also open up new markets for UK firms internationally. Financial institutions, for example, are at the centre of efforts to evaluate climate vulnerability and act on the risk to investments it poses. Some major banks have undertaken research to support investment managers to incorporate climate-related risks in assessments of investment portfolios.

Climate Ready

The Environment Agency has a role to provide advice and support to businesses, public sector and other organisations in England to help them adapt to a changing climate. Its aim is to help key sectors increase their resilience to climate risks. Organisations based in Scotland should contact Adaptation Scotland or the Scottish Environment Protection Agency (SEPA) for advice. The Environment Agency is working closely with Defra as part of Climate Ready—the Government's national programme for adaptation. The Environment Agency has information and tools to help business adapt. Sign up to their Climate Ready e-bulletin. For more information on the risks the UK faces from climate change and the actions underway in Government visit the website.

The report [“Insights into Climate Change Adaptation by UK Companies”](#) provides further details and case studies of how FTSE 100 companies have adapted to climate risks.

Chapter 2: Guidance on mandatory reporting requirements for quoted companies

Under the Companies Act 2006 (Strategic and Directors' Reports) Regulations 2013 quoted companies are required to report their annual emissions in their directors' report.

This section specifically applies to those companies affected by the regulation. It sets out both the requirements of the regulation and also outlines additional information that is likely to be useful to data-users.

Is my company required to report?

Quoted companies in this respect are those that are UK incorporated **and** whose equity share capital is officially listed on the main market of the London Stock Exchange; or is officially listed in a European Economic Area; or is admitted to dealing on either the New York Stock Exchange or NASDAQ. Companies within the scope of the regulation must adhere to its requirements.

If you are a company or organization not affected by these regulations you are recommended to report voluntarily in line with the voluntary accounting & reporting guidance in the following chapter of this document. Quoted companies may also choose to report in line with that guidance in addition to meeting the regulatory requirements.

Determine whether you are a quoted company required to report within the terms of the regulation. Check with your finance director or company secretary if you are unsure.

When will my company have to start reporting?

The requirement comes in to place for company reporting years ending on or after 30 September 2013. You will need to check what reporting year your

company uses. This refers to the year-end date, not the date of publication of the directors' report.

Your usual financial year	Your first reporting year under the regulation
1 January to 31 December	1 January 2013 to 31 December 2013
1 April to 30 March	1 April 2013 to 30 March 2014
1 October to 30 September	1 October 2012 to 30 September 2013

Depending on your financial year, your company might be required to report data on emissions that occurred before the regulation was made. If you do not have the information necessary to meet the regulatory requirement in the first reporting year, you must either:

- provide an estimation instead, based on extrapolating data that you do have, or use generic data that is not specific to your company. You are required to disclose your methodology and this would form part of your methodology; or
- explain why you are unable to provide 12 months' data¹⁹.

What period should I collect data for?

You should ideally report on emissions for the period corresponding with your company's financial year. You may report emissions for a different twelve month period to your financial year but you must state in the directors' report if

¹⁹ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 15(4).

you have done so²⁰. For example, company A historically reports emissions data on a calendar year basis whereas their financial year is April to March. In this example company A could either continue to report emissions on a calendar basis or switch to reporting emissions on a financial year. If you report emissions for a different period to your financial year, the majority of your emission reporting year should still fall within the period in directors' report.

Quoted companies may use a reporting time period that does not correspond with their financial report, but must state if they have done so.

What must my company report?

Under the regulations quoted companies are required to report on their greenhouse gas emissions from activities for which they are responsible. Many companies have established reporting practices using GHG accounting methodologies such as the [GHG Protocol Corporate Standard](#) and [ISO 14064-1](#). These companies should satisfy themselves that their existing GHG accounting approaches cover emissions from activities for which they are responsible. The next step is to consider the requirements of the directors' report as this is the context in which greenhouse gas emissions information must be reported. The directors' report contains information relating to operations²¹ covered by the consolidated financial statement. That includes their operations both in the UK and abroad.

If companies consider that reporting emissions from activities for which they are responsible means that they will:

- Not report on GHG emissions from certain operations covered by the consolidated financial statement; or
- Report on GHG emissions from operations that are not included in this statement

²⁰ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 19.

²¹ Please note that the term "operations" is used here as a generic term to denote any kind of business activity, irrespective of its organizational, governance, or legal structures.

they must make this clear.

Readers of the emissions data should have a clear understanding of the operations for which emissions data has been reported and if and how this differs from operations within the consolidated financial statement.

For example, you may conclude that you have responsibility for the GHG emissions of one of your associate undertakings, hence include them in your inventory even though you do not consolidate but equity account for that associate in your consolidated accounts: you must explain this. Alternatively you may consolidate a subsidiary for the purposes of preparing financial statements but conclude that you are not responsible for the greenhouse gas emissions from that subsidiary (because for example, the GHG-emitting activities have been outsourced and are under the control of a third party). In those circumstances you may exclude the GHG emissions from the directors' report but you must explain why.

Quoted companies must report on emissions from activities for which they are responsible.

Must I report all my emissions?

You are required to quantify and report on emissions of the following greenhouse gases²² - carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆). (But see later guidance for a discussion of materiality.)

You are not required to give individual figures for emissions of each of the GHGs listed. Indeed few companies will emit all of the GHGs listed. However, you must state in your directors' report the annual quantity of GHG emissions

²² As defined in section 92 of the Climate Change Act 2008

in tonnes²³ of carbon dioxide equivalent²⁴ (CO₂e) from the following emission sources²⁵:

- a) the combustion of fuel, e.g.:
 - Stationary combustion: combustion of fuels in stationary equipment such as boilers, furnaces, burners, turbines, heaters, incinerators, engines, flares, etc.
 - Mobile combustion: combustion of fuels in transportation devices such as automobiles, trucks, buses, trains, airplanes, boats, ships, barges, vessels, etc.
- b) the operation of any facility

This category is not limited to emission sources that are permanent or land-based or stationary. This category would also include emission sources that are: mobile; temporary e.g. mobile offices; and marine-based e.g. oil production platforms. The following types of sources of emissions should be considered when identifying emissions on which to report²⁶:

- **Process emissions:** emissions from physical or chemical processes such as CO₂ from the calcination step in cement manufacturing, CO₂ from catalytic cracking in petrochemical processing, PFC emissions from aluminum smelting, etc.
 - **Fugitive emissions:** intentional and unintentional releases such as equipment leaks from joints, seals, packing, gaskets, as well as fugitive emissions from coal piles, wastewater treatment, pits, cooling towers, gas processing facilities, etc.
- c) a separate figure giving the annual quantity of emissions in tonnes of carbon dioxide equivalent resulting from the purchase of electricity, heat, steam or cooling by the company for its own use.²⁷

²³ Tonnes or metric tons

²⁴ The Climate Change Act 2008 says a “tonne of carbon dioxide equivalent means one metric tonne of carbon dioxide or an amount of any other greenhouse gas with an equivalent global warming potential (calculated consistently with international carbon reporting practice).”

²⁵ See Companies Act 2006 (Strategic Report and Directors’ Reports) Regulations 2013 paragraph 15(2).

²⁶ This list is taken from page 41 of the GHG Protocol Corporate Accounting and Reporting Standard.

²⁷ See Companies Act 2006 (Strategic Report and Directors’ Reports) Regulations 2013 paragraph 15(3).

In the case of companies that are lessees of an emission source, they should decide if they have responsibility for that emission sources e.g. electricity²⁸ use within the building. This determines whether companies must report emissions associated with the electricity²⁹, rather than their method of payment. (Refer to earlier section on “What must my company report” for a discussion on boundaries of reporting).

If you decide that you do have responsibility for emissions either as a lessee or as a lessor, but cannot get the consumption data necessary to calculate the emissions, then you may either estimate the emissions or state that emissions from the building are excluded and explain why (see the section on “Comply or explain”).

The totals arrived at from the above are similar respectively to scopes 1 and 2 of the GHG Protocol Corporate Standard and the direct emissions and energy indirect emission categories of ISO 16064-1.

You are **not** required to report on other emissions associated with inputs into your company (such as emissions from your supply chain) or emissions linked with outputs from your company (such as emissions from your products when they are used by your customers). However, you should consider reporting these separately to give a wider picture of your organisation to investors and shareholders (See the recommendations on scope 3 emissions in the following chapter on voluntary reporting).

Having established the activities for which you are responsible, you may also wish to consider whether particular emissions are material to the total of your company emissions. Materiality will depend on the circumstances of your individual company. It will be influenced by issues such as the size and nature of an operation. It is for you to judge whether an emission is material or not.

²⁸ Or heat, steam or cooling.

²⁹ Electricity traders would not report the emissions from electricity that they bought for re-sale within this category, although they could report these emissions as a separate, optional information item. See the voluntary accounting and reporting guidance for how to account for emissions associated with the use of electricity, heat, steam or cooling generated by another organisation, which you do not pay for. This is more likely to occur with heat where the generating organisation has surplus heat that it passes to another organisation rather than waste it.

The *'characteristics of materiality aim to provide a 'workable filter on information, allowing investors to see major trends and significant events'³⁰* and eliminate *'immaterial clutter'* and *'unnecessary or duplicative detail that obscures major trends and events'³¹*. In considering which emissions are material to your company, you may wish to consider whether the collection and reporting of certain emissions or operations would provide additional value for users in the context of your company's overall emissions data and management.

Comply or explain

You must make every reasonable effort to acquire all material data to comply with the regulations. However, there may be circumstance where you find it difficult to compile all necessary data in a timely manner to comply with reporting requirements, e.g. because of significant restructuring or acquisitions by your company in the run up to producing your directors' report.

Should you be in the situation where you cannot report on all material emissions for which you have responsibility, you must state what is omitted and explain why in your directors' report³². It is recommended that you set out the steps you are taking to acquire the information.

Quoted companies must report on all material emissions of the 6 Kyoto gases from direct sources and from purchased electricity, heat, steam and cooling.

Quoted companies must state in their directors' report if they have omitted any material emissions.

³⁰ Climate Change Reporting Framework – Edition 1.1 September 2012. Climate Disclosure Standards Board.

³¹ *ibid*

³² See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 15(4).

Must I use a particular methodology for my calculations?

There is no prescribed methodology under the regulations, but for effective emissions management and transparency in reporting it is important that you use robust and accepted methods. It is recommended that you use a widely recognized independent standard, such as:

- [ISO14064 – Greenhouse gases. Part 1 \(2006\)](#)
- The WRI / WBCSD [Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard](#) (Revised Edition)
- UK Government’s Environmental Reporting Guidance (2013 version)

There are also reporting approaches and programs based on or drawn from the Greenhouse Gas Protocol Corporate Standard and [ISO 14064-1](#), including:

- [The Climate Disclosure Standards Board Climate Change Reporting Framework – Edition 1.1 October 2012.](#)
- [The Global Reporting Initiative Sustainability Reporting Guidelines](#)

CDP has developed a list of commonly cited methodologies, protocol and standards³³. There may be existing methodologies developed by certain sectors, such as those for the petroleum industry³⁴. Companies within those sectors may wish to consider using sectoral methodologies where appropriate.

You may use relevant information from other domestic and international regulatory reporting processes to fulfill your mandatory reporting obligations in your directors’ report. Data from the following may be useful:

- Climate Change Agreements (CCA)
- The EU Emissions Trading Scheme (EU ETS)

³³ [Guidance for companies reporting on climate change on behalf of investors & supply chain members 2013 See Q7.2](#)

³⁴ The International Petroleum Industry Environmental Conservation Association (IPIECA) “Petroleum industry guidelines for reporting greenhouse gas emissions”.

- The Carbon Reduction Commitment Energy Efficiency Scheme (CRC Energy Efficiency)
- Reporting or disclosure schemes in other countries

If you have used data compiled in fulfillment of other regulatory requirements, then state this as one of the methodologies that you have used to make your report.

If you decide to use information from regulatory schemes, you need to consider whether additional data is needed to satisfy these GHG reporting requirements. Data under other schemes may only cover some of your organisation's GHG emissions and only give part of the required information. For example the CRC Energy Efficiency scheme only applies to certain emissions in the UK and only covers carbon dioxide, so the electricity figure calculated under CRC Energy Efficiency would be different to one calculated under the UK Government's voluntary reporting guidelines or GHG Protocol Corporate Standard. You will need to consider where the data you have collected needs to be supplemented with additional information.³⁵

You must state in your directors' report the methodology or methodologies used³⁶.

Quoted companies must state what methodology or methodologies they have used for calculating their GHG emissions.

Must I show emissions over time?

Reporting of previous years' emissions with your latest information provides readers with the ability to see trends in your emissions over time.

With the exception of the first mandatory reporting year, you must repeat the emissions data disclosed in your previous report alongside information on

³⁵ Methane and nitrous oxide are emitted in small amounts when fuel is combusted to generate electricity. Companies that have already calculated their emissions from purchased electricity using the CRC Energy Efficiency's emission figures should decide whether emissions of these gases are material and therefore warrant recalculation.

³⁶ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 16.

emissions from your present year³⁷. In effect you will have a rolling one year comparator for your data.

If you have been voluntarily reporting your greenhouse gas emissions for a number of years, you will have information that could be helpful to readers to understand trends and how your company is managing emissions. You may wish to report information beyond the minimum mandatory requirement of the previous year to give readers a longer emissions history.

If companies have undergone structural changes since the previous reporting period, they may wish to re-calculate the previous year's emission figures. Chapter 5 of the [GHG Protocol Corporate Standard](#) explains about re-calculating past emission figures. This is **not** a regulatory requirement, but, if you have done so, please make this clear in your report.

Quoted companies must state the emissions disclosed in their previous year's directors' report alongside their current year's data.

Intensity ratios

Your directors' report must also express your emissions by way of an intensity ratio or ratios³⁸. Intensity ratios compare emissions data with an appropriate business metric or financial indicator, such as sales revenue or square metres of floor space. This allows comparison of performance over time and with other similar types of organisations. The voluntary reporting guidance in the next section provides further advice on intensity ratios and the measurements that may be appropriate.

Companies must state at least one intensity ratio that relates to their annual emissions i.e. for the entire company³⁹. However, they may provide additional metrics either covering all or part of the company at their discretion.

³⁷ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 18.

³⁸ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 17.

³⁹ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 17.

Quoted companies must express their annual emissions using at least one intensity ratio related to their activities.

Should I get my emissions data verified?

There is no requirement in the regulations for emission data to be independently verified or assured so the statutory auditor of the financial statement does not need to assure or verify environmental information provided in the directors' report. However the auditor will be required to:

- consider whether the information is consistent with the financial statements⁴⁰; and
- consider whether the information is apparently materially incorrect based on, or materially inconsistent with, the knowledge acquired by the auditor in the course of performing the audit⁴¹; and
- consider the need to qualify their report if they become aware of such an inconsistency or apparent misstatement, and that matter is unresolved. In addition, whilst they are not required to consider whether the directors' report complies with the relevant laws and regulations, if they become aware of any material non-compliance (which might include becoming aware of failure to provide material emissions data) then they would need to discuss the matter with management and those charged with governance.⁴²

Whilst assurance is not a regulatory requirement it is recommended as good practice. Independent verification/assurance on the accuracy, completeness and consistency of GHG emissions data will be beneficial to both internal decision-making and for external stakeholders.

⁴⁰ S496 Companies Act 2006 and ISA (UK and Ireland) 720 Section B.

⁴¹ ISA (UK and Ireland) 720 Section A (Revised October 2012).

⁴² ISA (UK and Ireland) 250 Section A.

Example corporate GHG report

The table below shows the data-points that are required under the regulation.

Companies are not required to use this format. Note that in the first year of reporting companies are not required to give a comparison year⁴³, so this table shows a second year of reporting.

Global GHG emissions data for period 1 April 2014 to 31 March 2015		
	Tonnes of CO ₂ e	
	Current reporting year	Comparison year
Emissions from:	2014-2015	2013-2014
Combustion of fuel & operation of facilities	18,100	11,700
Electricity, heat, steam and cooling purchased for own use	14,500	15,100
Company's chosen intensity measurement: Emissions reported above normalised to per tonne of product output	0.49	0.54

Methodology

We have reported on all of the emission sources required under the Companies Act 2006 (Strategic Report and Directors' Reports) Regulations

⁴³ See Companies Act 2006 (Strategic Report and Directors' Reports) Regulations 2013 paragraph 18.

2013. These sources fall within our consolidated financial statement. We do not have responsibility for any emission sources that are not included in our consolidated statement.

We have used the GHG Protocol Corporate Accounting and Reporting Standard (revised edition), data gathered to fulfil our requirements under the CRC Energy Efficiency scheme, and emission factors from UK Government's GHG Conversion Factors for Company Reporting 2014.

Who will enforce mandatory reporting requirements?

The regulations are made under the Companies Act 2006. The Conduct Committee of the Financial Reporting Council is responsible for monitoring compliance of company reports and accounts with relevant reporting requirements of that Act. The Committee has the power to enquire into cases where it appears that relevant disclosures have not been provided. The Committee also has the power to apply to the court under section 456 of the Act for a declaration that the annual report or accounts of a company do not comply with the requirements and for an order requiring the directors to prepare a revised report and/or set of accounts.

As far as possible, however, the Conduct Committee operates by agreement with companies whose reports it reviews and, to date, has achieved its objectives without recourse to court. The Committee exercises its functions with regard to the principles of good regulation including proportionality, consistency and targeting. It raises concerns with companies where there is evidence of apparent substantive non-compliance. It also responds to well informed complaints.

Chapter 3 – Voluntary greenhouse gas reporting

The guidance in this chapter is based on an internationally-recognised standard from the World Resources Institute and World Business Council for Sustainable Development: the GHG Protocol Corporate Accounting and Reporting Standard [“the Corporate Standard”](#) and so corresponds with many widely used national and international voluntary schemes such as the [International Organisation for Standardisation \(ISO\) 14064-1](#), [CDP](#), and the Climate Disclosure Standards Board’s [Climate Change Reporting Framework version 1.1](#). This guidance is also based on a second standard from the GHG Protocol team: the Corporate Value Chain (Scope 3) Standard. This is referred to as the [“GHG Protocol Scope 3”](#) standard.

Some organisations already report emissions data for regulatory schemes such as the EU Emissions Trading System, Climate Change Agreements or the CRC Energy Efficiency Scheme. These schemes only cover some of an organisation’s GHG emissions, whereas this guidance covers an organisation’s **total** GHG emissions (also known as its corporate carbon footprint).

Please review the section on [principles](#) in the general guidance on collecting and reporting environmental impact data. You should use these principles as a yardstick when assessing whether your inventory is fit for purpose.

What emissions should I report?

A number of gases contribute to climate change. The Kyoto Protocol – the international agreement addressing climate change - covers six main GHGs: carbon dioxide (CO₂), methane (CH₄), hydrofluorocarbons (HFCs), nitrous oxide (N₂O), perfluorocarbons (PFCs) and sulphur hexafluoride (SF₆).

Different activities emit different gases, for example, burning fossil fuels releases carbon dioxide, methane and nitrous oxide into the atmosphere, while producing aluminium releases carbon dioxide and perfluorocarbons. [Annex B](#) has a list of the GHGs produced by different manufacturing processes.

GHG emissions can be reported in terms of the metric tonnes of gas emitted or in metric tonnes of carbon dioxide equivalent (CO₂e). This gives the global

warming effect of the mass of GHG in terms of what mass of carbon dioxide would produce the equivalent effect.

There are a number of other greenhouse gases not covered by the Kyoto Protocol that enter the atmosphere because of human activities. There are relatively few organisations that emit these gases. The [UK Government GHG Conversion Factors](#) does have a list if you think they might be relevant to your organisation, but they should be reported separately from the gases listed under the Kyoto Protocol.

Organising your data

The Scopes

A widely-accepted approach is to identify and categorise emissions-releasing activities into three groups known as scopes. These are defined in the [GHG Protocol Corporate Standard](#) and are described below with their equivalent term from [ISO 14064-1](#) in brackets:

Scope 1 (Direct emissions): Emissions from activities owned or controlled by your organisation that release emissions into the atmosphere. They are direct emissions. Examples of scope 1 emissions include emissions from combustion in owned or controlled boilers, furnaces, vehicles; emissions from chemical production in owned or controlled process equipment.

Scope 2 (Energy indirect): Emissions released into the atmosphere associated with your consumption of purchased electricity, heat, steam and cooling. These are indirect emissions that are a consequence of your organisation's activities but which occur at sources you do not own or control.

⁴⁴

Scope 3 (Other indirect): Emissions that are a consequence of your actions, which occur at sources which you do not own or control and which are not classed as scope 2 emissions. Examples of scope 3 emissions are business travel by means not owned or controlled by your organisation, waste disposal which is not owned or controlled, or purchased materials or fuels.

⁴⁴ A company may use electricity, heat, steam or cooling generated by another organisation, but does not pay for it. This is most likely to occur with heat where the generating organisation has surplus heat that it passes to another organisation rather than waste it. In these cases, the heat (or electricity, steam, cooling) should be treated as purchased for the purposes for GHG emissions accounting. This is aligned with the approach in the GHG Protocol Corporate Standard (page 25) and ISO 14064-1 (section 2.9).

The graphic below shows the three scopes. You draw the blue circle according to the approach that you have decided to use to report your emissions (for example financial control, operational control or equity share). All other sources of emissions are defined with reference to that circle.

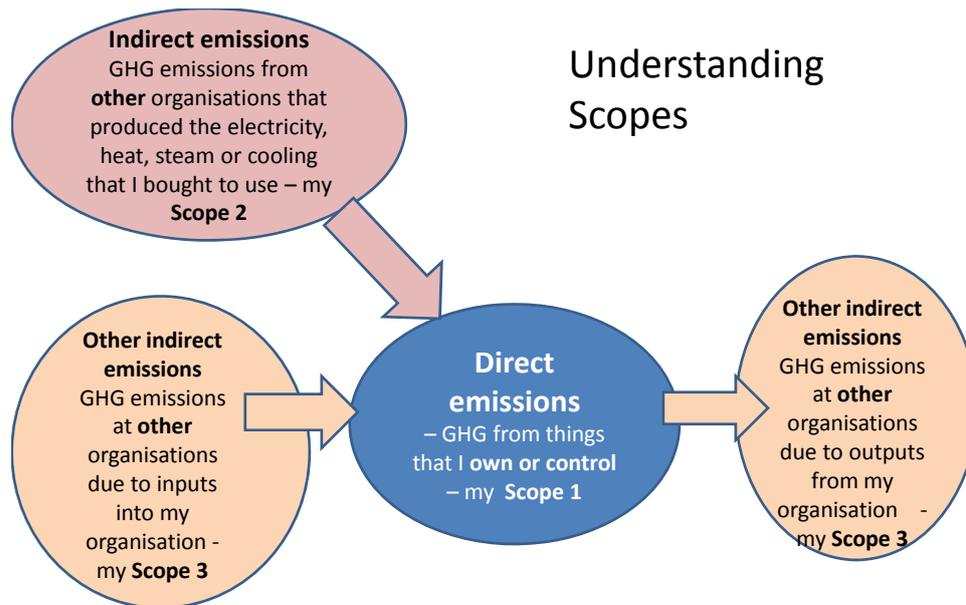
Understanding scope 2 is fairly straightforward: these are emissions that occur when the electricity (or heat, steam and cooling) that you bought was generated⁴⁵. Deciding if emissions from a vehicle, office or factory that you use is Scope 1 or Scope 3 is more difficult. It depends on how you draw that blue circle. In deciding how to report the emissions, ask yourself:

- If I have chosen to use a control approach, do I control it? If the answer is yes, it is your Scope 1. If the answer is no, it is Scope 3.
- If I have chosen to use the equity share approach, do I own or part-own it? If the answer is yes, it is your Scope 1. If the answer is no, it is your Scope 3.

It becomes more complicated in some leasing situations. In these cases, look at the [GHG Protocol's leased assets document](#).

⁴⁵ This is electricity that was bought for your own consumption rather than electricity purchased to sell on to other organisations or individuals.

Understanding Scopes



Carbon dioxide produced from biologically-sequestered carbon, e.g. from the combustion of biomass for electricity and / or heat generation, or from other industrial processes, such as industrial fermentation, should be reported separately to emissions in scopes 1, 2, and 3. This is because the carbon dioxide would have been emitted anyway when the plants - from which the biomass is derived - decayed naturally at the end of their life. However, two other GHGs – nitrous oxide and methane – are commonly emitted when biomass is combusted. These would not be emitted during natural decay and any nitrous oxide or methane emissions from biomass / biofuel consumption should therefore be included in your emissions under the three scopes. This is the approach generally taken in international accounting standards.

If you have quantified GHGs not covered by the Kyoto Protocol, then report those separately from your figures for the three scopes.

More information on calculating emissions related to heat and steam is given in [Annex D](#) and in [Annex G](#) for electricity.

More on Scope 3

You will get a more complete understanding of your organisation's emissions and potential exposure to climate change risks if you understand your scope 3. Accounting for some scope 3 categories can be difficult because the

required data lies with other organisations in the value chain. (“Value chain” refers to all activities upstream and downstream of your organization). As a result, there is a higher degree of estimation in scope 3 accounting. Many organisations start with their scopes 1 and 2 before progressing to scope 3.

You should read the section on upstream and downstream environment impacts. Then follow these steps:⁴⁶ identify where your organisation sits in the value chain; identify relevant and significant sources; determine the magnitude or size of expected emissions through screening your scope 3 emissions using a range of estimation approaches.

The table in [Annex E](#) gives generic data on the GHG emissions typically associated with particular purchases in terms of the amount of money spent. It can be used to identify potentially large sources of GHG emissions in your supply chain. These can then be the focus of efforts to gain better quality data. For example, if £1,000 is spent on ‘ceramic goods’ (in purchasers’ prices i.e. including VAT) in 2009, then the table calculates that 585 kilograms of CO₂e were released during all stages of the production of these goods, including raw material extraction, processing, manufacturing, transportation, packaging etc.

The table should only be used to gain an overview of emissions in your supply chain in cases where the only data you have is how much money you have spent on a particular item. It should not be used in cases where you know the mass of coal/ kWh of electricity/distance travelled in particular types of transport, etc, as using this data will give you more accurate figures.

Once you have identified which Scope 3 emission sources are relevant, you need to organise your data collection.

How do I calculate my GHG emissions?

Some big emitters may measure their emissions using equipment that detects the GHGs or use scientific equations to estimate their emissions, but the most common approach is to record or estimate activity data e.g. the amount of electricity used or distance travelled and then multiply it by an emission (conversion) factor which gives an estimate of the GHG emissions.

$$\text{Activity Data} \times \text{Emission Factor} = \text{GHG emissions}$$

⁴⁶ based on the [GHG Protocol Corporate Value \(Scope 3\) Standard](#).

The [UK Government GHG Conversion Factors](#) are annually updated with emissions factors⁴⁷ and should be used to report on UK emissions. If we have not been able to provide the appropriate emission factor for your activity data or you have overseas operations, you should refer to the emissions factors in the [GHG Protocol calculation tools](#)⁴⁸. Other sources of emission factors are:

- Other Government sources e.g. United States Environmental Protection Agency
- Other credible sources such as universities and research institutions, the EU, International Energy Agency, [International Panel on Climate Change](#).

Where your organisation reports GHG emissions data for regulatory schemes (e.g. EU ETS, CCAs, CRC Energy Efficiency, and regulatory schemes in other administrations or overseas), you can use this emissions data for the purposes of reporting your organisation's total emissions. As there are some differences in approach between regulatory schemes and this reporting guidance, you should provide information on the calculation approach and conversion factors used for those emissions reported for other regulatory purposes.

Where your data reported for existing regulatory schemes does not cover all the emissions sources or greenhouse gases that your organisation is responsible for, you should use the approach in this guidance to measure or calculate those remaining emissions.

Different GHGs have different Global Warming Potentials (GWPs). These have changed over time as scientific understanding of climate change has developed. Emission factors that represent emissions of more than one GHG already have these built in. However, you should check which set of GWPs the emission factors use: it should match the GWPs used in the current version of the UK Government Conversion Factors.

⁴⁷ Some organisations may have site specific emission factors which they should use if they will give a more accurate measurement of GHG emissions.

What do I disclose in my report?

Outline your climate change strategy to provide context to your emissions balance sheet (an example of reported emissions is given below). It is suggested that you should also identify the risks and opportunities that climate change poses to your business; and demonstrate how you address, or plan to address them.

Emission reduction actions and gross and net emissions

You should report GHG emissions as a **gross** figure in tonnes of CO₂e. This should be your reported headline figure.

There are a number of measures that can be taken to reduce your organisation's direct scope 1 emissions such as installing boilers that use less gas, reducing electricity use to decrease scope 2 emissions or producing more energy-efficient products, which would decrease scope 3 emissions.

However, there are also actions that an organisation can take that would not be reflected in gross figures for these three scopes:

- Buying and retiring offsets and Woodland Carbon Units and exporting renewable energy generation. The impact of these actions can be quantified. We recommend that organisations account for these emissions reductions against their gross figure to report a net figure in tonnes of CO₂e. This net figure should be **additional** to your gross figure and should not replace it. Please note that if you are a project developer of offsets, you should show your sale of offsets in your net emissions figure. This will lead to your net emissions figure being higher than your gross figure.
- Where your organisation has purchased and retired, or sold, emission reductions that meet certain 'good quality' emission reduction criteria (see [Annex G](#)), we recommend that you report on all these transactions whether they are for the purposes of compliance⁴⁹ or offsetting.

⁴⁹ Credits purchased for EU ETS can be included.

Intensity ratios

Organisations should normalise at least their total global scope 1 and 2 emissions using an intensity ratio. We recommend you use the intensity ratios which are most relevant to your organisation and will provide the most context to users of this information. This may mean reporting intensity ratios that relate to scope 3. See [Annex F](#) for examples.

Recommended supporting explanations

You should provide the following written explanations when you report your greenhouse gas emissions. This will help to explain how these figures have been calculated and provide context for the data for your stakeholders.

	Recommended supporting explanations
1	General company / organisational information
2	The reporting period covered
3	The reason for any significant changes in emissions since previous year
4	The quantification and reporting methodology followed. If you have used data collected for CCA, EU ETS, CRC Energy Efficiency or other schemes, please state as these form part of your methodology.
5	The approach chosen to identify the operations you have collected data from
6	The scopes included. Provide a list specifying the activity types included in each scope.
7	Provide detail of any specific exclusions of emissions from scopes 1, 2 and 3 (including estimation of the % they represent).
8	Explain the reason for any exclusions from scopes 1, 2 and 3.
9	The calculation approach used, specifically stating for each activity the % of activity data estimated.
10	The conversion / emission factors you used.
11	Provide a breakdown by country of total GHG emissions
12	Provide detail of any exclusions of countries.
13	The base year chosen and approach used to set the base year
14	The base year recalculation policy
15	State appropriate context for any significant emissions changes that trigger base year emissions.
16	State your target, including scopes covered and target completion date. Provide a brief overview of progress towards target.
17	The name of the person(s) responsible for achievement of this target and their position in your organisation
18	The reason for your intensity measurement choice
19	The reason for any significant changes in your intensity measurement

	from the previous year
20	Provide an outline of any external assurance received and a copy of any assurance statement, if applicable.
21	For purchased carbon credits and Woodland Carbon Units, state the reduction in tonnes of CO ₂ e per year.
22	See Annex G for a list of the information that should be provided for carbon credits and Woodland Carbon Units.
23	State in MWh the amount of electricity purchased for use or consumption in owned or controlled sources.
24	For purchased green tariffs state the reduction in tonnes of CO ₂ e per year.
25	State the supplier and the name of the tariff.
26	State the additional carbon saving associated with the tariff as a percentage (%).
27	State in MWh the amount of electricity generated from owned or controlled sources. State if the owned or controlled source is onsite or offsite.
28	State if applicable in MWh the amount of own generated renewable electricity exported to the grid and if this is backed by REGOs within the UK.
29	State in MWh the amount of heat generated from owned or controlled sources. State if the owned or controlled source if offsite or onsite.

Chapter 4: Water

This chapter covers the impact that water and its use can have on your business, ways to measure and report on it and water use in:

- your direct operations; and
- your supply chain.

There is also information on a range of tools available to help you evaluate or understand the implications of water as a resource in your business in Annex I. The annex explores in greater detail the background behind the reporting recommendations below.

Chapter 7 on emissions gives information on discharge consents and emissions of nutrients, organic pollutants and metals to water. Chapter 5 on waste covers waste water alongside information on discharge consents.

Why this matters to business

Good management of water resources can provide opportunities to build relationships with local communities, demonstrate leadership, improve or maintain brand reputation, and reduce costs.

By understanding your use of water you will be able to consider efficiency measures leading to direct cost savings. There are number of basic steps you can take to reduce water use and wastage in your own buildings and operations. Simply ensuring that fixtures and fittings are water efficient and educating staff to use them in a more sustainable way, will help reduce water usage. Water audits are available through most water companies and suppliers. There is also more about resource efficiency in chapter 6.

There are risks to businesses concerning water that fall into four broad categories: physical, reputational, regulatory, and litigation risk and more detail can be found in annex I.

What to measure and what to report

A first step in considering your water is to understand where your supply comes from: is your water abstracted, supplied, collected/harvested or a mixture of these?

Your water company should be able to provide you with all the detail you need regarding water supplied to you. If you abstract water, compliance with abstraction consents, such as those provided by the Environment Agency

should be reported. The majority of charges are levied according to the licensed volume, but actual volumes abstracted are reported to the Environment Agency in England and Wales, SEPA in Scotland and the DOENI in Northern Ireland. The data provided for this can be used for your reporting. If exact figures cannot be given, estimation techniques should be used. Direct abstraction should be reported as the volume taken, not the licensed volume, per annum.

You should have systems in place in to identify where your water has been re-used, recycled, returned to source or discharged to sewer. From the figures of your total volume of water used (both supplied and abstracted), confirm the proportion of this that is reused, and the amount and quality that is returned to source, via consented discharge to a water course, direct to sewer or elsewhere. This data should be reported in m³/year against the volume of water used, and the volume of water abstracted. If an exact figure cannot be given, estimation techniques should be used based on flow rates.

If you have made any investment into technologies that aim to improve your water efficiency you may wish to report on these and any targets that you have set. Information and general guidance on how your organisation can improve its water efficiency can be found at <http://www.wrap.org.uk/>

For reporting there are three key actions:

- a) Identify whether any of your direct operations are located in water-scarce regions and if so what percentage of your direct operations are located in those regions. This will enable you to identify possible risks to your business related to water scarcity and plan for this in any environmental strategy your business develops. If you are unable to do this you should explain why you are not able to identify which of your operations are located in water-stressed regions and whether you have any plans to explore this issue in the future.
- b) establish your water usage
- c) have systems in place in to identify where your water has been re-used, recycled, returned to source or discharged to sewer and whether the quality of water returned to source has been improved or degraded. Be aware of, and understand any obligations or instruments related to water.

In summary you should report:

- your supplied (mains) water used in cubic metres per annum.

- direct abstraction of water as the volume taken per annum (not the licensed volume).
- water returned to source in cubic metres per annum against the volume of water supplied, and the volume of water abstracted. Report on reused/recycled water quality and temperature. Discharge consent data can be used.
- details if you collect/harvest and use rain water.
- a narrative of any investment into technologies that aim to improve your water efficiency
- the above metrics against a base year/targets
- any strategies developed to minimise or manage the impact your water use has on the environment.

If you are using any of the tools in annex I you should detail which. The information generated from the tool should be sufficient for the needs and interest of your stakeholders and investors.

Metrics/ Normalisation factors

You may wish to normalise your water data to enable comparison across product streams, locations, etc. [Guidance](#) on page 11 provides you with more information on intensity ratios/metrics. If you are presenting data that is normalized please give a brief explanation of the ratios/metrics you have used.

What to measure and what to report in your supply chain

Water scarcity in other parts of the world will impact on UK businesses, especially those that are dependent on imports of materials or components (e.g. food & drink, metals, electronics sectors). With the globalisation of supply chains you may find that there are risks associated with water scarcity either directly to your operations or along your supply chains.

When recording your water usage you should, where possible identify whether any part of your supply chain is located in regions vulnerable to drought, pollution or flooding and what percentage is located in those regions.

For your supply chain, it may not be possible to record quantitative indicators as a measure of your water impact/risk. Nevertheless, engaging with suppliers and those you supply and starting to identify and record the types of risks you may be exposed to is key to managing them. A good starting place will often be asking what actions they are taking with respect to water. You should discuss where possible whether they have given any consideration to water efficiency and impacts.

In annex I there is a list of questions regarding the impacts of water use in your supply chain. Going through these will help you understand and identify the risks and opportunities that your business faces and enable you to plan and report accordingly.

In summary:

- Engage with your suppliers to establish where there are potential risks.
- Establish whether any part (how much) of your supply chain is vulnerable to water impacts.
- Encourage those in your supply chain to develop their own water efficiency measures and review their own water impacts. You could make it part of any contract review.
- Have contingency plans for managing any risks.

Chapter 5: Waste

This chapter covers waste and ways to measure and report on it. The definition of waste has been in use for over three decades and it is now embedded in the 2008 Waste Framework Directive (Directive 2008/98/EC). Article 3(1) defines “waste” as:-

“...any substance or object which the holder discards or intends or is required to discard...”

Annex J provides detailed background information regarding the management of waste, the hierarchy of waste and duty of care.

Why this matters to business

As an organisation waste and its disposal represents a cost, so the measures you take to minimise waste can have a direct financial benefit as well as making your business more environmentally friendly. A growing awareness of the circular economy, with its greater focus on resource efficiency of materials, means that the application of the waste hierarchy becomes all the more important in minimising waste and maximising efficiency.

Resource efficiency measures, even basic ones such as reusing packaging and printing double-sided, can contribute to real savings. As part of your overall environmental strategy you should be reviewing your supply chain. Making changes in your supply chain could produce savings, for example, through re-designing products/processes and services to reduce materials used and design out waste. An introduction to the principals of eco-design is available from: <http://envirowise.wrap.org.uk/uk/Topics-and-Issues/Eco-Design.html>.

For more information on resource efficiency please view [chapter 6 on materials and resource efficiency](#).

What to measure and what to report

There is a hierarchy of how to deal with your waste which has legal standing under the 2008 WFD see [Annex J](#). The Waste Hierarchy gives priority to waste prevention, followed by activities that prepare waste for re-use (e.g. cleaning, checking, repairing), followed by recycling, then other forms of recovery (including energy from waste). Disposal (e.g. landfill) is regarded as

the last resort. Under this you must take responsibility of the waste you produce and, depending on the nature of such waste, ensure that you use the best option on the hierarchy.

You will need to start measuring your waste if you are not already so that you can reduce it and manage it more sustainably. If you have a contract with a waste management company, they should be able to provide you with much of the relevant data. Establishing a relationship with your waste contractor is often a key way of understanding the waste you produce.

If you don't use a waste contractor then you can use estimation techniques that are appropriate to your operations, such as the number and weight of waste containers that leave the organisation over a set period of time. If the waste is sorted prior to collection (i.e. via recycling bins), then a more detailed measurement of specific waste can be made (e.g. tonnes of glass, cubic meters of paper).

You may already be monitoring and recording your waste through guidance produced by WRAP⁵⁰, or under regulatory requirements such as WEEE⁵¹, or via guidance produced by your Trade Association, or using the GRI indicator protocols, and the data produced for these can be used for the purpose of corporate reporting.

You should report your waste as follows:

1. Total metric tonnes per annum;
2. broken down into separate categories by weight – use the most appropriate ones for the waste you produce (e.g. paper, glass, aluminium, plastics, WEEE, aggregates, hazardous etc); and
3. the final destination of the waste reported as per the hierarchy in annex J (e.g. 30% re-used , 50% recycled, 10% incinerated with energy recovery, 10% to landfill, this can also be presented by weight or volume).
4. the above metrics against a base year and/or set targets.
5. any waste prevention activities and the expected benefits (savings) from these. This may include improvements to the design, manufacture and packaging of your products.
6. energy produced from your waste if you run an industrial process and have an on-site energy-from-waste plant.
7. any costs reduced from waste which you have sold.
8. activities undertaken to divert waste from landfill.

⁵⁰ E.g. Courtauld Commitment, Sustainable Clothing Action Plan, Halving waste to Landfill

⁵¹ Waste in Electronic and Electrical Equipment Directive 2002/96/EC

The Government sponsored initiative WRAP (Waste and Resources Action Programme) is set up to provide you with support and guidance. It works closely with a wide range of business sectors and individuals to help them reap the benefits of reducing waste, developing sustainable products and using resources in an efficient way.

<http://www.wrap.org.uk/business/index.html>

There are also initiatives in Scotland and Northern Ireland to guide you such as Zero Waste Scotland and Rethink Waste in Northern Ireland.

<http://www.zerowastescotland.org.uk/>; <http://www.rethinkwasteni.org/>

Metrics/ Normalisation factors

You should normalise your waste data to enable comparison across product streams, locations or another metric that is useful to your organisation and/or its investors and stakeholders. The guidance in the introduction (pg10) provides you with information on intensity ratios/metrics. If you are presenting data that is normalised please give a brief explanation of the ratios/metrics you have used.

Chapter 6: Resource Efficiency and Materials

This chapter covers ways to measure and report on materials in two separate ways;

- your organisation's use of materials i.e. your resource efficiency . There are very strong and clear links between measures taken to improve your resource efficiency and those to minimise your waste.
- measuring and reporting for the materials extractive industries (i.e. oil, coal, gas, peat, minerals, metals, aggregates, biomass and forestry).

The term “materials” in the context of this guidance is defined as:

- **Metals**
- **Minerals**
- **Fossil fuels** – coal, oil, gas and peat
- **Biomass, including forestry**

Why this matters to business

There are risks to your organisation in terms of increasing competition for resources, price volatility and potentially interruptions in supply. These risks are caused by a combination of factors, such as growing worldwide demand for materials, concentration of supply in a small number of countries for some materials, trade restrictions, lack of alternatives, and time lags in the supply response to increased demand. Improved resource efficiency (reuse, recycling and recovery of resources), is one of the options for mitigating these risks.

In recent years it has become increasingly apparent that there is a concern regarding the security of supply of **critical materials** that are used in a wide range of consumer goods and advanced manufacturing. A study for the European Commission has identified 14 economically important metals

subject to potential supply interruption⁵². However business use a wide range of metals, minerals and other materials and their criticality to your business will depend on a range of factors, including how important they are to your operations, the diversity of supply and how easy they may be to substitute for another. The UK has little domestic production of these type of precious metals so there is a risk management issue for businesses that use these materials, and others, directly or in their supply chains, including in the products and components they use. In terms of environmental impacts, the issues are the same as for mining of other metals and minerals although the magnitude of the energy and greenhouse gas impacts can be significantly greater than for the more common metals. The Resource Security Action Plan⁵³ provides an overview of the risks and issues, and the Government's approach to help you ensure you are more resilient to changes in supply and price of these materials. It aims to develop better coordination between businesses and industry and to make sure everyone is armed with information about the availability of these resources to make the right decisions.

By improving your resource efficiency it can help you cut costs, enhance brand value, reduce risks of exposure to volatile and high commodity prices, and improve resilience and competitiveness in global markets. Your organisation could benefit in the following ways:

- Increased productivity
- Increased economic performance
- Increased marketability
- Increased margins
- Improved environmental performance
- Reduced waste storage and disposal costs
- Reduced operational costs
- Reduced transport and logistics costs
- Reduction in utility (water, electricity, gas etc) costs
- Reduced greenhouse gas emissions

WRAP⁵⁴ and Zero Waste Scotland⁵⁵ are the principal sources of information and advice available to businesses in the UK with regard to looking at and improving your resource efficiency.

⁵² These are: Antimony, beryllium, cobalt, fluor spar, gallium, germanium, graphite, indium, magnesium, niobium, platinum group metals (PGM), rare earth elements (REE), tantalum, and tungsten.

⁵³ https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69511/pb137_19-resource-security-action-plan.pdf

⁵⁴ <http://www.wrap.org.uk>

For your operations to be as resource efficient as possible you might find it helpful to have in place a strategy which looks at your operations and the potential savings or efficiencies you could make. By identifying business critical materials and those that you use most, you can plan how to manage any potential risks around price volatility and supply disruption.

Raw Materials Extraction and Processing

Materials extraction through activities such as mining can have serious environmental impacts as extractive industries often produce large volumes of waste; use large amounts of water and have the potential, given the nature of some of the materials being extracted, for pollution to occur to the environment. You should review the chapters of this guidance on biodiversity, waste, water, and emissions to air, land and water.

If you currently operate within well established and structured sustainability guidance developed by your trade association or governing body you could use the data collected for that in your corporate reporting.

With biomass being increasingly used as a renewable source of energy, cultivation of energy products can be accompanied by significant impacts on biodiversity, for example, due to taking up large areas of natural habitats or extensive water use. Due to the nature of these activities you should also review [chapter 8](#) of this guidance on biodiversity and ecosystem services and consider whether you should report on biodiversity or ecosystem services impacts.

What to measure and what to report

Resource Efficiency

The actual metrics you report on will vary depending on your organization but could be:

- changes in consumption of key materials
- volume of material, i.e. wood purchased, against volume of that material going to waste, recycling, reuse.
- spend on low environmental impact materials as a proportion of total materials.

⁵⁵ <http://www.zerowastescotland.org.uk/>

Your reporting will be strengthened if :

- you measure the above metrics against a base year and/or set targets.
- provide a narrative on initiatives to continually improve the environmental performance of a company's operations, for instance on energy and water efficiency, raw material efficiency, waste minimisation and resource recovery projects, including the use and sharing of best available practices in environmental management or any existing stewardship schemes in operation.

If your organisation is already monitoring and recording materials use through voluntary agreements set up by WRAP such as the Construction and Courtauld2 Commitments (see annex K for further detail) you can report the results in your corporate report.

Raw Materials Extraction and Processing

If your main business is in the extractive industries, such as, oil, coal, gas, peat, minerals, metals, aggregates, biomass and forestry products it is likely that you record your production levels and publish a yearly statement of these as this demonstrates your core business activity. In addition to these headline figures, you should also consider what environmental impacts are relevant.

The GRI has specific sector supplements for the Oil and Gas Sector and Mining and Metals. IPIECA is the global oil and gas industry association for environmental and social issues and they provide a substantial body of guidance on environmental and sustainability reporting.

<http://www.ipieca.org/focus-area/reporting>

If you are managing, recording and reporting through one of these you can use this data for your reporting. You should also highlight the key points of any Environmental Impact Assessment survey and your response to those points.

Possible reporting measures

- Where materials extraction has either **positively or negatively affected species and habitats** before, during and after their operational life-span, this should be reported. These impacts are relevant to indicators on biodiversity and ecosystem services and further information can be found in chapter 8.

- If you are a large user of aggregates you should **record and report the source of aggregate used i.e. the percentage split between mined and recovered aggregate material** as this will demonstrate your commitment to efficient use of resources. This also links closely to chapter 5 on waste and the waste hierarchy.
- If you are using significant amounts of biomass, or if the use of biomass is critical to your operation, you should report on the origins of your biomass source and the **amount used in metric tonnes per annum dry weight**.
- Harvested timbers and other wood products, as well as residues of harvesting, should be reported in **absolute cubic meters per annum by type** of wood (prior to any drying process).
- The geographical area that the wood was sourced from, whether from the organisation's own plantation or outsourced producers and any evidence of whether the wood was sourced from sustainably managed forests should also be reported.
- You may find it useful to state whether the species harvested is listed on the Convention of International Trade in Endangered Species of Wild Fauna and Flora (CITES) and whether the species are Forest Stewardship Council (FSC)-certified, recycled or from sources that protect forest and communities.

You should have a clear auditable supply chain for your materials and ensure where possible that your key materials are sustainably sourced and produced against recognised or certifiable standards such as FSC, MSC, Fairtrade or initiatives such as joint [The Strategy for Sustainable Construction](#)⁵⁶. The UK Government Central Point of Expertise on Timber ([CPET](#))⁵⁷ is also a useful resource.

Normalisation factors

You may wish to normalise your resource efficiency data to enable comparison that is useful to your organisation and/or its investors and stakeholders. Guidance in section two of the introduction (pg10) provides you with information on intensity ratios/metrics. If you are presenting data that is

⁵⁶ <http://www.bis.gov.uk/files/file46535.pdf>

⁵⁷ <http://www.cpet.org.uk/>

normalized please give a brief explanation of the ratios/metrics you have used.

Chapter 7: Emissions to Air, Land and Water

This chapter covers reporting of emissions to air, land and water, with the exception of greenhouse gases which are dealt with separately in [chapters 2](#) and [3](#).

The aim of this chapter is to help you focus on those emissions (intentional or accidental) from your organisation's operations and processes and how to report on them, including using information from current permitting regimes.

The table below summarises the main emissions and where they are likely to be emitted (air/land/water). The Annex to this chapter explores in greater detail the background behind the reporting recommendations and provides further details about the relevant legislation.

Emission	Air	Land	Water
Oxides of nitrogen	x		
Particulate matter (PM)	x		
Sulphur oxides	x		
Acid and Organic chemicals	x	x	x
Nutrients and organic pollutants		x	x
Volatile organic compounds (VOCs)	x		
Metal emissions	x	x	x

Why this matters to business

Emissions to the environment have a range of impacts and the effects are varied: emissions to air have negative impacts on human health and the natural environment; 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; Volatile Organic Compounds (VOCs) can cause significant pollution and disruption to aquatic habitats. Significant discharges of organic waste (nutrients) into bodies of water can cause damage to life in rivers, lakes, estuaries, coastal and marine waters. While nutrients have an indirect effect on oxygen levels, oxygen-demanding pollutants have a direct effect.

You should be aware of your organisation's products, operations and processes and know whether any of these lead to any emissions, where these occur and whether it is during production, during the lifetime of the product or at the end of the product's use.

The risks outlined in [Chapter 4](#) on water are also relevant here, with the potential for reputational, regulatory and litigation risks where you do not monitor and manage your emissions. There are also potential costs associated with accidents and spillages for clean up and restoration. Conversely there are potential reputational benefits and market opportunities when your organisation is seen as leading the field in managing its emissions.

Emissions can also occur through, or been seen as, wastage through poor design, inefficient operations or business practices. You should review [Chapter 6](#) on materials and resource efficiency and [Chapter 5](#) on waste when considering what to report.

What to measure and report

The first step is to consider your organisation, your products and your supply chain and where there might be emissions. Whilst we are not suggesting you should report on the emissions of your supply chain it is important to recognise that emissions do occur as a result of your organisation's activities, for example, air emissions affecting air quality through transportation of goods. If you understand where emissions do occur in your supply chain you can consider what you can do to minimise them. Putting in place an environmental management system such as those listed [on page 9](#) can help you do this.

If your organisation produces large amounts of emissions you are likely to be a regulated businesses covered by legislative controls. The information you are required to record for compliance to this legislation, i.e. your permitting and discharge consents, can be used for corporate reporting.

The Environmental Permitting (England and Wales) Regulations 2010⁵⁸ bring most emissions permitting under one environmental permitting process; separate arrangements are applicable in Scotland and Northern Ireland. Operators of some activities must also ensure they meet the [European Pollutant Release and Transfer Register](#) (E-PRTR) Regulation⁵⁹ requirements which requires those operators to quantify and report the amounts of substances released to each environmental medium (air, water, soil) or transferred off-site for waste management or wastewater treatment. Your reporting of emissions also links directly to your materials use ([Chapter 6](#)). Some permit holders are required to report on resource efficiency measures using the Resource Efficiency Physical Index (REPI) metrics⁶⁰ and this data can be used for reporting against resource efficiency in that chapter.

The Offshore Chemical Notification Scheme ([OCNS](#))⁶¹ manages chemical use and discharge by the UK offshore petroleum industries. The scheme is regulated in the UK by the Department of Energy and Climate Change. If you operate in this sector you may wish to use your OCNS data/returns in your corporate reporting.

If your activities are subject to environmental permitting as outlined above, you should:

- report against environmental permits and discharge consents. The data you provide for this can be used to give summary data on your levels of emissions and used for the purposes of corporate reporting.

Transport, Logistics, Vehicle use

Euro standards seek to reduce pollutant emissions released into the air from vehicles. Since 1991, the standards have progressively tightened as the European Commission has demanded emissions limits to curb the release of air pollutants such as oxides of nitrogen, particulate matter and hydrocarbons. The renewal of vehicle fleets to higher Euro standards can help to reduce air pollution alongside other operational measures such as driver training, route management and reduced empty running which lowers fuel usage and ultimately carbon. You should:

⁵⁸ <https://www.gov.uk/government/policies/protecting-and-enhancing-our-urban-and-natural-environment-to-improve-public-health-and-wellbeing>

⁵⁹ http://www.environment-agency.gov.uk/static/documents/Business/eptr_guidance_doc_1426519.pdf

⁶⁰ http://www.environment-agency.gov.uk/static/documents/Business/The_REPI_Metrics_and_Guidance.pdf

⁶¹ <http://www.cefas.defra.gov.uk/industry-information/offshore-chemical-notification-scheme.aspx>

- review your logistics and any freight or transport operations that your organisation may have.
- If you have or use a vehicle fleet you should report how this fleet measures against the Euro standards.

The Freight Transport Association⁶² has on its website advice and guidance on the Euro standards.

Your reporting will be strengthened if you report against:

- the metrics of your permits or discharge consents set against a base year /targets
- abatement technologies in place,
- plans for substitution where feasible or to move to safer alternatives
- investments made to clean up your processes. This also links to [Chapter 6](#) on resource efficiency and materials.

Accidents and spillages

If there are any breaches of the permits set for your organization or accidental emissions or spills, you should record and report:

- the type of emission
- the substance and amount (weight or volume) emitted
- the absolute number of spills should be reported, and
- the volume of individual spills if they are significant.

You should also report on any investments made to prevent future accidents/spills.

If the treatment method for clean up after a spillage is the disposal of any land that has been contaminated then this should be reported according to the criteria set out in [Chapter 5](#). You should also consider the implication of any accident or spillage on biodiversity and report on any action undertaken.

⁶² http://www.fta.co.uk/policy_and_compliance/environment/vehicle_emissions.html

What to report if outside the scope of EPR and EPRTR

Where you have sites that are in countries that are not signatories to the Aarhus conventionⁱ and as such not required to keep a Pollution Release and Transfer Register (PRTR), you should report on whether these sites meet a standard comparable to those within the EU and generate a PRTR. If the country where the operation is located has a comparable reporting standard you should report or include the data from that standard. If not you should endeavour to be operating all sites to best practice.

You should review your activities to identify any potential emissions and consider whether these are of material risk to your business. Where your emissions are material, you should record what these emissions are (substance), the amount (weight/volume) of the substance emitted (estimation methods may be used) on the basis of what you do not measure you cannot manage.

Your reporting will be strengthened if you report on abatement technologies in place, any plans for substitution where feasible, or investments made to clean up your processes, whether this is ensuring your vehicle fleet runs on low sulphur fuel and has catalytic converters, or capture and collection methods or changes to your processes.

Metrics/ Normalisation factors

You should normalise your waste data to enable comparison across product streams, locations or another metric that is useful to your organisation and/or its investors and stakeholders. The guidance in chapter 1 (pg11) provides you with information on intensity ratios/metrics. If you are presenting data that is normalised please give a brief explanation of the ratios/metrics you have used.

Statutory Nuisance Control Orders

These link to the production of excessive amount of odours, noise, lights and smoke for example and other antisocial practices.. If you are subject to statutory nuisance control order, you should mention this in your corporate reporting and your efforts to contain the issue.

Chapter 8: Biodiversity and Ecosystem Services

This chapter covers the measurement and reporting of biodiversity and ecosystem services (BES). It:

- Explains the concepts of BES, and how they are linked
- Explains why BES are an important organisational consideration
- Provides guidance on how to assess and report on BES that may impact on your organisation
- Suggests how organizations should select and develop performance indicators for BES, to measure their dependency on them (and therefore identify risks) and to measure their direct and indirect impacts.

[Annex M](#) explores in greater detail the definitions of, and background behind, BES and the reporting recommendations below.

Why should this matter to business

Biodiversity is declining, in the UK and globally, despite an increasing understanding of both its importance and the factors that are driving the decline (land use practices, pollution, deforestation, habitat fragmentation, over-consumption of resources, climate change etc).

The natural environment, including its biodiversity, provides us with valuable benefits, known as “ecosystem services”, that are critically important for our economic prosperity and wellbeing⁶³. These benefits include cleaning air and water, providing food, timber and other resources, pollinating our crops, regulating flooding and giving us health, wellbeing and recreational benefits. A healthy, properly functioning natural environment is the foundation of a healthy economy and society.

Exploring the ecosystem services that your organisation is dependent upon allows you to understand the potential impacts that your business could be

⁶³ UK National Ecosystem Assessment, 2011, http://archive.defra.gov.uk/environment/natural/documents/UKNEA_SynthesisReport.pdf

having on biodiversity and the wider environmental systems it supports, as well as any key risks that may stem from these dependencies. They may also be opportunities, such as new or expanding markets for ecosystem services.

Your organisation can potentially have **direct** and **indirect** interactions with biodiversity and ecosystem services, and impacts can be either **negative** (e.g. degrading the quality/quantity of biodiversity or ecosystem services) or **positive** (e.g. creating a net contribution to the quality/quantity of biodiversity or ecosystem services).

Direct impacts can occur when your organisation's activities physically affect land, air or water environments and the organisms that occupy them, and examples are: developing land that was previously undeveloped which can displace a wide range of species; extracting water for irrigation can alter the amount of water reaching rivers and lakes, which in turn impacts upon the species that occupy them; emissions of toxic pollutants into the environment can damage or kill organisms. Direct impacts can also have a positive effect, for example, including measures that benefit wildlife and/or public enjoyment in management and maintenance regimes for landholdings and buildings.

Indirect impacts can arise from activities carried out by parties in your supply chain(s) or impacts associated with the use of your products/services. Indirect impacts may be difficult to predict and manage, but they can in some instances be far more significant than direct impacts. They can also present fundamental risks to business resilience, and understanding the impacts of your supply chain on BES can help identify potential vulnerabilities. This challenge is amplified in large global supply chains where materials are sourced from countries that are, for example, highly water stressed, or where valuable natural resources (e.g. rain forests) are being removed to enable the production of other agricultural commodities whose market value may not truly reflect the wider ecosystems value of the resource they replaced. These issues can be damaging for an organisation's reputation, but also highlight potential vulnerabilities and risks where there is a reliance on sensitive environmental systems.

Understanding your organisation's impacts and dependencies can help you manage and reduce risks and potentially highlight new business models and market opportunities, such as:

- New technologies and products – that will serve as substitutes, reduce degradation, restore ecosystems or increase efficiency of ecosystem service use;

- New markets – water quality trading, certified sustainable products, wetland banking and biodiversity offsetting;
- New revenue streams – for assets currently unrealised such as wetlands and forests, but for which new markets or payments for ecosystem services could emerge.

What to measure and report

As noted in The Economics of Ecosystems and Biodiversity (TEEB) Report⁶⁴ “the challenge is to establish reliable information management and accounting systems that can provide relevant information on biodiversity and ecosystem services to support operational decisions (e.g. the choice of production technology), to inform financial valuations or project assessments (e.g. capital investment), and for internal and external reporting”. This section aims to help you understand how you might go about measuring and reporting on biodiversity and ecosystems.

Assessing impacts and dependencies on biodiversity and ecosystems presents a challenge as they may be outside the boundaries of your organisation’s operations and changes in an ecosystem are typically not solely the result of your organisation’s activities. Unlike other environmental indicators, there is no single easily quantifiable unit that can be recorded or measured.

You should aim to integrate BES reporting into the reporting of the other aspects of this guidance i.e. water, greenhouse gas emissions, etc. For example, as well as measuring water use in your operations, you may want to consider the impact of activities in your supply chain on water resources and on the wildlife which they support.

There are a number of steps we recommend you consider when thinking about how to measure and report on biodiversity and or ecosystem services in relation to your organisation:

Step 1 – Identify the main interactions your organisation has with the natural world and identify the ecosystem services that your business relies upon or impacts. Organisations that have in place an accredited environmental management system (EMS) should already be identifying the risks to biodiversity their activities may pose. There are a number of areas

⁶⁴ <http://www.teebweb.org/>

that your organisation can review in order to understand its direct biodiversity interactions. You can:

- Identify biodiversity features and impacts on landholdings controlled by your organisation (including any high value environmental assets e.g. woodland, rivers);
- Establish the proximity of your sites to important wildlife features, e.g. SSSI's, SACs/SPAs, nature reserves
- Explore opportunities for including biodiversity features in your buildings and landholdings (green roofs, ponds, trees, wildlife gardens) that can offer a range of benefits including habitat creation, green corridors, recreation/amenity, solar shading, positive public perception, rain water/ flood attenuation); and
- Assess the scale of air, water, noise, and light emissions that may impact on the environment.

There are a number of areas that your organisation can review in order to understand its indirect biodiversity interactions. You can:

- Audit supply chain policies on biodiversity.
- Establish the origin of materials, and determine whether they are supplied from highly biodiverse or water stressed regions.
- Understand the biodiversity impacts associated with the use of your products and services (e.g. provision of finance for activities that encourage deforestation, emission of pollutants, production of hazardous waste/ by-products).

Step 2 – Select a set of priority biodiversity and ecosystem interactions that your organisation can influence, and develop these into clear targets for your organisation. It will be easier if you start simply with just one or two indicators, or a specific site, and set out your intention.

Step 3 - Develop indicators that will allow your organisation to monitor trends against the key interactions identified in step 2. Developing indicators is best viewed as an iterative process. Start by doing what is possible with your current levels of information. Use available knowledge and indicators as a starting point, adopting a small set of specific, business-relevant indicators. Focus your resources to address your key elements i.e. those most relevant to your organisation and any information gaps. No single indicator can tell the

full story. A combination of indicators ought to provide a comprehensive overview of your organisation's performance. A narrative that explains the indicator and identifies the relationship linking performance and impacts will aid comprehension.

Where direct measures are not yet developed or where there is no data, good proxy indicators can be used. There is potential for employing biodiversity indicators (which are generally more well developed) as proxies to indicate something about the flow of an ecosystem service (which is often difficult to measure or lacking in data), as long as the linkages between the two are well understood. However, although in some categorisations biodiversity is classified as an ecosystem service they are not inter-changeable. It is important not to lose sight of the importance of biodiversity by focusing only on ecosystem service benefits.

The World Resources Institute ecosystem service indicators database⁶⁵ can also be used as a source of reference on ecosystem services.

Step 4 – Establish data and reporting requirements. If using a tool, report which one and set out the data sources and input parameters. There are many tools available⁶⁶ and recently there has been a focus on integrating BES data sets and indicators within pre-existing organisation decision-making frameworks, notably ISO standards (14000)⁶⁷, the Global Compact Performance Model and the Global Reporting Initiative's reporting framework. If you are using one of these this can be used as part of your reporting.

The EU Business and Biodiversity platform has pulled together a non-exhaustive list of cross-sectoral biodiversity and ecosystems toolkits which could be used to assist in the measurement and monitoring of biodiversity and ecosystem interactions⁶⁸.

Step 5 - Develop a business strategy in response to the findings in step 2 (above). You should report on what systems and structures you have in place to reduce any impact and to ensure the benefits gained are maintained. You should have a strategy to reduce the negative impact of your organisation's operations and products on the environment, maximise potential new

⁶⁵ http://www.esindicators.org/indicator_details/1776

⁶⁶ [WBCSD CEV MIMES inVEST](#), [ARIES IBAT](#) Integrated Biodiversity Assessment Tool, [Natural Value Initiative](#) Environmental Impact Assessments (EIA), roundtables and standards, biodiversity offsets, NGO partnerships, investor questionnaires such as SAM (Sustainable Asset Management) and CDP

⁶⁷ <http://www.iso.org/iso/home/standards/management-standards/iso14000.htm>

⁶⁸ <http://www.business-biodiversity.eu/global/download/%7BEWONBFPFXE-10312011145629-QVBVDVTBVX%7D.pdf>

business opportunities and increase activities that restore and preserve habitats. A local strategy may be appropriate for site specific considerations such as where your estate covers an SSSI⁶⁹ or a particular habitat. The emphasis should be on a management plan with mitigation measures or abatement technologies utilised to reduce environmental pressures and a narrative of how these measures will result in reduced impacts on BES.

Step 6 – Report on your biodiversity and ecosystem services performance, and present information on any additional biodiversity related initiatives deployed such as offsets. If you use offsetting in your work, you might want to report on:

- The methodology used to calculate the impact of your development
- The site you have chosen as an offset, and
- How you have used the methodology to ensure there will be no net loss of biodiversity.

Offsetting work should be considered as an additional tool in managing and reporting on impacts on biodiversity and ecosystems, and not a substitute for it. (For further details on offsetting see [Annex G](#)).

⁶⁹ <http://publications.naturalengland.org.uk/publication/50008>

Annexes

Annex A: Organisational boundary

This section looks in more detail at the approaches to setting organisational boundaries.

Control can be defined in either financial or operational terms. In most cases, whether an operation is controlled by the organisation or not does not vary based on whether the financial control or operational control approach is used. A notable exception is the oil and gas industry, which often has complex ownership/operator structures.

Financial control

An organisation has financial control over the operation if the former directly or indirectly has the ability to direct the financial and operating policies of the latter with a view to gaining economic benefits from the operation's activities. For example, financial control usually exists if the organisation has the right to the majority of benefits of the operation. Similarly, an organisation is considered to financially control an operation if it retains the majority risks and rewards of ownership of the operation's assets.

An organisation has financial control over an operation for environmental reporting purposes if the operation is considered a subsidiary for the purposes of financial reporting, i.e., if the operation is fully consolidated in the reporting organisation's financial statements. This approach follows the guidance set out in International Financial Reporting Standards (IFRS) and in UK Generally Accepted Accounting Principles (GAAP), such that the economic substance of the relationship takes precedence over the legal ownership. Therefore a company may have financial control over an operation even if it has less than a 50 percent interest in that operation.

Financial control covers a similar group of entities to those within the financial statement. Associates are exceptions as they are represented within the financial statement, but are excluded from the financial control boundary for environmental reporting purposes as they are not under the control of the parent organisation.

Operational control

An organisation has operational control over an operation if the former or one of its subsidiaries has the full authority to introduce and implement its operating policies at the operation. Such arrangements commonly arise in the oil and gas industry, where one of the investors in a joint venture or consortium is nominated to operate the joint venture activity on behalf of other investors.

Equity share

The equity share reflects the extent of the rights a company has to the risks and rewards from an operation based on an organisation's equity interest. Equity share will therefore be the same as the ownership percentage.

Climate Change Reporting Framework (CCRF)

The [Climate Disclosure Standards Board](#)'s CCRF requests reporting on impacts from entities within the financial control boundary – categorized as “Part 1”. The impacts of associates are reported as a separate item in Part 2. This provides alignment with the financial control approach of the GHG Protocol Corporate Standard while also enabling emissions from investments in associates to be reconciled to the entities within the consolidated financial statement.

It also requests that the impacts of the following entities are reported as Part 2 items.

Impacts from entities that are operationally-controlled and/or other entities/activities/facilities that:

- a) are not consolidated in Part 1;

and

- b) must be reported under regulatory requirements by the disclosing organisation in its capacity as operating licensee or in any other capacity (e.g. tenant);

or

- c) due to the nature of the contract for the operation or use of the entity/activity/facility:
 - i. expose the reporting organisation to risk, opportunity or financial impacts;

or

ii. enable the reporting organisation to influence the extent to which GHGs are emitted.

This approach has the advantages of providing a comprehensive set of data and alignment with other reporting practices.

The following table shows how to consolidate environmental impacts according to the approaches described above. Columns three, four and five show the percentage of the environmental impact that should be summed to reach a total.

Table 1: Accounting for environmental impacts

			Control Approach	
Accounting classification	Accounting definition	Equity share approach	Financial control	Operational control
Group companies = parent company and subsidiaries	The investor controls the operation through its ability to direct the financial and operating policies of the operation with a view to gaining economic benefits. Typically, the investor holds more than 50% of the voting rights of the operation.	Equity share of the impact	100% of the impact	100 percent of the impact if operational control
Associates	The investor has significant influence over the financial and operating policies of the operation but	Equity share of the impact	0% of the impact	100 percent of the impact if operational

	does not have control. Typically, the investor holds less than 50% of the voting rights of the operation.			control 0 percent of the impact if no operational control
Joint ventures	A joint venture is defined as: <i>a joint arrangement whereby the parties that have joint control of the arrangement have rights to the net assets of the arrangement</i> ⁷⁰	Equity share of the impact	Equity share of the impact	100 percent of the impact if operational control 0 percent of the impact if no operational control
Joint operations	A joint operation is defined as: <i>a joint arrangement whereby the parties that have joint control of the arrangement have rights to the assets, and obligations for the liabilities, relating to the arrangement</i> ⁷¹ .	Equity share of the impact	Equity share of the impact	100 percent of the impact if operational control 0 percent of the impact if no operational

⁷⁰ IFRS 11:16 & Appendix A

⁷¹ IFRS 11:15 & Appendix A

				control
Other equity investments	The investor does not have control, joint control or significant influence over the operation.	0% of the impact	0% of the impact	0% of the impact
Franchises	A franchise is a separate legal entity usually not under the financial or operational control of the franchiser, and which gives the franchise holder rights to sell a product or service. Where the franchiser holds an equity interest in the franchise, the treatments described above will apply.	0% of the impact, unless the franchiser holds an equity interest	0% of the impact unless the franchiser holds a controlling equity interest	100% share of the impact if the franchiser has operational control 0% of the impact if the franchiser does not have operational control

Leases

If you own leased assets you should follow the same consolidation approach for including the environmental impacts from the leased assets as you have used for your organisational boundary. However you will need to know what type of lease applies to your assets. See the [GHG Protocol's leased assets document](#) for more information.

Annex B: Process Emissions

The table below enables you to identify which of these GHGs your organisation is likely to emit. The dark areas represent the gases that are likely to be produced/emitted. The processes are those typically used in the UK. Process emissions might be slightly different for processes in other countries.

Process related emissions ¹							
Process		Emission					
		CO ₂	CH ₄	N ₂ O	PF ₅ C	SF ₆	HF ₂ C
Mineral Products	Cement Production						
	Lime Production						
	Limestone Use ⁷²						
	Soda Ash Production and Use						
	Fletton Brick Manufacture ⁷³						
Chemical Industry	Ammonia						
	Nitric Acid						
	Adpic Acid						
	Urea						
	Carbides						
	Caprolactam						
	Petrochemicals						
Metal Production	Iron, Steel and Ferroalloys						
	Aluminium						
	Magnesium						
	Other Metals						
Energy Industry	Coal mining						
	Solid fuel transformation						
	Oil production						
	Gas production and distribution						
	Venting and flaring from oil/gas production						

⁷² For use of limestone in Flue Gas Desulphurisation (FGD) and processes such as those in the glass industry. Not all uses of limestone release CO₂.

⁷³ This is specific to Fletton brick manufacture at the mineral processing stage, a process that uses clay with high organic content. Other types of brick manufacturing in the UK do not release Greenhouse Gases during the processing stage.

Other	Production of Halocarbons						
	Use of Halocarbons and SF ₆						
	Organic waste management						

Source: Greenhouse Gas Inventory Reference Manual, Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories (IPCC, 1997) adapted for UK processes by AEA.

If you have identified process emissions of GHG other than those covered in this Annex these may be converted to carbon dioxide equivalents by using the factors provided in UK Government conversion factors.

Annex C: GHG Emissions from Use of Refrigeration, Air Conditioning Equipment and Heat Pumps

Air conditioning and refrigerators can leak leading to GHG emissions. If you own or control the equipment, you should report the emissions under scope 1. However, these emissions may fall into scope 3 for other companies benefitting from the equipment.

There are two methods presented here for the estimation of emissions from the use of refrigeration, air conditioning equipment and heat pumps. For smaller users, the Screening Method will likely be the easiest way to calculate their emissions. Some larger users of refrigerant should have the information necessary to perform a more accurate estimation using the Simplified Material Balance Method.

Please note, there are also regulatory requirements governing the operation of stationary equipment using fluorinated greenhouse gases. See information on F-gas regulations on the Defra website.

Screening Method

This Screening Method will help you to estimate emissions from refrigeration, air conditioning and heat pumps based on the type of equipment used and emissions factors. This approach requires relatively little actual data collection because default factors are used instead e.g. installation emission factors, annual leak rate. However there is a high degree of uncertainty with these factors. Therefore if emissions from this equipment are determined to be significant when compared to your organisation's other emissions sources, then you should apply a better estimation method (e.g. a Material Balance Method).

To complete these tables you will need to:

1. Carry out an inventory of equipment

Find out the following information on refrigerant type and charge capacity.

- (i) the number and types of each refrigeration/air conditioning/heat pump unit;
- (ii) the type of refrigerant used (e.g. HFC 134a, R404a, etc);
- (iii) the total charge capacity of each piece of equipment (charge capacity is the mass of refrigerant used in the equipment). Typical values are shown below:

Typical Charge Capacity for Equipment	
Type of Equipment	Typical Range in Charge Capacity (kg)
Domestic Refrigeration	0.05-0.5
Small Hermetic Stand-Alone Refrigeration Units	0.2-6.0
Condensing Units	50-2,000
Centralised Supermarket Refrigeration Systems	50-2,000
Industrial Systems	10-10,000
Small Stationary Air Conditioning	0.5-100
Medium Stationary Air Conditioning	0.5-100
Large Stationary Air Conditioning (Chillers)	10-2,000
Heat Pumps	0.5-100
Land Transport Refrigeration	3 - 8
Marine Transport Refrigeration	3 - 8
Light-Duty Mobile Air Conditioning	0.5-1.5
Other Mobile Air Conditioning	0.5-1.5

- (iv) the time in years used during the reporting period (e.g. 0.5 if used only during half of the reporting period then disposed);

2. Once you know the refrigerant type, please refer to the UK Government Conversion Factors to identify its Global Warming Potential (GWP).

3. Determine installation emissions

Identify any new equipment that was installed during the reporting period and was charged (filled) on-site. The typical amount is shown in the column headed "Installation Emissions Factor %". Emissions from equipment that was charged by the manufacturer are not the responsibility of your organisation. For each new piece of equipment charged on-site estimate emissions:

Emissions from Installation of Refrigeration and Air-conditioning Equipment

Type of Equipment	Number of Units	x	Equipment Charge Capacity (kg)	x	Installation Emission Factor %	x	Global Warming Potential of refrigerant ⁷⁴	=	Total kg CO ₂ equivalent
Domestic Refrigeration		x		x	0.6	x		=	
Small Hermetic Stand-Alone Refrigeration Units		x		x	1	x		=	
Condensing Units		x		x	2	x		=	
Centralised Supermarket Refrigeration Systems		x		x	2	x		=	
Industrial Systems		x		x	1	x		=	
Small Stationary Air Conditioning		x		x	0.5	x		=	
Medium Stationary Air Conditioning		x		x	1	x		=	
Large Stationary Air Conditioning (Chillers)		x		x	0.5	x		=	
Heat Pumps		x		x	1	x		=	
Land Transport Refrigeration		x		x	0.2	x		=	
Marine Transport Refrigeration		x		x	1	x		=	
Light-Duty Mobile Air Conditioning		x		x	0.5	x		=	
Other Mobile Air Conditioning		x		x	0.5	x		=	
Total									

⁷⁴ See the latest UK Government Conversion Factors <https://www.gov.uk/measuring-and-reporting-environmental-impacts-guidance-for-businesses>

4. Determine operating emissions

Estimate losses from equipment leaks and service losses over the life of the equipment. For all pieces of equipment, use the table below. You will need to determine the length of time (in years) that each piece of equipment has been used.

Emissions from Installation of Refrigeration and Air-conditioning Equipment

Type of Equipment	Number of Units	x	Equipment Charge Capacity (kg)	x	Time used during reporting period (years)	x	Annual Leak Rate %	x	Global Warming Potential of refrigerant	=	Total kg CO ₂ equivalent
Domestic Refrigeration		x		x		x	0.3%	x		=	
Small Hermetic Stand-Alone Refrigeration Units		x		x		x	1.5%	x		=	
Condensing Units		x		x		x	10.0%	x		=	
Centralised Supermarket Refrigeration Systems		x		x		x	17.0%	x		=	
Industrial Systems		x		x		x	8.0%	x		=	
Small Stationary Air Conditioning		x		x		x	3.0%	x		=	
Medium Stationary Air Conditioning		x		x		x	6.0%	x		=	
Large Stationary Air Conditioning (Chillers)		x		x		x	3.0%	x		=	
Heat Pumps		x		x		x	6.0%	x		=	
Land Transport Refrigeration		x		x		x	15.0%	x		=	
Marine Transport Refrigeration		x		x		x	39.0%	x		=	
Light-Duty Mobile Air Conditioning		x		x		x	10.0%	x		=	
Other Mobile Air Conditioning		x		x		x	10.0%	x		=	
Total											

5. Determine disposal emissions

Identify any pieces of equipment that were disposed of on-site during the reporting period. Emissions from equipment that was sent offsite for third party recycling, reclamation or disposal are not the responsibility of your organisation. For each piece of disposed equipment, use the table below to estimate emissions.

Emissions from Disposal of Refrigeration and Air-conditioning Equipment

Refrigerant Type	Number of Units	x	Equipment Charge Capacity (kg)	x	Capacity remaining at disposal (%)	x	Refrigerant recovered (%)	x	Global Warming Potential of refrigerant	=	Total kg CO ₂ equivalent
Domestic Refrigeration		x		x	80%	x	65%	x		=	
Small Hermetic Stand-Alone Refrigeration Units		x		x	80%	x	60%	x		=	
Condensing Units		x		x	80%	x	85%	x		=	
Centralised Supermarket Refrigeration Systems		x		x	100%	x	92%	x		=	
Industrial Systems		x		x	100%	x	85%	x		=	
Small Stationary Air Conditioning		x		x	80%	x	70%	x		=	
Medium Stationary Air Conditioning		x		x	80%	x	70%	x		=	
Large Stationary Air Conditioning (Chillers)		x		x	80%	x	80%	x		=	
Heat Pumps		x		x	80%	x	66%	x		=	
Land Transport Refrigeration		x		x	50%	x	80%	x		=	
Marine Transport Refrigeration		x		x	50%	x	71%	x		=	
Light-Duty Mobile Air Conditioning		x		x	50%	x	70%	x		=	
Other Mobile Air Conditioning		x		x	50%	x	70%	x		=	
Total											

6. Calculate total emissions

Add the emissions from each piece of equipment for each of emission - installation, operation and disposal - to get total emissions. Calculate separate totals for each type of refrigerant used.

Simplified Material Balance Method

This will enable more accurate estimation of refrigerant leakage than the previous method because it requires you to record the quantities of refrigerants that you have used rather than relying on default factors.

1. Calculate installation emissions

This step is only necessary if your organisation installed any new equipment during the reporting period that was not pre-charged by the equipment supplier. Emissions are calculated by taking the difference between the amount of refrigerant used to charge the equipment and the total capacity of the equipment. The difference is assumed to be released into the environment.

2. Determine equipment servicing emissions

Equipment servicing emissions result from the refrigerant that is used to service operating equipment. It is assumed that the servicing refrigerant is replacing the same amount that was lost to the environment.

3. Calculate disposal emissions

This step is only necessary if your organisation disposed of equipment during the reporting period. Emissions are calculated by taking the difference between the total capacity of the equipment disposed and the amount of refrigerant recovered. The difference is assumed to be released to the environment.

4. Calculate emissions

Emissions are calculated by summing the results of the first three steps. This approach should be used for each type of refrigerant and blend. Bear in mind that some equipment may be modified to use a different type of refrigerant. In these cases, treat it as though the equipment has been retired and then installed using a new type of refrigerant.

Estimating Refrigerant Emissions with Simplified Material Balance Method													
Purchases of refrigerant used to charge new equipment (kg)	-	Total full capacity of the new equipment (kg)	+	Quantity of refrigerant used to service equipment (kg)	+	Total full capacity of retiring equipment (kg)	-	Refrigerant recovered from retiring equipment (kg)	x	Refrigerant type	Global Warming Potential (GWP)	=	Total kg CO ₂ equivalent
Refrigerant 1	-		+		+		-		x			=	
Refrigerant 2	-		+		+		-		x			=	
Refrigerant 3	-		+		+		-		x			=	
Refrigerant 4	-		+		+		-		x			=	
Refrigerant 5	-		+		+		-		x			=	
Refrigerant 6	-		+		+		-		x			=	
Refrigerant 7	-		+		+		-		x			=	
Refrigerant 8	-		+		+		-		x			=	
Refrigerant 9	-		+		+		-		x			=	
Refrigerant 10	-		+		+		-		x			=	
Total													

Sources of this data

The following sources have been used: UK Greenhouse Gas Inventory for 2011 (Ricardo-AEA); [2006 IPCC Guidelines for National Greenhouse Inventories](#); [US EPA Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance - Direct HFC and PFC Emissions from use of Refrigeration and Air Conditioning Equipment](#).

Annex D: Heat, Steam and CHP

Generating heat/steam/electricity

If you generate heat/steam by burning fuel, you can use the UK government conversion factors for different fuels to calculate the emissions. If you have a Combined Heat and Power (CHP) plant and you use all the electricity and heat that it produces, there is no need for you to allocate the emissions from the CHP plant between the electricity and heat output in your reporting. This is because you are using all the outputs from the CHP. Remember emissions from burning biomass are logged differently to those from fossil fuel: the N₂O and CH₄ emissions would be logged under your Scope 1 but the CO₂ emissions from biomass are logged separately from the scopes.

If you sell some or all of the electricity and/or heat that you produce to others, then emissions need to be allocated. In non-CHP plant, it is an allocation of the total emissions in proportion to the amount of heat/steam that they buy. If you have a CHP plant, then you need to allocate emissions between the heat and electricity first before allocating emissions between yourself and customers. There are three methods for doing this. One option is shown below; other methods are shown in the [UK Government conversion factor methodology document](#).

It is typically roughly twice as efficient to generate heat from fossil fuels as it is to generate electricity. Therefore you can attribute the GHG emissions from the CHP plant in the ratio 1:2 respectively per kWh of heat and electricity generated. Emissions per kWh of heat or electricity produced by the CHP plant may be calculated in this way using the appropriate formulae below:

$$\text{Emissions (in kgCO}_2\text{e) per kWh electricity} = \frac{2 \times \text{total emissions (in kgCO}_2\text{e)}}{2 \times \text{total electricity produced} + \text{total heat produced (in kWh)}}$$

$$\text{Emissions (in kgCO}_2\text{e) per kWh heat} = \frac{\text{total emissions (in kgCO}_2\text{e)}}{\text{total electricity produced} + \text{total heat produced (in kWh)}}$$

2 x total electricity produced + total heat produced (in kWh)

Buying heat/steam/electricity

You may buy heat or steam from others via a direct connection. Emissions associated with the heat or steam would fall into your (the customer's) scope 2. Contact the organisation that you buy from for help in calculating these emissions (you can show them the instructions above if they are unsure). If you cannot get the information from the supplier of the heat/steam, there are some default factors to use in the UK Government conversion factors though these are based on data from CHP schemes only.

Where the location of use of the heat is some distance from the point of production, there are distribution energy losses. These losses are typically around 5%, which need to be factored into the calculation of overall GHG emissions. Emissions due to losses in distribution are classed as scope 3 under the GHG Protocol Corporate Standard, so therefore only need to be accounted if you are accounting for your scope 3 emissions.

If you purchase electricity for your own consumption from a CHP plant, you should use the grid average emission factor to calculate your emissions.

Annex E: Supply chain emissions

How to use the table:

- 1) Identify the amount spent on different product groups (in prices in £s, including VAT).
- 2) Multiply the amount of spending by the conversion factor to get total emissions in kilograms of carbon dioxide equivalent (kg CO₂e). The factors are for products supplied for consumption in the UK. They also take account of the emissions relating to the production of products imported for intermediate consumption i.e. those products that are used by UK industries in the process of supplying products for consumption in the UK. The estimates do not incorporate any allowance for emissions relating to the formation of capital assets, whether in the UK or overseas.

The emission factors in the table are for broad categories of goods and services and are based on averages. So if you have data that is more representative of your particular purchases, you should use that data instead. The factors relate to 2009 and it is worth taking price changes since then into account.. The categories are based upon the Standard Industrial Classification (SIC): further information on the SIC 2003 is available [here](#).

The factors for each of the six Kyoto gases included in the overall calculation are available by emailing: Enviro.Statistics@defra.gsi.gov.uk

Supply chain emission factors for spending on products: kgCO ₂ e per £						2004	2005	2006	2007	2008
SIC code (SIC 2003)	Code	Product category	Category description	Total kg CO ₂ e per £						
01	UK-1	Agriculture products ²	Products of agriculture, horticulture, including living plants, unmanufactured tobacco; live animals and animal products	3.53	3.53	3.29	2.95	2.55	2.68	
02	UK-2	Forestry products	Wood in the rough, other forestry products	0.61	0.59	0.56	0.54	0.47	0.40	
05	UK-3	Fish products ²	Aquatic animals, live, fresh or chilled, not prepared for consumption	1.29	1.22	1.27	1.15	1.01	0.72	
10	UK-4	Coal, lignite, peat ³		6.21	5.83	8.74	7.17	7.14	6.13	
11	UK-5	Crude petroleum, natural gas ³		1.33	1.11	0.93	0.92	0.81	0.72	
13	UK-6	Metal ores		1.00	1.18	1.27	1.23	1.23	n/a	
14	UK-7	Stone, sand and clay, other minerals		1.57	1.42	1.36	1.32	1.32	1.08	
15	UK-8	Food and drink products	Prepared meat, fish, fruit, vegetables etc; dairy products; beverages; oils and fats	1.30	1.28	1.23	1.14	1.08	0.97	
16	UK-9	Tobacco products		0.17	0.17	0.16	0.16	0.14	0.13	

17	UK-10	Textiles	Preparation & spinning of textile fibres, textile weaving, finishing of textiles & wearing apparel, manufacture of made-up textile articles, except apparel	0.43	0.43	0.38	0.35	0.35	0.32
18	UK-11	Wearing apparel		0.38	0.35	0.32	0.30	0.28	0.29
19	UK-12	Leather products	Includes footwear and imitation leathers or leather substitutes, such as rubber footwear, textile luggage	0.40	0.38	0.38	0.38	0.34	0.30
20	UK-13	Wood and wood products	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.12	1.00	0.97	0.95	0.90	0.80
21	UK-14	Pulp and paper products		0.85	0.80	0.77	0.73	0.72	0.78
22	UK-15	Printing and publishing		0.45	0.44	0.40	0.39	0.38	0.36
23	UK-16	Refined petroleum and other fuels ³	Fuel oil and gas; lubricating oils. Petroleum gases and other gaseous hydrocarbons, except natural gas. Waste oil . Radioactive elements, isotopes and compounds; radioactive residues. Fuel elements (cartridges), non-irradiated, for nuclear reactors. Coke oven prods.	1.23	1.24	1.17	1.20	1.19	1.06
24.11,24.12	UK-17	Industrial gases and dyes	Industrial gases, dyes, pigments.	1.59	1.63	1.53	1.42	1.36	1.06
24.13	UK-18	Inorganic chemicals	Chemical elements n.e.c.; inorganic acids and compounds. Metallic halogenates; hypochlorites, chlorates and perchlorates.	1.32	1.31	1.22	1.15	1.13	1.36
24.14	UK-19	Organic chemicals	Hydrocarbons/derivatives. Alcohols, phenols, phenol-alcohols and halogenated/ sulphonated/nitrated/	1.85	1.53	1.38	1.34	1.27	1.06

			nitrosated derivatives; industrial fatty alcohols. Industrial monocarboxylic fatty acids; carboxylic acids & derivatives. Organic compounds with nitrogen functions. Organosulphur compounds and other organo-inorganic compounds; heterocyclic compounds n.e.c.. Ethers, organic peroxides, epoxides, acetals and hemiacetals; other organic compounds.						
24.15	UK-20	Fertilisers		4.48	3.97	3.74	4.06	3.67	2.25
24.16,24.17	UK-21	Plastics & synthetic resins etc		1.62	1.65	1.51	1.44	1.38	1.08
24.2	UK-22	Pesticides	Pesticides and other agro-chemical products.	1.27	1.21	1.12	1.08	1.01	0.97
24.3	UK-23	Paints, varnishes, printing ink etc		0.67	0.65	0.63	0.60	0.58	0.50
24.4	UK-24	Pharmaceuticals	Basic pharmaceutical products. Pharmaceutical preparations.	0.71	0.66	0.59	0.59	0.52	0.43
24.5	UK-25	Soap and toilet preparations		0.45	0.45	0.40	0.39	0.39	0.33
24.6	UK-26	Other chemical products	Explosives, glues, gelatines, essential oils, photo chemicals, others nec.	1.05	1.04	0.96	0.92	0.92	0.76
24.7	UK-27	Man-made fibres	Synthetic fibres. Cellulosic and other artificial fibres. Waste of man-made fibres.	2.08	1.80	2.07	2.13	2.13	1.54
25.1	UK-28	Rubber products		1.03	1.05	0.92	0.96	0.86	0.67
25.2	UK-29	Plastic products		1.23	1.22	1.16	1.13	1.09	0.85

26.1	UK-30	Glass and glass products		1.53	1.42	1.28	1.26	1.23	1.25
26.2,26.3	UK-31	Ceramic goods	Non-refractory ceramic goods other than for construction purposes; refractory ceramic products. Ceramic tiles and flags	0.86	0.80	0.71	0.74	0.70	0.58
26.4	UK-32	Structural clay products	Bricks, tiles and construction products, in baked clay	1.23	1.31	1.23	1.17	1.21	1.68
26.5	UK-33	Cement, lime and plaster		6.89	6.69	7.06	7.07	7.07	6.78
26.6-26.8	UK-34	Articles of concrete, stone etc	Articles of concrete, plaster and cement . Cut, shaped and finished ornamental and building stone and articles thereof. Other non-metallic mineral products	1.62	1.53	1.57	1.46	1.40	1.21
27.1-27.3	UK-35	Iron and steel	Basic iron and steel and ferro-alloys. Tubes.	3.86	3.49	3.44	3.44	3.31	2.97
27.4	UK-36	Non-ferrous metals	Precious metals. Aluminium and aluminium products. Lead, zinc, tin and products thereof. Copper and Nickel prods.	2.39	2.21	2.49	2.45	2.36	1.92
27.5	UK-37	Metal castings	Foundry work services. Casting of iron, steel, light metals, other non-ferrous.	1.63	1.55	1.55	1.50	1.40	1.12
28	UK-38	Metal products	Structural metal products. Tanks, reservoirs and containers of metal; central heating radiators and boilers. Steam generators, except central heating hot water boilers. Forging, pressing, stamping and roll forming services of metal; powder metallurgy. Treatment and coating services of metal; general mechanical engineering services.	1.30	1.29	1.32	1.36	1.27	1.07

			Cutlery, tools and general hardware. Other fabricated prods.						
29	UK-39	Machinery and equipment	Machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines. Agricultural and forestry machinery. Weapons. Machine tools. Other special purpose.	0.84	0.82	0.81	0.82	0.79	0.70
30	UK-40	Office machinery and computers		0.81	0.76	0.76	0.65	0.61	0.53
31	UK-41	Electrical machinery	Electric motors, generators and transformers. Electricity distribution and control apparatus. Insulated wire and cable. Accumulators, primary cells and primary batteries. Lighting equip.	0.91	0.87	0.87	0.83	0.80	0.62
32	UK-42	Radio, television and communications		0.48	0.47	0.46	0.37	0.38	0.48
33	UK-43	Medical and precision instruments	Medical, precision and optical instruments; watches and clocks.	0.57	0.55	0.54	0.44	0.43	0.30
34	UK-44	Motor vehicles manufacturing		0.97	0.91	0.90	0.90	0.85	0.70
35	UK-45	Other transport equipment	Ships, railway roll-stock, aircraft, spacecraft, motorcycles, cycles.	0.73	0.73	0.67	0.66	0.60	0.59
36, 37	UK-46	Furniture, other manufactured goods, recycling services	Furniture, musical, sports, games, secondary raw materials, shipbreaking.	0.62	0.61	0.58	0.56	0.56	0.48
40.1	UK-47	Electricity production and distribution ³	Production and distribution services of electricity.	7.51	6.97	6.50	6.15	5.18	4.80
40.2,40.3	UK-48	Gas distribution ³	Manufactured gas and distribution services of gaseous fuels through mains. Steam and hot water supply services.	3.94	3.48	3.26	3.25	3.12	2.03

41	UK-49	Water Supply	Collected and purified water; distribution services of water.	0.82	0.74	0.71	0.65	0.56	0.44
45	UK-50	Construction ⁴		0.62	0.59	0.56	0.53	0.53	0.49
50	UK-51	Motor vehicle distribution and repair, automotive fuel retail	Trade, maintenance and repair services of motor vehicles and motorcycles; retail trade services of automotive fuel.	1.03	0.95	0.90	0.92	0.85	0.77
51	UK-52	Wholesale distribution		0.70	0.69	0.66	0.62	0.61	0.51
52	UK-53	Retail distribution		0.49	0.45	0.44	0.41	0.39	0.38
55	UK-54	Hotels, catering, pubs etc		0.66	0.64	0.60	0.57	0.54	0.49
60.1	UK-55	Railway transport ⁵		1.20	1.15	1.11	0.96	0.84	0.93
60.2	UK-56	Road transport ⁵		1.25	1.23	1.19	1.15	1.14	0.95
61	UK-57	Water transport ⁵		3.96	3.58	2.63	2.31	1.99	1.96
62	UK-58	Air transport ⁵		3.44	3.50	3.37	3.16	2.91	2.86
63	UK-59	Ancillary transport services	Trade, maintenance and repair services of motor vehicles and motorcycles; retail trade services of automotive fuel.	0.43	0.41	0.38	0.36	0.34	0.32
64	UK-60	Post and telecommunications		0.47	0.45	0.72	0.46	0.44	0.41
65	UK-61	Banking and finance		0.25	0.23	0.21	0.19	0.16	0.15
66	UK-62	Insurance and pension funds		0.38	0.37	0.36	0.33	0.31	0.28

67	UK-63	Auxiliary financial services	Services auxiliary to financial intermediation, insurance and pension funding	0.33	0.30	0.29	0.25	0.24	0.23
70	UK-64	Real estate activities		0.14	0.13	0.12	0.11	0.11	0.12
71	UK-65	Renting of machinery etc		0.53	0.52	0.50	0.47	0.44	0.32
72	UK-66	Computer services		0.29	0.28	0.28	0.26	0.24	0.20
73	UK-67	Research and development	Research and experimental development services on natural and social sciences, humanities and engineering.	0.66	0.63	0.58	0.55	0.52	0.30
74	UK-68	Legal, consultancy and other business activities	Legal, accounting, book-keeping and auditing services; tax consultancy services; market research and public opinion polling services; business and management consultancy services; holdings services. Architectural, engineering and related. Technical testing and analysis. Advertising. Security. Recruitment & HR. Industrial cleaning.	0.24	0.22	0.21	0.19	0.17	0.17
75	UK-69	Public administration and defence		0.53	0.48	0.46	0.43	0.41	0.39
80	UK-70	Education		0.33	0.31	0.29	0.26	0.24	0.23
85	UK-71	Health and social work	Human health. Veterinary services. Social work.	0.51	0.48	0.42	0.40	0.38	0.34
90	UK-72	Sewage and refuse services	Sewage and refuse disposal services, sanitation and similar services	2.37	2.13	2.01	1.91	1.77	1.42

91	UK-73	Membership organisations		0.25	0.23	0.20	0.19	0.17	0.15
92	UK-74	Recreational services	Motion picture and video services. Radio and TV services. Library, archives, museums and other cultural services. Sporting and other entertainment / recreational services.	0.39	0.36	0.33	0.31	0.29	0.28
93	UK-75	Other service activities	Washing and dry cleaning services. Hairdressing and other beauty treatment services. Funeral and related services. Physical wellbeing services.	0.43	0.40	0.38	0.35	0.32	0.31

Calculated by Centre for Sustainability Accounting ([CenSA](#)), Leeds, UK.

Footnotes

1. Agricultural and fish products are those bought direct from farmers or the fisheries industry. Where products have been prepared for consumption they should be treated as products from the food and drink manufacturing industry (UK-8 in the above table).
2. These emissions relate to the activities of the industries engaged in the extraction of energy carriers. Where fuels are processed before use then the factors identified by footnote 3 should be used.
3. These emission factors relate to the supply and distribution of energy products for general consumption, and take into account emissions relating to the extraction and processing of the energy carriers (e.g. oil refineries). Except in the case of electricity, they do not include emissions relating to your company's use of the energy. In the case of electricity, these factors include the emissions relating to the production of the fuels used to generate the electricity.
4. These factors relate to spending on construction projects, not to emissions relating to construction projects in the supply chain.
5. These factors relate to transport services for hire or reward (including public transport services), not to emissions from vehicles owned by your company (for which estimates of actual fuel use should be used).

Annex F: Intensity ratios

This guidance sets out below some examples, by sector, of activity and financial intensity ratios⁷⁵.

	Intensity measurement
All	Tonnes of CO ₂ e per total £m sales revenue
	Tonnes of CO ₂ e per total £m Earnings Before Interest, Tax, Depreciation and Amortisation (EBITDA)
	Tonnes of CO ₂ e per full time equivalents
Integrated oil and gas	Tonnes of CO ₂ e per tonne of output, broken down for: Exploration and production Refining Petrochemicals
Transport sectors	Tonnes of CO ₂ e per revenue tonne kilometre (RTK – revenue from transporting one tonne over a distance of one kilometre)
	Tonnes of CO ₂ e per pallet cases
Passenger carrying sector	Grammes of CO ₂ e per passenger kilometre
Beverages	Grammes of CO ₂ e per total litres of beverage eg beer, spirit
Retail	Tonnes of CO ₂ e per square metre of gross store area
Banking	Tonnes of CO ₂ e per £ million of income
Manufacturing	Tonnes of CO ₂ e per total million tonnes of production
Postal services	Grammes of CO ₂ e per 1,000 items
Water utilities	Tonnes of CO ₂ e per megalitre broken down by clean and wastewater
Electricity utilities	Tonnes of CO ₂ e per megawatt hour
Telecommunications, internet software and services	Tonnes of CO ₂ e per gigabyte transmitted
Property sector	Tonnes of CO ₂ e per total square metres

⁷⁵ A number of these intensity ratios have been sourced from CDP.

Annex G: Emission reduction actions

Accounting for renewable electricity

This section – and the approach for quantifying emissions from purchased electricity in general - is still being reviewed and will be updated in due course. In the meantime, please use the grid average conversion factor for calculating emissions from purchased electricity.

Refer to the Green Tariffs section in Annex G of the previous 2009 Guidance on how to account for renewable electricity. That guidance is available on the GOV.UK website at the following location: <https://www.gov.uk/measuring-and-reporting-environmental-impacts-guidance-for-businesses>. However, the grid rolling average conversion factor referred to in this section has been replaced in the 2013 UK Government Conversion Factors by a grid average factor.

In accordance with the 2009 Guidance, you may report an emissions reduction in your **reported net CO₂e figure** for any renewable electricity that you have generated and exported to the national grid or a third party. The emission reduction should be calculated using the grid average factor. Total emissions reductions from generated and exported renewable electricity (and green tariffs if appropriate) must not be greater than gross scope 2 emissions.

Biogas and biomethane

Biogas is a mixture of methane and other gases from decomposing wastes such as crop wastes, manure or sewage. It can be burnt as is or cleaned to become a purer product: biomethane. As biogas and biomethane have their origins in biological matter, the CO₂ emitted when they are burnt is not accounted for within an organisation's scope 1 emissions. It would be logged separately under biogenic emissions. This reduces a key metric of an organisation's GHG inventory – scope 1 emissions.

Biomethane can be injected into the national gas grid. This has been encouraged by the UK Government through the Renewable Heat Incentive which is paid to the producer of the biomethane. Some organisations are prepared to pay extra for this renewable gas, but since it becomes mixed in the pipes with natural gas, a fossil fuel, there are tracking issues similar to buying renewable electricity from the grid.

Tracking systems have been set up overseas and are being introduced in the UK to ensure that only one customer claims the GHG benefit of the gas.

The accounting of grid-injected biomethane is under review in parallel with the review of purchased electricity and updated guidance on that will be issued in due course.

Offsets

Your organisation may choose to reduce your emissions through projects that reduce GHG emissions outside your operations. This may be because GHG reductions can be achieved more practically or cost effectively from these external sources. You should list separately external GHG reduction activities, which should not be accounted for in your reported gross CO₂e tonne figure, and provide a net CO₂e tonne figure. You may do this where these external reduction activities meet Defra's good quality criteria set out below.

'Good Quality' Criteria

Additionality – Projects must demonstrate that they have produced a saving in carbon that would not have happened otherwise i.e. the project could not take place without the carbon finance from selling credits. The project must not be required by legislation or to demonstrate compliance against legally binding targets. This should be demonstrated via a project methodology developed by a recognised body.

Avoiding leakage – The project must demonstrate that it has not caused an increase in carbon emissions elsewhere. Leakage is when the carbon saving made at a project/location/time increases emissions elsewhere. An assessment must be made of any effects from the project whether up stream or downstream. This must be taken into account in determining the total emissions that can be sold from that project.

Permanence - If the project could be impermanent, (e.g. forestry projects are at risk of disease or fire) then this must be addressed by the project developer or offset provider. To achieve this, projects with a risk of carbon loss should undertake a risk assessment and identify actions to minimise and compensate for loss.

Validation and verification - The project must receive **independent verification**. The verifier must be an accredited and recognised independent third party. Purchasers of credits should also ensure that robust, independent validation and verification procedures were in place to check projects were implemented according to the methodology (validation) and subsequently monitored to ensure that emission reductions were properly measured (verification)

Timing – Carbon credits should be ex-post, that is, they must only have been issued from the project **after** the emissions reduction has taken place.

Avoiding double counting – A registry must be used to register, track and permanently cancel credits to avoid **double counting** or double selling. Project must not be double counted against another policy or mandatory targets.

Transparency - Credits should be supported by publically-available information on a registry to set out the underlying projects (when they were considered approved and implemented), the quantification methodology applied, independent validation and

verification procedures, project documentation, proof of credit ownership and date of retirement of credits.

Where your organisation is carbon offsetting, you should provide the following information as a minimum:

- The reduction in tonnes of CO₂e per year
- Type of carbon credit (Kyoto-compliant or non-Kyoto compliant credit)
 - If carbon credits are Kyoto-compliant, organisations should specify which external GHG programme has approved them (e.g. the Clean Development Mechanism, Joint Implementation), provide the name of the supplier, a hyperlink to the project documentation, the date you retired the units from the registry and a hyperlink to the proof of retirement.
 - If carbon credits are non-Kyoto compliant, organisations should provide the name of the supplier, a hyperlink to the project documentation, details of who developed the quantification methodology, how the project was validated and verified, the date you retired the units from the registry and a hyperlink to the proof of retirement and how other 'good quality' criteria were met.

Woodland Carbon Units

Woodland Carbon Units⁷⁶ (WCU) quantify CO₂ sequestration due to woodland creation in the UK. They are another option to carbon credits from projects overseas. They are certified to the Woodland Carbon Code⁷⁷, but are not termed offsets or carbon credits because they do not meet all aspects of "additionality" requirements, in common with all domestic emissions reduction projects. (This is related to UK government policy towards reducing emissions under UNFCCC agreements), This does not mean that it is inappropriate to finance domestic projects; indeed doing so helps the UK to meet its targets efficiently.

Where your organisation has purchased and retired WCUs, you should provide the following information as a minimum in your **net CO₂e tonne figure**. These units should be shown as a separate line to carbon credits/offsets:

- The reduction in tonnes of CO₂e per year
- The ID/name of the project and a hyperlink to the project documentation
- The date you retired the units from the registry and a hyperlink to the proof of retirement.

⁷⁶ The registry of these units will be operational from 1 July 2013.

⁷⁷ <http://www.forestry.gov.uk/carboncode>

- The name of the validator/verifier

Annex H: Example reporting format

In the example reporting template shown below, Scope 3 categories are shown individually. This gives the detail necessary for users seeking to reduce emissions.

Company Information

XX is a public limited company, incorporated in the UK. Registered address is 1 New Street, London, SW1 1AA.

Reporting period

6 April 2013-5 April 2014⁷⁸

Reasons for Change in Emissions

Our reported emissions have fallen this year because we have invested in more energy efficient process equipment in our operations. The Scope 3 categories for which we have reported emissions have changed for the following reasons:

Purchased goods and services – We have worked with our suppliers of plastic packaging to reduce the mass of plastic required and this has resulted in the reported reduction in emissions.

Business travel – Tighter departmental budgets have led to a reduction in business travel expenditure.

Employee commuting – Staff have reported reduced use of cars to get to work and an increase in cycling.

Waste generated in operations, upstream leased assets, and franchises – We do not know the reason for these slight changes.

Quantification and Reporting Methodology

We have followed the 2013 UK Government environmental reporting guidance. We have also used the GHG Protocol Value Chain (Scope 3) Standard, but we are not as yet able to report on all categories that may be relevant. The figures relate to the required elements of each scope 3 category rather than the optional elements.

⁷⁸ This date is in the future to allow for inclusion of Woodland Carbon Units in the example report. The WCU registry will be operation from 1 July 2013.

We have used 2013 UK Government's Conversion Factors for Company Reporting and the XYZ Emission Factor Database 2013 version and the GWPs used within that were consistent with those used in the 2013 UK Government Conversion Factors.

Organisational boundary

We have used the financial control approach.

Operational scopes

We have measured our scope 1, 2 and certain scope 3 emissions. Where we have not estimated a % for exclusions, it is because we have not carried out this estimation yet.

SCOPE 1 in metric tonnes CO2e	2013- 2014	Specific exclusions, % this represents for relevant scope (excluding geographic exclusions) & give an explanation	% of activity data that is estimated	2012- 2013	2006- 2007
Gas consumption	3,600	None	8	3,700	2,800
Owned transport	1,500	None	9	1,550	990
Process emissions	12,000	None	9	12,250	9330
Fugitive emissions		Emissions from air conditioning and refrigeration units in office buildings excluded due to cost of data collection. These are estimated to account for less than 0.5% of total scope 1 emissions.			
Total scope 1	17,100	N/A		17,500	13,120

SCOPE 2 in metric tonnes CO2e	2013- 2014	Exclusions	% of activity data that is estimated	2012- 2013	2006- 2007
S2	14,500	None	2	15,100	10,000
SCOPE 3 in metric tonnes CO2e	2013- 2014	Exclusions	% of activity data that is estimated	2012- 2013	2006- 2007
Purchased goods & services	30,000	We have only attempted to quantify emissions from our supply chains to the UK and USA operations.	50	Not quantified	Not quantified
Capital goods	Not quantified	We have not tried to quantify these emissions yet. ⁷⁹	N/A	Not quantified	Not quantified
Fuel- and energy-related activities not included in Scopes 1 & 2	Not quantified	We have not tried to quantify these emissions yet.	N/A	Not quantified	Not quantified
Upstream transportation & distribution	Not quantified	We do not consider these emissions relevant as	N/A	Not quantified	Not quantified

⁷⁹ If you were conforming to the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard emissions would either be quantified or a justification given for their exclusion based on their relevance. However, it is recognised that most companies are not yet at the stage of being able to estimate emissions for all categories.

		estimations show that they account for less than 5% of our scope 1 emissions.			
Waste generated in operations Activities included: process waste only.	2,530	Office waste not included as yet as thought to be less significant than process waste.	15	2,540	Not quantified
Business travel Activities included: flights, train, rental car trips.	6,190	Bus trips excluded from inventory as little-used.	10	7,000	8,000
Employee commuting Activities included: car and train trips only.	690	Bus trips not included as yet as other modes of transport thought to be more significant. Excluded from inventory as seem to be little-used.	25	700	Not quantified
Upstream leased assets Activities included: All upstream leased assets.	4,500	None	15	4,450	Not quantified
Downstream transportation & distribution	Not quantified	We do not consider these emissions relevant as estimations show that they account for less than 5% of our	N/A	Not quantified	Not quantified

		Scope 1 emissions			
Processing of sold products	Not quantified	We have not tried to quantify these emissions yet.	N/A	Not quantified	Not quantified
Use of sold products	Not quantified	We have not tried to quantify these emissions yet.	N/A	Not quantified	Not quantified
End-of-life treatment of sold products	Not quantified	We have not tried to quantify these emissions yet.	N/A	Not quantified	Not quantified
Downstream leased assets	0	We do not have any leased out assets.	0	0	Not quantified
Franchises Activities included: fuel & electricity use in franchises.	14,000	Data not collected for any other emission sources. We do not know what % they may represent.	10	14100	Not quantified
Investments ⁸⁰	0	We have not tried to quantify these emissions yet.	N/A	0	Not quantified
Biogenic emissions	10,000	None	10	11,000	Not quantified

⁸⁰ If the reporting company is an initial sponsor or lender of a project, also account for the projected lifetime emissions of relevant projects financed during the reporting year and report those emissions separately from scope 3.

	2013-2014	Exclusions	2012-2013	2006-2007
Company's chosen intensity measurement scope 1 & scope 2 emissions in tonnes CO ₂ e per tonne of output	0.49	See scope 1 & scope 2 exclusions	0.54	0.52

	2013-2014	2012-2013	2006-2007
Tonnes CO₂e	S1, S2-, S3	S1, S2, S3	S1, S2, S3
Gross emissions	89,510	91,390	31,120
Exported renewable electricity reduction	(18)	(15)	0
Offsets	(5,000)	0	0
Woodland Carbon Units	(100)	0	0
Net emissions	84,392	91,375	31,120

GEOGRAPHICAL BREAKDOWN

2013-2014	Tonnes of CO ₂ e	
	Scope 1	Scope 2-ga
UK	3,000	2,520
USA	11,100	9,480
South Africa	3,000	2,500
Mongolia	N/A	N/A

Emissions from facilities in Mongolia excluded as these are newly acquired operations which did not exist in our base year. We estimate that this is less than 2% of total scope 1 and 2 emissions.

2013-2014 Scope 3 categories – where quantified						
Tonnes CO ₂ e	Purchased goods & services	Waste generated in operations	Business travel	Employee commuting	Upstream leased assets	Franchises
UK	12,000	1,000	500	Not known	1,500	6,000
USA	15,000	1,000	690	Not known	2,000	7,000
South Africa	3,000	530	5,000	690	1,000	1,000
Mongolia	Not known	Not known	Not known	Not known	0	0

Base Year

We have a fixed base year of 2006. We chose this year as it was the first year for which we considered that we had reliable data and it was typical in respect of our operations. Our base year recalculation policy is to recalculate our base year and the prior year emissions for relevant significant changes which meet our significance threshold of 5% of base year emissions.

We have recalculated our base year to account for the sale of our facilities and operations in Kazakhstan which accounted for 2,000 tonnes of CO₂e emissions in the base year.

Targets

Our emissions reduction target is to reduce our gross, global scope 1 and 2 emissions in tonnes of CO₂e per tonne of product output by 10.0% from 2006-2007 to 2014-2015. Our progress towards reaching this target has been reasonable this year and we expect to meet this target in 2014-2015. Allan Woods, Managing Director, and Paul Smith, Chief Operating Officer, are responsible for the achievement of the target.

Intensity Measurement

We have chosen the metric gross global scope 1 and 2 emissions in tonnes of CO₂e per tonne of product output as this is a common business metric for our industry sector. Our intensity measurement has fallen this year as we have invested £5 million in more energy efficient process equipment in our operations in the USA.

External Assurance Statement

We have received an independent external assurance statement from xxx. To see the external assurance statement, please go to www.xx.co.uk.

Carbon Offsets

We have purchased carbon credits which reduce our GHG emissions by 5,000 tonnes. The credits are Kyoto-compliant Certified Emission Reductions (CERs) covered by the Clean Development Mechanism (CDM). These carbon credits were supplied by Carbon Offsetting Ltd. The credits are from Project 0939: Yutan Hydroelectric Project. Project documentation can be found here: <http://cdm.unfccc.int/Projects/XX/XX/view> and the notice of retirement here: <http://cdm.unfccc.int/XX/XX/XX>

Woodland Carbon Units

100 Woodland Carbon Units of vintage '2009-2013' were retired in early 2014 for the purpose of reporting in this report. The credits are non-Kyoto-compliant UK Woodland Carbon Units (WCUs). The credits are from Project ID: 2012/SC/0005 Project Name: Milton of Mathers. Project documentation can be found here: <http://www.forestry.gov.uk/forestry/infd-863h7a>. The project was validated and verified by SFQC. Credits were retired from the registry as demonstrated here <<web address of 'credit retiral' page>>

Electricity

Electricity purchased for own use or consumption: 31,696 MWh

Renewable electricity generated from owned or controlled sources: 400 MWh generated onsite backed by REGOs

Electricity exported to the grid: 40 MWh

We have exported electricity from on-site wind turbines to the grid. We have multiplied the amount of electricity, which is backed by REGOs, by the grid average emissions factor and deducted the emissions figure from our gross emissions figure as allowed under the 2013 UK Government environmental reporting guidance.

Heat Generation

We have not generated any heat.

Annex I: Water

It is important to distinguish whether the water used is from a region under water stress or one where supplies are abundant, as this has implications of the risk levels to your business. Water-stress is caused by physical⁸¹ and/or economic⁸² water-scarcity.

Physical risk

A lack of freshwater can limit your operations, raw material supply, and product use in a variety of ways. Reductions or disruptions in water supply can undermine industrial operations where water is needed for production, irrigation, material processing, cooling, and cleaning. Clean water is critical to many industrial processes, and lack of it can present a range of costs. A contaminated water supply often requires additional investment and costs for pre-treatment. When alternative sources of water or treatment options are not physically or financially feasible, operations may be disrupted or require relocation. Industrial expansion may also be constrained in regions where the water supply is already contaminated or at risk of contamination.

Many businesses also fail to recognise water demands embedded across their supply chain. For example, water supply risks are often hidden in companies' raw material inputs or in the inputs of intermediate suppliers or downstream. Information and general guidance on how your business can improve its water efficiency can be found at

<http://www.wrap.org.uk/>

Reputational Risks

Constraints on water resources can make your business more susceptible to reputational risks. Declines in water availability and quality can increase competition for clean water, giving rise to tensions between businesses and local communities, particularly in developing countries where local populations often lack access to safe and reliable drinking water. Community opposition to industrial water withdrawals and perceived or real inequalities in use can emerge quickly and affect business profoundly. Local conflicts can damage brand image or even result in the loss of a company's license to operate. The concept of "access to clean water as a human right" is gaining more recognition globally, with multinational companies like PepsiCo adopting a companywide policy in support of the human right to water.

⁸¹ Physical scarcity occurs when demand for water in a region exceeds the supply due to limited physical availability.

⁸² Economic scarcity occurs when the low supply is caused by inadequate water management practices due to lack of financial resources or capacity.

Regulatory Risks

Physical and reputational pressures are increasingly resulting in more stringent local and national water policies that, if unanticipated, can raise costs and limit industrial activity.

Water scarcity, coupled with increased concern among local communities about corporate water withdrawals and water pollution, puts pressure on local authorities to consider changes in water allocations or caps on water use, increase water prices, set new permit standards, reduce permit availabilities, and develop more stringent wastewater quality standards. Businesses operating in the European Union are facing growing pressure to reduce water pollution in response to the EU's Water Framework Directive⁸³. Enacted in 2000, the directive takes an integrated, water basin-based approach, and commits EU member states to achieving high water quality conditions for all water bodies by 2015. The Environment Agency, SEPA and DOENI are the UK enforcement agencies for this.

Litigation Risks

With increased attention from regulators and communities on water scarcity, businesses face growing risks stemming from lawsuits or other legal actions responding to the impacts of a company's operations or products on water supplies.

Other Information

How your business manages its water use is also crucial to ensuring the effects your business has on biodiversity and ecosystem services are minimal. As part of your environmental strategy you need to consider the impact your use of water has on the environment and plan accordingly to ensure that any impacts are taken into account and managed.

Source of water: Mains (Supplied) and Abstracted

Nearly every business is supplied with water, and the quantity of this water use can usually be easily measured. However, it is important to distinguish between water abstracted directly from the environment from that supplied by a water company. Most business will use mains water. The environmental impacts associated with mains water use are indirect and need to be viewed up and down the supply chain of your business. The questions [below](#) explore this further.

When understanding your business you need to be aware of any obligations or instruments related to water, both financial and legislative, that you are required to comply with and report accordingly, as should your supply chain

⁸³ <http://www.environment-agency.gov.uk/research/planning/33362.aspx>

Abstraction of water can have significant local and widespread impacts on the environment and can be abstracted for a wide variety of uses.

Water use in your supply chain and global risks

For many UK businesses, the main risks to water use aren't necessarily within the UK - but often in their overseas operations or global supply chains where materials, goods or services are imported from areas vulnerable to drought, pollution or flooding.

WWF's 2008 UK's Water Footprint Report showed that around 62% of the UK's total "water footprint" comes from imported products.⁸⁴ While many companies are well prepared to manage their direct water risk, disruptions that occur in supply chains are often much harder to understand and quantify. According to CDP's Water Disclosure Global Report 2011, the awareness of risk in the supply chain was much lower than in direct operations (27% compared to 55%). And while 82% of respondents were taking direct action to manage water in their direct operations, a much smaller figure (41%) reported taking action in their supply chain and watershed management.⁸⁵ Given the UK's reliance on "imported water", it is important for individual companies and for the UK as a whole, to better understand these global risks.

Tools to assess supply chain/global risks

International methods and standards used to assess and report the impacts of water use across supply chains are less advanced or accepted than for carbon but there are a range of tools that can help you identify any potential risks within your supply chain for example:

- a. **CDP Water Disclosure** provides a platform for companies to respond voluntarily to a structured questionnaire regarding water which helps businesses build internal capacity for water reporting. Further details can be found on the [CDP website](#)⁸⁶
- b. **Global Reporting Initiative.** GRI provides a management and disclosures approach to water in its guidelines (EN8, EN9, EN10, EN21 and EN25). Further details can be found on the [GRI protocols guidance](#)⁸⁷
- c. **WBCSD's Global Water Tool** can assist companies in estimating the percentage of their own operations and supply chain located in water-stressed regions (i.e. where availability does not meet demand). This web-based software allows companies to identify sites in water-stressed areas, identify how many employees live in countries that lack access to improved water and sanitation, and to identify suppliers in water-stressed areas. Please note that this tool provides an

⁸⁴ http://assets.wwf.org.uk/downloads/water_footprint_uk.pdf

⁸⁵ <https://www.cdproject.net/CDPResults/CDP-Water-Disclosure-Global-Report-2011.pdf>

⁸⁶ <https://www.cdproject.net/water>

⁸⁷ <https://www.globalreporting.org/resourcelibrary/G3.1-Environment-Indicator-Protocols.pdf>

assessment of risks related to water availability and does not consider risks associated with water quality and discharges. Access to the tool and additional information is available in the [WBCSD website](#).⁸⁸

- d. **Global Environmental Management Initiative's (GEMI) Water Sustainability Tool** developed to help business understand their opportunities and risks related to water – and help tailor a strategy to manage and track performance. The tool provides guidance to enable companies to understand risk rather than specific quantified indicators and is a useful tool. Access to the tool is available on the [GEMI website](#)⁸⁹
- e. **The Ceres Aqua Gauge** is an excel-based tool for investors to assess a company's water management activities. Although aimed at investors, the tool may also be useful for companies to facilitate internal assessment and engage with suppliers – by setting out key questions to ask. Access to the tool is available on the [CERES website](#)^{90*}
- f. **Water stewardship initiatives** encourage business to reduce their water use and engage with all water users at catchment level to agree how the resource should be sustainably managed. The European Water Stewardship Partnership recently published a standard for pilot testing that sets out principles and criteria (covering water use, impact, and governance) a company must meet to be verified as meeting the standard.⁹¹ The Alliance for Water Stewardship is also developing a global standard for water stewardship.⁹² The CEO Water Mandate⁹³ also assists companies in the development, implementation and disclosure of water sustainability policies and practices through its Water Action Hub.
- g. **Water footprinting** is a tool for measuring both the direct and indirect (e.g. supply chain) water use of a product, business or community. Water footprinting is very useful in developing a comprehensive measure of a product or business' water use. However, the methodology for water footprinting is insufficiently mature to support consistent assessments that account for both the “volume” of water consumed and it's “impact” in the local environment. The method can also be resource intensive to carry out and the level of accuracy can vary significantly depending on the season, location, data etc. Key tools include:
- h. **The Water Footprint Network** method to measure the volumetric water footprint – quantifying water use by source and type of water.⁹⁴

⁸⁸ <http://www.wbcds.org/work-program/sector-projects/water/global-water-tool.aspx>

⁸⁹ <http://www.gemi.org/water/overview.htm>

⁹⁰ <http://www.ceres.org/issues/water/aqua-gauge/downloads/aqua-gauge-executive-summary>

⁹¹ <http://www.ewp.eu/>

⁹² <http://www.allianceforwaterstewardship.org/index.html>

⁹³ <http://ceowatermandate.org/about/>

⁹⁴ <http://www.waterfootprint.org/?page=files/home>

- i. **The International Standards Organisation** is currently developing a water footprint standard that is aiming to represent both the volume and impact of water use in relation to local situations.

If you are using any of these tools please detail this in your reporting.

1. Indicators for understanding supply chain risks

The following is a short list of questions which you should consider against your business operations to help you identify any risks, understand issues or highlight opportunities that may occur along your supply chain or your business or product line, that could impact on the viability of your business.

- a. Do you know whether your suppliers operate in areas vulnerable to drought or flooding?
- b. How many of your suppliers are located in water stressed regions? (You may wish to gather data on water use and compliance from suppliers, particularly in vulnerable regions)
- c. What is the source and reliance on water by your suppliers in sensitive areas?
- d. Is there any risk to degradation of water affecting your suppliers' use of that water?
- e. How is water managed in your supply chain?
- f. Do your suppliers have management systems in place to mitigate any of the above risks and improve management in the catchment they operate?
- g. Are they aware of the other users of water in their catchment? Is there competition for a limited resource?
- h. Estimate the severity and timeframe whereby you may be exposed to the above risks
- i. Are these short term (i.e. within the next 5 years) or long term risks?
- j. Is it a seasonal risk?
- k. How might this affect your operations?

Annex J: Waste

Waste Hierarchy

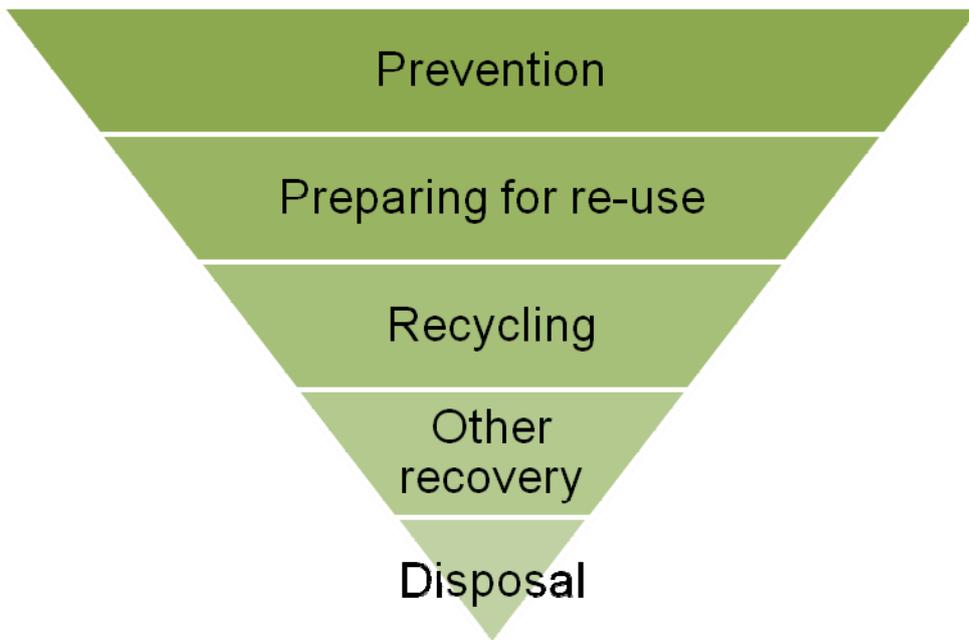
Defra published comprehensive guidance for business on the definition of waste which can be found at the link below:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69590/pb13813-waste-legal-def-guide.pdf

Waste is regulated in the UK and the laws that are in place regarding waste are designed to prevent the environment from being damaged and to encourage resource efficiency through the prevention and sustainable management of waste. These are based primarily around the EU Waste Framework Directive (2008/98/EC). Some of the legislation applies to all business waste, whilst some deals with particular types or sectors. If in doubt contact you can contact WRAP, the Environment Agency, or your local authority waste service for advice.

There is a hierarchy of how to deal with your waste which has legal standing. You will need to tick a box in your Waste Transfer Note when you hand over your waste saying that you are applying the Waste Hierarchy. That means that you are ensuring that your waste will be treated with the best waste management available for that specific waste (See the section on “Duty of Care”). You must give priority to waste prevention, followed by activities that prepare waste for re-use (e.g. cleaning, checking, repairing), followed by recycling, then other forms of recovery (including energy from waste). Disposal (e.g. landfill) is regarded as the last resort. Defra has issued guidance on the application of the Waste Hierarchy:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69403/pb13530-waste-hierarchy-guidance.pdf



Duty of Care

You have a legal responsibility as an organisation to ensure that you produce, store, transport and dispose of your waste without harming the environment: this is called your *duty of care*. This should help you understand the implications of your organisation's waste activities and detail of what to measure and report under for each.

You must ensure that you:

- Store and transport your waste appropriately and securely so it does not escape and any hazardous waste is kept separately from other waste streams.
- Check that your waste is transported and handled by organisations that are authorised to do so. If a waste carrier takes your waste away, you may also need to check that the site it is taken to is authorised to accept it.
- Complete waste transfer notes (WTNs) to document all waste you transfer and keep them as a record for at least two years. In the case of hazardous waste you will need to use consignment notes and keep them for 3 years. The WTN will provide the evidence trail to ensure that you have correctly applied the Waste Hierarchy to the type of waste you consigned.

The duty of care principle also applies to the trade and export of waste. If you sell or trade in waste you have a responsibility to know where any traded waste ends its journey, even if you sell to an intermediary or broker for onward sale.

There are also statutory Producer Responsibility Schemes on packaging, batteries, end-of-life vehicles and waste electronic and electrical equipment. Producer Responsibility laws require businesses to reuse, recover and recycle waste which comes from products they produce. You can find more information on all of these (including what your organisation may have to do to comply at:

<http://www.environment-agency.gov.uk/business/topics/waste/32206.aspx>

Hazardous Waste

Hazardous waste also follows these general principles of a duty of care and the waste hierarchy. should always be kept separate from the general waste stream and from other types of hazardous waste. There are specific requirements for those who produce, handle, transport, store and manage hazardous waste.

<http://www.environment-agency.gov.uk/business/topics/waste/32180.aspx>

Radioactive Waste

Radioactive waste also follows these general principles of a duty of care and the hierarchies approach. However, in conjunction with the nuclear industry, the Environment Agency has developed and published a Nuclear Sectoral Plan which sets out performance measures and targets for the Nuclear Sector. Objective 4 in this plan covers waste and gives targets therein and can be used as the basis for any data you wish to place in your corporate report.

<http://publications.environment-agency.gov.uk/pdf/GEHO0709BQGI-e-e.pdf>

Regulatory details with respect to waste can be found on the Defra website. Other organisations which provide help and guidance with regard to your waste practices are the Environment Agency and WRAP.

The Environment Agency is also developing a set of tools known as **Resource Efficiency Appraisal Development** (READ) which organisations will be able to use to benchmark how well they manage resources such as materials and energy, and what are the biggest opportunities to improve. These tools will be available on the Environment Agency's website.

Annex K: Resource efficiency and materials

Raw materials – Issues to consider

1. Aggregates

Aggregates in the context of this guidance are raw materials that are used to make construction products such as lime, mortar, asphalt and concrete. Specifically, aggregates are defined as a “granular material used in construction. Aggregate may be natural, manufactured or recycled.” (European Standard BSEN 12620: 2002)

Aggregates are extracted by quarrying and mining operations but can also arise from secondary sources such as building and demolition waste. Quarrying, processing and the transportation of aggregates to the marketplace has the potential to both positively and negatively affect the environment, which in turn can have social as well as economic effects

For aggregates that are dredged from marine sources there are regulatory controls in place enacted through [Marine Works \(Environmental Impact Assessment\) Regulations 2007](#)⁹⁵

Throughout the world, sustainability controls are being applied to mining operations (including oil, gas and coal), and project-specific key performance indicators are being developed to demonstrate to stakeholders that mining operations are complying with these wider requirements. Some sector specific guides are:

- The International Council on Mining and Metals (ICMM) has 10 Sustainability Principles with which members must comply⁹⁶.
- The Global Reporting Initiative (GRI) produces sector supplements that are relevant to this chapter for mining and metals sector⁹⁷ and the oil and gas sector⁹⁸. If you have used the GRI reporting framework and obtained a GRI grade level this should be detailed, including where you have sought independent third party assurance. These GRI reports can be used in lieu of this guidance (except for the process of fracking - see below - which is not contained within the GRI documents and should be reported on).

⁹⁵ <http://marinemanagement.org.uk/licensing/documents/guidance/08.pdf>

⁹⁶ The world's largest mining companies are members of the ICMM. Further detail can be found at <http://www.icmm.com/our-work/sustainable-development-framework/10-principles>

⁹⁷ <https://www.globalreporting.org/resourcelibrary/MMSS-Complete.pdf>

⁹⁸ <https://www.globalreporting.org/resourcelibrary/OGSS-G3.1-Complete.pdf>

- Minerals UK also offer an introduction to minerals and sustainability⁹⁹.

2. Biomass

Biomass is defined as the total dry organic matter or stored energy content of living organisms¹⁰⁰. Biomass is the fourth largest energy source in the world after coal, oil and natural gas.

Biomass is the resource that is grown or collected, to be differentiated from bio-fuel which is a fuel manufactured from biomass (such as chips, pellets, biodiesel etc.). Bio-energy is the use to which the fuel is put to supply energy, e.g. heat, transport or electricity. Regulations and directives that control how and where biomass derived fuels and conversion technologies can be used are listed in the footnote.¹⁰¹

Biomass resources can be classified according to the supply sector, as shown in the table below. There are five basic categories of biomass material:

- 1) virgin wood from forestry, arboricultural activities or from wood processing;
- 2) energy crops, both high yield and grown specifically for energy applications;
- 3) agricultural residues from harvesting or processing;
- 4) food waste from manufacture, preparation/processing, and post-consumer waste; and
- 5) industrial waste, including co-products from manufacturing and industrial processes.

Supply sector	Type	Example
Forestry	Dedicated forestry	Short rotation plantations (e.g. willow, poplar, eucalyptus)
	Forestry by-products	Wood blocks, wood chips from thinnings

⁹⁹ <http://www.bgs.ac.uk/mineralsuk/sustainability>

¹⁰⁰ "biodegradable fraction of products, waste and residues from agriculture (including vegetal and animal substances) forestry and related industries, as well as the biodegradable fraction of industrial and food waste" (EU Renewables Directive).

¹⁰¹ The Environmental Permitting Programme (EPP); Waste Incineration Directive (WID); the Building Regulations; the Clean Air Act; the Pollution Prevention and Control Regulations (England and Wales); the Large Combustion Plant Directive; and the Plant Health Import Regulations including on importing wood.

Agriculture	Dry lignocellulosic energy crops	Herbaceous crops (e.g. miscanthus, reed canary grass, giant reed)
	Oil, sugar and starch energy crops	Oil seeds for methylesters (e.g. rape seed, sunflower)
		Sugar crops for ethanol (e.g. sugar cane, sweet sorghum)
		Starch crops for ethanol (e.g. maize, wheat)
	Agricultural residues	Straw, prunings from vineyards and fruit trees and excess production.
Livestock waste	Wet and dry manure, poultry litter	
Industry	Industrial residues	Industrial waste wood, sawdust from sawmills
		Fibrous vegetable waste from paper industries
Waste	Dry lignocellulosic	Residues from parks and gardens (e.g. prunings, grass)
	Contaminated waste	Demolition wood
		Organic fraction of municipal solid waste
		Biodegradable landfilled waste, landfill gas
		Sewage sludge

3. Forestry

Wood is the largest resource of solid biomass. The forestry sector covers a wide range of different bio-fuels with different characteristics – wood logs, bark, wood chips, sawdust and more recently pellets. The ecological functions of forests are highly valuable (genetic, species and ecosystem diversity) and should be maintained. (see reporting guidance on biodiversity and ecosystems services).

Forestry and wood are often considered renewable resources, but over-exploitation from plantations which are not sustainably managed, threatens the environment as a whole and in particular biodiversity. Harvesting and appropriate use of timber from legal or sustainably managed forests may be a positive indicator of environmental performance.

The UK Forestry Standard (UKFS) is the reference standard for sustainable forest management in the UK. <http://www.forestry.gov.uk/ukfs>

Further guidance can be found here:

[http://www.forestry.gov.uk/pdf/FCPH001.pdf/\\$FILE/FCPH001.pdf](http://www.forestry.gov.uk/pdf/FCPH001.pdf/$FILE/FCPH001.pdf)

Defra has also published guidance to help organisations report reductions in greenhouse gas (GHG) emissions resulting from investment in UK woodland creation projects and how organisations should account for the carbon savings associated with newly created woodland absorbing additional carbon dioxide from the atmosphere. The guidance should be used in conjunction with the Woodland Carbon Code whose purpose is to provide a robust quality assurance process that will promote market confidence in carbon sequestration by woodlands and re-assure investors that woodlands in which they have invested provide additional and permanent GHG abatement.

Annex L: Emissions to air, land and water

This Annex explores in greater detail the background behind the reporting recommendations and provides further detail about the relevant legislation.

Background

1.1 Emissions to Air

Whereas greenhouse gases are most active high in the atmosphere, the most important factor for air quality is the concentration of emissions closer to the ground. Nevertheless, air emissions can travel long distances, chemically reacting in the atmosphere to produce other pollutants, leading to air pollution problems locally as well as a long way from the source.

There is an important distinction between emissions of air pollutants and the concentrations of such pollutants in the air we breathe. Emissions contribute to the concentration of pollutants in ambient air, so it is essential to monitor the amount emitted. It is the concentration in the air we breathe that affects human health and the environment.

A tool for calculating emissions is available at National Atmospheric Emissions Inventory http://naei.defra.gov.uk/data_warehouse.php

The most common emissions are:

1.2 Oxides of Nitrogen (NO_x)

All combustion processes in air produce oxides of nitrogen (NO_x). Nitrogen dioxide (NO₂) and nitric oxide (NO) are both oxides of nitrogen and together are referred to as NO_x.

Road transport is the main source of NO_x and NO₂, followed by the electricity supply industry and other industrial and commercial sectors. Although large combustion plants are polluting, they tend to be located away from major centres of population, and for this reason road transport contributes far more to the public's exposure to air pollutants. Deposition of pollutants derived from NO_x emissions contribute to acidification and eutrophication of sensitive habitats leading to loss of biodiversity. NO_x also contributes to the formation of secondary particles and ground level ozone, both of which are associated with ill health effects.

1.3 Sulphur Oxides

Sulphur oxides (SO_x) are compounds of sulphur and oxygen molecules. Sulphur dioxide (SO₂) is the predominant form found in the lower atmosphere. Sulphur oxides in the atmosphere can influence the habitat suitability for plant communities as well as animal life. Sulphur oxide emissions are a precursor to acid rain and atmospheric particulates.

The main sources of sulphur oxides are emitted following the combustion of fossil fuels such as coal used in power generation, domestic and industrial purposes and certain types of vehicle ships, trains and those cars without catalytic convertors.

1.4 Particulate matter (PM)

Particulate Matter (PM) is made up of a wide range of materials and arise from a variety of sources. PM is generally categorised on the basis of the size of the particles (for example PM_{2.5} are particles with a diameter of less than 2.5µm which is very fine material that can penetrate deep into the lung). PM derives from both human-made and natural sources (such as sea spray and soil dust). In the UK the biggest human-made sources of PM are stationary fuel combustion and transport. Road transport gives rise to primary particles from engine emissions, tyre and brake wear and other non-exhaust emissions. Other primary sources include quarrying, construction. Secondary PM is formed from emissions of ammonia, sulphur dioxide and oxides of nitrogen as well as from emissions of organic compounds from both combustion sources and vegetation.

1.5 Volatile Organic Compounds (VOCs)

VOCs are either emitted to air as gases from certain substances or as a by-product of fossil fuel combustion.

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 (a dry cleaning fluid), trichloroethane, benzene, toluene, and xylenes. 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 not practical to give an exhaustive list of the processes that produce them.

1.6 Metal Emissions to Air

Metals that can have significant environmental impacts include lead, mercury, cadmium, arsenic and nickel. Certain 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 a negative 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 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.

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 do 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.

1.7 Metal Emissions to Land

Emissions of metals to land by industrial processes can have a serious impact on the local environment. All metals can have adverse effects on natural habitats depending on the amount emitted and the acceptable biological limit. In particular, metals such as mercury, cadmium, arsenic, chromium, copper, zinc and lead, can be highly toxic.

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.

1.8 Metal Emissions to Water

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.

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

1.9 Acid and Organic Chemicals

There is the potential for a wide range of organic chemicals to be emitted into the environment – for example, long chain hydrocarbons (from oil, etc) 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. These emissions are usually caused by accidental spillage. 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.

2. Nutrients and Organic Pollutants

Many sectors are responsible for emitting organic pollutants to water including farming, water treatment, textile production, the paper industry and chemical industry. Pollutants

also reach water from the run-off from roads and highways. Sources of nutrients commonly include human sewage, crops and animal production, food processing, pulp and paper manufacturing, detergent manufacturing and fertiliser manufacturing. Organic pollutants can be found in wastewater treatment, drinking water, and boiler feed water, cooling water, and storm water.

Organic matter is commonly found in groundwater and inland waters, and can cause pollution and disruption to aquatic habitats. Discharges of organic waste (nutrients) into bodies of water can cause eutrophication in rivers, lakes, estuaries, coastal and marine waters. Sources of nutrients commonly include human sewage, crops and animal production, food processing, pulp and paper manufacturing, detergents manufacturing and fertiliser manufacturing. Organic contaminants can lead to the death of animals and fish as well as changes in appearance, reproductive patterns or behaviour in fish. Organic pollutants can be found in influent and effluent of wastewater treatment, boiler feed water, cooling water, and storm water.

While nutrients have an indirect effect on oxygen levels, oxygen-demanding pollutants have a direct effect. They are contained in organic effluents such as sewage discharges and discharges from the industrial sectors (food and drink). Organic effluent includes contaminants such as polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), hexachlorocyclohexanes (HCH), benzene, toluene, xylenes, ethylbenzene, dioxins and phenols, as well as general brewing waste and sewage. Oil spills can also contribute to organic pollutants.

3. Issues to consider and Legislation

The **European Pollutant Release and Transfer Register (E-PRTR) Regulation** applies directly to operators within 9 industrial sectors – covering approximately 65 economic activities:

- Energy
- Production and processing of metals
- Mineral industry
- Chemical industry
- Waste and waste water management
- Paper and wood production and processing
- Intensive livestock production and aquaculture
- Animal and vegetable products from the food and beverage sector
- Other activities

The Regulation requires operators to report annually emissions of any of the 91 substances listed in the Regulation which is emitted in quantities above the threshold for that substance. The objective of the E-PRTR is "to enhance public access to information through the establishment of coherent, nationwide pollutant release and transfer registers (PRTRs)".

4. Industrial Emissions Directive

The Industrial Emissions Directive recast seven existing Directives, related to industrial emissions, including the Large Combustion Plant Directive and the Integrated Pollution Prevention and Control (IPPC) Directive, into a single Directive. Much of the component Directives remains substantively unchanged or has been clarified, but a few new activities are subjected to IPPC, notably wood preservation and some waste recovery activities, and minimum requirements in respect of emissions from existing large combustion plants are significantly tightened from 2016.

Details of the industries and activities that will be subject to the provisions of the IED can be found here: <http://www.defra.gov.uk/environment/quality/industrial/eu-international/industrial-emissions-directive/>

Further detail on E-PRTR can be found here: <http://prtr.defra.gov.uk/>

And here:

http://www.environment-agency.gov.uk/static/documents/Business/eptr_guidance_doc_1426519.pdf

5. Off Shore Chemical Notification Scheme

The use and discharge of hazardous substances in the offshore oil and gas industry have been identified as a cause for concern. To reduce the overall impact of offshore chemicals on the marine environment, OSPAR has adopted a [harmonised mandatory control system](#)¹⁰² for use and reduction of discharges of offshore chemicals. This system promotes the shift towards the use of less hazardous or preferably non-hazardous substances. There is a common OSPAR interpretation of which [chemicals are covered and not covered](#)¹⁰³ by the control system. The Offshore Chemical Notification Scheme (OCNS)¹⁰⁴ manages chemical use and discharge by the UK offshore petroleum industries. The scheme is regulated in the UK by the Department of Energy and Climate Change using scientific and environmental advice from Cefas and Marine Scotland. If you operate in this sector and use chemicals that are covered by OSPAR you should report using your

¹⁰² <http://www.ospar.org/documents/DBASE/DECRECS/Decisions/od00-02e.doc>

¹⁰³ http://www.ospar.org/documents/DBASE/DECRECS/Agreements/02-06e_Common%20interpretation.doc

¹⁰⁴ <http://www.cefas.defra.gov.uk/industry-information/offshore-chemical-notification-scheme.aspx>

OCNS data/returns and discuss within your organisation plans for substitution where feasible to move to safer alternatives.

The [EP Regulations 2010](#) covering England and Wales provide industry, regulators and others with a single extended permitting and compliance system and includes those systems for discharge consenting, groundwater authorisations and radioactive substances regulation. Environmental Permitting also provides a tool for delivering the permitting and compliance requirements of EU directives such as those relating to the Batteries Directive and Mining Waste Directive.

More information on emissions to air is available at Defra website at:

<https://www.gov.uk/government/policies/protecting-and-enhancing-our-urban-and-natural-environment-to-improve-public-health-and-wellbeing/supporting-pages/international-european-and-national-standards-for-air-quality>

Information about air quality laws and regulations for industry are available at Environment Agency

<http://www.environment-agency.gov.uk/business/topics/permitting/32320.aspx>

Information about air quality monitoring is available at UK Air: <http://uk-air.defra.gov.uk/>

The National Atmospheric Emissions Inventory is also a source of detailed information on air emissions in the UK. <http://naei.defra.gov.uk/index.php>

6. Other Information

The following table is a list of metals and some of their main industrial uses.

Pollutant ¹⁰⁵	Processes & Activities
Antimony	Petroleum refineries Fire retardants Electronic production Ceramic production Steel production (solder)
Arsenic	Glass production Electronic production Fruit production

¹⁰⁵ Main source: United States Environmental Protection Agency. Note that not all these will be applicable in the UK, but the table is left complete to assist multinational UK registered companies that wish to refer to these guidelines.

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

	Landfill Electronic devices' batteries
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

Annex M: Biodiversity and ecosystem services

What are Biodiversity and Ecosystem Services?

Biodiversity. The UN defines biodiversity as "the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems".

Ecosystems. An ecosystem is a dynamic complex of flora, fauna, microbes and their non-living environment (soil, air, water) interacting with one another as a functional unit. Examples of ecosystems are forests, grass-lands, mangroves and urban areas..

Ecosystem Services. Ecosystem services are the benefits that humans obtain from ecosystems, and they are produced by interactions within the ecosystem. Different types of ecosystems and services can be distinguished.¹⁰⁶

The Millennium Ecosystem Assessment (MA), grouped ecosystem services into four broad categories:

- Provisioning services: Goods or products obtained from ecosystems such as food, freshwater, timber and fibre;
- Regulating services: Benefits obtained from natural processes such as climate, disease, erosion, water flows and pollination, as well as protection from natural hazards;
- Cultural services: Non-material benefits obtained from ecosystems, such as recreation, spiritual values and aesthetic enjoyment (elements of biodiversity are included within this e.g. charismatic species);
- Supporting services: Functions that maintain all other services, such as photosynthesis, water and nutrient cycling.

The report on The Economics of Ecosystems and Biodiversity (TEEB) further refined this list of 4 by identifying 22 service types that ecosystems provide. You might find these

¹⁰⁶ This definition has been derived from 'Ecosystems and human well-being; Opportunities and Challenges for Business and Industry' of the Millennium Ecosystem Assessment.

helpful in understanding the linkages to natural capital¹⁰⁷ by making a distinction between the natural capital assets that give rise to a flow of benefits, and a particular aspect of human well-being.

Biodiversity Offsets

Biodiversity offsets are conservation activities designed to deliver biodiversity benefits in compensation for losses, in a measurable way. They can be used to compensate for residual impacts on biodiversity from development activities, as a final step after avoiding losses wherever possible, and mitigating for impacts on site.

Biodiversity offsets are distinguished from other forms of ecological compensation by the requirement to measure losses (due to impact) and gains (achievable through the offset) in the same way.

The Business and Biodiversity Offsets Program (BBOP) is an international partnership between companies, financial institutions, governments and civil society organizations to explore biodiversity offsets: <http://bbop.forest-trends.org/>. In January 2012, BBOP published the latest version of its standard for offsetting, which aims to help auditors, developers, conservation groups, communities, governments and financial institutions that wish to assess biodiversity offsets against the BBOP principles, criteria and indicators.

Indicators

Indicators are measures that summarise complex data into simple, standardised and communicable figures. Many indicators that relate to the aspects of biodiversity exist, however none capture biodiversity in its entirety.

You might find it easier to understand, communicate and act upon your biodiversity indicators if you consider the linkages that connect your activities to outcomes as follows:

- Responses — actions to prevent or reduce biodiversity loss
- Pressures — the threats to biodiversity that your responses aim to address
- State — the condition of biodiversity and how it is changing
- Benefits — amount and change in benefits and services that humans derive from biodiversity

¹⁰⁷ 105 The term 'capital' is used to describe a stock or resource from which revenue or yield can be extracted. Four basic categories of natural capital are generally recognised: air, water (fresh, groundwater and marine), land (including soil, space and landscape) and habitats (including the ecosystems, flora and fauna which they both comprise and support).

There is cyclical nature to these four indicators where the state of, or action in one impacts on the next. Linking these 4 indicator types together makes it clear that there is a cyclical nature to your decisions and the corresponding impact on biodiversity i.e. your decisions can lead to pressures on biodiversity which in turn impact on the state of biodiversity which can then alter the benefits from biodiversity. You can start from any point in this cycle i.e. a change in the benefits from biodiversity could lead to a response by your organisation. etc. This approach can be applied to any organisation, sector or system and is a simple way of understanding the Response-Pressure-State-Benefit approach.
