



# Comparable environmental indicators for companies

Establishment of indicators allowing comparisons of environmental performance of companies and benchmarking as an element to transform EMAS into a system of excellence

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# Summary

Environmental Management Systems (EMSs) are based on a principle of continuous improvement and it is possible to become EMS-certified without fulfilling any given level of environmental performance beyond legal compliance. Thus, in principle companies with a poor environmental performance can be EMS-certified and just make tiny improvements every year in order to fulfil the standard because it is not necessary to fulfil any minimum requirements or criteria as far as actual environmental performance is concerned. A certificate does thus not reflect that a certain level of performance has been achieved but only that appropriate management practices have been used in a systematic manner.

This aspect has been criticised by several organisations, resulting in an focus on attempting to transform EMAS into a system of excellence, meaning that a certain environmental performance level above legal requirements, must be required in order to obtain an EMAS certification.

The purpose of this report has been to:

- Review existing approaches, practices and guidelines in the field of corporate environmental reporting (especially GRI) with a special focus on quantitative environmental indicators allowing comparisons of the performance of different organisations/companies.
- Discuss the possibilities of using quantitative and qualitative indicators in the comparison of companies as well as benchmarking options. GRI reports are used to discuss and illustrate possible problems.
- Develop a set of indicators, based on the review as well as the discussion, which could be used in the context of the EMAS revision. The indicators are supplemented with a discussion of the preconditions necessary to produce and use meaningful key environmental performance indicators, that does not compromise fair trading/comparison.

In the review several approaches/practises have been examined:

- Benchmarking indicators used by investment research companies
- Defra Environmental KPIs (Defra: The Department for Environment, Food and Rural Affairs, United Kingdom Government).
- OECD Key Environmental Indicators
- The European Pollutant Emission Register (EPER)
- The Global Reporting Initiative (GRI)

It was concluded that the Global Reporting Initiative has potentials in terms of creating comparable figures, thus, environmental reports based on the GRI were investigated in detail in order to use the experiences from this review in developing key performance indicators. GRI reports within different sectors (1. Banks, 2. Construction & Building materials and 3. Household Goods & Textiles) were chosen for the review.

Furthermore, several different environmental reports (including non-GRI reports) were reviewed in order to locate data that could be used for

establishing baseline and excellence levels associated to specific environmental impacts within the three investigated sectors.

The conclusions were that:

- Even between GRI reports within the same sector it is practically impossible to compare the environmental performance of two different companies, unless extensive further calculations were performed. The main problems were different reporting formats as well as a lack of sufficient background information related to the data reported.

Based on the review and analysis of sustainability reports, a procedure for developing comparable environmental performance indicators, useful for benchmarking, has been described. This procedure has been used for developing three key performance indicators - two within the financial sector, and one within the cement-producing sector. The three developed indicators are judged to be useful as comparable indicators, however pilot studies are needed in order to learn whether it is practically possible for the companies to report in the suggested format.

A scaling and rating system of how the key performance indicators should be used in practise in EMAS has been suggested. The scaling system should be regarded as an example of what is possible, and should be discussed by the stakeholders involved, before being developed further.

In short the scaling system used within EMAS could be carried out as follows:

- A maximum of four environmental key performance indicators are developed for each sub-sector. The four indicators should represent the most relevant environmental issue for this sub-sector and these environmental issues are of course different from sub-sector to sub-sector.
- For each indicator a scaling system consisting of three levels (for simplicity – more levels could of course be used) is established. The baseline level represents the level where approximately 75% of the companies potentially can apply. The figures used to establish baseline and excellence levels in this report are primarily fictive.
- The scores are converted to a total score for all (max.) four environmental indicators. We have used the approach of a simple average, but weighting between the four environmental indicators could also be a possibility, however this is not done within this study.
- On the basis of the total score, the company is assigned for an EMAS A, B or C level.

The main conclusions and recommendations of the project are:

- Qualitative indicators are informative and can be used for benchmarking on general or systemic aspects, but may also work well in combination with quantitative indicators. However, they cannot be used to determine the actual level of performance in detail.
- It is possible to develop comparable environmental indicators; however, they should be quantitative and be developed on a sub-sector level.
- The task of developing useful and fair key performance indicators is complex.
- The level of detail required in terms of reporting on comparable environmental indicators is relatively high, though varying between sub-sectors.

- Within each sub-sector concerns should be made in order to determine whether the required level of details, makes it unreasonable to develop quantitative indicators useful for benchmarking.
- Future studies involved in developing comparable indicators within sub-sectors should focus on maximum four important environmental impacts associated with a given product or service.
- Future studies should focus on gathering knowledge regarding whether it is practical possible for the companies to report in the suggested way (e.g. in the form of pilot studies).
- Studies related to gathering information necessary to establish realistic baseline – excellence level within the specific sub-sectors are needed.
- It is possible to use comparable environmental indicators as an element to transform EMAS into a system of excellence, however it might not be possible for all sub-sectors to develop quantitative comparable indicators necessary for achieving an EMAS A, B or C certification.

# 1 Introduction

## 1.1 Background

### 1.1.1 Today's Environmental Management Systems

Environmental Management Systems (EMSs) are based on a principle of continuous improvement and it is possible to become e.g. ISO 14001 certified without fulfilling any given level of environmental performance beyond legal compliance. So in principle companies with a poor environmental performance can be certified according to e.g. ISO 14001 and just make tiny improvements every year in order to fulfil the standard because it is not necessary to fulfil any minimum requirements or criteria as far as actual environmental performance is concerned. A certificate does thus not reflect that a certain level of performance has been achieved but only that appropriate management practices have been used in a systematic manner.

A former Secretary General from ANEC – the European consumer voice in standardisation – states: “At the moment, the EMS standards are so weak that almost anyone can apply to them and claim to be acting in an environmentally friendly way without actually changing much in their business practise” (ANEC, 2003).

According to the PERFORM project on Sustainability Performance Benchmarking (Sorell et al, 2005) there seems to be a positive significant difference in the environmental performance between EMS and non-EMS companies, but only for some sectors and for a few indicators. The study therefore concludes that the analysis provides no clear evidence that producers with an EMS have a “better” environmental performance.

Having an EMS certification is, however, seen as a positive characteristic with regard to the environmental performance of the company. EMS certifications are for example used as a positive indicator in green procurement in the public sector.

It is therefore relevant to ensure a minimum level of environmental performance for the companies which are to obtain an EMS certification. In this way it will be more “correct” to view the EMS certification as a positive characteristic with regard to the environmental performance of the company.

This lack of absolute requirements is the basic premise of e.g. the ISO 14001 EMS standard and will also become the premise of the up-coming guideline on social responsibility – ISO 26000 standard – which will encompass guidelines on social, ethical and environmental aspects of sustainability.

Absolute minimum requirements based on internationally recognised UN and ILO conventions have been proposed within the field of social responsibility, as reflected in the standard SA 8000. Something similar could be useful in the environmental field where it would be relevant to have a set of minimum performance requirements, a set of reporting requirements and a set of

adequate benchmarks. The requirements can be set for both product and company performance.

Product performance has been the subject of e.g. Eco-label schemes, whereas process or site performance has been treated in e.g. the pan-European – so-called BREF documents<sup>1</sup> (BAT Reference Documents), but a comprehensive and interrelated set of requirements, criteria and benchmarks has not been developed.

The European Environmental Bureau (EEB) and the European consumer voice in standardisation (ANEC) express their concerns and their views on Environmental Management Systems such as ISO 14001 and EMAS in a joint position paper. The major points of criticism were:

- The lack of differentiation of organisations due to the fact that both the front runner and the heavy polluter can qualify for certification.
- The absence of any substantive minimum performance requirements beyond legal compliance.
- Inadequate (for EMAS) or missing (ISO 14001) reporting requirements and benchmarks.
- No evidence of actual environmental performance improvement.

The conclusions of this paper are that there is little evidence to suggest that the adoption of an EMS can be viewed as an environmental performance boost, and that the following measures should be considered to make the instrument more substantive (only some of the measures mentioned are listed):

- EMS standards must contain a clear obligation to comply with legal provisions.
- Continual improvement of environmental performance has to mean a measurable reduction of environmental burdens and resource consumption.
- ***Key environmental performance indicators, which allow for comparison between different organisations by using appropriate references for normalisation, shall be developed.***
- ***The number of indicators suitable for comparisons and benchmarking will have to focus on a (very) limited number of key performance aspects (and ignore many other aspects).***
- The indicator approach should be complemented by minimum performance requirements, going beyond legal compliance, which need to be defined at the sector level.
- Minimum performance levels based on the state-of-the-art shall be defined.
- Detailed reporting requirements should be established allowing the reader to understand how good the environmental performance is. Levels of excellence need to be defined.
- Whilst a strengthening of the product dimension is much appreciated, the EMAS and Eco-label systems need to be clearly separated, not precluding the use of synergies between both systems. EMAS logos should not be used on products (ANEC/BEUC/ECOS/EEB, 2006).

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<sup>1</sup> IPPC Reference Document on Best Available Techniques. European Commission, Integrated Pollution Prevention and Control (IPPC).

### 1.1.2 The EVER study

As part of the normal legislative process, the EMAS Regulation is in a revising process. In the framework of the revision, the European Commission had contracted out an external evaluation study on the performance of EMAS and the Eco-label schemes (Evaluation of EMAS and Eco-label for their Revision – the so-called EVER study). The final report of the study was published in December 2005 (EVER, 2005).

The EVER study proposes options and recommendations for the revision process. One of the highlighted options for the EMAS scheme is to transform the EMAS system into a truly and widely recognised “standard of excellence”. This should be carried out by defining and using Key Performance Indicators (KPIs) in order to stimulate a higher attention to performance and to enhance benchmarking between competitors. The KPIs are to be identified and created by different working groups under the European Commission and should be sector-specific. Companies operating in different sectors would then be asked to measure their performance on the basis of the different KPIs (e.g. global warming, ozone depletion, energy saving etc.) and publish them in their environmental statement.

The EVER study suggests to use the BREF documents or the EU Ecolabel criteria as the basis for creating the different KPIs. Finally, the EVER study suggests to set a requirement for the EMAS registered organisations of a certain minimum improvement – e.g. to improve a minimum number of KPIs. This will ensure that the organisations must pursue continuous improvements (EVER, 2005). This will send future EMS in the direction of a system that promotes benchmarking between companies.

### 1.1.3 Going beyond EMS

The Consumer Council at the Austrian Standards Institute commissioned a study carried out by FORCE Technology, Denmark, in 2006 entitled: “Going beyond EMS”. The basic idea behind this study was to develop an alternative to the shallow management system approach by establishing generic, global minimum requirements for environmental performance of companies complemented by a set of higher level sectoral requirements. In the study this was demonstrated by using the textile industry as an example.

The purpose of the study was merely to show the principle of a possible approach. For this reason a limited number of environmental parameters and requirements were developed. In total, 20 requirements were developed on a general global level and 33 requirements on a sector level for the textile industry. The requirements covered the following aspects:

- General principles
- Air emissions
- Liquid effluents
- Waste
- Noise
- Consumption of energy in production
- Consumption of water in production
- Hazardous and harmful substances
- Consumption of water, energy, etc. by products (only on sector level)
- Product quality (only on sector level)

The study report contains some suggestions for reporting including the use of normalised relative data (such as MJ per product or kg output) but this aspect is not dealt with in detail.

In this previous study examples of quantitative environmental requirements for companies having environmental management systems are developed on both a general level and on a sector level, but it is commented that the general indicators preferably should be benchmarked against levels within the specific sector. (FORCE Technology, 2006).

#### 1.1.4 EMAS reporting requirements

According to the EMAS regulation, organisations are obliged to produce an environmental statement<sup>2</sup>. The minimum requirements for the environmental statement include, amongst other elements, an obligation to report on environmental performance:

“a summary of the data available on the performance of the organisation against its environmental objectives and targets with respect to its significant environmental impacts. The summary may include figures on pollutant emissions, waste generation, consumption of raw material, energy and water, noise as well as other aspects indicated in Annex VI. The data should allow for year-by-year comparison to assess the development of the environmental performance of the organisation” (Reg. No. 761/2001, annex III, 3.2 (e)).

The organisation is encouraged to use performance indicators in their reporting of environmental performance and criteria for the reporting of such indicators have been defined (cf. Reg. No. 761/2001, annex III, 3.3).

According to the EMAS regulation, indicators should:

- give an accurate appraisal of the organisations performance
- be understandable and unambiguous
- allow for year on year comparison to assess the development of the environmental performance of the organisation
- allow for comparison with sector, national or regional benchmarks as appropriate
- allow for comparison with regulatory requirements as appropriate.

A guidance document has been produced concerning the selection and use of performance indicators<sup>3</sup>. The guidance document encourages the organisation to report - not only absolute values of environmental impacts - but also indicators based on normalisation. Furthermore, it is recommended that organisations take their point of departure in ‘common standards’ set by for instance research, trade associations, non-governmental organisations, local, national or regional governments in order to allow for benchmarking.

Some of the listed examples of indicators are:

- Electricity (mWh)/employee
- Paper consumption (kg)/employee
- Travel (km)/employee

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<sup>2</sup> REGULATION (EC) No 761/2001 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 19 March 2001 allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS).

<sup>3</sup> COMMISSION RECOMMENDATION of 10 July 2003 on guidance for the implementation of Regulation (EC) No 761/2001 of the European Parliament and of the Council allowing voluntary participation by organisations in a Community eco-management and audit scheme (EMAS) concerning the selection and use of environmental performance indicators.

However, the suggested examples of performance indicators do not take into account the problems raised in this report.

## 1.2 Purpose

The purpose of this study is:

**To critically review** existing approaches, practices and guidelines in the field of corporate environmental reporting (especially GRI) with a special focus on quantitative environmental indicators allowing comparisons of the performance of different organisations/companies (i.e. relative indicators and concentrations based emission levels).

**To discuss** the possibilities of using quantitative and qualitative indicators in the comparison of companies as well as benchmarking options. GRI reports will be used to discuss and illustrate possible problems related to how detailed a sector level is required in order to be able to have a meaningful comparison of their environmental performance. Furthermore the possibilities of introducing scales or grades, which allow for a differentiation between best, good and not so good environmental performers with EMAS certification will be discussed.

**To develop** a set of indicators, based on the review as well as the discussion, which could be used in the context of the EMAS revision. The indicators will be supplemented with a discussion of the preconditions necessary to produce and use meaningful key environmental performance indicators.

**To prepare recommendations** regarding further work which may need to be carried out.

It must be emphasized that one important prerequisite for developing comparable indicators, useful in benchmarking, is that they must represent a fair comparison. If they do not, companies would not use them and the idea of benchmarking on environmental indicators would weaken.

## 2 Review of existing approaches and guidelines

An Internet search has been performed in order to find information about different systems for reporting on environmental key performance indicators (KPIs) and benchmarking between the environmental performances of companies.

A number of different systems for reporting environmental indicators exist. Some of them e.g. the European Benchmarking Indicators developed by the Netherlands Environmental Assessment Agency<sup>4</sup> are, like the OECD indicators, developed to benchmark between countries and not between companies, meaning that the indicators are normalised according to the country (for example CO<sub>2</sub> emissions per capita) instead of e.g. per product. Therefore, all these environmental indicator systems will not be described in this report – the OECD indicators will, however, be described briefly as an example of this type of environmental indicators.

The European Environment Agency (EEA) has developed a set of environmental indicators to monitor Europe's environment. These indicators have, among other things, been developed to streamline EEA's contribution to other European or global indicator initiatives such as OECD environment indicators. The EEA indicators are used to follow the environmental performance of Europe (as a total) on several aspects. Again this is on a much higher level which cannot be used for comparison between companies.

Similarly, a number of different systems exist for benchmarking on responsible businesses. An example of this is the Business in the Community (BITC) from the UK. Their Corporate Responsibility (CR) index is the UK's leading benchmark of responsible business, helping companies to integrate and improve responsible business across their business and providing a systematic approach to managing, measuring and reporting their impacts on society and the environment. BITC also contains an Environment index<sup>5</sup>, which assesses a company on everything from its environmental management processes to its performance in key areas. However, this assessment does not involve reporting of the severity of the environmental impacts or the exact measurable impacts. The companies are given a total score depending on their performance on several issues. With respect to the environment the companies are judged according to which extent they measure, manage and publicly report their key environmental impacts. They are not judged by whether their impacts are high or low within their area. Benchmarking systems of this type will therefore not be further described.

In this review the following approaches and guidelines will be reviewed:

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<sup>4</sup> Found at <http://www.mnp.nl/en/publications/2006/EuropeanBenchmarkIndicators.html>.

<sup>5</sup> Found at [http://www.bitc.org.uk/take\\_action/in\\_the\\_environment/getting\\_involved/the\\_environment\\_index/index\\_participation.html](http://www.bitc.org.uk/take_action/in_the_environment/getting_involved/the_environment_index/index_participation.html)

- Benchmarking indicators used by social responsible investors.
- Defra environmental KPIs, which is a set of indicators developed for all business areas in the UK.
- OECD key environmental indicators.
- European Pollution Emission Register (EPER)
- Global Reporting Initiative (GRI).

The main focus will be on the GRI standards which are the most developed environmental indicators of the above.

## 2.1 Benchmarking indicators used by investment research companies

The market for Socially Responsible Investing (SRI) has grown during the past decades. Socially Responsible Investing is an investment strategy which combines the intentions to maximize both financial return and the 'sustainable performance' of organisations. An SRI approach implies that stocks are not only selected based on past and future expectations regarding the economic performance of companies, but on a broader perspective including also their ethical, social and environmental performance.

The sustainability research of stocks/companies is either performed by in-house sustainability research departments or – more often – the research is provided by independent investment research companies such as for instance the US based KLD Research & Analytics, the UK based EIRIS or the Nordic based GES Investment Services.

Different approaches are applied by the investment research companies including:

- **Negative screening** where companies are excluded from the investment universe if they are engaged in activities which violate defined values (for instance producers of weapons, tobacco or other “controversial” products or companies involved in serious or systematic violations of internationally recognized conventions and norms).
- **Positive screening** where companies are (positively) selected for their relative performance compared to others within the industry (best-in-class).
- **Shareholder activism** where investors are engaging in an active dialogue with the company, for instance through the presentation of shareholder resolutions on annual general meetings with the aim of pushing in the direction of sustainability improvements.

A review of some of the standardised questionnaires used by different investment research companies<sup>6</sup> shows that the majority of indicators being used are of qualitative character, addressing the commitment of the company as demonstrated through environmental policies, management systems and reporting practices<sup>7</sup> (cf. some examples of questions in the textbox below).

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<sup>6</sup> The companies serving the investment community with information about companies' ethical, social and environmental performance

<sup>7</sup> Company information gathered through standardised questionnaires used by screening companies such as SAM (Sustainable Asset Management screening for the Dow Jones Sustainability Indexes) and SIRI Group.

Examples of questions used in a standard questionnaire
Has your company adopted a corporate environmental policy? Coverage?
Have quantified environmental targets been defined for the whole company?
Please indicate how your environmental management system is verified/audited/certified? And the percentage of total revenues verified/audited/certified according to these systems?
<b>Source: SAM Research, Corporate Sustainability Assessment Questionnaire, 2004</b>

Some performance data are also being used such as energy consumption, water use, direct GHG emissions, waste generation etc. However, these figures are used to monitor trends (the development of indicators over time) and relate them to reduction targets. Some examples of quantitative environmental indicators are listed in the table below:

	Indicator / Unit
Energy consumption	GJ
Water consumption	1,000 m <sup>3</sup>
Discharge to water	Total (Kg.)
GHG emissions	Metric ton CO <sub>2</sub> equivalent
VOC emissions	Dioxin (g teq/year)
ODC (CFC <sub>11</sub> eq.) use	
Industrial and common waste	Ton
Total nutrient emissions to water	Ton N+(10*P)
COD	Ton
Metal emissions to air	Total (Kg.)
Acid emissions to air	Acid Deposit Potential expressed as 1000 Acid equivalents.
<b>Source: www.siricompany.com</b>	

In summary, the general approach taken by investment research companies reflects the fact that the methodology is tailored to the large number of stocks being researched. Companies are benchmarked on their “systemic performance” (qualitative indicators), i.e. whether they have policies, management systems, reporting practices etc. in place and whether they are working in the right direction – currently improving their performance. The standardised methodology being used does not take account of the individual companies’ ‘point of departure’, i.e. whether they are good, medium or relatively bad performers.

## 2.2 Defra environmental KPIs

The Department for Environment, Food and Rural Affairs (Defra) is the United Kingdom government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in England. Defra has developed a set of 22 environmental key performance indicators that are significant to UK businesses and describe which KPIs are most important to which business sectors. However, a research undertaken by the Environment Agency showed that in their annual report 84% of FTSE (Financial Times Stock Exchange) All-Share companies currently reporting have not yet disclosed their environmental performance according to Defra’s guidelines. This is despite the fact that according to the new company reporting laws all FTSE All-Share companies producing annual report and accounts must disclose environmental key performance indicators where relevant. However, as the Defra guidelines are voluntary, companies do not have to use them (Customer Contact Unit at Defra (ccu.correspondence@defra.gsi.gov.uk)).

The guideline (which includes the 22 KPIs) is derived from an analysis of the impact the UK businesses have on the natural environment and is developed for all businesses operating in the UK. According to Defra, the purpose of the environmental KPIs is to provide businesses with a tool for measurement. The KPIs are quantifiable metrics, which reflect the environmental performance of a business in the context of achieving its wider goals and objectives.

***Reporting principles for the KPIs***

Defra sets up three reporting principles specific for the KPIs. **The first** is that the KPIs should be quantitative in nature, thus allowing for setting up targets expressed in quantitative terms. **The second** is that the KPI should be accompanied by a general narrative, explaining its purpose and impacts. **The third** is that KPIs should be expressed in absolute terms that cover the entire business for each period of reporting and also related to a normalising factor. They mention two commonly used normalising factors - turnover and production output, but realise that other normalising factors may be relevant for companies in a particular sector. Finally they state that reporting should be consistent with other types of company reporting as far as possible (Defra, 2006).

***The environmental key performance indicators***

In appendix 1, the 22 environmental key performance indicators from Defra are listed, together with their suggestions of how to calculate, measure and report the different indicators.

Defra further suggests the companies to consider the environmental impact in their supply chain as well as downstream for their products. However, they do not suggest any measurable indicators related to this. The following table demonstrates how a number of KPIs for a typical service industry company could be reported:

Table 2-1: How to report environmental performance indicators according to Defra (directly taken from Defra, 2006).

Figure 3: Sample Company Plc – Environmental Key Performance Indicators								
Environmental Key Performance Indicators – Financial Year 2005								
Direct Impacts (Operational)			Quantity					
Greenhouse Gases	Definition	Data source & Calculation Methods	Absolute Tonnes CO2		Normalised Tonnes CO2 Per £M Turnover			
			2004	2005	2004	Target	2005	Target
Gas	Emissions from utility boilers.	Yearly consumption in kWh collected from fuel bills, converted according to Defra Guidelines.						
Vehicle Fuel	Petrol and diesel used by staff and van hire fleet.	Expense claims and MOT recorded mileage, converted according to Defra Guidelines.						
Waste	Definition	Data source & Calculation Methods	Quantity					
			Absolute Tonnes		Normalised Tonnes Waste Per £M Turnover			
			2004	2005	2004	Target	2005	Target
Landfill	General office waste, which includes a mixture of paper, card, wood, plastics and metals.	Volume of waste generated per annum, calculated by recording the number of bins and skips removed, converted to tonnes according to Defra Guidelines.						
Recycled	General office waste recycled, primarily cardboard.	Volume of waste recycled per annum, calculated by recording the number of bins and skips removed for recycling, converted to tonnes according to Defra Guidelines.						
Indirect Impacts (Supply Chain)			Quantity					
Greenhouse Gases	Definition	Data source & Calculation Methods	Absolute Tonnes CO2		Normalised Tonnes CO2 Per £M Turnover			
			2004	2005	2004	Target	2005	Target
Energy use	Directly purchased electricity, which generates Greenhouse Gases including CO2 emissions.	Yearly consumption of directly purchased electricity in kWh, converted according to Defra Guidelines.						
Water	Definition	Data source & Calculation Methods	Quantity					
			Absolute Cubic Metres		Normalised Cubic Metres Water Per £M Turnover			
			2004	2005	2004	Target	2005	Target
Supplied water	Consumption of piped water. No water directly abstracted by the Group.	Yearly consumption of purchased water.						

### 2.3 OECD key environmental indicators

OECD (Organisation for Economic Co-operation and Development) initiated their work on environmental indicators in 1989, and in 1991 an OECD Council Recommendation on Environmental Indicators and Information was approved by the OECD Governments. Since then the work on the environmental indicators has been developed further. The latest version of the OECD environmental indicators is from 2003 and is described in the report “OECD Environmental Indicators. Development, measurement and use. Reference paper. OECD 2003.” (OECD, 2003).

The OECD environmental indicators are designed to be a valuable tool in strengthening countries’ capacity to monitor and assessing environmental conditions and trends so as to increase their accountability and to evaluate

how well they are satisfying their domestic objectives and international commitments. The purpose and scope of the indicators are to contribute to the harmonisation in the field of environmental indicators by developing a common approach and conceptual framework.

The OECD work focuses mainly on indicators useful for national, international and global decision making. However, according to OECD the approach may also be used to develop indicators at sub-national or ecosystem level. OECD encourages actual measurements of indicators at these levels, but the responsibility lies within the individual countries. (OECD, 2003).

OECD operates with several types of indicators:

- Core environmental indicators (CEI)
- Key environmental indicators (KEI)
- Sectoral environmental indicators (SEI)
- Decoupling environmental indicators (DEI)

**The core environmental indicators** are designed to track environmental progress and analyse environmental policies. The OECD core set consists of about 50 indicators and is commonly agreed upon by OECD countries for OECD use. **The key environmental indicators** are a reduced set of 10 indicators, selected from the core set and serve wider communication purposes, such as the general public and policymakers. **The sectoral environmental indicators** are designed to help integrate environmental concerns into sectoral policies. A set of indicators are developed for each sector (transport, energy, household consumption, tourism, agriculture). **The decoupling environmental indicators** measure the decoupling of environmental pressure from economic growth and are used for determining whether countries are on track towards sustainable development.

OECD lists the following guiding principles for using the environmental indicators:

- The indicators are not designed to provide a full picture of environmental issues, but rather to help revealing trends and drawing attention to changes that require further analysis and possible actions.
- Indicators' relevance varies by country and by context. They must be reported and interpreted in the appropriate context (taking into account the different ecological, geographical, social, economic and institutional features of the countries).
- Most OECD indicators are designed to be used on the national level and to be used in an international context. There is no single method of standardisation for the comparison of the environmental indicators across countries.

The OECD core environmental indicators are listed in appendix 2. The boxes are a directly copy from the report "OECD Environmental Indicators. Development, measurement and use. Reference paper. OECD 2003." (OECD, 2003).

The **10 OECD key environmental indicators** have been reported in 2001, 2004 and the latest version – from 2007. All indicators are annual indicators, i.e. emissions etc. are measured per year. In the table below the OECD key environmental indicators are presented and briefly commented (OECD, 2003; OECD, 2007).

Table 2-2: OECD key environmental indicators.

Pollution issues	Key indicator	Measured in	Comment
Climate change	CO <sub>2</sub> emission intensities	<ul style="list-style-type: none"> <li>Greenhouse gases emissions per unit of GDP (ton CO<sub>2</sub>-eq/USD)</li> <li>Greenhouse gases emissions per capita (ton CO<sub>2</sub>-eq/capita)</li> <li>CO<sub>2</sub> emissions from energy use per capita (ton CO<sub>2</sub>-eq/USD)</li> </ul>	
Ozone layer	Indices of apparent consumption of ozone depleting substances	<ul style="list-style-type: none"> <li>Consumption of CFCs and halons – indexed (first year equals 100)</li> <li>Consumption of HCFCs and methyl bromide – indexed (first year equals 100)</li> </ul>	Does only show trends – a fall or increase in emissions. Does not reveal anything about the different countries' emissions compared to each other – non-comparable.
Air quality	SO <sub>x</sub> and NO <sub>x</sub> emission intensities	<ul style="list-style-type: none"> <li>SO<sub>x</sub> emissions per unit of GDP (kg/USD)</li> <li>NO<sub>x</sub> emissions per unit of GDP (kg/USD)</li> </ul>	
Waste generation	Municipal waste generation intensities	<ul style="list-style-type: none"> <li>Municipal waste per capita (kg/capita)</li> <li>Municipal waste per unit of PFC (private final consumption) (kg/USD)</li> </ul>	
Freshwater quality	Waste water treatment connection rates	<ul style="list-style-type: none"> <li>Percent of waste water connected to sewage treatment plant (with/without treatment)</li> </ul>	Does not reveal anything about the total amount of wastewater
Freshwater resources	Intensity of use of water resources	<ul style="list-style-type: none"> <li>Freshwater use per capita per year (m<sup>3</sup>/capita)</li> <li>In percent of total renewable resources</li> <li>In percent of internal resources</li> </ul>	
Forest resources	Intensity of use of forest resources	<ul style="list-style-type: none"> <li>Harvest of forest in percent of annual growth</li> </ul>	
Fish resources	Intensity of use of fish resources	<ul style="list-style-type: none"> <li>Share of world catches (in percent)</li> </ul>	Is only relevant to compare on a national level. Says more about the size of the fishing industry in the different countries.
Energy resources	Intensity of energy use	<ul style="list-style-type: none"> <li>Energy supply per capita (toe/capita)</li> <li>Energy supply per GDP (toe/USD)</li> </ul>	
Biodiversity	Threatened species	<ul style="list-style-type: none"> <li>Threatened species in percent of species known (for birds, mammals and vascular plants)</li> </ul>	Is only relevant to compare on a national level.

## 2.4 The European Pollutant Emission Register (EPER)

The European Pollutant Emission Register (EPER) is a European-wide register of industrial emissions into air and water. The register, which was established by a Commission Decision<sup>8</sup>, enjoins the Member States to produce triennial reports which cover the emission of 50 pollutants. Only pollutants which exceed a given threshold value should be included in the register. The first reporting year, which was 2001, covers approx. 9,200 industrial facilities within the EU 15 Member States and the second reporting year (2004) comprises data from app. 12,000 industrial sites. The 50 pollutants are grouped into 5 categories respectively:

- Environment issues
- Metals and compounds
- Chlorinated organic substances
- Other organic compounds
- Other compounds

For each of the 50 pollutants a threshold value is listed – for both emissions into air and water, the indicator used is kg/year. The EPER database enables the comparison of data on a number of different dimensions including reporting year, country, facility, activity and pollutant. An interesting question arises here in terms of whether EPER could be used to define necessary baseline and excellence levels.

However, during the attempt to answer this, several problems appear. One of the main problems is the level of aggregation, i.e. a given facility might produce a number of different products which makes it difficult and misleading to compare emissions from two different facilities. This is partly overcome in the EPER register by the possibilities of making comparisons at “activity” level. As illustrated in the example below, specific activity categories have been defined.

***Examples of activity categories:***

***3.1/3.3/3.4/3.5 Installations for the production of cement clinker (>500t/d), lime (>50t/d), glass (>20t/d), mineral substances (>20t/d) or ceramic products (>75t/d)***

***6.1 Industrial plants for pulp from timber or other fibrous materials and paper or board production (>20t/d)***

Despite the more detailed level of aggregation, benchmarking might still be misleading as you can have a producer of respectively cement clinker and mineral substances in the same activity group.

Another main problem is the lack of normalisation. Emissions are registered per year and not related to production volume, number of employees or other relevant normalisation parameters. These data are not listed in the EPER database and should thus be found elsewhere if indicators based on normalisation should be developed.

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<sup>8</sup> COMMISSION DECISION of 17 July 2000 on the implementation of a European pollutant emission register (EPER) according to Article 15 of Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC) (2000/479/EC)

A third problem regarding the possibilities of using the data to define respectively baseline and excellence levels is that only companies exceeding the threshold levels are included in the database. Should the register be used to define top and bottom performance levels, the definition of these levels will be based on a group of companies which – measured in absolute figures - is among the heavy polluters. Companies which might be excellent producers with very low emission levels (below the threshold level) are not included in the register.

EPER will be succeeded by E-PRTR (the European Pollutant Release and Transfer Register)<sup>9</sup> and future reporting requirements will be extended to include more facilities, more substances to report, additional coverage of releases to land, off-site transfers of waste and releases from diffuse sources, public participation and annual instead of triennial reporting. However, the new reporting requirements of E-PRTR will not solve the problems described regarding benchmarking.

## 2.5 Global reporting initiative (GRI)

The GRI environmental guidelines, as set out in the standards GRI 2002 (G2) and GRI 2002 – 2006 (G3), are reviewed in this report with the aim of examining if and how the quantitative indicators can be used for comparison of the environmental performance of different companies.

On [www.globalreporting.org](http://www.globalreporting.org) – the GRI website, the GRI environmental guidelines are available as well as several GRI reports, which are following either the standards of the former GRI guidelines – G2, or the latest version of the standards G3 from 2006.

In the following, the standards are briefly described. In order to learn more about the possibilities of using the GRI standards for comparison of environmental performance between companies, a selection of GRI reports are reviewed in more details.

### 2.5.1 GRI in general

The Global Reporting Initiative (GRI) was established in 1997 by the Coalition for Environmentally Responsible Economies (CERES) in partnership with the United Nations Environment Programme (UNEP). The goal was to elevate sustainability reporting practices to a level equivalent to those of financial reporting, while achieving comparability, credibility, rigour, timeliness, and verifiability of the reported information. GRI released its first version of “Guidelines” in 2000, the second version (G2) in 2002 (Global Reporting Initiative, 2002), and their last version (G3) in 2006.

The GRI guidelines are a framework for reporting on an organisation’s economic, environmental, and social performance. The GRI guidelines hence set guidelines and options for reporting (report content, report quality and report boundaries).

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<sup>9</sup> E-PRTR is based on REGULATION (EC) No 166/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directives 91/689/EEC and 96/61/EC

### ***Sector supplements***

To address the need for capturing the unique set of sustainability issues faced by different industry sectors (e.g. mining, automotive, banking) GRI has developed a set of sector supplements. The sector supplements developed for the time being involve the following sectors:

- Financial services – Part A: Social performance and Part B: Environmental performance
- Logistics and transportation
- Mining and metals
- Public agency
- Tour operators
- Telecommunications
- Automotive

### ***Content of a GRI report***

The content of the GRI report itself is suggested to comprise the following main areas:

Figure 2-1: Content of a GRI report (Global Reporting Initiative, 2002).

1. *Vision and Strategy* – description of the reporting organisation's strategy with regard to sustainability, including a statement from the CEO.
2. *Profile* – overview of the reporting organisation's structure and operations and of the scope of the report.
3. *Governance Structure and Management Systems* – description of organisational structure, policies, and management systems, including stakeholder engagement efforts.
4. *GRI Content Index* – a table supplied by the reporting organisation identifying where the information listed in Part C of the *Guidelines* is located within the organisation's report.
5. *Performance Indicators* – measures of the impact or effect of the reporting organisation divided into integrated, economic, environmental, and social performance indicators.

### ***Who should use the Guidelines?***

The use of the GRI guidelines is voluntary and not specific to any single industry sector. They are meant to be applicable to organisations of all sizes and types operating in any location. The Guidelines and GRI-based reports are not a substitute for legally mandated reporting or disclosure requirements, nor do they override any local or national legislation (Global Reporting Initiative, 2002).

### ***Usefulness of the GRI reports***

The target group of the reports is, according to GRI, consumers, employees, investors, researchers, and other interested individuals.

The reports issued should be used to:

- Assess sustainability performance with respect to laws, norms, codes, performance standards, and voluntary initiatives.
- Create a continuous platform for dialogue about expectations for responsibility and performance.
- Understand the impacts (positive and negative) that organizations can have on sustainable development.
- Compare performance within an organization and between different organizations over time to inform your decision-makers.

## 2.5.2 GRI 2002 (G2)

G2 is as mentioned earlier the former version of the GRI Guidelines. In the following the environmental indicators presented in G2 are described, including possible suggestions from GRI as how to measure the indicators. Finally considerations regarding the possibility of normalizing the data, based on existing information in the G2 reports, will be presented.

### ***The environmental indicators***

Performance indicators within the context of GRI can be either qualitative or quantitative. GRI considers qualitative indicators, those indicators requiring textual response, to be complementary and essential to presenting a complete picture of an organisation's economic, environmental, and social performance.

However, due to the nature of this project we will in the following focus on the quantitative indicators.

The environmental performance indicators in G2 are organised according to the following hierarchy (Global Reporting Initiative, 2002):

**Category:** The broad areas, or groupings, of economic, environmental, or social issues of concern to stakeholders (e.g. human rights, direct economic impacts). In this report we focus only on the environmental category.

**Aspect:** The general subsets of indicators that are related to a specific category. A given category may have several aspects which may be defined in terms of issues, impacts, or affected stakeholder groups.

**Indicator:** The specific measurements of an individual aspect that can be used to track and demonstrate performance. These are often, but not always, quantitative. A given aspect (water) may have several indicators (e.g. total water use, rate of water recycling, discharges to water bodies). The balance between quantitative and qualitative indicators will vary by aspect depending on a range of factors. Indicators have been aligned to the maximum degree possible with existing international conventions and agreements.

Additionally GRI divides the indicators into respectively core indicators (CI) and additional indicators (AI). The core indicators are those relevant to most reporters and of interest to most stakeholders. The additional indicators are viewed as one or more of the following: 1) leading practice in economic, environmental, or social measurement, though currently used by few reporters; 2) providing information of interest to stakeholders who are particularly important to the reporting entity; and 3) deemed worthy of further testing for possible consideration as future core indicator (Global Reporting Initiative, 2002).

A listing of the environmental indicators used in G2 can be found in the table below (the following pages). The table illustrates how the different indicators are measured (i.e. which units are used), as well as whether the indicator is qualitative or quantitative of nature.

Table 2-3: environmental indicators used in G2 (Global Reporting Initiative, 2003).

Indicator	Type of Indicator	Unit of measurement	Quantitative	Qualitative	Both
Aspect: Materials					
<b>EN1. Total materials use other than water, by type.</b> Provides definitions used for types of materials. Report in ton, kilograms, or volume.	CI	Weight and volume.	X		
<b>EN2. Percentage of materials used that are wastes (processed or unprocessed) from sources external to the reporting organisation.</b> Refers to both post-consumer recycled material and waste from industrial sources. Report in ton, kilograms, or volume.	CI	Percentage (Fraction).  Weight and volume.	X		
Aspect: Energy					
<b>EN3. Direct energy use segmented by primary source.</b> Reports on all energy sources used by the reporting organisation for its own operations as well as for the production and delivery of energy products (e.g., electricity or heat) to other organisations. Report in joules.	CI	Joules.	X		
<b>EN4. Indirect energy use.</b> Reports on all energy used to produce and deliver energy products purchased by the reporting organisation (e.g., electricity or heat). Report in joules.	CI	Joules.	X		
<b>EN17. Initiatives to use renewable energy sources and to increase energy efficiency.</b>	AI			X	
<b>EN18. Energy consumption footprint (i.e., annualised lifetime energy requirements) of major products.</b> Report in joules.	AI	Joules.	X		
<b>EN19. Other indirect (upstream/downstream) energy use and implications, such as organisational travel, product lifecycle management, and use of energy-intensive materials.</b>	AI				X
Aspect: Water					
<b>EN5. Total water use.</b>	CI	Litre (probably).	X		

Indicator	Type of Indicator	Unit of measurement	Quantitative	Qualitative	Both
<b>EN20. Water sources and related ecosystems/habitats significantly affected by use of water.</b> Includes Ramsar-listed wetlands and the overall contribution to resulting environmental trends.	AI			X	
<b>EN21. Annual withdrawals of ground and surface water as a percent of annual renewable quantity of water available from the sources. Breakdown by region.</b>	AI	Percentage (fraction). Pr. region.	X		
<b>EN22. Total recycling and reuse of water.</b> Includes wastewater and other used water (e.g., cooling water).	AI	m <sup>3</sup> (probably).	X		
Aspect: Biodiversity					
<b>EN6. Location and size of land owned, leased, or managed in biodiversity-rich habitats.</b> Further guidance on biodiversity-rich habitats may be found at <a href="http://www.globalreporting.org">www.globalreporting.org</a> (forthcoming).	CI	Area			x
<b>EN7. Description of the major impacts on biodiversity associated with activities and/or products and services in terrestrial, freshwater, and marine environments.</b>	CI			X	
<b>EN23. Total amount of land owned, leased, or managed for production activities or extractive use.</b>	AI	Area	X		
<b>EN24. Amount of impermeable surface as a percentage of land purchased or leased.</b>	AI	Percentage.	X		
<b>EN25. Impacts of activities and operations on protected and sensitive areas.</b> (e.g., IUCN protected area categories 1–4, world heritage sites, and biosphere reserves).	AI				x
<b>EN26. Changes to natural habitats resulting from activities and operations and percentage of habitat protected or restored.</b> Identifies type of habitat affected and its status.	AI	Percentage			x
<b>EN27. Objectives, programmes, and targets for protecting and restoring native ecosystems and species in degraded areas.</b>	AI			X	

Indicator	Type of Indicator	Unit of measurement	Quantitative	Qualitative	Both
<b>EN28. Number of IUCN Red List species with habitats in areas affected by operations.</b>	AI	Number	X		
<b>EN29. Business units currently operating or planning operations in or around protected or sensitive areas.</b>	AI	Number	X		
<b>Aspect: Emissions, Effluents and Waste</b>					
<b>EN8. Greenhouse gas emissions.</b> (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> ). Reports separate subtotals for each gas in ton and in ton of CO <sub>2</sub> equivalent for the following: • direct emissions from sources owned or controlled by the reporting entity • indirect emissions from imported electricity heat or steam. See WRI-WBCSD Greenhouse Gas Protocol.	CI	Weight (ton).  - from own sources  - indirect emissions	X		
<b>EN9. Use and emissions of ozone-depleting substances.</b> Reports each figure separately in accordance with Montreal Protocol Annexes A, B, C, and E in ton of CFC-11 equivalents (ozone-depleting potential).	CI	Weight (ton)	X		
<b>EN10. NO<sub>x</sub>, Sox, and other significant air emissions by type.</b> Includes emissions of substances regulated under: • local laws and regulations • Stockholm POPs Convention (Annex A, B, and C) – persistent organic pollutants • Rotterdam Convention on Prior Informed Consent (PIC) • Helsinki, Sofia, and Geneva Protocols to the Convention on Long-Range Trans-boundary Air Pollution	CI	Weight. (Probably).	X		
<b>EN11. Total amount of waste by type and destination.</b> “Destination” refers to the method by which waste is treated, including composting, reuse, recycling, recovery, incineration, or land filling. Explains type of classification method and estimation method.	CI				X

Indicator	Type of Indicator	Unit of measurement	Quantitative	Qualitative	Both
<b>EN12. Significant discharges to water by type.</b> See GRI Water Protocol.	CI		X		
<b>EN13. Significant spills of chemicals, oils, and fuels in terms of total number and total volume.</b> Significance is defined in terms of both the size of the spill and impact on the surrounding environment.	CI	Number. Volume.	X		
<b>EN30. Other relevant indirect greenhouse gas emissions.</b> (CO <sub>2</sub> , CH <sub>4</sub> , N <sub>2</sub> O, HFCs, PFCs, SF <sub>6</sub> ). Refers to emissions that are a consequence of the activities of the reporting entity, but occur from sources owned or controlled by another entity. Report in ton of gas and ton of CO <sub>2</sub> equivalent. See WRI-WBCSD Greenhouse Gas Protocol.	AI	Weight (ton).  - indirect emission.	X		
<b>EN31. All production, transport, import, or export of any waste deemed "hazardous" under the terms of the Basel Convention Annex I, II, III, and VIII.</b>	AI	Weight. (Probably)	X		
<b>EN32. Water sources and related ecosystems/habitats significantly affected by discharges of water and runoff.</b> Includes Ramsar-listed wetlands and the overall contribution to resulting environmental trends. See GRI Water Protocol.	AI	Number. (Probably)			X
Aspect: Suppliers					
<b>EN33. Performance of suppliers relative to environmental components of programmes and procedures described in response to Governance Structure and Management Systems section (Section 3.16).</b>	AI			X	

Indicator	Type of Indicator	Unit of measurement	Quantitative	Qualitative	Both
Aspect: Products and Services					
EN14. Significant environmental impacts of principal products and services. Describes and quantifies where relevant.	CI				X
EN15. Percentage of the weight of products sold that is reclaimable at the end of the products' useful life and percentage that is actually reclaimed. "Reclaimable" refers to either the recycling or reuse of the product materials or components.	CI	Percentage (fraction).	X		
Aspect: Compliance					
EN16. Incidents of and fines for non-compliance with all applicable international declarations/conventions/treaties, and national, sub-national, regional, and local regulations associated with environmental issues. Explains in terms of countries of operation.	CI	Number.			X
Aspect: Transport					
EN34. Significant environmental impacts of transportation used for logistical purposes.	AI			X	
Aspect: Overall					
EN35. Total environmental expenditures by type. Explains definitions used for types of expenditures.	CI				X

### ***The possibility of normalizing the indicators***

G2 states that "it is particularly important to provide environmental performance information in terms of both absolute figures and normalised measures (e.g. resource use per unit of output)" and that "absolute figures provide a sense of scale or magnitude of the use or impact, which allows the user to consider performance in the context of larger systems. Normalised figures illustrate the organisation's efficiency and support comparison between organisations of different sizes". They further state that "stakeholders should be able to calculate normalised figures using data from the report profile (e.g. net sales) and absolute figures reported in the environmental performance section". G2 asks the reporting organisations to provide both normalised and absolute figures and encourages the organisations to relate their individual performance to the broader ecological system, e.g. reporting their pollution output in terms of the ability of the environment (local, regional, or global) to absorb the pollutants (Global Reporting Initiative, 2002).

In Annex 5 of G2 is described how and why they want the companies to report absolute figures as well as ratios. Below is a summary of their statements.

**Absolute figures:** G2 states that companies should present raw performance data in terms of absolute figures and for a given period of operation (most often a year). The absolute figures should be given in currency or physical units (ton, cubic metres, gigajoules, etc.). Absolute environmental figures are essential as a linkage to the carrying capacity of an ecosystem. They are also useful for locating for instance the 10 largest emitters of a given pollutant.

**Ratios:** According to G2 ratio indicators serve to relate two aspects to each other; make relationships visible and interpretable; and enable comparison of different scales of operation relative to a specific activity (e.g. kilograms of product per litre of water used). Organisations should form ratios with their performance data that make sense for their business and support their decision-making.

G2 divides the ratios used into three different types:

### 1) Productivity/Efficiency ratios

These ratios relate value to impacts, thus an increase in the ratio reflects improvement in the amount of value received per unit of impact. Examples of environmental productivity/efficiency ratios include:

- Resource productivity (e.g., sales per unit of energy consumption, GDP per unit of material input).
- Process eco-efficiency (e.g., production volume per unit of waste, net sales per unit of greenhouse gas emissions in ton of CO<sub>2</sub> equivalent).
- Functional eco-efficiency of products or services (e.g., water efficiency of a washing machine, fuel efficiency of a car).

### 2) Intensity ratios

These ratios express an impact per unit of activity or unit of value. A declining ratio thus reflects performance improvement. Examples of environmental intensity ratios include:

- Emission intensity (e.g. ton of SO<sub>x</sub> emissions per unit of electricity generated).
- Waste intensity (e.g. amount of waste per production volume).
- Resource intensity (e.g. energy consumption per function, material input per service).

### 3) Percentages

A percentage indicator is a ratio between two identical issues, with the same physical unit. Examples of environmental percentage ratios include:

- Losses (e.g. electricity transmission loss, non-product output per materials input).
- Recycling percentages (e.g. fraction of waste recycled per total waste).
- Fractions (e.g. percentage of renewable energy, fraction of recycled materials, percentage of hazardous waste).

G2 claims the possibility of producing normalised data based on absolute figures compared to information located in the section “Profile of the company” (presented in details below).

Table 2-4: Reporting demands regarding the organisation profile in G2.

Organisational profile		
No.	Information required	Comment
2.1	<i>Name of reporting organisation</i>	
2.2	<i>Major products and/or services</i> , including brands if appropriate. The reporting organisation should also indicate the nature of its role in providing these products and services, and the degree to which the organisation relies on outsourcing.	
2.3	<i>Operational structure</i> of the organisation	
2.4	<i>Description of major divisions</i> , operating companies, subsidiaries, and joint ventures.	
2.5	<i>Countries</i> in which the organisation's operations are located.	
2.6	<i>Nature of ownership</i> , legal form.	
2.7	<i>Nature of markets served</i> .	
2.8	<p><b>Scale of the reporting organisations:</b></p> <ul style="list-style-type: none"> <li>- number of employees</li> <li>- products produced/services offered (quantity or volume)</li> <li>- net sales</li> <li>- total capitalisation broken down in terms of debt and equity.</li> </ul> <p>Reporting organisations are encouraged to provide additional information, such as:</p> <ul style="list-style-type: none"> <li>- value added</li> <li>- total assets</li> <li>- breakdowns of any or all of the following:                             <ul style="list-style-type: none"> <li>- sales/revenues by countries/regions that make up 5 percent or more of total revenues</li> <li>- major products and/or identified services</li> <li>- costs by country/region</li> <li>- employees by country/region.</li> </ul> </li> </ul>	
2.9	<p>List of stakeholders, key attributes of each, and relationship to the reporting organisation.</p> <ul style="list-style-type: none"> <li>- communities (locations, nature of interest)</li> <li>- customers (retail, wholesale, businesses, governments).</li> <li>- shareholders and providers of capital</li> <li>- suppliers</li> <li>- trade unions.</li> <li>- workforce, direct and indirect</li> <li>- other stakeholders.</li> </ul>	

Information located in section 2 (Report scope) and section 3 (Report profile) of the overall Profile (see appendix 2) may also be useful in attempting to normalize data.

If one in theory should attempt to create comparable parameters based on data from G2, the section 2.8 in "Organisational profile data" becomes of great importance. For example, the environmental indicator EN1 (Total materials use other than water, by type. Reported in ton or volume) could produce a comparable figure if it was divided by the amount of products offered (no. 2.8 in the "Organisational profile data"). However, this result would only indicate how much material is used per produced unit. This figure would thus only be reasonable to compare with other companies producing exact same type of product (and perhaps under same conditions).

Environmental indicator EN3 (Direct energy use segmented by primary source. Reported in joule) could also be relevant as a comparable parameter, if it likewise was divided by the amount of products produced. However, several other aspects play an important role. Is it for instance possible to compare a low use of energy produced by coal with a high use of energy produced by water power?

### 2.5.3 GRI 2002 – 2006 (G3)

G3 was introduced in October 2006. The development of G3 aimed at enhancing the comparability, clarity, ease of use, and reliability of the GRI Guidelines and reports. There have been several changes in G3, compared to G2. Below a few of the most relevant changes are presented (Global Reporting Initiative).

#### ***Selection of general changes in G3 compared to G2***

- Further guidance on defining the content of a report; the quality of data; and on setting the report boundary.
- Protocols have been created for each indicator, which outline key definitions, compilation methodologies (which include information on what to measure), and resources.
- The G2 “Report Scope” and “Report Profile” have been reorganized into “Report Parameters”, which provide information on what the report covers and key information about the processes underlying its preparation.

#### ***Changes in the environmental indicators***

The indicators have been refined so that they are focused results or outcome and can be used to show change over time if results are compared year-by-year. Main changes and points of interest for the indicators are:

##### ***1) Changes in the nature of indicators toward greater comparability***

- Each indicator was worded so that it would elicit comparable information which means the reporting organization can report changes in specific issues/results over time.
- In some cases the qualitative indicators were changed to quantitative measures, and in other cases they were broken into binary sub-components.

##### ***2) Changes to the indicator set as a whole***

- Six indicators were removed and one new added, thus the total number of indicators changed from 35 (G2) to 30 (G3).
- Environment indicators – mostly clarifications, refinements, and ensuring feasibility of measurement.
- Biodiversity indicators were streamlined to reduce overlap and inconsistencies.

An interesting change is the development of a protocol for each indicator. This protocol should be used when reporting on a G3 indicator. Each protocol is concise in length (approx. 1 page) and contains definitions of terms used in the indicator wording, a set of compilation methodologies or expectations, and a list of useful resources for the practitioner. The protocols can be seen as the “recipe” behind each indicator.

Due to the form/volume of these protocols, it is not appropriate to present the G3 indicators in a table (the G3 indicators cover 33 pages in total). However, in appendix 3 a list of the G2 and G3 indicators is presented (in headlines) with a short description of the main changes for each indicator. Below the changes to environmental indicator EN1 (Material use) is described as an example in order to clarify the type of changes that has been done.

The EN1 indicator was in G2 and G3 formulated as follows:

<b>G2</b>	<p><b>EN1 Total materials use other than water, by type.</b> Provides definitions used for types of materials. Report in ton, kilograms, or volume.</p>
<b>G3</b>	<p><b>EN1 Materials used by weight or volume.</b></p> <p><b>1. Relevance</b> This Indicator describes the reporting organization's contribution to the conservation of the global resource base and efforts to reduce the material intensity and increase the efficiency of the economy. These are expressed goals of the OECD Council and various national sustainability strategies. For internal managers and others interested in the financial state of the organization, material consumption relates directly to overall costs of operation. Tracking this consumption internally, either by product or product category, facilitates the monitoring of material efficiency and cost of material flows.</p> <p><b>2. Compilation</b></p> <p><b>2.1</b> Identifies total materials used, including materials purchased from external suppliers and those obtained from internal sources (captive production and extraction activities). This can include:</p> <ul style="list-style-type: none"> <li>• Raw materials (i.e. natural resources used for conversion to products or services such as ores, minerals, wood, etc.);</li> <li>• Associated process materials (i.e. materials that are needed for the manufacturing process but are not part of the final product, such as lubricants for manufacturing machinery);</li> <li>• Semi-manufactured goods or parts, including all forms of materials and components other than raw materials that are part of the final product; and</li> <li>• Materials for packaging purposes.</li> </ul> <p><b>2.2</b> Identifies non-renewable and direct materials used. Converts any measurements into estimated weight or volume, calculated 'as is' rather than by 'dry substance/weight'.</p> <p><b>2.3</b> Reports the total weight or volume of :</p> <ul style="list-style-type: none"> <li>• Non-renewable materials used; and</li> <li>• Direct materials used.</li> </ul> <p><b>3. Definitions</b></p> <p><b>Direct materials</b> Materials that are present in a final product.</p> <p><b>Non-renewable materials</b> Resources that do not renew in short time periods, such as minerals, metals, oil, gas, coal, etc.</p> <p><b>4. Documentation</b> Potential information sources include billing and accounting systems and the procurement or supply management department.</p> <p><b>5. References</b></p> <ul style="list-style-type: none"> <li>• OECD, Recommendation of the Council on Material Flows and Resource Productivity, 2004.</li> </ul>

The changes in terms of measurement and reporting demands were first of all a demand of reporting non-renewable and direct materials (present in the final product) separately, and in terms of total weight or volume. They furthermore suggest identifying materials used from different sources, however it is only *suggested* that materials are reported in the above mentioned sources (raw material, associated process materials, etc.). Thus using this indicator does not necessarily solve the problem of companies reporting

different types of sources, which are not easily compared. An improvement would be reporting total material use per product type, thus allowing for comparison on product level.

The explanation for the changes was reported by GRI as the following “The original indicator of total materials use presented a number of technical measurement problems. The indicator was therefore revised to focus on non-renewable materials and major materials used, which are defined in the protocol. The intent was to identify a subset of materials that were measurable by most organizations and represented the material flows, which would be important to track from the perspective of sustainable development either due to their sensitivity or volume of use. Volume was added to make calculation easier for organizations that use liquid materials.”

#### 2.5.4 GRI and normalisation

G2 states that “as a general principle, reporting organisations should present indicator data in absolute terms and use ratios or normalised data as complementary information”. Thus, they suggest, normalised data as complementary information.

However, in the section describing environmental performance indicators, G2 emphasizes the importance of the normalised data by stating that they illustrate organisations’ efficiency and support comparison between organisations of different sizes. G2 thus asks the reporting companies to report absolute as well as normalized values. However, they also state that it should be possible, based on data from the report profile, to produce the normalised data from the information derived from a G2 report.

G2 furthermore mentions cross-cutting indicators (such as “amount of emission per unit of output or per monetary unit of turnover) and states that in developing and reporting cross-cutting indicators, care should be taken to, among other things, “ensure that the indicators use ratios derived from normalised measures, and, when possible, from internationally accepted metrics.” (Global Reporting Initiative, 2002).

According to G3, comparability is necessary for evaluating performance and stakeholders using the reports should be able to compare environmental information “against the organizations’ past performance, its objectives, and, **to the degree possible**, against the performance of other organizations”.

G3 states that comparisons between organizations require sensitivity to factors such as differences in organizational size, geographic influences, and other considerations that may affect the relative performance of an organization. They further states that “where necessary, report preparers **should consider** providing context that will help report users to understand the factors that may contribute to differences in performance between organizations”. An organization thus should, according to G3, include total numbers (absolute data) as well as ratios (normalized data) to enable analytical comparisons. According to their guidance on data compilation they state that ratios or normalised data in some cases are appropriate and that if normalised data are used, absolute data should also be provided.

Though, in their extended versions of environmental indicators, the term normalised appears only twice – once in the core indicator EN6, and once in the indicator EN26. EN6 concerns “Initiatives to provide energy-efficient or

renewable energy based products and services, and reductions in energy requirements as a result of these initiatives”, and EN26 deals with “Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation”. In both cases the term normalised appears during the compilation section, in which it is stated that “*if* use-oriented figures are employed, the company should clearly indicate the underlying assumptions regarding consumption patterns or normalization factors.

Overall it seems that the statements regarding the need for normalised data have been softened in G3 (using terms as “*to the degree possible*”, *should consider*” and “*if*”) compared to G2. However, both systems still include remarks concerning the usefulness and need of normalised data, but not in terms of requirements.

### 2.5.5 GRI and benchmarking: Seminar held in Denmark on CSR-reporting

FORCE Technology participated in a small seminar on CSR reporting held in Denmark May 29<sup>th</sup> 2007 by the Danish CSR Forum. The seminar was named “The reporting process from A to Z”.

Two keynote speakers were invited. One of them was Ralph Thurm from Global Reporting Initiative who gave a presentation about the newest GRI guidelines for reporting. The second keynote speaker was Colin Baines from Co-operative Bank who gave a presentation about the Co-operative Bank’s approach to sustainability and reporting.

The rest of the afternoon consisted of a handful of Danish companies who gave a small discussion-based presentation about issues like:

- Reporting as a management tool – how?
- How do we meet the reporting needs of our stakeholders?
- Data collection – how is it done best?
- CSR strategy and reporting strategy – which strategy drives which?

Ralph Thurm from GRI also participated in the discussion-based presentation where he gave a more specific presentation about the third edition of the GRI guidelines. Here we asked him more specifically about GRI and benchmarking. His comments were (not a directly quote, but free from memory):

“The goal of the global reporting is comparable information. GRI wishes to develop integrated indicators that can be normalised – the ultimate goal is benchmarking. However, GRI is now at a very early stage on normalisation and integrated indicators. **At this stage GRI is far away from benchmarking and it will take more generations of GRI before benchmarking is possible and available.** A lot of work was put into normalisation of indicators for this version of the GRI guidelines (G3), but we did not succeed and did not include anything about normalisation”.

According to Ralph Thurm, political will and involvement are needed in order to develop normalised indicators. The sector Mining is one of the most developed sector supplements/industries, and his guess is that this sector will be the first sector to develop indicators that can be used for benchmarking.

## 2.5.6 Selection of GRI reports to further studies

A small selection of GRI reports within three different sectors is included in this review of the GRI standards, with the aim of exploring the possibilities and relevance of using the indicators to compare the performance of different companies within the same sector.

GRI reports (available from the website [www.globalreporting.org](http://www.globalreporting.org)) are either following G2 or the new G3.

**G2** reports are divided into three categories:

- ***In Accordance*** - self-declared, in accordance with GRI or in accordance and checked by GRI.
- ***Content Index*** - does not completely follow GRI, an index is added to help the reader find the GRI relevant data.
- ***Ref-only*** – the reports state that they are made based on the G2 guidelines.

**G3** reports are divided into six categories: C, C+, B, B+, A and A+, depending on how carefully the G3 guidelines are followed. The “+” indicates that the reports are externally assured. The A, B or C category refers mainly to how many of the indicators are reported as listed below.

Table 2-5: Categories used in dividing G3 reports (does not present the full version of criteria related to the different levels).

C or C+	B or B+	A or A+
Must report on: <ul style="list-style-type: none"> <li>- Statement</li> <li>- Organizational profile</li> <li>- Report profile</li> <li>- Report scope and boundary</li> <li>- Governance</li> <li>- Stakeholder engagement</li> </ul>	Must report on all criteria listed for level C, and must additionally report on: <ul style="list-style-type: none"> <li>- Description of key impacts</li> <li>- Data measurements techniques</li> <li>- Policy for external assurance of report</li> <li>- Commitments to external initiatives</li> <li>- Extra on stakeholder engagement</li> </ul>	Same as for level B
Must report on minimum 10 performance indicators, including at least one from each of social, economic, and environment.	Must report on minimum 20 performance indicators, including at least one from each of social, economic, environment, human rights, labour, society, and product responsibility.	Responds on each core G3 and Sector supplement indicator by either: a) reports on the indicator or b) explains the reason for its omission.

In the table below, the number of available GRI reports as of April 2007 (G3 and G2 respectively) is listed. In order to review the GRI reports and their usability for comparison, it is necessary to have a number of GRI reports from the same sector which all, as a minimum, are in accordance with the GRI guidelines.

Table 2-6: Available GRI reports as of April 2007. For GRI reports 2002 the numbers indicate the number of reports. One company may have several annual reports in the GRI database. Some reports are not available in English.

	G3 2006			GRI 2002		
	All G3	Only A or A+	GRI checked	All	In accordance	IA GRI checked
Aerospace & Defence	0	-	-	5	0	-
Automobiles & Parts	0	-	-	73	7	1
<b>Banks</b>	10	0 and 7	5	183	<b>47</b>	22
Beverages	1	-	-	53	15	0
Chemicals	3	-	-	59	7	1
<b>Construction &amp; Building materials</b>	1	-	-	94	<b>21</b>	4
Distributors	0	-	-	5	0	-
Diversified Industrials	3	-	-	67	10	1
Education	0	-	-	6	0	-
Electricity	4	0 and 1	0	142	28	4
Electronic & Electronic equipment	1	-	-	67	1	0
Engineering & Machinery	0	-	-	39	4	1
Food & Drug retailers	1	-	-	22	3	0
Food Producers & processors	0	-	-	49	4	1
Forestry & Paper	1	-	-	63	4	1
Gas Distribution	0	-	-	15	6	1
General Retailers	1	-	-	44	3	0
Government, Authorities & Agencies	1	1 and 0	1	17	3	0
Health	0	-	-	24	5	1
<b>Household Goods &amp; Textiles</b>	0	-	-	46	<b>7</b>	0
Information Technology Hardware	1	-	-	85	7	0
Insurance	3	-	-	47	7	2
Investment companies	1	-	-	4	0	-
Leisure, Entertainment & Hotels	3	-	-	12	0	-
Life Assurance	0	-	-	7	0	-
Media & Photography	1	-	-	28	2	1
Mining	7	0 and 2	1	108	26	0
Multi-utilities	2	-	-	30	3	1
Oil & Gas	1	-	-	84	26	4
Other	0	-	-	12	4	0
Packaging	0	-	-	7	0	-
Personal care & Household Products	1	-	-	29	4	0
Pharmaceutical & Biotechnology	1	-	-	50	6	2
Real Estate	2	-	-	16	0	-

	G3 2006			GRI 2002		
	All G3	Only A or A+	GRI checked	All	In accordance	IA GRI checked
Software & Computer Services	0	-	-	6	1	1
Speciality & Other Finance	3	-	-	39	3	0
Steel & Other metals	1	-	-	44	4	0
Support Services	5	-	-	75	14	80
Telecommunication Services	1	-	-	84	18	2
Tobacco	1	0 and 1	0	55	2	0
Transport	4	-	-	79	10	0
Water	2	1 and 1	0	45	7	0
<b>Total</b>	<b>67</b>	<b>2 and 12</b>	<b>7</b>	<b>2019</b>	<b>319</b>	<b>131</b>

With the limited number of G3 reports available at this stage, only G2 reports have been included in this review. The sectors included in the review have been chosen by use of the following criteria:

- GRI reports must be “in accordance” with the GRI guidelines.
- Reports from companies producing the same kind of products should be available within that sector.
- One sector should be a simple sector (simple products).
- One of the sectors chosen should have GRI sector supplements.
- One of the sectors chosen should produce consumer products.

These selection criteria resulted in the selection of the following three sectors, from which several reports will be analysed (next chapter):

- Banks (sector supplements exist)
- Construction & Building materials
- Household goods & textiles

# 3 Comparison of environmental performance between companies

The overall aim of this chapter is to analyse several sustainability reports in order to determine whether it is possible to compare the environmental performance of companies.

The first (three) sections will concentrate on comparing two G2 reports within each of the sectors:

- Construction and Building materials,
- Banks and
- Household Goods and textiles.

The final section will compare a higher number of companies, but only on one or two indicators. The aim of this section is primarily to illuminate further problems encountered when attempting to compare the environmental performance between companies, and if possible establish baseline and excellence levels on the basis of the different environmental performance levels given in the reports.

Since it is voluntary (to a certain degree) which indicators to report on, the six chosen companies, which will be analysed within the first three sections, report on different environmental indicators. In the following table, it is summarised which indicators (we can see) they report on.

One of the main results of the comparison is, that a direct comparison between the reported indicators from the different companies in most cases is difficult or impossible. The primary reason for this is, that the companies only to some extent follow GRI, i.e. they for example only reports in tons CO<sub>2</sub> and not in tons CO<sub>2</sub>-equivalents. If GRI was used as it is meant to be used, comparison would be much easier.

Table 3-1: Environmental G2 indicators of which the selected companies report on.

G2		Building & Construction		Banking		Textile	
Environmental indicator	Type of indicator	Holcim	Lafarge	National Australia Bank	ABN Amro	Puma	Inditex
Aspect: Materials							
EN1	Core	x	x	x	x		
EN2	Core	x	x	x	x	x	x
Aspect: Energy							
EN3	Core	x	x	x	x	x	x
EN4	Core			(x)	x		
EN17	Additional			x			
EN18	Additional						
EN19	Additional				x		
Aspect: Water							
EN5	Core	x	x	x	x	x	x
EN20	Additional						
EN21	Additional						
EN22	Additional	x	x				
Aspect: Biodiversity							
EN6	Core						
EN7	Core						
EN23	Additional						
EN24	Additional						
EN25	Additional						
EN26	Additional						
EN27	Additional	x	x				
EN28	Additional						
EN29	Additional	x					
Aspect: Emissions, Effluents and Waste							
EN8	Core	x	x	x	x	x	x
EN9	Core			x		x	
EN10	Core	x	x			x	x
EN11	Core	x	x	x	x	x	x
EN12	Core						
EN13	Core						
EN30	Additional						
EN31	Additional						
EN32	Additional						
Aspect: Suppliers							
EN33	Additional						
Aspect: Products and Services							
EN14	Core			x	(x)		
EN15	Core						
Aspect: Compliance							
EN16	Core	x		x		x	
Aspect: Transport							
EN34	Additional	x				x	
Aspect: Overall							
EN35	Additional						

### 3.1 Comparison of G2 reports in the sector Construction & Building materials

Two companies within the sector Construction & Building materials are chosen in order to clarify whether it is possible, based on information derived from their G2 reports, to compare results related to their environmental performance. Both G2 reports are conducted in accordance with G2 (see section 2.5.6).

#### ***Selected elements from the profiles of the two cement companies***

It should be noted that the report from Lafarge is from 2004 while the report from Holcim is from 2005. However, in cases where the Holcim report presents data from 2004 these are included in the tables.

Table 3-2: Profile data from the two companies within the Building and Construction Materials sector.

No.	Profile data from G2	Holcim	Lafarge
2.1	<i>Name of reporting organisation</i>	Holcim	Lafarge
2.2	<i>Major products and/or services, including brands if appropriate. The reporting organisation should also indicate the nature of its role in providing these products and services, and the degree to which the organisation relies on outsourcing.</i>	Worldwide supplier of cement and aggregates as well as downstream activities such as ready-mix concrete and asphalt, including services. 60% of their offered products are composite cements made with mineral components.	No.1 worldwide in cement and roofing. No.2 worldwide in aggregates and concrete and no.3 in Gypsum.
2.3	<i>Operational structure of the organisation</i>		
2.4	<i>Description of major divisions, operating companies, subsidiaries, and joint ventures.</i>		
2.5	<i>Countries in which the organisation's operations are located.</i>	Present in more than 70 countries, on all continents.	Present in 75 countries.
2.6	<i>Nature of ownership, legal form.</i>		
2.7	<i>Nature of markets served.</i>	80% of their purchases are locally sourced.	
2.8	<b><i>Scale of the reporting organisations:</i></b> <ul style="list-style-type: none"> <li>- number of employees</li> <li>- products produced/services offered (quantity or volume)</li> <li>- net sales</li> <li>- total capitalisation broken down in terms of debt and equity.</li> </ul> Reporting organisations are encouraged to provide additional information, such as: <ul style="list-style-type: none"> <li>- value added</li> <li>- total assets</li> <li>- breakdowns of any or all of the following:               <ul style="list-style-type: none"> <li>- sales/revenues by countries/regions that make up 5 percent or more of total revenues</li> <li>- major products and/or identified services</li> <li>- costs by country/region</li> <li>- employees by country/region.</li> </ul> </li> </ul>	Net value of their global sales in 2005 was CHF 18,468 billion.  Number of employees: 59,901.  Production of cement:  (2004): 106.8 mio. ton (2005): 113.3 mio. Ton.	Posted sales in 2004: 14,436 million €.  Number of employees: 77,000.  Production:  Cement: 119.4 mio. ton. Aggregates: 234.2 mio. ton Roof tile and components: 153.8 mio. ton  Sales per division: Cement: 47% Aggregates: 33% Roofing: 11% Gypsum: 9%  Total 437.8 mio. ton of rock extracted.

No.	Profile data from G2	Holcim	Lafarge
2.9	List of stakeholders, key attributes of each, and relationship to the reporting organisation. <ul style="list-style-type: none"> <li>- communities (locations, nature of interest)</li> <li>- customers (retail, wholesale, businesses, governments)</li> <li>- shareholders and providers of capital</li> <li>- suppliers</li> <li>- trade unions</li> <li>- workforce, direct and indirect</li> <li>- other stakeholders.</li> </ul>		

***Environmental indicators reported in the two G2 reports***

The two reports provide information on a relatively narrow selection of the indicators available in G2. The following sections provide a tabular summary of a selection of the indicators reported, together with a short discussion on their suitability for benchmarking and comparisons. Please note that not all indicators are discussed in the same detail. Also note that text in ***bold and italic*** is our own calculation in order to try to compare the numbers given in the different reports.

Below some of the environmental indicators, which seem to be comparable, are listed, followed by a short discussion of the problems that arise when attempting to compare them.

- EN1 Materials use: Use of raw material
- EN1 Materials use: Use of alternative materials
- EN5 Total water use: Water consumption
- EN 8 Greenhouse gas emission: Specific gross CO<sub>2</sub> emission
- EN 8 Greenhouse gas emission: Specific net CO<sub>2</sub> emission
- EN 10 NO<sub>x</sub> and SO<sub>2</sub> emission: NO<sub>x</sub>, SO<sub>2</sub> and dust emission
- EN22 Total recycling or reuse of water: Water recycling systems
- EN27 Programmes for protecting: Rehabilitation plants

In order to compare the environmental performance of the companies it is necessary to use a common reference parameter. In this case the most sensible reference seems to be cement, thus in the following cement is used as a reference parameter.

**3.1.1 Resource aspects**

Resource aspects are within these reports primarily addressed by three indicators, one for total materials use (CI EN1), one for the consumption of water (CI EN5) and one for total recycling and reuse of water (AI EN22).

Table 3-3: Core Indicator EN1. Total materials use other than water, by type.

Holcim	Lafarge
Total use of natural raw material:	Total use of quarried raw material:
(2004): 140.5 mio. ton (2005): 145.6 mio. ton	(2004): 437.8 mio. ton.
16 mio. ton of alternative materials.	Use of alternative materials (as a percentage of total material consumed):
Produces a long range of products, of which cement constitutes 60%.	- Cement: 9.8% - Roofing: 1.3% - Gypsum boards: 50.5%
	Production :
	Cement: 119.4 mio. ton Aggregates: 234.2 mio ton. Gypsum boards: 153.8

The scope of Core indicator EN 1 is to “Provide definitions used for types of materials. Report in ton, kilograms, or volume”.

With respect to the **use of raw material** (assuming natural raw material equals quarried raw material) it seems like Holcim uses 140.5 mio ton raw material, whereas Lafarge uses 437.8 ton raw material (data from 2004). The difference may lie in the fact that Lafarge (as stated in the report) produces a fairly large amount of other products (234.2 mio. ton of aggregates and 153.8 mio. ton of roof tiles and components), whereas it is not clearly documented in the Holcim report, what other products they produce and in which amounts. However, they do mention that 60% of their products are cement but it cannot be assumed that this corresponds to 60% of their production volume being cement. Thus, a need for a precise quantification of production volume based on product type is needed in order to make a reasonable comparison. For multi-product output the material consumption is a very crude indicator.

As to **the use of alternative materials**, both companies report on this issue, however in very different terms. One company reports a total amount of alternative materials used, and the other company reports the use of alternative materials as a percentage of total material consumed. A “manual” calculation could be performed in order to produce a comparable figure, but this requires further information on whether the percentages refer to the total material consumed per product type or total material all together. In each case, further “manual” calculations are required, which is not desirable in terms of benchmarking.

Table 3-4: Core Indicator EN5. Total water use.

Holcim	Lafarge
Water consumption (2005):	Consumption water L/ton of cement: 383.0.
- Cement: 430 l/t – 50 M m <sup>3</sup> /a	Consumption water L/ton aggregate: 338 (est.)
- Aggregates: 450 l/t – 74 M m <sup>3</sup> /a	Consumption water L/ton concrete: 270 (est.)
- RMX: 250 l/t – 9.3 M M <sup>3</sup> /a	Consumption L/m <sup>3</sup> of roof tile: 4.6
	Consumption water L/m <sup>3</sup> of Gypsum board: 5.7

Regarding **total water use** both companies report a figure of water consumption per ton of cement, thus allowing for comparison. Holcim reports a use of water consumption in the order of 430 L/ton cement, whereas Lafarge reports 383.0 L/ton cement.

Table 3-5: Additional indicator EN22. Total recycling and reuse of water.

Holcim	Lafarge
Water recycling systems: - Cement ? - Aggregates: 50% - RMX: 77%	% sites with a water recycling system: - Cement: - - Aggregates & Concrete: 69% - Roof tile: 59% - Gypsum board: 40%

The scope of the indicator is to report total recycling and reuse of water, including wastewater and other used water (e.g. cooling water).

Both companies likewise report on amount of **water recycling systems**. The unit used is percentage sites (within each product type) with a water recycling system. The only product type which both report on is aggregates for which Holcim has recycling systems in 50% of sites and Lafarge in 69% of sites. However, Lafarge reports their product type as aggregates and concrete whereas Holcim only mentions aggregate, thus not providing a true comparison. Furthermore, the issue of how effective the different water recycling systems are should be considered (e.g. effectiveness in percentages).

### 3.1.2 Emission aspects

Emission aspects are addressed by two indicators, addressing greenhouse gases (CI EN8) and other significant air emissions (NO<sub>x</sub>, SO<sub>x</sub> and others) (CI EN10), respectively.

Table 3-6: Core Indicator EN8. Greenhouse gas emissions.

Holcim	Lafarge
Absolute gross emission of CO <sub>2</sub> : (2004): 71.8 mio. ton (2005): 74.5 mio. ton	Group Cement plants gross CO <sub>2</sub> emissions: (2004): 84.1 mio. Ton. (of which 34.9 is from emerging economies and 49.2 from industrialized countries)
Specific gross emission: kg CO <sub>2</sub> /ton cementitious materials: (2004): 673 (2005): 658	Specific gross emission per ton of cement (2004): 0.687 ton of CO <sub>2</sub> per ton of cement.
Specific net emission: kg CO <sub>2</sub> /ton cementitious material: (2004): 650 (2005): 635	Net emissions= 0.672 ton of CO <sub>2</sub> /ton of cement.
<b>Indirect emission</b> Indirect CO <sub>2</sub> emission due to purchased electricity was 5.5 mio. Ton in 2005 (2004: 5.1 mio. Ton).	Emissions related to fossil waste fuels = 0.687-0.672 = 0.015 ton CO <sub>2</sub> /ton of cement.

The scope of Core Indicator EN 8 is “Greenhouse gas emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>). Report separate subtotals for each gas in ton and in ton of CO<sub>2</sub> equivalent for the following:

- direct emissions from sources owned or controlled by the reporting entity
- indirect emissions from imported electricity heat or steam. See WRI-WBCSD Greenhouse Gas Protocol.”

In terms of **greenhouse gas emission**, the numbers reported also seem comparable. Lafarge reports a specific gross emission of 0.678 ton of CO<sub>2</sub>/ton cement, while Holcim reports 0.673 ton of CO<sub>2</sub>/ton cement (both numbers refer to 2004). The corresponding net emission is respectively 0.672 ton of CO<sub>2</sub>/ton cement (Lafarge) and 0.650 ton of CO<sub>2</sub>/ton of cement (Holcim).

The numbers are very similar which could indicate a fair comparison. However, Holcim reports their cement as 'cementitious material', which might not be 100% comparable to the cement material reported from Lafarge.

Table 3-7: Core Indicator EN10. NO<sub>x</sub>, SO<sub>x</sub>, and other significant air emissions by type.

Holcim	Lafarge
Total annual (2005) emission of NO <sub>x</sub> : 162,110 ton SO <sub>2</sub> : 53,575 ton Dust: 18,380 ton Organics: 8,310 ton Mercury: 2.6 ton  Average specific conc. (g/ton cementitious materials) (2005): NO <sub>x</sub> : 1,315 SO <sub>2</sub> : 435 Dust: 150 Organics: 70 Mercury: 0.02  Average specific conc. (g/ton cementitious materials) (2004): NO <sub>x</sub> : 1,330 SO <sub>2</sub> : 540 Dust: 120 Organics: 80 Mercury: 0.02	The amounts of NO <sub>x</sub> , SO <sub>2</sub> and dust emitted in the year 2004 are reported only in the form of bar diagrams, which give no possibility of extracting precise numbers. The reporting is furthermore divided per country.

The scope of reporting includes emissions of substances regulated under: local laws and regulations; Stockholm POPs Convention (Annex A, B, and C) – persistent organic pollutants; Rotterdam Convention on Prior Informed Consent (PIC) and Helsinki, Sofia, and Geneva Protocols to the Convention on Long-Range Trans-boundary Air Pollution.

Both companies report on emission of **dust, SO<sub>2</sub> and NO<sub>x</sub>**, however once again in different formats. Holcim reports total emission of the three substances as well as the average specific amount in g/ton cementitious material, whereas Lafarge report emissions of the three substances in tables with no precise measurement and furthermore divided per country.

### 3.1.3 Biodiversity aspects

Biodiversity aspects are addressed by a single indicator related to programmes and targets for protecting and restoring native ecosystems (AI EN27).

Table 3-8: Additional indicator EN27. Objectives, programmes, and targets for protecting and restoring native ecosystems and species in degraded areas.

Holcim	Lafarge
Rehabilitation plans in place: - Cement: 71% - Aggregates: 86% - RMX: n/a	Quarries with a Lafarge approved rehabilitation plan 2004: - Cement: 99 out of 234 ( <b>≈ 42%</b> ) - Aggregates & Concrete: 565 out of 608 ( <b>≈ 93%</b> ) - Roofing: 27 out of 32 ( <b>≈ 84%</b> ) - Gypsum: 11 out of 16 ( <b>≈ 69%</b> )  In 2004 79% of their quarries had a rehabilitation plan compliant with Group standards. This rate reaches 93% in the Aggregates & Concrete division.

With regard to programmes for protecting and restoring native systems, both companies report on number of **rehabilitation plans** per product type. Holcim reports 71% rehabilitation plans (assuming out of total number of sites

producing cement) within cement, while Lafarge reports 42% rehabilitation plans. Though, the quality of the rehabilitation plans is not clearly stated, since the number from Lafarge refers to quarries with a Lafarge approved plan, while it is not clear which type of plans Holcim refers to.

### 3.2 Comparison of G2 reports in the sector Financial services

Two companies within the Financial sector are chosen in order to clarify whether it is possible, based on information derived from their G2 reports, to compare results related to their environmental performance. Both G2 reports are conducted in accordance with G2.

#### ***Selected elements from the profiles of the two financial companies***

Table 3-9: Profile data from the two companies within the financial sector.

No.	Profile data from G2	National Australia Bank	ABN Amro
2.1	<i>Name of reporting organisation</i>	National Australia Bank	ABN Amro
2.2	<i>Major products and/or services, including brands if appropriate. The reporting organisation should also indicate the nature of its role in providing these products and services, and the degree to which the organisation relies on outsourcing.</i>	One of Australia's largest financial service institutes.	International bank with European roots.
2.3	<i>Operational structure of the organisation</i>		
2.4	<i>Description of major divisions, operating companies, subsidiaries, and joint ventures.</i>		
2.5	<i>Countries in which the organisation's operations are located.</i>	Main operating areas are: Australia, the UK and New Zealand.  But as also operations in Asia and the USA.	Present in 58 countries.
2.6	<i>Nature of ownership: legal form.</i>		
2.7	<i>Nature of markets served.</i>		
2.8	<b><i>Scale of the reporting organisations:</i></b> <ul style="list-style-type: none"> <li>- number of employees</li> <li>- products produces/services offered (quantity or volume)</li> <li>- net sales</li> <li>- total capitalisation broken down in terms of debt and equity.</li> </ul> Reporting organisations are encouraged to provide additional information, such as: <ul style="list-style-type: none"> <li>- value added</li> <li>- total assets</li> <li>- breakdowns of any or all of the following:               <ul style="list-style-type: none"> <li>- sales/revenues by countries/regions that make up 5 percent or more of total revenues</li> <li>- major products and/or identified services</li> <li>- costs by country/region</li> <li>- employees by country/region.</li> </ul> </li> </ul>	Number of employees: Australia: (2005): 23,803 (2004): 24,524 New Zealand: (2005): 4,755 (2004): 4,719 United Kingdom: (2005): 9,988 (2004): 13,351 (incl. Irish banks)  In total about 7.8 million banking clients.  Gross value add in the community: (2005): 10,664 mil.\$	Number of full-time employees (FTE's): (2005): 97,523 (2004): 98,140  Total assets of EUR 880.8 billion (2005)  Total operating income: (2005): 19,827 mio. EUR  Net profit: (2005): 4,382 mill. EUR

***Environmental indicators reported in the two G2 reports***

Once again the two reports provide information only on a relatively narrow selection of the indicators available in G2. The following sections provide a tabular summary of a selection of the indicators reported, together with a short discussion on their suitability for benchmarking and comparisons. Please note that not all indicators are discussed in the same detail. Also note that text in ***bold and italic*** is our own calculation in order to try to compare the numbers given in the different reports.

The financial sector is a relatively simple sector with few environmental impacts, which in general are considered to be related to consumption of paper, consumption of energy and generation/handling of waste. The financial sector is special as there is no product output that easily can be measured. Therefore, normalisation per FTE (full-time employee) and/or per area occupied is investigated as possible approaches in this sector.

The selected indicators are:

- EN1 Materials use: Paper use in kg per FTE (full-time employee)
- EN2 Materials used that are wastes: Use of recycled paper in percent of total paper use
- EN3 Direct energy use: Total energy consumption in GJ per FTE
- EN3 Direct energy use: Total energy consumption in GJ per m<sup>2</sup> of property occupied
- EN5 Total water use: Total use of water in m<sup>3</sup> per FTE.
- EN8 Greenhouse gas emissions: Total CO<sub>2</sub> emissions/greenhouse gas emissions (CO<sub>2</sub>-equivalents) in ton per FTE
- En11 Total amount of waste: Total waste in kg per FTE

**3.2.1 Resource aspects**

Resource aspects are primarily addressed by three indicators, one for total materials use (CI EN1), one for the percentage of materials used that are waste (CI EN2), and one for the consumption of water (CI EN5).

Table 3-10: Core Indicator EN1. Total materials use other than water, by type.

<b>National Australia Bank</b>	<b>ABN Amro</b>
Only for Australia: <b>Total purchase of paper (A4):</b> (2004): 1,309 ton (2005): 1,254 ton  <b>A4 paper use per FTE:</b> (2004): 53.4 kg/FTE (2005): 52.7 kg/FTE	<b>Total paper consumption</b> (extrapolation based on data from 58% of the FTE=full-time employee): (2004): 12,254 ton (2005): 12,401 ton  Average number of employees (FTE): (2004): 105,918 (2005): 97,523  <b><i>Paper use per FTE (our calculation):</i></b> <i>(2004): 115.7 kg/FTE</i> <i>(2005): 127.2 kg/FTE</i>

The scope of Core indicator EN 1 is to “Provide definitions used for types of materials. Report in ton, kilograms, or volume”.

With respect to **use of paper** the G2 indicator on materials use yields somewhat comparable results with respect to paper consumption. The National Australian Bank uses about 50 kg of A4 paper per FTE and ABN Amro about 115 kg of paper per FTE. The more than double use of paper

per FTE could be due to the fact that ABN Amro report on all paper and not just A4 paper. This is not apparent from the report. This underlines the need for precise definitions of what to be reported – and how.

Table 3-11: Core Indicator EN2. Percentage of materials used that are wastes (processed or unprocessed) from sources external to the reporting organisation.

National Australia Bank	ABN Amro
In Australia: - 90% of paper or 1.130 ton of paper is from recycled sources	In Brazil: - 82% of paper for internal use is from recycled sources.
In New Zealand: - 0% paper used with recycled content	
In United Kingdom: - 0% paper used with recycled content	

The indicator “Materials used that are wastes” refers to both post-consumer recycled material and waste from industrial sources, to be reported in ton, kilograms, or volume.

As such it appears to be useful for a comparison between the two companies. The National Australian Bank buys 90% of their paper as recycled paper in Australia, but no paper originates from recycled sources in neither UK nor New Zealand. For ABN Amro the number is 82% in Brazil. It is noticed that both companies report on country-specific level, while no average of the totals is given. The differences between offices in different countries/regions may be due to two factors, i.e. availability of recycled paper on the market and/or company policies regarding which type of paper to purchase and use.

Table 3-12: Core Indicator EN5. Total water use.

National Australia Bank	ABN Amro
<b>Total water consumption:</b> Australia: (2005): 718,498 kL (2004): 702,359 kL New Zealand: (2005): Not available (2004): Not available United Kingdom: (2005): 134,974 kL (2004): 153,063 kL  kL assumed to equal m <sup>3</sup>  <b>Total water use per FTE: (our calculation)</b> Australia: (2005): 30.19 m <sup>3</sup> /FTE (2004): 28.64 m <sup>3</sup> /FTE United Kingdom: (2005): 13.51 m <sup>3</sup> /FTE (2004): 11.46 m <sup>3</sup> /FTE	<b>Total water use:</b> (2005): 2,099,398 m <sup>3</sup> (2004): 2,039,200 m <sup>3</sup>  <b>Total water use per FTE:</b> (2005): 21.53 m <sup>3</sup> /FTE (2004): 19.25 m <sup>3</sup> /FTE

The indicator “Total water use in m<sup>3</sup> per FTE “ seems to be directly comparable between the two companies, although it must be recognized that there are large in-company differences: Water use for the National Australian Bank is thus 30.2 m<sup>3</sup>/FTE for Australia and 13.5 m<sup>3</sup>/FTE for United Kingdom. A full explanation of the large difference in water use between the two countries for the same bank cannot be found in the report, but can e.g. be due to regional aspects like the need for watering of lawns in different climates. Furthermore, the Australian Bank explains that for Australia the

exact use of water cannot be calculated as use of water is part of the rent, and is not known for the specific offices the bank occupies, but only for the entire building. ABN Amro only reports total water consumption, i.e. a highly aggregated figure without possibility of discriminating between offices, countries or regions.

Although water consumption in general is a relevant environmental aspect it cannot be considered as highly important when benchmarking the environmental performance of banks. Its inclusion as an indicator is therefore not recommended for the moment being.

### 3.2.2 Energy aspects

Energy aspects are addressed in G2 by indicators relating to direct energy use (CI EN3), indirect energy use (CI EN4, initiatives to use renewable energy and to increase energy efficiency (AI EN17) and other indirect energy use (AI EN 19). In combination, the four indicators provide an overview of the most important aspects of energy management in relation to banks, although some obviously are more important than others.

Table 3-13: Core Indicator EN3. Direct energy use segmented by primary source.

National Australia Bank	ABN Amro
<b>Total stationary energy consumption:</b> Australia: (2005): 749,593 GJ (2004): 736,085 GJ New Zealand: (2005): 93,902 GJ (2004): 86,854 GJ United Kingdom: (2005): 320,544 GJ (2004): 356,047 GJ	<b>Total energy consumption (including energy consumption from other sources):</b> (2005): 915,550,154 kWh (2004): 920,557,428 kWh  <b>From these figures electricity consumption are covering:</b> (2005): 699,302,119 kWh (2004): 705,241,555 kWh  <i>Calculated in GJ – total energy consumption (our calculation)</i> (2005): 3,295,717 GJ (2004): 2,538,667 GJ  <i>Calculated in GJ per FTE (our calculation)</i> (2005): 33,8 GJ/FTE (2004): 25.9 GJ/FTE  No information about m <sup>2</sup> of property occupied.
<b>Stationary energy consumption per FTE:</b> Australia: (2005): 31.5 GJ/FTE (2004): 30.0 GJ/FTE New Zealand: (2005): 19.8 GJ/FTE (2004): 18.4 GJ/FTE United Kingdom: (2005): 32.1 GJ/FTE (2004): 32.7 GJ/FTE	
<b>Stationary energy consumption per m<sup>2</sup> property occupied:</b> (2005): 0.98 GJ/m <sup>2</sup> (2004): 1.05 GJ/m <sup>2</sup> New Zealand: (2005): 0.66 GJ/m <sup>2</sup> (2004): 0.59 GJ/m <sup>2</sup> United Kingdom: (2005): 1.24 GJ/m <sup>2</sup> (2004): 1.32 GJ/m <sup>2</sup>	

The scope of Core Indicator EN3 “Direct energy use segmented by primary source” is to report (in Joule) on all energy sources used by the reporting organisation for its own operations as well as for the production and delivery of energy products (e.g., electricity or heat) to other organisations.

Calculation of Total energy consumption per FTE is possible for both companies. The National Australian Bank uses e.g. 31.5 GJ/FTE in Australia

and 19.8 GJ/FTE in New Zealand. ABN Amro uses 33.8 GJ/FTE in total for all their offices around the world. The differences between the reported figures are thus large – about a factor 2. Whether the differences reflect “good” or “bad” environmental performance cannot be assessed. Obviously, a bad or missing energy management will – other things equal – cause a higher energy consumption, but the labour intensity (number of employees) in banking operations may very well be of equal or larger importance.

Calculation of Total energy consumption per m<sup>2</sup> is only possible for one bank, and the suitability of such an indicator for comparisons cannot be assessed. At this very early stage of developing indicators, it is however seen as a possible supplement to the figure for energy consumption per FTE. Also for this indicator differences by a factor are envisioned between countries. Again, bad or missing energy management may be a decisive factor, but the nature of banking operations, climatic aspects and national building traditions/regulations are most probably even more important. Aggregated indicators on the overall company level can therefore be misleading, while site-specific indicators appear to be more useful.

Table 3-14: Core Indicator EN4. Indirect energy use.

National Australia Bank	ABN Amro
<i>Included in EN3.</i>	Total energy consumption from other sources such as fossil fuels, district heating and district cooling: (2005): 216,248,035 kWh (2004): 215,315,873 kWh

The scope of Core Indicator EN 4 is “Report (in Joule) on all energy used to produce and deliver energy products purchased by the reporting organisation (e.g., electricity or heat).”

One bank has chosen to include the Indirect energy use in the figures for total energy consumption, while the other reports the indicator separately, using kWh instead of Joule as requested in G2. Given the nature of banking operations it is obvious that both types of energy play an important role for their overall environmental impact.

Energy from stationary sources (for heating purposes) may be produced internally as well as externally of the company, while electricity is almost always produced externally. The best base for a comparison and benchmarking is therefore judged to be an indicator for thermal energy consumption combined with an indicator for electricity consumption, without any considerations of whether the production is external or internal. Still, however, country- and site-specific factors which can only be managed to a very limited extent by an EMS may prove to be decisive for the performance of many banking operations. Some of the possibilities are addressed in Additional Indicator EN17, see below.

Table 3-15: Additional Indicator EN17. Initiatives to use renewable energy sources and to increase energy efficiency.

<b>National Australia Bank</b>	<b>ABN Amro</b>
Began in UK in 2005 to purchase green energy for nine commercial buildings. In New Zealand a switch from gas-fired to coal fired generation has been made over the years.	<i>Not reported</i>

The nature of this indicator is judged to be semi-quantitative by nature, but with some additional efforts the basic information on e.g. “Amount of green electricity purchased” can be used to calculate a ratio, which can be used for comparisons and benchmarking.

Table 3-16: Additional indicator EN19. Other indirect (upstream/downstream) energy use and implications, such as organisational travel, product lifecycle

<b>National Australia Bank</b>	<b>ABN Amro</b>
<i>Not reported</i>	Business air-travel is reported, but is reported in terms of CO <sub>2</sub> -emissions.

The general scope of the indicator is to report energy use and implications (emissions) related to organisational travel, product life cycle management and use of energy-intensive materials. For banking operations, only organisational travel can be regarded as relevant, but neither of the two reports examined have made energy considerations as envisioned in the scope.

### 3.2.3 Emission aspects

Emission aspects are addressed by three indicators, addressing greenhouse gases (CI EN8), ozone depleting substances (CI EN9) and waste (CI EN11), respectively.

Table 3-17: Core Indicator EN8. Greenhouse gas emissions.

National Australia Bank	ABN Amro
<b>Total stationary energy-related greenhouse emissions:</b> Australia: (2005): 243,969 t CO <sub>2</sub> -e (2004): 242,341 t CO <sub>2</sub> -e New Zealand: (2005): 4,755 t CO <sub>2</sub> -e (2004): 3,592 t CO <sub>2</sub> -e United Kingdom: (2005): 16,303 t CO <sub>2</sub> -e (2004): 24,045 t CO <sub>2</sub> -e <b>Stationary energy-related greenhouse emissions in t CO<sub>2</sub>-e/FTE:</b> Australia: (2005): 10.24 t/FTE (2004): 9.88 t/FTE New Zealand: (2005): 1.00 t/FTE (2004): 0.76 t/FTE United Kingdom: (2005): 1.6 t/FTE (2004): 2.2 t/FTE <b>Total fuel-related greenhouse emissions:</b> Australia: (2005): 5,732 t CO <sub>2</sub> -e (2004): 5,545 t CO <sub>2</sub> -e New Zealand: (2005): 2,720 t CO <sub>2</sub> -e (2004): 2,728 t CO <sub>2</sub> -e United Kingdom: (2005): 1,556 t CO <sub>2</sub> -e (2004): 1,610 t CO <sub>2</sub> -e	<b>Total energy consumption related CO<sub>2</sub> emissions:</b> (2005): 276,857 ton (2004): 340,640 ton  <b>CO<sub>2</sub> emissions because of business air-travel:</b> (2005): 69,602 ton (2004): 66,194 ton  <b>Total CO<sub>2</sub> emissions:</b> (2005): 346,459 ton (2004): 406,834 ton  <b>CO<sub>2</sub> emissions per FTE:</b> (2005): 3.55 ton/FTE (2004): 3.84 ton/FTE

The scope of Core Indicator EN 8 is “Greenhouse gas emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>). Report separate subtotals for each gas in ton and in ton of CO<sub>2</sub> equivalent for the following:

- direct emissions from sources owned or controlled by the reporting entity
- indirect emissions from imported electricity heat or steam. See WRI-WBCSD Greenhouse Gas Protocol.”

The Emission of greenhouse gases in ton of CO<sub>2</sub> per FTE appears a possible indicator for comparisons and benchmarking. However, in this example, it is obvious that the companies only follow GRI to some extent – a true comparison is not possible due to the fact that one bank reports in CO<sub>2</sub> equivalents and the other in CO<sub>2</sub> emissions.

As for energy consumption, the in-company differences can possibly be attributed to external factors like climate dependency and fuels used in electricity production as well as internal factors like an adequate energy management system with good habits and use of energy-efficient appliances.

Use of the indicator is therefore recommended to be cautious, e.g. including explanatory notes from the company addressing the predominant reasons for observed differences between sites, countries and regions.

Table 3-18: Core Indicator EN9. Use and emissions of ozone-depleting substances.

National Australia Bank	ABN Amro
<b>Use of ozone-depleting substances:</b> Australia: 7,724 kg ODS (ozone depleting substances)	<i>Not reported</i>

The scope of reporting of ozone depleting substances is to report each figure separately in accordance with Montreal Protocol Annexes A, B, C, and E in ton of CFC-11 equivalents (ozone-depleting potential).

Given the very broad range of ozone-depletion potentials (ODP) for different substances, reporting of the total amount of substances with an ODP, which is done by National Australia Bank, is more or less meaningless. Given the assumption that banks use relative large amounts of ozone depleting substances (with different ODP) for e.g. cooling systems, an indicator for this may be relevant. The indicator should, however, be calculated in CFC-11 equivalents (ozone-depleting potential) as stated by GRI, as the total amount of substances with an ODP is not useful as an indicator. This example illustrates again, that the companies reporting only to some extent follow GRI.

On the other hand, one could question the need for use of an ODP indicator, as a global regulatory framework exists in this area (the Montreal Protocol).

Table 3-19: EN11. Total amount of waste by type and destination.

National Australia Bank	ABN Amro
<b>Total waste to landfill (estimated):</b> Australia: (2005): 4,861 ton (2004): 5,889 ton New Zealand: (2005): Not available (2004): Not available United Kingdom: (2005): 2,288 ton (2004): 2,827 ton  <b>Total waste to landfill per FTE (own calculation):</b> Australia: (2005): 204.2 kg/FTE (2004): 240.1 kg/FTE United Kingdom: (2005): 229.1 kg/FTE (2004): 259,3 kg/FTE  <b>Paper collected and recycled (estimated):</b> Australia: (2005): 5,938 ton (2004): 1,189 ton New Zealand: (2005): 1,051 ton (2004): 1,060 ton United Kingdom: (2005): 1,932 ton (2004): 2,030 ton	<b>Total waste:</b> (2005): 31,426 ton (2004): 28,878 ton  <b>Total waste per FTE (own calculation):</b> (2005): 322.2 kg/FTE (2004): 272.6 kg/FTE

The term “Destination in Core Indicator EN11 refers to the method by which waste is treated, including composting, reuse, recycling, recovery, incineration, or land filling. The type of classification method and estimation method shall be explained.

Obviously, the reports of the two banks do not meet the requirement of G2 with respect to the level of detail reported for waste management practices. From an environmental point of view, recycling of paper (rather than landfilling or incineration) is an important issue. The same is disposal of waste from electric and electronical equipment, while disposal of common household waste is of little concern. If waste handling is to be included as an

indicator it is therefore necessary to employ the level of detail envisioned in the G2-requirements, modified to meet the actual challenges faced by banks in their everyday waste management operations.

### 3.2.4 Financial services sector supplements: Environmental performance

The sector supplement for the financial service sector is as all the other sector supplements in development, but a pilot version 1.0 is available on the GRI website<sup>10</sup>. When a final version is ready, all sector supplements indicators will be perceived as core indicators for the financial sector. The sector supplement for the financial services consists of the following 13 environmental performance indicators:

Table 3-20: GRI Sector supplements for the financial sector.

	<b>Environmental performance indicator</b>	<b>Description</b>
1.	Description of environmental policies applied to core business lines.	<u>Qualitative:</u> Key points of policy. Which products covered by the policy. Objectives and targets.
2.	Description of process(es) for assessing and screening environmental risks in core business lines.	<u>Qualitative:</u> Evaluating the env. impacts of the company's clients etc.
3.	State the threshold(s) at which environmental risk assessment procedures are applied to each core business line.	<u>Qualitative:</u> Type of clients, transaction size and types.
4.	Description of processes for monitoring client's implementation of and compliance with environmental aspects raised in risk assessment process(es).	<u>Qualitative:</u> Clients level of env. compliance with objectives etc.
5.	Description of process(es) for improving staff competency in addressing environmental risks and opportunities.	<u>Qualitative:</u> Levels of staff and departments involved in training. Frequency of training. Etc.
6.	Number and frequency of audits that include the examination of environmental risk systems and procedures related to core business lines.	<u>Qualitative:</u> Explain the scope of the audits.
7.	Description of interactions with clients/investee companies/business partners regarding environmental risks and opportunities.	<u>Qualitative:</u> Describe methods of communication. Criteria used to prioritize companies. Etc.
8.	Percentage and number of companies held in the institution's portfolio with which the reporting organisation has engaged on environmental issues.	<u>Quantitative:</u> Percentage and numbers of companies where the organisation has engaged on env. issues.
9.	Percentage of assets subjected to positive, negative and best-in-class environmental screening.	<u>Quantitative:</u> Percentage of total assets.
10.	Description of voting policy on environmental issues for shares over which the reporting organisations holds the right to vote shares or advise on voting.	<u>Qualitative:</u> General principles applied in voting on env. issues.
11.	Percentage of assets under management where the reporting organisation holds the right to vote shares or advise on voting.	<u>Quantitative:</u> In percentages.
12.	Total monetary value of specific environmental products and services broken down according to the core business lines.	<u>Quantitative and qualitative:</u> In monetary value. Explanation of how the service delivers an env. benefit.
13.	Value of portfolio for each core business line broken down by specific region and by sector.	<u>Quantitative:</u> In percentages.

Furthermore, this sector supplement comments on

<sup>10</sup> Found at <http://www.globalreporting.org/InDevelopment/SectorSupplements/>

- EN1 Total material use - and states that paper represents the most significant material input for the financial sector.
- EN30 Indirect greenhouse gas emissions – and states that the financial institutes should report on the resulting green house gas emissions from their business travel.
- En11 Total waste by type and destination – and states that the primary types of waste streams for the financial institutions are paper and waste IT products.

The majority of the 13 extra indicators included in this sector supplement are qualitative. The comments to three of the existing indicators mean that these indicators may be used for comparison between the companies. However, no type of normalisation is suggested.

### 3.3 Comparison of G2 reports in the sector Household Goods & Textiles

Two companies within the sector Household Goods & textiles are chosen in order to clarify whether it is possible, based on information derived from their G2 reports, to compare results related to their environmental performance. Both G2 reports are conducted in accordance with G2.

#### ***Selected elements from the profiles of the two textile companies***

Table 3-21: Profile data from the two companies within the Household Goods & Textiles sector.

No.	Profile data from G2	Puma	Inditex
2.1	<i>Name of reporting organisation</i>	Puma	Inditex
2.2	<i>Major products and/or services, including brands if appropriate. The reporting organisation should also indicate the nature of its role in providing these products and services, and the degree to which the organisation relies on outsourcing.</i>	Sport lifestyle footwear, apparel and accessories.	8 fashion distribution chains; Zara, Kiddys Class, Pull and Bear, Massimo Dutti, Bershka, Stradivarius, Oysho and Zara home.
2.3	<i>Operational structure of the organisation</i>		
2.4	<i>Description of major divisions, operating companies, subsidiaries, and joint ventures.</i>		No. of stores: 2,244
2.5	<i>Countries in which the organisation's operations are located.</i>	43	56
2.6	<i>Nature of ownership: legal form.</i>		
2.7	<i>Nature of markets served.</i>		

No.	Profile data from G2	Puma	Inditex
2.8	<p><b>Scale of the reporting organisations:</b></p> <ul style="list-style-type: none"> <li>- number of employees</li> <li>- products produced/services offered (quantity or volume)</li> <li>- net sales</li> <li>- total capitalisation broken down in terms of debt and equity.</li> </ul> <p>Reporting organisations are encouraged to provide additional information, such as:</p> <ul style="list-style-type: none"> <li>- value added</li> <li>- total assets</li> <li>- breakdowns of any or all of the following: <ul style="list-style-type: none"> <li>- sales/revenues by countries/regions that make up 5 percent or more of total revenues</li> <li>- major products and/or identified services</li> <li>- costs by country/region</li> <li>- employees by country/region.</li> </ul> </li> </ul>	<p>App. 4000 employees worldwide. (?)</p> <p>Total worldwide sale: 2,016.6 mi. €.</p> <p><b>Total sale by product:</b>  Footwear: 1,127.1 mio €.  Apparel: 710.4 mio.  Accessories: 179.2 mio. €.</p>	<p>Net profit: 628 mio. Euro.</p> <p>Total turnover: 5,670 mio. Euro.</p> <p>Number of employees: 47,046</p> <p>Sales divided per distribution chain (mio.euro):  Zara: 3,819.6 (67.4%)  Kiddys Class: 120.6 (2.1%)  Pull and Bear: 378.9 (6.7%)  Massimo Dutti: 481.3 (8.5%)  Bershka: 516 (9.1%)  Stradivarius: 5241.9 (4.3%)  Oysho: 71.7 (1.3%)  Zara Home: 40.4 (0.7%)</p> <p>They also list percentage sale divided in geographic areas.</p>
2.9	<p>List of stakeholders, key attributes of each, and relationship to the reporting organisation:</p> <ul style="list-style-type: none"> <li>- communities (locations, nature of interest)</li> <li>- customers (retail, wholesale, businesses, governments)</li> <li>- shareholders and providers of capital</li> <li>- suppliers</li> <li>- trade unions</li> <li>- workforce, direct and indirect</li> <li>- other stakeholders.</li> </ul>		

### ***Environmental indicators reported in the two G2 reports***

Again the two reports provide information on a relatively narrow selection of the indicators available in G2. In accordance with the previous sections the following sections provide a tabular summary of a selection of the indicators reported, together with a short discussion on their suitability for benchmarking and comparisons. Please note that not all indicators are discussed in the same detail. Also note that text in ***bold and italic*** is our own calculation in order to try to compare the numbers given in the different reports.

The first main problem that arises when attempting to compare the two environmental profiles is the fact that Puma reports in terms of total sale by product type (footwear, apparel and accessories) whereas Inditex reports sale by distribution chain (Zara, Kiddy's Class, etc.). Thus it is impossible to convert figures reported from Inditex into numbers per product (which so far seems to be a necessary criterion in terms of sensible comparison).

### 3.3.1 Resource aspects

Resource aspects are within these two reports primarily addressed by two indicators focusing on respectively percentage of materials used that are wastes (CI EN2) and total water use (CI EN5).

Table 3-22: Core Indicator EN2. Percentage of materials used that are wastes (processed or unprocessed) from sources external to the reporting organisation.

Puma	Inditex
100% recycling of wastewater (390,360 m3/year)	Destination of waste according to type and treatment type:
100% recycling of solid waste: - Nylon 7.56 metric tons - Paper: 10.32 metric tons - Fabric: 29.76 tons	Other urban waste sent to treatment plant and compost: 13.77%
(All data refer to one of their suppliers: Erenko in Turkey which has a production capacity)	Wood sent to recycling plant: 6.27%
	Plastic sent to recycling plant: 4.19%
	Cardboard and paper sent to recycling plant: 55.25%
	Textile waste sent to recycling plant: 20.36%
	Hazardous waste sent to authorised waste treatment plant: 0.16%
	(not clearly stated whether this is their future plan or existing data, probably the later).

The indicator refers to both post-consumer recycled material and waste from industrial sources. Reports in ton, kilograms, or volume.

Both companies report on **percentage of waste** that is recycled. The only reasonable comparable parameter is paper for which Puma reports a 100% recycling (though not clearly described), while Inditex reports a recycling of 55.25% of cardboard and paper. It is not clearly stated in the report from Puma whether paper covers cardboard as well which complicates the comparison.

Table 3-23: Core Indicator EN5. Total water use.

Puma	Inditex
They only mention recycling of 390,360 m3 waste water/year.	(not clearly stated whether it is wastewater or water they report on)
Manufacturing one kilogram of pure white cotton requires 3000 litres of water	2004: 115,016 m3

Both companies attempt to report on **total water use**, but it is not clearly stated in the report from Inditex, whether it is water consumption or production of wastewater they report on, thus complicating comparison.

### 3.3.2 Energy aspects

Energy aspects are primarily addressed by one indicator focusing on direct energy use segmented by primary source (CI EN3).

Table 3-24: Core Indicator EN3. Direct energy use segmented by primary source.

Puma	Inditex
<p><b>Total energy consumption at Erenko (all data refer to one supplier, Erenko):</b></p> <p>4,301 MWH of electrical energy</p> <p>2,266 MWH of energy from natural gas</p> <p><b>Per product that corresponds to:</b> 1.2 KWH/product and 0.28 KG CO<sub>2</sub>/product (including dyeing process, and assuming electricity generation is from oil).</p>	<p><b>Annual energy consumption (includes factories and stores world-wide).</b></p> <p>Renewable energy: 4,278,489 kWh Electricity (public network): 492,738,250 kWh Cogeneration gas consumption: 6,472 Tep Gas-oil consumption: 1,848 Tep.</p> <p>(tep = petroleum ton equivalent)</p>

The scope of the indicator is to report on all energy sources used by the reporting organisation for its own operation as well as for the production and delivery of energy products (e.g. electricity or heat) to other organisations. Reports in joules.

In terms of **energy consumption**, Puma reports a total energy consumption of one of their suppliers, while Inditex reports a total energy consumption that includes all factories and stores worldwide. Thus comparison is not possible. Even though Puma additionally reports a use of energy per product, comparison is still not possible due to the fact that Inditex reports by distribution chains.

### 3.3.3 Emissions aspects

Emission aspects are primarily addressed by one indicator focusing on greenhouse gas emission (CI EN8).

Table 3-25: Core Indicator EN8. Greenhouse gas emission.

Puma	Inditex
<p>Carbon dioxide emission (per year)</p> <p>Electricity – 1,091,846 kg – 0.20 kg/piece of product.</p> <p>Natural gas – 140,694 kg – 0.08 kg/piece of product.</p> <p>(All data refer to one supplier, Erenko)</p> <p><i>(a calculation error seems to exist here, since the relationship between the two calculations is not equal)</i></p>	<p><b>Total CO<sub>2</sub> emission: 271,371 T/year.</b></p> <p><b>Divided by:</b></p> <p>Industrial centres: 31,733 CO<sub>2</sub>T/year Transport: 13,338 CO<sub>2</sub>T/year Stores: 226,660 CO<sub>2</sub>T/year</p> <p><i>Industrial centres (total 31,733 TCO<sub>2</sub>):</i></p> <ul style="list-style-type: none"> <li>- Natural gas consumption 15,127 T CO<sub>2</sub></li> <li>- Propane consumption: 26 T CO<sub>2</sub></li> <li>- Gas-oil consumption: 5,677 T CO<sub>2</sub></li> <li>- Electricity consumption: 10,903 T CO<sub>2</sub>.</li> </ul> <p><i>Transport:</i></p> <ul style="list-style-type: none"> <li>- Emissions caused by transport: 13,338 T CO<sub>2</sub></li> </ul> <p><i>Stores</i></p> <ul style="list-style-type: none"> <li>- Electricity consumption in stores: 226,660 T CO<sub>2</sub></li> </ul>

The scope of Core Indicator EN 8 is “Greenhouse gas emissions (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, SF<sub>6</sub>). Report separate subtotals for each gas in ton and in ton of CO<sub>2</sub> equivalent for the following:

- direct emissions from sources owned or controlled by the reporting entity
- indirect emissions from imported electricity heat or steam. See WRI-WBCSD Greenhouse Gas Protocol.”

As to **emission of CO<sub>2</sub>** Puma reports emission in terms of respectively electricity (app. 0.2 kg) and natural gas (app. 0.08 kg) per product, whereas Inditex reports a total CO<sub>2</sub> emission (ton/year) as well as by industrial centres, transport and stores. Thus comparison seems not possible, again due to the different methods of reporting.

### 3.4 Comparison of several companies on a few indicators

In the previous section we attempted to compare the environmental performance of two companies (within each of the three sectors) based on information derived from their sustainability reports (which were conducted in accordance with G2). As described above several problems arose during the attempt to compare the environmental performance of the companies.

In order to make sure that the high number of problems arising was not simply a case of accidentally choosing some bad examples of sustainability reports, a further analysis was conducted.

This analysis consisted of comparing the environmental performance of 15 banks and 7 cement-producing companies. Once again it was attempted to derive the necessary information from sustainability reports, though in this case the focus was not explicitly on G2 reports. Due to the scope of this project, it was, however, not possible to compare the companies on all reported environmental indicators, thus two of the apparently most relevant indicators within the financial sector were chosen and one within the Construction and Building materials sector was chosen.

The analysis was furthermore conducted in order to locate additional problems not illuminated by the previous analysis, as well as the possibility of identifying a potential baseline/excellence level, regarding the chosen indicator, within each of the two sectors.

#### 3.4.1 Banks

Below we have extracted data from the sustainability reports of 15 banks on respectively energy consumption and consumption of paper. In order to generate potential comparable numbers, figures related to FTE (or m<sup>2</sup>) are chosen.

##### ***Energy consumption per FTE in banks***

A number of problems immediately arise when attempting to extract comparable data, thus validating our previous conclusion of extensive problems related to comparing the environmental performance of the companies. Besides the problems mentioned during the previous analysis, the following issues emerge:

##### ***Format-related problems***

- Not all companies report a normalised figure, as in terms of energy consumption pr. FTE or m<sup>2</sup>. However, in many cases the normalised data can be calculated, based on the reported FTE number
- However, not all companies report a FTE number
- FTE is furthermore reported in different ways, some report FTE per country, others in total

- One company extrapolates energy consumption based on FTE at one site
- The types of energy consumption reported differ significantly. Companies report in various combination of the following:
  - o total energy use (not always specified what it includes)
  - o total energy use by buildings
  - o total energy use by stationary energy consumption
  - o total direct energy use
  - o total indirect energy use
  - o total other indirect energy use (represents in one company flights and travel in vehicles not owned by the company)
  - o business trips in terms of km travelled by car, airplane or train
  - o electricity consumption
  - o gas consumption
  - o fossil fuel consumption
  - o heating
  - o litres of kerosene use for heating
  - o litres of gasoline used for automobiles
- Some of the above mentioned energy consumptions are furthermore reported in different ways, such as by country, by site, by corporation, etc.
- And as seen from the previous analysis in different units (GJ, kWh, L, etc.)
- Probably a different use of conversion factors

***Content-related problems***

- Different amount of energy types is available in different countries
- Environmental impact associated with the use of electricity (CO<sub>2</sub> emission, etc.) varies according to the specific region/country since electricity is produced in different ways according to country (Norway produces electricity by water, Polen by coal, etc.)
- Even if same type of fuel is used to produce electricity, the energy efficiency of each power plant differs, thus resulting in different environmental impact

The reporting format of energy use differs to such an extent that it is not sensible/useful to present the raw figures in a table. However, most of the companies reported a figure of electricity consumption per FTE (though in several cases a recalculation was needed). These figures are listed in the table below in order to give an impression of potential base- and excellence levels regarding electricity consumption in banks.

Of the 15 banks studied, only 7 reported numbers of specific electricity consumption, thus allowing for comparison. These are presented below.

Table 3-26: Energy consumption per FTE per year in seven banks.

Bank	Electricity consumption/FTE per year (kWh)	Comment
BancoSabadell	7,117	Based on <b>electricity</b> consumption at four sites, covering 25% of FTE.
Daegu Bank	2,599	<b>Electricity</b> use based on headquarters.
Delta Loyd Group	4,460	
Dexia	2,805	

ING Group	5,300	
KBC	3,722	
Rabobank	4,580	

As seen in the table, the electricity consumption seems to range from 2,599 to 7,117 kWh/FTE/Yr, thus suggesting an excellence level of the former.

Though, the large difference in electricity consumption between BancoSabadell and Daegu Bank could be caused by the fact that the data from Daegu Bank are based on their headquarters in which they are carrying out a variety of conservation campaigns. They furthermore have a designated “energy saver”, being a person who monitors conservation efforts and provides guidelines (Daegu Bank Sustainability Report, 2006). This could result in a headquarters with significantly lower electricity consumption than other more “un-attended” sites. If they had reported electricity consumption at corporate level, the number would probably be quite different.

The high number reported by BancoSabadell could be caused by the fact that environmental management systems just recently (2006) have been implemented at the corporate headquarter, thus assuming a recent focus on energy consumption. Furthermore, the electricity consumption per FTE is reported based on information from four corporate sites (located in Spain), in which their activities consumes more power than the remaining facilities (according to their sustainability report).

### ***Paper consumption per FTE in the 15 banks***

When studying the information regarding paper consumption in the sustainability reports, several problems appear in terms of comparison. These problems are listed below.

#### ***Format-related problems***

- Some report a figure per FTE, others just an absolute figure of paper consumption
- Paper consumption is reported in terms of different paper types. The different companies report paper consumption in varying combinations of the following:
  - o Paper consumption (without specifying what it includes)
  - o ECF paper (Elemental Chlorine Free paper)
  - o Blank paper
  - o Printed paper
  - o Office paper
  - o Total A4 copy paper
  - o Envelopes, bank statements and insurance policies
  - o Printed matter
  - o Organisational printed matters (probably paper printed for internal use)
  - o Commercial printed matters (probably paper printed for external use).
  - o Post-consumer recycled (which covers 100% recycle post-consumer waste)
  - o New fibres ECF + TCF (totally chlorine free paper)
  - o New fibres chlorine bleached
  - o FSC-labelled paper (paper approved by the Forest Stewardship Council as having originated from responsible managed forests. Paper bearing the FSC quality mark denotes

- that at least 50% of the wood fibres used in the production process originates from responsibly managed forests)
- Some report in terms of paper purchased, others by paper consumed
- Some report figures aggregated across their corporation, others extrapolate based on data from one site.
- Some report in kg, other in ton (minor problem)

**Content-related problems**

- The different types of paper used result in different environmental impacts
- Different types of working areas require different amount of paper (exchange of money consumes less paper than for instance establishing a credit loan)
- Different banks do not have the same distribution of working areas (insurance, retail banking, merchant and private banking, etc.) which requires different amounts and types of paper
- Some reports different initiatives per site in relations to reduction in paper consumption.

Once again the reporting format of paper consumption differs to such an extent that it is not sensible to list the raw figures in a table. However, in most cases (11 of the 15 banks), it was possible to extract a number of paper consumption per FTE, though the specification of the paper reported was not always clear. The numbers are presented in the table below.

It should be mentioned, that several banks also report figures of percentage use of recycled paper (or FSC paper, Green paper, etc.) as well as an overall reduction (in percentage) in paper consumption. The percentage use of recycled paper could be used as an indicator (since 100% use of recycled paper should be considered better than for instance 20% use of recycled paper).

Table 3-27: Paper consumption per FTE per year in seven banks.

Bank	Kg paper consumption/FTE per year	Comments
ABN AMRO	110	Number refers to “ <b>paper consumption</b> ” – not clear exactly what it covers.
BancoSabadell	63	Number refers to “ <b>paper consumption per employee</b> ”. Not clear exactly what it covers. However, the number does not include Banco Urquijo and their offices outside Spain.
BBVA	130	Number refers to “paper consumed per employee”. Probably includes <b>ECF paper and recycled paper</b> . Number includes all sites (Spain, Mexico, Latin America, rest of the World).
Delta Loyd Group	105	Number refers to “ <b>paper consumption</b> ” in Delta Loyd Group (including the Netherlands, Germany and Belgium).
Dexia	228	Number probably refers to <b>blank paper and printed paper</b> .
FORTIS	140	Number refers to “ <b>Paper consumption per FTE</b> ” and relates to the Benelux countries. FORTIS exist in US, Asia, Rest Europe

		and Benelux.
ING Group	371	Number refers to total paper, which includes <b>office paper, organisational printed matters and commercial printed matters.</b>
KBC	162	Number refers to total paper including <b>post-consumer recycled, ECF/TCF paper, FSC paper and new fibres chlorine bleached.</b> Data reported aggregated across their worldwide operations for both 2005 and 2006. The total number of FTE covered for environmental performance is 44 291, or almost 90% of KBC Group.
National Australian Bank	Australia: 52 New Zealand:61.6 UK: 54.6	Number refers to <b>total A4 copy paper</b> purchased.
Rabobank	48,7	Number refers to " <b>Paper</b> ". Not clearly stated in the report what it covers.
SNS REAAL	404	Number refers to total paper consumption, probably covering <b>envelopes, bank statements, insurance policies; printed matter and A4 paper.</b> Absolute figures of consumption related to these are also reported.

As seen in the table the use of paper ranges from 48.7 to 404 kg paper/FTE. The fairly large variation could indicate that paper consumption would be a sensible/useful indicator in terms of benchmarking. However, the preconditions behind the reported figures are not always clear, thus in terms of creating a solid baseline-excellence level, further studies are required.

For instance, the major difference between Rabobank and SNS REAAL (top and bottom) could be caused by Rabobank only reporting the use of office paper, while SNS REAAL reports the use of all types of paper (envelopes, A4 paper, insurance policies, etc.). In order to establish a sensible baseline-excellence level, more comparable numbers are required.

### 3.4.2 Cement-producing companies

Based on the fact that the cement industry produces 5% of global man-made CO<sub>2</sub>, thus implying that CO<sub>2</sub> emission is a significant environmental impact related to the production of cement, we have below investigated further the possibility of using CO<sub>2</sub> emission as a comparable environmental performance indicator for cement-producing companies.

#### ***CO<sub>2</sub> emission per amount of cement produced***

A number of problems immediately arise when attempting to extract comparable data, thus once again validating our previous conclusion of extensive problems related to comparing environmental performance across companies. Besides the problems mentioned during the previous analysis, the following issues emerge:

#### ***Format-related problems***

- Some report CO<sub>2</sub> emission per product, without specifying which product types are included (clinker, cement, cementitious material, etc.)

- Some report CO<sub>2</sub> emission including shareholdings in joint ventures and associates – others not
- One company reports CO<sub>2</sub> emission from electricity consumption compared to turnover
- Some do not report total production volume except in terms of turnover
- A few report a reduction (or increase) in CO<sub>2</sub> emission per ton of cement in percentage compared to a base year
- Some report amount of emitted CO<sub>2</sub> per product produced, others by product sold
- Some report in CO<sub>2</sub> equivalents, others just in CO<sub>2</sub>
- Probable use of different conversion factors

***Content-related problem.***

- ***Type of cement produced***
  - o The different types of cement require different composition of raw material which influences CO<sub>2</sub> emission (e.g. a higher content of clinker means higher CO<sub>2</sub> emission, due to the high amount of heating required to produce clinker)
  - o And again the quantity of CO<sub>2</sub> emitted for each kilogram of clinker produced depends on the chemical composition of the raw materials
  - o Furthermore different regions/countries have different standards regarding the type of cement used which influences the type of additives used which again influences amount of CO<sub>2</sub> emitted
- ***The type of process used in producing the cement***
  - o Due to different energy efficiency in the different processes used to produce cement, the CO<sub>2</sub> emission varies according to the chosen process (see later)
  - o Different use of additives/raw materials in the different processes results in varying CO<sub>2</sub> emission
  - o The kilns used during production have specific thermal consumption that influences amount of CO<sub>2</sub> emitted
- ***The type of energy used***
  - o Types of fuels used in indirect energy production (electricity) result in different CO<sub>2</sub> emission - use of coal to produce electricity results in higher CO<sub>2</sub> emission than for instance water-power.
  - o Types of fuels (gas, fossil fuels, alternative fuels) used in direct energy consumption result in different CO<sub>2</sub> emission
  - o Types of energy used for transport (transportation by ship means less CO<sub>2</sub> emission per product weight than transport by truck (if transport exceeds 300 km))
  - o Proportion of renewable fuels used influence CO<sub>2</sub> emission. Use of alternative by-products (tires, etc.) as fuels affects CO<sub>2</sub> emission
  - o Different countries have different amount of alternative energy available, thus providing different opportunities for using alternative energy – which influence CO<sub>2</sub> emission. A company in Poland, for instance, does not have the same possibility of purchasing electricity produced by water-power as a company located in Norway.

As mentioned above the reporting format of CO<sub>2</sub> emission differs to such an extent that it is not sensible/useful to present the raw figures in a table. However, most of the companies reported a figure of CO<sub>2</sub> emission per amount of cement produced (though in several cases a recalculation was needed cf. the above mentioned format-related problems). These figures are listed in the table below in order to give an impression of potential base- and excellence levels regarding CO<sub>2</sub> emission per ton of cement produced.

Table 3-28: CO<sub>2</sub> emission per ton cement in seven cement-producing companies.

Cement-producing company	Kg CO <sub>2</sub> emission/ton of cement	Comment
CEMEX	Missing?	
Heidelberg	667	
GRH	31*	*Reports per ton of product
Buzzi - Italy	641	
Buzzi- Germany	657	
Buzzi - USA	857	
Buzzi- Mexico	653	
Cimpor	629	
Aalborg Portland - "Grey"	827	
Aalborg Portland - "White"	1225	
Castle Cement average	801	

As seen in the table, GRH reports a significantly lower emission of CO<sub>2</sub> (31) compared to the other companies. However, the difference is most likely caused by the fact that GRH reports per ton of product and not per ton of cement. The activities of GRH include a number of clay brick plants (which have begun to use landfill gas) and asphalt mixing plants (which use significant quantities of recycled oil), which may alter the outcome of CO<sub>2</sub> emission per product significantly. However, this is only an assumption.

The high CO<sub>2</sub> emission related to Aalborg Portlands "white cement" could be caused by the production of "white cement" being a more energy consuming process. However, this is not clearly stated in the report.

Furthermore, it is seen that there are large variations from site to site (Buzzi company), which means that average figures reported on company level are of little value.

Excluding GRH (due to reporting on range of group products) and Aalborg Portland's "White" cement (which is a cement type used for sculptures and white facades), the variation in CO<sub>2</sub> emission per ton of cement produced ranges from 827 to 629 kg CO<sub>2</sub>/ton cement; thus suggesting a baseline of 827 and an excellence level of 629.

## 4 Discussion

A number of organizations (including the European Consumer voice in standardisation, ANEC) have criticized the usefulness of EMS in terms of benchmarking on environmental good performance. They claim that the implementation of an Environmental Management System does not equal excellent environmental performance, due the fact that Environmental Management Systems are based on a principle of continuous improvement, thus not requiring any fulfilment of given levels of environmental performance beyond legal compliance.

ANEC, BEUC, ECOS and EEB believe that it is relevant to ensure a minimum level of environmental performance (beyond legal requirements) for the companies that are to obtain an EMS certification, thus creating a realistic possibility of benchmarking based on an EMS certification. In other words, a company that has obtained an EMS certification should per definition perform better than legally required.

The European Environmental Management System, EMAS, is in a revision process, thus providing an opportunity to meet the above mentioned requests. This project aims at developing (a system for developing) comparable environmental indicators that can be integrated in EMAS, thus allowing EMAS certified companies to benchmark against other EMAS certified companies as well as non-EMAS companies.

The subsequent discussion is divided into two main discussions. Firstly, the possibility and problems of using comparable environmental indicators at general level are discussed, based on the review of existing approaches and guidelines and the analysis of several sustainability reports. Secondly, the possibility and problems of using comparable environmental indicators at sector level are discussed, likewise based on results/information from the previous section.

The main focus will be on quantitative indicators. However, considerations regarding the possibility of using qualitative comparable environmental indicators as well as scales will be included in the discussion as well.

Finally, a conclusion regarding the possibility of using comparable environmental indicators on sector and general level is presented.

Before opening the discussion on useful comparable indicators it must be emphasized that an important prerequisite for developing comparable indicators, useful in benchmarking, is that they must represent a fair comparison. If they do not, companies would not use them, and the whole idea of benchmarking on environmental indicators becomes useless.

An important dilemma appears here in terms of whether a truly fair indicator, that does not compromise fair trading, inevitably would become too complicated to be useful in benchmarking. Thus, creating a fair indicator that is simple enough for use as benchmarking is the real challenge.

The following discussion brings forward the major concerns related to this dilemma, thus providing an opportunity to conclude whether creating these indicators are possible and if so under which preconditions.

#### 4.1 Comparable quantitative environmental indicators

##### 4.1.1 Problems and possibilities associated with using comparable quantitative environmental indicators at general level

In order to compare the environmental performance of one company with another, it is necessary to make some kind of normalisation, simply due to the fact that it is not fair to compare the environmental impacts of a small company with that of a large company in absolute figures. Several parameters could be considered as potential normalisation references. These include product volume, turnover, full time employee, etc. The usefulness of these in terms of benchmarking at general level is discussed below.

###### ***Product volume***

The first major difficulty that arises when considering how companies could compare their environmental performance at a general level (not sector-specific) is of course the fact that they produce different products. It is not rational to compare one companies consumption of energy per produced unit of plastic bags with another companies energy consumption per produced unit of computers, simply because it is not possible to produce a computer with the same amount of energy required to produce a plastic bag. Neither is it fair to compare amount or type of for instance chemicals used in the production since the composition of products differ significantly and thus have different requirements in terms of content of chemical substances.

A further problem is the fact that not all companies produce so-called "products". The financial sector, for instance, offers non-physical products, such as loans, counselling etc. This further complicates the comparison of environmental performance between companies on generic level because products and services are non-comparable.

###### ***Turnover***

The use of turnover as a normalisation reference is complicated, once again due to the fact that companies produce different types of products with different types of turnover rates (some product types create more profit than others, while not necessarily causing higher environmental impacts). Thus relating environmental impacts to turnover is not feasible.

###### ***Full time employee (FTE)***

Comparing a company's environmental impact per full time employee is likewise not sensible, again due to the problems related to the fact that different companies produce different products. Comparing a company's energy consumption per employee with another company's might not be fair since the amount of employees needed to produce a certain type of product differs significantly and might not correspond with the different energy use (or chemical use) related to the production of the two types of products.

In general, a company would not exist without producing some kind of product/service that it profits on (or at least make enough money to pay employees). Thus, all environmental impacts are in some way or another related to the fact that companies produce some kind of product or service. With this in mind it seems/is impossible to compare environmental impacts

across sectors, nor develop baseline/excellence scales related to these indicators. This conclusion can also be derived from the previous study “Going Beyond EMS” (FORCE Technology, 2006), where examples of quantitative environmental requirements for companies having environmental management systems are developed mostly on a sector level, or on a general level, but with a comment that the indicators should be benchmarked against levels within the specific sector.

#### 4.1.2 Main problems associated with developing comparable quantitative environmental indicators at sector level

When addressing sector level, it seems more appropriate to consider comparable environmental indicators, simply due to the fact that within the different sectors companies produce, to some degree, the same kind of product or service. However, as the previous analysis has demonstrated, several problems still exist.

The purpose of this section is to describe/discuss the general main problems that were identified when comparing environmental performances at sector level, thus providing basis for developing a procedure regarding the development of comparable environmental indicators at sector level.

The specific problems related to the three sectors investigated will be addressed later as will an attempt to develop indicators related to these sectors.

The setup and reporting format of an indicator is highly dependent on the context and purpose of which it is to be used. Indicators could be used in various ways, such as input to national inventories, CO<sub>2</sub> compliance regimes and emission trading, industry benchmarking etc. In this study, we focus on a setup for industry benchmarking, thus acknowledging the before mentioned dilemma of creating fair, yet simple indicators, that are useful for benchmarking while not compromising fair trading.

##### ***Sub-Sector specific***

The study of sustainability reports at sector level made it clear that sectors are not as specific as one would think. The Construction and Building materials sector, for instance, includes companies that produce a wide range of products – ranging from poster paper, cement and roads to bridges and even services like maintaining airports. This means that comparing companies at the sector level may pose the same problems as attempting to compare companies at general level - that is the challenge of comparing environmental impacts related to different types of products and services. Thus, it seems necessary to descend to sub-sector level when developing comparable environmental indicators. By sub-sector level we mean a group of companies that produces the same kind of products, e.g. cement-producing companies. By doing this, it becomes reasonable to discuss comparable environmental indicators, since environmental impacts are incontestable linked to products (or services).

##### ***Normalisation reference***

As mentioned earlier it is not reasonable to report absolute values when attempting to compare the environmental performance of different companies. Absolute values may be useful in terms of providing a sense of scale or magnitude of the impact in the context of larger systems. For instance, absolute values in terms of total emission of a certain chemical to a

nearby water system may be relevant in order to determine whether the water system can tolerate the emission. However, in terms of quantitative comparison of environmental performance between companies it is not sensible to use absolute figures.

Thus, reporting on environmental performance needs to include some sort of normalisation. However, as the previous analysis demonstrated different normalisation parameters are relevant regarding the different sub-sector levels which complicates the task of developing environmental indicators. For instance, banks do not produce a specific product, thus using “per product” as normalisation reference seems not useful. A more appropriate normalisation reference here would be “per full time employee” or perhaps per “m<sup>2</sup>”. On the other hand, a cement-producing company would benefit from using “per product unit” as reference parameter. Consequently, it is necessary to select which normalisation reference would be appropriate regarding the specific sub-sector.

Several different normalisation references are relevant. These include the following:

### ***Product***

The most obvious normalisation reference seems in many cases to be “per product”. Several other reporting systems (GHG Protocol, etc.) suggest this parameter. However, it is necessary to consider whether the parameter should be “per product produced” or “per product sold”. Even though the difference might be minor, one could imagine a situation, in which the amount of products sold does not equal the amount of products produced (storing). However, as a general rule it would be more appropriate to use the reference parameter “per product produced”, since using “per product sold” could result in overestimating the environmental impact per product since the environmental impacts related to the production stored would not be included.

When dealing with sectors, as for instance the textile industry, the situation becomes even more complex since some textile companies cover life cycle stages beyond production (laundries, etc.). This means that the reference parameter “per product sold” might be more appropriate at a certain life cycle stage (use phase) which again means that different normalisation references could be relevant at different life cycle stages, once again complicating the task of developing comparable indicators.

Another major issue regarding the use of “per product produced” as a reference parameter is the determination of the specific product type it covers. As the analysis revealed, even a common “simple” product as cement exists in various types. The different types of cement use different types and amount of raw material resulting in different environmental impacts. Thus, it is essential to specify exactly what kind of product the reference parameter relates to, and furthermore, as far as possible, establish a set of “sub-indicators” that clarify the cause of a potential difference (e.g. the percentage of clinker content in the cement, since high content of clinker results in higher CO<sub>2</sub> emission).

Another issue regarding the reference parameter “per product produced” is the unit of which to report in. Using the unit “unit” causes problems since different companies may produce the same product in different amounts (200

ml shampoo bottles compared to 1 L shampoo bottles) which is not comparable. Thus, it seems more feasible to use the weight unit (or volume unit).

A final issue, that needs to be addressed when using “per product produced” as reference parameter, is the fact that most companies produce co-products, meaning for instance they produce clinker which then are transformed into cement. In this case, the energy consumption regarding cement as the “product produced” needs to include the energy consumed in order to produce clinker. In other words, relevant aggregation across the product chain is needed.

### ***Full time employee (FTE) and $m^3/m^2$***

Our analysis revealed the use of FTE as a reference parameter when comparing energy consumption between banks. It seems that FTE could be a functional reference parameter within sub-sectors providing services and not physical products. However, further studies are required in order to determine whether this is a reasonable general assumption regarding all types of services.

Though, using FTE as a reference parameter could cause problems, if not used correctly. The study of sustainability reports revealed a company that extrapolated energy consumption based on FTE at one site. This is not desirable, since this could mask significantly higher energy consumption at other sites (however, this is mainly an “extrapolation-problem”). Thus, an exact definition of reporting format and scope is necessary.

In terms of using “per FTE” as reference parameter when reporting energy consumption, another problem appears. Energy consumption is related to square meter (or more precisely  $m^3$ ), since bigger rooms require more energy in terms of lighting, heating and air-conditioning. This means that a company housing 100 employees in large buildings consumes more energy than a company housing 100 employees in smaller buildings. It seems appropriate to include cubic meters in the reference parameter. However, it would probably be easier for the companies to locate figures in terms of square meters, thus using this as a substitute might be more appropriate.

### ***Turnover***

Several reporting systems, such as Defra and OECD, use turnover as a reference parameter. However, this is not always feasible since different countries have different “economical setups”. In other words, two identical companies, located in respectively China and Denmark, will have two different turnovers even though they produce the exact same type and amount of product and have the same environmental impact. The reason for this being, that the price of labour and materials are significantly lower in China as compared to Denmark. Consequently, the turnover (income from sales) is considerably higher in Denmark as we have to pay more money for the same product (assuming that the product is sold in the country it was produced).

A further problem by using turnover as a reference parameter is the fact that it only reflects the amount of products sold, and not the amount produced, which as mentioned above is the amount that reflects the true environmental impacts related to the company. Products stored could even result in higher environmental impacts due to e.g. heating the storing facilities.

### ***Organizational boundaries***

Besides defining the sub-sector and normalisation reference it is essential to define the organizational boundaries related to the companies within the sub-sector. Business operations vary in their legal and organizational structures. They include fully owned operations, incorporated and non-incorporated joint ventures, subsidiaries, and others. When developing the environmental indicator within a sub-sector, it is essential to decide whether reporting should be done only by fully owned operations or whether partially owned operations should be included as well.

Regarding partly owned operations, The GHG Protocol proposes two approaches in terms of reporting. The first approach is named the equity share approach, in which a company accounts for emissions from operations according to its share of equity in the operation. Regarding the other approach – the control approach – the company accounts for 100% of the emissions from operations of which it has control. The choice of organizational boundaries should depend on the sub-sector in question. However, a general suggestion would be reporting on operation, which are 100% owned and/or controlled.

### ***Site/Country specific***

As demonstrated by the cement-producing company Buzzi during our previous analysis, the environmental impacts associated with producing a certain product differ according to site and country. The reason for this being, among other things, the fact that electricity production differs among countries in terms of choice of fuels (water, coal, etc.) and energy efficiency. Furthermore, different countries have different laws and standards regarding the composition of the desired product. The United States, for instance, require a higher content of clinker in their cement which results in the Buzzi site in the United States having higher environmental impact than other sites (since the production of clinker is an energy-intensive process).

Consequently, it seems in many cases necessary to report on environmental indicators at site level, thus allowing for realistic comparison between companies in terms of for instance electricity consumption. Reporting on corporate level is not always useful, since this could result in situations in which a company could mask an extremely poorly performing site, if for instance the majority of the remaining sites were performing excellent.

Another issue supporting the choice of reporting by site is the fact that different companies may own/control different amount of sites, even though they are in the same sector (and sub-sector). For instance, a textile company may control/own sites that are specialised in respectively producing yarn, colouring yarn, sewing, distributing, etc. Other textile companies, as for instance Nike, are strictly administrative businesses focusing only on distribution. Comparing these two types of companies on corporate level would not be fair.

### ***Life cycle level***

As commonly known the environmental impacts related to a product are linked to its entire life cycle – from raw material extraction to disposal. Thus, when considering how to report on a single indicator it seems necessary to consider how many life cycle stages it is appropriate to report on. When doing this it is equally important to consider how many life cycle stages that the company in question controls (or owns). For instance, regarding companies within the financial sector (banks), it is not appropriate to consider

environmental effects from their “product” throughout the entire product chain since the product chain in this specific sector only involves the operation building itself. Thus, reporting on for instance energy consumption seems appropriately in this case for only one life cycle phase (“production”). However, when discussing the cement-producing companies, it is necessary to include the raw material phase as well as the transport and production phase when reporting on energy consumption in order to create the necessary basis for realistic comparison between companies.

The situation becomes even more complex when dealing with the textile industry since this sector in some cases covers life cycle stages beyond production. For instance, some textile companies own laundries as well as production sites, thus reporting on for instance water consumption could be relevant at several life cycle stages.

The fact that different life cycle stages should be taken into consideration when developing comparable indicators, further emphasizes the importance of descending to sub-sector level. The reason is that it is necessary to compare companies that can report on similar life cycle stages. However, it is not necessary for the companies to control/own the same “amount” of life cycle stages since reporting should be comparable at the individual life cycle stages.

The conclusion is that it is necessary to consider relevant life cycle stages when an indicator is developed and bear in mind that the relevant life cycle stages change according to sub-sector and choice of indicator. When determining which life cycle stages are relevant (as regards to a specific environmental impact linked to a specific product) it would be appropriate to use life cycle assessments.

### ***Reporting format***

A major problem related to the possibility of comparing environmental performance between companies at present is the diversity in which they report on their environmental performance. As described in section 3, the companies report using a combination of different units (L, kg, kWh), conversion factors, references (product, distribution chain, country, site, corporate), etc. Besides the variety in reporting format, the task of locating the desired information within the reports also causes a problem since the companies report figures for a given impact various places throughout their reports.

Thus, it seems necessary to create a systematic reporting format that ensures an easy location of the figures, as well as a straightforward comparison of figures between companies. The reporting units should be standardised within each sub-sector. However, the use of units could vary according to sub-sector. The possibility of aggregating as well as disaggregating information should also be possible and since the indicators are meant to work within the EMAS system, it would be appropriate to create the reporting system in compliance with the reporting system used within EMAS; however, even more detailed.

### **Conclusion**

The conclusion is that it is possible to develop comparable environmental indicators, but only at sub-sector level. However, this requires a fairly large amount of necessary preconditions, as described above.

All the investigated companies/sites have the information necessary to document the performance on company level, as well as product level (since comparable figures can be extracted). However, detailed guidelines are necessary to produce directly comparable information. The level of detail should be significantly larger than that currently found in the GRI guidelines.

#### 4.1.3 Possibilities of using scales (excellence, baseline) on sector level

In terms of creating a scaling-system (including a baseline-excellence level) related to each indicator, the task seems possible; however, yet again only at sub-sector level (meaning comparable products).

Our previous analysis demonstrated that it is possible (to a certain degree) to extract data from sustainability reports in order to create a list of comparable figures that could be used to demonstrate a potential baseline and excellence level. However, the preconditions of the reported figures are not always clear, thus the comparability of the reported figures is questionable. Furthermore, the difficulty of extracting the necessary data makes it a tedious and not-recommendable method. Additionally, it would not be reasonable to assume that the companies producing sustainability reports are the ones representing the true baseline and excellence levels.

Another source of information regarding baseline and excellence levels could be the BREF documents. The IPPC Directive requires the European Commission to organise “an exchange of information between Member States and the industries concerned on best available techniques (BAT), associated monitoring and developments in them”. This information is published in the so-called BREF documents. BREFs are designed to demonstrate best available techniques (BAT) for each sector covered by IPPC. The BREF documents available at present include 32 areas/sectors (see appendix 5).

However, BREF documents deal primarily with techniques and are thus not necessarily a good source of information in terms of establishing an excellence/baseline level on product level. The BREF document regarding cement, for instance, provides information on the best available technique for e.g. reducing NO<sub>x</sub> emission. The report also states a BAT emission level associated with the use of this technique. However, the number is presented as mg NO<sub>x</sub>/m<sup>3</sup>, and thus represents the emission measured, and not the excellence level of NO<sub>x</sub> emission per product produced.

However, the BREF document for cement also suggests a best available technique in terms of production of cement clinker, in which they report an associated BAT heat balance value of 3000 MJ/ton clinker. This figure could be used as a potential excellence level. To conclude: the BREF document could provide relevant information regarding excellence levels in some sectors, however probably not on all relevant indicators.

EU Ecolabels could also be a source when attempting to determine excellence/baseline levels. The EU Ecolabel for paper establishes (based on emission parameters on statistical information from different authorities, environmental reports from paper producers, CEPI and the BAT values from the IPPC report (July 2000)) mean values for the collected emission values. They state that the variation of the emission around the mean value is large, suggesting that they have data to establish excellence and baseline levels. However, whether the figures reported take into account the reporting format

that we suggest (sites, life cycle stages, etc.) is not investigated in details at present time (in this study), but a preliminary guess is that they do not take this into account. Furthermore, it is only a limited number of products for which Ecolabel criteria have been developed.

Due to the high number of companies reporting, the previous mentioned EPER system could be a valuable source of information in terms of establishing baseline and excellence levels. However, at the time being EPER does not provide normalised data which is needed in order to establish baseline and excellence levels related to comparable indicators.

Thus, the most viable method to achieve data necessary to establish excellence and baseline levels at present is to locate information from relevant existing monitoring systems.

#### 4.2 qualitative environmental indicators

A number of qualitative indicators are already an integrated part of environmental management systems. Requirements such as “an environmental policy”, “documented environmental objectives and targets”, “programme(s) for achieving objectives and targets”, an obligation to “determine aspects that have or can have significant impact(s) on the environment” etc. can be regarded as qualitative indicators. These qualitative indicators are “systemic” in nature as they give information about the degree to which an organisation has a well-functioning environmental management system. However, even though a well-functioning management system is an important prerequisite for progress in environmental performance, the qualitative indicators included can only be used for systemic benchmarking. A good system is not in itself a guarantee for a good performance. This also reflects the critique of the present environmental management systems raised by EEB, BEUC, ECOS and ANEC.

The key problem in terms of benchmarking with qualitative indicators is that they do not give specific information about the level of performance. Qualitative indicators are often yes/no indicators or descriptive/explanatory indicators.

The interesting question is whether meaningful qualitative indicators which provide information about the actual environmental performance can be developed. Below a few suggestions are discussed.

##### ***Yes/no indicators***

Examples of yes/no indicators are the presence/absence of certain problematic chemicals (e.g. no CMR substances or no brominated flame retardants) or compliance with certain sustainability schemes (e.g. use of wood from only FSC certified forests or paper reduced from such wood). Such indicators would function well, given that a large differentiation between the companies is not required (as only two categories are available: yes or no). If a larger differentiation is needed, it is necessary to transform the indicator into a quantitative indicator by e.g. measuring the use of CMR-substances per kg product output.

As described this type of quantitative indicator do not reveal much about the level of performance. Either the company comply or not. The yes/no indicator do not distinguish between a company very close to complying and a

company far away from complying with the indicator. However, when combining a more descriptive qualitative indicator with the yes/no indicator, more detailed information can be obtained, if necessary.

### ***Qualitative descriptive indicators***

Qualitative descriptive indicators can be quite different in nature. They can be simply vague management system type of information (as described in the beginning of this chapter) or they can be linked to concrete verifiable commitments, as e.g. eliminating brominated flame retardants by 2010 or non-use of free nanoparticles in the future. Other examples are full transparency concerning lobbying activities or a description of stakeholder relationships and dialogues/controversies of the organisation to environmental NGOs, as for example different rating agencies uses in their assessments.

Qualitative descriptive indicators can be used alone, but can be difficult to assess. Numbers, as a result of quantitative indicators, are easy to assess, which makes it possible to determine which level is good and which is bad. The drawback of the qualitative descriptive indicators are that they need further analysis compared to quantitative indicators, in order to be used for distinguishing between the environmental performance of different companies.

However, in some cases qualitative descriptive indicators are necessary in order to give meaning to a quantitative indicator (or to be used in stead of a quantitative indicator) or to complement a quantitative indicator. An example is the use of biodiversity as an environmental indicator. This aspect is difficult and could be misleading if monitored by a quantitative indicator. This aspect is better assessed by the use of an expert judgement, i.e. use of a qualitative indicator works better on this specific aspect than a quantitative indicator (it is not feasible to for instance count the number of frogs in an area).

Another example is the G3 EN23 indicator “Total number and volume of significant spills” (see Appendix 3 for details). Significant spills are defined in terms of both the size of the spill and impact on the surrounding environment, however in this case, one need a qualitative indicator in order to describe and elaborate on the severity of the spills to the environment. In other words, a large spill could be less damaging to the environment than a small spill, depending on the nature of the area in which the spills occur.

### ***General and sector specific level***

In this discussion of the qualitative indicators we have not distinguished between qualitative indicators on a general level and on a sector specific level. Use of qualitative indicators is obvious on a general level, but the relevance of using qualitative indicators on sector level cannot be excluded.

Would it, for instance, be possible to point out a number of key impact areas for specific industries and benchmark on qualitative environmental indicators? Within the field of health & safety, an industry directory has been developed in Denmark which outlines the most important health & safety aspects within different industries. When building up their health & safety management systems, companies consult these directories in order to be sure that they have addressed the main risk areas for their industry in their management system. An equivalent directory does not exist for the environmental impact of industries. This would require a profound environmental analysis and assessment of specific industries.

However, if such an industry-specific environmental assessment could be developed, it might be possible to list key areas of environmental impact which the organisation was obliged to include in their environmental management system. The companies could then be obliged to set environmental performance objectives (specific goals and targets) for all the listed key impact areas. If not, the “comply or explain” principle could rule, i.e. if a key impact area is not treated, an explanation of why has to be included. This could allow for some kind of benchmarking (do they address all key environmental issues or only a few), however, not in terms of comparison of actual measurable level of environmental performance.

***Further studies***

This study has not dealt with the use of qualitative environmental indicators in details, but merely suggested examples and discussed how it could be done. In a more detailed follow-up study it would be relevant to look closer at this aspect and suggest the most relevant qualitative indicators at a general level and examine the possibilities of using qualitative indicators at sector levels as well. For example: Are certain qualitative indicators more useful in some sectors than others?

To sum up: Qualitative indicators are informative and can be used for benchmarking on general or systemic aspects, but may also work well in combination with quantitative indicators. Furthermore, in some cases, qualitative indicators seem to be the most appropriate indicator to use. However, qualitative indicators cannot be used to determine the actual level of performance in detail.

# 5 Development of key performance indicators

As concluded in the previous section it is not possible to develop quantitative environmental indicators suitable to compare the environmental performance of companies at a general level. It may, however, be possible at sub-sector level.

In the following section we will, based on the previous discussion, describe/develop a procedure (set of recommendations) of how to develop comparable sector-specific indicators that can be used in terms of (quantitative) benchmarking.

Subsequently, we will use the procedure to develop two specific indicators relevant for the financial sector (sub-sector: Banks) and one specific indicator relevant for the Construction and Building materials sector (sub-sector: Cement producing companies). Additional suggestions regarding indicators relevant for the textile industry will be presented.

When developing the indicators the level of detail required in order to produce a meaningful indicator that does not compromise fair trading/comparison is discussed.

Finally, we will provide recommendations of how to use these indicators within a revised EMAS system.

## 5.1 Procedure of developing comparable sector-specific environmental indicators

A set of important aspects to take into consideration when developing comparable quantitatively environmental indicators at sector-specific level is presented below. The selected aspects are derived from the analysis performed in this study and thus does not necessarily represent all relevant issues. They are, however, assumed to represent subjects of major importance and thus give a good starting point.

Table 5-1: Important issues to consider when developing comparable indicators.

<b>Important issues to consider when developing indicators</b>	
<b>1. Define the relevant sub-sector and subject</b>	Sub-sector is a group of companies that produces the same kind of product or service. Thus the product or service of interest needs to be defined. When determining the subject (product/service) of interest it is vital to ensure that the product/services are comparable, meaning that they fulfil the same “functional unit” (for instance cement is a fairly well-defined subject, while “insulation material” is not, since this comprise a range of products such as stone wool, flax and hemp).
<b>2. Determine the most significant environmental impacts associated with the respective subject (= main indicator)</b>	Search literature (e.g. BREF documents or Ecolabel criteria) regarding studies concerning environmental impacts associated with the subject (product/service) in question. If not available alternatively perform a life cycle assessment.
<b>3. Determine relevant normalisation reference</b>	<b>Products:</b> If the sub-sector “subject” is a product, the normalisation reference “per product quantity produced” is often the best option. However, other reference parameters could also be relevant, depending on the nature of the product in question. <b>Services:</b> If the subject is a service, the reference parameter “per Full Time Employee” should be considered for use, but other parameters as for instance m <sup>2</sup> could be relevant as well. Relevant parameters depend on the nature of the service and will often emerge during the detailed discussion regarding the specific service.
<b>4. Define the organizational boundaries</b>	Decide whether the companies should report only on fully owned operations, or whether partly owned/controlled operations should be included as well. The choice depends on the nature of the sub-sector, and it shall ensure that the indicator addresses comparable activities.
<b>5. Define how many and which life cycle stages to report on</b>	It is necessary to decide how many and which life cycle activities to report on, bearing in mind that the relevant life cycle stages change according to sub-sector and choice of indicator.
<b>6. Define report scope</b>	In order to ensure fair comparison, it is in many cases only relevant to report per site. Increasing levels of aggregation, e.g. on the country level or on the overall company level, are desirable, but may be associated with very large uncertainties.
<b>7. Uniform reporting format</b>	It is necessary to design a uniform reporting procedure and format, which states precisely what to report on, and how. Areas that need to be defined are e.g. <ul style="list-style-type: none"> <li>• Object of measurement (e.g. direct and/or indirect energy use)</li> <li>• Units to be used - numbers/figures reported in the same unit</li> <li>• Conversion factors, e.g. referring to the GHG CO<sub>2</sub> emission protocol</li> <li>• Period of reporting (most typically per year).</li> </ul>
<b>8. Establishment of scales</b>	When establishing a benchmarking-scale associated with an indicator it is important to take into consideration the following: <ul style="list-style-type: none"> <li>• Does the scale need to be defined on a national or global scale – or perhaps within certain climate zones?</li> <li>• Can information from relevant BAT-documents be used for establishing scales?</li> <li>• Are there other relevant monitoring systems within the sector/sub-sector, which can be used for deriving numbers for establishing baseline and excellence levels?</li> <li>• How many levels are suitable? (The initial recommendation within this report is a maximum of three levels – A, B and C)</li> </ul>

The figure below illustrates how reporting on one main environmental indicator can be established. As indicated in the figure reporting on just one

main indicator (as for instance energy consumption) in one sub-sector may require that  $(3 \text{ (sub-indicators)} \times 3 \text{ (sites)} \times 4 \text{ (life cycle activities)}) = 36$  sub-indicators are aggregated.

If four main environmental indicators are chosen (related to 4 significant environmental impacts), this could require that  $(4 \times 36 = 144)$  sub-indicators are measured and aggregated at an appropriate level. Of course, the number of sites could vary as well as the number of relevant life cycle stages, resulting in different figures. Nonetheless, it is judged that two and maximum 4 indicators would be sufficient a challenge for the companies to begin with.

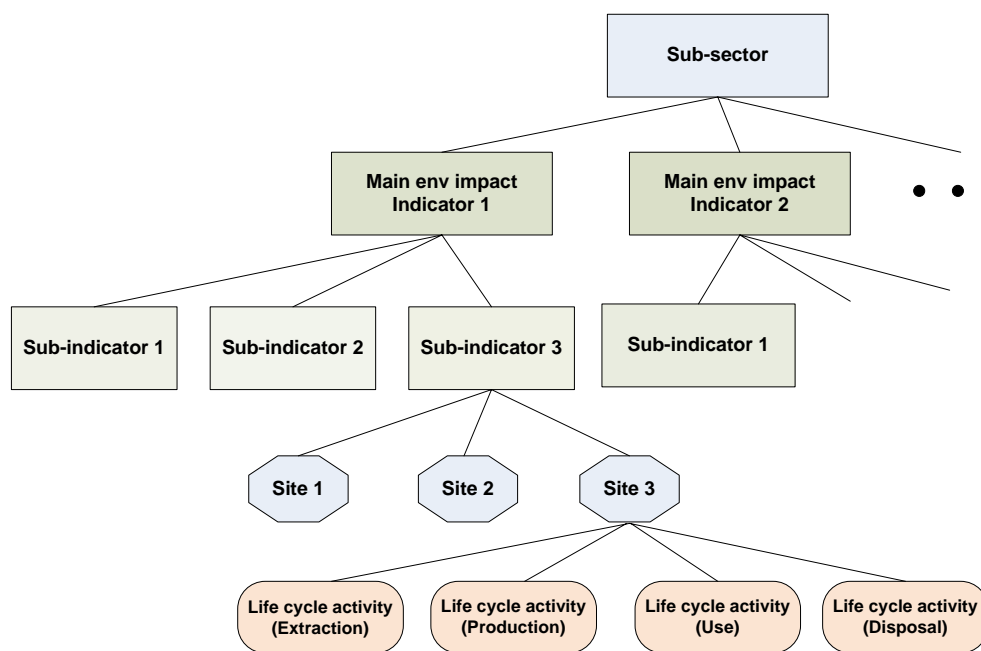


Figure 5.1: Illustration of reporting on one sector-specific indicator. The life cycle activities related to use and disposal are only relevant for a limited number of sub-sectors.

Considerations regarding how to transform this way of reporting on indicators into a general system (including scales) useful within EMAS are presented in section 5.6.

## 5.2 Comparable key environmental indicators for banks

Below we describe how energy and paper consumption could be used as comparable indicators, using our developed set of recommendations.

### 5.2.1 Paper consumption as comparable indicator

#### 1. Define the relevant sub-sector and subject

In line with our recommendation of specifying the sub-sector and subject, we have chosen to develop an indicator specifically related to banks as a sub-sector within the financial sector. As regards to the subject of interest (product or service associated with a functional unit), it may be necessary to distinguish between different activities, because the general definition “financial services” in practice comprises a range of services (loans, exchange of money, etc.). However, for the time being the subject “financial services” is chosen.

## 2. Determine the most significant environmental impacts associated with the respective subject and choose a main environmental impact

The environmental impacts related to the financial sector can be divided into two main areas: 1) indirect impacts from financing and investment activities (e.g. investing in a new power plant) and 2) direct impacts from their operations (buildings).

It could be discussed whether banks should be held responsible for the impacts, their investments have on the environment. However, this is a discussion beyond the scope of this project. Thus, we focus on the most significant environmental parameters related to the direct impacts from their operations.

The identification of the most important environmental indicators is made based on the GRI sector supplements and information derived from reports and studies related to the financial sector.

The GRI supplements for the financial sector specify the content of the following G2 core indicators:

- EN1 (Total material use) – focus on **use of paper**
- EN11 (Total waste by type and destination) – focus on **waste of paper and IT products**
- EN30 (Indirect CO<sub>2</sub> emissions) – focus on **greenhouse gas emission** from business travel

A collaborative project between Credit Suisse, four other banks and a major insurance company resulted in a sustainability policy targeting the financial sector. The policy established a number of environmental quantitative goals to be reached by 2004. The goals included the following:

- reduction in **electricity** consumption (to 110kWh/m<sup>2</sup>)
- reduction in **heat** consumption (to 80kWh/m<sup>2</sup>)
- reduction in **paper** consumption (by 15% from 1994-2004)
- 60% of total paper consumption to be **recycled**
- > 15% of photocopier paper to be **recycled** (Bisang, 2000)

A study regarding development of environmental indicators relevant for the financial sector (Schmid-Schönbein, et al. 2005) suggested the following five indicators as most relevant:

- waste
- water
- paper
- business travel
- premises energy

Finally, ABN AMRO states in their sustainability report 2006 that as a financial institution they consider energy, CO<sub>2</sub> and paper consumption as the key indicators concerning their environmental performance.

Based on the above we suggest that the following four indicators are of significant importance regarding environmental impacts related to banks.

- 1) Energy consumption (direct and indirect)
- 2) CO<sub>2</sub> emission (from direct and indirect energy consumption)
- 3) Consumption of paper
- 4) Waste of IT equipment

From this list we choose “paper consumption” as a main “environmental impact” for which to develop a useful indicator.

### 3. Determine relevant normalisation reference

Since the subject is a service, the normalisation reference per full time employee should be considered. Inherent uncertainties are linked to this reference parameter, among these the fact that full time employees worldwide have varying standard working weeks. In the large perspective, however, this uncertainty can be disregarded for the moment being.

The reference parameter “m<sup>2</sup>“, is not considered as relevant in this case since paper consumption is assumed to be related to the number of employees rather than the office space of the bank. However, the paper consumption is also related to the type of transaction performed since the different types of transactions require different amounts of paper. If available, the number of transactions could thus be used as an extra reference parameter. Defining all the different types of transactions performed in banks (and their number) will, however, require a large effort. Therefore, the distinctions made in the GRI supplements with respect to four different business categories are used.

Category	Definition
Retail Banking	This category refers to everyday high street banking including the provision of private and commercial banking services to individuals. It also includes banking for more affluent clients, including wealth management and portfolio management services (either on a discretionary or managed basis). It may also include everyday transaction management, payroll management, small loans, foreign exchange, derivatives, etc. for individuals in their business activity.
Commercial and Corporate Banking	This category includes all transactions with organisations/business counterparts of all sizes, including but not limited to commercial and corporate banking, project and structured finance, transactions with small and medium enterprises (SMEs) and the provision of financial services to governments/government departments. It also includes corporate advisory services, mergers and acquisitions, equity/debt capital markets, and leveraged finance (i.e. lending money for transactions). This excludes the provision of services to individuals in their private capacities (see Retail Banking).
Asset Management	This category refers to the management of pools of capital on behalf of third parties. This capital is invested in a wide range of asset classes, including equities, bonds, cash, property, international equities, international bonds, alternative assets (e.g. private equity, venture capital, hedge funds). The definition also encompasses elements of investment banking including the trading in shares and share derivatives, as well as fixed income - trading bonds, debt instruments, trading loans and loan portfolios and credit derivatives.
Insurance	This category refers to both pension and life insurance services provided directly or through independent financial advisors to the general public and employees of companies. It also covers the insurance of products or services for businesses and individuals and re-insurance services.

Figure 5-2: Financial service categories as defined by GRI supplements for the Financial Sector.

The business categories can be used as “working areas” or sub-sub-sectors, for which the number of employees can be determined. The consumption of paper can then be reported as kg paper consumed/FTE per working area. This allows for some differentiation according to the type of transaction, assuming that the activities of banks are comparable within each of the working areas. Figures for the number of FTE’s and paper consumption within each business category is assumed to be available (or can be established), although they are not currently reported in e.g. sustainability reports. A pilot study can elucidate this.

#### 4. Define the organizational boundaries

A study performed by E2 Management Consulting Inc. on behalf on a number of financial institutions (Schmid-Schönbein et al., 2005) developed a set of indicators for the financial sector. Based on experiences from applying an earlier set of indicators, they presented an overview of the practical problems related to the definition of system boundaries. Their suggestion for inclusion/exclusion of activities can be viewed below.

	Systems with high influence and/or data availability	Systems with limited influence and/or data availability	Systems with little or no influence and/or data availability
	System boundary of a financial institution		
Premises	Large- and medium-sized buildings in ownership	Rented but managed buildings	Buildings rented, not managed
Energy	Internal EDP centres		Outsourced EDP centres
Business	Cars owned by the financial institution	Rail travel	External courier services
Travel	Air travel		
Paper	Centralised purchases of paper	Decentral purchases of paper	Externally produced and distributed marketing material
	Marketing material distributed by in-house units		
Water	Large- and medium-sized buildings in ownership	Rented but managed buildings	Buildings rented, not managed
Waste	Waste of large- and medium-sized buildings	Waste from small branch offices	Waste from staff restaurants
	Centrally managed waste (for security reasons)		Construction waste

Figure 5-3: Definition of relevant activities/system boundaries within the financial industry (Schmid-Schönbein et al., 2005).

If focusing on paper, it can be seen that centralised purchase of paper has a large influence and availability of data, whereas systems (operations) with decentralised purchases of paper only have limited influence and data availability. Externally produced and distributed marketing material is excluded from the investigations due to little or no influence.

We suggest to set the system boundaries as illustrated in the figure, including only operations which have centralised and decentralised purchase of paper.

#### 5. Define how many life cycle stages to report on

In terms of which life cycle stages to report on, only one life cycle stage is considered as relevant, i.e. “the production stage”.

#### 6. Report per site and country

Reporting per site in terms of paper consumption can be relevant since varying levels of IT-implementation may be observed in different countries, resulting in a different consumption of paper. A higher IT level is not necessarily associated with lower paper consumption, and the indicator is judged to be relevant on all levels, i.e. site, country and company.

#### 7. Uniform reporting format

In terms of creating a uniform reporting format, the first challenge is determining which paper-types to report on. As demonstrated by the paper consumption reported by respectively The National Australian Bank (50 kg A4 paper consumed/FTE) and ABN Amro (115 kg of non-defined paper consumption/FTE), having an unequivocal definition is a precondition for benchmarking and comparison.

The undefined paper used by ABN Amro most probably include a variety of paper-formats such as blank paper, printed paper, office paper, A4 paper, envelopes etc., and different paper qualities such as post-consumer recycled paper, FSC paper, ECF paper, TCF paper, new fibres chlorine bleached

paper etc.). Since the use of different types of paper results in different environmental impacts it is necessary to distinguish between the paper types if the overall level of performance of a bank shall be judged by the parameter.

The study performed by Schmid-Schönbein et al. (2005) states that, based on experience, the following paper-forms make up the largest share of paper used:

- office paper (multi-functional paper for copying and printing)
- letterhead/pre-printed forms
- envelopes
- continuous paper forms (account statements for clients, etc.)
- marketing material and publications (internal and external)

Our preliminary suggestion is to include the same formats, although it should be recognized that there may be a limited availability of data for externally produced marketing material and publications.

The overall paper consumption is judged to be the most important figure. The quality and nature of the paper (e.g. virgin/recycled and chlorine bleached/chlorine free) plays a more secondary role, but is nevertheless suggested to be included as ratios, providing a signal of the company's efforts to purchase products with less environmental impacts as for example chlorine-free (ECF, TCF) paper and recycled paper..

The three sub-indicators suggested are therefore:

- Total use of paper (kg/FTE), per business category
- Ratio of chlorine free paper, per business category
- Ratio of recycled paper, per business category

In determining whether it actually is possible for the banks to report as described above, it would be sensible to perform a pilot study, in which one or more banks attempt to report on the figures at the level of detail outlined above.

## **8. Establishment of scales**

Assuming that the above indicator is usable, a scale can be established, indicating baseline and excellence levels. For the moment being, such a scale is arbitrary as none of the reports available allow for a distinction at this level of detail. In previous sections, the order of magnitude of paper consumption per FTE is indicated, but the preconditions behind the reported figures are not clear. A very preliminary scale is suggested in the table below, but it should be revised as soon as more information becomes available, e.g. through the suggested pilot study.

In this example three levels has been used (baseline, intermediate, excellence) for the scaling system. The three levels have been chosen for simplicity, but the number of levels could of course be increased.

Table 5-2: Paper consumption as a comparable indicator within banks. The numbers are preliminary suggestions/fictive estimates.

Working area	Indicator	Baseline (Europe)	Inter-mediate (Europe)	Excellence (Europe)	Company in question	Score
Retail Banking	Kg total paper used/FTE	70-100	30-70	<30	28	1
	Ratio of recycled paper	15-30%	30-85	> 85%	15%	3
	Ratio of chlorine-free paper	30-50%	50-90	> 90%	35%	1
Commercial and Corporate Banking	Kg total paper used/FTE	>80		<10		
	Ratio of recycled paper					
	Ratio of chlorine-free paper					
Asset Management	Kg total paper used/FTE	>50		<30		
	Ratio of recycled paper					
	Ratio of chlorine-free paper					
Insurance	Kg total paper used/FTE	>40		<8		
	Ratio of recycled paper					
	Ratio of chlorine-free paper					

Paper-forms to be reported comprise office paper (multi-functional paper for copying and printing), letterhead/pre-printed forms, envelopes, continuous paper forms (account statements for clients, etc.) and marketing material and publications for internal use.

Note that it is judged not to be necessary to report per site within this indicator. Thus companies can aggregate numbers across sites. The reason for this being that it is assumed that the availability of recycled and chlorine-free paper is equal between countries in Europe.

Focusing on the indicator “Ratio of chlorine-free paper” within the working area ‘Retail banking’ the range “90% < x ≤ 100%” represents excellence level, while 30% is the baseline level. Values in between represents achievements above baseline, but below excellence level, while values below 30% indicates a poor performance, e.g. to be used to exclude a company from having an EMAS-certification. Using legal requirements is not possible for this indicator.

## 5.2.2 Energy consumption as comparable indicator

### 1. Define the relevant sub-sector and subject

The subsector and subject of interest are the same as described above – banks and “financial services”.

### 2. Determine the most significant environmental impacts associated with the respective subject (= main indicator)

The four most significant environmental impacts associated with this subject are likewise described above. In this section we focus on energy consumption

as one of the most significant environmental impact associated with the subject (financial services).

The energy consumption depends on a number of factors, e.g. climate conditions, insulation of walls and attics, glazing of windows, air-condition appliances, power-saving fixtures and electronic devices, etc. Reduction in energy consumption is an obvious target for an environmental management system, and good practices are easily reflected by simple measurements.

### **3. Determine relevant normalisation reference**

The parameter  $m^2$  is seen as most relevant, since energy consumption to a large degree is related to the area/ occupied by a bank. It is also a commonly used measure in (national) building regulations, making it possible to establish baseline performance on a national level.

The parameter FTE can also be considered as a useful normalisation reference, which is used by some financial institutions in their reporting. However, given the assumption that the number of FTE and the area occupied are closely related, using FTE for an indicator will only yield a limited amount of additional information on performance. If information on the area occupied is not readily available, FTE can easily be employed as a substitute normalisation reference-

The indicator chosen here to reflect the performance with respect to energy consumption is therefore "Energy consumption/ $m^2$ ".

### **4. Define the organizational boundaries**

The appropriate organisational boundaries, based on practical experience, can be found in the study performed by Schmid-Schönbein et al. (2005). As presented in figure 4.2 high or limited influence and data availability is found in operations including large- and medium-sized buildings in ownership as well as rented but managed buildings (and internal Electronic Data Processing (EPD) centres). Systems with little influence and/or data availability include buildings rented, but not managed as well as outsourced EPD centres).

Once again we suggest the same system boundaries as Schmid-Schönbein et al. (2005), including operations in ownership as well as rented but managed buildings, but excluding buildings rented, but not managed and outsourced activities.

### **5. Define which life cycle stages to report on**

In terms of which life cycle stages to report on, only "the production stage" is considered to be relevant.

### **6. Report per site and country**

Site-specific reporting is seen as both viable and relevant, allowing the environmental manager an easy comparison between different business units. Aggregating on the national level is also relevant in most cases, while aggregating on a multinational company level is potentially misleading because the location (and hence the climatic conditions) may prove to be crucial for the consumption. At this level, it must therefore be recognized that the indicator is very crude.

## 7. Uniform reporting format

In terms of creating a uniform reporting format, the first major challenge regarding energy consumption is the fact, that energy comprises a range of “types of energy”. As demonstrated through our analysis of the energy consumption within banks, the companies consume a variety of “energy types” including:

- Direct energy consumption
  - o Consumption of natural gas oil and kerosene for heating
  - o Gasoline used for car transportation
- Indirect energy consumption
  - o Electricity consumption
- Other indirect energy consumption
  - o Business travels (by air (and train))

A study regarding the environmental impacts associated with the service sector, performed for the Danish Environmental Protection Agency (Binder, et al. 2003), focused on two areas concerning energy consumption within banks. The two areas were electricity consumption and heating. Furthermore the European Bank states in their Sustainability Report (2006) that their main use of energy is linked to lighting, heating, running of equipment and cooling their buildings (and business travels). Business travel is categorised as “other indirect energy” consumption, but is generally only accounted for by a CO<sub>2</sub> emission indicator. One important reason for this is probably that information on CO<sub>2</sub>-emissions per plane-kilometre is available from many sources, while the energy consumption (in MJ) is not known. It is therefore suggested to omit this consumption from the indicator.

Energy for heating purposes may be produced by stationary sources internally or externally to the company, while electricity is almost always produced externally. The two different types of energy will in general reflect different conditions, and the best basis for a comparison and benchmarking is therefore judged to be an indicator for each type, i.e. thermal energy consumption and electricity consumption, without any considerations of whether the production is external or internal.

Thus, in terms of reporting on energy consumption, banks should report as follows:

- Electricity consumption/m<sup>2</sup> per site (kWh/m<sup>2</sup>)
- Energy consumed for heating/m<sup>2</sup> per site (kWh/m<sup>2</sup>)

As previously mentioned, using FTE for normalisation purposes may be an equally good indicator.

It is noted that the energy indicators do not reflect any efforts towards using energy sources with less environmental impacts, e.g. green electricity or biomass for generation of heat. Such efforts will eventually be reflected by reporting on CO<sub>2</sub>-emissions. It has been outside the scope of this report to develop such an indicator, but it is an obvious target for future refinements.

## 8. Establishment of scales

Defining scales (and scoring-systems) on national level for the two types of energy consumption allows for benchmarking across countries. Defining

scales at a multi-national level is much more difficult and if defined, there is a risk that they may be misleading and/or out of line with national regulations.

Our analysis of sustainability reports provided data on electricity consumption within banks, however the data represented banks worldwide, thus creating baselines – excellence levels based on these figures are not reasonable, due to the before mentioned different requirements for electricity consumption between countries.

Thus, a preliminary scale on national level (with Denmark as example) is suggested, based on results from 623 energy audits in Danish buildings with banking and postal activities. X50 indicates that 50% of the companies have reported, e.g. an electricity consumption of 35,3 kWh/m<sup>2</sup> or below.

Table 5-3: Energy consumption (in kWh/m<sup>2</sup>) in Danish office buildings with banking activities.

Energy source	Thermal energy consumption			Electricity
	District heat	Oil	Natural gas	Power
No. of reports	521	6	51	623
X10	62	144	72	3,9
X25	77	144	94	6,5
X50	97	172	115	35,3
X75	124	183	139	65,1
X90	147	191	158	96,2

The intention with the baseline level is that not all companies in principle can obtain an EMAS certification – they must have a somewhat better environmental performance than the bottom. Where the baseline should be is of course debatable, but in this example we have chosen the figures, where 75% of the companies can comply with the indicator level. Similarly, the excellence level represents the figure where 25% of the companies can comply with the indicator. The following levels for baseline and excellence performance are suggested:

Table 5-4: Energy consumption per area as an indicator for banks.

Sub-Indicator	Baseline (National)	Intermediate (National)	Excellence (National)	Company in question	Score
Electricity (kWh/m <sup>2</sup> )	50 < x < 65	10 < x ≤ 50	≤ 10	42	2
Heating – natural gas (kWh/m <sup>2</sup> )	125 < x < 140	95 < x ≤ 125	< 95	110	2
Heating – fuel oil (kWh/m <sup>2</sup> )	170 < x < 185	145 < x ≤ 170	< 145		
Heating – district heat (kWh/m <sup>2</sup> )	110 < x < 125	75 < x ≤ 110	< 75		

The baseline and excellence levels with respect to consumption of heating energy make a distinction between the energy sources used. This allows the single unit to compare its performance with others, even though different energy sources are used. It can be argued that the distinction reduces the motivation for improvement, e.g. by changing heating technologies. However, it is often outside the scope of possibilities for an environmental manager to decide which technology to use, as for example district heat and natural gas is not available in all cities and regions.

Another and possibly simpler way of identifying scales for energy consumption is to use the national (and in the future European) minimum and excellence energy performance levels of buildings, and the energy certificates (“Energy passports”) required by the Energy Performance of Buildings Directive. Today, a single methodology, indicator and performance benchmark for energy performance applicable in all European countries is missing (Mötzl et al., 2007).

As an example a new standard for energy certificates for buildings have been developed in Austria (Önorm H5055, 2008). In this standard the different levels for the heating is given as described in the table below.

Table 5-5: Limit values for different energy classes (Önorm H5055, 2008).

Energy class	Heating demand (kWh/m <sup>2</sup> per year)	Example of use of sub-indicator
A <sup>++</sup>	≤ 10	Excellence level
A <sup>+</sup>	10 - ≤ 15	
A	15 - ≤ 25	
B	25 - ≤ 50	Intermediate level
C	50 - ≤ 100	
D	100 - ≤ 150	Baseline level
E	150 - ≤ 200	
F	200 - ≤ 250	
G	> 250	

One way of using this information is simply to say that energy class A, A<sup>+</sup> or A<sup>++</sup> is the excellence level, energy class B and C is the intermediate level, and D and E is the baseline level. A company with “Energi class” level of F and G will not pass.

Similar information for establishing scales at the national level of other countries is most probably available in relevant statistics, or will become so following implementation of the Directive on Energy Performance of Buildings (2002/91/EC). It is, however, outside the scope of the current report to identify and present such information.

### 5.3 Comparable key environmental indicators for cement-producing companies

Cement production was chosen for development of indicators because it is a tangible product well large and well-known environmental impacts.

#### 5.3.1 CO<sub>2</sub> emission as comparable indicator

##### 1. Define the relevant sub-sector and subject

Cement is one of the most widely used man-made substances on the planet, and producing it is an energy and resource intensive process with local as well as global environmental impacts. Recognizing this, several cement companies initiated the Cement Sustainability Initiative (CSI) in 1999 as a member sponsored program of the World Business Council for Sustainable Development.

As part of this program a two-year study was carried out by the Battelle Institute, in which the primary goals were: identifying critical sustainability

issues for the cement industry; catalogue and evaluate current industry performance on these issues; recommending actions for future improvement and providing tools for all cement producers to use in improving their performance (CSI Newsletter Issue 2, 2002).

## **2. Determine the most significant environmental impacts associated with the respective subject**

According to the CSI Initiative the most important environmental issues associated with cement industry operations:

- Impacts of resource extraction (fossil fuel, limestone, and other minerals) upon environmental quality, biodiversity, and landscape features
- Depletion of non-renewable or slowly renewable resources (fossil fuels or groundwater)
- Dust emissions (from quarrying, cement production, and transport)
- Emission of NO<sub>x</sub>, SO<sub>2</sub>, CO, VOC, dioxins, metals, etc.
- Emission of CO<sub>2</sub>
- Solid wastes, including cement kiln dust (Toward a Sustainable Cement Industry – Summary Report, 2002)

Based on the study by Battelle Institute, a set of tools were developed which included a protocol for Greenhouse Gas emission. Other tools were developed by CSI including a guideline for emission monitoring, in which a set of KPI for emission of primarily NO<sub>x</sub>, SO<sub>x</sub> and dust were defined. With energy consumption being a main source for these emissions, this aspect is of course also relevant.

Based on the fact that the cement industry produces 5% of global man-made CO<sub>2</sub>, we have chosen to focus on CO<sub>2</sub> emission as a comparable environmental performance indicator for cement-producing companies.

## **3. Determine relevant normalisation reference**

With cement being defined as a product the most appropriate normalisation reference is “per product produced” – or more specifically per amount/unit of product produced.

## **4. Define the organizational boundaries**

Following the suggestion by the CSI Cement CO<sub>2</sub> Protocol it is in this case most appropriate to require reporting from owned as well as controlled operations.

## **5. Define which life cycle stages to report on**

In order to define which life cycle stages that are relevant to include when reporting on this indicator, it is necessary to take a closer look at the manufacturing of cement.

Cement is made by heating limestone with small quantities of other materials (such as clay) to 1450 degrees in a kiln. The resulting hard substance, called clinker, is then ground with a small amount of gypsum into a powder to make the most commonly used type of cement (Ordinary Portland Cement). Many users require cement with particular properties, and these can be made by grinding additional constituents with the clinker. Typical additives include slag and fly ash. However, due to its use in construction, cement is made to

strict standards. These standards vary from region to region, but may limit the type and amount of additives used (CSI Agenda for action, 2002).

Two primary processes are used in producing cement, vertical kiln technology and rotary kiln technology. The latter is furthermore divided into wet and dry processes, of which the dry process is the less energy demanding.

The environmental aspects related to the manufacturing of cement (by a quarry and dry-process plant) are illustrated in the figure below. Life cycle stages represented are raw material extraction (quarrying), production (and transport).

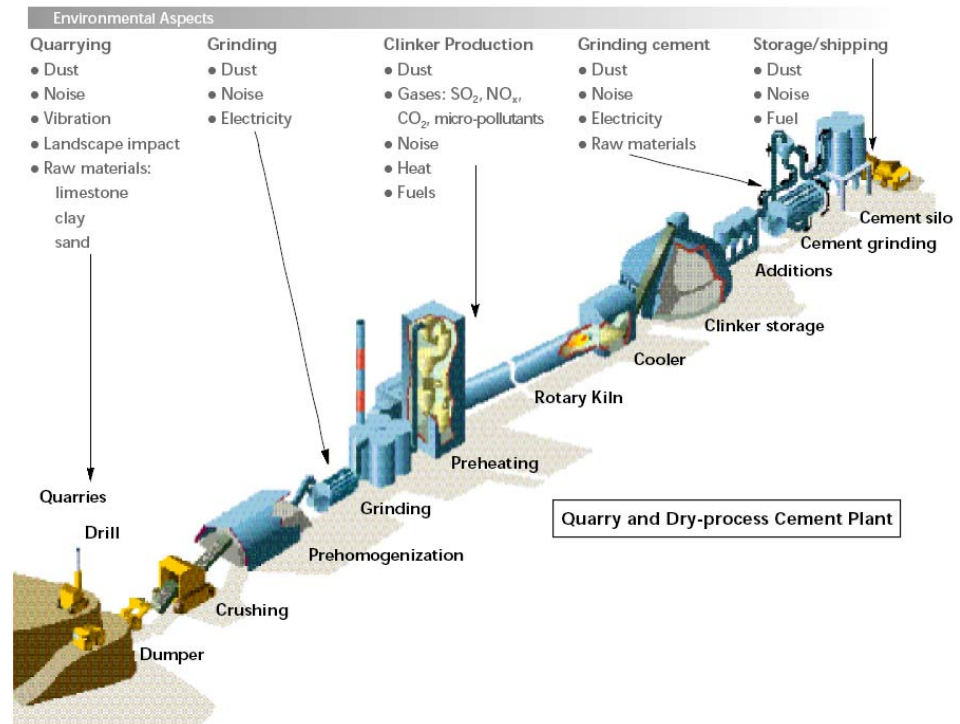


Figure 5-4: Environmental aspects related to cement production (CSI Agenda for action, 2002).

Focusing on CO<sub>2</sub> emission alone, the Cement CO<sub>2</sub> Protocol suggests a rather complex system for reporting on CO<sub>2</sub> emission. Despite its complexity, the system is used by many producers World-wide, and it is therefore suggested to use the same system.

In their definition of direct specific (unit-based) CO<sub>2</sub>-emissions, the following general formula is applied:

$$\begin{array}{l}
 \text{Specific CO}_2 \text{ per ton of} \\
 \text{cementitious product} \\
 = \\
 \frac{\text{direct CO}_2 \text{ emission from cement manufacturing}}{\text{own clinker consumed} + \text{own clinker sold directly} + \text{gypsum, limestone, CKD \& clinker substitutes consumed for blending} + \text{cement substitutes produced} + \text{clinker bought \& consumed}} \\
 \underbrace{\hspace{10em}} \\
 = \text{own clinker production}
 \end{array}$$

Figure 5-5: Specific CO<sub>2</sub> emission per ton of cementitious material as defined by the Cement CO<sub>2</sub> Protocol.

The numerator account for company-specific CO<sub>2</sub>-emissions, while the denominator includes own-produced clinker sold directly and excludes the amount of clinker bought from external producers and consumed in the production.

With respect to indirect emissions, the Protocol specifies that CO<sub>2</sub> from external electricity production as well as from bought clinker shall be included. With respect to the latter it is noted that it is emissions related to net clinker purchases that are calculated, cancelling out company-internal clinker transfers between plants.

The choice is made in order to avoid double-counting. Obviously, there is a risk of making an error relating to im- and export of clinker, but the perhaps most important aspect, i.e. that bought clinker does not reduce specific emissions, is considered in an appropriate way.

The indicator suggested is therefore defined as CO<sub>2</sub> emission from cement production, measured in kg CO<sub>2</sub>/ton cement. The full details on calculation procedures (and an accompanying spreadsheet) can be found in the report from WBCSD.

#### **6. Report per site and country**

While calculation of specific CO<sub>2</sub>-emissions on the company level is viable using the Protocol, establishing site-specific indicators is much more difficult. The main obstacle is that not all sites has the full line of activities related to production of cement, starting with quarrying and ending with cement ready for use.

As an example, CIMPOR divides their operations into the following areas:

- cement plant
- cement grinding units
- clinker plants
- slag grinding plants
- bulk cement units
- dry mortar plants
- cement production complex

In order to establish comparable figures on the site-level it is therefore necessary to focus on selected activities as relevant. With clinker production being the most important process, our suggestion is to develop a calculation procedure specifically related to this activity. It must, however, be recognized that this development requires a relatively large effort from the industry. It is remarked that companies with the full range of activities from extraction of raw materials to final production of cement can use the procedure outlined in the Protocol, without modifications.

On the country level, it may be possible to calculate the same indicator as used on the (multi-national) company level. Cement production is very demanding in terms of transportation, and most of the exchange of raw materials and semi-processed goods can therefore be assumed to be handled within the national boundaries. It is therefore possible to perform the calculations on the national level, aggregating the impacts from different activities as specified in the Protocol.

## **7. Reporting format**

The reporting of the indicator is simple, i.e. only one figure is provided per company (and on the national level).

## **8. Establishment of scales**

The Cement CO<sub>2</sub> protocol developed by CSI establishes a common approach to monitoring and reporting all direct and indirect CO<sub>2</sub> emissions from the cement manufacturing process in absolute (tons of CO<sub>2</sub> per year) and specific, unit-based terms (kg of CO<sub>2</sub> per ton of cementitious product). According to CSI it also enables them to establish baseline emissions against which progress can be measured (CSI Agenda for Action, 2002). Results from this can be used for establishing baseline/excellence levels.

As shown in Table 3-28, the emission of CO<sub>2</sub> as reported in the sustainability reports vary between 629 and 857 kg CO<sub>2</sub>/ton cement. The very low value reported by GRH (31 kg CO<sub>2</sub>/ton) is assumed to include other and less demanding materials and is therefore considered to be outside the general scope. The very high value for white cement from Aalborg Portland (1225 kg CO<sub>2</sub>/ton) is assumed to address a type of cement with other and more stringent requirements to performance.

The remaining values give an indication of the range of emissions per produced unit. It has not been possible to investigate to which the emissions are representative of the industry as a whole. If the range reflects differences in environmental performance, a baseline value of 800 kg CO<sub>2</sub>/ton is suggested together with an excellence level of 650 kg CO<sub>2</sub>/ton cement. It is, however, stressed that reliable levels can only be established if and when experience and results from many more companies become available. Differences related to external electricity production may play a significant role in the differences, but all producers have in principle the possibility of improving their performance, e.g. through the use of less clinker (and more substitutes) and waste-derived fuel/biomass, thereby reducing the direct CO<sub>2</sub>-emissions.

### **Other possible indicators**

As stated previously, emissions of SO<sub>x</sub>, NO<sub>x</sub> and dust is considered to be relevant environmental issues in relation to cement production. Protocols have been defined for their calculation, and it should in principle be rather straightforward to establish normalised figures in the same way as for CO<sub>2</sub>-emissions.

The ratio of clinker in cement is also seen as a useful indicator, addressing the achievements with respect to diverting waste streams from disposal to usable products. Substituting clinker with e.g. fly ash will also have a positive effect on the specific emission of CO<sub>2</sub>, decreasing the need for the energy-intensive production of clinker.

## **5.4 Considerations regarding comparable key environmental indicators for textile-producing companies**

The textile industry is even more complex than the cement industry, which makes developing indicators specifically designed for this industry even more complex.

First of all, the textile industry differs significantly in terms of corporate setup. As demonstrated through our analysis, some textile companies own several sites, which besides distributing clothes also produce them, while others are simply an administrative office (e.g. Nike) specialised in product development, purchase and distribution. Some companies also control the use-phase of their product (textile service industries), which makes issues like energy and detergent consumption in washing their core environmental issues. This makes it very difficult to define the general boundaries.

Defining a subject of interest, i.e. a product unit used for comparisons, is even more difficult. "Clothes" comprise a range of products (e.g. shoes, pants, jackets, socks), the production of which has large and inherent differences with respect to raw materials and manufacturing processes. For comparative purposes, the subject of interest therefore needs to be defined much more narrowly, most probably so narrow that textile producers will be unable to distribute their impacts in a meaningful way on their production range.

However, as shown both in eco-labelling and in the previous study regarding the textile industry, the approach used here could simply be to use qualitative indicators, e.g. relating to the non-use of certain chemicals in the production. This issue has been addressed previously and is not considered further in the current project, where the general conclusion for the textile industry is that development and use of quantitative indicators is not feasible for the textile industry.

#### 5.5 Concluding remarks on the possibility of using sub-sector specific indicators

It is our opinion that it is possible to develop usable and meaningful quantitative comparable environmental indicators for some sectors. However, one of the main findings of this study is the fact that in order to produce reasonable comparable quantitative indicators which can be used in benchmarking, it is necessary to descend to sub-sector level and thereby narrow down the comparison to product/service level. Conclusively, it is necessary to develop a set of indicators related to each sub-sector.

In some cases an extensive reporting is necessary in order to develop a fair quantitative comparable indicator. This may as worst case trigger a boycott from the companies, due to the work involved in the reporting being too extensive. However, the opposite may also be the case; that is the companies may boycott the system if they feel that the benchmarking simply is not fair! However, it should be realised that an environmental indicator never can be 100% fair.

Whether the benefits of being able to benchmark on environmental performance related to each product/service makes up for the extensive work required in order to develop the indicators is a discussion that needs to be addressed before developing further indicators.

Qualitative indicators are informative and can be used for benchmarking on general or systemic aspects, but may also work well in combination with quantitative indicators. However, they cannot be used to determine the actual level of performance in detail.

Since we conclude that useful comparable indicators can be developed within some sub-sectors, the following section presents concerns/suggestions regarding how indicators could be used within a revised EMAS.

#### 5.6 The use of scales/environmental indicators within EMAS

The primary challenge related to using the developed indicators within the EMAS system is that companies most often produce more than one product. Thus it would be unfair to award a company an EMAS certification with a certain score, based on fulfilling indicators for only one of their product types.

Since EMAS focuses on the state of a company's reporting/management system in terms of more (or less) qualitative indicators, it is easier to relate the EMAS system certification to the overall company (that is valuating the overall company in terms of acquiring (one!) EMAS certification. However, when descending to product/service-level (which is necessary in terms of quantitative benchmarking) the situation becomes more complex, since companies as mentioned seldom produce only one product.

Thus, in order to use the developed indicators within the EMAS system, it seems necessary to develop sub-sector supplements.

These sub-sector supplements should define a maximum of four environmental indicators of which to report, in order to focus on the most important environmental aspects related to the sub-sector in question. The environmental indicators should be developed based on available specific sector information, such as the CO<sub>2</sub> protocol for the cement producing sector.

Depending on the level of the company's performance on these relevant indicators, the company would achieve an EMAS A, B or C certification. In this way the company could benchmark itself against other companies.

The number of environmental indicators to report on is of course debatable and should be considered more carefully in a fully developed system. However, it is recommended that a maximum of four indicators is used for each sub-sector.

Furthermore, the number of levels in the scaling system is also debatable. For simplicity, a scale with three levels has been used, but it may easily be divided into a higher number of levels if found desirable. Increasing the number of levels in the scales of course complicates the process of determining where to set the correct cuts between the different levels. However, more levels in the scale will give the companies more incentive to perform better as it will be easier to ascend a level.

#### ***The scoring system***

In terms of creating a useful scaling system, including baseline and excellence levels, the situation is rather complex, as illustrated by the figure below.

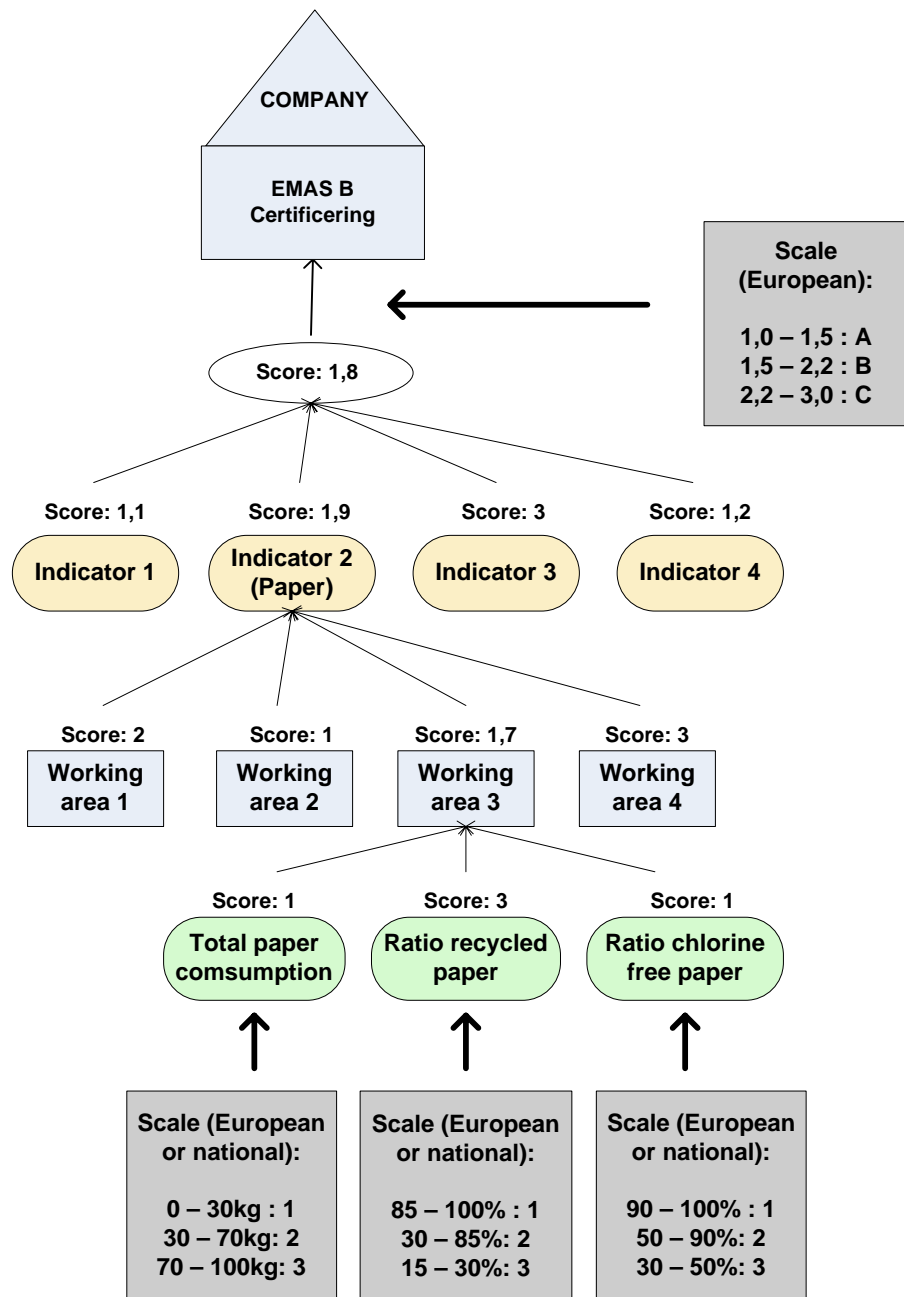


Figure 5-6: Scaling system for using comparable environmental indicators within EMAS.

The need for aggregation necessitates the use of normative values (meaning numbers, instead of for instance letters). Though, when reaching the “top level”, the added numbers could be converted into a scoring system based on letters (see figure). The scales at the lowest level could be different from indicator to indicator, but in order to make a reasonable aggregation it must be assumed that the four chosen environmental impacts related to each product are of equal importance, thus eliminating the need for weighting. Weighting of the four indicators could of course be done, but the weighting used between the different indicators is of a more political nature.

In analogue with the Energy labelling system, it is of course necessary to revise the baseline and excellence levels on a periodic basis, thus securing that the excellence level is truly excellent.

For some sectors and indicators it may be necessary to prepare scaling systems on a national basis in order to develop a more fair comparison (e.g. for the energy indicator developed for banks and the indicator developed for cement). This means for example that a bank in southern Europe had to have a lower energy consumption per m<sup>2</sup> compared to a bank in northern Europe in order to get the same overall score. For other indicators, such as the paper indicator for banks, scales on European/regional level are enough.

The scaling system on national level is not directly in conflict with the reporting requirements in EMAS as the companies who wish to get a certification at concern-level only can get the certification at a national level (if they are reporting on every site). If one site is situated in another country, this site must get its own specific EMAS certification (and would then use the national developed scale for this country).

## 6 Recommendations for further work

The purpose of this project has been to address the issue of developing comparable environmental performance indicators that can be used for benchmarking between EMAS companies. The development of such indicators together with established performance requirements (see previous study “Going beyond EMS” (FORCE Technology, 2006)) can thereby turn EMAS into a system of excellence.

In this report, a reporting system is presented which demonstrates how a company could be awarded an EMAS A, B or C certification based on the quantitative performance of four main environmental impacts/indicators related to their specific sub-sector. However, it is not addressed how the EMAS A, B, C system could be used within companies producing several different products. This issue needs further considerations.

Future studies should focus on gathering knowledge regarding whether it is practically possible for companies to report on the indicators developed in this study (e.g. in the form of pilot studies).

Moreover, studies related to gathering information necessary to establish realistic baseline and excellence levels within the specific sub-sectors are needed, and further considerations are likewise needed in terms of defining the needed quality-level of reported data.

This study has primarily focused on the use of quantitative indicators. It is recommended that the use of qualitative indicators is studied in more details in for example a follow-up study. In such a follow-up study, one could look closer at this aspect and suggest the most relevant qualitative indicators at a general level and examine the possibilities of using qualitative indicators at sector levels as well. For example: Are certain qualitative indicators more useful in some sectors than others?

Finally, it is relevant to look more closely at the BAT emission limits that exists for different sectors, and discuss the possibilities of using these limits for developing scales related to environmental performance indicators. In such a study, actual scales for indicators should be developed, and uncertainties, possibilities of fair comparisons etc. should be discussed.

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# Appendix 1: Environmental key performance indicators from Defra

KPI	Calculation and measurement procedures	Reporting guidance
<b>Emission to air</b>		
<b>1. Greenhouse Gases</b>	GHGs can be measured by recording emissions at source by continuous emissions monitoring or by estimating the amount emitted using activity data (such as the amount of fuel used) and conversion factors (e.g. calorific values, emission factors, oxidation factors). For instance, factors can be used to calculate the amount of CO <sub>2</sub> emitted as a result of burning a particular quantity of oil in a heating boiler. Conversion factors are published by a number of agencies. It is recommended that UK companies not already reporting for regulatory purposes use Defra's conversion protocols. These can be found on Defra's website, in the annex sections of Defra's Guidelines for Company Reporting on Greenhouse Gas Emissions, at: <a href="http://www.defra.gov.uk/environment/business/envrp/index.htm">http://www.defra.gov.uk/environment/business/envrp/index.htm</a> .	Greenhouse gases should be reported in metric tonnes emitted per annum individually.  If an estimation method has been used this should also be reported. Greenhouse gases should always be reported in this way. For normalising purposes, GHGs can also be reported as CO <sub>2</sub> equivalents.
<b>2. Acid Rain, Eutrophication and Smog Precursors</b>	Although ozone is one of the primary components of smog, it is produced through secondary processes that occur naturally rather than directly from industrial processes or fuel consumption. However, the precursors (see table) are primary emissions and can be measured, as can the other main component of smog – primary emissions of particulate matter (note that particulate matter is covered by a separate KPI). These emissions arise from the consumption of fossil fuels and can be calculated using standard emissions factors, provided the quantity and type of fuel combusted is known, along with the type of boiler or engine. Producers of nitric acid who utilise the Ostwald process should be able to calculate their emissions of nitrogen oxide based on the efficiency of their process (which can be calculated by comparing the mass of products compared to the mass of reactants). In a 100 per cent efficient process, no nitrogen oxides would be emitted, however it is unlikely that the process would be 100 per cent efficient.	SO <sub>2</sub> , NO <sub>x</sub> , NH <sub>3</sub> and CO should be reported in metric tonnes emitted per annum.  If an estimation method has been used this should also be reported.
<b>3. Dust and Particles</b>	Primary particulate matter emissions arise from the consumption of fossil fuels and can be calculated using estimation methods <sup>29</sup> , provided the quantity and type of fuel combusted is known, along with the type of boiler or engine.	Primary particulate matter emissions should be reported in metric tonnes emitted per annum, by size of particle. If an estimation method has been used this should also be reported.
<b>4. Ozone Depleting Substances</b>	Ozone Depleting Substances are often only emitted to the environment by accident. Companies should record the ODS currently in use (which can be estimated based on the type of refrigeration, air conditioning or fire extinguisher system containing the ODS) and the amount emitted if leakage occurs, or fire extinguishers are used. The manufacturer of the system should be able to provide data on the quantity of ODS used in the system and the likely amount emitted in the case of a fault. Ozone Depleting Potentials or Global Warming Potentials can be used to compare the effects of ODS <sup>30</sup> substances.	ODS should be reported in metric tonnes by type emitted per annum. If an estimation method has been used this should also be reported.
<b>5. Volatile Organic</b>	VOC emissions from fuel consumption can be calculated using the appropriate fuel conversion protocols which	VOCs should be reported in metric tonnes emitted per annum. If an estimation method

<b>Compounds</b>	convert fuel used to VOC emitted, provided the amount and type of fuel and the type of boiler or engine is known. VOC emissions from specific industrial processes can be estimated based on the specific type of chemical known, its volatility/vapour pressure and the amount used. Solvent mass inventories can also be used to measure VOC emissions (amount of solvent used subtracted from the amount of solvent recovered).	has been used this should also be reported. The combustion of fuel gives rise to many different types of VOC, so it is impractical to record them individually, in which case the masses of individual VOCs should be totalled together. This approach should also be taken where the amount of any individual VOC emitted is negligible (i.e. in kilograms per annum). In cases where a large quantity of an easily identifiable VOC is emitted (e.g. formaldehyde) the specific name and amount of that VOC should be reported.
<b>6. Metal emissions to air</b>	The amounts of metal emitted as a result of fuel combustion can be estimated using standard fuel emission factors, based on both the type of fuel used and the type of boiler/engine it is combusted in. The quantity of fuel used can often be estimated from fuel bills. In the case of industrial processes, emissions are likely to be highly localised and can be calculated by direct measurement at emission sources (as required under PPC permit conditions) or estimated by sampling and analysing the local air quality. The best way of sampling varies between industrial practices but generally involves the analysis of dust samples to determine metal content and particle size and an estimation of how much dust is produced.	Metal emissions to air should be reported in metric tonnes emitted per annum.  If an estimation method has been used this should also be reported. As metals vary in toxicity, reporting should involve a discussion of the type of metal, the mass emitted (kilograms or tonnes), particle size (which has a large effect on potential toxicity) and the means by which it is emitted – i.e. from a point or dispersed source.
<b>Emissions to water</b>		
<b>7. Nutrients and Organic Pollutants</b>	Discharged organic substances are commonly measured in one of two ways: by determining the concentration of the emitted substances where it is known that specific substances have been emitted (where few of them are emitted or when they are easy to identify in processes) or by assessing the overall quality of the effluent when specific assessments are difficult to make due to the diverse nature of the components of the discharge. For specific measures, standard laboratory tests can be performed to determine the concentration of the contaminant in the water. Water quality measures are more varied. Combined parameters to assess potential eutrophication in water include: • Biochemical Oxygen Demand (BOD), which refers to the amount of oxygen that would be used if all the organic components in water were consumed by bacteria. • Total Suspended Solids (TSS or SS) are solids in water, which constitute an indication of high concentrations of bacteria, nutrients or pesticides and can harm the aquatic life/cause problems for the industrial use of water. General organic matter concentration can be defined by the following measures: • Total Organic Carbon (TOC), which measures the organic content of a sample that can be oxidised to Carbon Dioxide. • Chemical Oxygen Demand (COD), which is the amount of oxidisable material as measured by the potassium dichromate test. Materials and data collection processes are particular to each one of the methods stated and require more or less costly investments in resources and equipment depending on the technique used.	Total discharge of effluents should be recorded in absolute cubic meters per annum, and the content of effluent described. In addition, specific or general water quality measures should be undertaken to assess the impact of these emissions to water. For specific measures, the kg of pollutant per cubic metre should be reported. If spills have contributed to organic pollutant emissions to water directly, the absolute number of spills should be reported, and the volume of individual spills if they are significant. If an estimation method has been used this should also be reported. Discharge consents should also be discussed where relevant.
<b>8. Metal emissions to water</b>	Metal emissions to water arise from various processes as described in the table above. These emissions can be calculated using emission estimation techniques and manuals. Sampling and source monitoring procedures for analyses vary from country to country and requirements for direct measurement methods depend on the reporting requirements and methods established by pollution inventories. In the EU various tools have been developed to quantify emissions of metal to water.	Substances should be reported as absolute kilograms emitted per annum. Where discharges are made to surrounding controlled waters discharge consents are required which may provide useful data. Details of the technique used for sampling and monitoring should be given to enable comparisons to be made.

<b>Emissions to land</b>		
<b>9. Pesticides and Fertilisers</b>	The amount of pesticides and fertilisers applied to land in a given accounting year should be measured.	Pesticide or fertiliser emissions to land should be measured in terms of the total weight applied (kilograms). Companies could also report the total area treated (hectares). If an estimation method has been used this should also be reported.
<b>10. Metal emissions to land</b>	Metal emissions to land can be determined with emissions estimation methods, ranging from sampling or direct measurement and mass balance calculations to conversions using emissions factors. Procedures for analyses vary from country to country and requirements for direct measurement methods depend on the reporting requirements and methods established by pollution inventories. In the EU various tools have been developed to quantify emissions of metal to land.	Metal emissions to land arising from industrial activities should be reported as absolute quantities in metric tonnes or kilograms emitted to land. The list of metal emissions that are reported on should include, but not be restricted to, the substances in the exhibit above. Additional metal emissions should be reported if their disclosure to a pollutant inventory, such as the European Pollutant Emission Register <sup>33</sup> , requires it. If an estimation method has been used this should also be reported.
<b>11. Acids and Organic Pollutants</b>	Spillages can be estimated by comparing the volume/mass of a substance before and after a production process. If the spillage occurs at the end of a pipe or hose then the emission can be estimated by monitoring the flow rate and duration of spill.	This KPI should be reported by type of emission and total mass of product spilled. The total amount emitted in tonnes per annum of each type of chemical should be reported. The absolute number of spills should be reported, and the volume of individual spills if they are significant. If an estimation method has been used this should also be reported. Note that any contaminated land disposed of should also be reported according to the criteria set out in KPI 12 – Waste.
<b>12. Waste (Landfill, Incinerated and Recycled)</b>	Waste can be measured by estimating the number and weight of waste containers that leave the business over a set period of time. If the waste is sorted prior to recycling, e.g. to comply with the Producer Responsibility Obligations (Packaging Waste) Regulations 2005 <sup>34</sup> then more detailed measurement of specific waste (e.g. tonnes of glass) can be taken. Further guidance on how to measure waste is available on Defra's website, at: <a href="http://www.defra.gov.uk/environment/business/envrp/index.htm">http://www.defra.gov.uk/environment/business/envrp/index.htm</a>	Waste should be reported in metric tonnes per annum. In the UK many companies will already be recording levels of waste sent to landfill, as the UK landfill tax is charged per tonne. Where possible, waste materials should be broken down into types (e.g. paper, glass, aluminium). Companies obligated under the packaging Regulations should have records of the amount, and different types of packaging waste they send to a recycler, in order to demonstrate that they have met their recovery and recycling obligations. The final waste management route should be also reported (e.g. 50 per cent to landfill, 20 per cent incinerated, 20 per cent recycled, 10 per cent re-used). If an estimation method has been used this should be reported.
<b>13. Radioactive Waste</b>	Companies measuring radioactive waste should follow guidelines from the environmental regulators. More information can be found at: <a href="http://www.defra.gov.uk/environment/radioactivity/waste/index.htm">http://www.defra.gov.uk/environment/radioactivity/waste/index.htm</a> Companies that produce electricity from nuclear power should measure spent fuel. The weight of spent rods should be recorded by the company's management system and then totalled for the year in order to report in metric tonnes per annum.	Solid radioactive waste should be reported at the company level on an annual basis in kg or metric tonnes of HLW, ILW and LLW. For LLW it is normal practice to report on disposals or transfers as a proxy for LLW generation. Where this is done, the information provided to the Environment Agency (for the purpose of monitoring compliance with the relevant transfer or disposal authorisation under RSA 93) should be reported. For HLW and ILW, it is normal practice to use estimates based on the information which the company has reported to Nirex for inclusion in the National Radioactive Waste Inventory. Nuclear power generators should report on the quantity of

		spent fuel used in power stations, in metric tonnes of uranium (teU) per annum. In addition, electricity producers should report the amount of electricity produced each year using nuclear energy in TWh. If an estimation method has been used this should also be reported.
<b>Resource use</b>		
<b>14. Water Use and Abstraction</b>	For abstracted water, the majority of charges are levied according to the licensed volume, but actual volumes abstracted are reported to the Environment Agency. It is the actual volumes abstracted that should be measured.	The table overleaf illustrates the scope of measures that should be reported. In most cases reporting will be much simpler, as most companies focus on a specific type of abstraction. The most appropriate way of reporting abstracted water should be in cubic metres. If an estimation method has been used this should also be reported. Compliance with any abstraction consents, such as those provided by the Environment Agency in the UK, should also be reported. Companies should also discuss whether water has been re-used or returned to source (e.g. cooling water). Direct abstraction should be reported as the volume taken, not the licensed volume.
<b>15. Natural Gas</b>	Extraction of natural gas is commonly measured at source.	Reporting of natural gas quantities should be in cubic metres or barrels of oil equivalent extracted per annum.
<b>16. Oil</b>	Extraction of crude oil is commonly measured at source.	Crude oil should be reported in cubic metres or barrels of oil equivalent extracted per annum.
<b>17. Metals</b>	Extraction of metals is commonly measured at source.	Metals extracted should be reported in metric tonnes extracted per annum, broken down by type of metal.
<b>18. Coal</b>	Extraction of coal is commonly measured at source.	Coal should be reported in metric tonnes extracted per annum, broken down by type of coal (such as lignite or hard coal) and extraction (deep or open cast).
<b>19. Minerals</b>	Extraction of mineral material is commonly measured at source. Companies should measure the quantity of mineral (not ore) that is extracted.	Minerals extracted should be reported in metric tonnes extracted per annum, broken down by type of mineral.
<b>20. Aggregates</b>	Extraction of aggregate material is commonly measured at source.	Aggregates should be reported in metric tonnes extracted per annum, broken down by type of aggregate.
<b>21. Forestry</b>	Forest management operations should monitor the environmental impacts of their operations on a regular basis and should measure the volume of wood harvested, including waste and residues. The frequency and intensity of monitoring will depend on the scale and intensity of the operation.	Harvested timbers and other wood products, as well as residues of harvesting, should be reported in absolute cubic metres per annum by type of wood (prior to any drying process). The geographical area that the wood was sourced from (check whether felling is permitted in that area and if there are any restrictions on felling), and any evidence of whether the wood was sourced from legal or sustainably managed forests, should also be reported. Reporters may also find it useful to state whether the species harvested is listed on the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
<b>22. Agriculture</b>	Sellers of agricultural resources are likely to collect data on the types and amounts of resources its company produces or extracts and should therefore be able to measure the overall quantities produced on a yearly basis. Crops, botanical and zoological resources should be regularly weighed as this will provide clear and reliable data on agricultural resource use.	Extracted or sold agricultural resources should be reported in metric tonnes extracted per annum, and broken down into type of resource or species. The wet weight of the resource should be reported, prior to any drying process.

## Appendix 2: OECD Core Environmental indicators

The boxes are a directly copy from the report “OECD Environmental Indicators. Development, measurement and use. Reference paper. OECD 2003.” (OECD, 2003).

Main core indicators are presented in bold. Each character specifies the indicators’ measurability: S = short term (basic data currently available for a majority of OECD countries). M = medium term (basic data partially available, but calling for further efforts to improve their quality (consistency, comparability, timeliness) and their geographically coverage (number of countries covered)). L = long term (basic data not available for a majority of OECD countries, calling for a sustained data collection and conceptual efforts).

Issue		Core indicators	
Climate Change	Pressures	Index of greenhouse gas emissions	M
		- CO2 emissions	S
		- CH4 emissions	S/M
		- N2O emissions	S/M
	Conditions	* Atmospheric concentrations of greenhouse gases; Global mean temperature	S
	Responses	Energy efficiency	M/L
		- Energy intensity (total primary energy supply unit of GDP or per capita	S
		- Economic and fiscal instruments (e.g. prices and taxes, expenditures)	S/M
Ozone layer Depletion	Pressures	* Index of apparent consumption of ozone depleting substances (ODP)	M
		- apparent consumption of CFSs/and halons	
	Conditions	Atmospheric concentrations of ODP	S/M
		Ground level UV-B radiation	
		- Stratospheric ozone levels	S/M
	Responses	CFC recovery rate	M
Eutrophication	Pressures	Emissions of N and P in Water and Soil → Nutrient Balance	L
		- N and P from fertilizer use and from livestock	
	Conditions	BOD/DO in inland waters, in marine waters	S/M
		Concentration of N and P in inland waters, marine waters	
	Responses	Population connected to biological and/or chemical sewage treatment plants	M/L
		- Population connected to sewage plants	S
		- Charges for waste water treatment	M
		- Market share of phosphate-free detergents	S/M
Acidification	Pressure	Index of acidifying substances	M/L
		- Emissions of NOx and SOx	S
	Conditions	Exceedance of critical loads of ph in water and soil	M/L
		- Concentrations in acid precipitation	S
	Responses	% of car fleet equipped with catalytic converters	S/M
		Capacity of SOx and NOx abatement equipment of stationary sources	M/L
Toxic contamination	Pressures	Emissions of heavy metals	M/L
		Emissions of organic compounds	L
		- Consumption of pesticides	S/M
Conditions	Concentration of heavy metals & organic compounds in env. media & in living		

		species	
	Reponses	- Concentration of heavy metals in rivers Changes of toxic contents in products and production processes	S/M L
		- Market share of unleaded petrol	S
Urban Environmental quality	Pressures	Urban air emissions (SOx, Nox, VOC)	M/L
		- Urban traffic density	M/S
		- Urban car ownership	S
		- Degree of urbanisation (urban population, growth rates, urban land)	S/M
	Conditions	Population exposure to air pollution, to noise	L/M
		- Concentrations of air pollutants	S
		Ambient water conditions in urban areas	M/L
	Responses	Green pace (areas protected from urban development)	M/L
		Economic, fiscal and regulatory instruments	M
		- Water treatment and noise abatement expenditure	S/M
Biodiversity	Pressures	Habitat alteration and land conversion from natural state to be further developed (e.g. road network density, change in land cover.)	L
	Conditions	Threatened or extinct species as a share of total species known	S
		Area of key ecosystems	M
	Responses	Protected areas as % of national territory and by type of ecosystem	S/L
		- Protected species	S
Cultural landscapes	Pressures	Indicators to be further developed E.g. Presence of artificial elements, sites protected for historical, cultural or - aesthetic reasons.	
Waste	Pressures	Generation of waste (municipal, industrial, hazardous, nuclear)	S
		- Movements of hazardous waste	S
	Responses	Waste minimisation (to be further developed)	L
		- Recycling rates	S/M
		- Economic and fiscal instruments, expenditures	M
Water resources	Pressures	Intensity of use of water resources (abstractions/available resources)	S
	Conditions	Frequency, duration and extent of water shortages	M/L
	Responses	Water prices and user charges for sewage treatment	S/M
Forest resources	Pressures	Intensity of forest resource use (actual harvest/productive capacity)	M
	Conditions	Area, volume and structure of forests	S/M

# Appendix 3: Indicator changes from G2 to G3

Environment					
G2 Numbering	G2 Indicator Wordings	G3 Draft Numbering	G3 Draft Indicator Wordings/Reasonings	G3 Final indicator Wordings/Reasonings	G3 Final Numbering
EN1	Total materials use other than water, by type.	EN1	Weight of materials used.	Materials used by weight or volume.	EN1
			The original indicator of total materials use presented a number of technical measurement problems. The indicator was therefore revised to focus on non-renewable materials and major materials used, which are defined in the protocol. The intent was to identify a subset of materials that were measurable by most organizations and represented the material flows which would be important to track from the perspective of sustainable development either due to their sensitivity or volume of use.	"Volume" added to make calculation easier for organizations that use liquid materials. Wording was modified to streamline the language.	
EN2	Percentage of materials used that are wastes (processed and unprocessed) from sources external to the reporting organization.	EN2	Percentage of materials used that are recycled.	Percentage of materials used that are recycled input materials.	EN2
			Wording "from external to the reporting organization" is included in the protocol in addition to "internal". Term "waste" was changed to "recycled" to better reflect the intent of the indicator.	Wording was modified to clarify the scope of the indicator and make it consistent with protocol.	
EN3	Direct energy use segmented by primary source.	EN3	Direct energy consumption broken down by primary energy source.	Direct energy consumption by primary energy source.	EN3
			"Use" was changed to "consumption" for all of the energy indicators.	The words "broken down" deleted to streamline the language.	
EN4	Indirect energy use.	EN4	Indirect energy consumption broken down by primary source.	Indirect energy consumption by primary source.	EN4
			"Use" was changed to "consumption" for all of the energy indicators and the wording "broken down by primary energy source" was added for consistency with EN2.	The words "broken down" deleted to streamline the language.	
EN5	Total water use.	EN9	Total water withdrawal by source.	Total water withdrawal by source.	EN8

			It was decided that total water use is more clearly expressed by the term "water withdrawn" and that reporting on source would provide indication where the impact of water use lies.	No change.	
EN6	Location and size of land owned, leased or managed in biodiversity-rich habitats.	EN12	Location and size of land owned, leased, or managed in, or adjacent to, protected areas.	Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.	EN11
			The indicator focuses on geographical areas with biodiversity value. Given the difficulty of developing a definition of "biodiversity-rich" that could be consistently applied, the indicator addresses protected areas. The indicator also includes land adjacent to areas since activities in these areas can also affect biodiversity within the protected areas.	" and areas of high biodiversity value outside protected areas." added to the scope of the indicator. Focusing on protected areas only would have resulted in excluding areas that are of critical importance for biodiversity.	
EN7	Description of the major impacts on biodiversity associated with activities and/or products and services in terrestrial, freshwater, and marine environments.	EN13	Description of significant impacts of activities on protected areas.	Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas.	EN12
			The wording was also simplified since protected areas can include terrestrial, freshwater, and marine environments, and the change would also create a direct linkage with the previous indicator. Products and services are captured in indicator EN14 which asks for disclosure of initiatives to reduce environmental impacts of products and services.	"products, and services on biodiversity" and "areas of high biodiversity value outside protected areas." added. Focusing on protected areas only would have resulted in excluding areas that are of critical importance for biodiversity. In addition, products and services are specifically referenced to enable reporting for organization's whose primary impacts are indirect, but significant.	
EN8	Greenhouse gas emissions.	EN17	Greenhouse gas emissions.	Total direct and indirect greenhouse gas emissions by weight.	EN16
			No changes.	"Total direct and indirect" and "by weight" added to indicator wording for consistency with the accompanying protocol.	
EN9	Use and emissions of ozone-	EN18	Emissions of ozone-depleting substances.	Emissions of ozone-depleting substances by weight.	EN19

	depleting substances.		It was decided that the indicator should focus on emissions, not use, and the indicator was reworded accordingly.	"by weight" added to indicator wording for consistency with the accompanying protocol.	
EN10	NOx, SOx, and other significant air emissions by type.	EN19	NOx, SOx, and other significant air emissions by weight.	NOx, SOx, and other significant air emissions by type and weight.	EN20
			"By type" was removed from indicator wording and placed in the compilation section of the protocol. The word "weight" was added to the indicator wording to more clearly state the information expected.	"by weight" added to indicator wording for consistency with the accompanying protocol.	
EN11	Total amount of waste by type and destination.	EN20	Total amount of waste by type and destination.	Total weight of waste by type and disposal method.	EN22
			No changes.	Changes to wordign of indicator made to clarify the indicator and for consistency with the accompanying protocol.	
EN12	Significant discharges to water by type.	EN21	Total water discharge and quality.	Total water discharge by quality and destination.	EN21
			The indicator covers the total amount of water discharged to complement the measure of total water withdrawal. Water quality is included in the indicator to indicate whether the discharge is clean water or contains pollutants.	Further breakdown by "destination" was added to respond to public comments indicating that destination is an important element in assessment of the impact and importance of different types of water discharge.	
EN13	Significant spills of chemicals, oils, and fuels in terms of total number and total volume.	EN22	Total number and volume of significant spills.	Total number and volume of significant spills.	EN23
			The indicator now focuses on all types of spills rather than chemicals, oils, and fuels only.	No change.	
EN14	Significant environmental impacts of principal products and services.	EN26	Initiatives to manage the environmental impacts of products and services and extent of impact reduction.	Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation.	EN26
			The indicator was revised to address impacts, but focus on actions taken to reduce negative impacts.	Wording ("manage" replaced with "mitigate") changed to better reflect the intent of the indicator.	
EN15	Percentage of the weight of products sold that is	EN27	Percentage of products sold that is reclaimed at the end of the products' useful life by product category.	Percentage of products sold and their packaging materials that are reclaimed by category.	EN27

	reclaimable at the end of the products' useful life and percentage that is actually reclaimed.		The indicator was simplified to focus on the practical outcome of the amount of product that is reclaimed. The percentage of weight that is reclaimable was deleted on the basis that it was not possible to develop an appropriate technical definition and that the amount reclaimed was: a) the more important measure for sustainability purposes; and b) related to the percentage of the product that could be reclaimed. Breakdown by product category was added to the indicator wording to help clarify the aggregation approach needed.	Packaging materials were included since public comments indicated that these materials can be as important in terms of impact as the product itself in some sectors/product areas. Deleted "at the end of the products' useful life"	
EN16	Incidents of and fines for non-compliance with all applicable international declarations/conventions/treaties, and national, sub-national, regional, and local regulations associated with environmental issues.	EN28	Incidents of, and fines or non-monetary sanctions for, non-compliance with applicable environmental regulations.	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations.	EN28
			The indicator was revised to include non-monetary sanctions as other measures taken by authorities can often have similar or stronger effects. The wording was also simplified and explanations of the scope of regulations placed in the protocol.	Wording added to clarify the measurements required: "monetary value of significant" fines and "total number" of sanctions. Addition of "laws".	
EN17	Initiatives to use renewable energy sources and to increase energy efficiency.	EN5	Percentage of total energy consumption met by renewable resources.	Indicator deleted as it can be calculated by use of EN3 and EN4.	Deleted
		EN6	Total energy saved due to conservation and efficiency improvements.	Energy saved due to conservation and efficiency improvements.	EN5
			The indicator was revised to focus on the results of initiatives rather than on narrative descriptions for purposes of comparability and assurance. The indicator was separated into two measures to reflect the use of renewable energy and the outcomes of initiatives to reduce consumption.	"Total" deleted for consistency with wording from other indicators.	
EN18	Energy consumption footprint (i.e. annualised lifetime energy requirements) of major products	EN7	Initiatives to provide energy-efficient products and services.	Initiatives to provide energy-efficient or renewable energy based products and services, and reductions in energy requirements as a result of these initiatives.	EN6

			Due to the fact that a definition for high-energy use products as well as variable consumption/usage patterns still remain major challenges for the comparability of the indicator, it was decided to focus on initiatives taken to develop energy-efficient products. It was felt that the reworded indicator addresses the same intent as the previous indicator.	"renewable energy based products" and "reductions in energy requirements (...)" these initiatives added to broaden the scope of the indicator to make it applicable to wider range of organizations and for consistency with the accompanying protocol.	
EN19	Other indirect (upstream/downstream) energy use and implications, such as organisational travel, product lifecycle management, and use of energy-intensive materials.	EN8	Initiatives to reduce indirect energy consumption.	Initiatives to reduce indirect energy consumption and reductions achieved.	EN7
			Due to the difficulty in gathering energy use data outside the organization's boundaries, it was decided to reformulate the indicator around initiatives taken to reduce other indirect (upstream/downstream) energy consumption	"reductions achieved" added for consistency with the accompanying protocol.	
EN20	Water sources and related ecosystems/habitats significantly affected by use of water.	EN10	Water sources and related habitats significantly affected by withdrawal of water.	Water sources significantly affected by withdrawal of water.	EN9
			The wording of the indicator was changed to make it consistent with other environmental indicators on water and biodiversity.	Deletion of "related habitats". Wording has been added for consistency with the accompanying protocol. At the same time the wording was also made consistent with the protocol requirements asking for "significant" changes only.	
EN21	Annual withdrawals of ground and surface water as a percent of annual renewable quantity of water available from the sources.	Deleted	The indicator was deleted since it was seen as not comparable and only relevant in specific regions. It was also decided that it was not feasible to collect the information required for reporting.		
EN22	Total recycling and reuse of water.	EN11	Percentage and total volume of water recycled and reused.	Percentage and total volume of water recycled and reused.	EN10
			Wording was modified to more clearly state the information required.	No change.	
EN23	Total amount of land owned, leased, or managed for production activities or	Deleted	This indicator was deleted as it was decided that it did not provide any information about biodiversity that was not already covered by other indicators.		

	extractive use.				
EN24	Amount of impermeable surface as a percentage of land purchased or leased.	Deleted	This indicator was deleted as it was decided that it did not provide any additional information that was not already covered by other indicators.		
EN25	Impacts of activities and operations on protected and sensitive areas.	Deleted	This indicator was deleted as the information is now captured in other biodiversity indicators particularly EN12 and 13 in the G3.		
EN26	Changes to natural habitats resulting from activities and operations.	EN14	Area of habitats protected or restored.  It was found that the descriptive information on "changes to natural habitats" overlaps with indicators EN6 and EN7 and was therefore not necessary. The indicator was changed to focus on the positive outcomes of the total amount of habitat protected or restored. This can be used in conjunction with EN6 to create a percentage.	Habitats protected or restored.  Deletion of "Area" to improve the clarity and grammar of the sentence.	EN13
EN27	Objectives, programmes, and targets for protecting and/or restoring habitats native ecosystems and species in degraded areas.	EN15	Programs for managing impacts on biodiversity.  It was decided that indicator should broaden its scope to address programs for managing all impacts rather than only those related specifically to habitat restoration. This could also complement the DMA disclosure.	Strategies, current actions, and future plans for managing impacts on biodiversity.  "Programs" replaced with "Strategies, current actions and future plans" to clarify the scope of the indicator and for consistency with the accompanying protocol.	EN14
EN28	Number of IUCN Red List species with habitats in areas affected by operations.	EN16	Number of IUCN Red List species with habitats in areas affected by operations broken down by level of extinction risk.  Wording was modified to more clearly state the information required.	Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations by level of extinction risk.  the scope of the indicator broadened to include "national conservation list species" because national lists might include issues that are not included in the IUCN lists.	EN15
EN29	Business units currently operating or planning operations in	Deleted	The indicator was deleted. EN6 was seen as capturing first portion of information. Disclosure of planned activities was further added to EN6.		

	or around protected or sensitive areas.				
EN30	Other relevant indirect greenhouse gas emissions	EN23	Other relevant indirect greenhouse gas emissions.  No changes.	Other relevant indirect greenhouse gas emissions by weight.  by weight" added to indicator wording for consistency with the accompanying protocol.	EN17
EN31	All production, transport, import, or export of any waste deemed 'hazardous' under the terms of the Basel Convention Annex I, II, III and VIII.	EN24	Weight of transported, imported, or exported waste deemed 'hazardous' under the terms of the Basel Convention Annex I, II, III and VIII.  Wording was modified to better reflect information required. "All" was deleted for purposes of technical assurance and because the revised wording of the indicator in combination with the revised GRI reporting principles make it redundant.	Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally.  Treated' added to respond to public comments that the risks and impacts associated with treated and untreated waste are different and that the indicator should specify the status of the waste being measured.	EN24
EN32	Water sources and related ecosystems/habitats significantly affected by discharges of water and runoff.	EN25	Water sources and related habitats significantly affected by discharges of water and runoff.  The wording of the indicator was changed to make it consistent with other environmental indicators on water and biodiversity.	Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the reporting organization's discharges of water and runoff.  "Identity (...) value of" added to the indicator wording for consistency with the accompanying protocol.	EN25
EN33	Performance of suppliers relative to environmental components of programmes and procedures described in response to Governance Structure and Management Systems section (Section 3.16).	Deleted	The indicator was deleted given the coverage of the issue by the Boundary Protocol.		

EN34	Significant environmental impacts of transportation used for logistical purposes.	EN29	Significant environmental impacts of transportation used for logistical purposes.	Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce.	EN29
			No change	Wording added to clarify the scope of the indicator, and the types of transportation implemented by the organization that are included.	
EN35	Total environmental expenditures by type.	EN30	Total environmental protection expenditures by type.	Total environmental protection expenditures and investments by type.	EN30
			No change.	"Investments" added to respond to public comments that indicated that expenditures offered an incomplete picture of monetary flows and particularly could risk missing the longer-term, preventative measures employed.	
NEW				Initiatives to reduce greenhouse gas emissions and reductions achieved.	EN18
				New indicator added to respond to results of the Public Comment Period.	

## Annex 4: Available BREF documents

The table below names the available BREF documents, which are in varying stages of development. To access the most up-to-date version available, go to the European Integrated Pollution Prevention and Control Bureau website where you can download the documents.

Title
Cement and Lime production
Ceramics
Chlor-Alkali manufacture
Common Waste Water and Waste Gas Treatment - Management Systems in the Chemical Sector
Cooling systems
Economic and cross media issues under IPPC
Emissions from storage of bulk or dangerous materials
Ferrous Metal Processing
Food and Milk Processes
Glass manufacture
Intensive Livestock Farming
Iron and Steel production
Large combustion plants
Large Volume Inorganic Chemicals - Ammonia, Acids & Fertilisers
Large Volume Inorganic Chemicals - Solid & Others
Large volume organic chemicals
Management of Tailings and Waste-Rock in Mining Activities
Monitoring systems
Non-Ferrous Metal processes
Organic fine chemicals
Polymers
Paper and Pulp Manufacture
Refineries
Slaughterhouse and animal carcasses disposal or reuse etc
Smitheries and Foundries
Speciality inorganic chemicals
Surface treatment of metals
Surface treatments using solvents
Tanning of hides and skins
Textile processing
Waste Incineration
Waste Treatments

# Annex 5: Direct and indirect CO<sub>2</sub> emission calculations by CSI Cement CO<sub>2</sub> Emission Protocol

Parameters and proposed data sources for the calculation of direct CO<sub>2</sub> emissions as required in the CSI Cement CO<sub>2</sub> emission protocol.

Emission components	Parameters	Units	Proposed source of parameters
<b>CO<sub>2</sub> from raw materials:</b>			
Calcination of clinker	Clinker produced	t	Measured at plant level
	CaO + MgO in clinker	%	Measured at plant level
	CaO + MgO in raw meal	%	Measured at plant level
Calcination of dust	Dust leaving kiln system	t	Measured at plant level
	Emission factor clinker	t CO <sub>2</sub> / t cli	As calculated above
	Dust calcination degree	% calcined	Measured at plant level
Organic carbon in raw materials	Clinker	t cli	Measured at plant level
	Raw meal : clinker ratio	t / t cli	Default = 1.55; can be adjusted
	TOC content of raw meal	%	Default = 0.2%; can be adjusted
<b>CO<sub>2</sub> from fuel combustion:</b>			
Conventional kiln fuels	Fuel consumption	t	Measured at plant level
	Lower heating value	GJ /t fuel	Measured at plant level
	Emission factor	t CO <sub>2</sub> /GJ fuel	IPCC / CSI defaults, or measured
Alternative fossil fuels (fossil AF)	Fuel consumption	t	Measured at plant level
	Lower heating value	GJ /t fuel	Measured at plant level
	Emission factor	t CO <sub>2</sub> /GJ fuel	CSI defaults, or measured
Biomass fuels (biomass AF)	Fuel consumption	t	Measured at plant level
	Lower heating value	GJ /t fuel	Measured at plant level
	Emission factor	t CO <sub>2</sub> /GJ fuel	IPCC / CSI defaults, or measured
Non-kiln fuels	Fuel consumption	t	Measured at plant level
	Lower heating value	GJ /t fuel	PCC / CSI defaults, or measured
	Emission factor	t CO <sub>2</sub> /GJ fuel	IPCC / CSI defaults, or measured
Wastewater combusted	--	--	Quantification of CO <sub>2</sub> not required

t = metric tonne, AF = Alternative fuels, cli = clinker, TOC = Total organic carbon

Parameters and proposed data sources for calculation of indirect CO<sub>2</sub> emissions as required in the CSI Cement CO<sub>2</sub> emission protocol.

Emission	Parameters	Units	Source of parameters
CO <sub>2</sub> from external power production (indirect emission)	Power consumption Emission factor excl. T&D losses	GWh t CO <sub>2</sub> /GWh	Measured at plant level Supplier-specific value or country grid factor (see Appendix 2)
CO <sub>2</sub> from clinker bought (indirect emission)	Net clinker imports  Emission factor	t cli  t CO <sub>2</sub> /t cli	Measured at plant level (bought minus sold clinker)  Default factor = 862 kg CO <sub>2</sub> /t cli