Carbon Emissions Benchmarking for Public Sector Supply Chain Companies

by

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Abstract

The following dissertation uses an extensive literature review to develop a methodology with which to fulfill its main objective: to produce a carbon emissions benchmark or set of benchmarks for supply chain companies, which can be used to facilitate green procurement in the public sector.

The literature review covers such topics as environmental supply chain management, green procurement, public sector purchasing, emissions benchmarking, and greenhouse gas reporting.

The findings of this review were used to formulate a supplier questionnaire which along with a series of site visits, provided data which was input into a number of carbon dioxide emissions conversion tables as suggested by DEFRA (1999).

The suppliers targeted were those of Norfolk County Council, as they are currently funding a Supplier Support Scheme (SSS) at EcoTech in order to help its suppliers improve their energy efficiency. The SSS team at EcoTech provided valuable support in terms of resources and expertise in formulating the supplier questionnaire, and collecting the data.

During the research many hurdles were encountered, the greatest to do with the feasibility of collection of carbon emissions data from small to medium sized companies. The problems with data collection were compounded by lack of variation of received data. By far the largest response (and indeed only significant response) was from care homes. From this data a 'typical' and 'good practice' benchmark was established for emissions from both energy use and transport. Both these sets of benchmarks showed that there was a significant difference in levels of emissions between 'typical' care homes and those employing 'good practice'.

Due to small sample size, nature of the data, and assumptions made within the benchmarking process, it was concluded that the eventual benchmarks were of limited value unless used as guidance when procuring care home services specifically.

However, this research did reveal the problems that one can expect to encounter when benchmarking emissions from smaller companies and highlighted many solutions and new avenues that might be explored in further research.
Acknowledgements

I would like to thank Elaine Colk for her guidance and comments on earlier drafts of this dissertation and particularly for her help when securing contacts. Thanks also to Dr Simon Gerrard and Dr Keith Tovey, both of whom provided me with useful links for information regarding carbon emissions auditing.

This dissertation would not have been feasible without the support of all of the EcoTech team based in Swaffham, who helped in the formulation of the questionnaire and the logistics involved in its sending and return. Particular thanks must be attributed to Simon Best, Aisa Nebreda, and Marie Beech of the Supplier Support Scheme, who facilitated and accompanied me on a number of site visits.
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Chapter 1 - 'Beyond the Factory Gates': A Review of the Literature Surrounding Environmental Supply Chain Management and Green Procurement.

1.1 Introduction

As the environment has become an increasingly important issue to business, there has been a corresponding rise in the use of environmental management tools (O'Laoire et al., 1998). These tools have been mainly involved with 'in-house' improvement (Foster et al., 2001). However, 'having put their own house in order' with the installation of an Environmental Management System (EMS), there is a growing trend for organisations to extend the parameters of these EMS's outside the factory gates and into their supply chain networks (Foster et al., 2001).

This extension of responsibility has given rise to the concept of Environmental Supply Chain Management (ESCM). Organisations have for some time engaged in a tendering process when recruiting new suppliers or subcontractors. This traditionally centers on issues concerning quality and cost (Hill, 1997). However, increasingly customers are considering the environmental and socio-economic characteristics of suppliers and their products (Hill, 1997). This is due to increased public awareness of these issues, and a fear of litigation as growing amounts of legislation comes into force concerning the environmental responsibilities of business (O'Laoire et al., 1998). ESCM can be pursued from several directions: via liaison with suppliers in order to help them improve environmental performance, green procurement, or a mixture of the two. This research paper attempts to merge the two approaches by making a set of benchmarks, which suppliers can access to monitor their own performance; and public sector organisations can use to compare suppliers environmental performance during procurement decision making.

Extending environmental management into the supply chain via the use of 'green procurement', is where the organisation as a customer, takes account of environmental factors when deciding on which suppliers to use (Morton, 2002). Public sector procurement accounts for 14% of GDP in the EU as a whole (ICLEI, 2001a), and as such there is increasing pressure on governments to act from various EC Directives and Public Procurement Rules. The major acts of relevant legislation can be seen in table 1 below provided by the HMSO's statutory instruments site:

<table>
<thead>
<tr>
<th>EU PROCURMENT DIRECTIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Supplies Directive 93/36/EC as amended by Directive 97/52/EC</td>
</tr>
<tr>
<td>The Services Directive 92/50/EC as amended by Directive 97/52/EC</td>
</tr>
<tr>
<td>The Public Sector Remedies Directive 89/665/EC as amended by Directive 97/52/EC</td>
</tr>
<tr>
<td>The Utilities Remedies Directive 92/13/EC</td>
</tr>
</tbody>
</table>

Table 1 showing EC Directives relating to Public Procurement taken from http://www.hmso.gov.uk/stat.htm.

In the UK, the DTiR has requested that local authorities promote green procurement (ENDS 318, 2001), and one such council aiming to comply is Norfolk County Council (NCC). This dissertation aims to audit several organisations involved in the NCC’s supply chain in terms of their carbon usage. Best-practice in this field will then be derived from a selection of case study suppliers (of NCC), and benchmarks established. These benchmarks could then be used by the NCC and other local authorities to assess potential supplier's carbon footprints in an effort to promote green procurement. This research also hopes to illustrate some of the potential problems associated not only with measuring carbon emissions but also those issues that surround data collection for any supplier benchmark, particularly for smaller organisations.

Carbon usage is important as it is frequently emitted in its gaseous form (Carbon Dioxide), which is a major proponent of global warming. International targets for Carbon Dioxide reduction have been set in the Kyoto Treaty (1997), and the UK government has stated that at a national level: 'Carbon Dioxide emissions relative to economic output will have to be cut ten-fold and beyond if dangerous climate change is to be avoided' (ENDS 292, 1999). Dangerous climate change involves a change in temperature and weather conditions, which is likely to directly or indirectly cause hardship or even loss of life to a significant number of people.

1.2 Objectives:

The primary objective of this dissertation is to produce a carbon emissions benchmark or set of benchmarks for supply chain companies, which can be used to facilitate green procurement in the public sector.

This objective will be fulfilled by achieving a number of aims:

1. Using literature review and government guidelines to establish a method of carbon auditing for supply chain companies.

2. Using this methodology, carry out carbon audits on a selection of public sector supply companies.

3. Select 'best practice' criteria from case studies to create a benchmark.

4. Examine the viability of these benchmarks and suggest possible outlets for future study.
1.3 Environmental Supply Chain Management (ESCM) - Benefits and Hurdles

The following section provides a brief discussion of how ESCM is already tackled, and why it is important for companies to start examining their supply chains. This leads onto an analysis of the benefits of green procurement. The feasibility of carbon auditing for helping to establish 'carbon benchmarks' to be used as a tool in green procurement is then assessed.

Many organisations have, or are in the process of adopting Environmental Management Systems (EMS's) in order to provide a framework within which to implement their environmental policy, objectives, and targets. The British Standards Institute (1994) provides a definition for an EMS, 'the organization structure, responsibilities, practices, procedures, processes and resources for determining and implementing environmental policy'.

From this definition it would perhaps seems reasonable to assume that an EMS would cover issues like green procurement and the greening of the supply chain. However, many environmental policies despite including a provision for external communication, are unspecific about how exactly supply chain issues should be tackled. One of the main EMS standards adopted is that of ISO14001, however there is a lack of guidance on green procurement and supply chain issues throughout the standard and its associated guidelines (Netherwood, 1998). Within ISO14001, the most relevant documentation is referring to Life Cycle Assessment (LCA)(ISO14040 series). This documentation attempts to look at the environmental impacts surrounding products and processes, not just in house, but from conception of raw material to decommissioning - and therefore including (in small part) the impacts of suppliers and subcontractors.

Previously, 'competitive and regulatory pressures' have provided the impetus for carrying out LCA (ENDS 264, 1997). By tracking material and energy flows and transformations from raw material acquisition to the ultimate fate of the finished product, one can mitigate against any potentially damaging breaches in legislation associated with a product (Keoleian et al., 1993). However, more recently, the real environmental value of LCA has begun to be realised and there appears to have been a large rise in the use of LCA to improve the environmental performance of processes (ENDS 288,1999). By processes, one can infer that this refers to the environmental performance of suppliers (and indeed all organisations involved within the chain). In this way LCA can be used to not only suggest improvements that suppliers could make, but also for assessing which products are 'greener', and therefore aiding green procurement.

However, Life Cycle Assessment is an extensive process and can be very time consuming for an organisation that may order several thousands of different products from different suppliers. Therefore many companies have adopted a strategy for helping to improve their existing suppliers environmental performance. This is commonly done by screening suppliers for environmental performance and providing training to build supplier environmental management capacity (Lippmann, 1999).
Companies have found that this type of approach not only results in environmental benefits, but can also enhance quality of product, raise productivity, and reduce risk of supply chain interruption or damage to reputation (Lippmann, 1999). However, Ballou et al. (2000), suggest that although the benefits of such an approach may be easy to identify, realising them is much harder. The management tools required are relatively new, and in some cases flawed. Schemes like Project Acorn, a government sponsored programme to help small and medium enterprises (SME's) gain ISO14001 certification by bringing together larger companies to act as 'mentors' for their SME suppliers, have met with limited success. Indeed, only 19 SME's were recruited within its first 18 months of operation (out of a target of 250 in two years) (ENDS 320, 2001).

Sectoral initiatives have sometimes been more successful, an example of which is CIRIA (Construction Industry Research and Information Association) which has more than 500 corporate members. CIRIA is a not for profit organisation focusing on improving the environmental performance of construction companies via a combination of training events, seminars and conferences, in-house consultancy and discussion groups (CIRIA, 2003)\(^2\).

However, although CIRIA and other sectoral and regional initiatives have had some success, many customer organisations are increasingly using green procurement as an effective way of contracting 'best environmental practice' suppliers at an early stage; and so reducing the amount of environmental monitoring and mitigation needed at a later date (Gascoigne, 2002).

1.4 Green Procurement and Public Sector Purchasing

Hill (1997) suggests that the integration of environmental issues into purchasing is still in its infancy even though 'customer demands are seen as economically vital'. This is perhaps why green procurement is described by Green et al. (1996) as one of 'the most fertile areas of research for those concerned with the 'environmental' transformation of industrial economies'. Indeed, in many companies purchasing accounts for 50% of all expenditure (Kraljic, 1983). Procurement clearly has great scope to be an influential tool in the greening of supply chains, as consumer pressure joins legislation and stakeholder influence as a motivation for change (Green et al., 1996).

This importance has been recognised to some extent in the UK. As a result the government founded Business in the Environment group (BIE), who, in collaboration with the Chartered Institute of Purchasing and Supply (CIPS) created the 'Buying into the Environment' initiative - helping organisations incorporate environmental issues into their procurement policies (BIE, 1995).

This dissertation aims to facilitate the integration of environmental issues into purchasing via the formation benchmark tools that could be used to compare companies.

\(^2\) CIRIA (2003), 'Research, Best Practice and Implementation' (WWW), CIRIA: UK, http://www.ciria.org/about.htm, accessed 30/06/03.
One area of considerable purchasing activity identified by the International Council for Local Environmental Initiatives (ICLEI) was the public sector (Morton, 2002). However, within the UK, public sector uptake of green procurement had been described by the Panel on Sustainable Development, as 'disappointing', and little of the £40 billion spent in procurement per year was being used to influence environmental performance among its suppliers (ENDS 273, 1997). More recently, at a local level, survey's have revealed that although most authorities (84%) include green procurement criteria within their policies, these are often not followed (ENDS 318, 2001). Under the Local Government Act 1999, councils were committed to achieving 'Best Value' in all their operations, however, consideration of environmental value within this appears to be less than adequate (ENDS 318, 2001). Public sector procurement therefore, seems a viable area within which to create and utilize any proposed benchmarking tool.

Figure 1: Showing the steps taken during a procurement action, and element where benchmarking criteria could be applied (adapted from Foster et al., 2001).

Figure 1, illustrates a staged approach that may be taken during the tendering process and suggests that logical places to apply any benchmarking process would be at the 'supplier approval and qualification stage'. During 'contract review'; monitoring of the supplier could be carried out, and the results again
assessed against the benchmark. This cyclical process could occur annually, and so ensuring environmental requirements are kept up to date with new legislation and government public procurement requirements.

1.5 What is Emissions Benchmarking?

It is important at this point to understand what exactly is meant by a 'benchmark' in the context of carbon emissions. A carbon dioxide emissions benchmark for suppliers aims to provide representative values against which one can compare a supplier organisation. For instance, concerning energy use on premises, a comparison with the benchmark of annual carbon emissions per square meter of treated floor space, will enable emissions efficiency to be assessed and mitigation to be carried out. For the purpose of this dissertation the benchmark values are derived from surveys of a significant number of suppliers through questionnaires and site visits.

There are a number of different benchmarking methodologies that might be applied to carbon emissions benchmarking: Action Energy's guide to energy use in offices (2003) demonstrates the different levels of benchmark that can be useful. A 'typical' carbon emissions benchmark takes the median value of each set of results collected from surveying suppliers. Whilst a 'good practice' benchmark uses the data from organisations who have cut carbon emissions to a significantly lower rate (the lower quartile of data collected) using widely available and feasible techniques. The data to be used in the formulation of benchmarks is often collated in such a way so as to produce 'performance indices'. These will normally involve cost/performance assessment (£/number of staff) or annual energy consumption/treated floor space (Action Energy, 2002).

The DETR advocates the use of yardsticks within benchmarks. Yardsticks indicate not just one benchmark value but low, medium and high emission/consumption rates, which are not fixed (figure 2):

![Figure 2: Showing the use of yardsticks within a benchmark as advocated by the DETR.](image-url)
These yardsticks indicate potential for improvements and can illustrate progress over time. Using yardsticks is a more illustrated method but perhaps open to abuse as it may be assumed that medium emissions (anywhere within the yardsticks) is an acceptable level of emissions. Which methodology to use in this particular case is analysed further in Chapter 2. However, questions remain as to the robustness of any benchmark adapted from these methodologies, when taking into account the likely level of simplicity any data collected for this research. Chapter 3 examines what possible further measures might be taken to increase the viability of any benchmark, and whether these are feasible in the context of this research.

1.6 The Case for GHG Emissions Reporting and Benchmarking

Greenhouse gases (GHG’s), of which carbon dioxide is the major component, form a blanket in the atmosphere, which impedes the release of infrared photons from the atmosphere; leading to an increase in air temperature (Jepma et al., 1998). This rise in temperature could have a number of adverse impacts on our environment and society, including those associated with sea level rise, desertification, and increased frequency of extreme weather events.

As a consequence the United Nations ratified the Kyoto Treaty in 1997 which set member nations GHG emissions targets. In order to facilitate this process the Inter-governmental Panel on Climate Change (IPCC) established guidelines concerning national level GHG accounting (ISO/TMB AHGCC, 2002). At present, there exists no internationally accepted standard for measuring GHG’s at the sub-national level. However, the Ad Hoc Group on Climate Change (2002) suggests a number of reasons why corporations and governments should be interested in quantifying sub-national emissions, including a suggestion of a domestic emissions trading system, and the establishment of baselines and benchmarks (the latter of which, this research hopes to tackle). The importance of this topic is reflected in the recent formulation of an extra guideline within the ISO14000 series by the International Standards Organisation (ISO): ISO/AWI 14064 'Guidelines for measuring, reporting and verifying entity project-level greenhouse gas emissions'.

The UK government is committed to taking action on climate change and has proposed a reduction in emissions of 23% below 1990 levels by 2010 (almost double the Kyoto target) (DEFRA, 1999). To do this it has established the UK climate change programme, and as part of this programme central government has devolved a certain amount of responsibility to cut GHG emissions to local authorities - an issue which this dissertation will explore and suggest ways to monitor/control (through benchmarking).

One could assess many different criteria within supply chains, however, one issue of particular concern recently is that of global warming. Most activities in an organisation lead to carbon use in one form or another. The electricity and fuel that a company uses is likely to have come from fossil fuel reserves (directly or indirectly). Transport uses yet more fossil fuels, and even the products that an organisation may use in its everyday running will involve carbon use from the extraction of raw materials; the distribution of component parts/end product; and the production of the product itself. In disposal, the product releases this
carbon as carbon dioxide, a greenhouse gas (Lunine, 1999). One can therefore see that carbon use is intrinsic to almost every process within every company, making the measuring and control of such usage extremely important in the environmental performance of each organisation.

Definitions for carbon accounting are hard to find, although methodologies are becoming increasingly more numerous. Essentially it involves identifying all relevant GHG emissions generated along a company’s value chain (WBSCD, 1988). Carbon dioxide is the main indicator gas for GHG emissions and as such is the substance focused on in study. DEFRA, UNEP, ISO (International Standardisation Organisation), and the WBSCD, have all published similar guidelines on how to carry out carbon accounting within an organisation. The methods described are mostly easy to accomplish, and the data able to be derived from existing sources within the organisation. This data is then subject to several normalisation and conversion factors, in order to make the final derived carbon usage, comparable (see Chapter 2). Carbon accounting can cover all aspects of an organisation, including carbon usage from transport, energy use, process emissions, waste and indirect emissions (DEFRA, 1999).

As discussed, carbon use is inevitable in the running of any organisation, and the reduction of carbon dioxide emissions is currently an issue gaining considerable interest at both national and international levels. Therefore carbon accounting is quick becoming an important component of environmental management and hence is an appropriate issue to benchmark and compare when pursuing a green procurement policy.

This brief literature review has established three major conclusions: the public sector as being a key purchaser; the recent increase in awareness concerning carbon dioxide emissions; and the growth in interest around environmental supply chain management. A dissertation involving the formulation of a carbon emissions benchmark for use by local government in facilitating green procurement therefore holds significant value.

1.7 Norfolk County Council (NCC) Strategy

The subjects of this study are the suppliers and subcontractors of Norfolk County Council. The NCC has undertaken a number of objectives relating to best practice purchasing which were presented at a seminar on the subject on the 29th January 2003. The key points relating to this dissertation are as follows:

The council will -

- Promote the determination of suppliers’ environmental credentials through the appraisal process where appropriate.
- Ensure, where appropriate, that environmentally preferable procurement is specified in the award of contracts.
• Consider 'whole life' costs when procurement decisions are made, including non-quantifiable environmental impacts, impact of disposal and opportunities for recycling.
• Carry out an environmental assessment of the Council's major suppliers.
• Comply with all National and European purchasing legislation.

To carry out these objectives the NCC has developed a Purchasing Strategy also presented at the seminar. The strategy outlines several courses of action, one of which was to 'identify suppliers who are potentially the best providers of given services on their merits, resulting in the creation of a mixed economy of service provision'. This identification of suppliers via merit, provides an opportunity for benchmarking the different aspects of the organisation, and as stated in the aims, environmentally preferable procurement can be a deciding factor.

Norfolk County Council has recently gained ISO14001 certification and as such must make moves to extend continual environmental improvement into its supply chain. This is reflected in the NCC's Environmental Policy (2001), where the council pledges to 'consider the environmental impacts when decisions are taken on the purchasing of goods and services and engage with suppliers and contractors to encourage them to adopt environmentally responsible business practice'.

Carbon usage is an important environmental characteristic, and this fact, coupled with the demands of legislation, make carbon accounting a logical inclusion within the purchasing strategy.

The primary objective of this dissertation is to produce a carbon emissions benchmark for supply chain companies, which can be used to facilitate green procurement in the public sector.

This review of literature surrounding the issues of carbon emissions, green procurement and environmental supply chain management has established the importance of carbon emission monitoring. Further to this, it has enabled the formulation of a methodology (See Chapter 2), with which an organisations carbon emissions can be measured.

After the results have been collated, a benchmark can then be formed and its robustness assessed (Chapter 3), thus satisfying aims 3 and 4 in the fulfillment of the overall objective of this dissertation.
Chapter 2 - A Description and Justification of Methodologies Used When Formulating the Carbon Emissions Benchmarks.

The objectives of this project were fulfilled in three main ways, the results of which were assimilated and analysed in order to form the 'best practice' carbon usage benchmarks:

- Literature Review.
- Questionnaire.
- Site visits in conjunction with checklist.

The following section will describe how each method was carried out, and for what purpose.

2.1 Literature Review

A review of relevant literature was carried out to not only gain an understanding of the issues surrounding the dissertation topic, but also for the main purpose of identifying which characteristics of an organisation's carbon usage should be tackled when formulating the proposed benchmarks. To do this, one first had to establish the full range of possible uses of carbon, and also all the ways in which an organisation might emit carbon dioxide.

The topics headings under which investigation of literature was carried out, are listed below:

- Procurement, including public sector procurement and green procurement.
- Life cycle assessment (LCA).
- Environmental supply chain management (ESCM).
- Carbon usage, including the effects of climate change and related legislation/guidance.
- Carbon Dioxide emissions reporting.
- Norfolk County Council purchasing policy.

The results of this literature review are presented in part within Chapter 1, but also contribute directly to the methodology choice and the benchmarking process itself.

2.2 Questionnaire and the Reasons for Choice of Data Collated

The data for this dissertation has been accumulated with the co-operation of the Supplier Support Scheme (SSS) run by EcoTech, on behalf of Norfolk County Council (NCC). The ultimate aim of the SSS is to help the NCC's suppliers pursue environmental improvement in line with new public sector procurement laws
currently being reviewed to encourage sustainable business practices. The focus of the project is on encouraging resource efficiency, and in doing so, reducing costs and enhancing competitiveness. To enable this issue to be addressed the SSS first needs to establish company resource use baselines, and then best practice benchmarks. To this effect, an initial questionnaire tackling issues such as energy use, water use, transport emissions, and waste was formulated and sent to a cross section of the NCC's suppliers and service providers. The data collected by this questionnaire should contain all information needed to set the carbon usage benchmarks. However, to ensure this, regular contact and contributions were made to the compilation of the questionnaire so that all information needed regarding transport and energy use was included.

The questionnaire first asks for contact details of the company and most importantly the identification of a person responsible for liaison. The DEFRA (1999) reporting guidelines suggest that the identification of a 'greenhouse gas champion' is the first step to take when attempting to report on GHG's. This person should have the authority to collect data and draw up a strategy for managing and reporting on emissions, and should liaise with the relative consultative and statutory bodies.

A number of questions were asked to establish the characteristics of the organisation needed for normalisation of the results. Normalised factors are critical, as they screen out the noise created by differing turnovers, numbers of employees, floor space, and working hours; hence allowing comparisons to be made (James and Bennett, 1999).

For normalisation, eight denominators were chosen to take into account when collating data with regard to GHG emissions:

- Company's core business activities.
- Approximate annual turnover (£/yr).
- Annual output in tonnes (if applicable).
- Companies working pattern (does company operate 9 to 5, five days per week, or do they undertake late working, shiftwork, or 24 hour operation).
- Total floor space (m$^2$ or sq/ft).
- Approximate age of buildings (the age of the majority of buildings on site).
- Number of full time staff (or fulltime equivalent).
- Healthcare sector only - number of beds (included due to large number of nursing homes listed as service providers to the NCC).
These questions are followed by seven general questions on the environmental and staff commitments of the organisation (Section 1). The seven questions are shown below:

1. Is your company accredited to Investors in People?   
2. Does your company have a formal staff development programme?   
3. Do you have a written Environmental Policy?   
4. Have you ascertained your company's significant issues through an Initial Environmental Review?   
5. Is your company committed to any annual environmental targets?   
6. Has your company implemented an Environmental Management System (EMS)?   
7. If you answered "Yes" to the question above, has it been certified to either of the Standards EMAS or ISO14001?

These questions are designed to add transparency to the later results, and assist in the formulation of the benchmark. By assessing the current level of commitment to environmental issues within the supplier companies, a good-practice level can be prescribed during the benchmarking process.

The following table (2) shows the number of energy resource issues considered for this dissertation, and those actually selected for inclusion within the questionnaire. An explanation of the reasons for the following choices is included shortly after the table.

<table>
<thead>
<tr>
<th>Type of Energy Resource Usage</th>
<th>Questionnaire?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Use</td>
<td>Yes</td>
</tr>
<tr>
<td>This could be via grid electricity, gas, oil, or coal. Used to provide heating, lighting, and mains electricity.</td>
<td></td>
</tr>
</tbody>
</table>

| Emissions from Waste         | No             |
| Waste when sent to landfill or incineration produces large amounts of Carbon Dioxide and Methane (amongst other gases). Large amounts of waste can also mean large amounts of raw material usage which (particularly in the case of wood products) could have great implication for carbon usage. Hence both amounts of waste, and amounts of recycling are relevant. |

| Emissions from Transport     | Yes            |
| Most forms of transport will use fuel in some form or another, and most fuels will release carbon (in differing amounts) when combusted. An organisation may want to count transport used for sending out finished goods, importing raw materials, company vehicles, and staff vehicles. |

| Process Emissions            | No             |
| The carbon used during the manufacturing of a product or provision of a service. This would be particularly relevant for manufacturing sector companies. Emissions would vary hugely between sectors, and there may also be some overlap with the energy use category. |
Indirect Emissions

Any one organisation may have many indirect emission sources, some of which may not at first be obvious. These can range from product use - if a company manufactures a product that uses significant carbon in its running - these may be attributed to the manufacturer. Emissions caused during the mining and transportation of the raw materials used for the product, and emissions caused by the disposal and transportation of the product at the end of its working life. Outsourcing, franchises, and building construction may all involve emissions not directly considered when looking at a particular organisation. One factor overlooked is the carbon used within the actual building materials for an organisation’s premise, along with the materials used in construction equipment and furniture. Although this carbon is not directly emitted; being stored in this dormant state, carbon usage could be calculated via the potential sequestration rates of any wood used in building/equipment/furniture construction. Carbon will also be eventually released when this material falls into disuse and is allowed to decompose.

Fugitive Emissions

Intentional or accidental releases via spills and leaks.

Table 2 formed from information provided from the WBCSD (1988) guidelines into identifying and calculating GHG emissions.

As this table shows, the two resource issues chosen to be measured via the questionnaire for benchmarking purposes were 'energy use' and 'emissions from transport'. The ability of companies to answer the questionnaire affected the decision about what to include within it. Many supplier companies have limited resources, indeed most are Small to Medium Enterprises (SME’s) with less than 250 employers and downwards of £2 million annual turnover. The environment is often not the highest priority on their agenda, and so the lack of time, money, skills, and technology often mean no environmental initiatives are pursued (Gascoigne, 2002). The NCC however, has a commitment to greening its supply chain, and so most supplier companies are increasingly motivated by the competitive advantage gained by environmental improvement.

It is important to recognise the barriers faced by these smaller companies and provide assistance wherever possible along with setting feasible boundaries. By targeting resource use it becomes easier to explain to supplier organisations the monetary advantages that could be gained alongside the environmental benefits. Bearing this in mind, any data requirements should be easy to collate with minimum resource commitment; confidential; and provide a solid base upon which future resource efficiency can be founded.

The energy use section of questionnaire (section 2), asks for supplier names, fuel type, annual units used, and total annual cost, all of which should be easily obtainable from fuel bills covering the previous 12 months. This information could be filled in on the questionnaire, or returned in electronic format. Organisations were also given the option of sending in copies of energy bills so that it could be entered for them.
The emissions from transport section (section 4), obtains the carbon usage by asking for total units of fuel
(various types of fuel are given) used annually, or the total annual spend of an organisation on its fuel. This
information is normally logged by an organisation and hence should not be hard to collate. In addition, each
organisation was asked the type of vehicles that they lease or own and the total number; along with the
rough percentage of staff that use their own vehicles for work purposes each day.
Three questions also tackle the issues of implementation of green travel plans, and fleet management
strategies, along with route planning. These questions are phrased in a simple yes/no/unsure format.

Emissions from waste was carefully considered, taking into account various guidelines including those of
DEFRA (2000) which indicate two main tasks to waste reporting. First an organisation must identify the
types of waste that it produces, and then measure these waste streams. However, identifying types of waste
is not straightforward (unlike identifying types of fuel used for energy and transport), and this is illustrated
by Annex 2 in the DEFRA Environmental Reporting Guidelines for Waste (2000), which shows the huge
the array of different materials that can be classed as 'important' waste streams for individual sectors. This
waste is mainly processing waste, and the measuring of waste becomes even harder to make comprehensive
when one starts to consider waste produced by workers on site (non-industrial), decommissioned industrial
equipment, defunct IT/electrical equipment, stationary, and building materials. This does not include
specialist wastes defined in the 1996 Special Waste Regulations that are dealt with in a different manner to
other wastes.
Different waste streams will contain different amounts of carbon, and hence an average emission of carbon
to atmosphere per tonne of waste is likely to be inaccurate.
The method of disposal is also important, with recycling, incineration, and landfill all having different
repercussions upon the environment. Hence the exact waste being dealt with by each method must be
recorded.

Organisations must also provide information upon the sources of some of their raw materials. To take the
example of office paper and furniture: some wood product may be taken from afforested regions, some
having been actually recycled, whilst others may be from a more 'finite' source (such as tropical
hardwoods). All these factors will affect carbon sequestration rates as well as carbon emissions, and are
therefore crucial when estimating an organisations net carbon usage.

Taking all these factors into account it was decided that although emissions from waste is undoubtedly very
important, it would perhaps be better tackled when the supplier organisations were at a higher level of
environmental understanding and commitment.
The subject of process emissions was also considered taking into account the DEFRA (1999) Company Reporting and GHG Emissions guidelines. The major problem encountered almost immediately is the diverse range of suppliers and service providers that the NCC uses. These range from care homes to energy providers (using coal burning power stations), to courier companies. The carbon usage of these companies will not only vary greatly in amount, but also, many industries (chemical and manufacturing) may produce large amounts of different carbon compounds. These compounds may differ in carbon content, and toxicity, thus making the individual impact of each organisation difficult to compare with another.

The DEFRA (1999) guidelines attempt to cluster these process emissions into six main categories:
- Carbon Dioxide
- Methane
- Nitrous Oxides*
- Perfluorocarbons (PFC's)
- Sulphur Hexafluoride
- Hydrofluorocarbons (HFC's)

*Nitrous Oxides although having no carbon content, are thought to contribute to several polluting processes and to play a role in climate change.

The effectiveness of this categorisation is limited as there are many different types of HFC's and PFC's all with differing effects.

Many organisations, particularly those in manufacturing and power production will probably have records of these emissions (as required by controlling authorities), but a similar amount may have no idea (as their emissions may never rise to near legislative levels). The identification and measuring of these emissions is not simple and would require expertise that may be beyond the resource capacity of many suppliers. Further to this, the results would need to be segregated into different sectors. This would be detrimental to achieving the aim of producing a final set of benchmarks that would be simple and encompass all the NCC suppliers.

Process emissions will be important when considering some suppliers, but less so with others. However, the expertise required and the need for sector separation means that these emissions should perhaps be considered for further research rather than within the remit of this particular dissertation.

Several indirect emissions were investigated but none included within the questionnaire beyond those emissions incurred during transport of materials to and from the organisation via vehicles owned or leased by that particular organisation. These indirect carbon usage's can be as diverse as the emissions caused by the extraction of a raw material that is used in some form in one of a companies products, to the furniture
and stationary that the organisation owns. The inclusion of furniture or materials used in the building of premises may seem pedantic particularly as the carbon is not actually being emitted, however when estimating the value of carbon sinks and flows of carbon into and from the atmosphere, these stores of carbon are important. This issue is highlighted by Houghton (2002), who saw 'models over-estimating sinks' due to the exclusion of carbon emissions from products removed from the forest.

All these indirect effects tend to be product related and as such, comprehensive life-cycle assessments would be needed to establish the approximate emissions due to each particular product or service. This type of investigation will require expertise unlikely to be found within most supplier companies, and beyond the resources of many to acquire.

The final category considered was that of fugitive and accidental emissions. Emissions of this type have the potential to be large (again depending on the nature of the organisation), however, they tend to be random, and as such they may be hard to measure. It is even harder to establish an average carbon usage from these events. Added to this is the reluctance of many organisations to release information on fugitive emissions fearing negative public and legislative exposure. Some companies may have accident reporting systems in place as an integral part of their EMS. However, due to the limited resources of many of the suppliers concerned, often no such EMS is in place. Indeed, provisions for accidents and emergencies are often omitted from many organisation's environmental policies (personal communication within lecture, Elaine Colk, 02/03).

Different sectors will have different risk levels for fugitive emissions (and these releases may be likely to be larger or smaller depending upon sector), and hence there may well be a need to classify these emissions into different sectors.

The difficulty in measuring fugitive and accidental emissions along with need for separation into sectors for carbon usage due to these events, means that for the purpose of this dissertation, fugitive emissions will be excluded.

The data to be collected is defined by DEFRA in its Environmental Reporting: Guidelines for Company Reporting and Greenhouse Gas Emissions (1999) and the advised conversion factors then used. The reasons of the use of this particular set of guidelines and conversion factors are as follows: the electricity generation factors used within this guidance are in line with the figures to be used in Climate Change Levy Agreements and any future Emissions Trading Scheme. Also, the data to be collected and the consequent conversion factors are also suggested in the following items of guidance, lending the DEFRA guidelines further credibility:


The following section demonstrates how exactly the data is to be collected within the questionnaire, and which conversion factors are then to be applied:

Information about energy use will be collected in the table (3) below:

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Name of supplier</th>
<th>Annual standing charge</th>
<th>Annual Units Used</th>
<th>Total annual cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Natural gas</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas or diesel oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Heavy fuel oil</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Green electricity</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coking coal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The crucial information in this table is the annual units used. The information in this column will be input into the following fuel conversion factor table (4) as suggested by DEFRA (1999) - Annex 1:

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Amount used per year</th>
<th>Units</th>
<th>x</th>
<th>Kg CO2 per unit</th>
<th>Total kg CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid electricity</td>
<td>kWh</td>
<td>x</td>
<td></td>
<td>0.43</td>
<td></td>
</tr>
<tr>
<td>Natural gas</td>
<td>kWh</td>
<td>x</td>
<td></td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td></td>
<td>therms</td>
<td>x</td>
<td></td>
<td>5.50</td>
<td>3142</td>
</tr>
<tr>
<td></td>
<td>tonnes</td>
<td>x</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gas or diesel oil</td>
<td>kWh</td>
<td>x</td>
<td></td>
<td>0.25</td>
<td></td>
</tr>
<tr>
<td></td>
<td>litres</td>
<td>x</td>
<td></td>
<td>2.68</td>
<td></td>
</tr>
<tr>
<td>Heavy fuel oil</td>
<td>tonnes</td>
<td>x</td>
<td></td>
<td>3117</td>
<td></td>
</tr>
<tr>
<td></td>
<td>kWh</td>
<td>x</td>
<td></td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>Green electricity</td>
<td>N/A</td>
<td>x</td>
<td></td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Coking coal</td>
<td>tonnes</td>
<td>x</td>
<td></td>
<td>2603</td>
<td></td>
</tr>
<tr>
<td></td>
<td>kWh</td>
<td>x</td>
<td></td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Coal</td>
<td>tonnes</td>
<td>x</td>
<td></td>
<td>2419</td>
<td></td>
</tr>
<tr>
<td></td>
<td>kWh</td>
<td>x</td>
<td></td>
<td>0.30</td>
<td></td>
</tr>
<tr>
<td>Others*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aggregate total emissions from energy use =

*Conversion factors for several other types of fuel are indicated by the guidelines including:
• Petrol
• Liquid Petroleum Gas (LPG)
• Jet Kerosene
• Ethane
• Naphtha
• White lubricants
• Petroleum coke
• Refinery gas
• Other oil products

The conversion factor for green electricity or renewable energy is set at zero as long as the source has been certified by OFGEM.

The collected data combined with these conversion factors should provide an accurate total carbon dioxide emissions value from energy use for each supplier.

The issue of emissions from transport will be tackled in a similar fashion using a table (5) in addition to some further questions:

<table>
<thead>
<tr>
<th>Fuel Used</th>
<th>Total units used annually Please state litres of kilos</th>
<th>OR</th>
<th>Total annual spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>Including low sulphur diesel</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>LPG</td>
<td>(Liquid Petroleum Gas)</td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>CNG</td>
<td>(Compressed Natural Gas)</td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>(please specify)</td>
<td>£</td>
<td></td>
</tr>
</tbody>
</table>

If the column requesting the total units used annually is filled out, the results can be directly input into the DEFRA (1999) conversion tables (see below). However, if it is only possible for a supplier to reveal their total annual expenditure on fuel, additional calculations must be taken to establish the total units used annually:

1. To translate the amount of money spent into litres of fuel - divide the total spend on each type of fuel by the fuel price per litre. This price may vary from region to region, and from month to month. The Automobile Association (AA) publish information on monthly fuel prices on a region-by-region basis, and this information can be found upon their website (www.theaa.com/allaboutcars/fuel/index.html)³.

The prices per litre given appear to be a fairly accurate of representation of the average price in each region.

2. An average price per region for all twelve months of the year will be taken, and the total annual spend divided by that number - to get an approximation of total units used annually.

These results can then be fed into the following conversion table (6) suggested by DEFRA (1999) - Annex 6:

<table>
<thead>
<tr>
<th>Fuel Used</th>
<th>Total Units Used</th>
<th>Units</th>
<th>x</th>
<th>Kg CO2 per unit</th>
<th>Total kg CO2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td></td>
<td>litres</td>
<td>x</td>
<td>2.31</td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td></td>
<td>litres</td>
<td>x</td>
<td>2.68</td>
<td></td>
</tr>
<tr>
<td>Including low sulphur diesel</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LPG (Liquid Petroleum Gas)</td>
<td></td>
<td>litres</td>
<td>x</td>
<td>1.51</td>
<td></td>
</tr>
<tr>
<td>CNG (Compressed Natural Gas)</td>
<td></td>
<td>kg</td>
<td>x</td>
<td>2.67</td>
<td></td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Aggregate total emissions from transport =

The collected data combined with these conversion factors should provide a reasonably accurate total carbon dioxide emissions value from transport for each supplier.

In addition to this data, the questionnaire included some further questions designed to add transparency to these results (as some organisations will have larger emissions as a necessity, e.g. construction and delivery companies). The information derived from the questions will add value to any eventual benchmark.

The following questions were contained within the transport section of the questionnaire:

1) Please tick the boxes, below, to indicate which types of vehicles your company owns or leases:
   - None
   - Private car
   - Taxi
   - Minibus
   - Coach
   - Van
   - Panelvan
   - Rigid Lorry
   - Articulated
   - Other (please specify)

2) If your company owns or leases vehicles, please state the total number of vehicles

3) Roughly what percentage of staff use their own vehicles for work purposes each day? Yes No Unsure
   Please don't answer this if it's too difficult to quantify

4) Has your company implemented a green travel plan? Yes No Unsure

5) Have you implemented a green fleet management strategy? Yes No Unsure

6) Do you undertake route planning with the aim of reducing single trip journeys? Yes No Unsure
These questions are asked in order to establish the sort of vehicles that the organisation may use, and any efforts that the organisation might have established or be planning to lessen its transport emissions impacts. This information will be used in the derivation of the eventual benchmark. Travel by other means (train, ferry, aeroplane), are not included, as this would add a further level of complexity to answering the questionnaire and analysing the data. Unless hiring such transport wholly, it could be argued that the transport would be operational whether that particular company were using it or not, and hence the emissions from that transport might not be attributed to any one of the organisations using it. The DEFRA (1999) guidance does provide some information on how to collate emissions from air, rail travel, and shipping (Annex 6). However, these are approximations and for this study, the main cause of transport emissions: road travel, will be the only variable measured.

A full copy of the final questionnaire can be found as appendix 1. It should be noted that the questionnaire was carried out in conjunction with the SSS, and therefore information on water usage and waste has been requested in addition. For the purposes of this dissertation, only sections 1, 2, and 4 (covering general organisation characteristics, energy use, and transport) are relevant.

2.3 Site Visits Using Checklist

Two site visits were conducted in order to gain an idea of the problems that organisations face when compiling the information needed for the questionnaire. This will help ensure that the requirements of any eventual benchmark can be feasibly collected and also reveal some of the motivations for businesses to reduce their carbon usage. The checklist should help add value to the benchmarking process as it will highlight those areas that can realistically gain results, and those areas which companies may be more willing to improve.

Each section shall be targeted separately. The first section will examine the motivations for carrying out Initial Environmental Reviews and establishing Environmental Management Systems. The organisations enthusiasm towards EMS's will be gauged along with reasons why it may or may not be practicable. The aim of this section is to establish whether it is feasible to assess companies on the existence of an EMS, or willingness to develop one. The second section of the checklist will attempt to ascertain the ease (or not) with which companies found energy use data collection. This may enable the methodology to be adapted to become more user friendly if used in any future study. Section 2 will also explore organisations attitudes to different types of fuels (in order to establish the likelihood of any particular type of fuel suggested within the benchmark, being accepted). Section 3 is not directly relevant to this dissertation but attempts again to establish any difficulties in collecting waste data, and also reveal if the organisation has any specialist waste issues.
The feasibility of transport emissions data collection is analysed in the fourth section, along with the organisations attitude to alternative fuels or green transport strategies. Again this data will be used to ensure any requirements of the benchmark will be accepted and feasible to implement.

The following checklist (table 7) shall be carried out on all the site visits, in an informal interview with the environmental champion. The checklist should be carried out in an open style, so as to ensure flexibility between types of company, and to allow further investigation of any important issues that might arise:

<table>
<thead>
<tr>
<th>Section 1</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerning the Initial Environmental Review:</td>
<td></td>
</tr>
<tr>
<td>• How was it undertaken?</td>
<td></td>
</tr>
<tr>
<td>• What were the motivations? (to fulfill legislation, or EA advice?)</td>
<td></td>
</tr>
<tr>
<td>• Were all aspects investigated? Or just those deemed relevant? And how did they decide which were relevant?</td>
<td></td>
</tr>
<tr>
<td>Concerning EMS:</td>
<td></td>
</tr>
<tr>
<td>• If no, does the company have plans to implement an EMS?</td>
<td></td>
</tr>
<tr>
<td>• If yes, what are/were the motivations for implementing an EMS? (efficiency, environmental improvement, competitive advantage).</td>
<td></td>
</tr>
<tr>
<td>• How difficult did you find implementation? (resources - time/cost/expertise)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerning Energy Use:</td>
<td></td>
</tr>
<tr>
<td>• Did you find energy data usage easy to come by?</td>
<td></td>
</tr>
<tr>
<td>• Did you feel that the classifications were too broad or too narrow?</td>
<td></td>
</tr>
<tr>
<td>• Are you planning on the use of other types of energy? (LPG, CHP, etc)</td>
<td></td>
</tr>
<tr>
<td>• If not, are you interested in the use of other types energy?</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Section 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Concerning Waste:</td>
<td></td>
</tr>
<tr>
<td>• How was this waste information collected? Was it readily available from waste disposal contractors?</td>
<td></td>
</tr>
</tbody>
</table>
- If obligated under the Packaging Waste Regulations, why? (amount >50,000 tonnes, or because of specialist waste)

### Section 4

**Concerning Emissions from Transport:**
- Of the different types of vehicles identified that are leased or owned by company, do you have any idea of numbers, or, proportions of each?
- If not already answered, rough % of staff using own vehicles for work purposes each day?
- If unable to provide information on annual spend or units used of fuel, give option of mileage.
- Which method of information provision is easier?
- If 'other' fuels are used, what are these? The reasons for their use? (cut cost, cut carbon usage?) Has their use been a success?
- If organisation has not implemented a green travel plan, green fleet management strategy, or route planning; does it want to? (perhaps already in development?) If not, why not?

And finally:

**Were any particular difficulties encountered when collecting this data on carbon usage, particularly for Energy Use (Section 2) and Transport (Section 4)?**

---

### 2.4 The Benchmarking Process

This dissertation will utilise the method described by Action Energy (2003), of creating a 'typical' and 'good practice' benchmark so as to encourage companies to aim to be atypical and strive to reach the 'good practice' benchmark. The use of yardsticks was dismissed due to possibility that the system might be open to misinterpretation (as described in Chapter 1).

One aim of this research is to establish the amount of Carbon Dioxide emitted due to energy use and transport. Hence the performance indices which should be used to compare with the eventual benchmarks,
should be based on carbon dioxide emissions/ treated floor space or number of staff or no. of vehicles (the latter for the transport benchmark).

Taking the median value from all the collected data will reveal the 'typical' benchmark, whilst the 'good practice' benchmark will be formed by examining data from organisations who have cut carbon emissions to a significantly lower rate (the lower quartile of data collected) using widely available and feasible techniques. The questionnaire along with the site visit should enable the identification of those organisations making these emissions savings using BATNEEC's (Best Available Techniques Not Entailing Excessive Cost).

There will be two individual sets of benchmarks; one for transport and one for energy use. The proposed benchmarks are to be kept relatively simple to improve its usability, however in further study, more detailed benchmarks could be formulated in order to identify more precisely, particular areas within a company (whether by process or location) where emission rates are a problem.

This process as a whole will hopefully expose any flaws within the benchmarking process in terms of its methodology and feasibility. Any problems encountered will be useful within themselves as they should enable one to improve upon the benchmarking process in further studies.
Chapter 3 - Data Analysis and Discussion

The following chapter displays the data that was collected via the questionnaires and site visits. Once the data has been illustrated via a variety of graphs, the characteristics of the data will be analysed and any gaps within the data identified and accounted for. The discussion will then proceed to relate this data to the original objectives of the dissertation and establish the value of these results (and any possible further research).

3.1 Carbon Emissions Benchmarks Derived from Energy Data

Comprehensive energy results were received from ten companies all within the 'care home' sector. This was the only sector that provided adequate results from which a benchmark might be taken, and this reflects partly the data collection strategy of EcoTech (see section 3.5), and partly the large proportion of NCC supplier/subcontractor companies that are care homes. The energy data provided by these companies has been converted via the DEFRA (1999) conversion factors into total carbon emissions (kg) for firstly grid electricity usage (figure 3) and secondly, natural gas usage (figure 4):

![Figure 3, showing total kg CO2 emissions for grid electricity usage for 10 care homes.](image)
Figure 4, showing total kg CO2 emissions for natural gas usage for 10 care homes.

Figure 3 and 4, show a huge range in emissions from all the care homes. However, it is noticeable that companies 2, 5, and 7 have noticeably larger emissions than the other care homes. The results indicate that these three care homes have substantially more beds within their care and therefore it is perhaps useful to immediately normalise these results by converting them into performance indices.

As discussed within chapter 2, the original intention was to calculate these indices by dividing the total carbon emissions (kg) by the total floor space or number of staff. However, only two results were received for the total floor space of the care homes, compared to 7 results for number of full time staff, and 10 results for number of beds.

Site visits to two care homes revealed that many found it difficult to estimate total treated floor space due to irregular shape of the buildings and lack of structural information about their premises. Some difficulties were encountered when calculating number of full time staff, as the nature of care homes requires staff to be present on a shift system for varying hours (hence the term 'full time' will need to be defined in the future).

It was also noted that the number of staff may not accurately represent the total treated floor space within a care home, as a home caring for residents with special needs may employ more staff than a care home of a similar size catering for residents without special needs.

Therefore, it was decided that the number of beds that a care home caters for is perhaps the most accurate and feasible measure of indicating total treated floor space, and hence will be used to calculate the performance indices.
The following figures 5 and 6, shows the resultant performance indices for grid electricity usage and natural gas usage:

Figure 5, showing the resultant performance indices for grid electricity usage.

Figure 6, showing the resultant performance indices for natural gas usage.

Figure 5, now shows that emissions from grid electricity usage do not in fact vary as much from company to company as indicated in figure 3. Companies 2, 5, and 7 still show substantially larger emissions than the other care homes, and this perhaps indicates that energy use is not uniform, positively correlating to the number of beds, but in fact the relationship may be exponential. This is an area where further research is warranted, with the larger care homes (more than 50) beds perhaps being graded according to a separate set of benchmarks.

Figure 6 reveals that emissions from natural gas usage still vary from company to company, but not as noticeably as when the performance indices had not be calculated. There seems to be no relationship
between the size of the company and its emissions - perhaps reflecting the differing degrees of reliance on natural gas, which exists between care homes.

Company 8 has substantially smaller emissions than the other companies. This particular care home was indeed small, and more importantly was a day care home with no beds for residents. This may explain the decreased gas usage through the need for less heating and less treated floor space. On further inspection the results from the questionnaire show not only that the home is only operational from 9am-5pm, but also for only four days a week. This highlights another area of improvement that could be focused upon in further research: that of normalisation factors to take into account the different working hours of the companies, within the benchmarking system.

For this reason company 8 shall be disregarded when formulating the following benchmarks. Figure 7 shows the typical and good practice benchmarks for emissions from grid electricity, whilst figure 8 shows the same for emissions from natural gas usage. These two sets of benchmarks are then combined in figure 9 to make a total carbon emissions benchmark:

![Carbon Emissions Benchmarks for Grid Electricity Usage](image)

Figure 7, showing the typical and good practice benchmarks for emissions from grid electricity usage.

**Typical Benchmark for Carbon Emissions from Grid Electricity Usage (median value of data set):**

1066.9 kg CO2/bed (as shown by blue lines)

**Good Practice Benchmark for Carbon Emissions from Grid Electricity Usage (lower 25% quartile):**

953 kg CO2/bed (as shown by red lines)
Figure 8, showing the typical and good practice benchmarks for emissions for natural gas usage.

**Typical Benchmark for Carbon Emissions from Natural Gas Usage (median value of data set):**

2712.4 kg CO$_2$/bed (as shown by blue lines)

**Good Practice Benchmark for Carbon Emissions from Natural Gas Usage (lower 25% quartile):**

2370.825 kg CO$_2$/bed (as shown by red lines)

Figure 9, showing the typical and good practice benchmarks for total emissions due to energy usage.
Typical Benchmark for Carbon Emissions due to Energy Use (median value of data set):

4142.102 kg CO2/bed (as shown by blue lines)

Good Practice Benchmark for Carbon Emissions due to Energy Use (lower 25% quartile):

3630.475 kg CO2/bed (as shown by red lines)

To lend more value to this research, the questionnaires also collated data concerning the annual costs of energy. When these values are normalised by dividing the cost by the number of beds at each care home, one can compare the annual costs directly. The following figure 10 shows the annual energy costs for grid electricity and natural gas. It is possible that suppliers and service providers might find this information useful when choosing their own energy suppliers:

Figure 10 shows annual energy costs for each care home.

The mean annual cost of grid electricity/no. of beds: **119.9 £/bed.**

The mean annual cost of natural gas/no. of beds: **278.4 £/bed.**

Figure 10 shows that the cost of grid electricity can vary by up to £75 annually (per bed), whilst the cost of gas shows more striking variation. Again companies 2, and 5 show higher cost, which may be to do with another possible exponential relationship between number of beds and natural gas usage. Company 8, uses little natural gas, and therefore there is little cost; as discussed this may be to do with the shorter working hours which it maintains.

These inconsistencies in working hours and company size detract from the value of such a tool to suppliers and service providers, however, the mean cost may be of use as rough guidance when procuring energy.
3.2 Carbon Emissions Benchmarks Derived from Transport Data

The data received concerning transport were significantly less comprehensive than that of energy data. This is almost certainly due to the main sectoral response coming from care homes. As already highlighted, responses from organisations from other sectors were not significant enough so as to allow any useful data analysis.

Care homes themselves warrant relatively little transport needs as part of their everyday business. The site visits revealed that most have no 'company' transport, and on the rare times that a home may need transport (e.g. a minibus to transport residents on organised visits), a vehicle would be hired. However, this was infrequent enough so that mileage or money spent on petrol would not be recorded. Indeed if a staff vehicle was used for business purposes (seven care homes reported the very occasional use of one vehicle) it was reported that this would happen so little that formal records were not kept of annual spend or mileage.

The site visits also revealed that many did not know (or were reluctant to reveal) how many of their staff would commute by car into and from work. Whether this type of travel should be included within the organisations emissions from transport was also found to be contentious.

However, viable data was collected from six care homes (companies: 3, 4, 5, 6, 7, and 10). Data was able to be derived from these particular care homes due to their ownership of a minibus or paneled van.

Much of this data was received as 'annual spend' and therefore had to be converted into litres. As discussed within Chapter 2, to do this, an annual average petrol price for the East Anglian region will be taken (derived from the AA website), and the annual litre consumption approximated for each company from this data. The following table 8, shows the average monthly fuel price in East Anglia for unleaded petrol, from July 2002 through June 2003 (the time scale likely to have been recorded on the questionnaire which was circulated in May - June 2003):

<table>
<thead>
<tr>
<th>Month</th>
<th>Average Monthly Price Pence/Per Litre</th>
</tr>
</thead>
<tbody>
<tr>
<td>July 2002</td>
<td>74.4</td>
</tr>
<tr>
<td>August 2002</td>
<td>74.6</td>
</tr>
<tr>
<td>September 2002</td>
<td>75.2</td>
</tr>
<tr>
<td>October 2002</td>
<td>75.4</td>
</tr>
<tr>
<td>November 2002</td>
<td>74.9</td>
</tr>
<tr>
<td>December 2002</td>
<td>74.6</td>
</tr>
<tr>
<td>January 2003</td>
<td>75.9</td>
</tr>
<tr>
<td>February 2003</td>
<td>75.3</td>
</tr>
<tr>
<td>March 2003</td>
<td>79</td>
</tr>
<tr>
<td>April 2003</td>
<td>78.4</td>
</tr>
<tr>
<td>May 2003</td>
<td>75.4</td>
</tr>
<tr>
<td>June 2003</td>
<td>74.6</td>
</tr>
</tbody>
</table>


Using the figures in table 8 one can derive a yearly average price of unleaded petrol within East Anglia:

75.6 pence/litre
This value can then be used to convert annual spend into litres. Figure 11, shows the annual amount of unleaded petrol used by the companies, in litres:

![Annual Petrol Consumption within Selected Care Homes](image)

Figure 11, showing the annual petrol consumption within care homes.

Figure 11, shows us that the annual petrol consumption varies widely between care homes. Each care home ran only one minibus or paneled van (ensuring some degree of comparability), and there seems to be no relationship between size of home and petrol consumption. It must be remembered at this point that there will be a certain margin of error in these values as the yearly averages may be accurate for the East Anglian region, yet will not apply to other regions within the UK. However, regional averages vary relatively little (rarely more than 2p), and so it is assumed that these values although approximate will be good representations of the true value.

These amounts can then be multiplied by the petrol conversion factor (DEFRA, 1999), and thus an annual CO2 emissions can be worked out for each company. These amounts can then be divided by the number of vehicles which each company runs (in this case all care homes ran just one vehicle each), to enable the formulation of the relevant performance indices. Once these have been calculated, a typical and good practice benchmark can be derived. Figure 12 shows these performance indices and the resultant benchmarks:
Typical Benchmark for Carbon Emissions from Transport (median value of data set):

2750.1 kg CO2/no. of vehicles (as shown by blue lines)

Good Practice Benchmark for Carbon Emissions from Transport (lower 25% quartile):

1276.3 kg CO2/no. of vehicles (as shown by red lines)

As illustrated within Chapter 2, value was added to this research by the inclusion of several additional questions surrounding the transport habitats of companies. These questions surrounded the subject of green travel plans; green fleet management strategies; and route planning. These questions were followed up during the site visits (as discussed in the next section), so as to establish the intentions and willingness of different companies to implement these measures.

As could be expected from the care home sector (particularly those companies running one or less vehicles), no positive responses were received as regards the existence of travel plans or fleet management strategies. Four of the companies surveyed claimed route planning was carried out regularly (although one, only informally).

The site visits revealed this to be because when running only one vehicle, it was important to make effective use of time, if multiple tasks (pick ups) were to be carried out.
3.3 Findings of Site Visits

It was originally envisaged that three to five site visits would be carried out during this research. However, due to the time constraints caused by the slow uptake of the questionnaire, and the need to carry out any engagement according to the timescales and policies of EcoTech, only two companies were visited. However, both these companies were care homes and this therefore provides a representative sample (20%) of the final results utilised (10 care homes). Some of the main findings of these site visits are listed below:

- Energy bills are often kept off site with accountants or book keepers, increasing time needed for data to be found, processed and returned.
- Energy readings off meters taken informally with responsibility not being attributed to any one person. Often meaning some monthly reading were not taken, or the data lost.
- Lack of recycling. The main wastes included cardboard, and food. The council provided limited cardboard recycling facilities. Composting however, was rarely carried out due to sheer amount of food waste produced.
- Many care homes were undergoing renovation or expansion. Environmental criteria was rarely taken into account when developing these plans (although the developer themselves may be adhering to their own environmental policies).
- Often large 'wasteful' radiators.
- Often large water cisterns in toilets.
- Nature and size of companies meant that business travel was often an insignificant issue.
- A major problem often encountered was the lack of a committed environmental champion, or, environmental management framework. As most businesses were relatively small, CSR was not seen as a major issue.

The site visits also facilitated the analysis of data, particularly when understanding initially unforeseen results, as seen earlier in this chapter.

These findings can be used to advise the companies on how they might make energy savings - not only within energy use and transport, but with waste and water too. It was found that often care home staff were aware of the energy savings possible through implementing fairly basic measures, but were often too busy with concerns rated of higher importance to commence any changes. Recommended measures prompted by these site visits included:

- The use of energy saving light bulbs.
- The use of water saving devices within large cisterns.
- The use of various levels of thermostats on radiators.
• Free consultation with a government energy efficiency expert.
• Increased recycling, including the possibility of group composting schemes in conjunction with local farms etc.

More importantly the site visits revealed a number of issues that might lead to improvements in the benchmarking process, particularly for the care home sector:

1. The estimation of treated floor space was found to be difficult for care homes to estimate as the occupied buildings were often old (no formal records of area), and of an irregular shape. It was found that performance indices for energy use should involve the 'no. of beds' as an approximation of treated area instead.

2. Many care homes found it hard to identify the number of full time staff working within their companies. This was due to the nature of their business; employing staff for a variety of hours often on a shift system. Catering staff would also work different hours to nursing staff. The classification of full time staff needs to be clarified within any further questionnaire, as this issue is likely to be a problem amongst companies from many sectors.

3. Emissions from transport is a non-issue for many care homes due again to the nature of their work. Questionnaires perhaps should be tailored to each sector as an unnecessary section only serves to prolong the questionnaire and confuse the recipient. Green fleet management strategy questions could certainly be omitted for this sector.

4. The site visits reinforced the need to keep any benchmarking simple, at least until companies have been fully engaged and commitment from them gained. Engagement (as the EcoTech project intends to do) and longer time scales are essential if one is to effectively collect a comprehensive data set.

Section 3.5, introduces and expands on some further problematic issues that were encountered during this research, as well as offering some ideas for future study.

3.4 Relating the Discussion to the Fulfillment of Objectives

The original objectives of this dissertation were to produce a carbon emissions benchmark or set of benchmarks for supply chain companies, which can be used to facilitate green procurement in the public sector.

This objective was to be fulfilled by achieving a number of aims:

1. Using literature review and government guidelines to establish a method of carbon auditing for supply chain companies.
2. Using this methodology, carry out carbon audits on a selection of public sector supply companies.

3. Select 'best practice' criteria from case studies to create a benchmark.

4. Examine the viability of these benchmarks and suggest possible outlets for future study.

A literature review was indeed carried out, and a methodology for the carbon emissions auditing of several aspects of a supply chain company was formulated, with the help of government guidelines. Contact was then made with EcoTech, who were running the Supplier Support Scheme for Norfolk County Council, and the methodology was developed and implemented with their supervision and guidance.

To satisfy aim 3, 'typical' and 'good practice' benchmarks were created for both energy use and transport from the data received. These results were then presented and discussed so as to ascertain their viability and enable a discussion of possible issues to explore within further study (see section 3.5).

Each individual aim appears to have been satisfied, however, the viability of the results and the eventual value of the benchmark is questionable. Hence it is not certain as to whether the overall objective has been fulfilled.

The number of responses (10 for energy benchmark, 6 for transport benchmark), means that only a small cross section of the NCC suppliers have been taken into account. Coupled with this is the fact that similar companies who are not suppliers of the NCC have been ignored. With such a small sample, any resultant benchmark could be seen as unreliable.

Of the suppliers that did respond, the only significant response came from the care home sector. This is clearly not representative of the NCC's supplier base as a whole, and therefore it is possible that any benchmark made from such data might only be useful to other care homes, and for those wishing to procure their services.

Indeed the inclusion of all sectors under one benchmark can be seen as an intrinsic flaw within this methodology, and a suite of benchmarks may be of more use (as discussed further in section 3.5).

These inconsistencies in the data set mean that the resultant benchmarks are in fact of limited use for green procurement amongst public sector supply chain companies. However, when procuring the services of care homes, they might provide useful guidance.

Further to this, the methodologies employed in this study are at their roots, reasonably robust. Indeed one of the main benefits of this research has been the revelations about how this methodology could be improved and adapted so that it may be an essential tool within itself when attempting to benchmark supply chain companies.
The following section endeavors to explain some of the problems encountered which prevented the original primary objective from being met, and some of the ideas for further study which might enable the methodology employed within this research to become a useful tool in the future.

3.5 Problems Encountered and Recommendations for Further Study

The length of this section is not only evidence of the multitude of problems which were encountered when researching this project, but also the large potential that carbon emissions benchmarks used for green procurement practices could have, if further study was possible on the subject.

Conflicting Schedules

The main issue was that of differing timeframes. Due to the need for results to be obtained via the EcoTech team mainly for reasons of confidentiality, the project was reliant somewhat on their own timeframe. EcoTech were commissioned by Norfolk County Council to collect resource usage data from their suppliers and to aid the suppliers own pursuit of energy efficiency and therefore data collection is not their only concern. EcoTech have found that individual engagement is needed for most companies, for although the data to be collected was kept simple, there have been complications which has meant many smaller companies have needed assistance. Individual engagement also enables the EcoTech team to advice on possible energy efficiency measures and assistance schemes. It is now intended that EcoTech will concentrate on engaging one sector at a time.

Lack of Different Sectoral Data Sources

Another issue that may have been highlighted by a pilot questionnaire, was the unexpected numbers of certain types of suppliers. About 60% of suppliers to Norfolk County Council (and a figure that is not unrepresentative of local council suppliers nationwide), were either construction companies or care homes. (personal communication with Simon Best at EcoTech, 14/07/03). The majority of care homes were found to have no official ‘company’ transport, with the major emissions occurring due to energy use. The opposite might be found of many construction companies who have small offices using little energy, but large fleets of company cars and construction vehicles. These two types of company can therefore not be compared, as both have different carbon requirements. In practice most data received (indeed, all useful data) has been submitted by care homes. This not only reflects the significant percentage of NCC service providers that are care homes but also EcoTech’s policy of engaging one sector at a time. The fact that all data used to create the benchmarks has come from this sector, makes the benchmark perhaps not viable when applying it to suppliers from other sectors.
Complications Within Actual Data Collection

The complications that occurred when collecting the data were unexpected but may possibly have been avoided with a pilot scheme. In terms of energy bills, most energy providers have different billing systems and billing time periods. In practice, this has meant that for many suppliers, it has been hard to adapt their energy data for entry onto the tables provided within the questionnaire. A questionnaire that might take into account many different billing formats would inevitably become complex, and therefore in the future it may be easier to ask for copies of energy bills to be sent to the data collator, so that they might be disseminated by those with the necessary skills.

As suggested, a pilot questionnaire would have been useful. However, the research shown that it has taken many months to collect any data, and thus it would take a similar time for any problems to become apparent. Unfortunately, within the timescale of this dissertation, there would have been little time for a pilot survey to be conducted effectively. The Supplier Support Scheme operated by EcoTech will run over a period of three years, and therefore it is envisaged that it will have the time and flexibility to adapt to these sort of problems as they become apparent.

Problems Encountered when Engaging Small to Medium Sized Companies

The site visits have illustrated the problems of resource restrictions in smaller companies. On one site visit to a care home, the questionnaire had not been attempted and the energy bills were with the 'book-keeper'. This is a common problem amongst smaller companies who are not large enough to devote one person 'in-house' to their accounts. These 'book-keepers' are often part time and work off-site, thus extending further the time needed to collect the required data.

Indeed, the nominated environmental champion is sometimes a manager and very busy with many tasks. The collection of energy and transport data for environmental purposes is often low priority in such circumstances.

As the collected data needs to be extremely basic, questions could be raised as to the eventual value of the benchmark. Even if the benchmark was flexible and robust, it may not be all that useful for procurement purposes unless it was increased in detail to take account of differing suppliers sizes and separate sectors. For example, one cannot choose to use a care home on the basis of a guidance benchmark that is founded partly on data from construction or power companies. This is clearly an avenue for further study.

Factors to Consider With Future Benchmarking

The need for consideration of factors other than 'no. of beds', when preparing benchmarks, has become increasingly apparent during this research. A major problem encountered during calculating the energy use benchmarks was that of working hours. It is not viable to compare a care home (or any company) which operates on a 9-5 basis against one that operates 24 hours. It is possible that the total carbon emissions
could be divided by not only the 'no. of beds', but 'hours of operation' and any other factor which would affect the ease with which companies could be compared.

Another method of ensuring the comparability of companies is by the formulation of more detailed benchmarks which are better adjusted for coping with the individuality of each organisation. This could be carried out using three steps recommended by Action Energy in their benchmarking tool guidelines for industrial buildings (2002). One should firstly calculate the desired performance indices, and then formulate a site-specific benchmark by adjusting the 'good practice' benchmark to account for the individual site circumstances. Thirdly, the performance indices are then compared to this adjusted site-specific benchmark. This process, although ultimately crucial in terms of being able to precisely compare individual organisations, can be extremely complicated.

A number of factors should be considered, for example: the prevailing weather, the type of company, and the age of buildings on site, to name but a few. Most variables can be accounted for, such as the use of degree days (the average number of degrees by which the outside temperature on any given day is less or more than a base temperature, totaled for all the days in the period) to adjust for differing weather conditions (Action Energy, 2002).

However, for the purposes of this dissertation, simplicity is essential to gain supplier co-operation. It is envisaged that the resultant benchmarks may be built upon to take into account the individuality of different organisations and lend the benchmark further value, at a later date when supplier co-operation is ensured.

A suite of benchmarks could be considered with separate questionnaires being sent to suppliers of different sectors. These questionnaires can be tailored towards the particular sector and therefore should facilitate data collection and return. Whether, any carbon emissions reporting questionnaire will be fully accepted and completed by a significant number of the smaller suppliers, is debatable. This is due to carbon emissions reporting being fairly complex by its very nature. It therefore seems that a slow process of individual engagement with such companies is crucial to guide them through the process. Hence any further study into carbon emissions benchmarking should take into account this increased demand on time within its methodology.

An interesting trend to emerge from the benchmarking of carbon emissions from grid electricity (and to some extent natural gas), was the possible exponential relationship between care home size (in terms of number of beds) and carbon dioxide emissions. If proved this has repercussions for any benchmarking involving care homes, as the traditional method of comparing performance indices might discriminate against the larger homes. Further research is needed to confirm the trend and possibly account for it, before any adaptation within the benchmarking process can be accommodated.
Further Problems

Another possible issue, which might detract from the viability of the final carbon emissions benchmark, is that caused by the source of the data. All data used is derived from existing suppliers of Norfolk County Council and therefore is perhaps not representative of each sector as a whole. Companies employing best practice as regards energy efficiency may not be suppliers of the NCC, thus their potentially influential contribution will not be taken into account when deciding what is typical and what is good practice. However, the benchmark will still be of use to suppliers wishing to rate their own performance against those already contracted by the NCC, and also for the purpose of green procurement when seen as only a guidance tool.

It is clear that a pilot scheme lasting at least 6 months is needed to fully understand the complexities of carbon emissions data collection for benchmarking purposes. However, it does seem that the basic benchmarking process itself, as proposed in this dissertation is robust. The establishment of a typical and good practice level within the benchmark provides useful guidance. However, the setting of exact threshold levels which suppliers have to satisfy to be considered for procurement is perhaps dangerous, as it leaves no flexibility for those in charge of purchasing to take into account the suppliers individual (and exceptional) circumstances.
Drawing Conclusions

As shown, this paper has presented an effective benchmarking framework and derived three important carbon emissions benchmarks. The limitations of the benchmarks are due mostly to the confinement of the data to one sector, and the limited responses received. The predominant reason for this is a combination of the collection method employed and the limited time in which to do it. However, the production of two benchmarks in each category (a 'typical and 'good practice' benchmark), has revealed that even within these data confines there is some distance between the performance of the average care home and a 'good practice' care home. It is hoped therefore, that suppliers in this sector may be able to use these figures to set themselves carbon emissions targets, and that procurement managers may be able to benefit from a more in depth measurement of how a care home is actually performing.

This dissertation, despite fulfilling its aims of creating a set of carbon emissions benchmarks for supply chain companies, did not achieve its overall objective of creating a benchmark which would be of direct use for green procurement within the public sector. However, these benchmarks will be of use at least for guidance purposes, when procuring the services of care homes. The framework methodology could also be of use in future benchmarking exercises, and the problems encountered should be learnt from, so as to provide a more specialised and effective benchmarking process in the future.

The ultimate question of whether this benchmark or even a more specialised suite of benchmarks will be of any practical use when pursuing green procurement in the public sector is fundamental to the conclusions of this dissertation. It seems likely that environmental thresholds will be considered only after (if at all) those of quality and economy have already been applied (Bramely, 1998). Indeed, the triple bottom line of economical, environmental and social aspects rarely runs straight. However, a suite of specialised carbon emissions benchmarks could indeed be useful for guidance purposes, ensuring that if several companies offer similar benefits in terms of cost and quality, the competitive advantage would be gained by the one with enhanced environmental performance.
References


ENDS (2001), 'Late Spring for DTI's Acorn Supply Chain Project for Smaller Firms', ENDS Report 320.


International Organisation for Standardisation (publication date yet to be decided), ISO/AWI 14064 'Guidelines for measuring, reporting and verifying entity project-level greenhouse gas emissions', ISO: Geneve.


Supplier Survey

*the first step to making your business fitter*

The Supplier Support Scheme (SSS) provides real, practical guidance and direct support for your business to help you achieve financial savings and environmental improvement through resource efficiency. The scheme is being delivered in partnership with Norfolk County Council.

To help us to help you most effectively, please spare some time to fill out this brief survey. It will enable us to pinpoint where our efforts would be best focussed, identifying the areas where we can reap the best rewards for your company.

Please quote all costs **exclusive of VAT**. If you’re unsure about anything, or if something doesn’t apply, don’t hesitate to contact us (by phone on **01760 726751**). We’re always happy to talk you through the Survey or drop by in person.

When you have completed the Survey, please let us know and an advisor will call to arrange a site visit, where they will prepare an Opportunities Report. This will present specific actions you can take to make your business fitter – and we will help you to implement them.

**The information you provide is used to plan our work with you and will be treated in the strictest confidence**

Please give as much detail as possible, including copies of bills, where requested. If you have any queries, please call the Supplier Support Scheme on **01760 726751**
## Contact details

### Company Name

<table>
<thead>
<tr>
<th>Contact details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Company Name</td>
</tr>
</tbody>
</table>

### Company Address

Please tell us the address of the premises involved, rather than a head or area office.

<table>
<thead>
<tr>
<th>Contact details</th>
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</thead>
<tbody>
<tr>
<td>Company Address</td>
</tr>
</tbody>
</table>

### Contact name

Please identify a person responsible for liaising with the SSS advisors.

<table>
<thead>
<tr>
<th>Contact details</th>
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<tbody>
<tr>
<td>Contact name</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Contact details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name and job title</td>
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</table>

### Telephone

<table>
<thead>
<tr>
<th>Contact details</th>
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<tbody>
<tr>
<td>Telephone</td>
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<table>
<thead>
<tr>
<th>Contact details</th>
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<tbody>
<tr>
<td>Mobile</td>
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</table>

### Fax

<table>
<thead>
<tr>
<th>Contact details</th>
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<tbody>
<tr>
<td>Fax</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Contact details</th>
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<tbody>
<tr>
<td>Email</td>
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</tbody>
</table>

### Company website

<table>
<thead>
<tr>
<th>Contact details</th>
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</thead>
<tbody>
<tr>
<td>Company website</td>
</tr>
</tbody>
</table>

## Company Information

### Your company’s core business activities

Please include details of goods manufactured or services provided.

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Your company’s core business activities</td>
</tr>
</tbody>
</table>

### Your company’s working pattern

Does your company essentially operate 9-5, five days per week, or do you undertake late working, shiftwork or 24-hour operations?

<table>
<thead>
<tr>
<th>Company Information</th>
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</thead>
<tbody>
<tr>
<td>Your company’s working pattern</td>
</tr>
</tbody>
</table>

### Approximate annual turnover

£/year

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate annual turnover</td>
</tr>
</tbody>
</table>

### Annual output in tonnes

if applicable

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual output in tonnes</td>
</tr>
</tbody>
</table>

### Total floor space

Please state whether this is in m² or square feet

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total floor space</td>
</tr>
</tbody>
</table>

### Approximate age of buildings

Roughly how old are the majority of buildings at your site

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approximate age of buildings</td>
</tr>
</tbody>
</table>

### Number of full time staff

Or full time equivalent (FTE)

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of full time staff</td>
</tr>
</tbody>
</table>

### Healthcare sector only

Please tell us the number of beds you have

<table>
<thead>
<tr>
<th>Company Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthcare sector only</td>
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</tbody>
</table>

### Healthcare sector only

Please tell us the number of beds you have

<table>
<thead>
<tr>
<th>Company Information</th>
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</thead>
<tbody>
<tr>
<td>Healthcare sector only</td>
</tr>
</tbody>
</table>
Section 1 - General

1. Do you have to pay the climate change levy on your electricity bill? [ ] Yes [ ] No [ ] Unsure
2. Is your company accredited to Investors in People? [ ] Yes [ ] No [ ] Unsure
2. Does your company have a formal staff development programme? [ ] Yes [ ] No [ ] Unsure
3. Do you have a written environmental policy? [ ] Yes [ ] No [ ] Unsure
4. Have you identified your company’s significant issues through an Initial Environmental Review? [ ] Yes [ ] No [ ] Unsure
5. Is your company committed to any annual environmental targets? [ ] Yes [ ] No [ ] Unsure
6. Has your company implemented an Environmental Management System (EMS)? [ ] Yes [ ] No [ ] Unsure
7. If you answered “Yes” to the question, above, has it been certified to either of the standards EMAS or ISO140001? [ ] Yes [ ] No [ ] Unsure

Section 2 - Energy

Please use the option, below, that best suits you:

1. Complete the table below using fuel bills covering 12 months
2. Provide the information to us in an electronic format, for example, a spreadsheet
3. Supply the SSS team with copies of energy bills/invoices, covering at least 12 months (please email to anebreda@ecotech.org.uk)

Please send us copies of your bills, if possible. Do not use estimates, unless absolutely necessary, when completing this table:

<table>
<thead>
<tr>
<th>Fuel Type</th>
<th>Name of supplier</th>
<th>Annual standing charge</th>
<th>Annual units used (Please specify kWh/tonnes/litres)</th>
<th>Total annual cost (£)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grid electricity</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Natural gas</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Gas or diesel oil</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Heavy fuel oil</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Green electricity</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Coking coal</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Coal</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td></td>
<td></td>
<td></td>
<td>£</td>
</tr>
</tbody>
</table>
Annual waste disposal costs

Weight of waste disposed of annually (if known)

Please complete the tables, below, to provide us with more detailed information on the waste you dispose of and the materials you recycle. The information required may be obtained from your waste disposal contract or contractor. Please send us copies of the notes/bills if possible.

* If you don’t know the volume of your bins or skips, please state the types of container used.

### Waste Type

<table>
<thead>
<tr>
<th>Waste Type</th>
<th>Volume or bin/skip/container*</th>
<th>Number of bins/skips/containers collected per year</th>
<th>Cost of the bin/skip collection</th>
<th>Annual skip/bin/container rental charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>General waste</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Paper or card</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Clinical waste</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Sanitary waste</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Solvents</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Special wastes</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
</tbody>
</table>

### Materials you’ve recycled

<table>
<thead>
<tr>
<th>Materials you’ve recycled</th>
<th>Volume or bin/skip/container*</th>
<th>Number of bins/skips/containers collected per year</th>
<th>Cost of the bin/skip collection</th>
<th>Annual skip/bin/container rental charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminium cans</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Paper/cardboard</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Glass</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Plastic</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Toner cartridges</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Fluorescent tubes</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td>Other (please specify)</td>
<td>£</td>
<td></td>
<td>£</td>
<td>£</td>
</tr>
</tbody>
</table>

Are you obligated under the Packaging Waste Regulations?

Yes ☐ No ☐ Unsure ☐
Section 4 - Transport

Please tick the boxes, below, to indicate which types of vehicles your company owns or leases:

- None
- Private car
- Taxi
- Minibus
- Coach
- Panel Van
- Van
- Rigid lorry
- Articulated lorry
- Other (please specify)

If your company owns or leases vehicles, please state the total number of vehicles.

Roughly what percentage of staff use their own vehicles for work purposes each day?

Please provide information on the amount of fuel used in a year or how much is spent on each fuel type per year. Either fill in the table, below, or alternatively send us a spreadsheet or summary containing the relevant information (please email to anebreda@ecotech.org.uk).

<table>
<thead>
<tr>
<th>Fuel used</th>
<th>Total units used annually</th>
<th>OR</th>
<th>Total annual spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Petrol</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>Diesel</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>including low sulphur</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>LPG</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>(liquid petroleum gas)</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>CNG</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>(compressed natural gas)</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
<td>£</td>
<td></td>
</tr>
<tr>
<td>(please specify)</td>
<td></td>
<td>£</td>
<td></td>
</tr>
</tbody>
</table>

Please state litres or kilos OR total annual spend.

Yes  No  Unsure

1 Has your company implemented a green travel plan?
2 Have you implemented a green fleet management strategy?
3 Do you undertake route planning with the aim of reducing single trip journeys?
Before we can consider ways of reducing water and wastewater costs, we need to establish the true costs of water supply and disposal. The following information may be obtained from your water bills.

Where does your water come from?

- Metered mains
- Unmetered mains
- Borehole
- Unsure

Where does your water come from?  

<table>
<thead>
<tr>
<th>Service</th>
<th>Name of supplier</th>
<th>Tariff</th>
<th>Annual volume supplied</th>
<th>Annual standing charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>m³</strong></td>
<td><strong>£</strong></td>
</tr>
</tbody>
</table>

Does this satisfy your full requirement?

- Yes
- No
- Unsure

If “No”, please state the annual quantity of supplemented water supply  

<table>
<thead>
<tr>
<th>Service</th>
<th>Name of supplier</th>
<th>Tariff</th>
<th>Annual volume supplied</th>
<th>Annual standing charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sewerage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td><strong>m³</strong></td>
<td><strong>£</strong></td>
</tr>
</tbody>
</table>

How is your sewage disposed of?

- Metered sewer
- Septic tank
- Effluent plant
- Unsure

Please use the option, below, that best suits you:

1. Complete the table below using water bills covering 12 months, including copies if possible
2. Provide the information to us in an electronic format, for example, a spreadsheet
3. Supply the SSS team with copies of energy bills/invoices, covering at least 12 months (please email to anebreda@ecotech.org.uk)

Please send us copies of your bills, if possible. Do not use estimates, unless absolutely necessary, when completing this table:

Do you have a consent to discharge trade or sewage effluent?

- Yes
- No
- Unsure
Many thanks

Please indicate if there are any particular environmental issues you would like to address or if you seeking any specific advice:

Thank you for completing the Supplier Support Scheme Survey

Please phone us on 01760 726751 to let us know that you’ve completed the Survey, then fax it back to us on 01760 726763 or post it to us at:

Supplier Support Scheme
EcoTech
Turbine Way
Swaffham
Norfolk
PE37 7HT