

**ENVIRONMENTAL ACCOUNTING: WILL THIS BECOME AN
ESTABLISHED TECHNIQUE?**

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THESIS ABSTRACT

The thesis addresses the hypothesis of whether environmental accounting, currently a nascent technique, will become established within a business context. A subset of three hypotheses is used to test if this might happen and why. The hypothesis and its subset are examined via a literature survey, a survey of 100 Corporate Environmental Reports (CERs) and an in depth fieldwork survey of a sample of 20 businesses. All of this is then examined alongside the theoretical underpinning of stakeholder and other theories.

The literature survey conducted found some evidence to substantiate some of the hypothesis. As a result, it was felt appropriate to address a direct business source and so the CER survey was conducted. This survey differed from previous ones in concentrating exclusively on any quantitative information contained in CERs, especially any form of environmental accounting. It found that within these there was already some use of various methods of environmental accounting, together with considerable use of quantitative data but statistical analysis failed to find many associations. As secondary sources had yielded nothing conclusive, the investigation addressed the primary source, the businesses themselves. An in depth survey of a sample of 20 businesses was conducted. Amongst others, senior management from multinational companies (MNEs) were questioned about their use and expected use of environmental accounting. The survey addressed not only the facts of the situation but also their perceptions and was important in demonstrating what is actually occurring within businesses from primary knowledge. Whilst it indicated a trend towards increasing use of the various methods of environmental accounting, it did not indicate full integration within the management process. Nor did the fieldwork provide incontrovertible evidence of societal forces overriding commercial pressures in the need for environmental accounting. The reasons for the establishment of environmental accounting within a business context were not therefore wholly present. Overall, the various survey results demonstrated that environmental accounting in a business context is still an emerging technique. It did, however, demonstrate that there is a powerful trend for its establishment, due to its value as a control mechanism and in response to business needs and social pressures.

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Author’s declaration

I declare that this thesis represents my own work, except where due acknowledgement is made, and that it has not been previously included in a thesis, dissertation or report submitted to this University or any other institution for a degree, diploma or other qualification.

Signed: *Sandra C. Fox* Sandra C. Fox

CHAPTER 1: INTRODUCTION

1.1 Introduction

1.1.1 Hypothesis

Environmental accounting has emerged as a technique used at both national and individual business levels. For businesses, adoption of environmental accounting follows on from earlier initiatives such as cost benefit analysis, environmental auditing and other devices but seems to go a little further than these with some businesses accepting their social responsibility. It indicates a willingness to address the social costs of the business concerned and some willingness to incorporate these social costs in with the business's private costs.

The purpose of this thesis is to establish whether or not environmental accounting, currently a nascent technique, will become established within a business context. There are various reasons for postulating that this is the case and these form the subset of hypotheses proposed for establishing the main hypothesis, namely that:

1. Environmental accounting is both a necessary and useful process
2. Environmental accounting is likely to become integral to the management process and valued by the business world
3. World wide societal pressures are driving the use of environmental accounting and these are overriding commercial pressures, such as the absolute need for profit maximisation.

All of these are good reasons why, if they prove true, environmental accounting will become established within a business context. In particular, if techniques become established within the management process then they are likely to become firmly embedded within businesses themselves. Moreover, if their importance is such that the process points to a need to override certain commercial considerations, then they are of significant influence.

The hypothesis and its subset emerged as a result of the literature survey (Chapter 1) and evidence to substantiate them was subsequently sought within the literature and also via a more detailed and focussed survey of Corporate Environmental Reports (CERs) (Chapter 2). Both of these secondary sources indicated the need for fieldwork. As a

result, an in depth survey of a range of different types of businesses was conducted (Chapter 4). Throughout the investigation substantiation was sought for the hypothesis and its subset. One of the difficulties with this process was that it can be difficult if not impossible to quantify qualitative research (see Locke, Spirduso & Silverman, 2000, P97). At no time was it considered appropriate to test the hypothesis and its subset deductively in line with the experimental tradition of quantitative research. Instead it was necessary first to understand the data and secondly to work inductively in using this data to formulate theories (Locke, Spirduso & Silverman, 2000, P98). This was especially true as Grounded Theory was used in the analytical process and, as has been pointed out, this methodology aims to find substantiation for theories or hypotheses rather than to seek proof in the experimental tradition mentioned above (Taylor & Bogdan, 1997, P137). This use of Grounded Theory together with the methodology as a whole is discussed in Chapter 3. Finally in the last chapter (Chapter 5), the results are discussed and placed in the context of Stakeholder and the other theories relating to the issues of eco-efficiency and eco-justice and which underpin the whole need to conduct any sort of accounting for the environment.

1.1.2 Environmental accounting and the issue of social costs

The issues addressed by this thesis, whilst directly relating to environmental accounting, arise from the increased questioning as to who should take responsibility for any social costs resulting from a business activity. This debate is central to many environmental initiatives, including that of environmental accounting. *Social costs* are those costs created as a result of business activities, which are not paid for by the business concerned but which are paid for by society as a whole or, occasionally, by particular individuals. For example, a factory may emit smoke which blackens its environs and the costs of cleaning this may not fall upon the factory itself but on various other groups. Thus, the cost of cleaning up local public buildings may fall upon the local authority, whilst the health costs associated with breathing air with a high incidence of particulates is absorbed by the State via the National Health Service and the costs of re-laundering grimy washing or cleaning grimy houses falls to the individual householder concerned. These social costs do not accrue to the business except very tenuously via local and national taxation and are not internalised by it in any way. Many environmental costs such as the costs of reviving dead rivers after years of water use by users such as paper

mills, the health costs associated with factory air pollution or the costs of cleaning land polluted by manufacturing processes, are social costs.

Concerns about social costs have been the subject of public debate since the beginning of the 1960s. Rachel Carson's book *Silent Spring* (Carson, 1962) marked the watershed and is widely regarded as the first challenge to commerce and industry of their seeming right to pollute their environment at whatever cost to society. Carson's book was written for a popular, rather than an academic audience, which may help to explain the impact it had in alerting the developed world to their environmental problems. Others in the 1960s and 1970s (Schumacher, 1973) were likewise trying to alert a wider, non-academic audience to these problems. Ward (1966), Boulding (1966), Goldsmith (1972) and Commoner (1971 & 1972) also wrote about these issues for both academic and non-academic readers. Initially, there was little reaction from businesses or their organisations but during the 1970s and 1980s with incidents such as the explosions at the Union Carbide factory in Bhopal, at the Chernobyl nuclear powered plant and, here in the U.K., at the chemical factory at Flixborough, coupled with other incidents such as the oil spillage by the Exxon Valdez, there was a gradual realisation by businesses that they had to bear some responsibility for the social costs incurred.

The business problem of social costs is that publicly quoted companies are under continual pressure from shareholders to maintain and increase profits and hence dividends. If a business spends on environmental matters, such spending does not necessarily contribute to profits. It is more likely to be a cost to the business as in the example of the social costs given above, where if the factory were to reduce its emissions this would require a filter system - a cost to the business which in no way adds to increasing productivity or profits. Environmental improvements are often in conflict with business objectives such as profit maximisation or increasing market share. Yet global sustainable development demands social and environmental equity; it demands that there is eco-justice and eco-efficiency. In theory the world's resources should be used so as to avoid unnecessary resource degradation but also such that there is both *intra*-generational and *inter*-generational equity. In the factory example, social justice demands that a filter is fitted so that an unnecessary burden is not placed on those living in the immediate environs of the factory. Intra-generational and inter-generational equity

also demands this, as why should one group of people suffer this situation when others do not have to do so and why should subsequent generations inherit a degraded area? As previously indicated, the various theories discussed in the last chapter explore this need for eco-justice and eco-efficiency within the business context of a continual need to increase the 'bottom line' rather than a 'triple bottom line' (see Glossary). It links this theoretical and practical need for environmental accounting for the social/environmental costs of businesses to the research findings.

1.1.3 Chapter 1: outline

Environmental accounting has developed and is developing within a context of the need to incorporate environmental/social costs within business objectives. It is a means of identifying and accounting for these. This chapter seeks to establish, via the literature, precisely what is meant by the term 'environmental accounting', its current formats and usage, precursors and current state of development (especially in terms of motivations and pressures) and which groups are currently involved in its development. This will be used to inform the hypothesis.

1.2 Definition of environmental accounting and its current role

1.2.1 Environmental accounting: definitions

Definitions of environmental accounting are far from clear and this can be illustrated with reference to the first set of environmental accounts produced.

In 1991 BSO Origin, a Dutch firm of consultants and specialists in information technology, produced a set of environmental accounts as part of their 1990 Annual Report. This was the first such set of accounts produced by any business organisation and it initiated a new business trend. It consisted of accounts which attempted to estimate the "*Cost of environmental effects*", that is the "*environmental costs relating to the processing or treatment of emissions + costs of residual effects*" (BSO Origin, 1990) of the company's operations. In the notes to these accounts, the company freely acknowledged the difficulties of trying to compile anything of this nature and pointed out that "*the difficulty of being accurate has discouraged many experts from attempting such an assessment*" (BSO Origin, 1990). However, they went on to attempt such an assessment (expressed in guilders) of the effect of the company's atmospheric emissions,

wastewater and other forms of waste. Of all the figures included in these accounts, it was only those towards the end which included fuel levies, water treatment and refuse collection charges, sewerage charges and other environmental taxes, together with the cost of private sector waste processors, which were recognisable as figures likely to appear in a conventional set of accounts. This mix of accounting approaches encapsulated the problems of environmental accounting, namely:

- lack of precision in definition of the term 'environmental accounts' and lack of clarity as to precisely what environmental accounting is meant to encompass
- ambivalence as to what type of quantitative data to use, namely data expressed in terms of physical quantifications or financial figures.
- lack of an appropriate vehicle for the presentation of any environmental accounts – should they be presented as a separate set of accounts as in the BSO instance, should they be integral with a company report and accounts or should they be presented in some other way?

In order to address the imprecision in definition, the US Environmental Protection Agency (US EPA) attempted to define environmental accounting and considers that, at present, it has three meanings:

- “Environmental accounting in the context of national income accounting, *refers to natural resource accounting which can entail statistics about a nation's or region's consumption, extent, quality, and value of natural resources, both renewable and non-renewable.*
- Environmental accounting in the context of financial accounting *usually refers to the preparation of financial reports for external audiences using Generally Accepted Accounting Principles (GAAP).*
- Environmental accounting as an aspect of management accounting *serves business managers in making capital investment decisions, costing determinations, process/product design decisions, performance evaluations, and a host of other forward-looking business decisions.” (EPA, 1995a, P28).*

The first meaning addresses national income accounting rather than company accounts. This type of environmental accounting does not currently impact on how a company might construct its environmental accounts, although it is possible that national income environmental accounts and business environmental accounts might interface with each other in the future. Research is currently being conducted at the Wuppertal Institute in Germany (Seifert, 1997) on building up national income environmental accounts from company environmental accounts, in much the same way as normal national income accounts are constructed.

The other two meanings apply to individual businesses and it is with these that this thesis is concerned and where much of the confusion lies. Businesses have always produced financial accounts and, indeed, are required to do so by law. In much the same way, environmental accounts could be constructed but no format for doing so currently exists. Bodies such as the Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) (currently serviced by the UN Conference on Trade and Development - UNCTAD) at international level (UNCTAD, 1998a), the EU Accounting Forum at regional level (FEE, 1995b) and The Chartered Association of Certified Accountants (ACCA) at national level in the UK (Adams, 1996), amongst others, have all been addressing this problem of format. To date none of these bodies has produced one.

A format for financial figures may not be appropriate, instead physical quantifications of a business's environmental impact may be an easier way of handling environmental accounting. This leads to the third definition, which deals with management accounting. Management accounting is that part of the financial accounting process which is internal to a business because it involves investment decisions and figures which are commercially sensitive. In this instance where a range of investment options are being considered, presentation of physical quantifications, for say emissions or waste are very valuable (alongside any financial figures) when taking decisions on capital spending. Whilst technically not management accounting, such evaluations of physical quantifications are part of the management accounting process. It is this evaluative process, which considers the whole picture, that is the essence of management

accounting. In much the same way in environmental accounting the boundaries between financial accounting and accounting which is essentially evaluation of production function (see glossary) figures can also become blurred. Environmental accounting can and should be an aspect of management accounting but this leads to problems of imprecision of meaning and the use and blending together of different types of data.

In the face of this lack of clarity, some bodies have attempted a broader brush approach and have adopted the term Full Cost Accounting (FCA) when referring to accounting for a company's environmental impact. This has been defined by The Canadian Institute of Chartered Accountants (CICA) as:

"From an environmental perspective, full cost accounting is the integration of an entity's internal costs (including all internal environmental costs) with the external costs relating to the impacts of the entity's activities, operations, products and/or services on the environment." (CICA, 1997, Pxvi)

The CICA goes on to indicate the difficulties in this whole area by saying:

"It is questionable whether it will ever be practical for entities of all sizes and in all sectors to implement all aspects of full cost accounting." (CICA, 1997, Pxix)

There is thus much confusion in definition but it would seem that, simply put, environmental accounting could be deemed to be any attempt by a business, of whatever size, to present some sort of quantified environmental profile to the outside world. Such accounts may be quantified in terms of a monetary value, as BSO Origin has attempted to do in each of its successive sets of accounts (BSO Origin, 1990, 1991, 1992, 1993, 1994) or they may be in terms of physical measures as, for example, Det Danske Stalvalsevaerk A/S has done (Det Danske Stalvalsevaerk, 1994). They may be formal or informal. Both of the examples just cited are of a formal nature. Alternatively and less formally, a selection of figures may be presented within a company's environmental (and essentially qualitative) review. These may be quantified in financial or physical terms, or both. For example, British Gas (1995) gives all but one set of figures mentioned in its Environmental Review in terms of physical units, the sole exception being energy costs

which are given in terms of £M. Whilst Shared Earth in their 'Social, Environmental and Financial Accounts' (1995) also gives figures in terms of both physical and monetary values and, in one instance, in terms of both.

Whilst definitions of, and techniques for, environmental accounting may be emerging, it should be noted that the business environment is characterised by a certain amount of 'fashion', in as much as it responds to prevailing business conditions by producing devices to match circumstances. For example, in the high inflation period of the early 1980s when book values diverged from real values due to inflationary distortions, it became apparent that company accounts had to be adapted in order to reflect a more accurate picture of a business, in particular its asset value. As a result Current Cost Accounting was introduced and used for a time. As rates of inflation fell back, Current Cost Accounting fell into desuetude and there was a reversion to the use of the traditional Historic Cost Accounting. Environmental accounts could be a similar response to an immediate set of conditions and as such, a passing fashion. What has to be established is if the set of conditions which exist, means that environmental accounting will become a permanent business feature with an acknowledged standardised format.

1.2.2 Environmental accounting: current formats and usage

As has already been implied different formats for environmental accounting have already emerged. In addition to the BSO Origin mixed approach, there are the two distinct approaches of the Oko-bilanz (Mass-balance) which tends to be used by mainland European companies and the Anglo-Saxon format, which tends to be used by companies in North America and the UK. The former is simply an attempt at quantification, in absolute terms, of all inputs into and outputs from a process or commercial system with especial emphasis on anything potentially damaging or polluting to the environment. The latter is an attempt to extract from existing sets of accounts information that already exists, on items such as environmental expenditure, liabilities, costs, savings and other environmentally related figures. In addition there are formats such as ICI's technique of 'environmental burden' (ICI, 1997b) but this has as yet to be adopted by anyone else, although Volvo already has a similar system (Volvo, 1994) in operation. This format is more akin to the BSO Origin method than any other.

1.2.2i The Oko-bilanz

The Oko-bilanz gives an indication of a company's actual physical environmental impacts and quantifies these via an input-output analysis of the actual physical quantities involved. For any one particular site or process, the Oko-bilanz can summarise what materials, energy and waste are used and produced. It is a useful means of monitoring to ensure the minimisation of both inputs and outputs, especially where the latter may involve toxic emissions harmful to the environment. The Oko-bilanz format can give a clear picture of actual impact and, if substances are precisely quantified, it may give indications of where mitigating action may need to be taken to reduce impacts by, for example, end of pipe technology.

A clear example of an Oko-bilanz is that of the Green Accounts, 1994, for *Det Danske Stalvalsevaerk A/S* (Danish Steelworks Ltd.). These are a highly visual and colour coded presentation, which show inputs and outputs together with details for the three processes involved, that is, for the steel plant, plate mill and bar mill. Figures are given for items such as deposits, recycling, steam and air emissions plus energy consumption. Quantities of inputs can be tracked to determine precisely what happens to them and conclusions can be drawn as to the impact of these steel making processes on the environment. In addition to their Oko-bilanz, *Det Danske Stalvalsevaerk A/S* also includes an "Environmental Declaration" in their green accounts. This gives the net environmental impact for the production of 1 tonne of steel, broken down into separate figures for production of steel plates and steel sections. Each column of the "Declaration" gives figures for emissions produced by these two processes together with those for their energy consumption; emissions to both air and water and quantities of waste products are clearly marked in terms of the unit in which the emissions/waste are denominated. Overall *Det Danske Stalvalsevaerk A/S* present a clear picture of their environmental impact and the extent to which they are trying to mitigate this via improvements to their production processes.

Whilst their Oko-bilanz may be a necessary and useful process (hypothesis 1 – hypothesis subset) in attempting to address their environmental impact (social costs) *Det Danske Stalvalsevaerk A/S* was responding to two external pressures: those from the Danish Government and their customers. The Danish Government passed a law and

statutory order in 1995 concerning the duty for certain listed enterprises to report on their environmental performance. Green accounting thus became a legal requirement for some businesses. The steel industry is one such enterprise to which this law applies and, unless they are registered under the EU Eco-Audit scheme (EMAS), they must submit a set of green accounts. Such a legal requirement is clearly a considerable imperative, although it should be noted that Det Danske Stalvalsevaerk A/S first published an “Environmental Declaration” and Oko-Bilanz in 1993 well before the introduction of this law. Pressure from customers is also significant. For example, ABB (Asea Brown Boveri, a large Swiss-Swedish multinational company) amongst its many activities produces railway rolling stock; some of these are made from steel/stainless steel and they now ask their steel/stainless steel suppliers for details of the environmental impact caused by their steel making processes (Peel, 1996). If ABB consider this impact to be unacceptably high, they will not buy from the supplier concerned. ABB are a clear example of customer pressure and, interestingly, this is an instance of environmental pressure from an industrial customer.

Other Oko-bilanz for a manufacturing process or site have been produced by *Kunert* 1994/95 and *Neumarkter Lammsbrau* (1995). *Kunert* is a German company in the business of making yarn, hosiery and outerwear, a seemingly innocuous occupation. These energy intensive processes involve using water, dyes and other chemicals and so outputs can, potentially, pollute water in addition to producing other waste. These processes also use energy. As a company they appear very sensitive to their environmental impact; their Chief Executive Officer (CEO) in his preface to *Kunert's* Environmental Report says:

“An environment worth living in is indisputably one of the existential needs of the next generation.” (Kunert, 1995, P5)

Along with a discussion of their recycling methods, use of dyes and other manufacturing techniques, the *Kunert* Environmental Report for 1994 presents a site Oko-bilanz for the *Kunert* plant at Mindelheim, together with an Oko-bilanz for the production of 1000kg of Polyamide (a man made, artificial yarn). They conclude that:

“Each kilogramme of “solid waste”, each cubic metre of “waste water” and each kilowatt-hour of “waste heat” not only pollutes the environment but also considerably reduces company earnings. The company pays several times for these unused material and energy flows...” (Kunert, 1995, P55)

As a result the company set up an “Environmental Cost Management” pilot project. This resulted in both improvement to their environmental impact and in cost savings. Kunert concluded that:

“If the results of the Kunert pilot project were applied to the German economy, German industry could reduce their costs by tens of billions of Deutschmarks every year.” (Kunert, 1995, P6)

Kunert’s experience demonstrates how the preparation of an Oko-bilanz can be both a necessary and useful process and integral with the management process (hypotheses 1 & 2 – hypothesis subset).

Neumarkter Lammsbrau (1995), who have also constructed an Oko-bilanz, is a German, medium sized brewing company. The proprietor of this business (Franz Ehrnsperger) decided at the end of the 1970s that, because it is a product that people ingest, what concerned him was its purity. As a result, Neumarkter Lammsbrau became the first brewery to establish criteria for the brewing of beer from “eco-farming” (that is, farming with minimal chemical input). The logical developments from this were that much monitoring and data collection were conducted, given that the company was concerned to produce only ecologically sound products. From this they were able to develop four different types of Oko-bilanz (Neumarkter Lammsbrau, 1995, P15).

There is detailed environmental accounting (albeit of physical quantifications) and one that is addressing several different perspectives. In varying degrees of detail many other companies have also addressed environmental accounting by means of an Oko-bilanz approach. This applies to British companies as well as to others from mainland Europe. For example, Nuclear Electric (Nuclear Electric, 1995), whilst not quite achieving an Oko-bilanz, gives considerable detail on individual sites in terms of resource usage and

waste management, such that it is almost possible to construct an Oko-bilanz for each site. BT in their Environmental Review (BT, 1995), also give considerable detail of such items as energy and paper consumption, various types of emissions, metal recovery from exchanges and scrap cable recovered for recycling. Other companies such as BG and BA also give quantitative information in their environmental reviews but not in sufficient detail for an Oko-bilanz. They all demonstrate, via their publications, that this type of environmental accounting is considered a necessary and useful process (hypothesis 1 – hypothesis subset).

1.2.2ii The ‘Anglo-Saxon’ format.

Some companies are already well established in methods of disclosure for environmental performance data in their annual report and accounts, for example, Inveresk¹ (1996), Coats Viyella and Thorn EMI (1996). Such data is in financial format and as a result, the problem of how to report environmental issues in company accounts has exercised the minds of the accountancy profession. Issues such as:

“Definition, measurement and disclosure of environmental costs and expenditures” (Adams, 1996)

are the subject of debate and whether or not these should be within the existing

¹ Inveresk notes both environmental spending and liabilities in its report and accounts. Of the former it says:

“During 1994, £2m was spent to install and commission a biological effluent treatment plant at Kilbagie Mill. Approximately £0.2m has been spent on effluent and other tests in preparation for IPC application or exception and preparation for BS7750. 35% of the £0.8m Capital Expenditure at Carrongrove Mill was to reduce energy consumption while £0.1m was spent to reduce spillage or raw material wastage risks across the Group.” (Inveresk, 1996, P16)

and of the latter it notes:

“ The Company maintains an environmental provision within its accounts to meet any future environmental liabilities.” (Inveresk, 1996, P16)

accounting format or separate. This reflects pressure on companies from the City (see Glossary), the banking sector and others, to be given a true picture of what environmental costs, liabilities and expenditure may be for any one particular company. As lenders these financial institutions may have future issues of lender liability, whilst as investors they need to ensure growth and security for all monies. By contrast, in the USA there are more stringent requirements:

“The U.S. Securities and Exchange Commission (SEC) already requires businesses to follow certain procedures in recognizing and disclosing environmental liabilities in their financial reporting (U.S. SEC, 1993). The SEC is also pressing for even greater disclosure of environmental liabilities, especially the potential costs of cleaning up contaminated sites (Murphy, 1994; Roberts, 1994)” (Ditz et al., 1995, P8)

These have resulted in a considerable amount of work being conducted by US or US based companies in the environmental accounting field, thus contributing to the development of what has been termed the ‘Anglo-Saxon’ format. Some of the more significant of these initiatives are detailed in Ditz et al. (1995) which discusses work done by Amoco, Ciba-Geigy, Dow Chemical, Du Pont, S.C. Johnson Wax and Washington State. Then with the publication of the EPA Case Study on “Green Accounting at AT & T” (EPA, 1995b) this work was carried further forward still, in terms of detailing precisely what is involved and what should be covered by environmental accounting within the ‘Anglo-Saxon’ format. These driving forces all serve to demonstrate hypothesis 3 (hypothesis subset), that societal forces are driving this process and these are over riding commercial pressures.

Despite this work in the US, no one company has produced a totally separate set of financial environmental accounts. So far, critical disclosures of an environmental nature have often been within a company’s report and accounts. For example, Nortel (Northern Telecom Ltd.) of Canada a huge, international telecoms company note in their Notes to Consolidated Financial Statements for 1995 that:

“Nortel, primarily as a result of its manufacturing operations, is subject to

numerous environmental laws and regulations and is exposed to liabilities and compliance costs arising from its past and current generating, handling, processing, recycling, storing, discharging, and disposing of hazardous substances and wastes.

As at December 31, 1995, the accruals on the Corporation's consolidated balance sheet for environmental matters, including those referred to immediately below, were \$55m" (Nortel, 1995, P52)

Nortel goes on to discuss other environmental liabilities such as that of being a potentially responsible party at five Superfund sites in the USA and notes that remedial action at eleven manufacturing sites is likely to cost another \$51m. In other words, details of environmental expenditure and liability are given but not as a separate 'environmental balance sheet'. Inveresk (Inveresk, 1996), the UK paper company previously cited, takes a similar approach, although in this instance the figures are presented in a separate environmental report within the annual report rather than as notes to the accounts. Again, indication of environmental expenditure is given (see footnote 1) and liabilities are also discussed with one major investment in an effluent treatment plant being named as likely to be £1.25-1.5m. Anglian Water, one of the UK's privatised water companies and that with the biggest burden of water purification in terms of nitrates and other agro-chemicals leaching into watercourses, takes a similar approach to that of Inveresk (although rather than providing an environmental report within the annual report, they have produced this separately). Again, they do not provide notes to the accounts of an environmental nature but rather they discuss environmental items of expenditure throughout their separate environmental report (Anglian Water, 1996).

At present there is evidence that this 'Anglo-Saxon' approach to environmental accounting seems to be regarded by business as very much a management tool and part of the management accounting process (hypothesis 2 – hypothesis subset). For example, the AT & T approach is that:

"The Green Accounting Team believes that Green Accounting can support the achievement of AT & T's environmental policies by:

- *Supplying relevant cost data to understand and improve environmentally*

impactive processes, and drive desired behaviour towards designing environmentally preferable products and services;

- *Providing information to support the most cost-effective solutions to preventing and/or meeting environmental compliance needs; and*
- *Providing evidence of compliance with environmental standards (both regulatory and voluntary).” (EPA, 1995b, P6)*

The above refers to the management accounting process where facts and figures are available internally within a firm to enable personnel to make an informed decision on, for example, such items as investment projects or alterations to processes. These figures may not be available for public consumption and will not necessarily show up in the accounts, which have to be published annually² by law (certainly in the UK).

Others are concerned with the impact that environmental considerations may have on the current accounting and auditing process, lending weight to hypothesis 1 (hypotheses subset) concerning environmental accounting as a necessary and useful process. Roger Adams (Adams, 1996) considers this in his discussion on the EU paper *Environmental Issues in Financial Reporting*. Whilst Nuclear Electric, in their Environmental Report (Nuclear Electric, 1995) recognise this necessary and useful role for environmental accounting but additionally acknowledge the societal pressures for their production (hypotheses 1 & 3 - hypothesis subset):

“A criticism of the growing body of published company environmental reports has been the lack of quantitative information, particularly in relation to the financial implications of environmental issues. US accounting regulations now require disclosure of potential environmental liabilities while in the UK and Europe there is evidence that lenders and insurers are taking a greater interest in environmental liabilities and other costs.” (Nuclear Electric, 1996)

² In the UK any company having limited liability, whether it be private or public, must lodge a set of accounts (balance sheet and profit and loss account) at Companies House annually. Failure to do so results in fines of a significant level.

1.2.2iii The BSO Origin Format

The BSO Origin format incorporates both physically quantitative and financial data. It considers any impact the company might have on the environment, which might compromise “the ability of future generations to meet their own needs” (WCED, 1987) – demonstrating the societal pressures to which hypothesis 3 (hypothesis subset) refers. Thus they state that:

“ It is the purpose of the environmental accounting to quantify the damage caused to the environment in financial terms - in itself a difficult task, as damage to any eco-system cannot easily be expressed in terms of money.” (BSO Origin, 1993, P103)

They incur some environmental expenditure (via such items as environmental levies, taxes and payments to private waste disposal companies) but otherwise, they have the problem that there is no mechanism for assessing the environmental or social cost that the business is incurring. As they had decided to attempt this, their environmental accounts, whilst quantifying impacts in terms of actual emissions levels, had to move away from the Oko-bilanz approach by placing a value, for example, on their emissions. For example, in their 1994 accounts BSO Origin place unit cost values of 14 Dfl/Kg for SO₂, 10 Dfl/KG for NO_x, 10 Dfl/KG for Dust and 100 Dfl/Kg for their CO₂ emissions resulting from electricity consumption. When first initiated the BSO Origin accounts were unique and whilst other companies have started to produce environmental accounts, theirs has remained a unique approach, largely as a result of trying to address the issue of social costs. In this, they acknowledge the societal forces of hypothesis 3 (hypothesis subset).

BSO Origin freely admit that their method of environmental accounting is not an exact science. For example, some of their emissions figures include estimates such as when office energy consumption is unknown and difficult to disentangle from other figures. However, whilst criticisms can be made of the averages used and the extrapolations made (Fox, 1991), theirs was a pioneering attempt at environmental accounting produced well ahead of any other. Their persistence with environmental accounting acknowledges

it as a useful and necessary technique (hypothesis 1 – hypothesis subset) whilst their approach to the whole acknowledges societal pressures (hypothesis 3 – hypothesis subset).

1.2.2iv Assessment of the different formats.

To have any value, these various formats must facilitate both the use of current environmental accounting usage and its future development. If this is the case then the literature emerging on this subject should provide evidence to substantiate the hypothesis via the hypotheses subset.

The AT & T approach, as discussed, demonstrates that environmental accounting is both a useful tool and integral with the management process. This substantiates the first two hypotheses (hypothesis subset). The Oko-bilanz approach as adopted by Kunert (Kunert, 1995) also affirms these two hypotheses. In this instance environmental accounting is both a ‘necessary and useful process’ in terms of cost and especially waste management and has been very much part of the management process. Kunert by suggesting that “*An environment worth living in is indisputably one of the existential needs of the next generation.*” (Kunert, 1995) is also indicating that societal pressures may be driving their use of environmental accounting, as also do BSO Origin by their approach. This is evidence in support of the third hypothesis (hypothesis subset). Whilst continued production of environmental accounts by BSO Origin after its first set (ref: 1.2.1), helps to confirm that this may be again both a necessary and useful process (hypothesis 1 – hypothesis subset).

Initially, these were all isolated examples. For a long time following the production of their first and subsequent sets of environmental accounts, BSO Origin seemed to be unique in both their approach and their perceptions of what companies should be doing, not just in terms of environmental accounting but also in terms of their obligations to the future of the planet (hypotheses 1 & 3 – hypothesis subset). Then there were indications that other companies such as Kunert might be taking a similar view. For example, Ontario Hydro, an electrical utility in public ownership based in Ontario, Canada has declared that their mission is to:

“ make Ontario Hydro a leader in energy efficiency and sustainable development, and to provide its customers with safe and reliable energy services at competitive prices.” (Boone et al., 1995 P2)

Their strategy is very much underpinned by issues of sustainable development and this dates back to June 1993 when their new Chairman set up a Sustainable Energy Development (SED) Task Force. Above all else, SED was to be integrated into the planning and decision making process of the company, in other words into its strategic management process. Further, part of this included the implementation of Full Cost Accounting (FCA) (CICA, 1997), a form of environmental accounting. In order to avoid any confusion FCA was defined by Ontario Hydro as:

“a means by which environmental considerations can be integrated into business decisions. It is a tool which incorporates environmental and other internal costs, with data on the external impacts and costs/benefits of Ontario Hydro’s activities on the environment and on human health. In cases where external impacts cannot be monetized, qualitative evaluations are used.” (Boone et al., 1995, P4)

Ontario Hydro’s approach to FCA has two components:

- *“to better define and allocate our internal environmental costs, and*
- *to better define and cost the externalities associated with our activities.”*

(Boone et al., 1995, P4)

What is of real significance is the integration of this environmental accounting into the strategic management process. As a result the Ontario Hydro literature shows clear supporting evidence for the first two hypotheses (hypothesis subset) and goes some way towards evidence for the third hypothesis, especially in terms of their mention of a need for a sustainable development ethic.

Ontario Hydro and Kunert were not isolated examples. In 1997 in the UK, along with its Safety, Health and Environmental Report for 1996, ICI published a document on its “Environmental Burden Approach” (EB). The ICI EB approach is essentially one of

physical quantification of impact for a range of factors such as acidity and smog creation (ICI 1997a, P12 & ICI 1997b, P3) but, as a form of environmental accounting, it is not an Oko-bilanz. ICI say that:

“EB provides a way to rank the potential environmental impact of our different emissions.” (ICI, 1997b, P3)

There is no means of using their EBs to judge their significance against what other companies produce or what compliance might dictate. ICI have begun to introduce environmental accounting and suggest that it might have a role to play (hypothesis 1 – hypothesis subset) but there is no evidence that it has been integrated into the management process in any way (hypothesis 2 - hypothesis subset). Whilst they have demonstrated some business concern for environmental issues, at present they do not go beyond this.

Contrast this, however, with the Environmental Report 1996 from Novo Nordisk, a Danish health care company. Not only is there an extensive listing of the environmental impacts of their production sites worldwide, but they also list their environmental impact potentials in terms of data which is more familiar and which may be more readily cross-referenced. For example, global warming impact is listed in terms of tons of CO₂ equivalents. Added to which they make mention of their progress on developing sustainable products (Novo Nordisk, 1997, P14 Fig. 4) and state that:

“A commitment to sustainability must be accompanied by continuous and documented improvement. The life-cycle approach is a powerful and far-reaching way of identifying and qualifying the environmental performance of a product from cradle to grave.” (Novo Nordisk, 1997, P14)

This is a more extensive and meaningful documentation of environmental figures than that of ICI and seems to support much of the hypotheses subset under consideration.

What was quite clear was that, given the work already being done in the field of environmental accounting, it was a nascent technique. That the reasons existed

(hypothesis subset) to establish it properly within a business context was less certain.

1.3 History and precursors of environmental accounting

Evidence in support of the hypothesis and its subset can not only be found within existing literature on environmental accounting but should also be available within the literature on other environmental initiatives. If these have been established as necessary and useful, integral with the management process and have been driven by societal pressures that have over ridden the usual commercial pressures, then it might be reasonable to suppose that the same applies to environmental accounting. These precursors of environmental accounting were examined for such evidence.

1.3.1. *Cost Benefit Analysis*

The earliest initiative was that of *Cost-Benefit Analysis* (CBA). CBA is a technique used widely in the USA in the 1950s and used and advocated in Europe since the 1960s and early 1970s. Its use has tended to be mainly by public agencies for the evaluation of public projects of significant size. Put simply, it is an attempt when evaluating a project, to take account not just of the direct private costs³ and benefits of that project, but also to draw into the evaluation process a consideration of the social costs⁴ and benefits⁵

³ The EPA (EPA, 1995a, P34) defines *private costs* as “the costs a business incurs or for which a business can be held responsible. These are the costs that directly affect the firm’s bottom line. Private costs are sometimes termed *internal costs*.” The term ‘public agency’ may be substituted here for business/firm to convey the meaning of private costs for a public body.

⁴ The EPA (EPA, 1995a, P34) defines *social costs* as being either “a synonym for *societal costs*” or as being “a subset of external costs”, which are in turn “a synonym for *external costs*”. *Societal costs* are defined as “the costs of a company’s impacts on the environment and society for which the business is not financially responsible. These costs do not directly affect a firm’s bottom line. Societal costs may also be referred to as *external costs* or *externalities*. These costs may be expressed, qualitatively, in physical terms (e.g., tons of releases, exposed receptors), or in dollars and cents. *Societal costs* (or externalities) are sometimes subdivided according to whether the impacts are environmental, referred to as *environmental costs* or *environmental externalities*, or social, referred to as *social costs* or *social externalities*.” Again the term ‘public agency’ can be substituted here for business/firm to convey the meaning of social costs for such a body.

involved. As such it is a complex procedure involving the need to identify:

- which social costs and benefits should be included
- the valuation of these costs and benefits, which can be a complex process especially if dealing, for example, with the valuation of a landscape
- the interest rates at which the social costs and benefits concerned are to be discounted
- a consideration of the constraints involved, for example, space may be a constraint on the development of another site whereas it is not for the one under consideration

Whilst a simple technique in itself, due to the complexity of establishing the values involved, CBA is a technique that can become distorted, either by accident or design. However, it has continued to be popular, despite the development of new techniques such as *cost effectiveness analysis* (in which only resource costs are expressed in money terms, while benefits remain in non-monetary units) and *environmental impact assessment*. Its importance lies in the way in which it demonstrates a commitment to the absorption of social costs and in its long and continuing acceptance as an environmental technique. In certain contexts (large projects) it is both a necessary and useful technique and also integral to the management process (hypotheses 1 & 2 – hypothesis subset). Given its emphasis on social costs, it is societal pressures that clearly drive this process as much as commercial considerations (hypothesis 3 – hypothesis subset).

1.3.2. Environmental Impact Assessment

An environmental impact assessment (EIA) is the gathering and evaluation of information about the consequences for the environment of a proposed development,

⁵ Private benefits are those benefits which accrue solely to the business or public agency concerned. They are not enjoyed outside the organisation at all. Social benefits are those benefits which are enjoyed by society at large, outside the organisation concerned but as a result of the actions of that organisation. These benefits are of particular concern to governments, regional or national, when they conduct a cost benefit analysis - as also are the social costs.

whether public or private. An EIA not only attempts to predict the implications of the proposed development but also sets out to look at the advantages and disadvantages of alternative solutions. The aim of an EIA is to protect the environment by anticipating the problems that might occur as a result of a project, rather than by applying remedial measures after the event. Developed in the 1970s, by the 1980s the World Bank required the submission of an EIA before it would agree funding for any project, whilst over twenty developing countries had, by then, made EIAs compulsory for all developments likely to have any significant impact. The European Union (EU) had likewise introduced the requirement for an EIA to be conducted under certain circumstances (Environmental Impact Assessment Directive, 1985).

Critics of the EIA process maintain that it is a bad way of protecting the environment (Wathern, 1988, P25; Westman 1985, P3; Devuyst, 1993, P167), and an expensive long drawn out exercise that produces a result which may be only marginally different from the pre EIA situation. However, as with a CBA this technique demonstrates a commitment to the mitigation of social costs; societal pressures would again seem to be driving this (hypothesis 3 – hypothesis subset) and it is a well established and useful environmental technique, embedded in many management processes (hypotheses 1 & 2 – hypothesis subset). Both the CBA and the EIA are numerate techniques that use environmentally related figures. Although they are not continuous accounting over a particular time period, they are a broad over-view at a point in time.

1.3.3. Environmental Auditing

Both the CBA and the EIA as evidence of the growing concern for the environment, tend to demonstrate this concern at a macro (that is, national or regional) level. These are techniques which, partly because of the time which they may take to conduct and partly because of their expense, tend to be employed where large projects are involved, such as the building of a new motorway in the public sector or, in the private sector, the development of a large site for industrial purposes. They are also techniques that are used when new developments are under consideration, rather than being something that is applied to existing ones (as is the case with environmental accounting). However, as the groundswell of concern for the environment grew throughout the 1980s, it became clear that techniques had to be developed for assessing such existing developments, especially

at the micro (that is, business or site) level. For example, following incidents such as the explosions at Flixborough in the UK and Seveso in Italy, the chemical industry had the task of persuading residents in the locality of chemical factories that the emissions from their chimneys, whilst clearly visible, really were harmless; or that volatile raw materials really were stored safely, and so on. True this did not happen in every instance, for example, the Hydro Polymer plant at Newton Aycliffe in County Durham has never had problems with concerned local residents and employees, simply because this is an area previously dominated by mining, which was considered far more dangerous and unpleasant than a chemical factory (Baldwin, 1991). Businesses, therefore, had to find a way to demonstrate to society at large, and to their locality in particular, a heightened environmental awareness and sensitivity, coupled with a concern to limit the damage that they caused to the environment. In this they were being driven by societal pressures which were tending to over-ride commercial ones (hypothesis 3 - hypothesis subset). As a result, towards the end of the 1980s a technique known as environmental auditing began to emerge and to be adopted.

An *environmental audit (EA)* is an attempt by businesses both to give evidence of careful environmental management and also to ensure, when purchasing manufacturing facilities, that this has always been in place. In 1989 the International Chamber of Commerce (ICC) defined an EA as:

“A management tool comprising a systematic, documented, periodic and objective evaluation of how well environmental organisation, management and equipment are performing with the aim of helping to safeguard the environment by:

- (i) Facilitating management control of environmental practices;*
- (ii) Assessing compliance with company policies, which would include meeting regulatory requirements.” (UNEP, 1990, P100)*

EA went on to be incorporated into EU law via the EU Eco-Audit Regulation issued by the EU Council in June 1993. It was further reinforced by the development of environmental management systems, which were formalised within the UK in BS 7750 and internationally by ISO 14001 series. Whilst these standards address the problem in a

qualitative way, however, the theory behind the move to establish standards for sound environmental management is that, unless environmental management systems are competent, then there is no hope for managing the production of goods and services in anything approaching a sensible way as far as the environment is concerned. This marked the introduction of a further numerate technique, again, like the CBA and EIA concentrating on a particular point in time rather than being a continuous process. This was moving closer to environmental accounting but what forces were driving this process (hypothesis 3 – hypothesis subset) and whether or not this new technique was regarded as necessary and useful and part of the management process (hypotheses 1 & 2 – hypothesis subset) was unclear.

1.3.4. Life Cycle Analysis

At the micro level what was also becoming of considerable interest to many people by the end of the late 1980s was precisely what was the total environmental impact of products over their lifetime, not just at their point of production but both before this in terms of resource extraction/harvesting and after this in terms of their disposal, post use (Elkington & Hailes: Green Consumer Guide, 1988). In other words, interest in a cradle to grave analysis was emerging, termed Life Cycle Analysis (LCA) (See Glossary for other terminology). In brief, an LCA examines materials and energy input quantitatively and whether or not this is from renewable or non-renewable sources and if it is the former, whether or not these sources are being renewed post harvest; together with an examination of outputs. Outputs may be solid and/or liquid waste, waste heat, emissions to the air and finally, the product itself. The effects of these outputs must also be considered, especially that of the product post consumption, for example, can it be recycled/reused or does it go to landfill or incineration? The process of LCA involves some value judgements, however, it also involves the collection of quantitative data as part of the LCI stage.

The LCA is enshrined in European Union (EU) law as it is reflected in the EU Eco-labelling scheme. This only applies to a limited range of products to date and is not widely held to be successful⁶. However, it is a recognition that this technique is both

⁶ A CBI Environment Forum Workshop in January 1996 criticised the EU Ecolabelling Scheme

necessary and useful (hypothesis 1 – hypothesis subset), part of the management process (hypothesis 2 – hypothesis subset) and that factors such as concern for the environment should over-ride commercial considerations (hypothesis 3 – hypothesis subset) even though eco-labelling has a cost to firms which impinges on profits.

With standards for environmental management systems in place and the techniques of EA and LCA being addressed, both of which need some quantitative data, it was therefore not surprising that environmental accounting emerged in its current nascent form. Some of the data needed for environmental auditing can be extracted from business accounts (for example, figures for energy usage), whilst in the course of an LCA the business accounts may also be turned to (for example, in order to track waste disposal). From this it is logical to begin consideration of what other environmental figures might be held within business accounts or, if preparing an LCA, whether it might be more appropriate to show the physical quantities for emissions and waste as a quantitative balance of accounts. These other techniques had proved both necessary and useful, so it may be that environmental accounting is also both of these (hypothesis 1 – hypothesis subset). It also seems possible that, given the way in which CBA, EIA and even EA are embedded (to greater or lesser extent) in the management process, that this may become true for environmental accounting (hypothesis 2 – hypothesis subset). Undoubtedly the common thread throughout all this, is that of societal pressures driving these processes (hypothesis 3 – hypothesis subset). Therefore, conditions or “reasons” for the establishment of environmental accounting may well exist.

1.4 Pressures and motivations influencing the development of environmental accounting

If environmental accounting does have a necessary and useful role to play (hypothesis 1 – hypothesis subset) then there will have to be forces in operation to ensure that this occurs. Yet within society there are many different actions and inter-actions occurring between the different pressures and motivations which exist, which might or might not

for proving unsatisfactory. It also pointed out that not only is this scheme not working but there has emerged a “proliferation of national ecolabelling schemes in the EU” which “meant that harmonisation was essential.” (CBI, 1996, P21)

allow environmental accounting to play a role either now or in the future. Again, the literature illuminates this.

1.4.1 Business motivation: profits and shareholder pressure v social costs

The various environmental initiatives seem to have developed within what is, in terms of the overall length of the industrialisation process, a relatively short space of time. In particular, a sea change in attitude seems to have occurred in the late 1980s and this may be due to the greater attention being paid, within the developed world, to the problem of social costs. This is perhaps encapsulated by Coase's conclusions to his paper on *The Problem of Social Cost* (1960). In this paper he starts by outlining the conventional view of social cost dating back, in the main as he points out, to its treatment by Pigou in *The Economics of Welfare* (Pigou, 1932). Having discussed a number of different cases he does, however, conclude:

"If factors are thought of as rights, it becomes easier to understand that the right to do something which has a harmful effect (such as the creation of smoke, noise, smells, etc.) is also a factor of production. . . . The cost of exercising a right (of using a factor of production) is always the loss which is suffered elsewhere in consequence of the exercise of that right - the inability to cross land, to park a car, to build a house, to enjoy a view, to have peace and quiet or to breathe clean air." (Coase, 1960, P44)

The environmental management techniques discussed above, and the precursors of environmental accounting, are in many ways an attempt to identify how an exercise of a right (use of a factor of production) might create environmental losses which are currently valued by individuals. For example, the exercise of the right of the government to build a motorway to benefit some, might create the losses of enjoying a view, having peace and quiet or the ability to see natural environs and enjoy their wildlife for others. A CBA or an EIA would identify these problems. Whilst the exercise of the right of fertiliser factories to emit some nitrous oxides to the atmosphere, for example, would be identified by an LCA, an EA and, increasingly, by some types of environmental accounts. These techniques can be viewed as an attempt to arrive at some sort of appreciation of these social costs, the consequence of which may be an internalisation (to

the business concerned) of some or all of these.

Economic theory of the firm suggests that businesses have objectives which conflict with any absorption by them of all but their private costs. The most likely objective for any business to pursue is that of profit maximisation; any absorption of social costs would conflict with this as an objective, as it would distort cost curves, thus reducing profit if price remains constant. Add to this the growth in influence of the Institutional Investors, who by October 1986 between them accounted for holdings of nearly 52% of all shares traded on the London Stock Exchange (London Stock Exchange, 1986) and who have a considerable interest, on behalf of their investors, in the maintenance of share dividends, that is, profit levels, then there is invincible pressure to maintain profits at the expense of social costs. True, managerial theories of the firm argue that profit maximisation may not be a business's main objective. Given the divorce of ownership and control within modern business structures these theories argue that growth (Marris, 1963) or sales maximisation (Baumol, 1967) or the maximisation of discretionary expenditure (Williamson, 1963) may be alternative objectives. These will give managers status, power and security and will certainly affect salary levels. (George & Joll, 1981) However, whilst these theories may argue a different case than that of profit maximisation, they do not allow for the absorption of any social costs as again, this would affect cost curves and, especially given that these theories allow for the likelihood of a profit constraint, this would affect the achievement of these alternative objectives. There is, therefore, an inherent tension between any absorption of environmental (social) costs and a business's objectives, whatever these may be. Whilst environmental accounting may help to demonstrate a business commitment to the absorption of these social costs, this may be in conflict with its commitments to its shareholders. Business concern for the environment could, therefore, be muted and these pressures alone (for profit maximisation, growth or whatever) could disprove the hypotheses.

1.4.2 Environmental trends within society and on industry

Whilst doubt can be cast on business' willingness to absorb any social costs, they cannot always withstand the external pressures to do so. A good example here is that of the Greenpeace campaign against Royal Dutch Shell over the dumping of the Brent Spar oil platform at sea. This was external pressure concerned with social costs of an

environmental nature where a business had no other choice than to take note, regardless of its business objectives (The Economist, 24.6.95, P16). Environmental impacts or negative externalities are now unacceptable and the public perception of the cost of these (their social cost) is that this should accrue to the business concerned. The High Court judgement against Turner & Newall in 1995, concerning asbestos contamination caused by their factory in Armley Leeds is a further example⁷. These changing attitudes have influenced not just the development of environmental techniques such as LCA and EIA but also that of environmental accounting. They have generated legislation (for example, Environment Act, 1995) and pressures from the financial services sector (for example, the 'green' funds established by fund managers such as Jupiter (Jupiter Asset Management Limited, 1994)).

Legislation has been a particular pressure for change. It has turned the requirement for cleaner technologies from being merely something that companies should strive towards, into a necessity. It has also introduced into corporate strategy, the imperative of monitoring and accounting for the environment. So, for example, we find that in 1990 the Chemical Industries Association (CIA) was saying:

"It is therefore a primary responsibility of the management of the chemical industry in both the short and long term to protect the environment as an integral part of good business practice." (CIA, 1990, P43)

Contrast this with the past behaviour of the Turner & Newall factory in Armley, Leeds whose management ignored the environmental, health effects of their operations on the local community or with the operations of the companies which discharge into the Mersey Basin, highlighted in a table in Greenpeace Business (No. 1, June 1991), which indicated a lack of care for the marine life of both this area and of the Irish Sea which the

⁷ This refers to a ruling in the High Court in Leeds on October 27th, 1995, when the court ruled that compensation for the mesothelioma (a cancer of the lung) caused to an individual who lived near the factory in Armley as a child, must be paid. This was a landmark case, as for the first time such compensation was due not just to asbestos workers but also to those living near an asbestos plant as well (The Economist, 4.11.95).

Mersey feeds⁸.

Externalities are thus of increasing importance to companies and these can be reflected in the environmental accounting process. This is what is highlighted by the BSO Origin environmental accounts (BSO Origin, 1991 and subsequent years). What they have been attempting to value is their impact on the environment in general, in other words the cost to the environment of their externalities, which they freely admit to be difficult (BSO Origin, 1991, P59). BSO Origin has been unusual in its approach. For example, in the BT document on environmental accounting (BT, 1996) where there is a very clear outline of the four classifications into which environmental management accounting fall, environmental externalities are the lowest priority (BT, 1996, P17). This same document later states:

“Dow has decided for the time being to prioritise internal costs. This is due to both the difficulty of calculating externalities, and the risk that if this influenced pricing then a company which adopted the approach unilaterally could be put at a competitive disadvantage .” (BT 1996, P18)

But in contrast:

“Ontario Hydro has taken a broader approach:They would not accept the traditional accounting-based definition of “full cost” as limited to internal costs only. The objective is to reflect the full impacts and costs of their activities on a life-cycle basis.” (BT 1996, P19)

⁸ Greenpeace Business lists a number of companies, such as Consolidated Bathurst, Laporte Industries, Lever Bros., RV Chemicals & Unichema Chemicals, as discharging pollutants that deprive the water of oxygen, with the consequent implications which this has for marine life. They also list other companies which emitted chemicals harmful to the environment and to humans as having caused pollution offences within the time period 1985-90. For example, Croda Chemicals is listed as having committed 40 pollution offences in this category. (Greenpeace Business, No. 1 June 1991, P6)

There are, therefore, conflicting messages emerging from business literature as to whether or not environmental accounting is both necessary and useful (hypothesis 1 – hypothesis subset), part of the management process (hypothesis 2 – hypothesis subset) and that societal forces are driving this and over-riding some commercial pressures (hypothesis 3 – hypothesis subset), in other words as to whether or not the “reasons” exist for its establishment.

1.4.3 National and international pressures

The extent to which environmental externalities may be accounted for varies from country to country. Environmental liability can be a key issue in this context, especially for certain of the polluting industries and especially in North America. Not only can a company find itself legally liable for the clean-up of existing industrial sites (which are considered outside acceptable limits for pollution levels) but it may also find itself responsible for all or part of the clean up of sites which were, in the past, owned by the company or by what is now a part of that company. This applies both to the manufacturer concerned and also to any company in the financial services sector that has been responsible for lending money to a polluting company. Such lender liability may be joint with the company concerned or, where the company has gone into liquidation and no part of it can be traced, sole, as being the only surviving body that can be deemed to have any responsibility. This arises from the US Superfund legislation and references to obligations under Superfund can frequently be found in North American CERs, for example, those for Nortel (Nortel, 1995).

Such impetus in the USA also arises from a very close working relationship between the EPA and the Securities and Exchange Commission (SEC). Unlike the Stock Exchange (SE) in the UK, which is purely the equivalent of a trade association, the SEC is also a regulatory body. It is concerned with the good governance of all quoted companies and the EPA not only reports to it on all court actions which they may have brought against companies, the outcomes of these and any fines imposed but also trains SEC staff and downloads (via their computer networks) much environmental information to them. Further, the SEC regulations also require disclosure of much environmental financial information, especially as this relates to current and future spending (Gray, 1993, P205). Couple this with:

“The Ontario and Quebec Securities Commission require listed companies to include the financial or operational effects of environmental protection requirements on the capital expenditure, earnings and competitive position of the company for the current year and forecast of impact for future years.” (Gray, 1993, P205)

and it becomes clear that throughout North America there is an urgent imperative for environmental accounting. It is both necessary and useful (hypothesis 1 – hypothesis subset), has to become part of the management process if legal obligations are to be fulfilled (hypothesis 2 - hypothesis subset) and is being driven by pressures over-riding commercial considerations (hypothesis 3 - hypothesis subset).

There has been concern that the environmental liability issues of North America could become accepted in the UK. This is the subject of increased attention and banks would now be nervous of lending for acquisition where potential environmental liabilities are concerned, without very thorough environmental audits (Kelly, 1997). Legislation and issues of legal liability are driving the ‘Anglo-Saxon model’ of environmental accounting. It is now important for investors (especially the large institutional investors), financial analysts, lenders within the financial services sector and others, to know what provisions have been made and should have been made, against environmental costs and liabilities. Thus the Institute of Chartered Accountants for England and Wales (ICAEW) asks in its discussion paper of April, 1995 on this topic:

“When should future environmental expenditure be recognised as a liability? Does this depend on whether the related environmental damage has already occurred? Or on when the obligation for clean up was incurred?” (ICAEW, 1995a, P11)

Moreover, as companies have begun to look at environmental costs and liabilities they have discovered that, for example, where they can reduce waste by extracting as much as possible for recycling, then, whilst the cost of extraction is an addition to costs, there may well be considerable savings from the act of recycling and as a result of having less

waste disposal (Wilkinson, 1997). Savings as a result of increased environmental efficiency has, therefore, begun to feature. Environmental accounting is a way of tracking these (EPA, 1995a, P1-2). Environmental accounting would therefore seem to be a necessary and useful process (hypothesis 1 - hypothesis subset) and be making progress towards becoming part of the management accounting, and hence management, process (hypothesis 2 - hypothesis subset).

Whilst concern for the environment as expressed via regulation, legislation and liability issues has become of increasing importance in the so-called 'Anglo-Saxon' countries, it has become of really urgent concern in some mainland European countries, due to the fact that some of them are suffering the effects of pollution - originally from elsewhere. Some Scandinavian countries, for example, such as Norway, found that forests were dying and lakes were lifeless due to acid rain imported from the UK. The Netherlands likewise suffers from acid rain. For example, about 60% of the acid rain in the Netherlands comes from outside its borders (The Netherlands Ministry of Housing, Physical Planning and the Environment, 1992, P6), whilst it imports considerable pollution by water from Switzerland, Germany, France and Belgium via the major European rivers of the Rhine, Meuse and Scheldt (The Netherlands Ministry of Housing, Physical Planning and the Environment, 1992, P6). Not only this but, according to "Concern for Tomorrow", a report the Netherlands published in December 1988, the then state of the Netherlands environment was so serious that even the most comprehensive technological measures were unlikely to achieve the required 80% to 90% reduction in the level of their pollution (The Netherlands Ministry of Housing, Physical Planning and the Environment, 1992, P15).

Due to this Dutch concern about their environment a whole range of legislation has been introduced, as also have new instruments, including financial ones such as environmental taxes. As a result, it should not be surprising that it was a Dutch firm, BSO Origin, which published the first set of environmental accounts. Having been pioneered by a company in one mainland European country, the real initiative in terms of environmental accounting has come from another one. Denmark passed a law and statutory order in 1995 concerning the duty for certain listed enterprises to report on their environmental or green accounting (Danish Ministry of Environment and Energy, Danish Environmental

Protection Agency, 1996, P1); the first country world wide, to incorporate environmental accounting into law. Further, this is based on the attitude that public concerns are very real and must be answered as they state that:

“The main purpose of green accounts is to enable the public to attain information about environmental performance, but also to create a dialogue between the public and the enterprise.” (Danish Ministry of Environment and Energy, Danish Environmental Protection Agency, 1996, P7)

In addition, the Danes give encouragement to the EU EMAS scheme and also introduced economic incentives via *green energy taxes* introduced in January 1996.

The Danes have tended to adopt the Oko-bilanz approach to environmental accounting (as evidenced by the Danish companies of Det Danske Stalvalsevaerk and Novo Nordisk), both of whom have adopted this method of presentation. It facilitates monitoring year on year improvements and also the monitoring of emission levels in general. For example, the Novo Nordisk Oko-bilanz highlights items such as air emissions of sulphur dioxide, carbon dioxide and VOCs, together with water and energy consumptions and production of hazardous waste. Whatever the method, the very fact that the Danes have introduced a legal requirement for environmental accounting for some businesses lends considerable support to both the first and last hypotheses of the hypothesis subset.

That two different approaches to environmental accounting exist (and thus seemingly two different solutions to the problem) may be purely as a result of different business traditions in the various countries. Whereas the Anglo Saxon countries' business environment tends to be dominated by accountants, for mainland Europe it is the engineer who has pride of place. The two routes towards environmental accounting merely reflect the type of approach that the accountant would take on the one hand (financial environmental accounts) and the engineer would take on the other hand (Oko-bilanz). The latter may appear more ecologically orientated but financial pressures exist whatever the country, as evidenced by the following statement from a European publication:

“The widespread concern over the current state of the environment and the limited success of existing policies affect every link in the financial chain, from investor to producer. This situation causes confusion among bankers, insurers and corporate executives who realize that through the clean-up costs of industrial activities net worth might be eroded.” (Muller et al., 1994, P2)

What is important now is the realisation that, in addition to financial pressures, environmental ones exist and that these must be accounted for, in whatever format, by the business world. That societal pressures are driving this process seems fairly evident (hypothesis 3 - hypothesis subset).

1.5 Vested interests: the groups involved in the development of environmental accounting.

The examination via the literature survey of the different approaches to environmental accounting, its precursors and the pressures acting on the business world, have all demonstrated elements of proof of the hypothesis subset and hence of the core hypothesis. However, what is under consideration is an environment in which people act and inter-act with each other. If all of these hypotheses are to be proved, then environmental accounting and the processes involved must be powered by commitment from the individuals or groups of individuals involved, whatever their motivation. This must also be demonstrated quite clearly by the literature.

Whilst the history of environmental accounting is relatively young (dating from the early 1990s) many of the groups involved were, and are, groups of individuals who already had an interest in one or several aspects of the environment and saw this new area as an extension of these. These groups range from government departments at national level, through to professional bodies at both international and national level and back to consultancies and the businesses themselves, at a more micro level.

In the main, the groups with an interest in environmental accounting fall into three categories:

- those with an interest in the area but not actively involved:
 - Government departments and other governmental bodies, e.g. the Department of the Environment, Transport and the Regions (DETR)
 - Industry or business wide organisations, e.g. the Confederation of British Industry (CBI)
 - Non governmental organisations (NGOs), e.g. Business and the Environment (BIE)
 - Pressure groups, e.g. Greenpeace
- those who are actively involved, very often for commercial reasons:
 - Consultancies of an either exclusively environmental nature, e.g. Aspinwall & Company or of a more general nature, e.g. KPMG
 - Lawyers, e.g. Allen & Overy Solicitors
 - City institutions, e.g. NPI Global Care Investment Ltd.
 - Professional bodies concerned that their members both become involved but, in the process of this, also abide by professional standards that they, as their representative body, will help to monitor and evolve, e.g. The Chartered Association of Certified Accountants (ACCA).
 - The businesses themselves, e.g. BT in the UK, Kunert in Germany, BSO/Origin in The Netherlands, Dow Chemical in the USA.
- Those involved at trans-national and regional levels:
 - North American bodies, e.g. the US Environmental Protection Agency (EPA) and the US Securities & Exchange Commission (SEC)
 - European wide bodies, e.g. Federation des Experts Comptables Europeens (FEE)
 - International bodies, e.g. The International Federation of Accountants.

Such interest should provide evidence, via the literature, to substantiate the hypotheses

subset and hence the hypothesis.

1.5.1 Groups interested but not actively involved.

- *Government departments and other governmental bodies*

This first group involves bodies such as the UK government's DETR. The UK government has a vested interest in encouraging good environmental performance from the business world, as some aspects of this may help it to better fulfil its commitments under international treaties. For example, in June 1992 the UK signed the Rio Convention⁹ committing itself to a reduction of carbon dioxide (CO₂) emissions to their 1990 level by the year 2000. Greater energy efficiency on the part of businesses will not only save these businesses money but also help to reduce CO₂ emissions towards the government's agreed target. This situation is most easily monitored if clear quantitative information is available. Environmental accounting is a technique, if consistently formulated, which can facilitate this process. Government departments have been monitoring its development and, have shown signs of encouraging its further development. For example, in 1996 a Department of the Environment (DOE) (as the current DETR was then constituted) spokesman stated in this context that:

"The accounting profession's definition of certain terms are unclear, again impeding useful analysis and comparison." (Charles Duff, 1996a)

This would appear to be encouragement for the development of environmental accounting within the business environment. It also reinforces the hypothesis that environmental accounting has a necessary and useful role to play (hypothesis 1 - hypothesis subset).

⁹ The Treaty was ratified in December 1993, following which the UK government published a detailed report entitled "Climate Change - the UK Programme", setting out means towards meeting the target, which included fiscal, energy-saving and other targets. Carbon dioxide emissions need to be cut by 10m tonnes in order to achieve this target, 6.5m tonnes of which the government originally planned to come from reduced business and domestic energy consumption.

- *Industry or business wide organisations*

Industry wide and business organisations such as the CBI are interested in developments occurring in the field of environmental accounting but are not actively involved. For example, in the CBI Environment Newsletters¹⁰ reports touch on environmental accounting but in the main, emphasise new and current legislation and other more immediate developments. Similarly, whilst the Chemical Industries Association (CIA) produces information on environmental aspects of the chemical industry, nothing is produced on environmental accounting¹¹. These literature sources provide little to support the hypotheses, as the organisations concerned have a watching rather than a pro-active brief.

- *Non governmental organisations*

Many of the NGOs are also monitoring developments in this field but are not active participants. For example, the BIE (one of the leading NGOs in the environmental field) whilst conducting the first ever survey of City analysts' attitudes to the environment in 1994 (City Analysts and the Environment: A Survey of Environmental Attitudes in the City of London) and later producing an Index of Corporate Environmental Engagement and, in 1998, announcing a joint project with Royal and Sun Alliance Group of an investigation into "the production, reliability and use of environmental information by

¹⁰ For example, the CBI Environment Newsletter of May 1996 reports on the ACCA 1995 Environmental Reporting Awards. The report only touches on the quantitative nature of these awards and refers the reader to two individuals at the ACCA for further information - rather than being able to deal with this area, in house, at the CBI.

¹¹ For example, the CIA publications list for April 1996 includes many publications connected with its Responsible Care Programme, which is concerned with improving the environmental behaviour of its member companies. There is no mention of any publication on environmental accounting. However, many of its publications such as 'Responsible Energy, a practical guide to energy efficiency' undoubtedly touch on the quantitative information needed for environmental accounting. In 1996 the CIA launched the 1995 Chemical Industries Association fourth annual survey of industry-wide "indicators of performance." This was a unique sectoral review of its industry which covered such items as, for example, discharges of red list substances, energy efficiency and figures for capital spending on the environment. Whilst it covered 337 of its members' sites, it provided no complete set of figures for any one individual site.

financial institutions in the City of London” (BIE News, No. 12, Summer 1998, P3), has announced no project linked to environmental accounting. However, since its formation in May 1991, the UK Government’s Advisory Committee on Business and the Environment (ACBE) has moved to both fill this vacuum and to fulfil part of its terms of reference (DTI, 1997, P3) by demonstrating an active interest in environmental accounting. As this Committee includes many senior and influential figures from business (for example, from November 1993 it was chaired by Dereck Wanless, then Group Chief Executive of National Westminster Bank), it has tended, both as the government’s advisory body and also by virtue of its constitution, to attract attention. In April 1996, in accordance with its areas of interest, the ACBE issued a consultative document entitled “Environmental reporting and the financial sector - draft guidelines on good practice” (DOE, 1996). This was sent out to a number of businesses and elicited responses from many - including one from a respondent from the chemicals industry, which started:

“There is no common understanding of what is meant by environmental accounting.” (Environmental Accounting & Auditing Reporter, August/September 1996, P3)

In their report on the results of this consultative exercise, the ACBE comment on the financial reporting of environmental costs and liabilities and other environmental figures in an attempt to help the above respondent and others like him/her. They also comment, in the context of a CER, that:

“The report should where possible quantify the financial implications of the reported physical performance measures. . . . ” (DOE, 1997a, P7)

Their interest in environmental accounting is clear. Other bodies such as the UK Round Table on Sustainable Development have addressed the use of indicators and other areas of environmental performance but have yet to address environmental accounting. Again these organisations have a watching rather than a pro-active brief, so evidence in support of the three hypotheses from this literature source, is weak.

- *Pressure groups*

Pressure groups have not, as yet, become actively involved in any areas of environmental accounting. However, as with all environmental initiatives it is of interest as increasingly pressure groups are focussing on the 'triple bottom line', that is, not just a company's financial accounting but also its environmental and social accounting. This results from increasing emphasis by these groups and others, on stakeholder and other theories (See Chapter 5).

1.5.2 Business groups.

- *Professional consultancies*

Professional consultancies have adopted a high profile in this area. Unlike government departments, industry wide bodies or NGOs they have a direct commercial interest in being in the vanguard. There are two types of consultancy involved in this field. The first are those already involved in giving advice on a wide range of environmentally related activities and who have been involved in the environmental audit process for some time. For example, Aspinwall & Company have been involved in the environmental field for a number of years and have certainly been one of the pioneering consultancies in the field of environmental auditing. Clearly, the body of knowledge that such a consultancy has built up in this field is of considerable relevance to environmental accounting since, traditionally, they have worked with clients on environmental problems, have looked at costings of different options, have identified different technologies for emission reduction, and have all the environmental auditing techniques enabling them to identify environmental factors. As a result, they are well aware of what figures may or may not be available and are well placed to consider how best to construct a set of environmental accounts.

The other consultancies involved are those of a general nature, such as KPMG. Whilst these have a broad base they have, essentially, developed from accountancy and auditing services. Consultancies such as these have also had past involvement with environmental auditing. They bring to the area of environmental accounting a unique blend of an accountancy base with an understanding (from those who have been involved in the environmental auditing process) of the environmental dimension of many firms. They

are well placed to be able to construct a set of environmental accounts of a conventional nature, that is, in terms of extracting items of environmental expenditure, liability or other related items from the company's figures and presenting them separately but in a recognisable format in line with accounting conventions. Moreover, as many of the professional accountancy bodies already have an interest in looking at rules and conventions for this new area, they have considerable help and expertise available to them from within their profession. The literature from these two types of consultancy lends credence to hypotheses 1 & 2 of the subset (Aspinwall, June 1996; KPMG, 1996, 1997a, 1997b).

- *Lawyers*

Due to the legal liability issues that have emerged in recent years with respect to companies and environmental damage (for example, the Turner & Newell liability for environmental health damage caused by asbestos from their factory in Armley, Leeds), lawyers are involved in the environmental arena. Whilst unlikely to enter the business of constructing sets of environmental accounts, they have an active interest in reading them, not least because their business clients are increasingly tightly regulated and they must ensure that they are spending appropriately in order to comply with the law and declaring such spending in order to underline their compliance. Thus we find a lawyer declaring:

"Many companies often overlook their obligations to disclose environmental financial information via their annual reports and accounts. Under the Companies Act 1985 Schedule 4 Part II.12(b), all liabilities and losses which have arisen or are likely to arise in respect of the Financial Year to which the accounts relate or a previous Financial Year shall be taken into account." (Allen & Overy, 1996, P2)

Indeed, there is a widespread lack of appreciation by those running businesses of their statutory obligation to disclose environmental matters, not least in their annual report and accounts. This explains the lawyers' interest in this field as they must ensure compliance by their clients. It is for these legal reasons that we find lawyers have been sensitive to environmental concerns from the early 1990s when such issues started to emerge. A large City law firm stated at the beginning of this period:

“The business world is currently presented with a stark choice: to become environmentally responsible or face the prospect of ruin by the regulators. From the company director of a steel works to the chairman of a bank, no one can escape the incoming tide of environmental legislation.” (Davies Arnold Cooper, 1991, Introduction)

and again:

“Ignoring environmental concerns was always a short sighted approach. Now it is sheer social suicide for any . . . business to turn its back on Green Issues.” (Davies Arnold Cooper, 1992, P1)

In the past lawyers have not been involved in the environmental auditing process in the same way as have the consultancies discussed above. They have, however, often been included as part of the team, due to issues of legal compliance. Similarly, it may be that in the area of environmental accounts, lawyers may become part of the team rather than interested bystanders, again due to issues of such compliance. For example, such EU directives as Directive 90/313/EEC on Freedom of Access to Information may impinge on what is declared in a company's accounts by way of environmental information, in much the same way as the 1985 Companies Act already does. Whatever happens as we have been told:

“It is probable that in future years further regulation, and in particular, further standards of accounting will ensure that environmental matters are higher on the agenda in relation to company accounts.” (Allen & Overy, 1996, P3)

The literature currently being produced by the legal profession would seem to confirm at least the first hypothesis of the subset: that environmental accounting is both necessary and useful.

- *City institutions*

Many City Institutions have an interest in environmental accounting, in particular those

that run so-called 'green funds'. Growing environmental concerns have led in recent years to members of the public demanding the opportunity to invest in funds which either invest in companies that strive to minimise their impact on the environment or, alternatively, those companies which are trying to make a positive environmental contribution, such as being involved in energy conservation. As a result companies such as NPI Global Care Investment Limited (Tennant, 1996) and Jupiter Asset Management Limited (Jupiter Asset Management Limited, 1994) have set up these types of funds. Clearly, those managing these funds have an interest in as much environmental information as possible, including quantitative material. Environmental accounts are, therefore, useful in this context. However, when involved in a sector survey of the electricity distribution business in 1994 Jupiter found that:

"It was noticeable that: none of the companies' environmental reports contained significant quantification of performance" (Jupiter, Autumn 1994, P1)

In the same Bulletin, Jupiter also reported that the BIE survey 'City Analysts and the Environment: A survey of Environmental Attitudes in the City of London' found that:

"Many pointed out the problem of quantifying the financial impact of environmental issues." (Jupiter, Autumn 1994, P3)

Tessa Tennant of NPI speaking at a conference in 1996 (Tennant, 1996) reinforced this view by reporting that the City is looking for the quantification of key indicators to do with:

- energy use
- resource use
- waste streams

She went on to say that the City is also looking for quantification, where possible, in any environmental reporting.

Implicit in what Tennant was saying, was the conclusion that this need not be in the form

of environmental accounts but that these would be useful. Environmental figures are especially critical, as what analysts are looking for above all else, are risk factors. Analysts are concerned to ensure that, in analysing a company's situation and prospects, they have factored in all risks, especially environmental ones. What they are looking for is a vehicle by means of which they can compare data as between companies, in addition to any individual assessments they might make. Therefore, whilst City analysts are not directly involved in the environmental accounting process, they have a real interest in it for professional reasons. Further, whilst 'green funds' still represent only a fraction¹² of the investment made by the City of London, they are growing in significance and again, are a further City pressure for companies to present environmental information in a quantified form. This may be an instance of where "societal pressures" are driving the move for environmental accounting, as those investing in 'green' funds are considering sustainability as an issue. Moreover, in their process of risk assessment the analysts concerned are, in effect, taking account of social costs. Such literature as is emerging from the City therefore tends to reinforce both the first and third hypotheses of the hypothesis subset.

- *Professional bodies*

Whilst consultancies, lawyers and City institutions may have been involved with the development of, or have an interest in, the use of environmental accounts, some of the professional bodies involved are of considerable significance in terms of trying to carry the development of this area forward and, in so doing, of trying to ensure adequate standards. The ACCA have been particularly active in this respect. In order to encourage the process of environmental reporting by companies (whether in the form of environmental accounts or otherwise), in 1991 they instituted the ACCA Environmental Reporting Awards. By its fifth year, in 1995, these awards had seen a further increase in

¹² According to Tennant (Tennant, 1996) these 'green funds' have grown by over 500% in recent years. More specifically, Anne-Maree O'Connor claims that Socially Responsible Investment (SRI) or ethical investment (of which environmentally responsible investment is a part) in the UK "has grown from a total under management of £200m in 1989 to £2.05bn in 1998" (O'Connor, 1998b).

the numbers of companies entering, with nearly half of the reports submitted coming from mainland Europe. As one might expect, the Judges Report on the 1995 Awards made a clear reference to any financial, environmental reporting (that is, to any form of environmental accounting):

“The continued emergence of financial reporting for the environment in terms of the disclosure of provisions, liabilities and amounts spent, noted by the judging panel last year, is once again apparent.

A growing number of companies are beginning to disclose financial data on environmental investment and research and development expenditure, with Anglia Water and National Power very much to the fore in this area.....

In addition to the (slowly developing) trend towards increased disclosure of environmental expenditure and provisions, there are signs that a few companies are beginning to appreciate the true magnitude of the challenge posed by environmental accounting.” (ACCA, 1995, P10)

The Report then proceeds to discuss developments in this area being piloted by four companies. However, whilst the ACCA is keeping a watching brief over what developments are occurring within companies, they are also being pro-active. They are involved with the EU Accounting Advisory Forum (which receives guidance from DGXV advisors), which is concerned with:

“definition, measurement, allocation and disclosure of environmental costs and expenditures.” (Adams, 1996, P2)

The ACCA is further aware of the questions facing the profession in this area, as their Head of Technical Services and Research told an IBC Conference, the ACCA is not only concerned with the issue quoted above but also with:

- *“recognition, measurement and disclosure of impaired assets, environmental provisions and liabilities*

- *appropriate disclosure of environmental risks*
- *quantification and reporting of benefits/savings/additional revenue streams*
- *disclosure of environmental performance data” (Adams, 1996, P2)*

Further they are also posing the questions:

“Does the traditional financial accounting/reporting framework deal adequately with such environmental issues?

If not, how should it be amended.” (Adams, 1996, P2)

The ACCA is concerned with looking at the way in which environmental information is presented in a quantified form, monitoring developments world wide, making suggestions as to what might be done by way of standardised formats and also disseminating information to its members, in particular, and to other interested parties, in general. Its literature is supporting evidence for hypothesis 1 of the subset, that environmental accounting is a necessary and useful process.

Other professional bodies such as The Institute of Chartered Accountants in England & Wales (ICAEW) have also been addressing these issues. Both these accountancy associations are orientated towards ensuring that environmental accounting is both a necessary and useful process, hypothesis 1 - hypothesis subset.

- *The businesses themselves*

Businesses themselves, with the help of accountants, consultants and environmental experts, have been at the cutting edge of this new technique, as their literature (such as CERs) demonstrates. The Judges report for the 1995 ACCA Environmental Reporting Awards (ACCA, 1995) discusses environmental accounting developments by four such cutting edge businesses at some length (ACCA, 1995, P10). Other companies, such as British Airways have also attempted quantification of their environmental information. The latter has produced figures of an input-output nature, for example, for fuel consumption and aircraft emissions. Where available for their various sites, they also give figures for such items as recycled waste, water consumption, waste produced and so

on. This is in line with the mainland European format of the Oko-bilanz. BP (1997) and Thames Water (1998), amongst others, follow a similar format, however, whilst BT (1995) discusses quantities in terms of fuel used and emissions, for example, for its car fleet but also put financial values on some items such as the cost of rental telephone disposal (around £1 million in 1994/95). ICI meanwhile, have struck out on their own with their concept of and figures for, 'environmental burden' (ICI, 1997b).

Whatever the format adopted, there are undoubtedly many businesses working on the quantification of the environmental dimensions of their businesses. In many reports not only are the figures presented but there is also a clear visual representation of their derivation. National Power (National Power, 1996) presents a diagram of the operation of its Drax power station, together with some environmental figures for the site. This makes it possible to see to which stage of the process the figures refer. London Electricity (London Electricity, 1996), in discussing environmental expenditure uses a pie chart with the various segments of the pie representing expenditure by proportion. Other companies, such as Kraft Jacobs Suchard (Kraft Jacobs Suchard, 1995) and Kunert (Kunert, 1995), make use of graphs and bar charts to give clear visual representation of the figures, which whilst being both clear and visual, need a little more interpretation than the London Electricity example (London Electricity, 1996). Even the Neumarkter Lammsbrau (Neumarkter Lammsbrau, 1995) environmental report that gives a wealth of numerate detail (of an Oko-bilanz nature), also ensures that this is explained in such a way as to make it highly accessible to any reader. With all the environmental pressures from their various stakeholders on them, the business world is making very real attempts at a sensible response. They give every appearance that, for them, environmental accounting really does have a necessary and useful role to play (hypothesis 1 - hypothesis subset).

1.5.3 Trans-national and regional bodies.

- ***North American bodies***

The trans-national and regional bodies, whilst aware that there are developments in environmental accounting worldwide, are concerned that, especially given the current global nature of business and commerce, such developments should not be fragmented. The US EPA has been working on environmental accounting since 1993 (EPA, 1995,

Pviii). Given the influence that the EPA has on business life in North America plus its close working relationship with the SEC and taken together with the influence that North American businesses and business practice has on the rest of the world, it is scarcely surprising that the EPA's work in this field is of global importance. Thus the *EPA Environmental Accounting Network Directory for April 1996* (EPA, 1996c) lists participants from countries as far afield as Finland, India, Thailand, The Philippines, The Netherlands, England and Germany. Whilst the document which the EPA produced in June 1995 on environmental accounting (EPA, 1995a) has, for example, been reproduced in the UK by the ACCA as a document of note and has also been influential in other countries. Their environmental accounting case studies, such as that on AT & T (EPA, 1995b) are regularly referred to in the literature on this subject, whilst their other literature on environmental accounting is of seminal influence.

Many Canadian organisations have also had influence on the development of environmental accounting. In particular, the CICA has been conducting research in this area and, as early as 1993, produced a report concerning environmental issues with respect to accounting and financial reporting (CICA, 1993), which has been read and discussed worldwide. As a continuation of this work the CICA issued a draft *Statement of Principles on Environmental Costs and Liabilities* in the first quarter of 1996, which was sent to certain selected individuals for comment. Undoubtedly, the individuals encompassed by this organisation, other Canadian professional bodies, together with individuals working within the EPA, SEC and other professional and industry bodies are all working hard within North America towards bringing some semblance of order to this field. They are all concerned to introduce conventions and order to the presentation of environmental accounts, whether this is based on current accounting practice and conventions or whether other formats are followed. They have all produced literature, which provides evidence of the first two hypotheses of the hypothesis subset.

- *European wide bodies*

Many bodies in Europe are working towards advances in this area¹³, notably the

¹³ In much the same way as American business practice is of considerable significance worldwide, so also is that of Europe. Again, there are many European multinationals of significant size and hence, of world influence, for example, Unilever, Shell, BP, etc. Moreover,

Federation des Comptables Europeens. Whilst the FEE is interested in areas such as that of environmental auditing, clearly one of the main areas of interest for this Task force must be environmental accounting. If one looks at its terms of reference, this is evidenced by:

- *"Promoting the role of the accountancy profession in environmental accounting, reporting and auditing matters.*
 - *Commenting on proposals of, and influencing the Commission in the areas of both environmental accounting, environmental reporting and environmental auditing, including participating actively in the Commission's working parties.*
 - *Stimulating developments in environmental accounting, reporting and auditing."*
- (Saskia Slomp, FEE, 1996, P2)*

Further literature from the FEE (FEE, 1995a, 1995b) reinforces their involvement in this field. Other European bodies also demonstrate such interest via their literature, for example, the European Federation of Financial Analysts' Societies (EFFAS). In the course of managing portfolio investment and especially when trying to diversify risk within a portfolio, it is important that financial analysts understand any company environmental information, especially of a quantitative nature. The more consistently this is presented and the more in line with a recognised format, then the easier is their job. It is unsurprising, therefore, to find that by 1994 EFFAS produced a document on environmental reporting and other environmental disclosures (Muller et al, 1994) which, amongst other things, set out their environmental accounting requirements. Just as FEE has an interest in ensuring that environmental accounting emerges as a coherent discipline with a recognised format(s), so also does EFFAS. Implicit in this is an acceptance of a role for environmental accounting and one that is both necessary and useful (hypothesis 1 - hypothesis subset).

- *International bodies*

Given the level of activity of the trans national and regional bodies within this field, one

the EU currently contains some of the world's largest economies, in addition to being a significant trading block. Therefore, any new business practice which is being developed in Europe (in this case that of environmental accounting) is likely to be monitored world wide.

would also expect some involvement by international bodies. This is indeed the case. For example, in May 1993 the Round Table of the Organisation of Economic Co-operation and Development (OECD) Working Group on Accounting Standards, considered a survey on environmental accounting that had been prepared for them by FEE. The United Nations (UN) is likewise involved as the UN International Accounting Standards Committee (UN/IASC) has projects on the following areas, all of which relate to environmental accounting:

- *“Environmental Financial Accounting*
- *Provisioning and contingencies*
- *Environmental Accounting Beyond the Conventional Accounting Model: a Linkage between Financial Performance and Environmental Performance”.*
(UNCTAD, 1998b)

Other bodies monitoring environmental accounting are those such as the World Trade Organisation (WTO), the International Federation of Accountants (IFAC) and the United Nations Conference on Trade and Development (UNCTAD) via its Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) (UNCTAD 1994, 1996, 1997, 1998a, 1998b, International Environment Reporter, 1998). ISAR is probably of most significance here as it has been looking at environmental accounting since about 1989. Indeed:

“Since the late 1980s, ISAR has given extensive attention to issues relating to environmental accounting, and has undertaken a number of surveys at the national as well as at the enterprise level. In 1995, its thirteenth session was devoted exclusively to the subject of environmental accounting. During that session, the International Standards of Accounting and Reporting (ISAR) noted that, although considerable research was already under way, a significant effort was still required to study and evaluate the information being produced, so as to identify the most appropriate guidance that should be given to governments and other interested parties. It concluded that such guidance was important. Without its prompt development, ISAR felt that differences would arise, and member States would subsequently find themselves in the position of having to reconcile

their independent standards and procedures with those of other member States.”
(UNCTAD, 1997, P3)

The literature from these bodies serves to underline the fact that environmental accounting has both a necessary and useful role (hypothesis 1 - hypothesis subset).

1.5.4 Other developments

In addition to the increasing numbers of reports being produced by the various bodies involved with environmental accounting, there are currently two business sources that give some indication as to the growth and development of environmental accounting. One of these is that of a company's Annual Report and Accounts but whilst some of these contain relevant information¹⁴, a second, and rather more useful, source of environmental information seems to be that of the CER. These set out to cover any and all environmental achievements and developments of the company concerned, for the time-span since its last report (or to date, where it is the first such CER). Many of them, as already indicated, contain considerable quantitative data. This is all set within their particular business context. If environmental accounting or any of the quantitative techniques which can be a precursor to environmental accounting such as the collection of input-output data, are used by a business producing a CER then inevitably they will be included as part of the overall picture of what the business is currently doing in order to establish its environmental probity. Also in order to establish their environmental probity and defend themselves against outside criticism, businesses are likely to discuss what they hope to demonstrate with these initiatives. It was felt that CERs were likely to provide evidence of environmental accounting as a nascent technique and also help to indicate why it will become established within a business context, for example, by mention of the sorts of societal pressures upon the business concerned. It was for these reasons that it was decided to survey them.

¹⁴ For example, the Annual Report and Accounts for Inveresk, a paper company, has contained environmental information since 1995 but they do not issue a separate environmental report. See footnote 1.

1.6 Conclusion

Some evidence has been found within the existing literature to substantiate the subset of hypotheses and beyond these the main hypothesis. “That environmental accounting is a nascent technique” was incontrovertible. The various sets of environmental accounts already published (BSO Origin, 1991; Det Danske Stalvalsevaerk A/S, 1994; Kunert, 1994; Neumarkter Lammsbrau, 1995) are proof of this, as also is the fact that definitions already exist (EPA, 1995a, P28; CICA, 1997, Pxvi). The “various reasons” why “environmental accounting will become established within a business context”, that is, the main hypothesis subset of hypotheses had not been clearly established by the literature survey. Considerable evidence had emerged from the literature to substantiate the first two hypotheses of this subset. Books such as those by Gray (1993) and Schaltegger et al. (1996) lent weight to this. Indeed, one very clear indication that by some, environmental accounting was already considered both a “necessary and useful process” (a good reason for its establishment as a technique) was the fact that to date one country, Denmark, had made environmental accounting compulsory for certain enterprises. Other literature such as that from the various national and international bodies involved in this field had underlined this.

However, support for the third hypothesis (hypothesis subset) from within any literature on the subject seemed a little weak. Statements coming from such companies as Kunert (Kunert, 1995), BSO Origin (BSO Origin, 1991 & 1993) and Ontario Hydro (Boone et al., 1995) indicated that this hypothesis might be capable of substantiation. It was clear that societal pressures driving the use of environmental accounting existed. Whether these were strong enough to override commercial pressures was not clear from the literature but if they were, these were very strong reasons why environmental accounting would become established within the business context.

Overall the literature survey had indicated that further data collection and analysis was necessary. Given that CERs are an important secondary source of data in a business context (see Chapter 2) it was decided to proceed with a CER survey in order to discover if this could further inform the core of the research. It was felt even at this early stage that, given the nascent nature of environmental accounting, primary research (that is, fieldwork) might also have to be conducted.

CHAPTER 2: SURVEY OF CORPORATE ENVIRONMENTAL REPORTS

2.1 Introduction

This chapter examines the findings of the CER survey. It begins by looking at the early history of CERs, the reasons why they are produced, other CER surveys and what they have shown. It then moves on to the methodology for the survey and the three stages of data analysis together with their results. It was hoped that the data from this survey would demonstrate a trend towards some use or part use of methods of environmental accounting. Particular categories of information were looked for (see section 2.6) and it was also hoped that clear patterns of association might emerge from the data demonstrating links between inclusion of this data and such factors as size of company or nationality of ownership. After the initial simple, visual count, the statistical tests used were those of multivariate and hierarchical cluster analysis. The whole was informed by economic knowledge and the literature review.

CERs, whilst having a comparatively recent history, are an important secondary source of business environmental information. Together with the Annual Report and Accounts, they are the only direct source of environmental information emanating from businesses and in the public realm. Whilst an Annual Report and Accounts might contain notes to the accounts of an environmental nature or a small section on environmental initiatives, comparatively few such documents do so. Their survey is less easy and would yield less information, as their prime purpose is to report on a business's financial health and their marketplace. CERs, on the other hand, are concerned solely with a business's environmental health and initiatives. Their development followed on from the burgeoning of other environmental initiatives (see section 1.3) adopted by companies from the late 1980s onwards. Initially, they were often used as a public relations vehicle to inform the public at large, and stakeholders in particular, about company environmental initiatives. As increasingly, it became important that companies should have good 'green credentials', a CER was seen as a means of achieving this. For example, the estimated cost of \$50,000 for the Norsk Hydro CER, 1990 (Norsk Hydro, 1990b) *"more than repaid itself in terms of PR and publicity"* (Gray, 1993, P249).

The publication of the first CER in the UK, was this Norsk Hydro (UK) Ltd. report published in November 1990 and independently assessed for its accuracy by Lloyd's

Register (Norsk Hydro, 1990b). This had grown out of the CER which had been produced for the whole of the Hydro group in May of that year (Norsk Hydro, 1990a). In many ways, whilst the UK report may not have been, the Group CER was overtly geared towards mending public relations. There had been two serious environmental incidents in Norway preceding its publication, one where a fjord had been badly polluted by Hydro's operations and another, where it was discovered that a chlorine plant in southern Norway had been left with forty tons of mercury in the subsoil under the plant, as a result of the plant's operations (Baldwin 1991, P5). One way of addressing the poor environmental image that Hydro had acquired as a result, was to publish a CER. It seemed logical to extend this approach to the UK operations.

Since this early initiative by Norsk Hydro, the trend has grown towards general reporting on the environment by companies¹⁵, often (as stated above) within their Annual Report and Accounts but more particularly via a separate CER. It should be noted that, whilst there has been this increase, of the UK FTSE 100 companies only 20 produced an environmental report in 1993 - whilst this had grown to 34 in 1994, it fell back to 27 in 1995 and increased again in 1996 to 30 (KPMG, 1997b). There are few companies outside the FTSE 100 which produce a CER and, internationally, there is a paucity of separate CERs. A survey involving nine countries conducted by KPMG in 1993 found that, whilst of the 690 companies surveyed, "400 companies (58%) mentioned the environment in their annual report" only "105 (15%) had produced a separate environmental report" (KPMG, 1997b, P6). However, their 1996 survey, which had been extended to include thirteen countries, showed that of the 885 companies surveyed, 625 (71%) "*mentioned the environment in their annual report*", whilst of the 903 companies

¹⁵ The annual report by the Pensions and Investment Research Consultants (PIRC) monitors the overall trend towards any form of environmental data dissemination (PIRC,2000). Their survey for 2000 covered 674 companies from the All-Share Index and reported on whether they produced a CER, environmental notes within their Report and Accounts or nothing at all. Their reports are produced for the benefit of members and are geared towards use for risk assessment for investment purposes. Other general reports of this nature are produced by, for example, Management Today who have produced CEP2000 – Corporate Environmental Performance which likewise looks at all forms of environmental reporting but also considers environmental performance (Management Today, 1999).

included for the purposes of surveying for separate CERs, “220 companies (24%) produced some form of environmental report” (KPMG, 1997a, Pp7,9). This demonstrates that the trend is growing not just within the UK but also internationally. It is worth noting that when the UNCTAD Secretariat looked at the extent of environmental disclosures in either financial statements or annual reports for 1992 (Environmental disclosures: international survey of corporate reporting practices. E/C.10/AC.3/1994/4) there was scarcely any mention of the existence of CERs. This trend is now reinforced by such official bodies as the ACBE (see 1.5.1) in the UK, encouraging their production. They view these as a suitable vehicle for companies to use in order to disseminate details of their environmental affairs. (Department of the Environment, 1997a).

Whatever the reason for its production, a CER has inevitably to address the environmental bottom line and if environmental accounting is a growing technique, they should contain such information. Further because CERs are also a direct business source, they are likely to give some indication as to trends within the business world. Their use and presentation of quantitative environmental information could give important clues concerning the development of environmental accounting. As outlined in 1.1, a CER survey became the second stage of the research for this thesis.

2.2 CERs as a vehicle for reporting quantitative information.

Whilst what should be included in a CER is still a matter of considerable debate, for the purposes of the survey it was hoped that a reasonable amount of quantitative information could be found. Different companies have different agendas when they issue a CER. CERs may be issued for public relations purposes (Norsk Hydro 1990a, as previously mentioned, Royal Dutch Shell 1998c, following its bad press after the Brent Spar incident) or out of genuine conviction (Shared Earth, 1996). In the case of the former, it may be that no environmental initiative, least of all environmental accounting, will become embedded within the management process (hypothesis 2 – hypothesis subset) and thus truly established within the business world. On the other hand, societal pressures may be so great that they may have to be (hypothesis 3 – hypothesis subset). Whatever the reason for the production of a CER, there is increasing inclusion of quantitative information and the reasons for this are as follows:

- requirements of financial analysts, who need quantitative environmental information in order to have a complete picture of company value for investment purposes (ref: 1.5.2. See also footnote 15). For example, five Swiss Banks issued a draft paper on the voluntary disclosure of environmental information in spring, 1997. This was subsequently systematised by one of these banks, Swiss Bank Corporation (as it was pre take-over) (Knecht, 1997).
- increasing calls for bench marking of CERs has put increased emphasis on the provision of quantitative data (ref: section 2.4.1)
- increasing international emphasis on the provision of quantitative information. For example, the Danish legal requirement for companies engaged in certain economic activities to produce environmental accounts ref: 1.4.3); the US TRI provisions (ref: 1.2.2ii) together with other environmental disclosures required by the US SEC; the Canadians requirement for reporting on the financial or operational effects of environmental protection provision (ref: 1.4.3); Norwegian disclosure requirements post an environmental pollution incident (KPMG, 1997b, P4).
- stakeholders are increasingly asking for detail rather than bland statements (Tennant, 1996).
- there is a changed climate of public opinion on environmental issues. For example, whilst the EU EMAS scheme requires an environmental statement which usually includes physically quantified data, this scheme is currently voluntary. However, the EU could choose to make it mandatory for certain, more polluting industries such as the oil & gas, chemical and paper industries, as has been under discussion (Houldin, 1996). Moreover, various official bodies now call for quantification of the implications of what is being said in CERs¹⁶.

¹⁶ The ACBE has stated that:

“The (environmental) report should where possible quantify the financial implications of

- the trend for presentation of quantified detail is now being encouraged both internationally and nationally, by certain groups with vested interests, for example, the accountancy bodies (ref: 1.5.2). For example, the UK Environmental Reporting Award Scheme of the ACCA is about to enter its eighth year, and The First European Environmental Reporting Award Scheme (run in collaboration between three accountancy bodies, the Danish FSR, the Dutch Royal NivRA and the British ACCA) reported in 1997 and has continued in subsequent years.
- increasing issues of legal (environmental) liability mean that companies must be able to demonstrate what they are doing. Figures must be presented to demonstrate the *amount* by which emissions are being reduced or the *financial level* of proposed spending.

The reasons given above have helped to reinforce any trend towards the increased use of types of environmental accounting and for its inclusion within a CER. Whether or not the CER is an appropriate vehicle for quantitative data is still the subject of debate, as it can be argued that all necessary quantitative data can be contained in the annual report and accounts. Extensive environmental notes to annual accounts can be included (for example, as do Inveresk - see footnote 1), and such financial data will give a clear lead as to what is happening to emissions levels and other physical (quantitative) measures. However, bodies such as the ACBE, UNEP and others have all argued in favour of a separate CER. This reinforced the need to survey them as being one of the main, and very direct, literature sources emanating from the business environment and likely to contain relevant data.

reported physical performance measures, giving details of such matters as fines and prosecutions. Comparisons with peer group businesses, perhaps with performance measures established by trade associations, would be helpful where possible.” (Department of the Environment, 1997a, Pp7-8)

International bodies such as the UN’s ISAR (see 1.5.1) (UNCTAD, 1997) also emphasise the importance of environmental reporting.

2.3 CER surveys: what they have shown

Surveys have already been conducted on CERs but not only are such surveys few in number but they have also surveyed, in the main, for different factors. The *KPMG surveys of environmental reporting* are perhaps the best known of the regular surveys in this area. They conduct two of these annually, one focussed on the UK and one international. They survey separate, stand alone, environmental reports but also include the environmental reporting content of company annual report and accounts. For the UK their survey is narrow in focus, as they only look at the FTSE 100 companies. This ignores those companies outside the FTSE 100 who, whilst smaller in size, are still substantial and some of whom produce environmental reports, for example, Hickson International plc.

Organisation conducting survey	Numbers of CERs surveyed	CERs surveyed or mixed with other	Prime focus of survey
KPMG (KPMG, 1997b)	FTSE 100 – for CERs (1997=30) & for mention of the environment in annual report and accounts (1997=78).	Mixed: CERs & Annual Report and Accounts	Analysis: general trends/developments. 1997 survey also included small part on environmental accounting.
UNEP/SUSTAINABILITY (UNEP, 1996a & 1996b)	20	CERs only surveyed	Fifty reporting ingredients, in order to look at various stages of progress and development of CERs
UNEP/SUSTAINABILITY 1997 BENCHMARK SURVEY (EAAR, Vol 3, Issue 1, P3)	100	CERs only surveyed	The fifty reporting ingredients of the 1996a & 1996b surveys. Object: to monitor progress and development stage.
UNEP/SUSTAINABILITY OIL SECTOR SURVEY (SustainAbility/UNEP, 1999)	50 companies (33 CERs)	All forms of company environmental information surveyed.	In depth study of environmental reporting practices in the oil industry only.
FEEM (Unpublished)	30	CERs only surveyed	Verification statements
OXERA (Oxera Environmental, 2000)	35 companies (22 CERs)	All forms of company environmental information surveyed.	Fours sectors only studied: Food & retail; oil & gas; utilities; banking.

Organisation conducting survey	Numbers of CERs surveyed	CERs surveyed or mixed with other	Prime focus of survey
THIS SURVEY	100	CERs only surveyed	Quantitative information

TABLE 1: CER SURVEYS

It also excludes unquoted SMEs (albeit numerically small) who produce a CER, for example, Shared Earth. KPMG conduct an analysis of general trends and developments in what they report, especially by sector of economic activity. For example they comment that:

“In industries where the environment is a significant factor in understanding business performance, such as chemicals and oil and gas, environmental reporting has become established practice.” (KPMG, 1997b, P3)

What is described as included in CERs is done in a fairly general fashion. For example, whilst they describe how many companies disclose data on air emissions and whilst there is a useful bar chart (Fig 9, KPMG 1997b) of the “Frequency of Quantitative Data Disclosure”, there is no great detail on any of these, nor is there any discussion of formats, which might facilitate both comprehension of the data and comparison as between companies and industries and would also facilitate SEC and the Financial Services Sector data requirements, see 1.4.3 & 1.5.2. In 1997 they included a brief but limited account of any environmental accounting included in CERs.

The *UNEP/SustainAbility report* (1996a) is a highly structured survey of CERs. Not only is each CER considered in terms of fifty reporting “ingredients” (UNEP, 1996a) but each ingredient in turn has a list of indicators against which each CER must be measured. For example, energy and water consumption are both separate reporting ingredients (UNEP, 1996a, P82). Scores are given to each company for each of the fifty ingredients outlined, these are then added up and the company concerned can be placed in one of the five categories of their developmental model for CERs. Although this is a highly structured survey, it only surveyed twenty companies. However, it was enlarged in 1997, to include

100 companies (EAAR, 1998). Exactly the same fifty reporting ingredients were used but this survey found that more companies were climbing into the higher stages of development. Specifically, 71 companies had reached stage 4 - at which stage there is considerable quantitative information in a report. Given the positive development shown by this 1997 survey and given also that many of the fifty ingredients considered by both these surveys are quantitative, this indicates that CERs are a valuable source of such information and that this information should be of sufficient quality and quantity to be able to test the hypotheses being considered.

UNEP/SustainAbility, further extended their surveys on environmental reporting in 1999 by a specific sector focus on the oil sector. As a focussed survey it went into much more detail on reporting practices but, unlike its previous reports and as with the PIRC report mentioned in footnote 15, this report seems far more focussed on the requirements of the corporate sector. The OXERA survey is likewise narrow in its focus with only four sectors (a total of 35 companies) and only 22 CERs from these actually surveyed. These are surveyed in accordance with OXERA's own 'scoring protocol' (OXERA, 2000, Pp36-50) which is a fairly transparent benchmarking system which takes account of a whole range of factors many of them qualitative rather than quantitative.

Whilst surveys have already been conducted on CERs and on a regular basis (see Table 1), these surveys have been conducted for a variety of reasons such as looking at the validation statements (Rangheri, 1997) or at particular sectors (OXERA, 2000) and have not focussed exclusively on quantitative information. This survey focussed almost entirely on the types of quantitative information contained within CERs. Its primary focus was to find evidence to help to substantiate the hypothesis and its subset put forward in Chapter 1.

2.4 Methodology

100 CERs were surveyed. The analysis was informed by economic knowledge and the literature review. The latter guided the sourcing of the CERs and alerted to both the potential difficulties of the selection process and its limiting factors, whilst economic knowledge guided the selection process in terms of the research population and the sampling strategy. Economic knowledge also guided the analysis process in terms of the

categories of economic activity used, definition of company size, sector of the economy and other variables. Prior to analysis, several issues had to be considered within the selection process namely: quality of the CERs selected, any consistency in their form and content, possible bench marking for CERs, limiting factors, sourcing the CERs.

2.4.1 The selection process: potential difficulties

Consistency in form and content of CERs

There is seemingly a plethora of approaches to the form and content of a CER and different bodies each have their own approach. The implication for any analysis of CERs could have been that analysis would prove unmanageable. There does, however, seem to be some convergence of views on form and content especially as evidenced by the fact that one of the ISO technical sub committees is already examining this area (KPMG,1997a). As a result, variation in form and content of CERs whilst unhelpful, was not expected to be unmanageable for analysis purposes.

Some relevant bodies have indicated what they consider a good CER should contain and these are discussed in Appendix A.

A quality measure for CERs

In addition to variation in form and content, there is no validation standard guaranteeing quality. Where the environmental report has arisen out of the EU EMAS scheme then a certain quality is guaranteed, as the whole process has to be validated by officially recognised validators. Where this is not the case, and in an effort to lend authenticity to their CER, many businesses ask an external consultancy to validate it. Indeed, from their inception, this has been a common policy - for example, the first UK CER produced by Norsk Hydro (UK) Ltd. was externally validated by Lloyds Register (Norsk Hydro, 1990b). Whilst this lends credence to a CER there are problems with this procedure as:

- each validation is on an individual basis and covers only those items which a business has chosen to include in its CER
- the validation or 'expert statement' does not have a standard format (Rangheri, 1997)
- there is no one governing body for those validating CERs, which can

guarantee particular standards of expertise, experience or worth

- there are no codes governing the presentation of data in CERs.

As no validation or recognised quality measure existed it was felt that it might be difficult to compare CERs, as like could not be compared with like.

Bench marking of CERs

An analysis can be facilitated by a benchmarking system. Recent literature on CERs has made reference to the need for such bench marking - at the very least between companies in the same industry if not between companies in general (Deloitte Touche Tohmatsu, 1997). If no standard CER format exists (as has been established) and no bench marking can occur, clever design or the careful usage of graphical axes may otherwise persuade its audience that a particular company has sound environmental policies and processes when this may not be the case. Inconsistencies, and therefore an inability to benchmark, may even exist within any one particular CER. For example, the first worldwide Norsk Hydro Environmental Report contained a graphical comparison of VCM (vinyl chloride monomer) emissions for the three plants producing these. The two Norwegian plants had a different scale for the 'y' axis from that for the UK plant. They, therefore, all appeared comparable but the realities of the situation were that the UK plant produced fewer emissions (Norsk Hydro, 1990a).

In an attempt to try and bring some focus to this vexed issue, in 1997 Deloitte Touche Tohmatsu (DTT) produced what they have termed their 'Corporate Environmental Report Score Card'. This bench marking tool has attempted to draw together the threads of various international guidelines in this area and has also drawn heavily for its scoring system on the first UNEP CER survey (UNEP, 1994), with its original set of ingredients for assessing CERs¹⁷.

¹⁷ All of these various guidelines, together with the first and second UNEP surveys of CERs, have been developed via workshops facilitated not only by their practitioners but also by the International Institute for Sustainable Development (based in Canada) into the DTT checklist and Score Card. This, they claim, "can serve as a checklist for planning your environment report and may help identify opportunities for improvement. It can also be used for CER surveys and reporting awards programs." (DTT, 1997, P3).

OXERA in their "Accounting for the Environment" report (OXERA, 2000) also use a benchmarking process which they call a 'scoring protocol'. This encompasses many qualitative issues in addition to measuring quantitative data present. Whilst both the DTT score card and the OXERA 'scoring protocol' may prove useful tools as they become established over a period of time, the main benefit of well established benchmarking tools would have been to lend far more uniformity to CER content, which would have made the survey process rather more straightforward.

2.4.2 Selection of the CERs: limiting factors

The sample size proposed of 100 CERs represented 25-33.3% of the 300-400 suggested by the UNEP Report (1996a) as being produced annually, but only 1.43% of the 7000 CERs which Fondazione Eni Enrico Mattei (FEEM) claim exist (Ranghieri, 1997). Companies from as many different countries and from as wide a range of economic activities as possible had to be included but it was recognised that in addition to the difficulties already identified (ref: 2.4.1), there were certain limiting factors which might distort the survey:

- *language*. Whilst many CERs of companies in non-English speaking countries are produced in English, some are not. The CERs surveyed were those written in English, Italian and French.
- *existence knowledge*. It is possible to access CERs produced in the UK and other European countries with relative ease. It is less easy to access CERs produced in more distant countries such as Australia. These are seldom reported in the UK and are difficult to locate.
- *preponderance of CERs for particular industry sectors*. Companies within the tertiary sector are far less likely to produce a CER than those within the secondary or primary sectors, which have rather more environmental problems. This, coupled with compliance requirements for environmental figures (which are then in the public domain) for certain industries, means that there is a strong correlation between the economic activity which a company is engaged upon and the likelihood that it produces a CER (Section 2.3).

- *lack of CERs for small and medium sized enterprises (SMEs).* The lack of (m)any CERs produced by SMEs has already been noted above. Whilst it is possible to track these within the UK, it is far more difficult to do so for other countries. Regardless of this they are few and this distorts any survey towards larger companies and especially multi national enterprises (MNEs).

2.4.3 Selection of CERs: the research population, sampling strategy and sourcing of the CERs

Research population

The CERs were tracked from a number of different sources. The research population was those businesses worldwide who produce a CER. It was impossible to ascertain the size of this population as firstly, having complete knowledge worldwide is difficult. Secondly, whilst it is difficult but not impossible to discover what CERs might be produced by large companies, it is rather more difficult to discover what CERs are produced by SMEs, again especially worldwide. They do not report publicly and there is no one particular source which lists all CERs produced by SMEs or businesses in general within the UK or any other country, although the German Federal Agency's publication on CERs mentioned below is an attempt to come close to this for some countries (German Federal Agency, 1997a).

Sampling strategy

A *sample size* of 100 was chosen as being a large enough sample to be attainable, statistically reliable (Rees, 1989) and large enough to provide representation of the different economic activities, countries, sizes of company and sectors of the economy sought. The *type of sampling* was of a non-random nature as random sampling of the whole business population worldwide might have proved difficult and might also have thrown up businesses which did not produce a CER. As indicated above, it was almost impossible to determine the size of the research population to assist in this process and so a judgement or purposive sample was decided upon in order to obtain as wide a representation as possible of the various characteristics sought.

The *criteria to be used in selecting the sample* were to be size of company, sector of the economy, nationality of ownership of company and type of economic activity. It proved

possible to find CERs produced by companies in all of the categories required (see Appendix A, Tables 2-6).

Difficulties

The first 75 CERs proved relatively easy to identify but the remaining 25 were rather more difficult due to the limiting factor of existence knowledge and also due to the difficulties of accessing reports from more distant parts of the world. Every effort was made throughout the process to try and keep the sample representative. For example, despite the difficulties of obtaining CERs produced by SMEs, 9 were identified and surveyed; this compared with 36 produced by medium sized companies and 55 produced by large ones¹⁸ (see Appendix A, Table 5). The sample was skewed in favour of large sized companies but it is often only large companies that have the resources to produce a CER, so the proportions of small:medium:large sized companies represented was considered appropriate. Small companies seldom produce a CER and fewer medium sized companies produce CERs than large ones (KPMG, 1997a, 1997b; German Federal Agency, 1997a). For example, the first UK CER was produced by the UK part of a significant sized company, Norsk Hydro. In themselves the UK parts of Norsk Hydro were of significant size, for example, the UK fertiliser division alone had a turnover of approximately £100million and this was only a part of its UK presence (Baldwin, 1991). The parent company, as one of the main oil producers for Norway, also had vast resources. Thus it was felt that this skewedness probably represented the research population as a whole.

The main sources used for locating CERs were as follows:

- existing CERs collected since 1990. These companies were all contacted for their latest CER.
- general press, specialist journals and other sources: business sections of the national newspapers; The Economist; The Environmental Accounting &

¹⁸ For the purposes of the CER survey, the same definitions of size were used as were used for the fieldwork survey. For a discussion of these categories and the rationale behind using them, see Chapter 4 on the methodology for the fieldwork.

Auditing Reporter; US EPA publications; Internet sources.

- UK government publications mentioning CERs, such as that produced by the DTI's Environmental Best Practice Programme.
- approaches to companies registered under the EU EMAS scheme
- German Federal Agency's publication on CERs (German Federal Agency, 1997a)

2.5 CERs surveyed: their profile.

The 100 CERs covered seventeen different countries (including the first from a Chinese company), with five under mixed nationality ownership (two under Dutch/UK ownership, one French/UK owned, one US/UK owned and one Swedish/Swiss owned) (See Appendix A, Table 4 for a list of numbers by country). Half of the CERs originated from UK companies, this was partly due to access and partly due to the fact that, other than German and American companies, more UK companies have produced CERs than any other nationality¹⁹. For details of which company CERs were surveyed see Appendix A, Table 2.

CERs for companies engaged in all the categories of economic activity required were surveyed. These categories were based on the categories used in the KPMG surveys, as being more manageable than the DTI's industrial classifications. However, there were more from utility (power and water) companies than any other. Of these, there were 25 that, given that a more average figure for other economic activity categories was 6, indicated that there was possible over representation here. On the other hand, the one Chinese company in the sample was a power (utility) company, which would indicate a perceived need, world wide, for these companies to produce CERs more than most. The 25 in the sample is an undoubted reflection of their preponderance in the production of CERs and is confirmed by the German Federal Agency document previously cited. For a

¹⁹ This is confirmed by the German Federal Environment Agency's publication on CERs (German Federal Environment Agency, 1997a), which lists those known to have been produced by companies of various nationalities world wide and where clearly companies of these three nationalities have been most active in producing CERs.

breakdown by economic activity, see Appendix A, Table 6. The majority of the CERs surveyed were for companies located in the secondary sector but there were also a reasonable number from the tertiary sector. Bearing in mind that transportation is classed as a service and included in the tertiary sector, good representation from this sector is not only unsurprising but was also essential. For details of companies surveyed by sector of the economy, see Appendix A, Table 3. There was also a predominance of large companies in the sample (55% ref: 2.4.3ii). For the purposes of definition, the same definitions of size of company were used here, as were used for the main fieldwork (See methodology, 3.3.4).

2.6. Factors for which the CERs were surveyed

Within the limitations outlined of lack of consistency in quality, no generally recognised standard for form and content, no means of bench marking and no guarantee of the inclusion of any quantitative data, it was decided to survey for the following information:

1. Any input-output data expressed in physical units. (It was recognised that this might have to be broken down into sub-sections, such as emissions data, waste data and so on - possibly based on an adaptation of the input-output ingredients from the “50 reporting ingredients” of the UNEP Report, 1996a.)
2. Complete input-output data expressed in the form of an oko-bilanz/mass balance
3. Any environmental financial data. (It was recognised that this might have to be broken down into sub-sections such as data on environmental costs, liabilities, provisions and so on.)
4. Any attempt at full cost accounting.
5. Any mention of sustainable development within the CER²⁰

²⁰ Based on the Brundtland definition, as this seems to have the most widespread use within the business world:

6. Any mention of the reasons for the production of the CER

It was hoped that items 1 to 4 would help to demonstrate whether or not environmental accounting has any useful and necessary role within the business world (hypothesis 1 – hypothesis subset). These are all types of quantitative environmental information that can be part of the development process towards environmental accounting. This applies in particular to 4, FCA, which dependent on its form, can be a fairly complete form of this accounting. It was hoped that 4, 5 & 6 would help to demonstrate whether or not there were societal forces helping to drive this process and over riding commercial objectives (hypothesis 3 – hypothesis subset). Certainly any attempt at FCA, it was felt, would “demonstrate a business commitment to the absorption of social costs”. 6 might also help to indicate which forces might be driving this process. It was unlikely that any CER would reveal whether or not environmental accounting (if it existed within a company) played any role in the management process. Knowledge about these areas tends to be held within companies and is not usually the subject of public discussion. This would have to be researched as part of the in depth fieldwork survey. Nor was it expected that the CER survey would give the same detailed insight into any of these items as was expected from the main fieldwork survey. The CER survey would be dealing with facts already committed to paper, whilst the fieldwork survey would not only be dealing with facts already in the public domain but also with the particular perceptions existing within companies on this subject.

2.7 Method of analysis

For the purposes of analysis, two matrices were created. The first was a means of tracking which companies’ CERs had been surveyed. For each CER and the company concerned, it listed year of publication (the latest available), size of company, sector of economy, nationality of ownership and type of economic activity. Whilst this matrix was

“Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (WCED, 1987)

concerned with the structure of the survey in terms of the type of companies whose CERs were surveyed (Appendix A, Table 2), the second matrix held the actual data from the survey (Appendix A, Table 7). This matrix set against each company what information their CER held in terms of:

- input-output data expressed in physical units, in terms of 12 different categories of this data or none at all. See Appendix A, Table 7, 2.1 for details.
- whether or not there was any attempt at an Oko-bilanz or even a partial one. (ref: Appendix A, Table 7, 2.2)
- environmental financial data, in terms of 6 different categories or none at all. See Appendix A, Table 7, 2.3
- any attempt at FCA. See Appendix A, Table 7, 2.4
- any environmental performance indicators (EPIs) included in the CER, in terms of 3 different categories or none at all. See Appendix A, Table 7, 2.5
- whether or not environmental targets had been set for the following year, in terms of 3 categories or none at all. See Appendix A, Table 7, 2.6
- any mention of sustainable issues (sustainability/sustainable development/sustainable management), in terms of two categories or none at all. See Appendix A, Table 7, 2.7
- the apparent reasons for the production of the CER in terms of 8 categories. See Appendix A, Table 7, 2.8
- whether or not the CER had been verified and if so, by which type of consultancy in terms of 3 categories. See Appendix A, Table 7, 2.9

From this second matrix, Appendix A, Table 7, a simple count was conducted, in order to discover the extent of use of the various types of quantitative information. As so few companies had either constructed an Oko-bilanz or conducted FCA, this information could be easily read from the table. The extent of commitment to environmental issues and concern for sustainable development, via the establishment of Environmental Performance Indicators (EPIs), target setting and mention of sustainable development,

could also be read from the matrix relatively easily. The apparent reasons for the production of a CER were also clear in terms of particular patterns. In general, it proved relatively simple to extract information from the second matrix via this simple count (Analysis 1).

No conclusions could be drawn from the first analysis. Additionally because a simple 'pencil count' was conducted this did not throw up the information in tabular or graphical form which limited its usefulness. As a result, the data from both matrices was combined and transferred into a statistical package (SPSS for Windows). A multivariate analysis using the Crosstabs procedure (Analysis 2) was then conducted, in order to discover whether or not any associations existed within the data as, for example, between ownership and use of types of quantitative data or between particular types of economic activity and the use of such data. The results from the second analysis also proved inconclusive so some categories of data were regrouped and these were retested using the Crosstabs procedure (Analysis 3). Some results of a less inconclusive nature emerged from this second statistical processing.

In order to be absolutely certain that nothing had been missed by these various analyses, the Hierarchical Cluster Analysis procedure in SPSS was then used. Factor or Principal Component analysis was not considered as a procedure for these data as it could not be applied to the variables as almost all of them were categorical. Variables which are quantitative at the interval or ratio level are needed where this type of procedure is used (ref: SPSS on-line help files, 16.05.00).

It was also considered that multiple regression analysis was unsuitable for this data set. Multiple regression requires a "dependent" variable that has a scale or quantitative value, for example, the various expenditure categories for spending on environmentally related items would need to be expressed in £s or \$ instead of presence/absence. If there happens to be a categorical variable which could be treated as a dependent variable, then more complex models are needed – either a non-linear model or a generalised linear model. In the case of using such complex models, a larger size sample than data on 100 companies would be required.

Whilst note was taken of Cormack's reservations about hierarchical clustering procedures (Chatfield & Collins, 1980, P214) together with other comments about inappropriate use (Everitt, 1993, P88), it was felt worth proceeding with this as an additional check for any associations within the data, especially given that other procedures could not be used. Four cluster method tests for 'between groups linkage', 'within groups linkage', 'nearest neighbour' and 'furthest neighbour' were all run using the chi-square measure. For 'between groups linkage' or group-average clustering, *"the distance between two clusters is defined as the average of the distances between all pairs of individuals that are made up of one individual from each group"* (Everitt, 1993, P61). 'Within groups linkage' or centroid clustering relies on a mean value for groups once formed and the inter-group distance is *"defined in terms of distance between two such mean vectors"* (Everitt, 1993, P62). 'Nearest neighbour' is a single linkage process and as such is one of the simplest of these tests and is a means of comparing groups by looking at their closest members. It is the method recommended by Jardine & Sibson as that with most universal acceptance, although there has been considerable debate on this (Everitt, 1993, P71). 'Furthest neighbour' is a complete linkage process and *"is the opposite of single linkage in the sense that distance between groups is now defined as that of the most distant pair of individuals, one from each group"* (Everitt, 1993, P60).

2.8 Results of the CER survey

The analysis was searching for quantitative information as an indicator of the presence or likely future presence of environmental accounting. It was searching for signs of environmental accounting as a "nascent technique which, for various reasons, will become established within a business context". If environmental accounting is a necessary and useful process (hypothesis 1 – hypothesis subset) then it was likely that either it would be found in CERs or, if still nascent, some accounting for the environment would be present either in terms of input-output figures or some other presentation. If environmental accounting is a public relations device (hypothesis 2 – hypothesis subset), these figures might be fairly meaningless or rudimentary. If they were a true reflection of a company's relationship to the environment then this might signify that environmental accounting of whatever type has some value to the business world (hypothesis 2 – hypothesis subset). Finally, any mention of sustainable issues and any reasons given for the production of a CER that were not purely commercial, were

likely to signify societal pressures on companies concerning environmental issues. Whilst these pressures might not, as yet, have resulted in environmental accounting they might help to lend credence to hypothesis 3 of the subset, that world wide societal forces are driving the use of environmental accounting.

Further to this any associations in the data were sought, which linked a tendency to use some form of environmental accounting or to publish large quantities of quantitative environmental information to company size, economic activity, nationality of ownership or sector of the economy.

2.8.1 Results of Analysis 1

As previously mentioned, Analysis 1 was limited in nature. It produced quantitative results but did not automatically throw up tables of results. Its results were, in any event, inconclusive. In general, there was overwhelming evidence of the inclusion of input-output data in CERs. Whilst incomplete, such data could be a precursor to an Oko-bilanz and could signify a move towards considering, if not environmental accounting, certainly some sort of accounting for the environment, as both necessary and useful (hypothesis 1 – hypothesis subset). Thus:

- 94 of the CERs contained *input-output data expressed in physical units*. A German pharmaceutical company itemised 11 such categories
- 12 company CERs included significant quantities of input-output data (that is, 8 or more of such categories)²¹.

²¹ - distribution by size: 8 medium sized, 4 large

- distribution by sector: 1 - primary sector, 8 - secondary sector and 3 - tertiary sector. 75% of the 12 were from the primary and secondary sectors combined. These have the potential to cause more environmental damage than the tertiary sector.

-distribution by economic activity: 2 - transportation (this is environmentally sensitive and goes some way to explain why any companies involved in the tertiary sector had bothered with so much input-output data.) 2 - utilities; 2 - mining, metals & materials; 2 - pharmaceuticals; and the remainder were in forestry paper & pulp, electro-technical manufacturing, food and beverages and the personal care categories.

- *Oko-bilanz/mass-balance* was found in only 3 of the CERs with a further 6 including either a partial mass balance or a mass balance for one only of a multi site situation²².

And:

- 62 of the CERs surveyed contained *environmental financial data*.

There was no pattern to those companies mentioning environmental financial data in terms of economic activity, company size or sector of the economy, so it was difficult to draw any conclusions from this other than the fact that the use of environmental financial data is relatively widespread (possibly useful and necessary).

It could be argued that societal pressures may be important in persuading companies that they have to make public environmental commitments but the extent and reality of such pressures is unclear. This analysis (Analysis 1) also found that:

- *Targets were set* by the vast majority of companies²³.

²²-CERs including a mass balance were from companies under German, Danish and Norwegian ownership.

-CERs including some sort of partial mass balance were from companies of the following nationalities: 2 – Swedish; 4 each of Swiss, Finnish, Japanese and German ownership.

There was no discernable pattern to the nationalities but Scandinavian and German owned companies might be more likely to construct a mass balance or partial mass balance. This may be a reflection of the societies within which these companies operate and therefore of societal pressures. There was no discernable pattern between mass-balance production and category of economic activity.

²³ -2 companies (Astra a large Swedish pharmaceutical company and AWE, a British manufacturer of atomic weapons) appeared to make no mention of targets.

-1 company only, WMC a large Australian metals, minerals and oil conglomerate, set environmental targets in financial terms.

-42 companies set targets in terms of physical quantities (for example, a target figure for emissions reduction)

-55 companies set targets in fairly general tones (for example, they expressed every intention of

- *Sustainable issues* were not mentioned by 47 of the sample, despite the fact that they were presenting a record of their company's environmental performance to the outside world. If any societal pressures exist as far as sustainable issues are concerned, nearly 50% of the sample were immune to them.

When it came to looking at the reasons for the production of a CER, the data demonstrated that:

- *Reasons for the production of a CER* were overwhelmingly to do with announcing their compliance to the world²⁴.

reducing their emissions without putting a figure to what this should be).

²⁴ Only 15 of the sample made no mention of this in their CER. Of these 15, 13 of the companies were engaged in activities within the tertiary sector of the economy and so clearly had few problems of compliance. This tied in with the type of industry in which they are involved, only 24 of the 100 were not involved in an activity where it was either environmentally sensitive or had, potentially, high environmental impact. The vast majority (all but 13 of the sample) also used their CER as a vehicle to publicise new environmental policies, directions or initiatives. More importantly, all but 3 of the companies surveyed were using their CER as a vehicle for informing their stakeholders about which environmental policies they had in place, what environmental initiatives they were taking, which EMSs they had in place and what environmental standards they might have obtained. The same also held true for their customers, with the exception of only 5 companies they were all also clearly trying to inform this group through their CER. Whilst they were all trying to inform about their environmental achievements, this was generalised as evidenced by the fact that only 53 of the sample actually used their report to announce the achievement (or continuing achievement) of particular EMS standards. More particularly, only 8 of the companies concerned used their report to announce EU EMAS certification. Interestingly, of these 8, 5 were small companies whilst the other 3 were medium sized. In terms of economic activity, 3 fell within the forestry, paper & pulp category, 2 produce chemicals, 1 pharmaceuticals, 1 food & beverages and 1 was involved in the 'other manufacturing' category.

Clearly there was concern on the part of the companies to communicate with their various audiences. There must have been good reasons for them wishing to do so and these have to be societal forces as their audiences represent various sectors of society. However, how strong these societal forces may be and whether they are over riding commercial considerations (hypothesis 3 – hypothesis subset) was unclear.

Other data demonstrated no discernable proof of any of the hypothesis and its subset. Thus:

- *Full cost accounting* was only attempted by one company from the sample, BSO Origin (ref: 1.2.2iii). This was far from satisfactory evidence of a move towards the use of environmental accounting.
- *EPIs* were mentioned by 31 companies.

2.8.2 Analysis 2: first statistical analysis

As the initial simple data analysis was inconclusive, the data were inputted into the SPSS for Windows statistical package. At this point it was coded with simple codes such as 0=No, not present and 1=Yes, present. Larger coding sets were used where necessary, for example, for country of ownership. What was being sought was any association within the data, especially any relationship between the categories of economic activity, nationality, size and sector of the economy and the other variables. For these purposes it was decided to use the Crosstabs procedure as this produces contingency tables from nominal or ordinal categorical data. In this instance almost all the data were categorical. For the data see Appendix A, Table 7. The null hypothesis of the comparison assumed that there was no relation between the two variables, that is, that the percentages in the Crosstabs tables under the columns of those mentioning the particular variable from whichever grouping (sector, type of economic activity, nationality or size) would be equal. Under the Pearson Chi-Square test, a p value of <0.05 was sought as being evidence of a significant association between the two particular variables concerned. In this context, a 'y' value as small as possible was sought as, statistically, if this is greater than 20% the result may be considered unstable. Under the Symmetric measures, the Contingency coefficient (CC) was considered of interest as a measure of association between the variables. Lying between zero and 1, the higher the value, the stronger the association and this was what was looked for.

When these tests were run they demonstrated that no significant relationships existed. For example, the cross tabulation between physically quantified figures for energy consumption found within CERs and company sector (that is, primary, secondary and so on), showed no significance. It produced a table with four empty cells, whilst with respect to the value from the Pearson Chi-square test (5.561), 8 cells had an expected count of less than 5, making the result unstable and in any event its value was outside that being sought. Likewise the CC was too low (0.230) to be of any significance.

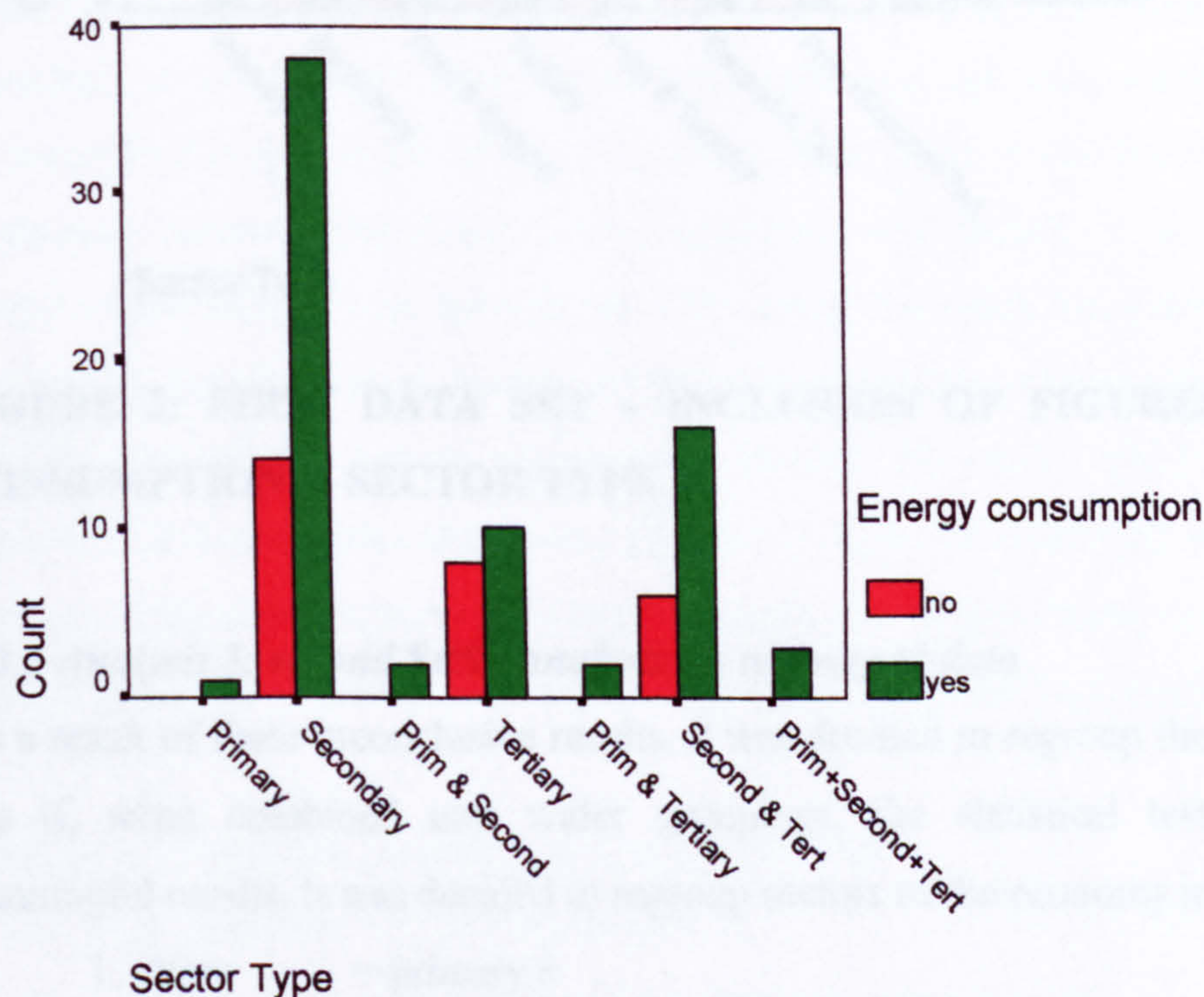


FIGURE 1: FIRST DATA GROUP – INCLUSION OF QUANTIFICATIONS FOR ENERGY CONSUMPTION & SECTOR TYPE

Similar results characterised other tests, for example, tests run to discover if there was any relationship between sector of company and mention of figures for water consumption. Again there were empty cells (7), the Pearson Chi-Square test value was high (4.667) whilst the CC was low (0.211), which meant that no significant relationship existed here either.

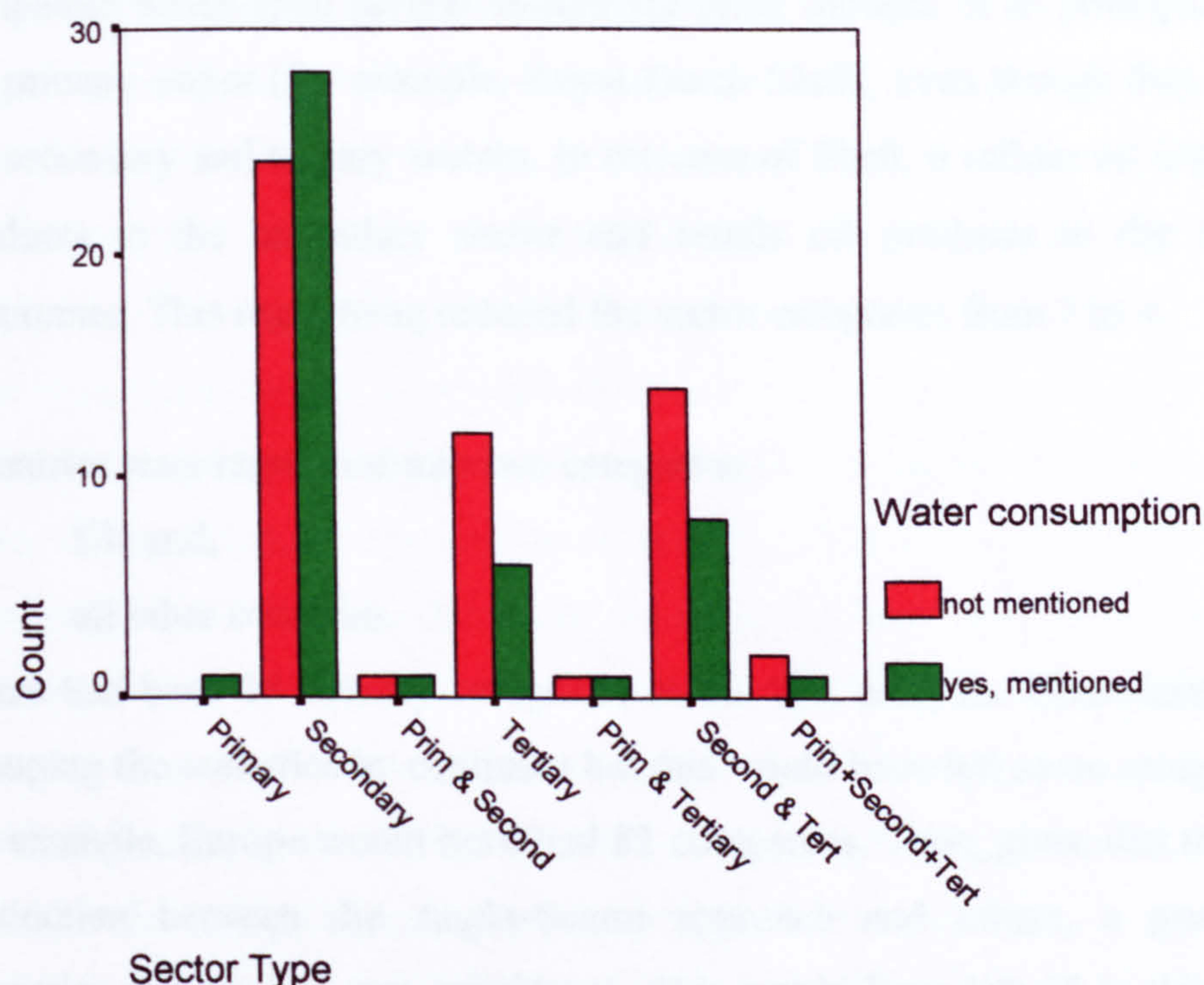


FIGURE 2: FIRST DATA SET – INCLUSION OF FIGURES FOR WATER CONSUMPTION & SECTOR TYPE

2.8.3 Analysis 3: second SPSS analysis on regrouped data

As a result of these inconclusive results, it was decided to regroup the data categories to see if, when combined into wider groupings, the statistical tests produced more meaningful results. It was decided to regroup sectors of the economy into four:

1. Other = primary +
primary & secondary +
primary & secondary & tertiary +
primary & tertiary
2. Secondary
3. Tertiary
4. Secondary & tertiary

It would have been difficult to remove the primary sector from the groupings, despite the fact that it only contained 1 company, as considering an economy in terms of sectors and omitting one of these would not be a valid procedure. It was decided instead to group the 1 primary sector company with the mixed groupings containing some presence in the primary sector as these were all likewise small in number (3, 3 and 2). Many of these

trade & retail
financial services
construction
communications & media
other service

This regrouping was far more difficult to achieve. Clearly the utilities with 25 companies represented within this group was of significant size already and could remain as it was. It was then necessary to achieve relatively balanced groupings by combining other categories of economic activity but clearly they could only be grouped where similar processes were involved. It was decided to group chemicals and pharmaceuticals + personal care, since these all involve chemicals of one sort or another. For example, much discussion goes on between the companies producing the chemical surficants for soap powders and the companies producing the soap powders themselves. The former would come under chemicals whilst the latter clearly comes under personal care. Likewise, companies producing chemicals for the pharmaceutical industry usually have a close relationship with their customer companies. Group 2, oil, gas & others were grouped together as they are all primary related and deal with some sort of extraction or harvesting. Group 4 emerged as a result of grouping together all the remaining manufacturing processes, that is, those activities located in the secondary sector. Group 5 then included all the remaining activities all of which had some sort of association with the tertiary sector. This gave 5 groups with the following numbers: 1=12; 2=13; 3=25; 4=30; 5=20. Whilst not balanced equally, it was felt that these groups were of sufficient size and not too imbalanced to result in, perhaps, some more meaningful results from the grouped figures.

With these regrouped statistics, the Crosstabs procedure was re-run including Chi-Square tests and Symmetric measures. What was being sought was a p value of <0.05 for the Pearson Chi-Square test, as being evidence of a significant association between the particular variables concerned. Again a 'y' value of less than 20% was sought in order to give the result stability. A reasonably high CC value was also looked for as, the closer to 1 the value the stronger the association between the two variables. Crosstabs was considered to be the most appropriate procedure to run as it can be used with categorical data (which applies to this data) and it is a procedure that can clearly show measures of

association, as required in this instance. It was hoped to demonstrate from these measures of association that, whilst it was already known from the first very simple analysis, that few companies were conducting any form of environmental accounting (which emphasised its nascent nature), that there was a pattern of increased use of the types of quantitative data used for environmental accounting. This would help to demonstrate some probability that environmental accounting would become established within a business context. Further it was hoped that it might demonstrate some association between the other variables and company size, sector of the economy, economic activity or country grouping of the companies concerned. As previously, each of the subset of hypotheses was examined separately in the light of the results in order to build up a picture. Clustered bar charts were also incorporated into this procedure as these help to summarise data for groups of cases.

The Crosstabs procedure run on the regrouped statistics showed significant associations in some instances. For all the Chi-square results and contingency coefficients see Table 8, Appendix A. These were examined to see if these associations assisted in any way in the testing of the hypothesis subset.

Input-Output data associations: items 1-4, section 2.6

As had been recognised in the simple analysis, there was quite significant usage of input-output data (see section 2.6, items 1-4) within the CERs. As was indicated in section 2.6, these are all types of quantitative environmental information that can be part of the development process towards environmental accounting. The second SPSS analysis showed that, in three instances, this association was of significance, specifically as between: all of sector of the economy, type of economic activity and countries regrouped with water emissions; and size of company and countries regrouped and mention of air emissions. There was also a significant association between the regrouped country figures and mention of waste figures.

The results were as follows:

- ***Sector of the economy & water emissions:***

There is a degree of association between the type of sector and whether water emissions

are mentioned. The significance of that association is a conservative one given that the sample size concerned was not huge. The p value was .002 (<0.05), evidence of a significant association and the $CC=0.335$, a fair association – not a really strong association as the CC was not close to 1 but it was sufficiently above 0 to indicate some association.

From the graph of the regrouped data it is clear that businesses located in both the primary sector grouping (other) and the secondary sector are more likely to mention water emissions. This ties in with the activities conducted within these sectors and also with general sensitivities about water emissions and compliance requirements (for example, as under the UK Environment Act, 1995).

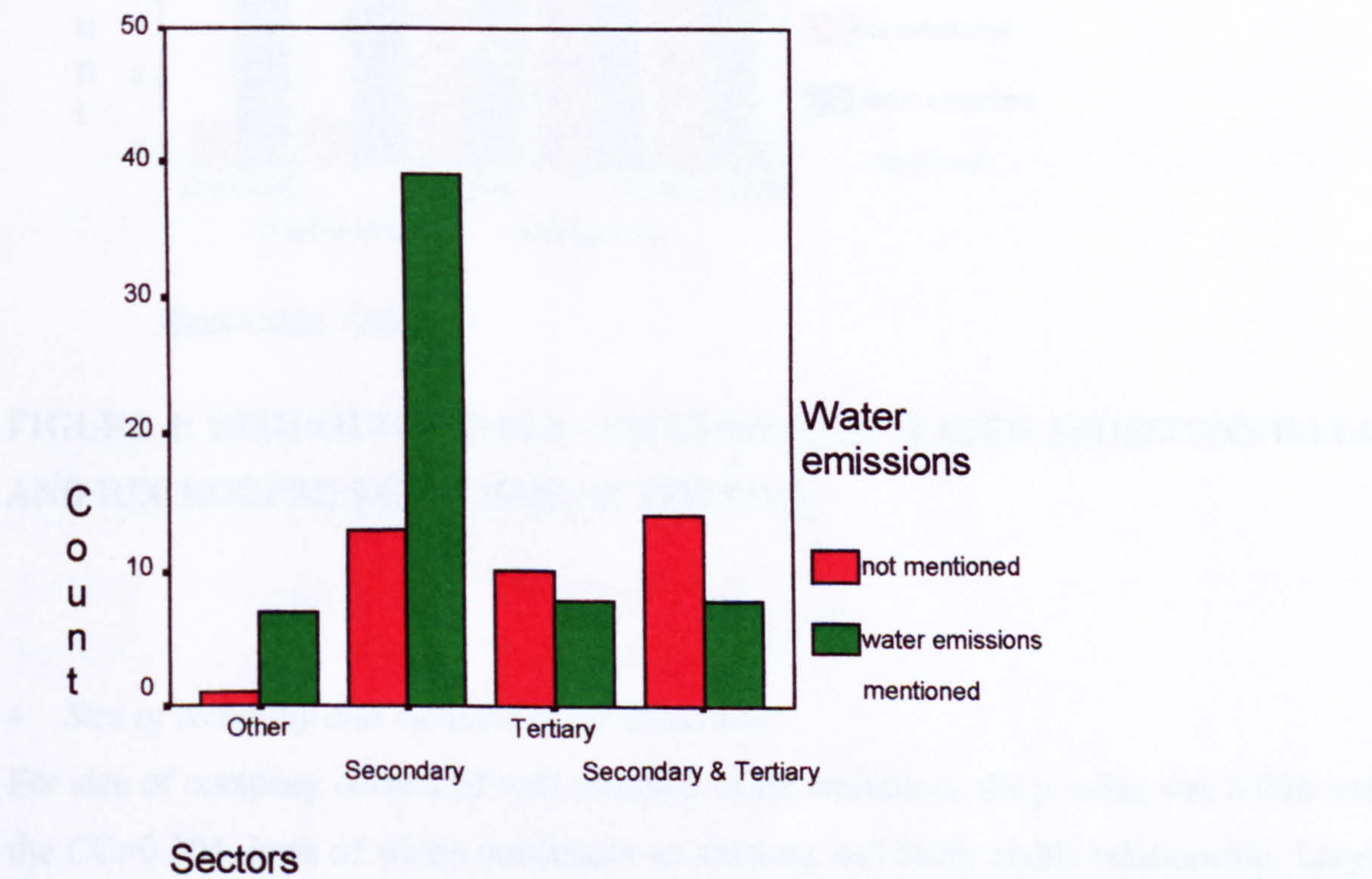


FIGURE 3: REGROUPED DATA – INCLUSION OF WATER EMISSIONS DATA & REGROUPED ECONOMIC SECTORS

- *Type of economic activity and mention of water emissions:*

The p value was 0.001 and $CC=0.408$ between type of economic activity and mention of water emissions, the highest value for any association. Further the ‘y’ value was 0%. The

association seemed particularly strong between the ‘chemicals’ and ‘oil, gas & others’ groups, with ‘manufacturing’ also showing a high percentage. These are all processes likely to both use water and to have water discharge consents. There seems a clear association between type of economic activity and mention of water emissions.

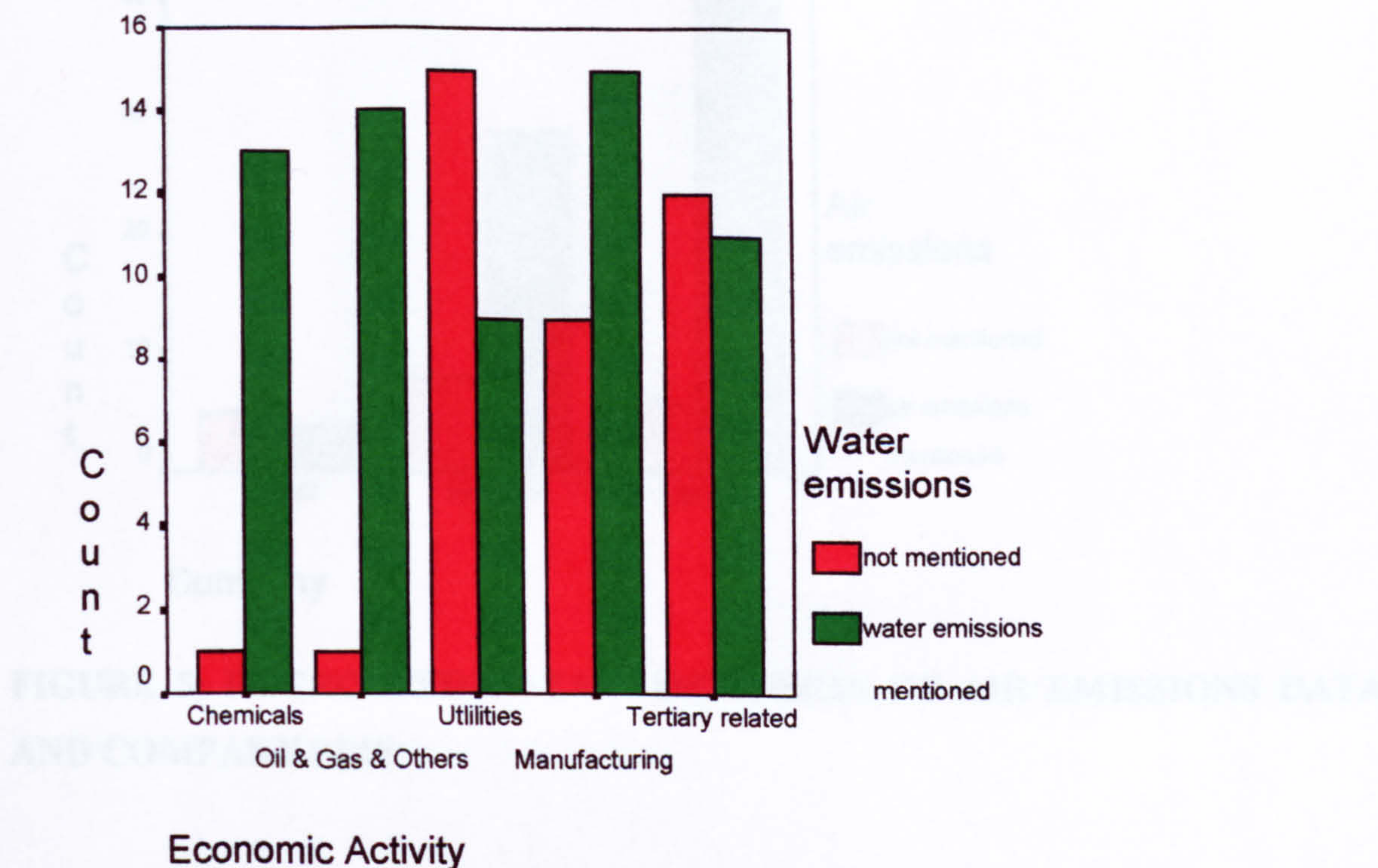


FIGURE 4: REGROUPED DATA– INCLUSION OF WATER EMISSIONS DATA AND REGROUPED ECONOMIC ACTIVITIES

• *Size of company and mention of air emissions*

For size of company correlated with mention of air emissions, the p value was 0.006 and the CC=0.304, both of which confirmed an existing and fairly stable relationship. Large and medium sized companies were both more likely to mention these. This may be related to minimum scale of production requirements for manufacturing processes, which means that certain activities such as oil & gas and chemical production are only likely to be conducted by large or medium sized companies. These are also activities where air emissions are carefully monitored.

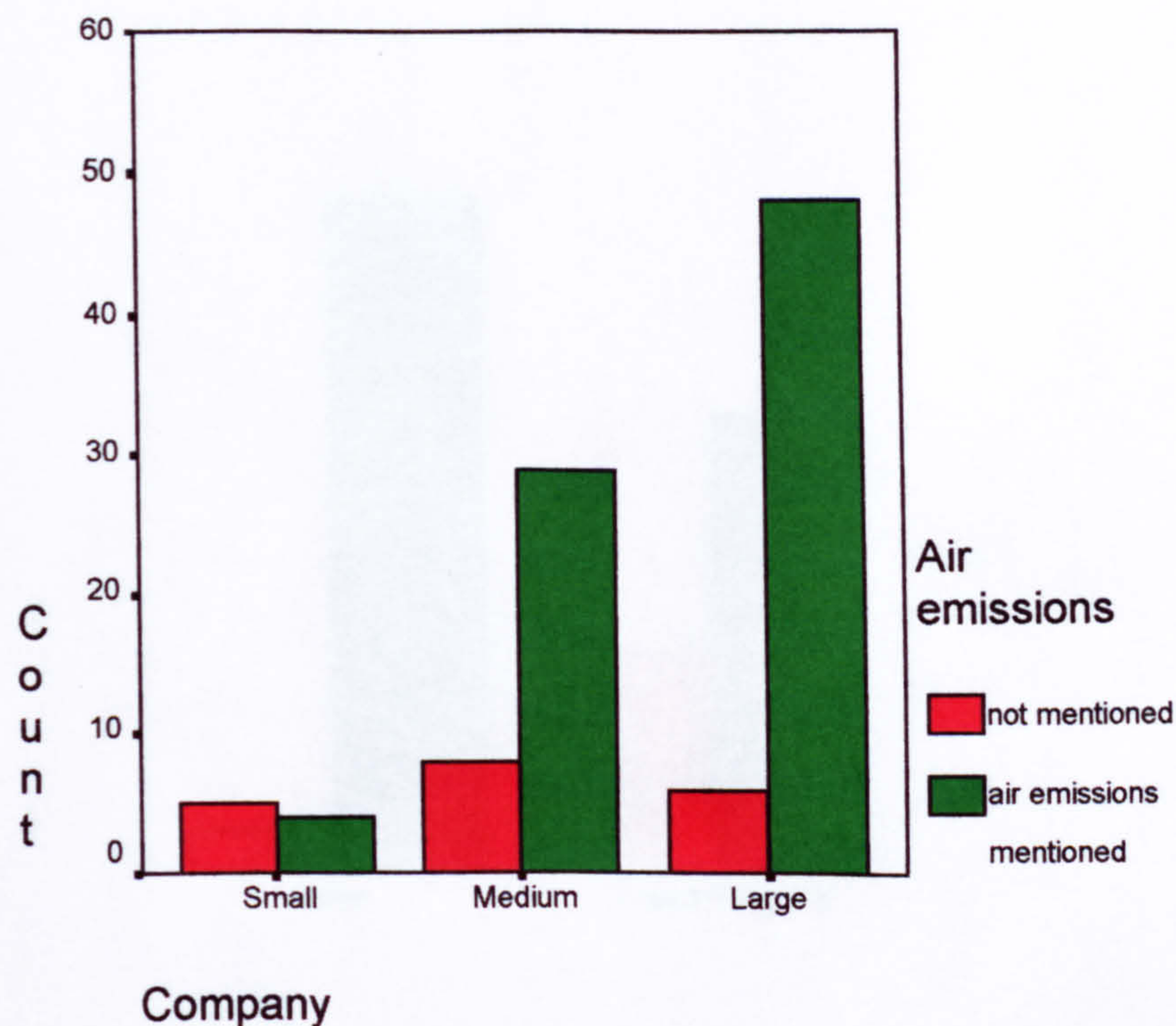


FIGURE 5: REGROUPED DATA – INCLUSION OF AIR EMISSIONS DATA AND COMPANY SIZE

Countries regrouped (i.e. UK and 'the rest') and mention of air emissions:

There was strong evidence of an association here with a p value of 0.001 and CC=0.323. A higher percentage of companies from other countries were more likely to mention these, although the percentage for UK companies was 67.3%.

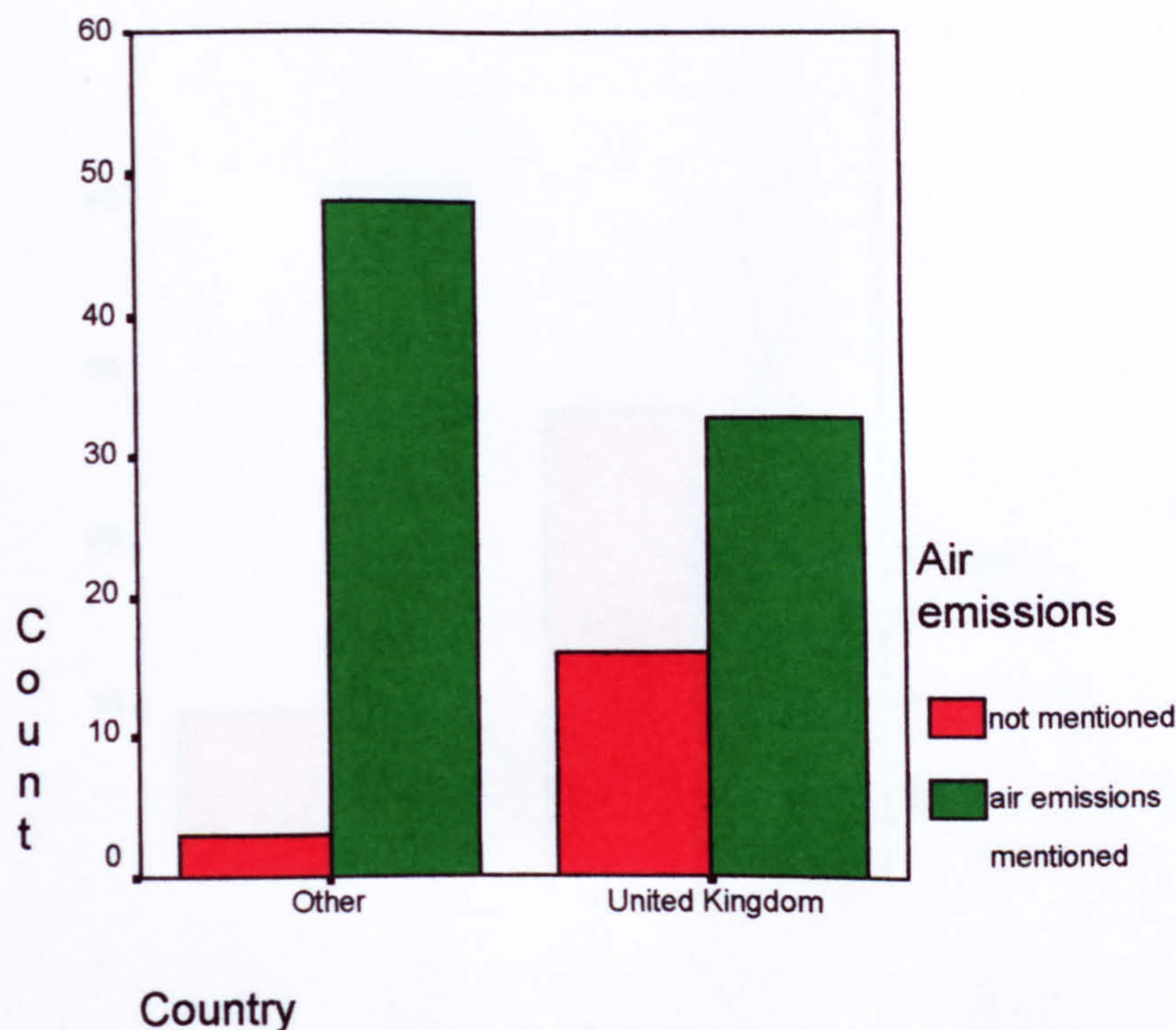


FIGURE 6: REGROUPED DATA - MENTION OF AIR EMISSIONS AND REGROUPED COUNTRY GROUPINGS

Countries regrouped and mention of water emissions:

The p value was 0.000 and the CC=0.361. There was strong evidence of a significant association between country group and mention of water emissions. Mention of these in other countries data (80.4%) was almost twice that of UK companies (42.9%). This links up with the greater likelihood of companies from other countries mentioning air emissions (see above) and could reflect different societal pressures. However, it could also be a reflection of the deindustrialisation that occurred in the early 1980s under the Thatcher government. The lower propensity for UK companies to mention air and water emissions could merely reflect the fact that, post deindustrialisation, these emissions have become of far less significance within the UK as there are far fewer of them.

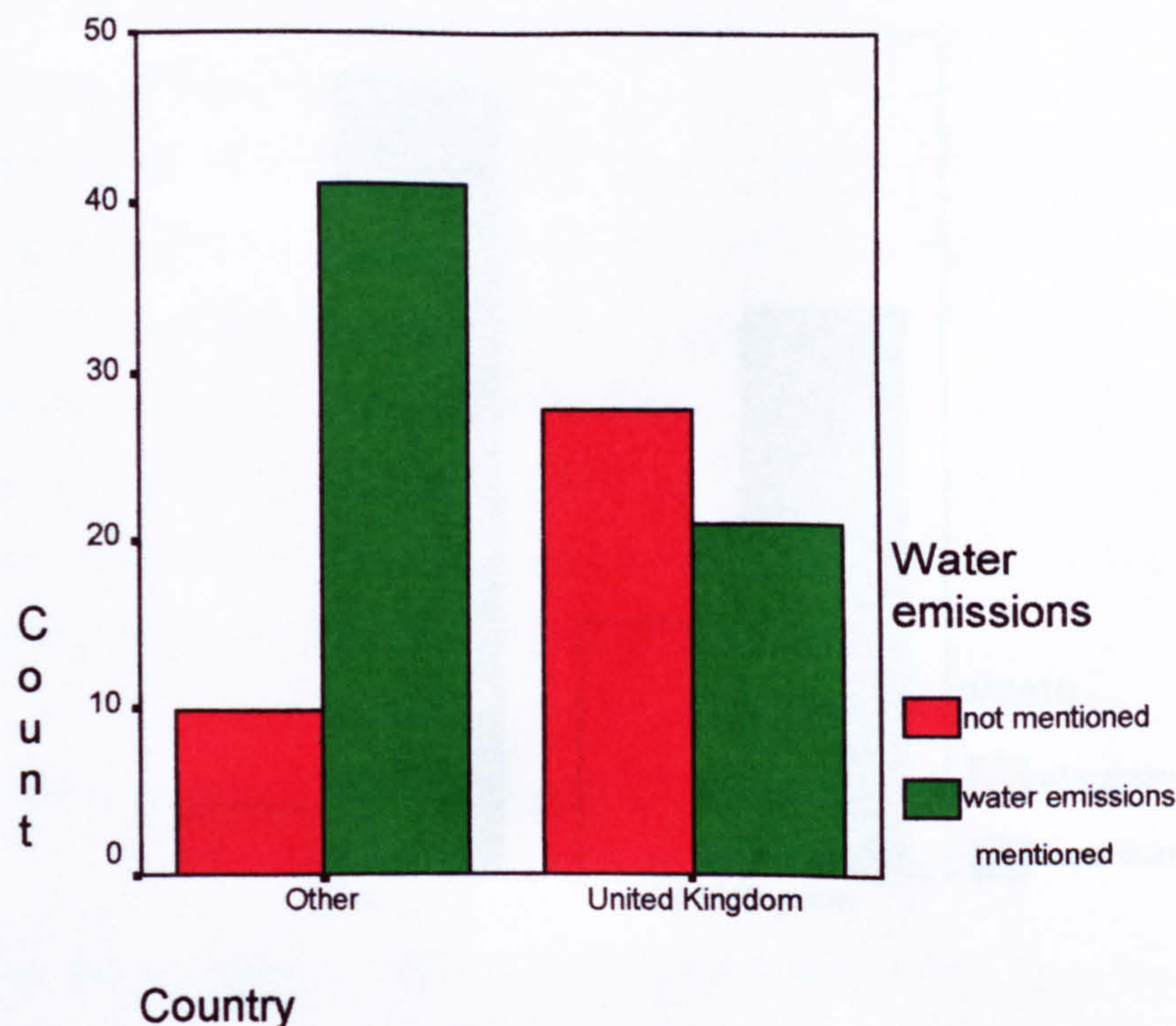


FIGURE 7: REGROUPED DATA – INCLUSION OF WATER EMISSIONS DATA AND COUNTRY GROUPINGS

• *Countries regrouped and mention of waste figures:*

The p value was 0.004 and the CC=0.279. This was a strong association and a stable result with the companies from other countries (92.2%) more likely to mention these than companies from the UK (69.4%). Overall, the association shows sensitivity to waste issues. In many countries this is a major environmental issue, however, as it has grown as an environmental issue and companies have had to look at waste management, they have discovered that careful waste management saves money (for example, Company 10 Chapter 4). This type of environmental accounting has therefore become very significant.

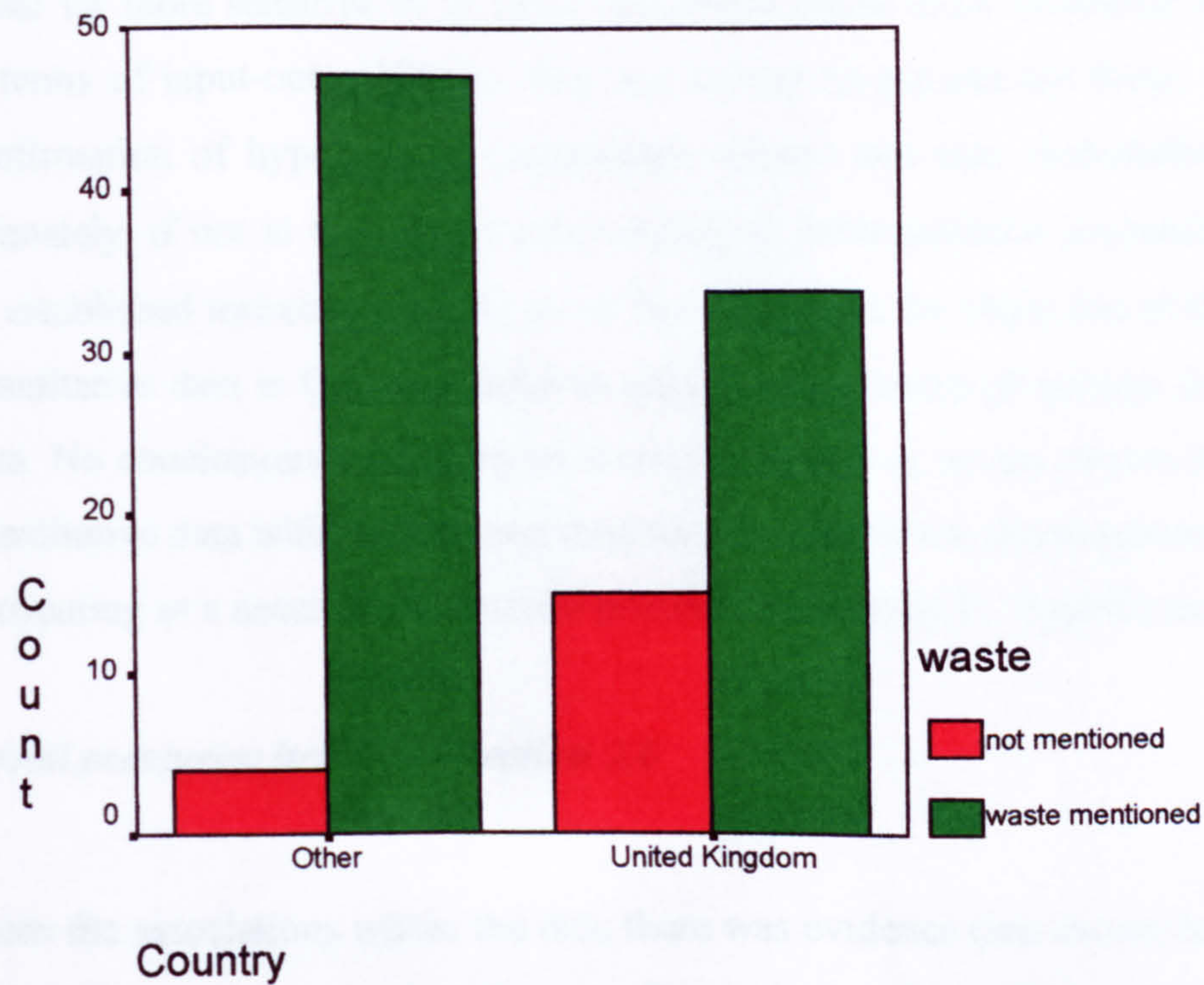


FIGURE 8: REGROUPED DATA: MENTION OF WASTE FIGURES AND COUNTRY GROUPINGS

Conclusions on the analysis of the input-out data associations

The results of the analysis as between sector of the economy and type of economic activity for mention of water emissions tended to reinforce each other, as companies from the secondary sector were more likely to mention these, whilst companies from the chemicals, manufacturing and oil gas & others (all very largely secondary based) were most likely to mention them also. This may say something about the pressures on these types of industries both in terms of compliance and societal pressures. Large and medium sized companies were also likely to mention air emissions.

Overall, the propensity to mention air and water emissions tied up with the fact that both companies from the UK and those of other nationalities were likely to mention these. What was interesting here was the greater likelihood of mention by non-UK companies. This coupled with the overwhelming likelihood that non UK companies were more likely to mention waste figures than were UK owned ones may say something about the different social contexts within which they operate. It may be that other countries are

either far more sensitive to or more concerned about these emissions figures. Certainly, in terms of input-output figures they are having to account for these. This may be part confirmation of hypothesis 3 (hypothesis subset) and may demonstrate a reason why, ultimately, if not in the UK, in other countries environmental accounting could become an established technique. Whilst all of this confirmed the likely use of these categories of quantitative data in CERs, it failed to confirm any overall propensity to use input-output data. No conclusions can be drawn from any of this as to any moves towards the use of quantitative data within CERs and thus the possible future development of environmental accounting as a necessary and useful process (hypothesis 1 – hypothesis subset).

Social pressures: items 5, 6, section 2.6

From the associations within the data there was evidence (see above) to demonstrate that certain pressures are driving the use of quantitative data. Whilst proving nothing about the use of environmental accounting other than an existing propensity to use quantitative data and therefore a possible propensity to move towards such accounting, there were other strong associations which demonstrated a need to publicise environmental facets of a business. These associations relate to section 2.6, factors 5 & 6.

The results were as follows:

Size of company and use of CER to publicise a new environmental initiative:

For these data categories, the p value is .004 and the CC=0.313, however, the result is slightly unstable as the 'y' value is 33%. The relationship is that larger companies are keener on such publicity than smaller ones. Medium sized companies are also more interested in such publicity but less so than larger ones. Overall, companies are very interested in publicising information about such initiatives and they may be anxious to communicate these in answer to societal concerns expressed about their environmental policies and behaviour.

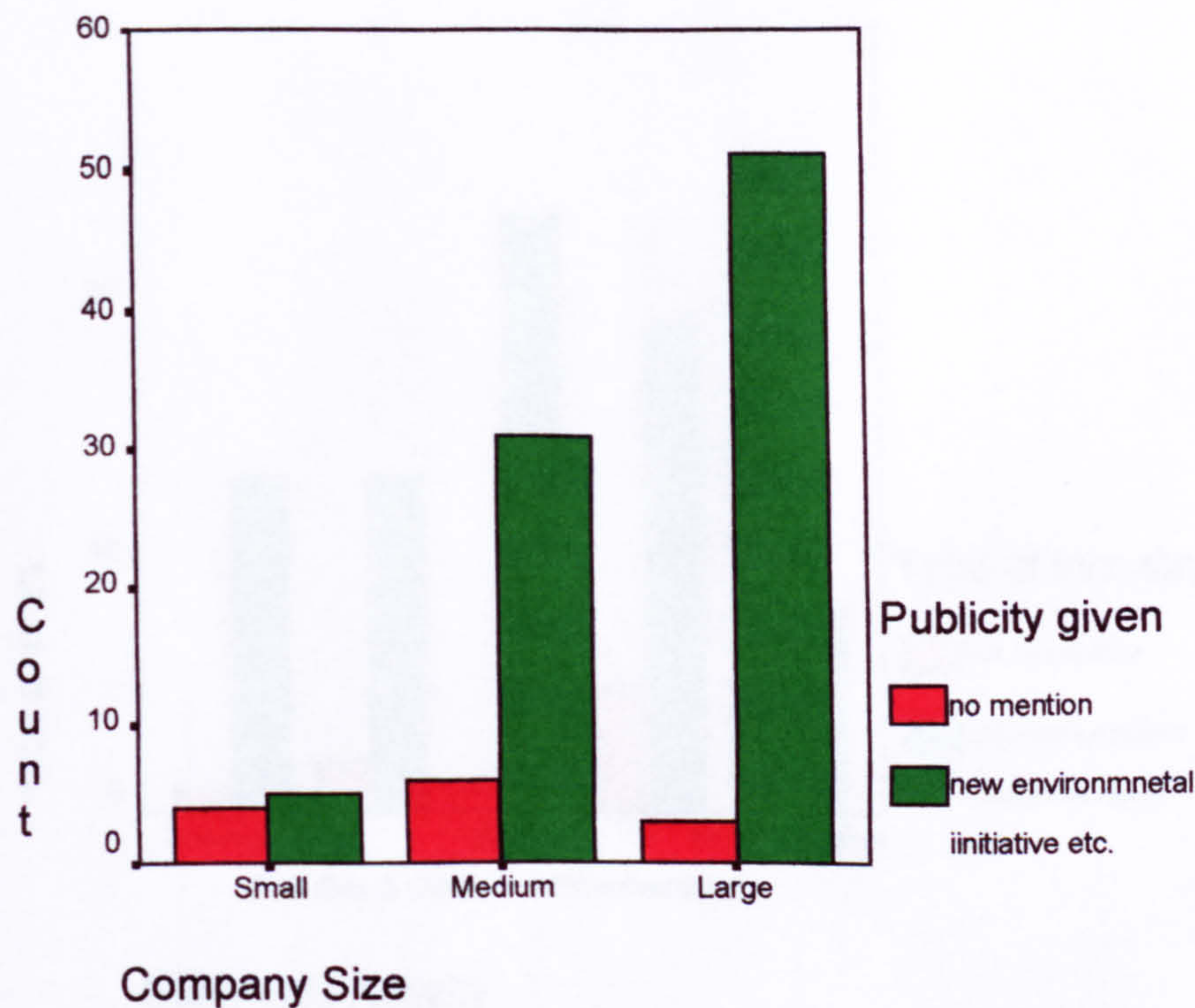


FIGURE 9: REGROUPED DATA - PUBLICITY FOR NEW ENVIRONMENTAL POLICY/INITIATIVE/DIRECTION AND COMPANY SIZE

- *Type of economic activity and the need to produce a CER due to type of industry:*

The p value is 0.000 and the CC=0.479. There is strong evidence supportive of a relationship between these two variables and the result is fairly stable. 47.9% of the variability in determining whether the type of industry needs a CER can be explained by the type of economic activity group within which the company is found. However, this is to be expected and in many ways is self-explanatory. This may well demonstrate societal pressures as the only companies that do not seem to feel impelled to produce a CER are those in the tertiary sector. Others in rather more polluting activities within the economy clearly do so and this may be significant in terms of the forces acting on all environmental initiatives, especially environmental accounting.

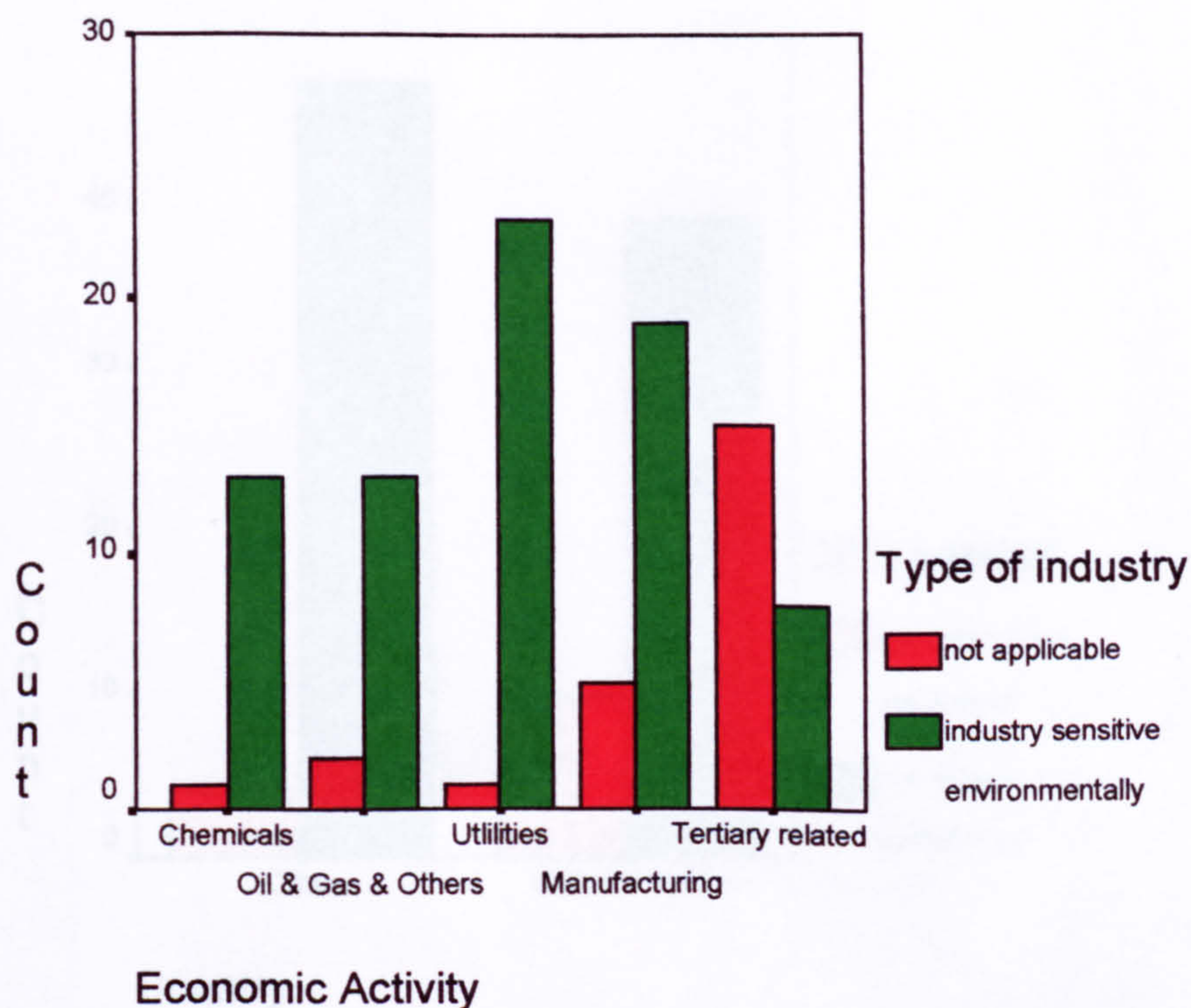


FIGURE 10: REGROUPED DATA – NEED TO PRODUCE CER DUE TO TYPE OF INDUSTRY AND ECONOMIC ACTIVITY

(Other strong correlations could not be shown)

• *Countries regrouped and the use of a CER to publicise compliance:*

Here the p value is .070 and the CC=0.178. There is a stable but only marginally significant association between these two variables. 79.6% of all UK companies would seem to have produced a CER (at least in part) for the purposes of publicising their compliance, as opposed to 92.2% of companies from other countries. In both instances, this association demonstrates societal pressures at work, if only the need to comply.

• *Sector of economy and land ownership/tenure*

Whilst the p value was .001, the χ^2 value was 10.9, which demonstrated evidence of instability within the table. This was not due to the χ^2 test being too small as the result was notable and as, in absolute terms, 10% of the 100 companies produced land certificates in their CERs. A chi-square test was also performed.

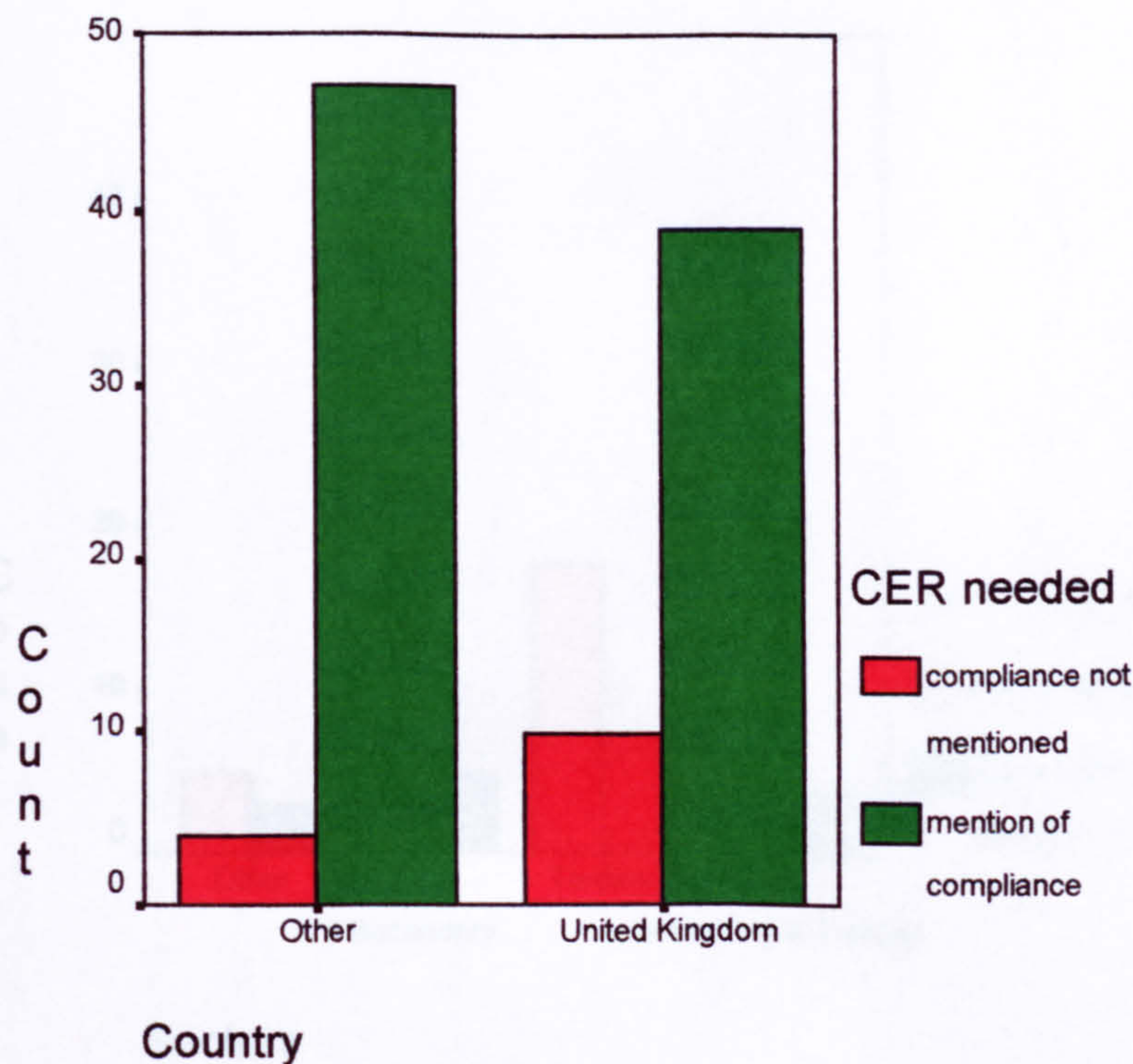


FIGURE 11: REGROUPED DATA: CER NEEDED TO DEMONSTRATE COMPLIANCE AND COUNTRY GROUPINGS

Other strong associations: noted but discounted

Other strong associations were found within the data as a result of the second SPSS data analysis (Analysis 3) on these regrouped figures. However, for various reasons it was difficult to see how any of these associations helped to prove the hypothesis.

The results and the reasons for considering these to be of no significance are as follows:

- *Sector of economy and land contamination figures:*

Whilst the p value was .037, the 'y' value was 37.5%, which demonstrated evidence of instability within the results. This was confirmed by a CC of 0.279. As the result was unstable and as, in absolute terms only 12 of the 100 companies mentioned land contamination in their CER, it was not considered significant.

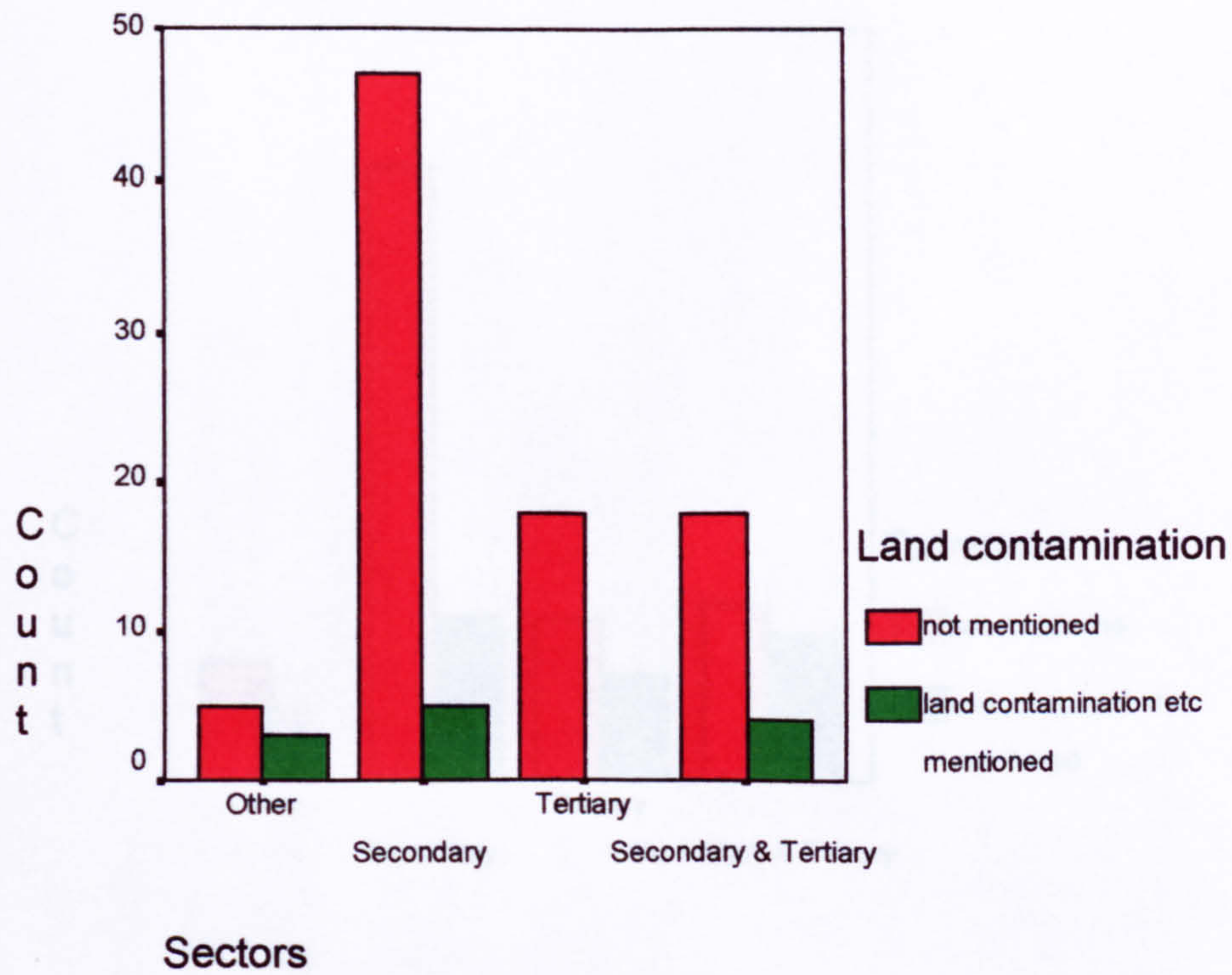


FIGURE 12: REGROUPED DATA – INCLUSION OF LAND CONTAMINATION FIGURES & SECTOR GROUPINGS

- *Sector of the economy and transport use mention*

For these two categories of data, the p value was 0.034 and CC=0.283 both of which confirmed an association existing and one which was fairly stable. However, again there was insufficient overall mention of transport use – only 28 of the 100 companies mentioned it – and so no useful conclusions could be drawn from this association.

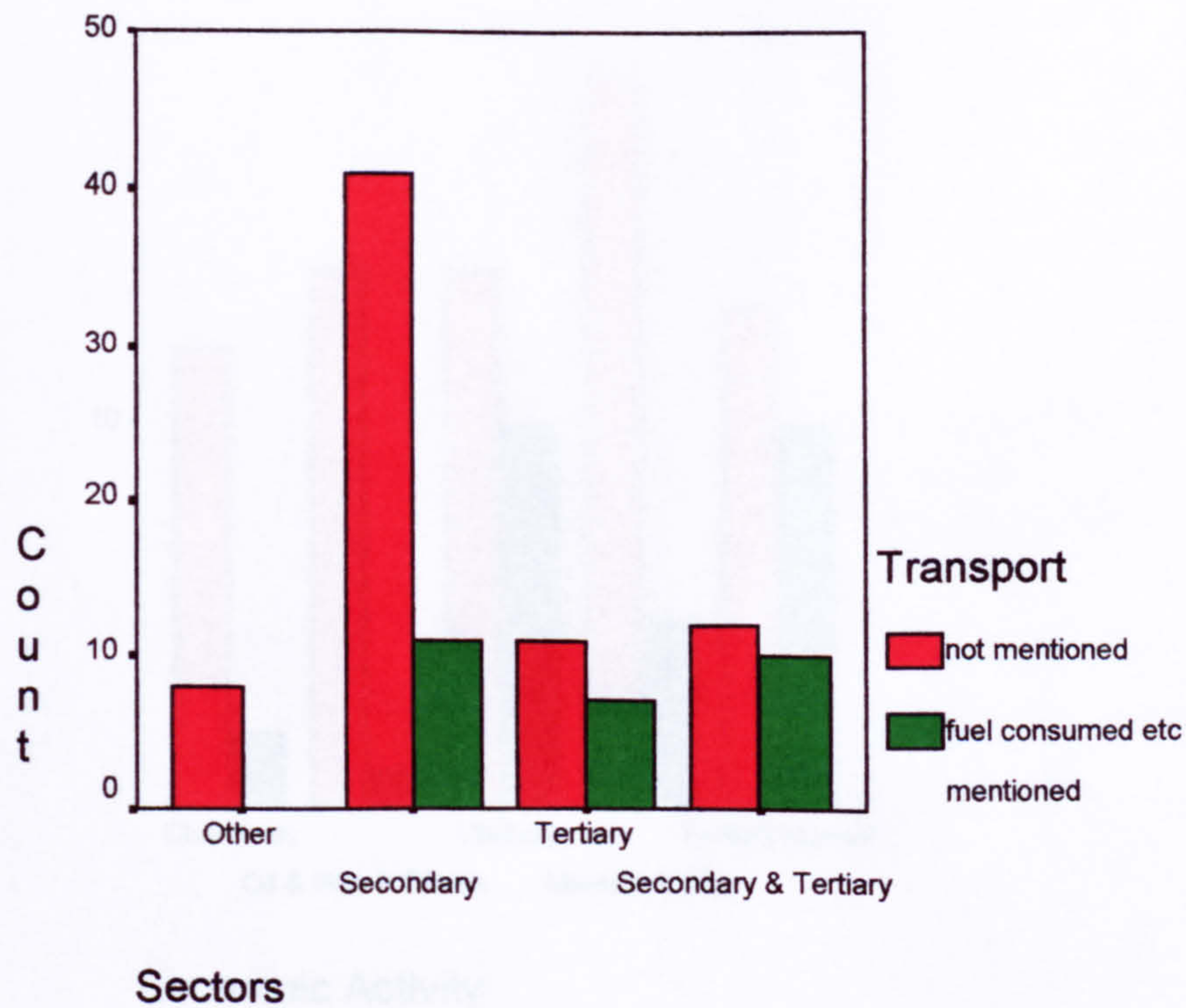


FIGURE 13: REGROUPED DATA - TRANSPORT USE (FUEL CONSUMED, CAR MILEAGE, ETC.) AND SECTORS REGROUPED

- *Type of economic activity and transport use:*

The p value was 0.036 and the CC=0.305. This was evidence of an association with fair stability. 30% of the variability in transport use could be explained by type of economic activity. As above, with the mention of transport use by sector of the economy, the numbers mentioning this were small (28/100) and no significance could be attached to this result.

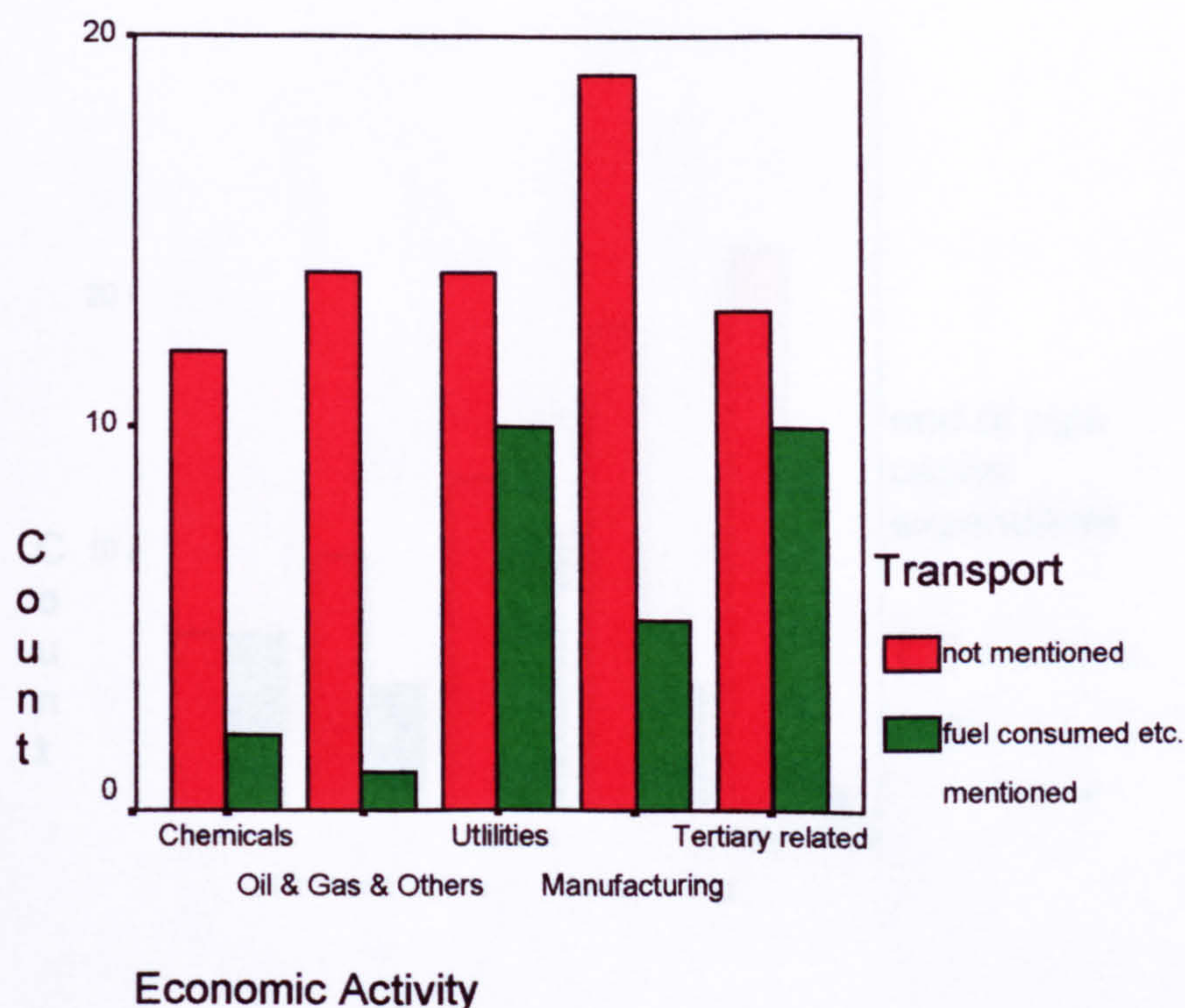


FIGURE 14: REGROUPED DATA - TRANSPORT USE (FUEL CONSUMED, CAR MILEAGE ETC.) AND ECONOMIC ACTIVITY

- *Type of economic activity and mention of any end of pipe capital expenditure:*

The p value is .007 and the CC=0.350. There is evidence of a fairly stable association between the two variables. The type of economic activity conducted by a company could be a fair determinant of whether there is any mention of end of pipe expenditure in their CER. However, only 29 of the 100 companies mentioned such expenditure so no conclusions could be drawn from this association.

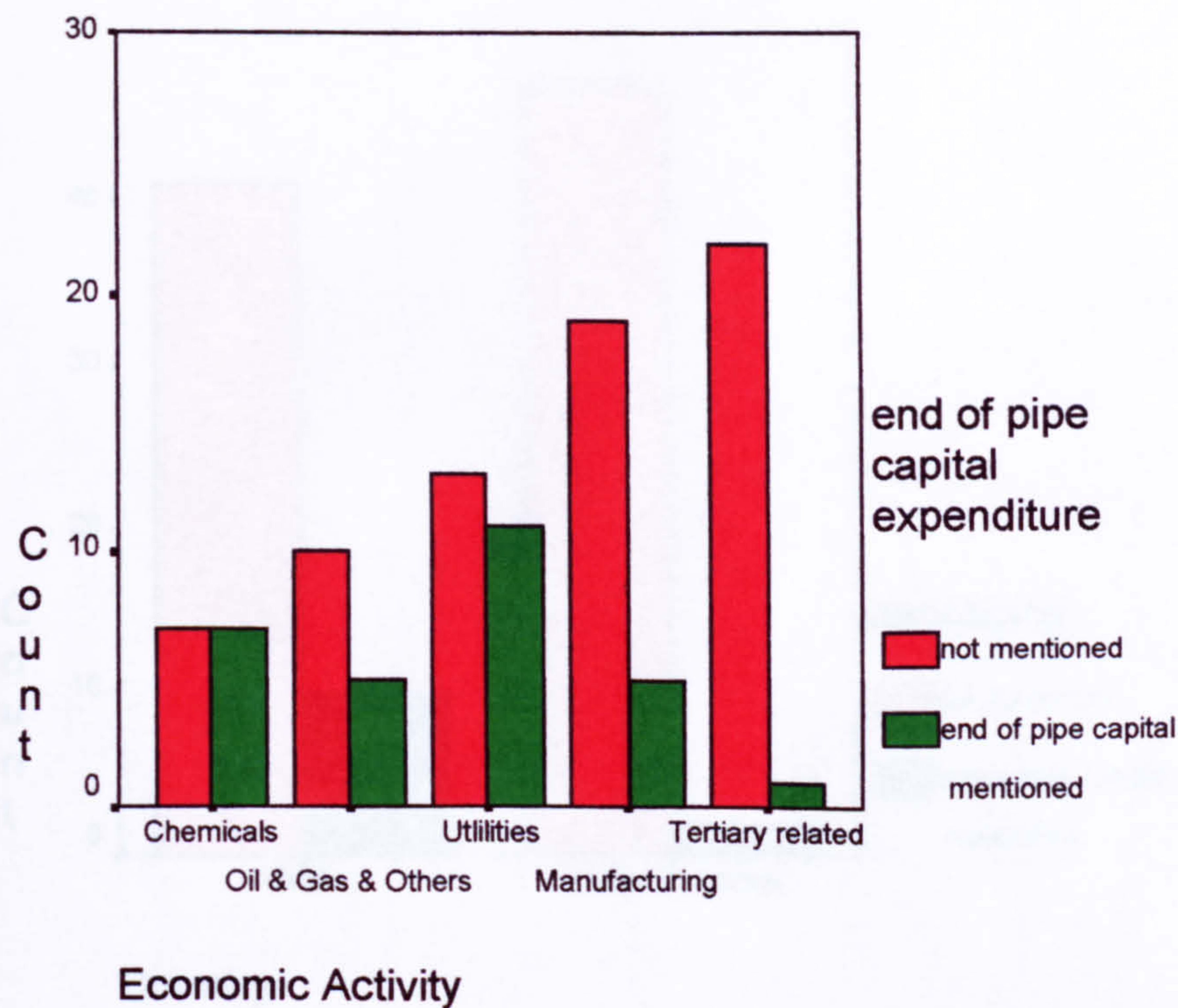


FIGURE 15: REGROUPED DATA - END OF PIPE CAPITAL EXPENDITURE MENTIONED AND TYPE OF ECONOMIC ACTIVITY

- *Countries regrouped and mention of packaging figures:*

The p value was .017 and the CC=0.232. There was good evidence here of a stable association between the two variables. Very few companies mentioned these figures but of those that did, 19.6% of companies from other countries mentioned these figures as opposed to only 4.1% from the UK. This provided no proofs for the hypotheses and, given the high proportion of CERs from EU based companies in the survey, it is interesting that only 12 of the 100 companies mentioned packaging, especially in the light of the EU packaging directive.

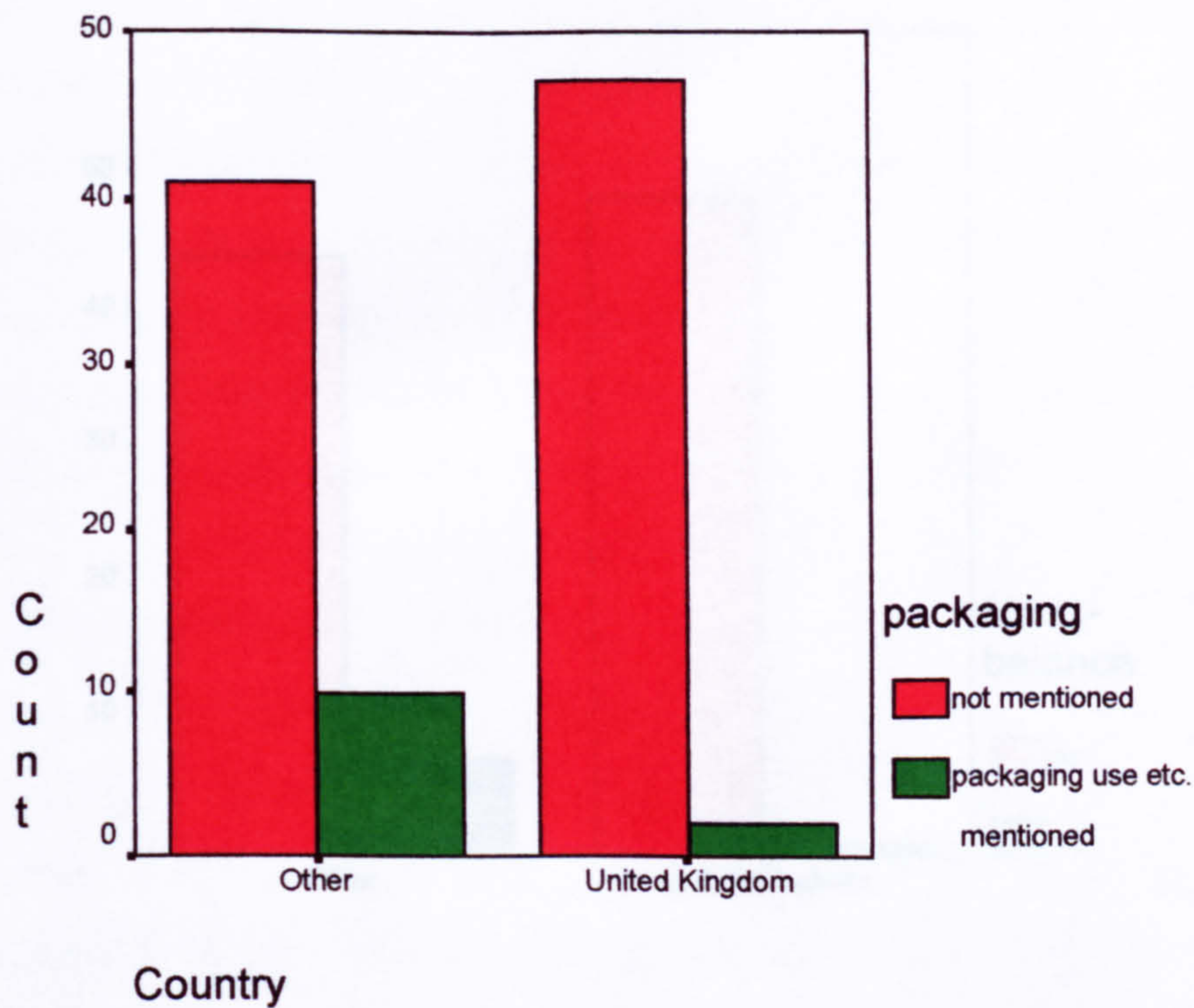


FIGURE 16: REGROUPED DATA - PACKAGING USE MENTIONED AND COUNTRY GROUPINGS

- *Countries regrouped and compilation of a mass balance:*

Whilst the p value was .031 and the CC=0.210 which indicates an association between the two variables, the result was unstable as the 'y' value was 50%. As was indicated by the very simple count, very few companies compiled one of these (8/100) and companies from countries other than the UK were more likely to do so. This association was of no significance in terms of any one of the hypothesis subset.

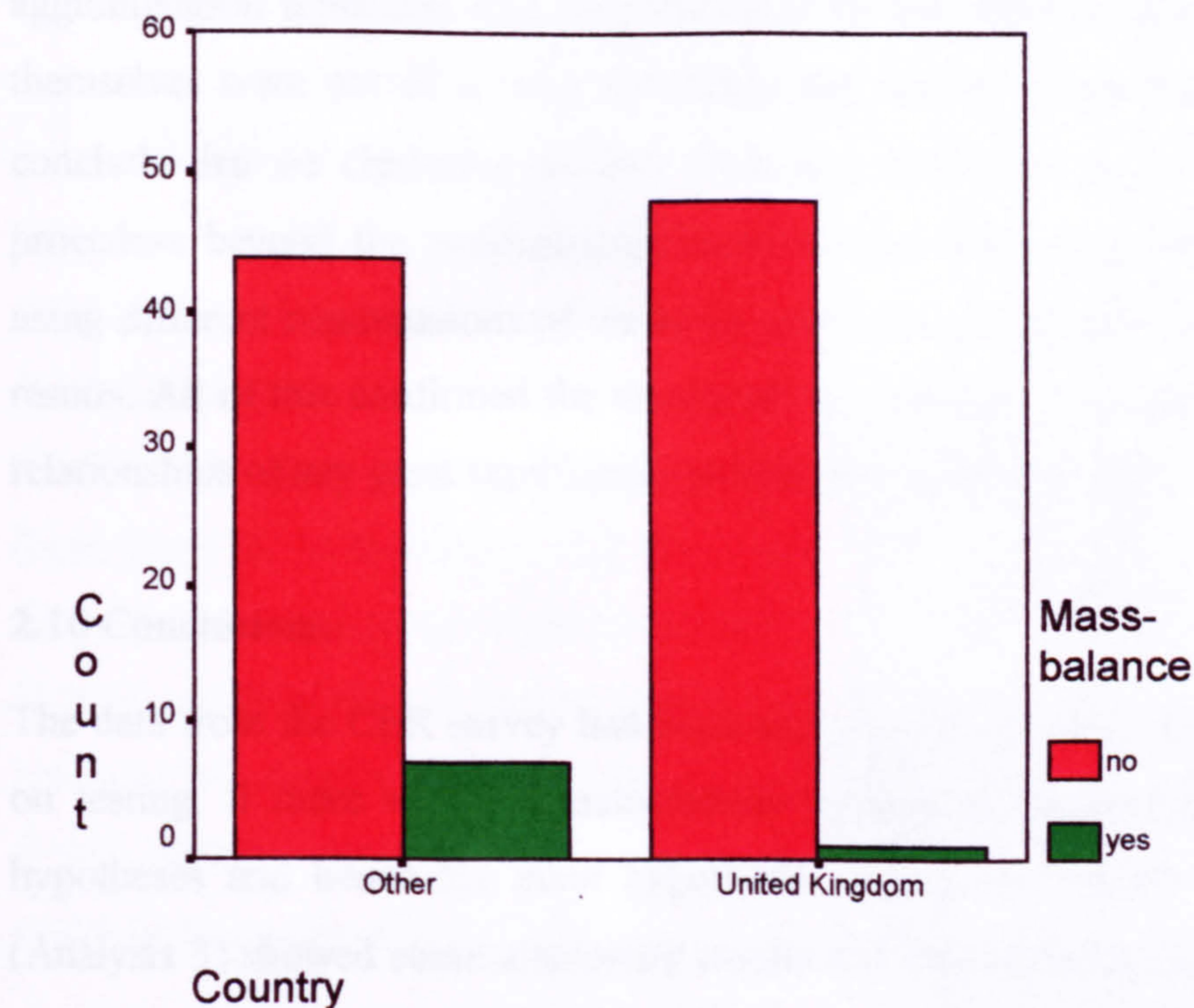


FIGURE 17: REGROUPED DATA - MASS BALANCE INCLUDED IN CER AND COUNTRY GROUPINGS

2.9 Hierarchical Cluster analysis

The Hierarchical Cluster analysis procedure was finally run in SPSS to check that nothing within the data had been missed. The agglomeration schedules and dendrograms for these four cluster method tests can all be found in Appendix B. Dendrograms are tree diagrams and are a means of illustrating the analysis process (see Everitt, 1993, P55). The dendrograms demonstrated that there were large distances between the variables and that they did not come together in clusters, with some variables at the bottom of each dendrogram that could only be forced into a cluster with very great difficulty. The agglomeration schedules show large jumps in the coefficients in terms of which clusters come together first and next and huge jumps in these towards the bottom of the schedules. As a result, the agglomeration schedules are not replicated in the dendrograms. Further, all the proximity matrices (not included in Appendix B due to their size) showed large discrepancies and huge values in the middle area which further demonstrated that no clusters existed.

Given that the proximity matrices showed these large discrepancies, that the

agglomeration schedules were not replicated by the dendrograms and the dendrograms themselves were not of a form indicating any sort of clustering, it was reasonable to conclude that no clustering existed. This was confirmed by the fact that no plotting procedure beyond the dendrograms could be run. Removing some of the variables or using different combinations of variables within the procedure did not produce different results. All of this confirmed the results of the Crosstabs procedure, that there were few relationships of any great significance to be found within the data.

2.10 Conclusions

The data from the CER survey had been analysed in different ways in order to discover, on testing, if there were any associations helping to substantiate the subset of three hypotheses and hence the main hypothesis. Whilst the second SPSS data procedure (Analysis 3) showed some interesting results and helped to highlight particular instances where types of quantitative data might be found in CERs, they did not inform (any more than had the initial simple count), on the overall use of quantitative data. Nor could they inform any more than had the initial simple analysis (1) on the overall use of any environmental accounting in any of its forms. The probability of such future use could not be predicted, as more than one such survey would have been required to demonstrate either increasing or decreasing usage of quantitative data and/or any forms of environmental accounting over time. This survey demonstrated the use of quantitative data within CERs in absolute terms and any inclusion of an Oko-bilanz or FCA. It also indicated what might be driving the trend towards the use of environmental accounting, such as mention of company concern for sustainable development, customer requirements, compliance issues or liability issues – all of which demonstrate societal forces at work in this area.

What the CER survey had shown conclusively is that some environmental accounting exists (in particular the use of the Oko-bilanz) and that there is considerable use of quantitative data within CERs. The fact that many CERs made mention of the need for sustainable development demonstrated that there were certain societal concerns driving environmental initiatives. The survey had undoubtedly reinforced the finding of the literature survey that environmental accounting is an emerging technique. Given the widespread use of the type of quantifications which lead on to full environmental

accounting, it is clear that many businesses find these methods useful (hypothesis 1 – hypothesis subset). Whilst the survey shed little light on the extent of environmental accounting's value to businesses via its use in the management process (hypothesis 2 – hypothesis subset), there had been very clear indications of societal pressures at work. Businesses do not usually spend money on a publication without good reason and the inclusion of such items as new environmental initiatives, compliance and sustainable development gives every indication that there are social pressures driving this process (hypothesis 3 – hypothesis subset). There was every indication of the incipient establishment of environmental accounting but further evidence was needed to establish if there was absolute substantiation of this. At this point only secondary sources of data had been investigated, there was therefore a need for a primary data source investigation. It was decided to conduct fieldwork, namely, an in depth survey of a carefully constructed sample of businesses.

CHAPTER 3: METHODOLOGY OF THE FIELDWORK SURVEY

3.1 Introduction

As indicated in 2.10, it was decided to proceed with an investigation of the primary source, businesses themselves. Qualitative research was the only option as quantitative research was not considered appropriate for an investigation which considered perceptions and intentions, amongst other factors (Brenner, Brown & Canter, 1985, P121). Undoubtedly this brings its own problems as qualitative research data can appear chaotic and difficult to categorise (Locke, Silverman & Spirduso, 1998, P145). This chapter outlines the methodology used for this investigation in ordering the chaos.

3.2 The use of Grounded Theory

Whilst the literature survey and economic knowledge had been used to guide and inform the CER survey and whilst this continued to be important in guiding the fieldwork survey, it was felt that the whole needed to use a methodology which could cope with the data collection, coding and analysis process. Grounded Theory was chosen as being appropriate, as not only does it allow for this process but it also allows that this may occur as much as possible simultaneously (Glaser & Strauss, 1967, P43). Further whilst other techniques such as Content Analysis can be criticised for being overprecise and forcing the data into categories, Grounded Theory allows the analysis to be faithful to the data rather than forcing it in particular directions, it allows that the research may be a developing organism rather than a perfect product (Glaser & Strauss, 1967, Pp32-40).

Implicit in the use of Grounded Theory is an acceptance of a phenomenological approach to the investigation. This is one that allows that the environment within which the researcher operates is both subjective and socially constructed. As a result rather than focusing on facts, the focus has to be on the meaning of trends, events or whatever. A holistic view is taken of the situation and the emphasis is on understanding what is happening within this situation, leading to the deduction of theories or ideas from this understanding. Here, the aim was to understand what was happening within businesses in terms of the development of environmental accounting and to explain the meaning of this within a wider societal context, the whole within an ever developing and intertwining context (Glaser & Strauss, 1967, P43). In other words, a holistic view was being taken

with any consequent understanding leading to the deduction of theories or ideas: a phenomenological approach. This is distinct from a positivist approach that demands total objectivity (Easterby-Smith et al, 1991, Pp22, 24).

The phenomenological approach as evidenced by Grounded Theory can, however, lead to criticism since, as a result, qualitative research can be labelled “unsystematic”, “impressionistic”, or “exploratory” (Glaser & Strauss, 1967, P223). Glaser & Strauss in its defence point out that such critics can easily loose sight of the fact that it is appraisal of plausibility that is needed in qualitative research, rather than degrees of accuracy. Moreover, other approaches to qualitative data analysis such as that of Content Analysis (previously cited) can be too precise, as numerical values have to be assigned to frequencies of occurrence with some precision (Leites & de Sola Pool, 1942, P1). This can detract from studying perceptions and plausibility. Content Analysis can also suffer from the further problem of coding irrelevant content (de Sola Pool, 1959, P14). It could, of course, be argued that irrelevant content can likewise be included under the Grounded Theory process. However, everything is considered in terms of a “*dimensional continua*” (Strauss & Corbin, 1990, P70) and thus less relevant data will be placed on the fringes of this continua rather than being included in any core. This is in line with the holistic view taken of the data, which means that it is not forced in a particular direction, which is the case if, as under Content Analysis, it has to be coded and placed in categories. Indeed, it has been argued that the purpose of Content Analysis is ultimately to convert raw material into scientific data (Brenner, Brown & Canter, 1985, P117). The purpose of Grounded Theory, on the other hand, is not to convert everything into scientific data in order to prove particular theories but is to discover and demonstrate sufficient support for such theories (Taylor & Bogdan, 1997, P137).

There is under Grounded Theory no need to pigeonhole all the data. Instead it must be allowed to tell a story. This raises the issue of reliability and validity under this process. Given that Content Analysis is more precise in its coding process and an outcome is “scientific data”, then it can be argued that it is easier to check for validity and reliability if this technique is employed. This applies only to the process of the data collection from the raw data and not to the reliability and validity of the data collection in the first place. The same comments that have been made about this in section 3.6.1 on the reliability and

validity of the data collection process, would apply here whichever method was being used. Under Grounded Theory, the validity and reliability of the data collection from the raw material is ensured by means of making the whole process transparent and traceable (Strauss & Corbin, 1990, P258)

As has already been indicated, Content Analysis can force data in a particular direction, so whilst it may be possible to ensure the validity and reliability of the data collection and processing from the original data, the outcomes may be invalid as the technique may not be appropriate if a more holistic process is required. Such a holistic approach was needed in this instance, especially for that part of the survey that addresses perceptions. The use of Grounded Theory seemed a more valid approach.

3.3 The research strategy

Against this background use of Grounded Theory, it was necessary to decide upon the most appropriate research strategy for handling this primary data stage of the investigation. Traditional research strategies for turning questions into worthwhile enquiries, are those of experiment, survey or case study. No dependent/independent variable relationship existed in this instance. This excluded conducting an experiment as one, independent variable could not be manipulated against other, dependent variables.

A case study was also rejected, as this implies the question 'how is it done?' and the building of a model, with an attempt to apply this to a 'real' business situation to discover whether or not it is valid. This research was not addressing the mechanics of the process but was looking at its value within the business context and the pressures that might exist for its implementation. A case study was, therefore, not possible.

A survey emerged as the most appropriate research strategy. The survey's aim was to gather qualitative data and then analyse it for predictive and other purposes. It was accepted at this early stage that it might not be possible to prove the correctness of the hypothesis but that it could be tested for either negative or positive results (Young, 1987, P104).

For survey administration the choice lay between a respondent-completed and, often,

postally administered questionnaire and an interviewer-administered questionnaire/schedule. The advantage of the latter is that it gives considerable scope for flexibility, whilst the former gives privacy and time but can make heavier demands on the respondent such that potential respondents often discard the questionnaire (a good response rate would be 10%). It was decided to choose the second option in order to achieve maximum information and to ensure a response from the businesses contacted.

3.4 Survey constraints

The survey was constrained by the following factors peculiar to any business environment:

- *the need for business utility*²⁵
Unless some business utility could be perceived as an outcome of the research, businesses might be reluctant to co-operate.
- *the problem of managerial paucity of time*
Given normal business pressures, time available with those at senior managerial levels is limited. It was hoped that this would not be insufficient to meet the survey needs.
- *the multi-disciplinary nature of the management process*
A multi disciplinary approach had to be adopted as this characterises the management process. Mintzberg (Mintzberg, 1973b) and Kanter (Kanter, 1983) both demonstrated this. This requires considerable background knowledge from a variety of disciplines, which may not be part of a researcher's knowledge base.

3.5 The survey construction

In constructing the survey the following had to be considered:

²⁵ The usual dictionary definition of utility is 'having the quality of being useful'. For business utility to exist, information concerning other companies' policies and actions, is usually required to be fed back from the findings of research. As this is perceived to be useful, utility then exists.

- objective of the survey: the specific questions that needed to be addressed had to be framed before the survey began.
- questionnaire design: the logical order in which to address the central issues.
- question design: use of open or closed questions; use of scaling mechanisms.
- identification of the research population: the group to whom the survey relates.
- sampling strategy: size of sample; structure of the sample; method of sampling; criteria to be applied.

Beyond the above there were other issues touching on the relevance of the research strategy, such as reliability and validity.

3.5.1 Objective

The objective was to explore the developing role of environmental accounting within business organisations and to gather information with which to test the hypothesis.

3.5.2 Questionnaire design

Seven clear questionnaire sections emerged and these were put in an order that would seem logical to anyone being questioned. For example, it is difficult to start asking questions on environmental accounting, without first exploring a company's environmental profile and other environmental initiatives it has adopted. The questionnaire sections were:

- a business's environmental activities/actions
- the extent of any environmental accounting conducted by a business
- what role such environmental accounting plays within the management, and especially within the management accounting, process

- any change that has occurred within the business as a result of environmental debate
- any commercial gains that can be identified from the use of environmental devices/accounting
- sources of pressure on the business from outside, pushing it towards a more environmentally conscious position
- government/EU environmental influence

These seven areas led on to particular, specific questions. At this stage, the research population, sampling strategy, contact time and administration of the survey had yet to be determined. Moreover, the problem of the huge variation in the nature of businesses and whether or not it was possible to design the questions such that they were generally applicable to all sizes and sectors of business and so that they elicited the appropriate information from each one, had still to be overcome. Later on, once the questionnaire was completed it was put, as an informal protocol, to a businessperson for a view both in general and on the issue of universal applicability. It seemed logical to them. It was also decided that the first two company representatives interviewed would be regarded as pilots. If the questionnaire proved to have problems then these two companies would be discounted and two more would be added. No problems were raised for the questionnaire by these first two interviews and so there was no need for alterations or the addition of other companies to the sample.

3.5.3 Question design

The questionnaire design gave a clear indication of what questions needed to be asked. Their wording had to be such as to either, in some instances elicit specific information, for example, question twenty (see Appendix B, Questionnaire) and others elicit an indication of business perceptions, for example in question seventeen (see Appendix B, Questionnaire). In the resulting schedule in addition to closed questions, many open ones were posed (Appendix B, Questionnaire), in order to allow respondents freedom in

response so as to extract all possible information from the interview process. It had to proceed on this basis in order that interviewees were given as much freedom as possible to express their views and perceptions (Young, 1987, P219). Moreover, it is acknowledged that such a situation is likely to create a more conducive atmosphere than might other means of investigation (Young, 1987, P222).

A potential problem with interviewer-administered questionnaires is the length of time that they take both to administer and analyse, as responses to questions can be lengthy both in terms of time and words. The finished questionnaire had twenty-eight main questions but including all sub-questions, had forty-one. The minimum estimated time that it would take to administer was between an hour and an hour and a half. Estimates of analysis time were not made at this stage. It was felt that a sample of twenty companies would be reasonable but that, given the time that analysis of the data might take, much more than this might become unmanageable.

3.5.4 Research population.

The research population was that of businesses in general but there was the problem of which ones in particular should be selected. Clearly there was little point in talking to individuals within a business about their environmental activities and possible environmental accounting, if that business had no interest in the environment in the first place. With these parameters, the population size was not easy to ascertain as, whilst it is relatively easy to discover what large publicly quoted companies are doing, it is not at all easy to discover what environmental initiatives are being taken by small and medium sized companies. They do not report quite as publicly as larger companies as, in the main, they are more concerned with the day to day running of their business than the public reporting of any environmental initiatives. Moreover, the number of publicly quoted and other companies who seemed to be active in the environmental field was limited (ref: 2.1). The population size of those companies actively interested in environmental initiatives appeared to be small and this was the research population for the survey. Beyond this, those interested in environmental accounting were likely to be even further limited in number.

Given the need for an overview of what each business was doing, it was decided to target

either the environmental managers of the businesses concerned or alternatively the senior managers/Board members with overall responsibility for environmental issues.

3.5.5 Sampling strategy

Sample size

Surveys have been conducted on a relatively small sample of businesses (Kisenyi & Gray, 1998) but what was clearly important was to have sufficient in the sample to, in this instance, provide representation from as many different types of economic activity within the economy as possible, in combination with different sizes of business and from different sectors of the economy. Whilst these considerations were paramount, a limiting factor was the minimum interview time of an hour, but more realistically an hour and a half, with a maximum of potentially any length (in practice, one interview took five hours). This imposed practical considerations of both time and resources, especially as good geographical representation throughout the UK was a further requirement.

A sample size of 20 was chosen. This was considered large enough to be representative but not so large as to be prohibitive in terms of the overall time and costs involved. This also allowed for a geographical spread of 9 areas within the UK as follows:

London	5
North East	4
West Yorkshire	3
North Yorkshire, East Anglia	2,each area
North West, South Yorkshire, Home Counties, Southern Counties	1,each area

Type of sampling

Random sampling did not seem appropriate given the need to target only businesses which were engaged in environmental initiatives or techniques. Moreover, as Strauss and Corbin point out, sampling under Grounded Theory cannot *"be guided by logic of other types of research because its purposes, logic, canons, and procedures are quite different than in quantitative research"* (Strauss & Corbin, 1990, P191). They go on to say that

the Grounded Theory technique aims to specify the conditions under which the phenomena exist, rather than attempting to generalise to a larger population. What is important is the dynamics of the situation in terms of actions and interactions, together with any consequences and outcomes from these. Given that no attempt would be made to generalise to any higher population in the statistical sense, then random sampling was not considered essential. Some sort of non-random sampling was necessary but one which was as representative as possible of types of economic activity, sectors of the economy and size of company. A judgement (or purposive) sample seemed to be the best alternative under these circumstances, as it aims to obtain as wide a representation as possible taking account of likely differences (Hall & Hall, 1996). As Locke, Spirduso and Silverman point out, for all forms of qualitative research, in order to maximise the use of the data for the research goals involved, selection is more likely to be purposeful. They suggest that random procedures are only rarely used (Locke, Spirduso & Silverman, 2000, P100).

It proved impossible to determine from approximately how many companies the sample size of 20 was being selected. Any count of the number of companies actively involved in this area was both difficult and probably inaccurate. The sources for these figures are highly fragmented and it is especially difficult to track what small, privately owned companies are doing.

Criteria used in selecting the sample

The problem of how to structure this sample such that it represented as wide a range of different businesses and business activities as possible was addressed by looking at the wider population, the business community. This is clearly segmented by size of business, by sector of the economy and within these, by type of economic activity, so businesses of varying size, from all sectors and engaged in a variety of economic activities were targeted. Given the extent of overseas investment in the UK economy, it was also decided that some companies under non UK ownership should be surveyed- different countries have different perceptions of the environmental imperative which can colour their approach to environmental initiatives.

Whilst it is easy to identify the sector of an economy within which a business operates

and nationality of ownership, it is less easy to define size. In the main, the British Economy is dominated by small and medium sized businesses but more especially by small ones. Mayes and Moir in their paper on *Small Firms in the UK Economy* (Royal Bank of Scotland Review, 1989) try to arrive at a definition of size and define a small firm in manufacturing industry as one having fewer than 200 employees (Mayes & Moir, 1989, P16). However, given the capital intensive nature of the manufacturing (secondary) sector together with the need to consider firms from other sectors of the economy, it also seemed sensible to bear in mind one of the Bolton Committee's characteristics for a small firm as being one with a relatively small share of its market (Bolton Committee, 1971 - quoted in Mayes & Moir, 1989, P16)

A large business, on the other hand, would seem to be sensibly defined as one that forms part of the FTSE 100 companies. For the purposes of this survey, therefore, medium sized companies become anything that fell in between these two categories. This can be viewed as insufficiently tight in terms of definition but this whole area of definition of size is a very difficult one. In deciding which criterion to use, size can be defined by market capitalisation (as was done by taking large as being any company in the FTSE 100) or by number of employees (as was done, in the main, for the definition of a small firm) or turnover, size of market share or some other measure. The problems of defining size have been discussed at length (for example, Mayes & Moir, 1989, Bolton, 1971). Despite the fact that the criteria were mixed, it was decided to adopt a pragmatic approach to these definitions.

Whilst the FTSE 100 companies often seem to dominate the economy and are clearly active in terms of mentioning environmental issues in their annual reports, they clearly represent only a small proportion of the number of firms within the UK economy. Medium and small firms are just as economically active. However, the FTSE 100 also represent a far larger proportion of GNP, so in terms of the significance of their economic activity they had to be well represented. Small firms do not often have the resources to devote to environmental initiatives, thus one would not expect them to be as numerous as the larger firms in this survey. As a result structure by size was decided as an equal number of large and medium sized businesses and about half whatever this number might be, of small businesses. Of the twenty businesses surveyed, this meant that

there needed to be eight each of large and medium companies and four small ones. Characteristics of the final sample of twenty companies are shown in Appendix B, Table 8. There also needed to be representation from the three sectors of the economy: primary, secondary and tertiary. This was achieved but whilst it was possible to find a small firm for the secondary and tertiary sectors, it proved impossible for the primary sector. As this particular sector contributes only a small proportion of GNP, it was not expected that as many businesses in this sector would be surveyed as from the other two. Further, whilst the UK economy in recent years has moved increasingly towards employment in the tertiary sector, given that the majority of environmental problems are usually found in the secondary sector, it was not expected that the majority of the 20 firms surveyed would be from this sector, therefore not fully reflecting UK employment patterns. In practice, of the firms surveyed, three came from the primary sector (although some of their activities were also within the secondary sector), ten from the secondary sector, four from the tertiary sector and a further three spanned both the secondary and tertiary sectors but with the bulk of their business in the tertiary sector. The areas of economic activity represented were:

- primary sector: oil and gas extraction; water supply
- secondary sector: energy generation; chemical processing (of different types); household goods manufacture; bed manufacture; construction
- tertiary sector: retailing; financial services; health care
- secondary and tertiary: music; IT; food manufacture and retailing

Within this sample, it was possible to survey two companies under Scandinavian ownership, two under joint UK/Dutch management, three under American ownership and one in French ownership. This 40% overseas ownership is probably in proportion to current overseas investment in the UK. A business still under public ownership was also included, so the public as well as the private sector is represented within the survey.

Deciding sample construction proved easier than tracking down the relevant population. As outlined in section 3.5.4 this can be problematic for all but the larger FTSE 100 companies. In practice it was found that some medium size businesses issued environmental information or environmental reports and indeed one small business not

only issued an environmental report but also environmental and social accounts. All of these were in the public domain. Another good indicator of environmental interest and environmental concern proved to be whether or not a company was EMAS registered or had adopted ISO14001 (BS7750). Smaller businesses named as having either or both of these were contacted.

Providing representative quotas were surveyed both from the various sectors and activities within the UK economy and by size of business and providing some overseas ownership was represented, then it was felt that the structure of the survey would be a reflection of the structure of the UK economy itself - the basic requirement.

3.6 Problems of the research strategy.

Beyond designing the fieldwork survey there were certain other considerations, such as:

- reliability and validity
- generalisability
- access
- confidentiality and ethics

3.6.1 Reliability and validity

Mintzberg (Mintzberg, 1973b P229) identified seven methods for studying managerial work, one of which is that of questionnaire and interview. Whilst he identified its major advantage as being that of convenience and pointed to an appropriate use as being a study of perceptions²⁶, he stated that the disadvantage of this method was that the data could be of questionable reliability (see Gill & Johnson, 1991;166, Easterby-Smith et al., 1991 P41 for discussions of reliability). The issue of reliability is especially problematic

²⁶ Mintzberg cited as an example a study conducted by Stogdill, Shartle and Associates of 1956, which had looked at a manager's perception of his or her job. In this instance the research was looking, amongst other things, at perceptions of what are the driving forces behind environmental accounting and other environmental initiatives in the business world. Here the focus is very similar but the subject matter is different.

when it involves face-to-face interview. Even the originators of Grounded Theory admit this problem as they point out that the facts may vary dependent upon the individuals in the organisation being interviewed and also dependent upon to whom they are speaking (Glaser & Strauss, 1967, P67). Thus the interaction between the interviewer and the interviewee may influence the responses given. A whole range of factors from voice modulations through to facial expressions and body language can influence the reaction and interaction between interviewer and interviewee and the information given and received (Young, 1987, P214).

The other problem is that interviewers can suffer badly from subjectivity and may be all too willing to apply their own interpretation to responses or even to input guesswork and impressions into this process (Young, 1987, P223).

It was anticipated that as the interviewees would be senior business executives, they would have a clear overview of any/all environmental initiatives, which would be unlikely to be altered to any appreciable extent by an interviewer. It was also expected that their senior status would reinforce this. Careful construction of all aspects of a survey also helps to mitigate any problem of either interviewer-interviewee inter-reaction and a "double dose of subjectivity". It was hoped that these factors in combination with awareness of the pitfalls, would ensure the reliability of the data collection process and would counteract any potential problems.

In addition to reliability, research validity can also be questioned (see Easterby-Smith et al, 1991 P41). Moreover:

"Because of the subjective nature of much interviewing data and because of unstandardised procedures in the interviewing process, problems of reliability and validity loom large. Inconsistencies, contradictions, colouring of the account by the informant and in the report by the interviewer cannot be lightly dismissed by social scientists intent on reliable analysis of data." (Young, 1987, P242)

Young (1987) reports on the work of Dean & Whyte and their article "How Do You Know If the Informant Is Telling the Truth" and whilst some of what they say did not

apply in this situation, careful note was made of some of their points in order to improve the validity of the interview. For example, they suggest (according to Young) that there is an *“important negative check which points out implausibility, that is, when the account strongly strains our credulity”* (Young, 1987, P243). Young also reports on the work of Roethlisberger and Dickson. Again, whilst some of this did not apply in this situation, some did and note was taken of this, especially their point about the interview itself being a social situation.

A further issue was the interview method employed, namely should a tape recorder be used for interviews or could written notes be taken. Both methods have their advantages and disadvantages. In general it is argued that a tape recorded interview is better as the individuals soon forget about its presence, it enables absolutely full information to be recorded and transcribed and this lends validity to the process. It is argued that this cannot be achieved in the same way from note taking. In a business environment when dealing with potentially confidential or commercially sensitive information, the use of tape recorders is not possible. A productive interview is more likely to occur if notes are taken and this was the method used. Several of the interviewees were questioned in informal conversation after the questionnaire had been administered, as to what their attitude would have been to a tape recorder. Only one said that they would not have minded, the rest would have refused and indeed some interviewees even said that they would have refused to go ahead at all with the interview. The reality proved to be that many of those surveyed were anxious to preserve the anonymity of their responses, note taking in some cases was threatening enough.

It was felt that, despite the possible disadvantages of note taking, the information was valid and reliable. All the questions were answered by interviewees and in a considered way. In many instances confidential information was given, which would not have been available via any other means.

Just as every precaution was taken to ensure the validity and reliability of the data collected, caution was also exercised in ensuring that any data collection from the original information was valid and reliable. This process is described below under ‘Cataloguing concepts and recoding’ and ‘Linkage’ in section 3.7.2. Great caution was

exercised in compiling the Tables described (Tables 10 & 11) in order to ensure that there was no distortion of the original data and that they were reliable. The validity of categorisation was checked and double checked for accuracy and (again as indicated below) in many instances the original transcripts were referred to in order to ensure validity and reliability. In order to illuminate this process and ensure transparency, Companies 10 & 19 were used as examples to demonstrate how categories had been used and where very individual responses had required individual categorisation. The need for reliability and validity of data collection from the data and how this was achieved is also referred to in Chapter 4 where appropriate. Under Grounded Theory (as under any other process) it is essential to ensure that validity and reliability apply in the analysis phase when a holistic view is being constructed and when all 'dimensional continua' are taken into account and without this process becoming unmanageable and chaotic.

3.6.2 Generalisability

Generalisability focuses on *"How likely is it that ideas and theories generated in one setting will also apply in other settings?"* (Easterby-Smith et al, 1991 P41) Gläser & Strauss also point out that there must be concern *"with the theory's being general enough to be applicable to the whole picture"* (1967, P242). In this instance, it was felt that it might not be possible to generalise from those companies surveyed to the business population as a whole. However, it is possible to generalise to other businesses also involved in environmental initiatives and conclude that certain developments may occur and certain pressures or influences may be being felt by them, as they exist in the same business environment. Beyond this it may be possible to draw conclusions as to certain pressures (especially legislative), which are being felt by all businesses in the UK. This cannot be extended to businesses located elsewhere in the world as their business environments will be different. Thus, whilst there might be some generalisability to be drawn from the research, caution needed to be exercised to ensure that it was not generalised to environments where it is not applicable.

3.6.3 Issues of confidentiality and ethics

Those individuals interviewed were free to impart as much or as little knowledge as they wanted within the structure of a finite process. This helped to assist the issue of confidentiality and ethics as, where something was said that was sensitive or

confidential, the interviewee usually instructed that this should be non attributable and in some instances, where the issue was still highly confidential, the interviewer was asked to check with the business concerned before using the information. Following requests from a number of companies that what the interviewee said should be non attributable, it was decided to anonymise the companies concerned by, for example, only referring to a medium sized chemical company rather than referring to it by name and also omitting a list of companies to whom thanks should be given for their co-operation. Tracking down who had said what would have been all too easy otherwise, whereas 'a water company' or 'a medium sized chemical company' could refer to any one of a number of such businesses. Such anonymisation was not felt to be detrimental in handling the data and it would serve to maintain good relationships with the companies concerned. None of the data collected raised any real ethical dilemmas, such as feeling that data given as confidential ought really to be in the public domain.

3.6.4 Considerations of access

It was felt that there could be problems of gaining access to the businesses given the seniority of the personnel targeted for interview. The companies were all contacted by telephone in the first instance, the name of the person who needed to be contacted having been ascertained first, where unknown. The telephone contact established an appointment time and this was followed by a letter confirming time, date and place of meeting. Subsequent to the meeting, a letter of thanks was sent to each interviewee. Of the twenty-four companies contacted, only four refused outright to be included. Lack of time as a result of commercial pressures and being targeted by too many researchers already, were given as the main reasons for refusal. This confirmed the initial view that access could be refused due to lack of time by personnel within some organisations. In these instances, the companies were not pestered for access as the sample (as designed) had been achieved through interviews with others. All the other businesses contacted proved willing to devote time to discussing their environmental initiatives, including environmental accounting, were only too anxious to explain the business context within which this occurred, discussed any problems encountered quite openly and were genuinely interested in the research. Time proved not too much of a constraint for those being interviewed. In some instances the interview was regarded as a two way process, as the businesses themselves wanted information - such as advice on what the company

should do to enhance their environmental profile, questions as to what similar sized companies were doing with respect to environmental initiatives and also questions as to where to go for information and assistance in what a company might be trying to do by way of an environmental initiative (usually from the smaller companies). This was a situation where the researcher also had something to give which was of value to them.

Those interviewed varied from owners of small businesses to senior managers and, in some instances, very senior management of large, multi-national companies. All were not only helpful at the time of the interview but some kept in contact subsequently. This would seem to vindicate the interviewer-administered questionnaire/schedule approach. However, what has to be born in mind in this inter-active process, is that businesses could have been manipulating the situation as a public relations exercise and could have been economical with the truth - especially if they have suffered from a bad press in the past or have been the target of a campaign conducted by an environmental pressure group. Careful interpretation of the data might be needed where such a situation was suspected.

3.7 Data analysis

3.7.1 Use of grounded theory

As previously stated, Grounded Theory informed the research. This was particularly critical for the analysis of the information obtained from this survey. Grounded theory recognises the problems thrown up by any qualitative research that has generated quantities of non-standard data (Jones, 1987 P25). It allows for great flexibility (which has been criticised as previously indicated, section 3.2) but avoids the type of rigidity described by Leites & de Sola Pool in their paper 'On Content Analysis' (1942, P14). Moreover, in this instance given one of the four major functions of Content Analysis outlined by Leites & de Sola Pool is that of either seeking confirmation of hypotheses already presumed to be valid or definite disconfirmation of hypotheses already taken to be invalid (Leites & de Sola Pool, 1942, P21), this particular method of analysis could not have been used, as the hypothesis was not yet presumed to be valid. Nor was it (or any of the subset) already generally presumed invalid.

Easterby-Smith et al (1991, Pp108-112) recognise seven stages in the process of the use

of grounded theory:

- “familiarisation” with the data and beginning to look for any patterns or ideas that this might throw up
- “reflection”. This “stage is distinctive for the volume and range of hypotheses, explanations or solutions” that it may generate, especially when the data collected is put alongside any other research, models or ideas.
- “conceptualisation”, of emerging concepts which may help to explain the patterns which may have been noticed at the familiarisation stage.
- “cataloguing concepts”. If the concepts seem to be a real explanation of events or trends or whatever, then they need to be noted and the data confirming these needs to be flagged up in some way.
- “recoding”. Continuing interpretation and analysis of the data, may show that any coding that has been used in the cataloguing or flagging process may need to be altered. Concepts may continue to emerge, alter or be redefined.
- “linking”. This is the stage at which all the fragmented parts may begin to become capable of linking together into an overall pattern(s) or theory(ies).
- “re-evaluation”. This inevitably occurs, either in the light of further reflection on the part of the researcher or in the light of comments from others.

In the light of the above, the process of familiarisation with the data was started, in the first instance, by means of construction of a matrix (see Appendix B, Table 9) of the businesses involved, with cross referencing according to size, economic activity and foreign/UK ownership (see Appendix B, Table 9). A second matrix was then constructed of answers to the questions, ranged against the companies concerned (see Appendix C, Table 10 for a very much abbreviated version). From this process, it was hoped that patterns would begin to emerge and that it would be possible to draw conclusions about the nature of the role of environmental accounting, its interface with the management process and the imperatives at work throughout this process, both in general and also with reference to company size, area of economic activity and type of ownership.

3.7.2 The analytic process.

Familiarisation

Familiarisation began with transcribing the interview notes and continued as a result of inputting essential data into the two matrices. Patterns started to emerge.

Reflection

The analytical process was governed throughout by the need to test the hypothesis and its subset. However, certain business parameters exist, namely:

- the objective of any business is, for any given resources, to maximise profits in order to maximise dividends to shareholders. Environmental issues are only given consideration in as much as they involve compliance issues and, if not observed, might negatively impinge upon the profit making process by way of large fines, plant closure or something similar.
- much of business life is about risk taking. Management is about taking calculated risks, whether this is to do with financial risk, the risk of launching into new markets, new products or other risk situations. As far as the environment is concerned, businesses are likely to take calculated risks. These are externalities which do not accrue to the business (unless there is a bad breach of consent limits, legislation or whatever, resulting in prosecution and fine) and which, if taken into account, might affect profits, sales maximisation or asset growth. Therefore, where possible environmental issues will, as a calculated risk, be dealt with minimally.
- the environment and its protection are assumed by many to be the concern of those not involved in the voluntary sector rather than the commercial sector.
- environmental matters are technical in nature and therefore the preserve of technical staff found in middle management. These individuals can influence but are powerless to change company policy, which may pay minimal attention to environmental issues.

These assumptions assume reaction rather than pro-action on the part of businesses but the hypothesis and its subset implied a certain amount of pro-activity. Moreover, the

hypotheses subset, especially hypothesis 3, implied a disregard for the usual norm of profit maximisation. Despite the implied pro-activity of the hypothesis and its subset, it was these re-active assumptions (as above) which underlay the questions being asked as part of the “reflection” stage of the Grounded Theory analysis and which were being challenged:

- does the analysis support existing knowledge and preconceptions about the hypotheses?
- does it challenge these?
- does it answer the questions being posed as a result of the hypotheses?
- what does the analysis reveal to be different about what was previously known or assumed?
- is the resulting information different? (adapted from Easterby-Smith et al, 1991: 109)

Conceptualisation

At the ‘*conceptualisation*’ stage the variables which had helped to decide the sample requirements, namely: size of company; sector of the economy; type of economic activity; and ownership became important as they dictate factors such as:

- management style
- company power structures
- legislative boundaries
- likely sensitivity to environmental issues
- likely extent of impact of environmental issues

These had to be considered alongside the data and taken into account in developing the concepts.

Cataloguing concepts and recoding

In order to help determine emerging concepts everything was re-checked for accuracy and for format. It was hoped that the resulting analysis sheets would provide accurate data which was neither too refined as to dictate particular outcomes to particular questions or too crude or simplistic as to lose the nuances of what had been said.

Whilst there was, initially, much data to grapple with, the process of inserting the information into the matrices led to a certain amount of cataloguing and categorisation. This applied in particular where answers were complex. For example, for Q2 (see Appendix B, Questionnaire) it was possible to group categories of action. All categorisation had to be achieved in such a way as to leave open the ability to cross-reference with the answers from other questions and in order to allow any common threads to emerge.

Throughout this process the only data that automatically fell into obvious categories were those questions capable of a yes/no answer. Even in this instance, additional categories had to be included such as for the various parts of Q18 (see Appendix B, Questionnaire) where 'unsure' categories had to be established. Other questions were far less capable of categorisation, let alone of easy assignment of the data. For example, the answers to Q22 were many and varied, clearly one category was N/A but beyond this many responses were highly individual. In this instance, it was felt that too rigid a categorisation might exclude some of the "dimensional continua" referred to in section 3.2 above, so the end result was N/A plus ten other categories. Such exclusion would have been contrary to Grounded Theory which, because it is far less rigid in its approach and lets the data guide the coding and recoding phase of the analysis, unlike Content Analysis which is very much geared to "*the systematic, objective, and quantitative description of the content of research data*" (Young, 1987, P480). For details of the preliminary categorisation, final categorisation and examples of how the data from Companies 10 and 19 were handled, see Appendix C, Table 11. This is an abbreviated version of the categorisation process. It demonstrates what categories were originally expected for each question and part question. These then had invariably to be altered as the analysis proceeded, sometimes very little but in some instances due to very individual answers from interviewees, many categories finally emerged (for example,

Q2a, see Appendix C, Table 11). Companies 10 & 19, two diverse companies, were used to demonstrate this process and so, for example, it can be seen from Q2b (see Appendix C, Table 11) that both of companies 10 & 19 formed one of these unique categories. Throughout the whole of this process the categories were not assigned codes or numbers because it was felt that this would make the data a lot less easy to read and link to both other questions and the hypothesis and its subset. Also as part of this process, as each question had been categorised and re-categorised, an overview of the responses was written for each question or part question. As a result the form and headings for Chapter 4 emerged. Some of these overviews were later incorporated into Chapter 4 but initially it helped to coalesce thought and to begin to see linkages. In order to further help this linking process, columns linking each question to Chapter 4 headings and to Table 10 and/or the interview transcripts (see Appendix C) were also included. The whole helped to give form to the process of data collection from the original data and helped ensure its reliability and validity.

Linking

It became possible to start seeing linkages between the hypotheses subset and question responses. The problem had been how to grapple with the mass of detail available. Whilst the interviews were highly structured, many of the questions were open and, as has already been noted above, the responses were not capable of easy categorisation. As much flexibility as possible had been built into the interview process, so that in some instances where interviewees spoke rather extensively (for example, the interview which lasted five hours), the data was considerable. However, by the time the process of compiling the two matrices and, in effect, compiling a third as a result of the categorisation process had been completed, the data had been sorted into manageable form. Abbreviated data from the interviews was present in one matrix (Appendix C, Table 10), whilst categorisation had been achieved in another (Appendix C, Table 11), so that it began to be possible to start evaluation. Even so it was difficult as so many of the responses were individual and not capable of easy categorisation (for example, Q22, see Table 11). As a result all too often whilst Table 10 could be used in the linkage process, the original transcripts had to be referred to for the purposes of accuracy. All of this is indicated in Table 11 (Appendix C) and is illustrated by the use of Companies 10 & 19 as examples as this applied to these companies in many instances, for example Q3

(see Appendix C, Table 11).

In addition to building up a complete picture of the various linkages, at this stage reference also had to be made to the hypothesis and its subset, in order to start linking the various responses to questions to these.

Re-evaluation

In essence, the data analysis involved an attempt to develop a developmental explanation of what appeared to be happening within the business environment. This was an attempt to trace and account for something that was not only a business phenomenon but, potentially, also a social phenomenon. Re-evaluation occurred after Tables 10 & 11 had been completed and double checked for accuracy and were considered together with the response overviews referred to above. Reference back to the original transcripts had still to be made at this stage.

3.7.3 Validity of interpretation

Validity of data interpretation is always of concern as was indicated in Section 3.6.1. The social dynamics in this instance seemed to have been positive as firstly, it had helped to know and understand the language of business. As a result questions for purposes of clarification were not needed and therefore did not interrupt the interview flow. Secondly, age may have helped as many of those interviewed, especially those who were in senior positions, were the same age group as the researcher. As a result, common stances were assumed and interviewees spoke more freely than might have been the case with a younger interviewer. At no time with any of the interviews was there a sense that it was 'going wrong' in some way. Indeed, in some instances, interviewees were remarkably frank. Beyond this, validity of interpretation depended on avoidance of preconceptions and the analysis of the data as it was, rather than as a researcher might like it to be.

As the data was analysed patterns began to emerge from the responses. Some of these were predictable and others less so. These are discussed in the next chapter.

CHAPTER 4: RESULTS OF THE FIELDWORK SURVEY

4.1 Introduction

From the early stages of the research, whilst the literature had early on thrown up a hypothesis, one of the characteristics of Grounded Theory analysis can be that due to the joint data collection and analysis, multiple hypotheses are pursued simultaneously (Glaser & Strauss, 1967, P39). This was the case with this research investigation as a subset of three hypotheses to the main hypothesis had emerged and in analysing the fieldwork survey this process of pursuing multiple hypotheses simultaneously occurred. This chapter discusses the results of this survey and represents a summary of the aggregate analysis. Its results were various and, in some instances, surprising. For example, there was no overwhelming acceptance of the Anglo-Saxon model for environmental accounting, despite the coining of the phrase for developments in the UK and North America. Nor was there resentment of environmental pressures other than when these were felt to be unfair, such as Greenpeace's actions, which were generally regarded as unwarranted and unfair.

These results were analysed within the context of the hypothesis and its subset. Appendix B, Table 9 contains a summary of the companies surveyed. A copy of the questionnaire used is also to be found in Appendix B. Appendix C, Table 10 consists of an abbreviated version of the questionnaire results, whilst Table 11 in Appendix C demonstrates the categorisation of the results both in terms of the categories expected and those eventually used and, for the purposes of illustration uses Companies 10 (a small sized bed manufacturer) and 19 (a large financial institution). These companies have also been used for illustrative purposes where possible in this chapter. These particular companies were chosen for this purpose as they are sufficiently diverse in activity and sector to be likely to have different perspectives and, as a result, to fall into different response categories.

Throughout, categorisation was difficult. Invariably a larger number of categories was needed than had originally been thought necessary (see Appendix C, Table 11). Whilst tabulation of the results for individual questions could have been included in this discussion, it was felt that due to their fragmentary nature it would be better to include all the information in the tables in the Appendices. Table 11 in particular illustrates the

difficulties of categorisation experienced throughout. It was felt that to categorise as originally intended would be to reduce the meaning of some of the data and this is clearly often the case in this table. The multiple categories which emerged did, in many instances, have a lot to say. This was the use of Grounded Theory to let the data speak. To have used any other technique such as that of Content Analysis might have destroyed much of this by being over precise. To be included in a particular category the results had to have sufficient features in common with each other but conversely they were often excluded from a category on the grounds that they showed a fundamental difference from those included (Glaser & Strauss, 1967, P50). At times the analysis of the data proceeded in some confusion, which is not unusual (Glaser & Strauss, 1967, P39) but there was every attempt made to order the process via the use of the matrices, rather than coding via noting categories in the margins of the interview transcripts which is allowable under this methodology (Glaser & Strauss, 1967, P106).

In this context Tables 10 and 11 were critical. Table 10 helped to précis the vast quantity of data collected, it also acted as a reference point back to the original transcripts to ensure that no details were overlooked. Whilst Table 11 was critical in the categorisation process (see section 3.7.2: cataloguing concepts and recoding).

4.2 Environmental sensitivity and initiatives

4.2.1 Environmental initiatives

As outlined in section 3.5.4., unless companies are environmentally sensitive they are unlikely to have taken environmental initiatives, let alone to be progressing to the use of environmental accounting. The sample businesses were questioned about these (ref: Appendix B, Questionnaire, Q 2b). Categorisation of their responses was according to the initiatives taken and should have been simple but proved complex in some instances. Companies 10 and 19 clearly illustrate this with respect to the section on any EMS adopted as both were the only ones in their particular category but could not be grouped with others as their categories were felt to be sufficiently diverse (see Appendix C, Table 11). It was felt important not to force the data by coding too rigidly but instead to allow for the “dimensional continua” referred to in Chapter 3 (section 3.2) as important under Grounded Theory. The important factor in this case is less the category involved but more the significance, as pointed out by Schaltegger (Schaltegger et al., 1996), that

whichever standard of EMS is adopted by a business it includes the key functions of good environmental management amongst which is information management. Traditional information management involves calculations and costings – a developmental stage towards environmental accounting.

Categorisation and clarity of response was simpler for other environmental initiatives. In the main responses fell into simple 'yes' 'no' categories and both Companies 10 and 19 were in the 'yes' category for all initiatives. The vast majority of companies had taken most of the environmental initiatives (see Appendix C, Table 10). Only one company responded negatively to everything (Company 6). It is a small company in the secondary sector and engaged in economic activity which attracts a certain amount of environmental attention. It was something of a surprise that it was taking no environmental initiatives at all. This might have been expected rather more from a tertiary sector business, where environmental impacts might be considered to be less critical. However, from other comments made by this company in the course of the interview, it was clear that it felt itself to be under siege from the Environment Agency and other authorities and was only prepared to be reactive and not proactive - any environmental initiative was seen as a cost. This was an instance where it was necessary to refer back to the original interview transcript in order to be able to understand this response. It was not necessary to do so for either of Companies 10 or 19.

Overall, amongst the twenty companies there was a high degree of engagement in environmental activities but no discernible pattern in terms of size of company, type of economic activity or ownership. This high level of engagement extended to the use of environmental quantifications. Whilst Company 10 fell into the 'yes' category and Company 19 into the 'yes, but limited' category. Reference back to the transcript revealed that Company 19 "issue financial statements but no mass balance as yet". Reference back to the transcript also revealed that Company 10 had stated "yes, financial" and this illustrates that even within the "yes" category there was a 'dimensional continua' as others had stated 'yes, mass balance'. Each category encompassed within it slightly different responses. For the purposes of validity and reliability, all of these had to be taken into account in the process of forming an overview of the whole. In some instances not just the abbreviated responses (Appendix C, Table

10) but also the transcripts were referred to in order to double-check both what this 'dimensional continua' really was and the reliability of the categorisation. The validity and reliability of data collection from the original transcripts had to be ensured.

A business will not usually devote time to anything unless it is likely to reflect in its economic performance. Business theory teaches that firms will seek to maximise revenue, reduce costs or prevent any addition to costs, in order to maintain a profit maximising position. Environmental initiatives inevitably impact on some or all of these for businesses to adopt them. If so they must be capable of quantification within the normal accounting process. Whilst this might be the case and whilst other environmental quantifications might be in relative widespread use within this sample, at this stage this was only a small part of the whole survey and proved nothing.

4.2.2 The extent of environmental accounting

For compliance purposes it is necessary for companies to track environmental impacts in physically quantitative terms. Schaltegger also claims that 'environmentally induced financial impacts have become an "established issue" of daily business' (Schaltegger et al., 1996, P263). Given that the main hypothesis focussed on environmental accounting, it was necessary to establish whether or not the sample concerned conducted any form of environmental accounting at all. See Appendix C, Table 10, Q5. That Company 10 used a financial form and Company 19 stated that they issued "reports and environmental targets" but that these were "product rather than finance based" was the reverse of what might be expected. One might expect a financial services sector business (Company 19) to be finance orientated and a secondary sector business (Company 10) to be product orientated and therefore orientated towards the use of physical quantifications.

It had originally been anticipated that there would be three categories of response: financial, mass-balance and none. However, four materialised with the fourth category allowing for the 'dimensional continua' by being termed mixed. In forming conclusions about the responses, therefore, reference had to be made back to the original transcripts in order to look not just at the four response categories but the complete 'dimensional continua'. It was important to let the data speak via this complete picture. There proved to be no discernible pattern to responses in terms of size of company, sector of the

economy, type of economic activity or nationality of ownership.

Part of this whole picture included some companies who were constructing a mass balance. This is an evolving field and there has been the suggestion that, certainly in North America, companies may be moving towards using a blend of the two methods. There are indications of this within the work done by Ontario- Hydro on environmental accounting, in which they discuss the need for the development of "financial and environmental performance indicators" (Ontario Hydro, 1993, P112). They also discuss physical input-output quantifications and ways of handling this information in terms of full cost accounting, especially in the context of monetized externalities (See Exhibit 4.3, Ontario Hydro, 1993). Only one company response indicated any blending of the two techniques as, having stated that they looked at financial environmental accounting, the company representative went on to say that:

"We have been looking at ways of costing externalities and have been looking into the RIV²⁷ model of the Environment Council. It is important to look at the sources and sinks of your product; views of stakeholders must also be considered." (Company 13)

Again it was insufficient to look solely at the numbers in the categories. It was necessary to refer back to the original interview transcripts and what was actually said. Not only did the categorisation have to be reliable but any conclusions drawn had to be valid.

A variety of reasons were given for the adoption of one particular type of environmental accounting technique (see Appendix C, Table 10). For example, Companies 10 & 19 stated that:

²⁷ RIV stands for Resources, Innovation and Values and the Environment Council state that:

"What a company can aim for is corporate environmental sustainability, that is, the ability to survive and indeed thrive on a range of strategically significant challenges and opportunities. The framework developed by the Sustainable Business Forum recognises that challenges and opportunities arise through three environmentally driven variables; Resources, Innovation and Values." (Environment Council, 1997)

- *“initially it was to raise the company’s profile, then they saw what savings they were making (that is, useful figures came out of the exercise) and they wanted to do it anyway” (Company 10)*
- *“the only method available at the time” (Company 19)*

There was no one single reason for having adopted a particular method and the same reason could be given for the adoption of either method. This made categorisation difficult. There was a very clear N/A group of 7 companies and 4 where answers approximated to ‘it was easier’. The other 9 responses were all individual, including those from Companies 10 and 19 quoted above – both pragmatic in their own way. What is incontestable is that more than half the businesses are conducting some form of environmental accounting, whether or not this is for public consumption. This was a useful outcome as it showed that environmental accounting as a “nascent technique” (main hypothesis) certainly existed. “Various reasons” for its establishment had yet to be established.

4.2.3 Future development

To become established environmental accounting must be perceived to have a future value, whether this is just as a “useful process”, part of the management process or in conformity with social norms. Some sort of future evolution must therefore be possible (ref: Appendix B, Questionnaire, Q6). For the responses, see Appendix C, Tables 10 & 11. Overall, the view was to regard the development of environmental accounting techniques as a trend here to stay but responses were more complex than just simple ‘yes’ ‘no’ categories. Again this was an instance where categorisation was attempted but a ‘dimensional continua’ emerged. In this instance, Company 10 responded ‘no’ whilst Company 19 responded ‘yes’ but ‘more than one type’.

In this context, one of the problems with its development is the range of areas within a business over which environmental accounting can apply. It could be incorporated into LCA in terms of all the physical inputs and outputs over the life cycle of a product or in terms of the costs of these. Alternatively, it can be applied to an EMS, EA or EIA in either of these ways or it could be applied to a business in general. The other problem is

knowing in which format it will be developed. Much of the discussion in the literature to date (US EPA, 1995a; Ditz et al., 1995; Schaltegger et al., 1996) has centred on the Anglo-Saxon or financial format. Bartolomeo (Bartolomeo et al., 1997) discusses both aspects. It was felt that it might be useful to discover (given the overall emphasis in the Anglo-Saxon literature) if the interviewees could discern the emergence of a standardised format for financial environmental accounts (Appendix B, Questionnaire, Q6a). The overwhelming view was that a single standardised format was unlikely to emerge. Here Companies 10 and 19 disagreed as whilst Company 10 went with the majority view, Company 19 felt that a standardised format could emerge. Interestingly, reference back to the transcripts did not inform Company 10's response but Company 19 had referred to the ACBE Working Group's Reporting Guidelines in which they had been involved and which they felt could aid evolution towards a set format.

A number of respondents commented that, if the accountancy codes were changed (that is, re-coded for the purpose), it would be very easy to extract environmental information of a financial nature from normal company accounts, for example, Company 6 commented that:

"We also have all the financial information available but buried in our figures – this could easily be extracted and may well be in future."

This could then be slotted into some sort of format to present environmental assets, liabilities, costs and savings.

Categorisation in this instance was again more complex than originally envisaged and in order to achieve a total picture, reference had to be made to the transcripts.

Much development work towards a standardised format has already been done both within North America, the UK and the rest of Europe by the various accountancy bodies. They have tried to arrive at conventions governing environmental costs, liabilities and notes to the accounts. Whilst these may be similar, they are likely to remain different due to different countries having different accounting requirements and systems. However, there has also been a high degree of co-operative work between these accountancy

bodies, especially between those of Europe. The responses underlined the fact that companies are still very open minded about which environmental accounting format to adopt and this is a reflection of how very young this approach to environmental issues still is.

Whatever the format there was an acknowledgement of environmental accounting as a technique with a future as well as current role. This reinforces the US EPA findings of 1995, that U.S. companies of whatever size are beginning to consider the implementation of environmental accounting (US EPA, 1995a, P3).

It had looked at environmental costs fairly carefully and also at the financial advantages of pollution prevention (P2) practices. They found that not only did the companies concerned have a clear idea of their environmental costs but that they had often found ways of reducing or avoiding these. As a result there were not only substantial savings and returns on investment documented for P2 projects but also substantial reductions in waste. They concluded that such results had "highlighted the benefits of environmental accounting to the business community" (US EPA, 1995a, P3).

4.2.4 Extent and pace of uptake of environmental accounting as a technique for tracking environmental issues.

The likely extent and pace of uptake of environmental accounting, should be an indicator of how necessary and useful it is regarded to be (hypothesis 1 – hypothesis subset). One indicator should be the extent to which companies have any separate budgeting and accounting for environmental spending. For many companies it is critical to measure environmentally induced financial impacts or any environmental damage done, especially in those industries with a high environmental profile such as chemicals or oil & gas. It was found that in most instances environmental spending is currently integrated into production or site budgets throughout a company as a necessary business expense. (See Appendix C, Tables 10 & 11)

In this sample, the only company replying that it had a separate budget for environmental spending was Scandinavian owned (Company 7). Such wholesale integration of all environmental spending within company and site budgets indicates that currently,

environmental accounting scarcely exists as a separate technique.

4.2.5 Tracking of environmental spending as an indicator of environmental accounting

Ditz et al. (1995) tend to emphasise environmental costs in their various case studies, as also does the US EPA (US EPA, 1995a). Other literature such as Schaltegger (Schaltegger et al., 1996) emphasises the tracking of efficiencies, whilst Bartolomeo (Bartolomeo, 1997) tries to look at the complete picture. Traditionally within businesses, environmental spending has been regarded as a negative item, see response of Company 4 Appendix C, Table 10. If this is the case, then businesses should track environmental spending in some detail given that it has an effect on profit levels. Interviewees were asked if, regardless of whether it had a separate budget, they knew how much their company spent per annum on environmental issues or measures. 11 companies did know and figures varied from millions of pounds sterling to more modest sums (see Appendix C, Table 10, Q4a). Whilst Company 10, a small company, had a small budget of £2-3,000, Company 19 had a budget of a little less than a £1m but was at pains to say that the Environmental Unit was responsible for annual savings of approximately £12m. Due to the lack of any pattern to the responses, categorisation proved difficult but five categories were achieved. The responses were referred to in order to arrive at a picture of the continua of responses and to see if size of company and size of environmental budget had any correlation (which on the whole they did – the larger the company, the larger the budget).

Not only did more than half the companies know what their environmental budget was but they also knew what had happened to environmental spending in recent years and the likely future pattern (see Appendix C, Table 10, Q4a, 4b, 4c).

From the responses it seems reasonable to conclude a fair level of financial commitment to environmental matters but judging by the response to the previous question this does not necessarily mean that such expenditure is tracked. There is an awareness of some need to do so as part of the management process (for example, the comment from Company 13 that they are working on a coding process so that they can separate out these figures) but there was no overwhelming sense of urgency.

Companies 10 and 19 were both positive in response as whilst their environmental spending had increased, they pointed out that savings had been made which offset the increases. Company 10 talked of direct savings, whilst Company 19 spoke of their increased efficiencies which had undoubtedly led to savings. In general, categorisation was difficult and more categories were needed than originally envisaged (see Appendix C, Table 11).

4.2.6 Problems of the construction of environmental accounts

Environmental accounts as a nascent technique will be difficult to establish if it proves to be a problematic process. Questions 7 & 7a explored this (ref: Appendix C, Table 10). One business (Company 20) emerged as having no problems at all. Reference to the transcript revealed that this was a company which now had everything on computer and could track the relevant figures. Problems encountered are categorised in Table 11, see this table for the problems encountered by Company 19.

The problems likely to be encountered were highlighted in BT's publication on environmental accounting when they included in issues for further debate (amongst others) both the need to raise management commitment awareness and also the need to raise regard for the environment in the decision making process (BT, 1996, P13).

Company 10 felt that the issue of overcoming any problems was not applicable to themselves as they had not experienced any in the first place but Company 19 mentioned the issue of looking at impacts rather than customers. The variety of response to this question again caused difficulties in handling categorisation and preconceived notions of being able to contain responses in few categories had to be abandoned (see Appendix C, Table 11).

If environmental accounting is to become established within businesses, there clearly needs to be efficient systems of tracking the data within companies. As yet this does not seem to exist. Indeed Schaltegger tells us that "Huge potentials for increasing a company's efficiency and financial performance remain undetected." (Schaltegger et al., 1996, P263). Clearly the literature also reflects the difficulties of persuading those within

business organisations that environmental accounting is both a necessary and useful process.

4.2.7 Relevance of environmental accounting, especially at an individual business level

The whole of this inevitably begs the question of just how relevant environmental accounts really are, especially when it comes to the individual business level. If one bears in mind that most large companies, and even medium sized ones, are usually organised as a series of small businesses, then it is the small business unit size which is of significance, as has been recognised, for example, by the EU EMAS scheme which is currently site specific rather than company wide. The survey sample were asked how relevant they felt environmental accounts to be at an individual business level (see Appendix B, Questionnaire, Q8). In effect, where companies were already small, this was asking them an irrelevant question but in virtually all other instances, the companies concerned were structured as holding companies and so it was asking how relevant these figures were for component companies/sites. The sample was also asked if they had any need to disaggregate these figures down to this level or if they felt they were of more use as a company wide tool. For responses see Appendix C, Table 10.

Whilst Company 10 felt that this was not applicable to itself, Company 19 commented that:

“At the individual level they have been used to create peer pressure; they are a motivational tool. For reporting purposes and for consistency, they are used at company level only”

This was an interesting comment as it says something about internal company dynamics. In this instance, whilst categorisation was achieved, for the purposes of reliability and validity of data collection from the data, the original transcripts were referred to in building up a holistic view. For categories, see Appendix C, Table 11.

For whatever purpose they are likely to be used, whether for information, the application of pressure, bench marking purposes and so on, it seemed worth pursuing what form these environmental figures might take at individual business level (see Appendix B,

Questionnaire, Q9). For responses see Appendix C, Table 10. Both Companies 10 and 19 said that they would use a financial format. The support from both these and other companies for a financial format at individual level may well be because companies are used to setting financial targets and it is easier to handle in this format as part of the management process. Any decisions taken about an individual unit, will always be taken in conjunction with the financial and management accounting figures.

A small subset of the sample felt that they might construct a mass balance (Appendix B, Questionnaire, Q9a). Their responses as to why were diverse and difficult to categorise, as a result it was difficult to draw conclusions even after reference back to the transcripts. That there may be some societal pressure prompting their actions (hypothesis 3 – hypothesis subset) is clear. See Appendix C, Table 10.

4.2.8 Positive factors in environmental accounting

A positive aspect of environmental accounting is the highlighting of financial savings as a result of environmental action or, within a mass balance, the highlighting of factors such as waste minimisation. The US EPA in their work (US EPA, 1995a) have underlined the substantial savings that can be made in this context. When pressed later in the interview on whether or not companies “take account of the potential savings as a result of environmental spending, such as savings from recycling” and whether or not this was “built into the accounting process in terms of the environmental figures” (Appendix B, Questionnaire, Q12), the response clearly demonstrated that the vast majority of companies were well aware of the details of these figures, even if they did not present them in any special or different format. 15 of the companies responded that they did (including Companies 10 and 19). See Appendix C, Tables 10 & 11.

However, whilst the response might be positive all was not positive in perception. One respondent from a medium sized company stated that as far as they were concerned, recycling was an expense not a saving (Company 7). The range of responses was interesting especially those for Companies 12 & 13 (see Appendix C, Table 10). However, interesting as these responses were they proved difficult to recode beyond the original yes/no categories especially if account was taken of some of the transcript responses. It was not felt that reducing the responses to yes/no categories reduced them

unreliably. However, as elsewhere when yes/no categories were introduced, whilst this made a simple count possible (a similar procedure to that of Content Analysis), the transcript responses were considered in building up a total picture. Failure to do so might have otherwise have made the process invalid under Grounded Theory. The positive aspect was that the environmental figures clearly existed even if they were not yet treated separately.

4.2.9 Conclusions from the first group of questions

Whilst this particular group of questions had demonstrated that the sample businesses were environmentally sensitive and, in the main, involved in conducting various environmental initiatives, they had not demonstrated an overwhelming adoption of environmental accounting. From the responses of some businesses it was clear that there was already some environmental accounting albeit of a piecemeal nature. That it is “useful” was clearly demonstrated, whether this was in terms of creating peer group pressure, tracking costs, emissions or savings. Given that some companies were not tracking any environmental figures and for others, many of the figures were integral to either their financial accounts, management accounts or production processes, then environmental accounting could not, at this stage, be deemed a “necessary” process. Part proof only existed for hypothesis 1 of the hypotheses subset. Therefore, whilst environmental accounting had certainly been shown to be a nascent technique, one possible reason for its establishment was far from clearly proved.

4.3 Environmental accounting within the management process

Knowledge of the management process is not usually within the public domain. Key within this process is management accounting, which is geared to efficient use of resources and making the best investment decisions. These figures are always held within a business as they are inevitably commercially sensitive. Environmental considerations and quantifications have increasingly to be incorporated into the management accounting process. It is impossible to take an investment decision without, for example, knowing the different emissions levels for each investment, whilst some ‘end of pipe’ investment may be dictated solely by current and prospective environmental legislation in respect of these. As Schaltegger tells us “*internal ecological accounting supports management in investment decisions*” (Schaltegger et al., 1996,

P263). It is critical to cost in potential environmental liabilities - even in the tertiary sector a business may have these in terms of, for example, disposal of shop refrigerators containing CFCs. Less tangible costs must also be included. For example, an end of pipe solution to a problem, whilst being ostensibly cheaper, may cost more to monitor and may create the need for more continuous liaison with the local community and other stakeholders, which is an added cost. If environmental accounting is integrated within the management accounting process with all liabilities, costs and savings properly considered, then it will be well and truly embedded within the management process and valued by the business world. It will also become properly established as a recognised business technique. This was a key part of the questionnaire.

4.3.1 Environmental initiatives and the management process

Questions 10, 10a & 11 (see Appendix B, Questionnaire) were concerned with the management accounting process and the extent to which environmental issues and the figures associated with these were taken into account in this process. For all responses, see Appendix C, Tables 10 & 11. In general environmental accounting figures did not seem important and were probably best summed up by one interviewee, who commented that there was not yet the right sort of management mind set amongst his peers (Company 12). Where they were important, it was emissions figures which were of more significance, although in both instances there seemed to be no particular pattern to the response. The initial categorisation into 'very important', 'low importance' and 'no importance' was simple but subsequent re-categorisation by response was more complex and fragmented into multiple categories. Again, it proved very difficult to compress data into particular categories without losing meaning or intent. This would not have been a valid process under Grounded Theory.

Company 10 was entirely pragmatic:

"It is a question of taking account of the figures. If they are not showing a profit we would not go down the environmental route."

Some companies clearly perceived environmental spending as a distortion to their investment decisions (see Appendix C, Table 10). Some of these businesses were

involved in activities which attract attention due to their processes and for one reason or another they had been targeted by local communities with respect to emissions. In order to build up the total picture here, these responses had to be analysed alongside other comments made in interview (and in the transcripts) and often as asides. There was no discernible pattern to the responses. Again, the initial categorisation was simpler than the final categorisation and forcing the data into small groups for count purposes as under a Content Analysis procedure would not have been useful.

In section 4.2.8 the response had been overwhelmingly positive when it came to any discussion of savings from environmental spending. Quantification of these had obviously been undertaken and, in some cases, had come as a very pleasant surprise. Of those responding “yes”, Company 10 which had only recently discovered the delights of a new EMS responded very enthusiastically “yes and yes”. This taken, together with the fact that the majority of companies did not feel that environmental spending distorts investment decisions, seems very positive and indicates that they may all take far more account of the figures in reality, than they would have the outside world believe.

This is reinforced by the literature. Work by the US EPA found that in many instances companies discover that their environmental costs can be offset by generating revenues (US EPA, 1995a, Pp1-2). The same holds true elsewhere, for example, Avesta a UK-Swedish stainless steel company has found that it can turn some of its waste into fertiliser for sale for use in certain parts of the UK (Wilkinson & Hay, 1997). The US EPA also refer to the fact that *“Better management of environmental costs can result in improved environmental performance and significant benefits to human health as well as business success.”* not to mention improvements in competitive advantage (US EPA, 1995a, P2). It would seem both from the literature and the responses to the survey that environmental issues are far more important within the investment appraisal part of management accounting than businesses might care to admit. The figures are integral within this process but, in a sense, far too integral as they are not separate. Given this complete integration it is difficult to draw conclusions concerning their value within the management process.

4.3.2 Important factors in investment decisions

Q13 (see Appendix B, Questionnaire) concerning certain factors which might be taken into account in considering “environmentally friendly” investments was the only question in the whole of the interview schedule where a scaling device was used and where, as a result, categorisation was easy and clear. A scale of 1 to 5 was used with 5 being very important and 1 being unimportant. The responses may be found in Appendix C, Table 10. Many of the items concerned were ranked high by many of the businesses (such as ‘available technology’) but only 6 businesses felt that other factors were of any importance (see Appendix C, Tables 10 & 11), including Company 1 which listed a whole string of other factors, demonstrating extreme sensitivity to their business and commercial/consumer environments. Interestingly, their activities have, in the past, been the subject of attention from some of the environmental groups. Categorisation of the responses of Companies 10 and 19 can also be found in Appendix C, Table 11.

The only conclusion that can be drawn from this is that, in considering any sort of ‘environmentally friendly’ investment, what really governs the business world is a need for efficiency and compliance. Only one company mentioned public perceptions. None of the companies really displayed any great commitment to anything other than making money for their owners or shareholders.

4.3.3 Senior personnel support within companies

What can make a huge difference within a company is whether or not there is genuine commitment to particular values or courses of action from the very top or, at the very least, whether there is a Board member with specific responsibility for, in this case, the environment. Gray discusses this and highlights its importance (Gray, 1993, P49). In order to probe this area, companies were asked how they ensured the integration of environmental best practice throughout the company (ref: Appendix B, Questionnaire, Q3). A variety of structures were discovered and companies were categorised according to these. Categorisation in this instance did not prove too problematic (see Appendix C, Table 11).

Company 10 was interesting as it had its own unique structure. It had set up an Environmental Performance Committee to monitor what they were doing. This drew in,

originally, anyone with any responsibility for this but not the Managing Director (MD). In the end, feeling left out, having seen the business benefits resulting from the environmental initiatives taken by the group and wanting to participate with a very active and committed group of people, he asked if he could be allowed to come to the meetings! Company 19 had an interested Chairman and CEO, together with various advisors but as the interviewee commented (interview transcript) *"implementation is at the coal face"*. Whilst categorisation had not proved too problematic, both the example companies illustrate how much of the 'dimensional continua' can be lost if the data is forced and sight is lost of the original transcripts. In their own way they both had interesting structures, especially Company 10. Indeed, the response from Company 10 gives some of the flavour of this company's enthusiasm for environmental initiatives.

It was clear from the responses (see Appendix C, Table 10) that most companies still regarded environmental responsibility as part of line management's remit. Even for the company which said that it was the responsibility of the MD of each operational unit (Company 4), it was still in a sense a 'line' responsibility (see Glossary) as it had been pushed away from the centre. Many referred to it as a 'line' responsibility. In each case it was mentioned that there was some sort of specialist or specialist advice available. Such organisation is very similar to the way in which other functional responsibilities, such as that for human resources, have been devolved away from the centre of organisations in recent years. A central, technical service is available to give advice only but the real decisions are taken on the ground and in the production context. There was a clear divide within the survey, between those who had a Chairman/CEO or Board member who drive environmental policy and environmental initiatives from the top and those companies where there is no great driving force from the top but instead environmental issues are everyone's responsibility and fully integrated into jobs throughout the company. Whichever groups are involved, any commitment within the management process is of significance as without this, no environmental initiatives will be taken and no consideration will be given to environmental factors within this process.

4.3.4. Conclusions with regard to environmental accounting within the management process

This group of questions had revealed that environmental issues were very much

integrated within the management process. Any environmental accounting figures taken into account as part of this process were almost incidental. What was clear was that environmental *considerations* were not a public relations device but were integral within the management process and therefore valued by the business world. Where financial figures or physical quantifications were such considerations then hypothesis 2 (hypotheses subset) applied but it did not seem that, as yet, environmental accounting was sufficiently well developed as a separate entity within the management process for this hypothesis to be true. Again environmental accounting undoubtedly existed as a nascent technique but one reason for its firm establishment, that of being integrated in the management process, has not yet fully developed even though environmental considerations have been.

4.4 The pressures driving environmental accounting

If it is accepted that businesses are, increasingly, taking environmental initiatives, one of which happens to be environmental accounting and, if it is also accepted that there is genuine concern for the environment, then certain factors have to be driving this process.

4.4.1 Pressures driving environmental accounting: importance of environmental profile

What needed to be ascertained was what motivation lay behind the introduction of environmental initiatives, and especially environmental accounting, other than the purely pragmatic. An underlying factor here seemed to be how important the public perception of a company's environmental profile and track record might be to a company. (see Appendix B, Questionnaire, Q1) Only 2 businesses, one of whom was Company 10, felt that it was not particularly important. Overwhelmingly for the sample businesses, public perception of their environmental profile and track record was of some degree of importance (see Appendix C, Table 10). For Company 10, the lack of importance ascribed to its public environmental profile seems to be due to the fact that they had recently obtained EU EMAS accreditation and so were fully confident of their environmental credentials. Company 19 felt that it was important but commented "*There is, however, not yet a two way dialogue, it is targeted communication*". Whilst categorisation was kept simple both these responses illustrated the need for reference to the original transcripts in order to build up a 'dimensional continua'. For example, the

response from Company 2 whilst being a straightforward “yes” was also interesting (see Appendix C, Table 10).

Emerging from the responses to this question was some concern for environmental image and varying degrees of commitment to the environment but no conclusions could be drawn.

4.4.2 Actions taken to enhance environmental profile

Concerns current in the business world would normally be acted upon. If an environmental profile is important to a company, one would normally expect everything possible to be done to nurture and enhance this. The businesses in this sample were taking a wide range of initiatives (ref: Appendix C, Table 10, Q2a) All of those trying to cultivate a positive environmental image, tended to mention more than one action, with the production of a CER heading the list of initiatives mentioned. For example, Company 19 mentioned the establishment of a Website.

The categorisations here were multiple in order not to lose any information. To force the data into smaller categories was felt to be invalid. Indeed, this was an instance of where the data could not only not be forced into a small number of categories but also reference needed to be made to other questions and the transcripts to build up a complete picture. Thus it was discovered that some of these responses were not in line with responses to the question on whether or not businesses produced a CER as, in response to this, 17 companies said that they issued an environmental report whereas only 8 companies mentioned these here. Environmental reports seem to have been mentioned here only when they were new ventures or when companies were especially proud of them for winning an award (usually under the ACCA scheme). Many companies took it as read that they had been issuing one of these for a number of years and had a clearly stated environmental policy; they then went on to discuss what other initiatives they had, such as conservation schemes that they ran in the locality. Moreover, whilst only one (large) company (Company 9) mentioned involvement in the World Business Council for Sustainable Development (WBCSD), others were certainly involved. For example, the parent company of one of the medium sized businesses (Company 7) had recently had a seconded member of staff working for WBCSD in Geneva. More than one of those

interviewed had produced a stakeholder report and yet it was only mentioned by one company (Company 14). The responses to this question seem to have been a reflection of where a business was currently placing its emphasis. For example, one of those mentioning its environmental report was in the process of altering it (in response to its American parent company) to include far more numerate information (Company 12). In this instance, reference to the transcripts and wider knowledge, informed the data analysis.

The real surprise amongst the responses to this question were those who said that they were doing nothing or were not bothered. They were all in British ownership. One was under public ownership where the public assume a certain level of good environmental conduct. They felt, very strongly, that they were delivering this and that if they were to spend any money on environmental initiatives, such as the production of an environmental report, the public might feel that this was money mis-spent. Of the two small companies doing nothing, as previously stated Company 10 had recently achieved EU EMAS accreditation. As a result they produce a brochure containing their environmental statement which is available to the public and do not view any of this as cultivating a good environmental image. The interviewee from this business had worked in manufacturing and had been factory based all his working life. He viewed the environmental initiatives they were taking as being sound business sense. They had made considerable savings as a result of these and, although they had had to spend money to achieve these savings, he could see nothing other than positive benefit to the profit and loss account and balance sheet. Whilst they were taking environmental initiatives and had enhanced their environmental image, this business's perception was not of this having happened. Here, whilst they were dedicated to business efficiency, what they had achieved was also environmental efficiency and commitment - in addition to any compliance requirements. Profit maximisation was still driving this business rather than societal pressures. This was a significant conclusion in respect of this company and would have been lost without reference to the interview transcript. These were referred to at all times when there was any possibility of the data collection and analysis process losing validity or reliability.

This coincidence of commercial interest and environmental best practice is reinforced by

the literature (see above for the US EPA's conclusions). Indeed a Coopers and Lybrand report states that: *"Businesses which are slow off the mark are likely to find it increasingly difficult to market their products, dispose of waste, obtain insurance, attract finance, keep within a new and much enhanced legal framework and recruit and retain the best staff."* (Coopers & Lybrand, 1992, P7) Pressures undoubtedly exist for not only adopting environmental best practice but also incorporating environmental accounting into the management process, after all without the correct environmental figures no management accountant can assess 'pay back' or Net Present Value (NPV) for an investment. The importance of an environmental profile and its enhancement are clearly business considerations in addition to compliance issues. Inevitably these stem from the business environment and as such are the result of societal pressures.

4.4.3 The meaning of 'sustainability'

It was felt that whether or not interviewees had an understanding of the term 'sustainability' (which is much bandied around within the context of environmental issues) might give some indication of the wider environmental context within which they operate (Appendix B, Questionnaire, Q24). A good understanding might also indicate rather more depth of commitment to environmental issues, as 'sustainability' should be the context within which environmental initiatives are taken if the wider interests of society as a whole are of concern (see Appendix C, Tables 10 & 11).

Categorisation, in this instance, was clear, for details of the definitions cited other than the Brundtland definition (see footnote 20, Chapter 2), see Glossary. Whilst some of the definitions display a lack of understanding, the majority of companies seem to have taken on board some understanding of the terminology from Company 10's vague *"anything used is replaced"* to Company 19's reference to the Brundtland definition. The implication of this is that there is some understanding that damage to the environment should be limited. However, this fails to answer the question of to what extent businesses have time for societal concerns such as 'sustainability' or whether they are more concerned about profits. World wide societal pressures may be driving nothing and may certainly be far from overriding commercial pressures (hypothesis 3 – hypotheses subset).

4.4.4 Pressures on companies from external groups

If societal pressures are pushing businesses in particular environmental directions, especially towards environmental accounting, then these should be clear to companies. They were questioned about a whole range of groups who it was felt could exert pressure in this way (see Appendix B, Questionnaire, Q20). The results of this are to be found in Appendix C, Tables 10 & 11. Some interesting results emerged from this, for example, the Institutional Investors (see Glossary) proved to be uninterested in environmental issues, only share values and dividends. Those companies which felt that they had been the subject of City attention (excluding Companies 10 & 19) felt that this was more directed at concern as to whether they were abiding by regulations, rather than any concerns over the process that they were using or any other environmental issues. This attitude by the City of scrutiny for regulation and compliance rather than for other factors, highlights one of the problems of education needed in this area. An aspect of this was questioned in the BT publication on environmental accounting when they posed the question of whether a company's performance would be judged on its savings from good environmental management or for its spending on environmental protection (BT, 1996, P14).

Customer pressure seemed only to have been of significance to companies involved in retailing of whatever size (excluding Company 19) or those companies from the secondary sector who were producing goods directly for consumer markets (including Company 10). This would seem to reflect the growing tide of green consumerism and the increased public awareness of environmental issues when choosing products. (There may also be an important thread here in terms of societal trends and imperatives as, more than half the sample, had felt environmental issues as a pressure from customers, to a greater or lesser extent.)

More businesses had experienced pressure from employees. Company 19 had experienced employee pressure whilst Company 10 had had "some". This may be related to past employment patterns when many employees have suffered badly at the hands of employers who have had poor environmental and, as a result, health and safety records. For example, explosions are not unknown in the chemical industry with their consequent extreme environmental results of death and contamination. Here one thinks of

Flixborough in the UK (Baldwin, 1991), Union Carbide's explosion at Bhopal in India (The Economist, 27.1.91 P73) and, back in the UK the explosion at Hickson & Welch, Castleford (Butterfield, 1992). Whilst in hindsight human health has often been jeopardised by dangerous emissions, for example, emissions of vinyl chloride from open crucibles led to deaths from liver cancer in the polymer industry until this was traced and a new process was introduced (Baldwin, 1991). Employees are on the ground and at the receiving end of any poor environmental policies which employers may pursue. The overall response to this part question gave an indication that some societal forces may be at work in this area.

Other stakeholders having a view on a business's environmental policy encompass a wide variety of individuals from suppliers and local communities through to those with a far more tenuous link. Pressure from stakeholders had been felt by some businesses, including Company 19 but not Company 10 (see Appendix C, Table 10). The stakeholders who were specifically mentioned were owners (where a company was owned from outside the UK). Unsurprisingly, in view of their attitude to environmental issues, Scandinavian owners were named as particularly concerned. Suppliers were also mentioned as having expressed concern; given that they are dependent on the company they supply for some of their business, again, this is hardly surprising. In one instance, the Chairman's children (Company 16) were mentioned as concerned stakeholders. This latter may give some indication of the extent of external societal pressure. The concerns of overseas owners also give an indication that this is not peculiar to the UK and that these pressures may, in some instances, be coming from the wider world community.

Local authorities can also be a significant source of pressure. They have statutory duties with respect to certain environmental issues, for example, they must be consulted on a site emergency/incident/accident plan and they also have to be consulted on the transport and storage of hazardous materials (Baldwin, 1991). They also represent, via local councillors, the interests of local communities and because of this express any anxieties that may be being felt concerning noise pollution, emission levels or anything else of an environmental nature. One of the dangers of ignoring local authority councillors is that they may well take issues of concern to the press if they feel that these are being ignored by the business concerned. No business wants any form of bad publicity, for example,

both Companies 5 & 6 commented on this. Therefore, local authorities, whether it is the paid officials sorting out transport routes for hazardous materials or the local councillors expressing wider concerns, must be taken into account as stakeholders. Many of the companies (including Company 10) had experienced pressure from local authorities (see Appendix C, Table 10). Company 19 had experienced none. In the main their influence was seen purely in terms of the regulatory role which they fulfil. However, they were also seen as exerting increasing influence as a result of Agenda 21. This latter can certainly be seen as societal pressure not just from the UK community but also from the wider world community, given that it emerged as a result of the Rio conference, so giving some proof that societal forces are at work here - although whether or not these result in environmental accounting is yet to be established (hypothesis 3 – hypotheses subset).

For all the above factors, categorisation proved simple and was kept simple in order to be manageable (see Appendix C, Table 11). However, in analysis continual reference was made to the original data as some companies had made additional comments with their yes/no responses (see Appendix C, Table 10 which indicates this). It was felt important not to lose the sense of these in the analysis as a result of the categorisation. Again, a 'dimensional continua' was being built in order to ensure that data analysis was valid and reliable. Under methods of analysis such as Content Analysis it might have been possible to allow a simple yes/no count but Grounded Theory presupposes a far more holistic approach.

4.4.5 Sources of pressure on companies to 'go green'

Any business has financial and commercial pressures but beyond this they feel other pressures from their environment. In addition to exploring specific sources of pressure, the companies were asked what they regarded as "the greatest single source of pressure on their company to institute change with regard to existing and new environmental measures" (ref: Appendix B, Questionnaire, Q19). Often more than one factor was cited. All the responses can be found in Appendix C, Tables 10 & 11.

The responses here to legislation and regulation (overwhelmingly the greatest single source of pressure including Company 10 but not Company 19) tie up with the answer to

a later question concerning the government and the EU as sources of pressure. A large proportion of the sample felt that they are subject to such pressure and clearly, as such, much of this pressure is felt legislatively. What is also interesting are the numbers within the sample who feel pressure from the public at large and NGOs in particular. As a significant influence on them, in terms of taking environmental initiatives, this certainly seems to be society acting on the business world. If it is also considered that legislation and regulation are merely a reflection of societal concerns as well (whether this is national, European or international society), then again, given that these are being mentioned as major sources of pressure by these businesses, this demonstrates further societal pressure on the business world (hypothesis 3 – hypotheses subset). The categorisation in this instance was a little more complex than originally envisaged but was not too problematic (see Appendix C, Table 11).

In the context of a ‘major’ or ‘main’ source of pressure on businesses one might expect customers and stakeholders to be mentioned but, in many ways, the more interesting factors to emerge from this question are “generated within the company” (including Company 19) and “peer group pressure within the industry”. There is no overlap between the companies citing these two factors. For those citing “generated within the company” size and American ownership may have some bearing here, especially in view of the US legislation and environmental liability issues which might be anticipated for the future in the UK. “Peer group pressure” was cited by those businesses (either large or medium sized) which operate within industries where, if accidents occur, the spotlight turns on the whole industry. The interviewee for Company 4 confirmed this with his comment that there was much peer pressure within the chemical industry as, if any sort of environmental incident occurred, it tended to affect the whole industry as it tended to blacken the whole of it rather than just the individual company involved. It should be noted that this is just another form of public pressure; it is the media on behalf of the public who will turn on the “spotlight”. This is societal pressure at work again (hypothesis 3 – hypotheses subset).

Some specific sources of pressure have already been addressed (the City, customers, employees, stakeholders and local authorities) in section 4.4.4. An additional six potential sources of pressure which were also explored (also part of Q20, see Appendix

B, Questionnaire). The first two categories here were public or pressure groups and NGOs. A distinction was made between the two as, whilst pressure groups are usually totally independent of government support and input, NGOs sometimes have a small amount of government funding or may have a government appointee to their Boards. Responses to questioning about these pressures may be found in Appendix C, Tables 10 & 11. The responses to the question on pressure groups was interesting as those companies feeling such pressure felt that whilst they had experienced pressure from these groups, they had no real dialogue with them. They seemed to feel that the attack came first without any attempt at real communication, the debate was then in the public domain and was very much of an attack then counter attack nature (Company 1). One company interviewee stated that:

“Some extreme environmental groups use perception rather than science against us. This is difficult to combat as emotion rather than logic is being used and appealed to.” (Company 8)

Such comments were made especially with reference to Greenpeace. What was striking was those companies, sooner or later and not necessarily in the context of this question, remarking that they

“never knew when they might have their Greenpeace.” (Company 19)

This even applied to companies within the service (tertiary) sector, some of whom seemed unlikely candidates for Greenpeace attention (Company 19). Of all the pressure groups, within the business world Greenpeace is currently an organisation of which they are all wary but for which they have little regard, especially Company 7 which stated that:

“Environmentalism as evidenced by Greenpeace is the New Marxism.”

Friends of the Earth and other organisations when mentioned, on the other hand, were always spoken of favourably. They were viewed as being willing to enter a dialogue with the business world and clearly there was the general feeling that both sides were willing

to listen to each other. For example:

"These work with us as part of the need for regulation, for example, English Nature." (Company 3)

The general view of Greenpeace seemed to be that it was usually unfair in its approach, that it was unwilling to listen, that if a company refused to see it then this would be emblazoned across the press as unreasonable behaviour but when they did see it then, unless they were willing to accede to all demands immediately (and without Greenpeace having listened to any view other than their own), then again this was emblazoned across the press as unreasonable behaviour. This view was reflected not only by companies who had been the subject of Greenpeace attention but also by those who had not. Indeed, it was even described by one company interviewee as:

"Disgraceful and disreputable" (Company 7)

Neither Company 10 or 19 had felt such pressure but when it came to NGOs, Company 19 had felt pressure from them but Company 10 had not. In general they were viewed more positively as many interviewees stated that NGOs worked with them in what they did, not against them. For example, English Nature was mentioned by Company 13 in this context (see Appendix C, Table 10 for responses).

One of the vehicles used by pressure groups but one that is quite capable of bringing pressure to bear on the business world on its own account, is the media. Few of the sample had experienced the full glare of the media spotlight. Company 19 felt that it had experienced some whilst Company 10 had experienced none. Those suffering media attention (for whatever reason) varied in size from small companies (who had clearly suffered at the hands of the local press) through medium sized ones, who had often felt media attention as a result of their targeting of a particular product which they happened to make or use (so the media attention was indirect and more the result of a particular campaign than an outright attack on them specifically), through to large companies who had been the subject of specific, directed, media campaigns (see Appendix C, Tables 10 & 11 for responses). One company felt that they had suffered globally as a result of this

(Company 14). These were all companies located in the primary or secondary sectors of the economy and engaged in economic activities where there could be environmental impacts. In one instance of media attention, whilst there had been some distortion of the facts by the press and others, this attention had followed on from an incident as a result of which there had been fatalities and where the company was legally proven to have been negligent (Company 4). The justification for press attention can, therefore, be quite valid. Companies seemed to recognise this but what they were usually commenting on was the media's seeming propensity to get their facts wrong. Thus one company commented that the press was:

"a mouthpiece for and manipulated by the NGOs." (Company 1)

Another comment which was made by some, was to the effect that they often took environmental initiatives and were doing good things in this sphere but this seldom got publicity. Good news, as always and in this instance also, is bad news, whilst at other times environmental issues were reported for:

"The news factor – bad news is good news." (Company 4)

Whilst simple categorisation occurred with respect to pressure groups, NGOs and the media (see Appendix C, Table 11), reference had to be made back to the original data on analysis, as comments spread across this part of the response to Q20 and on into Q21 and Q22. Whilst some of this was contained in Table 10 (Appendix C), for the purposes of accuracy continual reference had to be made back to the original data. The potential danger of categorisation in these instances was an over simplification of the responses and potential exclusion of interesting comments and the loss of the holistic view.

Above all else, the business world comes under pressure from the government and EU, especially with respect to legislation and regulation. This was confirmed by the responses to this part of Q20 (see Appendix C, Table 10). Both Companies 10 and 19 felt that they came under governmental and EU pressure, mainly legislative. Governmental influence here was seen as purely legislative, and often as a vehicle for EU regulations and directives. It was viewed as very significant by virtually all companies. Those

responding “no” either viewed the government as unimportant as it merely enacted EU law or alternatively they were in sectors such as retailing where environmental legislation has been, until comparatively recently, of less significance. All of those responding negatively acknowledged a role for government in the sphere of environmental legislation even if they felt that it had come from the EU or it had yet to affect them. It would seem to be that, as Gray tells us *“The most obvious of these (environmental) pressures arises from changes in legislation and the related institutional framework.”* (Gray, 1993, P45). In line with this, there was an overwhelming view from this sample that the EU is highly significant in terms of environmental initiatives but more especially in terms of environmental legislation.

There was also a certain amount of sensitivity to the global context of environmental issues including Companies 10 & 19 who both responded positively. A range of factors was mentioned in this context from the Rio and Kyoto conferences, the work of the World Business Council for Sustainable Development (WBCSD), the International Chamber of Commerce (ICC) and its Charter and the World Wide Fund for Nature (WWF). Overall, pressures closer to home emerged as more significant. It would seem that immediate rather than wider societal pressures are of more significance to companies. Categorisation with regard to these UK, EU and global influences did not prove problematic (see Appendix C, Table 11) but reference was made back to original data for the purposes of accuracy in analysis and to establish a ‘dimensional continua’.

4.4.6 Particular environmental pressures on companies

Whilst companies may have felt pressures on them from a number of different sources, in the main, they very often feel that these are fair. Their view seems to be that they operate within the public arena and, as such, must come under public scrutiny. However, groups named by companies in the sample as having exerted unfair/undue influence (Appendix B, Questionnaire, Q21) were pressure groups, the media, the government and the EU (through legislation) (see Appendix C, Table 10). Neither Company 10 or 19 felt that they had been subjected to unfair pressure.

Some companies had a view as to why some groups might exert unfair pressure on them. The reason mentioned by some companies and, therefore, mentioned most frequently

was:

"They pick up issues without understanding them" (Company 17)

and this was said in the context of the unfair pressure exerted by pressure groups especially Greenpeace. Other than this there were three reasons given which were very much inter-related:

- *"for the news factor" (Company 4)*
- *"the desire to develop their own profile" (Company 8)*
- *"the need to have a "big win" in order to maintain their customer base" (Company 1)*

In other words, for public relations or marketing reasons.

Two other reasons given were both political and were both given vis a vis pressure groups and especially Greenpeace; one explanation as previously quoted is that *"they are the New Marxism"* (Company 7) and the other was that:

- *"they have experienced a lack of progress with the political and legislative system, the environment is not high enough up the political/legislative agenda, so campaigning against business is an alternative" (Company 9)*

For other reasons given see Appendix C, Table 10.

Not only is there some not inconsiderable feeling that some pressure may be unfair but there is also some cynicism as to motivation. In informal conversation, many company representatives remarked that business was an easy/soft target for pressure groups, the media and others; that it was difficult for business to respond without ending up in a "slanging" match, which would be undignified and unbusinesslike anyway. There was a certain amount of ill feeling about business being targeted - especially given the fact that they provide jobs and often keep the business going despite a less than satisfactory return on capital, in the face of such vagaries as the fluctuating value of sterling, high interest

rates and fierce competition from overseas, especially from south east Asia. It is quite clear that many businesses would do all in their power to resist such pressures. This was a clear example of societal pressures working counter productively such that businesses would stick to their profit maximising targets (hypothesis 3 – hypotheses subset).

Again, categorisation in this instance (Q21) was seemingly relatively clear given the clear nomination of the various categories by the companies themselves. However, given the comments made, especially informally, whilst Tables 10 & 11 (Appendix C) summarised and categorised the responses, this was another instance where the original data had to be referred to in analysis for a holistic view.

4.4.7 Public consciousness of ‘green’ issues

There are many sources of environmental pressure on companies but what has to be considered is whether or not these represent genuine concern amongst the general public about environmental issues. In the main, the businesses felt that they had some genuine concerns (see Appendix C, Table 10, Q23). One interviewee commented somewhat cynically that:

“Most people are driven by utility and NIMBY.” (Company 13)

Companies 10 and 19 commented that:

- *“ the media has made it something that everyone understands” (Company 10)*
- *“ it mainly starts with issues such as recycling. Resource efficiency is the driver” (Company 19)*

For other comments see Appendix C, Table 10. What was interesting was the recurring theme of the role of the media in all of this, whether it was the local media and its comments on local problems such as low levels in rivers affecting fishing (which was one of the factors which one interviewee felt had alerted the majority of his workforce to environmental problems) or the national media with its comments on wider issues.

The general view seemed to be that whatever the role of the national and local media in

all of this, there is genuine concern by the public about environmental issues. This may be a possible instance of societal pressures being exerted on businesses (hypothesis 3 – hypotheses subset). Categorisation was done simply (see Appendix C, Table 11) but note had to be taken of the qualifications given to the yes/no/some answers by the interviewees. Yet again in analysis, reference had to be made back to original data.

4.4.8 Government and EU influence on environmental issues

Given the importance of legislation, what the government's environmental priorities might be and how this had become apparent was explored (Appendix B, Questionnaire, Q25). Responses were rather vague (including Company 19 being “unsure” and Company 10 feeling that the current Labour government has higher environmental priorities than the previous Conservative one), although two companies both mentioned that they thought that transport was a priority. Reference to the original data revealed other suggestions (see Appendix C, Table 10)

Many felt that a confusing set of signals was being handed down to the business world. This meant that responses here were very diverse. As a result, whilst the original number of categories proposed was 3, this grew to 10 on re-categorisation (see Appendix C, Table 11). Reference had to be made back to the original responses (see abbreviated version in Appendix C, Table 10).

Whilst few companies mentioned transport as an issue here, it came up in other parts of the interview (in interview transcripts) as something of importance, either because of concern over road congestion and the problems of moving goods around or because of energy saving issues. This seems to be an issue on which business is driving itself rather than being influenced by government.

Nevertheless, when it came to legislation companies felt significantly affected by government action, whether it was government acting on its own account or in enactment of EU legislation (Appendix B, Questionnaire, Q26). There was, however, a difference between feeling under some pressure or feeling pressure in general and being *significantly* affected by legislation. This meant there were conflicting signals with regard to hypothesis 3 (hypotheses subset). Clearly legislation is accepted and

incorporated into business plans. It does not seem to be regarded as societal pressure but as there to be abided by in the pursuit of profits (see Appendix C, Tables 10 & 11).

4.4.9 Business action to influence legislation/regulation

When companies feel significantly affected by legislation or under pressure from legislative bodies, one of the best ways of preventing resentment from building up is by keeping lines of communication open. Traditionally these lines of communication have been via employers associations. As a result of a question response (Q27, Appendix B, Questionnaire), what emerged was a clear picture of, in the main, a good dialogue existing at national level between business and government. Only 2 of the companies surveyed said that they had none at all. Such dialogue was either direct, via their industry association (as for Company 10) or both (as for Company 19) (see Appendix C, Table 10). What was interesting was those businesses feeling that they had a double dialogue encompassed all sizes of company, as the introduction of the EU EMAS scheme has meant that companies adopting this have had a dialogue direct with the Department of the Environment and the Regions (DETR), as part of this adoption process and they now feel that they are communicating directly with government. This has had a positive effect in opening up lines of communication with businesses. This was an interesting finding.

Those companies who talk to the government direct and do not do so through an industry association were all large, whilst those relying on their industry association were mainly medium sized, with one small sized company relying on this. Categorisation here proved simple (see Appendix C, Table 11).

This communication assumes that the government actually understands the needs of business (Appendix B, Questionnaire, Q27a). Whilst dialogue exists, there may be a feeling that this is ineffective and that government still lacks understanding (see Appendix C, Table 10).

Company 19 whilst responding “no” spoke of “*business drivers*” rather than “*needs*” and was positive that the government does not understand these. Company 10 was unsure on this issue. Clearly a communication gap exists here. Categorisation was kept as simple as possible but grew from 3 original to 5 final categories (see Appendix C,

Table 10).

In terms of this interface with government, the businesses were asked which environmental measures they favoured (Appendix B, Questionnaire, Q28). Half of the companies opted for a mix of measures dependent on the issue involved (including Company 19). Flexibility dependent on the circumstances was what came over as the most urgent requirement (see Appendix C, Table 10). When speaking of a mix, some companies mentioned specific preferences. Other companies did not want a mix but expressed preferences for particular measures only. The results of these preferences can be found in Appendix C, Tables 10 and 11.

What was interesting was the narrow margin in favour of direct regulation. The view here was that it then gave everyone a level playing field and was a fairer system. Taxation was most frequently mentioned for indirect regulation. The general acceptance of regulation could demonstrate a lack of resentment towards government interference, which is quite positive and one which accepts societal pressures (hypothesis 3 – hypotheses subset). Categorisation was fairly straightforward but grew from 4 to 6 categories (see Appendix C, Table 11).

4.4.10 Solutions to environmental issues and any attempts to absorb social costs.

Businesses can attempt to absorb social costs in many practical ways such as via recycling and waste treatment. If they experience societal pressures of whatever type then this is likely to occur. The sample were questioned about a range of practical measures (Appendix B, Questionnaire, Q16). For most parts of the question there was a 90-95% positive response, with Company 10 responding ‘yes’ to all parts and Company 19 ‘yes’ to all but the last two (see Appendix C, Table 10 and Table 11 for the subsequent categorisation). Energy efficiency drivers were mentioned, whilst one company which manufactures timber treatment products containing arsenic (Company 4) outside the UK, discussed their current research on whether another, less environmentally toxic substance, which could be used or to discover if, at the end of life, they can extract the arsenic from the wood and recycle it. UK/EU legislation has affected this area but it may also reflect increased interest from pressure groups. For example, in the early 1990s, Greenpeace ran a very successful campaign against a plant owned by

Albright & Wilson which had unacceptably high emissions of toxins in its wastewater (Greenpeace Business 3, October 1991, Pp1, 2).

Company 10 was looking at the use of recycled materials where possible, whilst Company 19 was looking, less at end-of-life product design, but more at how socially acceptable their products will be in twenty years' time.

Overall it seems fair to conclude that companies have environmental concerns and they are doing something about these. However, how this fits in with environmental accounting as a necessary and useful process (hypothesis 1- hypotheses subset), as part of the management process (hypothesis 2 – hypotheses subset) and the general pattern of any environmental sensitivity and potential deviation from the profit maximising stance, within the business world (hypothesis 3 – hypotheses subset), is less clear. In other words, whether the interest in these various measures will cause environmental accounting to become an established technique from its present nascent origins, is difficult to predict.

4.4.11 Commercial gains and the 'greening' process

The cynic might maintain that companies only become environmentally sensitive for commercial gain, that there is no real concern for the environment within the business world only concern for profits and that, as a result, issues of sustainability are far from their thoughts (the cynical response to hypothesis 3 – hypotheses subset). In effect, the cynical view is returning to the issue of social costs (ref: Chapter 1) and suggesting that no company will take account of these unless forced to do – which is the case with regulation and compliance. As Elkington et al. commented:

“Many companies, however, remain focussed on the dark clouds of regulation rather than the silver linings of opportunity.” (Elkington et al., 1991, P28)

As they also pointed out:

“a company's actual – and perceived – environmental performance increasingly determines the ease and degree of success with which it enters new markets,

makes and sells products, wins permission to develop new facilities, and attracts capital and skilled new recruits.” (Elkington et al., 1991, P18)

The businesses were questioned as to the business implications of their environmentalism (Q2, Appendix B, Questionnaire, Q17). The responses were overwhelmingly positive. (For detailed answers see Appendix C, Table 10). There was strong feeling that their environmental activities and the reporting of these was very helpful (including Company 19, although Company 10 felt it was N/A to themselves). One company even cited the example of a very large contract which they had won which they knew, as fact, had definitely been helped by the existence of their Environmental Report and its contents (Company 12). Of the companies responding “no” one was a small company more concerned with the struggle for existence than with the environment. Despite any doubts the businesses saw “environmental issues as a commercial opportunity both now and in the future”. All saw possibilities but some companies were considerably more imaginative than others (for responses, see Appendix C, Table 10). It seems that, even if it is commercial considerations, the environment and environmental issues certainly seem to play a not inconsiderable role in driving business strategy. This is an example of societal pressures driving the need for environmental initiatives – which could include environmental accounting (hypothesis 3 – hypotheses subset).

Clarification of the commercial opportunities was sought via a series of supplementary questions (Appendix B, Questionnaire, Q18, 18a, 18b). There was an overwhelmingly positive response to potential gain of market share (Appendix C, Table 10). This may be related to company perceptions of the gains to be made from so called ‘green marketing’. For the categorisation of these questions, which proved simple, see Appendix C, Table 11.

Creating new market niches is something that companies seek to do, regardless of whether or not it is under an environmental umbrella. Therefore, it was hardly a surprise to get a 65% “yes” response to the question on the creation of new market niches (including Companies 10 & 19). Those answering “no” (Companies 2, 6, 16, 20) were those already serving niche markets or facing heavily segmented markets. This was a

general facet of their marketing, regardless of environmental issues. Of those unsure, two companies were heavily single product orientated (Companies 7, 12) and in a situation where market niching was almost irrelevant.

Whether or not they could see themselves creating new markets or reviving old ones was the next question in this context and the majority of companies responded positively (including Companies 10 and 19. Likewise, 13 felt that they were likely to create new “environmental” products (also including Companies 10 & 19).

On the whole, whilst there was some slight variation in the responses, the basic response pattern was the same from one question to the next, for this set of questions (see Appendix C, Table 10). Some very large companies emerge as unconcerned by ‘green marketing’ initiatives as they probably think that they have their markets well ‘sewn up’ already. Some of these companies serve particular markets or are single product orientated and this hampers their room for manoeuvre; whilst others are clearly always looking for commercial (in this instance, ‘green’) opportunities. On the whole, more seem to be seeking to profit from ‘green’ marketing than not. Given that environmental accounting might have to be incorporated into this process, then this is an interesting situation of the commercial world using societal pressures for profit maximising purposes rather than the reverse (hypothesis 3 – hypothesis subset).

Geographically (Q18b), the businesses saw these opportunities as not just national or European but also global. There were some negative responses from, for example, Company 10, which clearly saw itself serving only local markets. Whilst a large retail company (Company 17) clearly perceived themselves to be a national or European rather than a global company - it may also have been a reflection of the problems which they had experienced when trying to expand outside Europe. Most companies felt that they might expand into any niche and any geographical area (including Company 19). The old ‘Eastern bloc’ countries were named as a particularly fruitful area for expansion by more than one company. (See Appendix C, Table 10)

Overall, the conclusion that can be drawn from the responses to this set of questions, together with the comments which often accompanied the responses, is that a sound

environmental profile and engagement in environmental activities is of very positive commercial benefit, both geographically and in terms of market profile and the ability to indulge in market segmentation. Only those companies focussed on particular (fairly narrow) market segments or single products felt that environmental activities were of little commercial advantage; although this did not apply to all these companies. This is an interesting situation as who is using whom? Is the business world using societal concerns to their own commercial advantage or is society driving the business world in a particular direction regardless of what might be in its commercial interests? Either way, the use of environmental accounting would be a profitable exercise but what it would be driven by is difficult to discern (hypothesis 3 – hypothesis subset).

4.4.12 Changes occurring within companies as a result of the environmental debate

Whilst environmental initiatives may produce commercial gains, the use of 'green marketing' techniques is, for many companies, still in its infancy. It is often chance occurrences which have flagged up the commercial advantages of these. For example, the company mentioned above which had won a large contract as a result of being able to produce their CER. The existence of this report at the right time was sheer good fortune (they had only just produced it, their first one, and not everyone in the company had been convinced of the wisdom of producing it) and they had not realised, until afterwards, that it was one of the small things that tipped the balance in their favour. This was one company's experience and others have discovered other commercial advantages of 'green' measures such as the savings to be made from effective environmental management systems (Company 10). In order for any of these initiatives to occur in the first place, there must have been debate within these companies focussing on these environmental measures. If such environmental debate is taking place within the business world, one of the most significant factors which it can affect is investment, whether this is investment in something small such as the production of a CER, or something more costly such as an EMS or a major piece of investment such as, maybe, some new technology designed to reduce environmental impact. Investment is, in any event, one of the more significant features of the business cycle and part of the management process. The businesses were questioned on whether the environmental debate which had taken place within their company had "produced different types of investment than might otherwise have been undertaken" (Appendix B, Questionnaire,

Q14). For responses, see Appendix C, Table 10.

Not all of those answering “yes” gave any indication of how their investment had altered. However, Company 19 did:

“the use of solar panels and photo voltaic investment” (Company 19)

Categorisation proved difficult and categories fragmented from the original 2 to 8 (see Appendix C, Table 11).

The companies were then asked what, in this context (of their environmental debate and changing investment patterns), had been the main impact or major difference (Appendix B, Questionnaire, Q14a). Recurring themes were those of energy efficiency and waste management (see Appendix C, Table 10). The latter covered all types of waste, whether water, solid or waste emissions such as the VOC reduction systems which one company (Company 16) referred to as a significant investment. Two other common threads also emerged, that of CFCs (and their removal from air conditioning and refrigeration systems, together with aerosols and other products) and customers. Company 10 commented on water and energy savings and Company 19 on embracing new technologies. Other than these common themes, companies commented on a wide variety of other effects of their environmental debate (see Appendix C, Table 10). Given this wide variety in response, categorisation broke down from the original 4 categories into individual ones as the answers were so diverse (see Appendix C, Table 11).

Finally, in this context, and in order to round off the picture of what might have been happening within companies, they were asked about whether or not their company’s R & D spending had increased as a result of the ‘environmental debate’ (Appendix B, Questionnaire, Q15). A small majority responded “yes” and some of them also spoke of a general refocusing of their R & D; in this context one company (Company 19) used as an example the pressure there had been for integrated building design, which had resulted in their latest computer centre being naturally heated and cooled - whatever the weather. Some referred to having increased research on product, others said that they had increased research on process, in particular cleaner technology, whilst others said that

they had increased R & D in both these areas. Company 10 responded negatively here. Inevitably categorisation was difficult here with this range of response but 3 categories were achieved, albeit reference being needed back to the original data (see Appendix C, Table 11).

4.4.13 Conclusions with regard to the social pressures driving the process

If the responses to these questions are taken together with the responses to the question which asked the companies what they were doing with respect to “recovery and recycling of inputs from waste”, “emission reduction measures” and so on, it is quite clear that a lot of environmentally related activity is going on within many of these companies. In answer to virtually all of this group of questions the response has been “yes” from well over half the companies. The environmental debate is obviously driving events internally. It is really a question of looking back at the common themes and threads and considering what is, in turn, driving this environmental debate and whether it is indeed an attempt to absorb social costs. In which case societal pressures are overriding commercial pressures, environmental accounting is needed and is a necessary and useful process and needs to be present in the management process (hypotheses 1, 2 & 3 – hypotheses subset). This would mean that the reasons for the establishment of environmental accounting are present and that what is currently a nascent technique will become mainstream. However, proper conclusions will be drawn on the hypothesis and its subset in the final chapter (5).

CHAPTER 5

5.1 Introduction: changing perceptions

Traditional financial accounting makes no allowance for social or environmental costs but in the past it has been deemed to be the only form of accounting necessary for a company. As freely admitted by one of the interviewees in the fieldwork survey:

“at the moment these externalities are not taken into account in business practices.” (Company 13)

Changing perceptions have altered this as they have demonstrated the need for environmental accounting in order for a business to be ecologically sustainable as well as economically sustainable. It is no longer acceptable for companies to use up natural capital and put intolerable loads on their surrounding environments. For example, one of the interviewees in the fieldwork survey from a company in the water industry stated that:

“The Innovation and Water Quality Department . . . they have a green, clean, compact technology. For example, land use may be balanced against energy intensity in the size of sewage treatment works and small works have been developed to use up less land.” (Company 3)

The innovation which was previously necessary for the economic sustainability of a company is now needed to ensure ecological sustainability. New technologies for reducing emissions, waste and energy use are imperative for both these reasons. This process of change resulted in the main hypothesis and its subset of hypotheses being thrown up by the initial stages of the investigation. This chapter examines the main hypothesis and its subset, within the context of the literature and CERs survey and in conjunction with the fieldwork but first (as indicated in Chapter 1) it looks at their theoretical underpinning before drawing conclusions.

5.2 Stakeholder and other theories

As previously stated, sustainable development demands not just eco-efficiency but also

eco-justice. It demands not just the use of the world's resources such that we avoid unnecessary resource degradation and over use but also that we allocate that use fairly, as between existing generations worldwide and also as between present and future generations. Sustainable development demands both intra-generational equity and also inter-generational equity, that is, eco-justice. The Bruntland definition of sustainable development implied this and this should logically lead on to a need for environmental accounting. Whilst these issues of eco-justice raised by sustainable development point to the logic of environmental accounting in addition to financial accounting, so also do certain theories.

Stakeholder theory

If intra-generational and inter-generational equity are to be considered, all stakeholders (see Glossary) need to be taken into account. The needs of these groups involve considerations of social costs and thus a necessity for some environmental accounting as traditional accounting takes no account of these. For example, traditional accounts only take account of legislated environmental costs such as compliance costs or environmental fines, they do not take account of the costs of any wider impact of a process such as the impact of any airborne or waterborne emissions on ecosystems. For example, whilst Company 6 referred to odour and pollution problems which affected the neighbourhood of their factory, in terms of their accounts they were concerned solely with the fact that due to these problems they had:

“had to spend money on extraction equipment improvements and have had to then invest in modifications.” (Company 6)

Such wider impacts as these pollution and odour problems affect many more than just the immediately obvious stakeholders of those investing in a business or those employed by it. It affects those living in the immediate neighbourhood and also, potentially, those living further afield if any pollutants enter watercourses. It also affects future generations who may inherit a degraded area. This raises the issue of precisely who is included as a stakeholder by businesses.

This problem of definition of stakeholders has led to two forms of stakeholder theory.

One form argues that, quite simply, anyone who is affected by the business/organisation concerned is a stakeholder and has to be taken into account - this would embrace, for example, not only local businesses in the vicinity of a factory whose cash flows might be affected by any employment decisions taken by the factory management but also, for example, NGOs campaigning in general on behalf of various communities against certain forms of emissions, some of which this particular factory might emit. The other form of stakeholder theory argues that it is for the business itself to decide who are its stakeholders, after all they know with whom they have dealings and how they impact. The problems which Shell had with Greenpeace over the disposal of the Brent Spar oil platform, serve to illustrate the confusion that these two forms of stakeholder theory can create. Shell had, in this instance, gone through quite an extensive period of consultation when deciding how to dispose of Brent Spar. They thought that, not only had they followed the proper legal procedures, but also that they had consulted with all the stakeholders involved (Bardsley, 1998). However, they had not realised that Greenpeace, campaigning on behalf of everyone in general (all stakeholders) in order to (as they saw it) ensure the preservation of the eco-systems of the North Sea, considered themselves to be a stakeholder in this instance. Shell had decided who their stakeholders were (one form of stakeholder theory) and their perception of this proved to be different from the reality when Greenpeace intervened on the grounds of representing the wider constituency of those affected by Shell's actions (the other form of stakeholder theory). Where companies decide who their stakeholders might be, identification can be the problem.

Whilst stakeholder identification may be a problem, there is an increasing recognition of stakeholder rights in our society. It is now possible to monetise environmental impacts, indeed Company 3 stated that they:

"are now beginning to try to value the environment." (Company 3)

and such financial monetisation gives increasing grounds for the production of environmental accounts. Via these, the costs of environmental investments (currently embedded in production costs) might be given some recognition for their less tangible benefits. For example, investments by paper mills to reduce chlorine emissions to water

courses are a production cost which results in the potentially quantifiable benefit of rivers and streams being left alive with an eco-system, rather than almost dead with little by way of living organisms. Whilst social/environmental accountability is still overshadowed by the legal requirements for financial accounting, there is increasing evidence of the stakeholder need for environmental accounting.

Social responsibility of businessmen

It can also be argued that there is a need for environmental accounting if one takes account of the social responsibilities of businessmen. Howard Bowen writing as far back as 1953 argued that:

“The decisions and actions of the businessman have a direct bearing on the quality of our lives and personalities. His decisions affect not only himself, his stockholders, his immediate workers, or his customers - they affect the lives and fortunes of us all.

The individual businessman often fails to apprehend fully the connection between his private decisions and the public welfare” (Bowen, 1953, P3)

He goes on to pose the question:

“Do they have social responsibilities that transcend obligations to owners or stockholders?” (Bowen, 1953, P4)

and states that:

“The unrivalled freedom of economic decision-making for millions of private businessmen, which characterises our free enterprise system, can be justified not if it is good merely for the owners and managers of enterprises, but only if it is good for our entire society.” (Bowen, 1953, P5)

He defines the term “social responsibilities of businessmen” as:

"It refers to the obligations of businessmen to pursue those policies, to make those decisions or to follow those lines of action which are desirable in terms of the objectives and values of our society." (Bowen, 1953, P6)

As early as 1953, this was an acceptance of a business obligation to leave society as undisturbed as possible and an implied acceptance of the need to absorb social costs. It was a significant and early recognition of the rights of stakeholders, other than those who were immediately obvious as such, and the responsibilities of the business world to them.

Whilst there may have been this early recognition of 'social responsibility' it did not evidence itself in terms of any environmental accountability. Rather it emerged as a somewhat paternalistic attitude towards local communities and other stakeholders. Hence it was the local businessman who would often present the prizes at the local schools or the village fete. As time went by they might be persuaded to provide them as well or even donate money towards local organisations and good causes (often a function organised and controlled by the Public Relations department in a large organisation). This did not mean, however, that stakeholder rights received any real recognition. Indeed, it was often difficult to make the business world accept responsibility for the health and safety of their workforce (Baldwin, 1991), let alone any other areas of stakeholder responsibility. Whilst some, such as Bowen might have felt that there should have been some sort of societal and hence environmental accountability, there was little.

However, there may now be a sea change in attitudes occurring as evidenced by one interviewee stating that:

"Good environmental practice is an essential part of the business." (Company 5)

and later that they:

"have also improved relationships with the local community as a result of the environmental debate." (Company 5)

Legitimacy theory

Individuals like Bowen were early on pointing the way if not towards environmental accounts, then at the very least towards environmental responsibility. Stakeholder theory eventually reinforced this as also did legitimacy theory. Legitimacy theory :

“argues that organisations can only continue to exist if the society in which they are based perceive the organisation to be operating to a value system which is commensurate with the society’s own value system.” (Gray et al, 1996c, P46)

Thus, for example, our current value system holds that child labour is wrong and many organisations are sensitive to this. So we find B & Q saying:

“ The Indian rug industry is notorious for child labour, although domestic and international pressure is having a positive impact. B & Q felt that it was important to investigate the sources of machine loomed rugs to be supplied in 1995” (B & Q, 1995, P79)

Our value system also holds that extreme exploitation of a workforce is wrong, especially if this involves dangerous and unhealthy working conditions. Many consumers would prefer not to buy products produced under such conditions. Thus again we find B & Q saying:

“The most vivid image from the visit [to India] was the sight of workers pouring molten brass into moulds within inches of their bare feet. The poor ventilation and lack of dust extraction was of particular concern given the clear link between brass polishing and the occurrence of tuberculosis. Despite these problems, B & Q decided to work with the supplier to improve the factory, rather than to walk away from the problem or to boycott the supplier. The buying controller commissioned B & Q’s health and safety consultants to visit the factory at regular intervals and give advice.Progress has been significant.”
(B & Q, 1995, P71)

All of this effort by B & Q is about explaining to a very important group of stakeholders, its customers, that its operation as a business is environmentally and socially acceptable. In terms of legitimacy theory - its value system is the same as theirs. Likewise, the chemical industry following such incidents as Flixborough in the UK and Bhopal in India, have introduced their Responsible Care programme world wide (based on the original US Responsible Care programme) in order to persuade communities in the vicinity of chemical plants that no such incident is likely to happen again. Their intention is one of continuous improvement and this programme is a way of conveying to those concerned another, but different, set of stakeholders from the customers just discussed, that they are in earnest about this. Further, there is considerable pressure within the chemical industry not to have an 'incident'. It is felt by all concerned that an incident, however much it may be pure accident and unrelated to the practices of any other company, affects the whole industry's reputation with their stakeholders (for example, Company 4, section 4.4.5). This is an acceptance of environmental responsibility and an attempt to start absorbing, if not all, at least some social costs. It is also the operation of legitimacy theory, with the chemical industry via this programme, proclaiming to the world that their value systems are in line with various societies' value systems. (It also reflects both eco-efficiency and eco-justice; not only should the environment remain as undamaged as possible but also, no accident should be allowed to affect present or future generations.) It is also worth noting that such pressure is not exclusive to the chemical industry, as one interviewee from a company in a different industry commented that:

"Industry peer pressure." (Company 9)

was one of the major sources of pressure on the company to conduct themselves with environmental probity. So whilst environmental accounting may not have fully emerged under legitimacy theory, environmental responsibility (at least in some instances) holds true for businesses under this theory.

Under legitimacy theory, environmental responsibility was not held to be true in the Brent Spar case. Whilst there was every attempt to consult widely with all stakeholders, there may have been a divergence between perception and reality. The reality was that the option that Shell chose of dumping the oil platform at sea was probably,

environmentally, the best option (Wilkinson, 1995). They had, moreover, followed all the consultative procedures laid down and consulted widely beyond these. The perception of Greenpeace and (following their campaign) of the public, was that environmentally, this was not the best option. A huge stakeholder group had not been accounted for. Shell was faced with a problem, their values were not perceived to be the same as society's, they were outside legitimacy theory and therefore perceived to be unacceptable. This had to be altered and so Shell called in a public relations consultancy to help them alter the public's perception of their values (Detre, 1998) - they could do nothing to alter the sequence of events but they could do something to alter perceptions of themselves. Shell subsequently recognised that they had not taken account of all stakeholders, that they had 'got it wrong' and needed to be far more transparent in their operations in future. As a result they have moved towards attempting better environmental accounting and social responsibility by issuing their first world wide Social Report in Spring 1998 to stand alongside their separate Environmental Report, followed by a first UK Environmental and Social Report in Summer 1998. They were still trying to legitimize themselves and were moving towards environmental responsibility and hopefully, ultimately, environmental accounting in the process.

Systems theory

Each of the four different types of scenarios outlined above (and in line with Lindblom's legitimation strategies, Lindblom 1994), take account of the stakeholders involved and it could be argued that, together with stakeholder theory and the need for eco-justice, they are a very real and necessary reason for environmental accounting in addition to financial accounting. A further argument supporting this need can be posed in terms of systems theory. This holds that everything is inter-related and that, in the business world as in any other area of life, things cannot be examined in isolation. Everything is part of a system and other systems overlap with it. On this basis you cannot isolate and separate out the financial accounts from other aspects of the business, nor can you do the same with any environmental reporting or accounting that is conducted. Indeed, as one interviewee pointed out:

"How do you value the environment?" (Company 13)

By the same token, consideration of the various stakeholder groups is integral with these two processes, it is impossible to separate the one from the other because, in a sense, the business is the stakeholders. If one is going to produce financial accounts then environmental accounts are also necessary to complete the picture.

Corporate Citizenship

Finally, whilst less of a theory and more of a concept but one which is the subject of increasing discussion there is the issue of corporate citizenship. Put simply:

“The basic idea is to understand business as part of society, contributing directly to the welfare of society, rather than somehow separate from it.” (Ward, 2000, P1)

This has echoes of Systems Theory and allows that business cannot stand aside but has to *“make strategic choices based on an understanding of the total impacts of their business in society”* (Ward, 2000, P1). One facet of understanding these impacts is environmental accounting and it is of considerable value in this context. Given the increasing propensity of purchasers at any point in the supply chain to demand environmental information, then it may well become essential. Given also the increasing emphasis on Corporate Social Responsibility (CSR) in general, it may also become essential as a means of helping to prove this. Indeed, one interviewee commented that what environmental accounting they currently undertook was

“to find out where everything goes” (Company 7)

whilst another commented that

“it is the scientifically rigorous approach to managing environmental impact” (Company 9)

and a third that it

“is a good way of picking up issues” (Company 12).

All of these comments point to an awareness within businesses, of the need to minimise environmental impact and of environmental accounting as a potential route for monitoring this – all in line with CSR.

Therefore, not only is there some general feeling that businesses/organisations, and more particularly the individuals working at senior levels within these, have a both a general social responsibility and also a corporate social responsibility, but there is also some basis in the stakeholder, legitimacy and systems theories which supports this and points the way towards accounting for sustainable development and within this practising some form of environmental accounting in addition to the existing financial accounting.

5.3 Hypothesis 1 – hypothesis subset: Environmental accounting is both a necessary and useful process

According to the theories outlined above environmental accounting should be found to be both *useful* and *necessary*. Useful as a device to help achieve eco-justice and necessary, if all stakeholders are to be properly considered, if businessmen are going to accept their social responsibilities (and the social costs of their actions), if businesses are going to not only adopt but be seen to adopt the value systems of society and if businesses are going to accept that they are part of a system larger than their own. What was the evidence for this?

Evidence

With so many individuals and their representative bodies involved in the development of environmental accounting (ref: 1.5), it is clear that its development can be far from straightforward. If it was entirely obvious, then with all these organisations involved and at every level, solutions would have been found - but they have not. We have every indication of these difficulties from the problems of definition (ref: 1.2.1), of format (ref: 1.2.2) and of debate on the items for inclusion/exclusion. There are clearly problems of defining how wide the boundaries of social responsibility should be set in terms of the absorption of social and environmental costs. After all as one interviewee put it:

“the issue is what do you account for? How do you value the environment? CV?

The issue is accounting for the environment, it is one small step beyond this to

valuing carbon dioxide sinks etc. and paying for these.” (Company 13)

Whilst it may have been accepted that businesses are part of a wider system, have stakeholders to consult and must abide by the value system of society, the extent of this is still the subject of debate. A set of environmental accounts should be a way of representing, in quantified form, a company's environmental performance and responsibilities. It should be a way of presenting both the positive and the negative aspects of this and be in line with the theories outlined and, as a result, be both *necessary* and *useful* (hypothesis 1). The mainland European approach of the Oko-bilanz comes close to this as, since it gives physical measures of inputs and outputs broken down by type, it is possible to track all potential environmental impacts. As a result, it should be possible to discover potential social costs (or their absorption) and it should be possible for stakeholders in particular and society in general to discover whether or not a business is operating within societal systems and values. From the business literature an example of such good practice is the Oko-bilanz of Neumarkter Lammsbrau Oko-Controlling Bericht 1994 (Neumarkter Lammsbrau, 1995) which gives, for example, a detailed breakdown of waste amongst other items, categorising it into various types of re-usable and non-reusable waste in tonnes together with disposal costs and what they call “Valuable matter proceeds” in deutschmarks. So it is possible to see at a glance what impact there is, both physical and financial. Such environmental accounting is *useful*, in as much as it is possible to track required inputs/outputs at a glance and, in some instances, *necessary* where companies are in polluting industries and have to monitor emissions levels and other figures on a regular basis.

When we look at the Anglo-Saxon approach to environmental accounts (ref: 1.2.2ii) the construction is totally different. Here the emphasis is on financial data and more especially, costs. Indeed, in the EPA case study on AT & T (EPA, 1995b, P2) Green Accounting is defined as:

“Identifying and measuring the costs of environmental materials and activities and using this information for environmental management decisions. The purpose is to recognise and seek to mitigate the negative environmental effects of activities and systems.”

A survey of the existing literature on this approach might lead one to believe that the emphasis on environmental items is very much about cost savings and that in many ways this form of environmental accounting is still about dealing with the inherent limits of any one particular economic activity. For example, Schaltegger and Muller (Schaltegger and Muller, 1997) have written about environmental cost accounting, Jasch (Bouma & Wolters eds, 1999, Chapter 5) devotes herself to environmental costs and attempts to build up an environmental cost accounting manual, whilst much of the emphasis in CERs, in addition to the physically quantified inputs and outputs is on cost figures, for example, London Electricity (London Electricity, 1996) (see also Ditz et al., 1995, P15). However, other subjects which are regularly tackled are such areas as:

- assets and liabilities
- environmental provisions, liabilities and contingent liabilities
- estimation issues
- off-setting liabilities and expected recoveries
- de-commissioning costs
- adequate disclosure of liabilities and provisions

Costs and the other areas outlined above are all about the absorption of social costs. Whilst environmental liabilities and provisions are all about allowing for the absorption of social costs (for example, the clean up of polluted industrial sites), current environmental costs are concerned with absorbing social costs from the beginning (for example, the adoption of end of pipe technology to reduce emissions). This is concerned with social responsibility and working within society's systems and values. It is about the longer-term view which environmental concerns require but which traditional forms of accounting do not allow. However, the method of extraction of these figures and their presentation is still highly debateable within business and academic circles. For example, how do you properly account for estimated costs when long-term effects can only be guessed at and are as yet unknown? Just how such accounts should be handled may involve a value judgement and all value judgements are subject to challenge, especially

in the context of one of the theories outlined above.

Aside from the efforts of the professionals (and their representative bodies) involved, there have been some genuine attempts to get to grips with the problems within this Anglo-Saxon approach on the part of a number of companies, not the least, the AT & T case (EPA, 1995b) already cited. Interpretation of social costs and responsibilities varies and so where the emphasis lies may vary. The current literature demonstrates that, at present, this method of environmental accounting could be *useful* but at its existing evolutionary stage has not yet achieved a suitable format for use. The key to its increased usage clearly lies in the emergence of some sort of recognised format. An interesting aspect of the fieldwork was the fact that, on the whole, if the businesses were going to do anything by way of environmental accounting, they seemed to feel that a financial format might be relatively easier. For example, one interviewee commented that it was merely a question of:

“Devising a programme or format; extracting the figures; coding the figures in a useful way.” (Company 6)

If such a format could be devised this would clearly assist this development. As other environmental initiatives have developed they have adopted a systemised approach and there is no reason for thinking that the same could not be true here. For example, as EA developed the British Standards Institute (BSI) became involved in devising a standard for environmental auditing (BS 7750). This was followed by the development of the EU Eco-audit scheme (EMAS) and the evolution of the BSI standard into the new International Standards Organisation (ISO) standard of ISO 14001. The EC Accounting Advisory Forum's paper of 1996 was a move in the direction of standardisation towards a format for financial environmental accounting (Federation des Experts Comptables Europeens, 1996). Whilst this was by no means a complete framework for environmental accounting, it went some way down the road of indicating what should be found in such accounts. The CICA research report (CICA, 1993) also went into great detail concerning the handling of environmental costs and liabilities, whilst the EPA document (EPA, 1995a) was also at the beginning of going down the path of giving detailed guidance. Just as in the early days of environmental auditing there are, therefore, the beginnings of

a certain systematisation. There is hope for the development of a format for financial environmental accounting, which will serve to underline how *useful* this technique can be.

Activity Based Costing (ABC) is a further development in this process. It has been developed in North America and is a means of costing on an activity basis, such that it becomes immediately clear where any environmental burden lies. As a result it becomes easier to see where social costs must be accepted and environmental improvements can be made. Whilst not full financial environmental accounting, ABC is clearly *useful* and, in some instances, may be *necessary*. Unfortunately though, a full financial format for environmental accounting does not currently exist. Given this, then whilst many might consider environmental accounting useful it is clearly, as yet, not considered *necessary* by businesses.

For the mass-balance format on the other hand, formats do exist. The Danish Law mentioned above (Danish Ministry of Environment and Energy, 1995a & 1995b) is likewise fairly specific as to what should be included in any Danish company legally required to produce 'Green Accounts'. The literature also points to what should be included and the fact that the Danish Steelwork Company (Det Danske Stalvalsevaerk A/S, 1994) can produce such a clear Mass Balance and "Environmental Declaration" pre-dating this act, indicates the progress being made with the Mass Balance format despite the difficulties. Nevertheless, whatever the method used, it is clearly as yet, far from easy to construct a set of environmental accounts.

Despite its developmental stage, the *literature survey* (including the business literature) demonstrated that the basis for the future development of environmental accounting existed. This also became clear from the *CERs survey* (ref: Chapter 2). There was already some use of environmental accounting within these but mainly in the Oko-bilanz format; there was also fairly extensive use of quantitative data. However, in the same way that the literature survey had been inconclusive, the CER survey also failed to demonstrate that environmental accounting was both *useful* and *necessary* (hypothesis 1), even though the various theories would hold this to be true. The *fieldwork survey*, on the other hand, demonstrated that, for most companies there had been adoption in

something of a piecemeal fashion, of various forms of environmental accounting. Company 20, for example, could track all its environmental figures with great precision on a computerised basis. Company 18 published some environmental accounts along with social accounts in its CER. These two companies also represented the two accounting approaches of the physically quantified input-output figures and the financial ones. Whilst most of the companies demonstrated that environmental accounts were useful. The *necessity* for constructing these as a separate item was less obvious. The interviewee for Company 13 summed up the situation by saying:

“There is a certain inertia in the business system, plus the issue is what do you account for? How do you value the environment?”

Whilst another interviewee commented:

“Yes, issues can be overcome but commercial sensitivity is an issue.” (Company 3)

The fieldwork survey had demonstrated that for all of them, environmental accounting was *useful* but not *necessary* (hypothesis 1). This is significant in as much as whilst some of the literature might imply that all of hypothesis 1 holds true:

“Thus, business cannot fully embrace the necessary environmental changes until accounting and finance have done so. For these pragmatic reasons if for no other, accountants must learn to incorporate environmental factors. . . . ”
(Gray et al, 1993, P10)

in practice, this is clearly not the case. Despite the theoretical underpinning, part proof only existed for hypothesis 1 and with this, part proof only for one of the “various reasons” referred to in the main hypothesis.

5.4 Hypothesis 2 – hypotheses subset: Environmental accounting is not a public relations device but is integral within the management process and therefore valued by the business world.

If businesses acknowledge the necessity of absorbing much of their social costs, if they are both socially responsible and living within the norms of societal values and systems, then environmental accounting is needed within the management process. If integral with this and if they truly accept these responsibilities and costs, it will be valued as a process and not as a public relations device. Schaltegger (Schaltegger et al, 1996) and others have written about the value of environmental accounting within the management accounting process. Such literature is limited in nature and fails to demonstrate environmental management accounting's value within the context of hypothesis 2. This is confirmed by Willequet, De Beelde and De Clerq (Bouma & Wolters, eds., 1999, Chapter 2) who suggest that, whilst they consider that there is an adequate literature relating to environmental management accounting, it is insubstantial. Nor was the *CERs survey* expected to inform this hypothesis as the management accounting process, by its very nature, is seldom discussed publicly given the potential commercial sensitivity of these figures. This proved to be the case. It was thus hoped that the *fieldwork survey* would, by discussing this process confidentially and in the field, be able to provide evidence relevant to hypothesis 2. The fieldwork survey found that any environmental accounting of however fragmented and rudimentary a nature conducted within the management accounting and thus management process, proved to be far from a public relations device. In fact, it would not normally be expected that anything considered within this management accounting process would be a public relations device, as this is a process confidential to a business and not for public consumption. The findings were that where they existed, environmental considerations were integral in this process whether these were financial or physically quantified figures. For example, in answer to question 10 of the questionnaire concerning the importance of environmental accounts figures in the management accounting process, one interviewee responded:

"They are of increasing importance. There is now an environmental accountant doing cost benefit analysis on all our schemes working within the company and trying to balance capital v operating costs." (Company 3)

whilst another commented:

“They are important in terms of IPC and in helping to produce the corporate profile on the environment. They are good and they will be super.” (Company 13)

Other companies were less developed with this process:

“They are currently being considered.” (Company 16)

There was clearly some variation within these businesses when it came to consideration of social costs and responsibilities within this management process. However, as has already been noted, companies cannot expect to ignore ecological sustainability in future. Whereas the management and management accounting process in the past may have taken account only of the forces present in the Porter model (Porter, 1985) such as competitors and market behaviour, in future they must also take account of natural capital and the stress that they may be placing on this whether of a direct or indirect nature. The issues here are those of the limitations of traditional accounting, as against the need to do damage costing both for avoidance and remediation. The latter does not have the two-year payback mentioned as necessary for any investment by Company 15 (ref: Table 10). As Rubenstein tells us (Rubenstein, 1994, P83) damage costing involves the:

- *identification and estimation of potential emissions and their impacts*
- *modelling the dispersion of airborne and waterborne emissions for their wider impact*
- *quantification of the physical impacts on human health, agriculture and natural ecosystems and all based on established “dose response functions”*
- *monetisation of physical impacts based on the principles developed by environmental accounting*
- *accounting for estimated costs*

This involves a sea change within the management process from an essentially short

term, often two-year and at most five-year view, to one of a much longer term. After all wider impacts may take much longer to emerge, such as the effects on watercourses and ecosystems of the intensive farming systems introduced post 1945. It also requires an accounting and management process which takes account not just of the business itself and only the business, but also of the world outside. Modelling the dispersion of airborne and waterborne emissions and monetising their physical impacts requires this. This is something that has not been required before in the management process; it has seldom looked beyond minimising the obviously harmful effects of business activities. For example, the health effects of airborne emissions have very seldom been accounted for (Baldwin, 1991). Traditional accounting, including management accounting, has looked at finite economic activity. Moreover, where there are less tangible benefits to environmental investment, why should that investment be made if there is not a direct return to the business? Businesses see profit as a return on risk. If some of that risk is environmental, this has not in the past been of any great concern – hopefully it is not their environment which is affected.

The future may be different; short-termism, ignoring less tangible benefits and only seeking returns on investment may not be possible. There may be future costs in doing nothing, for example, the 40 tonnes of mercury which Norsk Hydro have under one of their old chlorine plants in Norway (Baldwin, 1991). The management process cannot ignore this.

Ecological sustainability is as essential as economic sustainability and impinges on all business aims. It is a major rationale for having environmental accounting as part of the management process. However, the fieldwork demonstrated that whilst it is currently in place within this process, it is in fragmented form and the second hypothesis on testing with this fieldwork could not be proved. Again, one of the “various reasons” alluded to in the main hypothesis was therefore not in place.

5.5 Hypothesis 3 – hypotheses subset: World wide societal pressures are driving the use of environmental accounting and these are overriding commercial pressures, such as the absolute need for profit maximisation

The first part of the fieldwork and its analysis was concerned with the role that

environmental accounting currently plays within the business world, especially within the management and management accounting process. It also looked at other environmental initiatives and how these fitted with environmental accounting and with the wider picture of what was happening within the sample companies. However, none of this told us what lay behind interest in these initiatives: whether it is part of an overall pattern of business concern for the environment; whether it is reaction to selective targeting of businesses by external organisations; whether it is a response to governmental or EU regulation; whether it is a new marketing ploy; or whether it is a passing fashion. In other words, it tells us nothing about societal pressure on businesses to accept their social/environmental responsibilities, the pressure on them to operate within particular social systems, to abide by social values or to take account of all their stakeholders. Vicini maintains that the most significant pressure on companies is national and international regulation and that *“Pressure from society (law, environmental organisations, customers and employees) is stronger than the pressure from the market (suppliers and financial institutions).”* (Vicini, 1998, P18)

That companies face environmental pressure of various kinds is an undoubted fact of life. This emerged from the literature survey and was quite clearly shown to be the case within the CERs and fieldwork surveys. Indeed, we are told:

“pressure from stakeholders influences companies to consider environmental issues and to take initiatives to decrease the environmental impacts from processes and products.” (Vicini, 1998, P17)

These pressures seem to come from a variety of sources, not the least, pressure groups and legislation. What was also clear from the fieldwork was that large companies, in particular, are sensitive to and possibly more of a target for such pressures. Do such pressures on large companies happen because:

- by being large they are more of a target? (e.g. Company 19 felt this as they referred to ‘never knowing when they might have their Greenpeace’.²⁸)

²⁸ It is also worth noting that larger companies within the CER survey were also highly likely to

- because they are large it is more difficult to conceal environmental problems? (e.g. Company 9 remarked that they “must demonstrate their environmental credentials. Every company wonders where its Brent Spar is coming from, in a sense we want capital in the bank. We also need a good risk management strategy.”²⁹)
- because size often means global involvement, therefore increasing environmental exposure? (e.g. Company 14, which was targeted by environmental pressure groups in the USA)
- large size means large-scale plant, concentrating environmental problems? (e.g. Company 1, which by virtue of being involved in the oil industry has large-scale plant which has had the attention of pressure groups in the past. It is very obvious when there is an environmental problem due to their size.)
- large size means companies are ‘blue chip’, which means they may be very concerned with and sensitive about their share price and anything, such as environmental issues, which could affect this. (e.g. Company 9 displayed such sensitivity in the remark quoted above.)
- large size means that they are more likely to be selling under their own brand name, whereas medium sized and small companies often make own brand products and so their name is less in the public arena (e.g. Companies 5, 6 & 15 all do so and it is unlikely that the general public would have heard of them whereas Company 17 sells under its own name and is well known.)

Certainly, the responses to the questions concerning environmental pressure seem to have been more closely related to size of company than to economic activity or sector of

produce a CER to gain publicity for a new environmental initiative/policy/direction. This may indicate a need to demonstrate environmental probity and justify themselves in terms of their environmental policies.

²⁹ Large companies within the CER survey were highly likely to mention air emissions. This may demonstrate an inability to hide these, especially where their large size meant that they had large scale plants, and therefore a need to reassure their stakeholders that these were in line both with consent levels and what was considered acceptable by the communities affected.

the economy. Even for the two large companies involved in the tertiary sector within the sample, one had its responses evenly split between yes/no answers (Company 19), whilst the other one was very firmly (almost surprisingly) in the category of those responding more “yes” than “no” (Company 17). Whatever the reason, overall, the businesses displayed a consciousness of societal pressures in the environmental field.

The importance of the absorption of social cost:

That companies and especially large companies are susceptible to environmental pressure is undoubtedly true. This pressure may have grown with the growth in acceptance of the ‘polluter pays’ principle together with the idea that businesses are both socially and economically responsible for their actions. This whole area had been highlighted by the Brundtland Report of 1987 (World Commission on Environment and Development, 1987) on a general basis and by particular events such as the Exxon Valdez disaster of 1989, after which some of the business world had confronted the need for environmental responsibility by signing up to the Valdez Principles³⁰. This was followed by the International Chamber of Commerce (ICC) Charter for Sustainable Development (ICC, 1991), the introduction of the EU EMAS scheme of 1993, increasing emphasis on LCA and the broadening of Total Quality Management (TQM) into Total Quality Environmental Management³¹. This all seems evidence of a general acceptance of the need for increased environmental care and a need to absorb at least some element of social costs. There was clear evidence of society acting in accordance with the theories outlined at the beginning of this chapter.

This was reinforced by considerable pressure at national levels to account for the

³⁰ The Exxon Valdez disaster refers to the incident in Prince William Sound, Alaska, when Exxon’s oil tanker the Valdez ran aground spilling 11m gallons of oil and devastating the ecology of the area. The Valdez Principles which resulted from this, were an attempt to persuade companies to sign up to a charter requiring a commitment to sound environmental management systems, environmental auditing, the release of emissions data and a commitment to sustainable development.

³¹ In the UK this was characterized by the broadening of the TQM standard from BS 5750 to EMS of BS 7750. Internationally these became the ISO 9000 series and the ISO 14000 series.

environment and accept responsibility for any environmental impacts. For example, the EU speaks of the necessity for:

“a harmonised European system of integrated economic and environmental indicators and accounts which addresses the problems of the various economic sectors and policy fields at various scales. . . .” (COM (94) 670 final, 21.12.94)

This has been addressed via two Green Accounting Research Projects (GARP I & GARP II) at EU level which have used an Impact Pathway Analysis (IPA) to try and arrive at costings for environmental damage figures, which can then be incorporated into National Income Accounts as environmental satellite accounts. The methods used have been the subject of debate, however, if financial values can be ascribed to particular environmental damages and these can be traced to particular processes, then the logical conclusion is to push these costs onto the polluter. In the face of such an inexorable conclusion to this trend, then companies are going to have no choice other than to conduct some environmental accounting of their own in the face of this ‘polluter pays’ principle.

Regardless of size, the fieldwork survey found that the businesses concerned had experienced a wide range of pressures, especially from pressure groups and legislation. For Company 9 to remark in an environmental context that they needed ‘capital in the bank’ is some indication that they are finding themselves having to spend rather more on environmental initiatives than they might consider desirable. Company 18 had found that they had sacrificed profits in order to be able to produce their comprehensive (and award winning) set of environmental and social accounts. On the other hand, Company 17 had made it abundantly plain that they were not prepared to sacrifice any of their commercial targets for environmental initiatives (including accounting) and were only too keen to push this responsibility onto their suppliers. Whilst Company 10 had found that they could embrace environmental initiatives, conduct some environmental accounting for them and still be profitable – if not more so. So whilst the companies had experienced societal pressure which might well be driving them towards the use of environmental accounting, this pressure might not be sufficiently strong to over-ride commercial considerations as yet. Hypothesis 3 was, like hypothesis 1, only partly proven despite the

theoretical need for all companies to face their social responsibilities. In the same way that hypotheses 1 & 2 of the hypothesis subset had also not provided full proof of the “various reasons” mentioned in the main hypothesis, hypothesis 3 of this subset had likewise failed to do so.

5.6 Conclusion

The literature, CERs and fieldwork surveys have indicated a powerful trend towards increasing use of forms of environmental accounting and hence proof of the hypothesis and its subset. Undoubtedly environmental accounting exists as a “nascent technique” as also do a variety of reasons why it ought to become established within a business context. As Ditz et al. remark, “Environmental accounting is more than “green bean counting”.”(Ditz et al., 1995, P21) and indeed environmental accounting is a powerful tool for identifying environmental costs, liabilities, provisions and savings or for tracking inputs and outputs in order to minimise the former and maximise the latter with minimum environmentally harmful outputs. If fully integrated into the management process, it can assist with compliance requirements and can certainly assist in the thorough comprehension of how processes can be managed for greater efficiency and a better contribution to profitability. However, for environmental accounting to develop into an integral part of the management process there needs to be further evidence of the utility of the information gathered and developments in cost effective methods for gathering the data in a usable form that can impact on the business. It is clear from the primary research that the above will happen (see section 5.4, especially the comments from Companies 3 & 13) but in a differential manner with those exposed to societal pressure doing more, sooner and more publicly, than those with a lower profile as far as environmental issues are concerned.

Despite this powerful argument and despite there being a trend towards increasing use of forms of environmental accounting, it has yet to be implemented by many companies. Ditz et al. go on to remark that *“However interesting the numbers, firms will not go through the trouble and expense of developing them unless they can be used to enhance productivity and profitability.”* (Ditz et al, 1995, P21). This goes back to the concept of business utility mentioned above and briefly discussed in Chapter 3 (3.2), it also echoes what many of the companies, such as Company 6, had stated – that they could access the

figures but that it meant recoding them. This currently meant time (and as a result money) and also persuading the accountants within the company that it was necessary. In other words “trouble and expense”. However, it is also clear that where environmental accounting in any of its various forms, can be shown to increase productivity and profitability, there is significant impetus to use it and develop further the techniques.

Overall, despite the strong trends and sound business reasons involved, the hypothesis subset remained only partially proven. Given that there is insufficient proof of the reasons why environmental accounting should become established (the hypothesis subset), the conclusion has to be drawn that whilst environmental accounting is undoubtedly established as a “nascent technique”, it is as yet insufficiently well developed in sufficient companies to predict with certainty that it “will become established within a business context” as suggested by the main hypothesis.

GLOSSARY

Agenda 21: Agenda 21 is the “action plan for sustainable development” (Reid, 1995, P185) which emerged from the Rio Conference. It is very broad ranging and covers a huge range of issues. Its emphasis is also on community involvement and a ‘bottom up’ approach to the issues involved in sustainable development, on the involvement of ordinary people. As a result, local authorities, to a greater or lesser degree, have become involved in issues of sustainable development and in action plans for the achievement of Agenda 21.

Bottom line: The term used to refer to a business’s annual profit level. Whilst this is a term used loosely, it is normally taken to refer to net profits as opposed to gross profits as this is the bottom line on a company’s Profit and Loss accounts.

The City: The term ‘the City’ refers to the City of London which is “the centre of the UK’s financial system, embracing the Money Markets (commercial Banks etc.), Capital Market (Stock Exchange), Foreign Exchange Market, Commodity Markets and Insurance Markets.” (Pass & Lowes, 1993, P69)

ENVMAC: Environmental Management Accounting

Factors/Factors

of production: *Factors* or *factors of production* are the inputs into a firm which are needed for the production of a good or service. They are: land (this includes not just any land that may be directly needed by the business but also any natural resources, derived from land, and used by the business in a raw or refined state); labour; capital; entrepreneurship (this latter is usually included these days, as it is considered impossible to combine the three previous factors of production without this intangible ingredient).

GDP: Gross Domestic Product denotes the goods and services and the income stream derived from these produced by all the factors of production owned and held by the nationals of a country within that country’s

borders.

GNP: Gross National product denotes the goods and services and the income stream derived from these produced by all the factors of production owned and held by nationals of a particular country both within and outside that country's borders.

Institutional

Investors: The Institutional Investors, in the main, comprise the insurance companies and pension fund managers. Both of these have vast sums of money to invest on behalf of individuals against eventual payments of pensions, endowment policies, claims against household insurance or life insurance and so on. Between them, they now constitute over fifty per cent of all the transactions conducted on the London Stock Market and are, therefore, significant players in this market.

Life Cycle

Assessment/

Analysis/

Inventory: The term *Life Cycle Analysis* is still used, however, the terms *Life Cycle Inventory (LCI)* and *Life Cycle Assessment (LCA)* are also used to denote the two different stages of an LCA, namely:

the initial stage, where detailed data collection takes place on input use, emission and waste generation and so on, for each stage of the product's life cycle (LCI)

the second stage, where the findings of the first stage are evaluated. At this stage data is interpreted and value judgements may be made (LCA)

Other terms which are used in this context, and often interchangeably, are: *Cradle to Grave Analysis; Eco-balancing; Material Flow Analysis.*

The line: Within the business world, when anyone refers to the 'line' they are

referring to the chain of command which starts at the top with the MD/CEO and goes down through the production director and production managers to the shop floor (in the sense of factory floor) to those who are, for example, working machines. It is terminology, therefore, which is peculiar to the secondary /manufacturing sector.

Oko-bilanz: Is an eco-balance or a way of showing all the inputs into and outputs from a particular process or production site, expressed in units of physical quantities.

Market niche: A market niche is where a market may already be divided up into various sub markets or segments but it is still possible to further subdivide it. As a result of skilful marketing, a company may persuade certain consumers that their product is unique in some way, and is particularly appropriate to them. For example, in ladies wear, a particular designer label may be no better or worse than any others but a narrow part of the segment that buys designer wear may have been persuaded that it caters especially for their lifestyle

Market

segment: One of the objects of marketing is to divide up markets into segments in order to persuade consumers that there is not just one product but several all of which have unique characteristics. For example, in recent years, the market for soft fizzy drinks has been segmented by manufacturers producing energy giving/health drinks and persuading those indulging in sporting activities that these are what they need to give them energy, without damaging their health. Market segmentation is all about giving your product a USP (unique selling property). If consumers think that a product is unique then, in effect, a manufacturer has succeeded in creating a monopoly situation for themselves. They have no other competition and within this tiny part of the market they can sell for a high price and high profit.

Payback: The term 'payback' is a technique used in the management accounting

process when appraising investment proposals. It looks at the cash flows projected to be generated by the investment and tracks these to discover what period of time will elapse before the original sum invested is recovered (or paid back) from these cash flows. Payback periods vary from one industry to another, the norm in recent years has been considered a two to five year period, with two years considered preferable. However, in capital intensive industries, such as steel production or fertiliser manufacture, where huge capital sums need to be invested in new plant, the payback period can be at least ten years and as much as twenty.

Production

Function: The categories of activity found within a business are often referred to as functions. There are usually held to be four: finance, marketing, human resources and production. Thus, the production function refers to everything which is concerned exclusively with producing the good or service of the business concerned.

SME: SME stands for small and medium sized enterprise. Definitions of business size are difficult (see section 3.5.5). Definitions of 'small' and 'medium' can derive from a whole range of factors such as turnover, number of employees or market capitalisation, if indeed this latter can be estimated.

Stakeholder: A 'stakeholder' is taken to mean anyone with an interest in a business, whether this is direct or indirect. Previously it was only direct stakeholders who were considered such as the owners or shareholders and possibly employees, especially the management, and customers. This has now been broadened to include all employees, even the 'shop floor', suppliers, the local communities where a business is located or has an impact. Increasingly, also, as NGOs have campaigned on general environmental issues many of which relate to the environmental impacts of a wide range of businesses, these bodies have also come to be seen as stakeholders - but of a general nature and representing whole

communities or nations.

Sustainability

Definitions: *Brundtland definition:* “Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.” (World Commission on Environment and Development, 1987, P43)

John Gummer’s definition: “Living off the interest rather than the assets.” (In this context the environmental assets.)

John Elkington’s definition: “Equal opportunities for future generations” (Elkington et al, 1991, P221) This actually refers to sustainable development but was the definition quoted.

TRI: Toxic Release Inventory, that is, a listing of any potentially toxic substances which could be released into the environment.

Triple bottom

line: The triple bottom line refers not only to a company’s financial accounting (see bottom line above) but also to its environmental and social accounting. It is now felt by many that not only should a business account to its shareholders for its financial good housekeeping but also for its social and environmental impacts.

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APPENDIX A

A.1 The views of national and international bodies on what constitutes a good CER

- *UNEP & ISAR*

Various UN bodies have looked at this issue of the form and content of a CER. In the UNEP Technical Report No. 24, (UNEP, 1994) SustainAbility developed a five-stage model (originally introduced in Coming Clean, 1993) for corporate environmental reporting and the implications of their Report are that companies should adopt the form and content for their CER of Stages 4 or 5³². SustainAbility then revised its model for the UNEP publications of 1996 (UNEP, 1996a & 1996b) and its 1997 survey to allow for the development of such techniques as environmental accounting and bench marking.

The Intergovernmental Working Group of Experts on International Standards of Accounting and Reporting (ISAR) (currently serviced by the UN Conference on Trade and Development - UNCTAD) has also expressed a view on, not only corporate environmental disclosure via financial reporting, but also environmental reporting. They also perceive a need to communicate quantitative environmental data and look for form and content in CERs.

Form and content began to emerge in Spring 1999 when the Coalition of Environmentally Responsible Economies (CERES) announced their Global Reporting Initiative (GRI) of draft guidelines for what they called sustainability reporting, that is, environmental reporting. 25 companies worldwide signed up to test these guidelines, which are very exact in their requirements for: the key indicators that should be included,

³² These two stages are as follows:

Stage 4, Provision of full TRI-style performance data on annual basis. Input-output data for service companies. Corporate and site reports. Available on diskette or online. Environmental report referred to in annual report.

Stage 5, Sustainable development reporting. Aim: no net loss of carrying capacity. Linking of environmental, economic and social aspects of corporate performance, supported by indicators of sustainability. Integration of full-cost accounting.” (UNEP, 1994, P20)

13 categories in total; the qualitative characteristics, 11 categories; the underlying assumptions, 5 categories.

- *European bodies*

It was clear from the ACCA Report (Owen et al., 1997) on the Sixth Year of the Environmental Reporting Award Scheme that by then its judges could distinguish a certain form and content for CERs. They were looking for: quantitative data; targets set against which companies can measure themselves; in this context, at least some industry (if not wider) bench marking; 'multi-way' dialogue with stakeholders; and some move along the road towards putting their business in a sustainable development context. These criteria are very similar to those used in judging the First (and subsequent) European Environmental Reporting Award Scheme (1996/97) (Environmental Accounting & Auditing Reporter, 1997c, P2). So within Europe there seems to be a certain amount of agreement as to the content of a good environmental report. This is further underlined by work conducted by the European Federation of Financial Analysts' Societies (EFFAS), who produced a report "Environmental Reporting and Disclosures" in 1994 (Muller et al., 1994) and by the Swiss Bankers Association who have also addressed the same issues.

Other European bodies concerned with environmental reporting have indicated what they would like to see by way of form and content for a CER. The standard setting body for Germany (Deutsches Institut für Normung) has issued guidelines on environmental reporting. Called "Environmental Reports for the Public (DIN 33922)" (EAAR, 1997, P3). It seems to be aimed at facilitating the comparison of different reports and as such, has tried to devise guidelines that can apply to a whole range of companies, regardless of size and economic activity. It has, therefore, not focussed on content in detail but on what in general should be included (EAAR, 1997, P3). This German organisation is a standard setting body similar to the BSI in the UK; these bodies purely examine content and try and standardise approaches to different areas.

The development of this German standard is interesting as, with the increasing involvement of government or quasi government bodies in environmental reporting, it is an indication of the future possible emergence of an ISO standard relating to

environmental reports, in much the same way as ISO standards have now been developed for Environmental Management Standards (EMSs) and related areas (the ISO14000 series of standards). Given that one of the technical sub committees of ISO (the Technical Committee 207, Environmental Management Sub-committee 4 on “Environmental Performance Evaluation” KPMG, 1997a) is already addressing environmental reporting in their work, it is reasonable to suppose that such a standard cannot be far away. This will be given further impetus by such other developments as the Dutch government’s plans to make a CER mandatory for companies undertaking certain economic activities. Clear guidelines need to be and will have to be established. Such guidelines already exist within Europe for a few specific industries, such as those produced by the European Chemical Industry Council (CEFIC). In the UK there have also been recognised guidelines produced by such bodies as the Confederation of British Industry (CBI). Whilst also in the UK, the ACBE has said that not only does it feel that an environmental report is desirable but that also, it should address certain areas (DOE, 1997a, Pp7-8).

All the above suggested some sort of form and content for those CERs produced by European businesses.

- *North America*

In North America guidance as to CER form and content has emerged from various organisations. For example, the CICA place great emphasis on the requirements for quantified data as part of the reporting process, whilst the US EPA also places such emphasis on the need for quantification (indeed, they have a significant programme running on environmental accounting).

In order to facilitate the process of environmental reporting, not only for the US but also for the whole of North America, there have been some guidelines suggested by the Public Environmental Reporting Initiative (PERI). Recommendations for environmental reporting have also been suggested by the Global Management Initiative (GEMI, USA). It would seem that in north America, form and content is beginning to emerge and of a quantitative nature.

A.2 Company environmental reports analysed (100)

TABLE 2: COMPANY ENVIRONMENTAL REPORTS ANALYSED (100)

(Latest available at the time of the analysis)

Company	Year	Size	Sector	Nationality	Economic activity
ABB	1997	L	S	Swedish/ Swiss	Global engineering group
Anglian Water	1997	Top 500 M	S, T	British	Water treatment and supply; waste treatment; new technologies
Arjo Wiggins (Fine Papers)	1996	Top 500 M	S	French/UK	Paper manufacture
ASG AB	1996	M	T	Swedish	Transport and logistics
Astra	1997	L	S	Swedish	Pharmaceuticals
AWE	1996	M	S	British	Manufacture of atomic weapons etc.
Aylesford Newsprint	1996	M	S	South African	Paper making
BAA	1997/ 98	FTSE 100	T	British	Airport management
B & Q	1997	M (Note: parent co.)	T	British	DIY retailing
Bayer	1997	L	S	German	Chemicals & pharmaceuticals
Beacon Press	1996	S	S	British	Printing
BG	1996	FTSE 100	P	British	Gas exploration, production, storage, transmission, research & technology

Company	Year	Size	Sector	Nationality	Economic activity
BHP	1997	L	P, T	Australian	Mineral etc. extraction & specialised service industries
BNFL	1996	M	S	British	Nuclear fuel reprocessing.
Body Shop	1997	M	T	British	Retailer, toiletries
Boehringer Mannheim	1996	M	S	German	Pharmaceuticals
Bosch-Siemens	1996/97	L	S	German	Manufacture of electrical consumer goods
BP	1996	FTSE 100	P, S,T	British	Oil & gas exploration, extraction, production, distribution & retailing.
British Airways	1998	FTSE 100	T	British	Air transport
BSO Origin	1994	M	T	Dutch	IT specialists & consultants
BT	1997	FTSE 100	T (S)	British	Telecoms
CLP Holdings	1997	L	S	Chinese	Electricity generation & supply
James Cropper	1995/96	S	S	British	Paper making
Daimler-Benz	1996	L	S	German	Engine/car technology
Det Danske Stalvalsevaerk A/S	1996	M	S	Danish	Steel production
Dow	1997	L	S	US	Conglomerate - chemicals, plastics, hydrocarbons & energy
DSM	1996	L	S	Dutch	Conglomerate - chemicals & materials

Company	Year	Size	Sector	Nationality	Economic activity
Eastern Group	1996/ 97	FTSE 100	S, T	British	Energy generation and supply (fully integrated electricity & gas)
EMI Group	1996	FTSE 100	S, T	British	Music recording & production; music retailing
Enso Group	1997	M?	S	Finnish	Paper & board
Eskom	1997	L	S, T	South African	Energy generation, transmission, & distribution
Fiat	1997	L	S	Italian	Car, van, truck production.
GlaxoWellcome	1996	L	S	British	Pharmaceuticals
Guinness plc	1997	L	S,T	British	Production & distribution of alcoholic drinks.
Hickson International	1996	Top 500 M	S	British	Speciality chemicals
IBM	1996	L	S, T	US	Manufacture & supply of computer systems
ICI	1997	L	S	British	Basic & speciality chemicals
Interface	1997	L	S	US	Carpets, fabrics, floorings
Inveresk	1997	M	S	British	Paper manufacturer
John Moores University	1997	M	T	British	Higher education
Kraft Jacobs Suchard	1991- 95	L	S	Swiss	Manufacture of food products
Kvaerner	1996	L	S	Norwegian	Conglomerate - maritime transport, construction & engineering

Company	Year	Size	Sector	Nationality	Economic activity
Landis & Gyr	1996	L	T	Swiss	Consultancy in the fields of construction, utilities, payphone systems & visual security devices
Layezee Beds	1996	S (Note: parent)	S	British	Bed manufacture
London Electricity	1996	M	T	British	Purchase distribution & sale of electricity. Some gas interests and some power generation.
London Transport	1997	M	T	British	Transport services
Magnox	1996/97	M	S	British	Nuclear power generation
Manweb	1995	M	T	British	Electricity distribution. Some energy generation, gas supply & consultancy.
Marks & Spencer	1996/97	L	T	British	Retailing; clothing, food & household items
MoDo	1997	M	S	Swedish	Paper & board, sawn timber & pulp production
Monsanto	1997	L	S	US	Conglomerate
Morrison Construction	1995/96	M	S	British	Construction: roads, public buildings, shopping centres, housing association complexes
National Grid	1996/97	FTSE 100	S	British	Energy transmission
National Power	1996	FTSE 100	S	British	Power generation
NatWest	1996/97	FTSE 100	T	British	Financial services

Company	Year	Size	Sector	Nationality	Economic activity
Neste	1996	L	S	Finnish	Oil, chemicals & energy
Neumarkter Lammsbrau	1994	S	S	German	Brewers - beer
Norsk Hydro	1997	L	P,S	Norwegian	Conglomerate
Nortel	1994	L	S, T	Canadian	Telecoms co. Developers of communications products, systems and networks. (Electronics manufacture and supply.)
Northern Electric	1995/ 96	M	T	US	Distribution and retailing of electricity
Northumbria Water Group	1997	M	S,T	French	Water treatment and supply; waste treatment and energy generation
North West Water	1996/ 97	M	S, T	British	Water treatment & supply; waste management.
Novo Nordisk	1996	M	S	Danish	Health care products
NSK -RHP Europe Ltd.	1996/ 97	M	S	Japanese	Production of bearings for aero - space, automotive and industrial machinery markets
Nuclear Electric	1994/ 95	M	S	British	Nuclear electricity generation
Ontario Hydro	1995	M	S	Canadian	Electricity generation and supply.
Powergen	1996	FTSE 100	S	British	Power generation

Company	Year	Size	Sector	Nationality	Economic activity
Procter & Gamble	1996	L	S	US	Production of branded & packaged goods: household and personal care products
Rhone-Poulenc	1996	L	S	French	Chemicals & pharmaceuticals
Rio Tinto	1996	FTSE 100	P	British	Mining & mineral extraction
Rohm & Haas	1996	L	S	US	Speciality chemicals
Royal Dutch/Shell Group	1996	FTSE 100	P,S,T	UK/Dutch	Oil & gas exploration, refining, distribution and retailing
Safeway	1996/97	FTSE 100	T	British	Food retailing
J. Sainsbury	1996	FTSE 100	T	British	Food retailing
Salus	1996	M	S	German	Health food products
SAS	1996	L	T	Swedish	Transport & hotel services
Scottish Hydro-Electric	1997	Top 500 M	S	British	Energy generation
Scottish Power	1997/98	FTSE 100	S, T	British	Energy generation; water supply
Severn Trent plc	1997	FTSE 100	S, T	British	Water treatment & management; waste treatment etc.
Shared Earth	1995	S	T	British	Retailing - mainly products from third world countries.
SmithKline Beecham	1997	L	S	US/British	Pharmaceuticals
Solutia UK Ltd. (part of Monsanto)	1996	S	S	US	Speciality chemicals
Solvay	1996	L	S	Belgian	Conglomerate - chemical based

Company	Year	Size	Sector	Nationality	Economic activity
South West Water	1996	M	T	British	Treatment and supply of water; waste treatment.
Statoil	1996	L	P, S, T	Norwegian	Oil & gas exploration, production, retailing
Thomas Swan	1996	S	S	British	Speciality chemicals
Swiss Bank Corporation	1994	L	T	Swiss	Financial services
Tarmac	1995	Top500 M	S	British	Construction
Thames Water	1998	FTSE 100	T	British	Water treatment & supply; waste treatment.
Tinsley Wire - Sheffield	1997	S	S	Belgian	Manufacture - mild steel wire and wire products
Tioxide (part of ICI)	1997	M	S	British	Speciality chemicals
Unilever	1997	L	S	UK/Dutch	Production of branded & packaged goods: foods and household and personal care products
United Utilities	1997	FTSE 100	S, T	British	Water treatment & supply; electricity & gas supply
Volvo	1996	L	S	Swedish	Manufacture of means of transport and engines
Wessex Water	1997	Top 500 M	S, T	British	Water and sewage treatment; water supply
WMC	1996	L	P, S	Australian	Metals, minerals, oil
Wolstenholme International	1996	S	S	British	Powder coatings manufacturer

Company	Year	Size	Sector	Nationality	Economic activity
Xerox Corporation	1996/ 97	L	S, T	US	Manufacture, installation, servicing of document machinery
Yorkshire Electricity	1997	M	T	British	Electricity distribution; energy trading; electricity generation.
Yorkshire Water	1997	M	S, T	British	Water treatment and supply; waste treatment; new technologies/ consultancy

TABLE 3: DISTRIBUTION BY SECTOR, OF COMPANIES PRODUCING CERS

Primary		1
Secondary		51
Tertiary		18
Mixed	primary/secondary	3
	primary/secondary/tertiary	3
	secondary/tertiary	22
	primary/tertiary	2

TABLE 4: COUNTRIES REPRESENTED BY THE CERS

Country	Number of CERS
<i>Australia</i>	2
<i>Belgium</i>	2
<i>Canada</i>	2
<i>China</i>	1
<i>Denmark</i>	2
<i>Finland</i>	2
<i>France</i>	2
<i>Germany</i>	6
<i>Italy</i>	1
<i>Japan</i>	1
<i>The Netherlands</i>	2
<i>Norway</i>	3
<i>South Africa</i>	2
<i>Sweden</i>	5
<i>Switzerland</i>	3
<i>United Kingdom</i>	50
<i>United States of America</i>	9
<i>Mixed</i>	5 (2 Dutch/UK, 1 French/UK, 1 US/UK, 1 Swedish/Swiss)

TABLE 5: DISTRIBUTION BY SIZE, OF COMPANIES PRODUCING CERS

(same definitions used for size, as in methodology chapter)

Size	Number of companies
Small	9
Medium	36
Large	55

**TABLE 6: DISTRIBUTION BY ECONOMIC ACTIVITY, OF COMPANIES
PRODUCING CERS**

(attributed to categories according to major part of the business)

Economic activity	No. of CERS
Chemicals	6
Oil & gas	4
Forestry, paper & pulp	6
Mechanical manufacturing	6
Utilities (power & water)	25
Food & beverages	4
Electro-technical manufacturing	5
Mining, metals & materials	3
Transportation	4
Pharmaceutical & personal care	6
Trade & retail	6
Conglomerates	9
Financial services	2
Construction	2
Communications & media	2
Other service	4
Other manufacturing	6

A.3 Codes for CER analysis

2.1: Input-output data expressed in physical units

- 1 energy consumption
- 2 water consumption
- 3 raw material consumption
- 4 air emissions
- 5 water emissions
- 6 land contamination/emissions to subsoil etc.
- 7 waste
- 8 waste minimisation measures quantified
- 9 Transport use: fuel consumed/mileage/numbers in fleets of cars, vans etc.
- 10 land management (tree planting/increase in species/other flora and fauna schemes) and vegetation sampling
- 11 noise and odours
- 12 packaging
- 13 none

2.2: Mass-balance (oko-bilanz)

- 1 yes
- 2 no
- 3 partial

2.3: Environmental financial data

- 1 contingent liabilities and other liabilities
- 2a end of pipe capital expenditure
- 2b all other capital expenditure
- 3 future environmental expenditure commitments
- 4 other environmental costs, such as fines etc.
- 5 savings as a result of environmental expenditure
- 6 none

2.4: Full cost accounting

- 1 yes
- 2 no

2.5: EPIs

- 1a yes, relevant to industry
- 1b yes, general relevance
- 1c yes, but very generalised
- 2 no

2.6: Targets set

- 1a yes, financial
- 1b yes, in physical quantities
- 1c other
- 2 none

2.7: Mention of sustainable development

- 1a mentioned, but not integral with, environmental policies
- 1b mentioned, and integral with, environmental policies and initiatives
- 2 no

2.8: Apparent reasons for the production of a CER

- 1 confirmation of compliance
- 2 EU EMAS requirements
- 3 publicity for achievement of EU EMAS and/or other EMS standards
- 4 informing stakeholders
- 5 informing customers
- 6 publicising new environmental policies/direction/initiative
- 7 type of industry: sensitive environmentally, potential high environmental impact
- 8 other

2.9: Verification

- 1a yes, accountancy consultancy
- 1b yes, environmental consultancy
- 1c yes, other
- 2 no

A.4 Company environmental reports analysis

TABLE 7: COMPANY ENVIRONMENTAL REPORTS ANALYSIS (100)

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>ABB</i>	1, 3, 4, 7, 8	2	4, 5	2	1b	1b	1a	1, 3, 4, 5, 6, 7	1c
<i>Anglian Water</i>	1, 2, 7, 8, 9, 10, 11	2	2a, 2b, 4,	2	1a	1c	1b	1, 4, 5, 6, 7	1b
<i>Arjo Wiggins</i>	1, 2, 5, 7, 8	2	2a, 2b, 3	2	2	1c	1b	1, 3, 4, 5, 7	2
<i>ASG</i>	1, 2, 4, 7, 8, 9	2	6	2	1c	1c	1b	1, 4, 5, 6, 7	1b
<i>Astra</i>	1, 2, 4, 5, 7, 8	2	2b, 4	2	2	2	2	1, 3, 4, 5, 7	2
<i>AWE</i>	4, 5, 6, 7, 10	2	6	2	1a	2	2	1, 4, 7	2

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>Aylesford</i>	2, 4, 5, 7, 8	2	6	2	2	1c	2	1,	1b
<i>BAA</i>	1, 2, 4, 5, 7, 8, 9, 11,	2	2b, 4	2	1a	1c	1a	1, 4, 5, 6, 7	2
<i>B & Q</i>	13.	2	6	2	2	1c	1a	4, 5, 6, 7	2
<i>Bayer</i>	1, 4, 5, 7	2	2b	2	2	1b	1a	1, 4, 5, 6, 7	1a
<i>Beacon Press</i>	1, 2, 3, 8	2	2b	2	2	1c	2	1, 2, 4, 5, 6, 7	1b
<i>BG</i>	1, 4, 5, 7, 8,	2	6	2	2	1c	1a	1, 3, 4, 5, 6, 7	2
<i>BHP</i>	1, 2, 4, 5, 6, 10,	2	4	2	2	1b/c	2	1, 3, 4, 5, 6, 7	2
<i>BNFL</i>	4, 5, 6, 7, 8, 10	2	2b, 3, 4	2	2	1c	1a	1, 3, 4, 5, 6, 7	1c

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi-cation
<i>Body Shop</i>	1, 2, 4, 5, 7, 8, 9, 12	2	4	2	1b	1c	1b	3, 4, 5, 6, 8 (conviction)	1b
<i>Boehringer Mannheim</i>	1, 2, 3, 4, 5, 6, 7, 8, 9, 11, 12	2	6	2	2	1b/c	2	1, 2, 3, 4, 6, 5, 7	1a
<i>Bosch-Siemens</i>	2, 3, 4, 5, 7, 8, 9, 12	1	2a, 4	2	1a	1c	1b	1, 3, 4, 5, 6, 7	2
<i>BP</i>	1, 4, 5, 7	2	1, 2a, 2b, 4	2	2	1c	1a	1, 4, 5, 6, 7	1a
<i>British Airways</i>	1, 2, 3 (some), 4, 7, 8, 9, 10, 11	2	2a, 2b, 3, 4, 5	2	1a	1c	1a	1, 3, 4, 5, 6, 7	1b
<i>BSO Origin</i>	4, 5, 7, 8	2	4	1	2	1c	1a	4, 5, 6	2

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>BT</i>	1, 3, 4, 7, 8, 9	2	6	2	2	1c	1b	1, 4, 5, 6	1a
<i>CLP Holdings</i>	3, 4, 5, 6, 7, 8	2	6	2	2	1c	1a	1, 4, 5, 6, 7	1b
<i>James Cropper</i>	1, 2, 5, 7	2	6	2	2	1c	2	1, 2, 4, 7	2
<i>Daimler-Benz</i>	1, 2, 4, 7, 8	2	3, 4	2	2	1c	1b	1, 4, 5, 6, 7	2
<i>Det Danske Stalvalsevaerk A/S</i>	1, 2, 3, 4, 5, 7, 8, 11	1	6	2	2	1c	2	1, 3, 4, 5, 6, 7	2
<i>Dow</i>	1, 4, 5, 7	2	6	2	2	1b/c	2	1, 4, 5, 6, 7	2
<i>DSM</i>	1, 2, 4, 5, 7, 8	2	6	2	1c	1b	2	1, 3, 4, 5, 6, 7	1a

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>Eastern Group</i>	1, 2, 3, 4, 5, 7, 8	2	6	2	2	1b/c	1b	1, 3, 4, 5, 6, 7	2
<i>EMI</i>	4, 7, 9, 12	2	2b, 4, 5	2	2	1b/c	2	3, 4, 5, 6	1b
<i>Enso Group</i>	1, 2, 3, 4, 5, 7, 9, 10	2	2a, 2b, 3, 4	2	1a	1b	1b	1, 2, 3,	1c
<i>Eskom</i>	2, 3, 4, 5, 7, 8, 10	2	2b, 4	2	1c	1c	1a	1, 4, 5, 6, 7	1c
<i>Fiat</i>	1, 2, 4, 5, 7, 8, 9	2	6	2	1a	1c	1a	1, 4, 5, 6, 7	2
<i>Glaxo Wellcome</i>	1, 2, 4, 5, 7, 8,	2	1, 2a, 2b, 4, 5	2	1c	1b/c	1b	1, 4, 5, 6, 7	1b
<i>Guinness plc</i>	1 (rest mentioned in general terms)	2	6	2	2	1c	2	1, 3, 4, 5, 6, 7	2

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>Hickson International</i>	1, 7	2	2a, 2b	2	2	1c	2	1, 4, 5, 6, 7	2
<i>IBM</i>	1, 4, 5, 7, 8	2	4	2	2	1c	1a	1, 3, 4, 5, 6	2
<i>ICI</i>	4, 5, 7, 8	2	1, 2a, 4	2	1c	1b	1a	1, 3, 4, 5, 6, 7	1a
<i>Interface</i>	1, 3, 4, 5, 7, 8	2	5	2	1c	1b	1b	1, 3, 4, 5, 6, 7	2
<i>Inveresk</i>	1, 4, 5, 7, 8	2	2a, 3, 4	2	2	1b/c	2	1, 4, 5, 6, 7	2
<i>John Moores University</i>	13	2	4	2	1a	1c	2	4, 5, 6	2
<i>Kraft Jacobs Suchard</i>	1, 2, 3, 4, 7, 9, 12	2	6	2	2	1b/c	1b	1, 4, 5, 6	2

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>Kvaerner</i>	1, 3, 4, 7, 8	2	6	2	2	1b/c	1a	1, 4, 5, 6, 7	2
<i>Landis & Gyr</i>	1, 2, 3, 4, 5, 7, 8	3	1	2	1c	1c	2	1, 3, 4, 5, 6	1b
<i>Layezee Beds</i>	1, 2, 3, 7, 9	2	6	2	1a	1b/c	2	2, 4, 5	1b
<i>London Electricity</i>	1, 3, 4, 7, 8, 9	2	1, 2a, 2b, 4,	2	2	1b/c	1b	1, 4, 5, 6, 7	1b
<i>London Transport</i>	4	2	4	2	1c	1c	2	3, 4, 5,	2
<i>Magnox</i>	1, 2, 3, 4, 5, 7, 8, 9, 10	2	1, 4	2	2	1c	1a	1, 3, 4, 5, 6, 7	1c
<i>Manweb</i>	4	2	6	2	2	1c	2	1, 3, 4, 5, 6, 7	2

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>Marks & Spencer</i>	13	2	6	2	2	1c	2	4, 5	2
<i>MoDo</i>	1, 3, 4, 5, 7, 8, 10	2	1, 2a, 2b, 4	2	1a, 1b	1b/c	1b	1, 3, 4, 5, 6, 7	2
<i>Monsanto</i>	4, 5, 7, 8	2	1, 2a, 2b, 4	2	2	1c	1b	1, 4, 5, 6, 7	1b
<i>Morrison Construction</i>	13	2	6	2	2	1c	2	4, 5, 6	2
<i>National Grid</i>	1, 8	2	2a	2	2	1c	2	1, 4, 5, 6, 7	1a
<i>National Power</i>	2, 3, 4, 7, 8	2	2a, 2b	2	2	1b/c	2	1, 3, 4, 5, 6, 7	1c

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>NatWest</i>	1, 3, 8	2	5	2	2	1c	1a	3, 4, 5, 6	2
<i>Neste</i>	1, 3, 4, 5, 7, 9	3	2b, 4	2	2	1b	2	1, 3, 4, 5, 6, 7	1b
<i>Neumarkter Lammsbrau</i>	1, 2, 3, 4, 5, 7, 8	2	2a, 2b, 3	2	2	1c	2	1, 3, 4, 5, 6	2
<i>Norsk Hydro</i>	1, 3, 4, 5, 7, 8	2	6	2	1c	1c	1a	1, 4, 5, 6, 7	1a
<i>Nortel</i>	1, 2, 4, 5, 7, 8	2	6	2	2	1b/c	2	3, 4, 5, 6	1a
<i>Northern Electric</i>	13	2	6	2	2	1c	2	1, 3, 4, 5, 6, 7	2
<i>Northumbrian Water Group</i>	1, 4, 7, 8, 10	2	2a, 2b, 4	2	2	1b/c	2	1, 3, 4, 5, 6, 7	1b

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>North West Water</i>	1, 4, 7, 8, 9	2	6	2	2	1b/c	2	1, 3, 4, 5, 6, 7	2
<i>Novo Nordisk</i>	1, 2, 4, 5, 7, 8, 9, 12	2	2a, 2b, 4, 5	2	1a	1b/c	1b	1, 4, 5, 6, 7	1b
<i>NSK-RHP Europe Ltd.</i>	1, 3, 4, 5, 7, 8	3	2a, 2b, 4	2	2	1b/c	2	1, 4, 5, 6, 7	1b
<i>Nuclear Electric</i>	1, 2, 4, 5, 7	2	6	2	2	1b	2	1, 3, 4, 5, 6, 7	2
<i>Ontario Hydro</i>	1, 2, 4, 7	2	2a, 2b, 4	2	1a	1c	1b	1, 4, 5, 6, 7	2
<i>Powergen</i>	2, 3, 4, 5, 7, 8	2	6	2	2	1b/c	2	1, 3, 4, 5, 6, 7	2

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>Procter & Gamble</i>	1, 4, 5, 7, 8, 12	2	6	2	2	1b/c	2	1, 3, 4, 5, 6, 7	2
<i>Rhone-Poulenc</i>	4, 5, 7, 10	2	2a, 2b, 4	2	1a	1b/c	1b	1, 4, 5, 6, 7	1b
<i>Rio Tinto</i>	1, 2, 4, 5, 6, 10	2	1, 3, 4	2	2	1b/c	2	1, 3, 4, 5, 6, 7	1c
<i>Rohm & Haas</i>	4, 5, 7	2	2a, 2b	2	1a	1c	2	1, 3, 4, 5, 6, 7	2
<i>Royal Dutch/Shell Group</i>	1, 4, 5, 7	2	6	2	2	1c	1a	1, 4, 5, 6, 7	2
<i>Safeway</i>	8, 9	2	6	2	2	1c	2	4, 5, 6	2
<i>J. Sainsbury</i>	1, 2, 4, 9, 12	2	4	2	2	1b/c	1a	1, 4, 5, 6	2

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>Salus</i>	1, 2, 4, 5, 7, 8, 9, 12	3	3, 4	2	2	1c	2	2, 4, 5, 6	1b
<i>SAS</i>	1, 2, 4, 5, 6, 7, 8, 9, 11	3	2a, 2b, 4, 5	2	1a	1c	1b	1, 4, 5, 6	2
<i>Scottish Hydro-Electric</i>	1, 4, 7	2	1, 2a, 2b, 4	2	2	1c	2	1, 4, 5, 6, 7	1b
<i>Scottish Power</i>	1, 4, 5, 6, 7, 8, 9, 12	2	2a, 2b, 3, 4	2	2	1b/c	1a	1, 4, 5, 6, 7	1b
<i>Severn Trent</i>	1, 4, 5, 7, 8, 9, 10	2	1, 4, 5	2	2	1c	1b	1, 3, 4, 5, 6, 7	1b
<i>Shared Earth</i>	1, 4, 8, 9	2	4, 5	2	2	1c	1b	4, 5, 6	1c

Company	Input-output data (physical units)	Mass-balance (okobilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>SmithKline Beecham</i>	1, 2, 4, 5, 7, 12	2	2b, 4	2	2	1c	1a	1, 3, 4, 5, 6, 7	2
<i>Solutia</i>	4, 5, 6, 7, 8	2	2a, 4	2	2	1c	2	1, 2,	1c
<i>Solvay</i>	2, 4, 5, 7, 8	2	4, 5	2	1c	1b/c	1b	1, 4, 5, 6, 7	1c
<i>South West Water</i>	1, 3, 7, 8, 9	2	6	2	2	1c	2	1, 4, 5, 6, 7	1c
<i>Statoil</i>	1, 2, 3, 4, 5, 7, 8	1 (for 4 operations)	1, 2a, 2b, 4	2	1a	1c	1a	1, 4, 5, 6, 7	1a

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>Thomas Swan</i>	1, 2, 3, 4, 5, 7	2	6	2	2	1c	2	1, 2, 4, 5, 6, 7	1c
<i>Swiss Bank Corporation</i>	1, 4, 5, 7, 8, 9	2	6	2	2	1b/c	1a	4, 5, 6	1a
<i>Tarmac</i>	8, 9	2	6	2	2	1c	1b	1, 3, 4, 5, 6, 7	2
<i>Thames Water</i>	1, 4, 5, 6, 7, 8, 9, 11	2	4	2	2	1c	1a	1, 4, 5, 6, 7	1b
<i>Tinsley Wire – Sheffield</i>	1, 3, 5	2	6	2	2	1c	2	1, 3, 4, 5, 7	2
<i>Tioxide</i>	1, 4, 5, 7	2	6	2	1a	1b	2	1, 3, 4, 5, 6, 7	1c
<i>Unilever</i>	1, 2, 4, 5, 7, 8	2	4	2	2	1c	1a	1, 3, 4, 5, 6, 7	1b

Company	Input-output data (physical units)	Mass-balance (oko-bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verification
<i>United Utilities</i>	1, 5, 9, 10	2	6	2	2	1b/c	1a	1, 4, 5, 6, 7	2
<i>Volvo</i>	1, 2, 4, 7, 8	3 (for one site only)	2a, 2b	2	1a	1b/c	2	1, 3, 4, 5, 6, 7	2
<i>Wessex Water</i>	1, 3, 4, 7, 8, 9	2	6	2	2	1b/c	1b	1, 4, 5, 6, 7	1b
<i>WMC</i>	1, 2, 3, 4, 6, 7, 8, 10	2	1, 2a, 2b, 4	2	1b	1a	1a	1, 3, 4, 5, 6, 7	1a
<i>Wolstenholme International</i>	13	2	4	2	2	1b/c	2	1, 3, 4, 5, 7	2

Company	Input-output data (physical units)	Mass- balance (oko- bilanz)	Environmental financial data	Full-cost accounting	EPIs	Targets set	S.D. mention	Apparent reasons for CER	Verifi- cation
<i>Xerox Corporation</i>	2, 4, 5, 7, 8	2	1, 4, 5	2	2	1b/c	1a	1, 3, 4, 5, 6, 7	2
<i>Yorkshire Electricity</i>	1, 2, 4, 6, 7, 8, 9, 11	2	1, 2a, 4	2	2	1b/c	1a	1, 4, 5, 6, 7	1b
<i>Yorkshire Water</i>	4, 6, 7, 8	2	2a, 4	2	2	1b/c	2	1, 4, 5, 7	2

A.5 Second SPSS analysis results

TABLE 8: SECOND SPSS ANALYSIS RESULTS

Energy consumption * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.462 ^a	2	.177
Likelihood Ratio	3.621	2	.164
Linear-by-Linear Association	.041	1	.839
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.52.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.183	.177
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Energy consumption * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.561 ^a	3	.135
Likelihood Ratio	7.499	3	.058
Linear-by-Linear Association	1.378	1	.240
N of Valid Cases	100		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.24.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.230	.135
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Energy consumption * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.072 ^a	4	.132
Likelihood Ratio	7.883	4	.096
Linear-by-Linear Association	1.947	1	.163
N of Valid Cases	100		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.92.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.257	.132
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Energy consumption * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2.135 ^b	1	.144		
Continuity Correction ^a	1.534	1	.216		
Likelihood Ratio	2.146	1	.143		
Fisher's Exact Test				.183	.108
Linear-by-Linear Association	2.114	1	.146		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.145	.144
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water consumption * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.713 ^a	2	.425
Likelihood Ratio	1.725	2	.422
Linear-by-Linear Association	.680	1	.410
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.14.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.130	.425
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water consumption * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.325 ^a	3	.344
Likelihood Ratio	3.363	3	.339
Linear-by-Linear Association	2.198	1	.138
N of Valid Cases	100		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.68.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.179	.344
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water consumption * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.439 ^a	4	.656
Likelihood Ratio	2.462	4	.652
Linear-by-Linear Association	1.572	1	.210
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.44.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.154	.656
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water consumption * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.944 ^b	1	.026		
Continuity Correction ^a	4.092	1	.043		
Likelihood Ratio	4.990	1	.026		
Fisher's Exact Test				.029	.021
Linear-by-Linear Association	4.895	1	.027		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 22.54.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.217	.026
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Raw material consumption * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.092 ^a	2	.129
Likelihood Ratio	3.901	2	.142
Linear-by-Linear Association	.248	1	.618
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.70.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.198	.129
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Raw material consumption * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.756 ^a	3	.431
Likelihood Ratio	2.902	3	.407
Linear-by-Linear Association	.569	1	.451
N of Valid Cases	100		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.40.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.164	.431
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Raw material consumption * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.784 ^a	4	.216
Likelihood Ratio	6.092	4	.192
Linear-by-Linear Association	.000	1	.987
N of Valid Cases	100		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 4.20.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.234	.216
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Raw material consumption * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.389 ^b	1	.239		
Continuity Correction ^a	.922	1	.337		
Likelihood Ratio	1.397	1	.237		
Fisher's Exact Test				.279	.169
Linear-by-Linear Association	1.375	1	.241		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.70.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.117	.239
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Air emissions * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.164 ^a	2	.006
Likelihood Ratio	8.572	2	.014
Linear-by-Linear Association	8.577	1	.003
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.71.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.304	.006
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Air emissions * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.692 ^a	3	.196
Likelihood Ratio	5.891	3	.117
Linear-by-Linear Association	.230	1	.632
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.52.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.212	.196
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Air emissions * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.413 ^a	4	.491
Likelihood Ratio	3.507	4	.477
Linear-by-Linear Association	2.217	1	.136
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 2.66.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.182	.491
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Air emissions * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	11.637 ^b	1	.001		
Continuity Correction ^a	9.963	1	.002		
Likelihood Ratio	12.519	1	.000		
Fisher's Exact Test				.001	.001
Linear-by-Linear Association	11.521	1	.001		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.31.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.323	.001
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water emissions * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.838 ^a	2	.242
Likelihood Ratio	2.817	2	.245
Linear-by-Linear Association	.945	1	.331
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.42.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.166	.242
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water emissions * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.430 ^a	3	.002
Likelihood Ratio	14.730	3	.002
Linear-by-Linear Association	13.452	1	.000
N of Valid Cases	100		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.04.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.355	.002
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water emissions * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.987 ^a	4	.001
Likelihood Ratio	22.909	4	.000
Linear-by-Linear Association	9.111	1	.003
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.32.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.408	.001
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Water emissions * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	14.944 ^b	1	.000		
Continuity Correction ^a	13.393	1	.000		
Likelihood Ratio	15.406	1	.000		
Fisher's Exact Test				.000	.000
Linear-by-Linear Association	14.794	1	.000		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.62.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.361	.000
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land contamination/emissions to subsoil etc * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.891 ^a	2	.389
Likelihood Ratio	2.912	2	.233
Linear-by-Linear Association	.079	1	.779
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.08.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.136	.389
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land contamination/emissions to subsoil etc * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.457 ^a	3	.037
Likelihood Ratio	9.017	3	.029
Linear-by-Linear Association	.242	1	.623
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .96.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.279	.037
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land contamination/emissions to subsoil etc * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.194 ^a	4	.185
Likelihood Ratio	8.558	4	.073
Linear-by-Linear Association	3.542	1	.060
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.68.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.242	.185
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land contamination/emissions to subsoil etc * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.475 ^b	1	.491		
Continuity Correction ^a	.146	1	.703		
Likelihood Ratio	.477	1	.490		
Fisher's Exact Test				.550	.352
Linear-by-Linear Association	.471	1	.493		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.88.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.069	.491
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.981 ^a	2	.371
Likelihood Ratio	1.849	2	.397
Linear-by-Linear Association	1.896	1	.168
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.71.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.139	.371
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.261 ^a	3	.100
Likelihood Ratio	5.578	3	.134
Linear-by-Linear Association	.042	1	.839
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.52.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.243	.100
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.186 ^a	4	.126
Likelihood Ratio	9.258	4	.055
Linear-by-Linear Association	5.043	1	.025
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 2.66.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.259	.126
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	8.418 ^b	1	.004		
Continuity Correction ^a	7.004	1	.008		
Likelihood Ratio	8.838	1	.003		
Fisher's Exact Test				.005	.004
Linear-by-Linear Association	8.334	1	.004		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 9.31.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.279	.004
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste minimisation measures quantified * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.936 ^a	2	.230
Likelihood Ratio	2.875	2	.238
Linear-by-Linear Association	1.544	1	.214
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 3.60.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.169	.230
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste minimisation measures quantified * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.314 ^a	3	.510
Likelihood Ratio	2.287	3	.515
Linear-by-Linear Association	1.525	1	.217
N of Valid Cases	100		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.20.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.150	.510
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste minimisation measures quantified * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.215 ^a	4	.266
Likelihood Ratio	5.176	4	.270
Linear-by-Linear Association	2.677	1	.102
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.60.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.223	.266
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Waste minimisation measures quantified * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.960 ^b	1	.327		
Continuity Correction ^a	.602	1	.438		
Likelihood Ratio	.962	1	.327		
Fisher's Exact Test				.415	.219
Linear-by-Linear Association	.951	1	.330		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 19.60.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.098	.327
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Transport use * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.819 ^a	2	.244
Likelihood Ratio	2.766	2	.251
Linear-by-Linear Association	.777	1	.378
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.52.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.166	.244
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Transport use * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.703 ^a	3	.034
Likelihood Ratio	10.555	3	.014
Linear-by-Linear Association	8.169	1	.004
N of Valid Cases	100		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.24.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.283	.034
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Transport use * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	10.261 ^a	4	.036
Likelihood Ratio	11.102	4	.025
Linear-by-Linear Association	4.229	1	.040
N of Valid Cases	100		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 3.92.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.305	.036
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Transport use * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	3.636 ^b	1	.057		
Continuity Correction ^a	2.836	1	.092		
Likelihood Ratio	3.671	1	.055		
Fisher's Exact Test				.075	.046
Linear-by-Linear Association	3.600	1	.058		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 13.72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.187	.057
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land management * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.728 ^a	2	.695
Likelihood Ratio	.716	2	.699
Linear-by-Linear Association	.102	1	.749
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.35.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.085	.695
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land management * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.053 ^a	3	.256
Likelihood Ratio	3.343	3	.342
Linear-by-Linear Association	.111	1	.739
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.20.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.197	.256
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land management * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.826 ^a	4	.145
Likelihood Ratio	6.320	4	.177
Linear-by-Linear Association	1.102	1	.294
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 2.10.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.253	.145
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Land management * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.133 ^b	1	.716		
Continuity Correction ^a	.007	1	.933		
Likelihood Ratio	.133	1	.716		
Fisher's Exact Test				.784	.466
Linear-by-Linear Association	.131	1	.717		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.35.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.036	.716
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Noise and odours * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.531 ^a	2	.063
Likelihood Ratio	5.846	2	.054
Linear-by-Linear Association	.805	1	.369
N of Valid Cases	100		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.229	.063
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Noise and odours * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.234 ^a	3	.525
Likelihood Ratio	2.731	3	.435
Linear-by-Linear Association	2.147	1	.143
N of Valid Cases	100		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .64.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.148	.525
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Noise and odours * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.602 ^a	4	.331
Likelihood Ratio	5.984	4	.200
Linear-by-Linear Association	.101	1	.751
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.12.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.210	.331
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Noise and odours * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.634 ^b	1	.426		
Continuity Correction ^a	.183	1	.669		
Likelihood Ratio	.639	1	.424		
Fisher's Exact Test				.483	.335
Linear-by-Linear Association	.628	1	.428		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.92.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.079	.426
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Packaging * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.127 ^a	2	.938
Likelihood Ratio	.126	2	.939
Linear-by-Linear Association	.035	1	.851
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.08.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.036	.938
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Packaging * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.419 ^a	3	.490
Likelihood Ratio	3.486	3	.323
Linear-by-Linear Association	.030	1	.863
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .96.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.154	.490
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Packaging * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.599 ^a	4	.107
Likelihood Ratio	8.881	4	.064
Linear-by-Linear Association	.080	1	.777
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.68.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.266	.107
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Packaging * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.705 ^b	1	.017		
Continuity Correction ^a	4.329	1	.037		
Likelihood Ratio	6.191	1	.013		
Fisher's Exact Test				.028	.017
Linear-by-Linear Association	5.648	1	.017		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.88.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.232	.017
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

INPOUT * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	143.473 ^a	126	.137
Likelihood Ratio	132.629	126	.326
Linear-by-Linear Association	.069	1	.792
N of Valid Cases	100		

a. 192 cells (100.0%) have expected count less than 5.
The minimum expected count is .09.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.768	.137
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

INPOUT * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	194.520 ^a	189	.376
Likelihood Ratio	169.843	189	.838
Linear-by-Linear Association	.085	1	.770
N of Valid Cases	100		

a. 256 cells (100.0%) have expected count less than 5.
The minimum expected count is .08.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.813	.376
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

INPOUT * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	277.997 ^a	252	.125
Likelihood Ratio	236.458	252	.751
Linear-by-Linear Association	.099	1	.753
N of Valid Cases	100		

a. 320 cells (100.0%) have expected count less than 5.
The minimum expected count is .14.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.858	.125
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

INPOUT * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	70.931 ^a	63	.230
Likelihood Ratio	96.070	63	.005
Linear-by-Linear Association	5.171	1	.023
N of Valid Cases	100		

a. 128 cells (100.0%) have expected count less than 5.
The minimum expected count is .49.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.644	.230
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mass-balance * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.900 ^a	2	.638
Likelihood Ratio	1.613	2	.447
Linear-by-Linear Association	.617	1	.432
N of Valid Cases	100		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.094	.638
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mass-balance * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.164 ^a	3	.367
Likelihood Ratio	4.808	3	.186
Linear-by-Linear Association	2.959	1	.085
N of Valid Cases	100		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .64.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.175	.367
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mass-balance * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.142 ^a	4	.273
Likelihood Ratio	5.806	4	.214
Linear-by-Linear Association	.253	1	.615
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.12.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.221	.273
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mass-balance * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	4.636 ^b	1	.031		
Continuity Correction ^a	3.184	1	.074		
Likelihood Ratio	5.196	1	.023		
Fisher's Exact Test				.060	.034
Linear-by-Linear Association	4.589	1	.032		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 3.92.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.210	.031
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Contingent liabilities and other liabilities (financial) * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.099 ^a	2	.951
Likelihood Ratio	.103	2	.950
Linear-by-Linear Association	.094	1	.759
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 1.26.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.032	.951
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Contingent liabilities and other liabilities (financial) * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.944 ^a	3	.176
Likelihood Ratio	4.067	3	.254
Linear-by-Linear Association	.030	1	.862
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is 1.12.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.217	.176
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Contingent liabilities and other liabilities (financial) * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.087 ^a	4	.394
Likelihood Ratio	4.359	4	.360
Linear-by-Linear Association	1.045	1	.307
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.96.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.198	.394
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Contingent liabilities and other liabilities (financial) * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	1.522 ^b	1	.217	.258	.172
Continuity Correction ^a	.894	1	.344		
Likelihood Ratio	1.538	1	.215		
Fisher's Exact Test					
Linear-by-Linear Association	1.507	1	.220		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.86.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.122	.217
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

End of pipe capital expenditure * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.050 ^a	2	.218
Likelihood Ratio	3.263	2	.196
Linear-by-Linear Association	.000	1	.987
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.61.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.172	.218
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

End of pipe capital expenditure * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	6.243 ^a	3	.100
Likelihood Ratio	7.784	3	.051
Linear-by-Linear Association	.025	1	.875
N of Valid Cases	100		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.32.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.242	.100
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

End of pipe capital expenditure * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	14.004 ^a	4	.007
Likelihood Ratio	16.032	4	.003
Linear-by-Linear Association	10.521	1	.001
N of Valid Cases	100		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 4.06.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.350	.007
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

End of pipe capital expenditure * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.121 ^b	1	.728		
Continuity Correction ^a	.016	1	.898		
Likelihood Ratio	.121	1	.728		
Fisher's Exact Test				.827	.449
Linear-by-Linear Association	.120	1	.729		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.21.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.035	.728
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

All other capital expenditure (environmental) * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.106 ^a	2	.948
Likelihood Ratio	.106	2	.949
Linear-by-Linear Association	.098	1	.755
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.79.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.033	.948
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

All other capital expenditure (environmental) * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.505 ^a	3	.212
Likelihood Ratio	5.152	3	.161
Linear-by-Linear Association	.030	1	.863
N of Valid Cases	100		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.48.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.208	.212
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

All other capital expenditure (environmental) * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	8.584 ^a	4	.072
Likelihood Ratio	8.760	4	.067
Linear-by-Linear Association	6.084	1	.014
N of Valid Cases	100		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 4.34.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.281	.072
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

All other capital expenditure (environmental) * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.265 ^b	1	.607		
Continuity Correction ^a	.089	1	.765		
Likelihood Ratio	.265	1	.607		
Fisher's Exact Test				.669	.383
Linear-by-Linear Association	.262	1	.609		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.19.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.051	.607
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Future environmental expenditure commitments * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.089 ^a	2	.956
Likelihood Ratio	.087	2	.957
Linear-by-Linear Association	.001	1	.979
N of Valid Cases	100		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .81.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.030	.956
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Future environmental expenditure commitments * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.775 ^a	3	.856
Likelihood Ratio	.864	3	.834
Linear-by-Linear Association	.493	1	.483
N of Valid Cases	100		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.088	.856
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Future environmental expenditure commitments * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.647 ^a	4	.325
Likelihood Ratio	5.506	4	.239
Linear-by-Linear Association	.166	1	.684
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.26.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.211	.325
N of Valid Cases	100	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Future environmental expenditure commitments * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.170 ^b	1	.680		
Continuity Correction ^a	.004	1	.950		
Likelihood Ratio	.170	1	.680		
Fisher's Exact Test				.738	.474
Linear-by-Linear Association	.168	1	.682		
N of Valid Cases	100				

a. Computed only for a 2x2 table

b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 4.41.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.041	.680
N of Valid Cases	100	

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Other environmental costs, such as fines * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.186 ^a	2	.335
Likelihood Ratio	2.205	2	.332
Linear-by-Linear Association	.033	1	.855
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.32.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.146	.335
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Other environmental costs, such as fines * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.524 ^a	3	.471
Likelihood Ratio	2.535	3	.469
Linear-by-Linear Association	.443	1	.505
N of Valid Cases	100		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.84.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.157	.471
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Other environmental costs, such as fines * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.133 ^a	4	.889
Likelihood Ratio	1.136	4	.889
Linear-by-Linear Association	.543	1	.461
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.106	.889
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Other environmental costs, such as fines * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.043 ^b	1	.835		
Continuity Correction ^a	.000	1	.994		
Likelihood Ratio	.043	1	.835		
Fisher's Exact Test				.844	.497
Linear-by-Linear Association	.043	1	.836		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.52.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.021	.835
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Savings as a result of environmental expenditure * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.104 ^a	2	.949
Likelihood Ratio	.104	2	.949
Linear-by-Linear Association	.079	1	.779
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 1.08.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.032	.949
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Savings as a result of environmental expenditure * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.790 ^a	3	.122
Likelihood Ratio	5.790	3	.122
Linear-by-Linear Association	.702	1	.402
N of Valid Cases	100		

a. 3 cells (37.5%) have expected count less than 5. The minimum expected count is .96.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.234	.122
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Savings as a result of environmental expenditure * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.048 ^a	4	.133
Likelihood Ratio	7.963	4	.093
Linear-by-Linear Association	2.384	1	.123
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is 1.68.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.257	.133
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Savings as a result of environmental expenditure * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.475 ^b	1	.491		
Continuity Correction ^a	.146	1	.703		
Likelihood Ratio	.477	1	.490		
Fisher's Exact Test				.550	.352
Linear-by-Linear Association	.471	1	.493		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 5.88.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.069	.491
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

ENVIFIND * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	51.243 ^a	64	.875
Likelihood Ratio	54.099	64	.806
Linear-by-Linear Association	.058	1	.810
N of Valid Cases	100		

a. 96 cells (97.0%) have expected count less than 5. The minimum expected count is .09.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.582	.875
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

ENVIFIND * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	84.902 ^a	96	.784
Likelihood Ratio	76.539	96	.928
Linear-by-Linear Association	.789	1	.374
N of Valid Cases	100		

a. 128 cells (97.0%) have expected count less than 5. The minimum expected count is .08.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.678	.784
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

ENVIFIND * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	134.982 ^a	128	.319
Likelihood Ratio	122.503	128	.620
Linear-by-Linear Association	1.851	1	.174
N of Valid Cases	100		

a. 160 cells (97.0%) have expected count less than 5. The minimum expected count is .14.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.758	.319
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

ENVIFIND * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	27.197 ^a	32	.708
Likelihood Ratio	36.910	32	.252
Linear-by-Linear Association	.391	1	.532
N of Valid Cases	100		

a. 63 cells (95.5%) have expected count less than 5. The minimum expected count is .49.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.462	.708
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Full cost accounting * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.720 ^a	2	.423
Likelihood Ratio	2.006	2	.367
Linear-by-Linear Association	.474	1	.491
N of Valid Cases	100		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .09.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.130	.423
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Full cost accounting * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.602 ^a	3	.203
Likelihood Ratio	3.476	3	.324
Linear-by-Linear Association	.249	1	.617
N of Valid Cases	100		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .08.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.210	.203
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Full cost accounting * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.382 ^a	4	.496
Likelihood Ratio	2.973	4	.562
Linear-by-Linear Association	1.665	1	.197
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is .14.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.181	.496
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Full cost accounting * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.970 ^b	1	.325		
Continuity Correction ^a	.000	1	1.000		
Likelihood Ratio	1.356	1	.244		
Fisher's Exact Test				1.000	.510
Linear-by-Linear Association	.961	1	.327		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is .49.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.098	.325
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Environmental performance indicators * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.114 ^a	2	.347
Likelihood Ratio	2.368	2	.306
Linear-by-Linear Association	.102	1	.750
N of Valid Cases	100		

a. 1 cells (16.7%) have expected count less than 5. The minimum expected count is 2.61.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.144	.347
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Environmental performance indicators * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.247 ^a	3	.523
Likelihood Ratio	2.321	3	.509
Linear-by-Linear Association	.401	1	.527
N of Valid Cases	100		

a. 1 cells (12.5%) have expected count less than 5. The minimum expected count is 2.32.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.148	.523
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Environmental performance indicators * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.365 ^a	4	.850
Likelihood Ratio	1.400	4	.844
Linear-by-Linear Association	.001	1	.978
N of Valid Cases	100		

a. 2 cells (20.0%) have expected count less than 5. The minimum expected count is 4.06.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.116	.850
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Environmental performance indicators * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.285 ^b	1	.594		
Continuity Correction ^a	.098	1	.754		
Likelihood Ratio	.285	1	.593		
Fisher's Exact Test				.662	.378
Linear-by-Linear Association	.282	1	.596		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 14.21.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.053	.594
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Targets set * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.259 ^a	2	.533
Likelihood Ratio	1.428	2	.490
Linear-by-Linear Association	.097	1	.755
N of Valid Cases	100		

a. 3 cells (50.0%) have expected count less than 5. The minimum expected count is .27.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.111	.533
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Targets set * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.855 ^a	3	.415
Likelihood Ratio	4.009	3	.260
Linear-by-Linear Association	1.052	1	.305
N of Valid Cases	100		

a. 4 cells (50.0%) have expected count less than 5. The minimum expected count is .24.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.167	.415
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Targets set * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.085 ^a	4	.544
Likelihood Ratio	4.082	4	.395
Linear-by-Linear Association	1.495	1	.221
N of Valid Cases	100		

a. 5 cells (50.0%) have expected count less than 5. The minimum expected count is .42.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.173	.544
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Targets set * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.304 ^b	1	.582		
Continuity Correction ^a	.000	1	1.000		
Likelihood Ratio	.310	1	.578		
Fisher's Exact Test				1.000	.515
Linear-by-Linear Association	.301	1	.583		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 2 cells (50.0%) have expected count less than 5. The minimum expected count is 1.47.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.055	.582
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mention of sustainable development * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.860 ^a	2	.145
Likelihood Ratio	4.015	2	.134
Linear-by-Linear Association	2.466	1	.116
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.23.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.193	.145
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mention of sustainable development * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	2.071 ^a	3	.558
Likelihood Ratio	2.081	3	.556
Linear-by-Linear Association	.535	1	.464
N of Valid Cases	100		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.76.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.142	.558
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Mention of sustainable development * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.131 ^a	4	.889
Likelihood Ratio	1.136	4	.889
Linear-by-Linear Association	.160	1	.689
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.58.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.106	.889
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Mention of sustainable development * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.623 ^b	1	.430		
Continuity Correction ^a	.347	1	.556		
Likelihood Ratio	.624	1	.430		
Fisher's Exact Test				.548	.278
Linear-by-Linear Association	.617	1	.432		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.03.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.079	.430
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Grouped Reasons for Production of CER * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.812 ^a	4	.214
Likelihood Ratio	8.345	4	.080
Linear-by-Linear Association	1.114	1	.291
N of Valid Cases	100		

a. 3 cells (33.3%) have expected count less than 5. The minimum expected count is 2.79.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.234	.214
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Grouped Reasons for Production of CER * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.504 ^a	6	.036
Likelihood Ratio	15.732	6	.015
Linear-by-Linear Association	3.186	1	.074
N of Valid Cases	100		

a. 3 cells (25.0%) have expected count less than 5. The minimum expected count is 2.48.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.345	.036
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Grouped Reasons for Production of CER * Economic Activity
Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	26.376 ^a	8	.001
Likelihood Ratio	26.360	8	.001
Linear-by-Linear Association	8.386	1	.004
N of Valid Cases	100		

a. 4 cells (26.7%) have expected count less than 5. The minimum expected count is 4.34.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.457	.001
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Grouped Reasons for Production of CER * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.236 ^a	2	.889
Likelihood Ratio	.236	2	.889
Linear-by-Linear Association	.121	1	.728
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 15.19.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.048	.889
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Verification * Company Size

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	.702 ^a	2	.704
Likelihood Ratio	.703	2	.704
Linear-by-Linear Association	.534	1	.465
N of Valid Cases	100		

a. 2 cells (33.3%) have expected count less than 5. The minimum expected count is 4.32.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.083	.704
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Verification * Sectors Regrouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	1.801 ^a	3	.615
Likelihood Ratio	1.807	3	.613
Linear-by-Linear Association	1.206	1	.272
N of Valid Cases	100		

a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.84.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.133	.615
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
b. Using the asymptotic standard error assuming the null hypothesis.

Verification * Economic Activity Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.968 ^a	4	.291
Likelihood Ratio	5.035	4	.284
Linear-by-Linear Association	1.069	1	.301
N of Valid Cases	100		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 6.72.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.218	.291
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

Verification * Country Grouped

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.351 ^b	1	.553		
Continuity Correction ^a	.154	1	.695		
Likelihood Ratio	.351	1	.553		
Fisher's Exact Test				.689	.347
Linear-by-Linear Association	.348	1	.555		
N of Valid Cases	100				

- a. Computed only for a 2x2 table
- b. 0 cells (.0%) have expected count less than 5. The minimum expected count is 23.52.

Symmetric Measures

	Value	Approx. Sig.
Nominal by Nominal Contingency Coefficient	.059	.553
N of Valid Cases	100	

- a. Not assuming the null hypothesis.
- b. Using the asymptotic standard error assuming the null hypothesis.

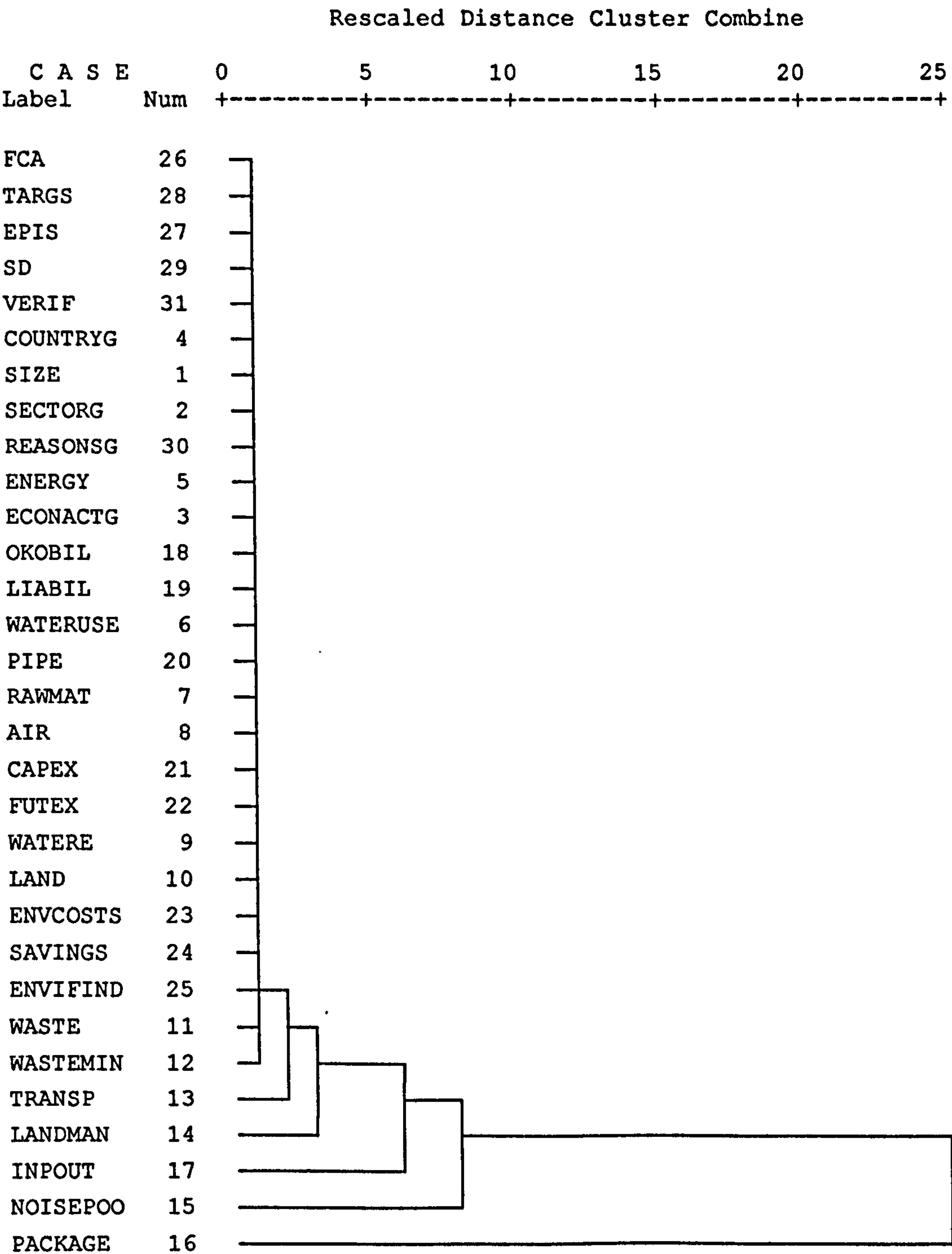
A.6 Results of hierarchical cluster analysis

Test 1: Average linking between groups

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	26	28	1.285	0	0	2
2	26	27	2.719	1	0	3
3	26	29	3.140	2	0	4
4	26	31	3.322	3	0	5
5	4	26	3.593	0	4	6
6	1	4	3.967	0	5	7
7	1	2	4.428	6	0	8
8	1	30	4.988	7	0	9
9	1	5	5.560	8	0	10
10	1	3	5.779	9	0	11
11	1	18	7.959	10	0	12
12	1	19	15.004	11	0	13
13	1	6	17.195	12	0	14
14	1	20	45.032	13	0	15
15	1	7	46.962	14	0	16
16	1	8	109.158	15	0	17
17	1	21	143.645	16	0	18
18	1	22	291.483	17	0	19
19	1	9	478.655	18	0	20
20	1	10	1033.500	19	0	21
21	1	23	1450.737	20	0	23
22	24	25	1792.361	0	0	23
23	1	24	2778.595	21	22	24
24	1	11	3472.994	23	0	25
25	1	12	13827.344	24	0	26
26	1	13	44250.973	25	0	27
27	1	14	110668.117	26	0	28
28	1	17	236512.547	27	0	29
29	1	15	281010.813	28	0	30
30	1	16	993472.125	29	0	0

Dendrogram using Average Linkage (Between Groups)

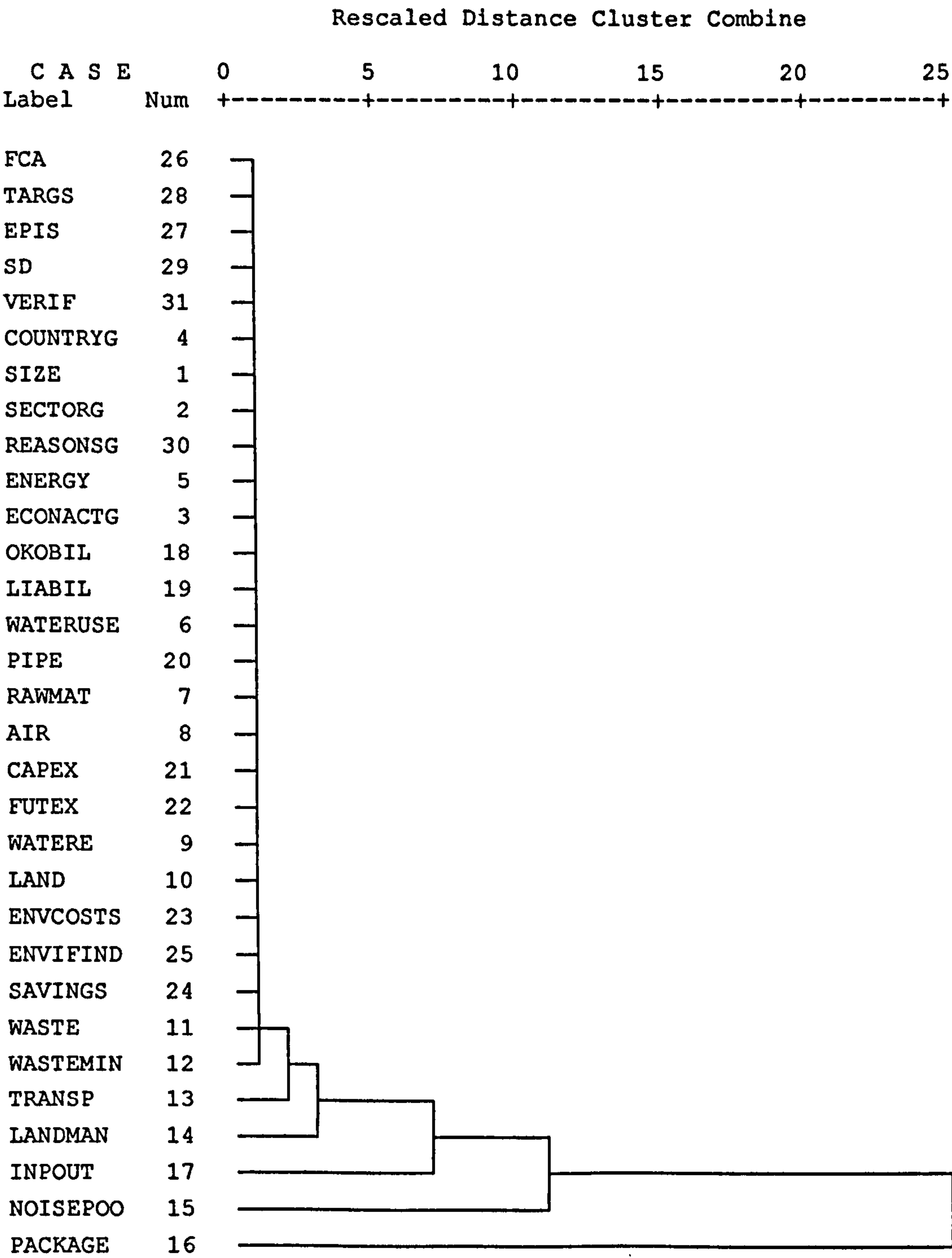


Test 2: Average linking within groups

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	26	28	1.285	0	0	2
2	26	27	2.241	1	0	3
3	26	29	2.691	2	0	4
4	26	31	2.943	3	0	5
5	4	26	3.160	0	4	6
6	1	4	3.390	0	5	7
7	1	2	3.650	6	0	8
8	1	30	3.947	7	0	9
9	1	5	4.270	8	0	10
10	1	3	4.544	9	0	11
11	1	18	5.113	10	0	12
12	1	19	6.635	11	0	13
13	1	6	8.143	12	0	14
14	1	20	13.062	13	0	15
15	1	7	17.299	14	0	16
16	1	8	28.106	15	0	17
17	1	21	40.944	16	0	18
18	1	22	67.317	17	0	19
19	1	9	108.450	18	0	20
20	1	10	196.550	19	0	21
21	1	23	310.567	20	0	22
22	1	25	483.104	21	0	23
23	1	24	709.390	22	0	24
24	1	11	930.478	23	0	25
25	1	12	1922.545	24	0	26
26	1	13	5057.984	25	0	27
27	1	14	12601.564	26	0	28
28	1	17	28043.701	27	0	29
29	1	15	44908.176	28	0	30
30	1	16	106105.852	29	0	0

Dendrogram using Average Linkage (Within Group)

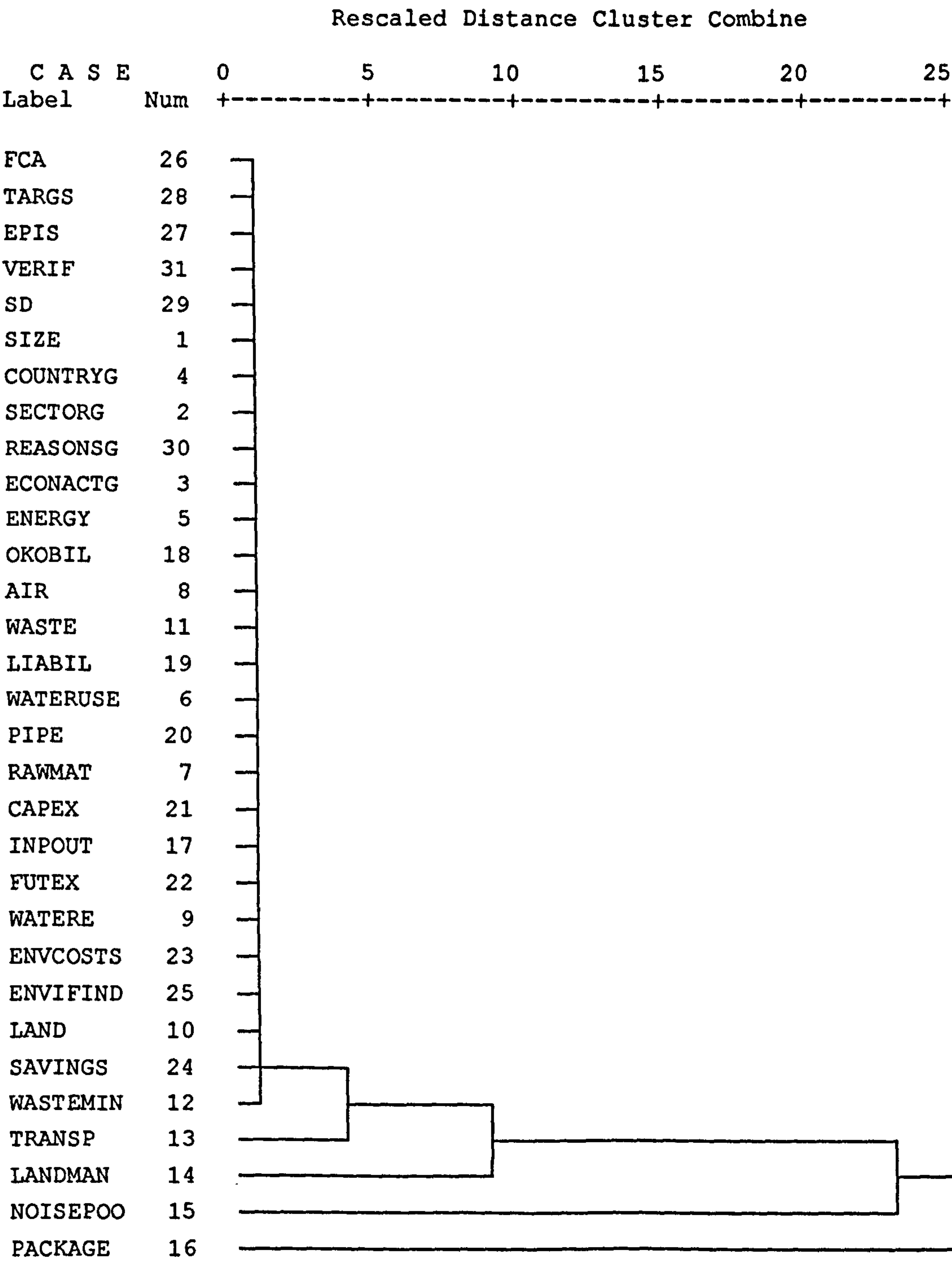


Test 3: Using single linkage – nearest neighbour procedure

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	26	28	1.285	0	0	2
2	26	27	2.623	1	0	3
3	26	31	2.680	2	0	4
4	26	29	2.799	3	0	5
5	1	26	2.882	0	4	6
6	1	4	2.925	5	0	7
7	1	2	3.501	6	0	8
8	1	30	4.043	7	0	9
9	1	3	4.644	8	0	10
10	1	5	4.996	9	0	11
11	1	18	6.412	10	0	12
12	1	8	8.540	11	0	13
13	1	11	8.544	12	0	14
14	1	19	11.411	13	0	15
15	1	6	11.973	14	0	16
16	1	20	33.219	15	0	17
17	1	7	33.788	16	0	18
18	1	21	91.288	17	0	19
19	1	17	214.172	18	0	20
20	1	22	276.641	19	0	21
21	1	9	278.475	20	0	22
22	1	23	585.818	21	0	23
23	1	25	706.973	22	0	24
24	1	10	932.616	23	0	25
25	1	24	1792.361	24	0	26
26	1	12	8660.257	25	0	27
27	1	13	37416.574	26	0	28
28	1	14	91287.516	27	0	29
29	1	15	244948.969	28	0	30
30	1	16	271838.406	29	0	0

Dendrogram using Single Linkage

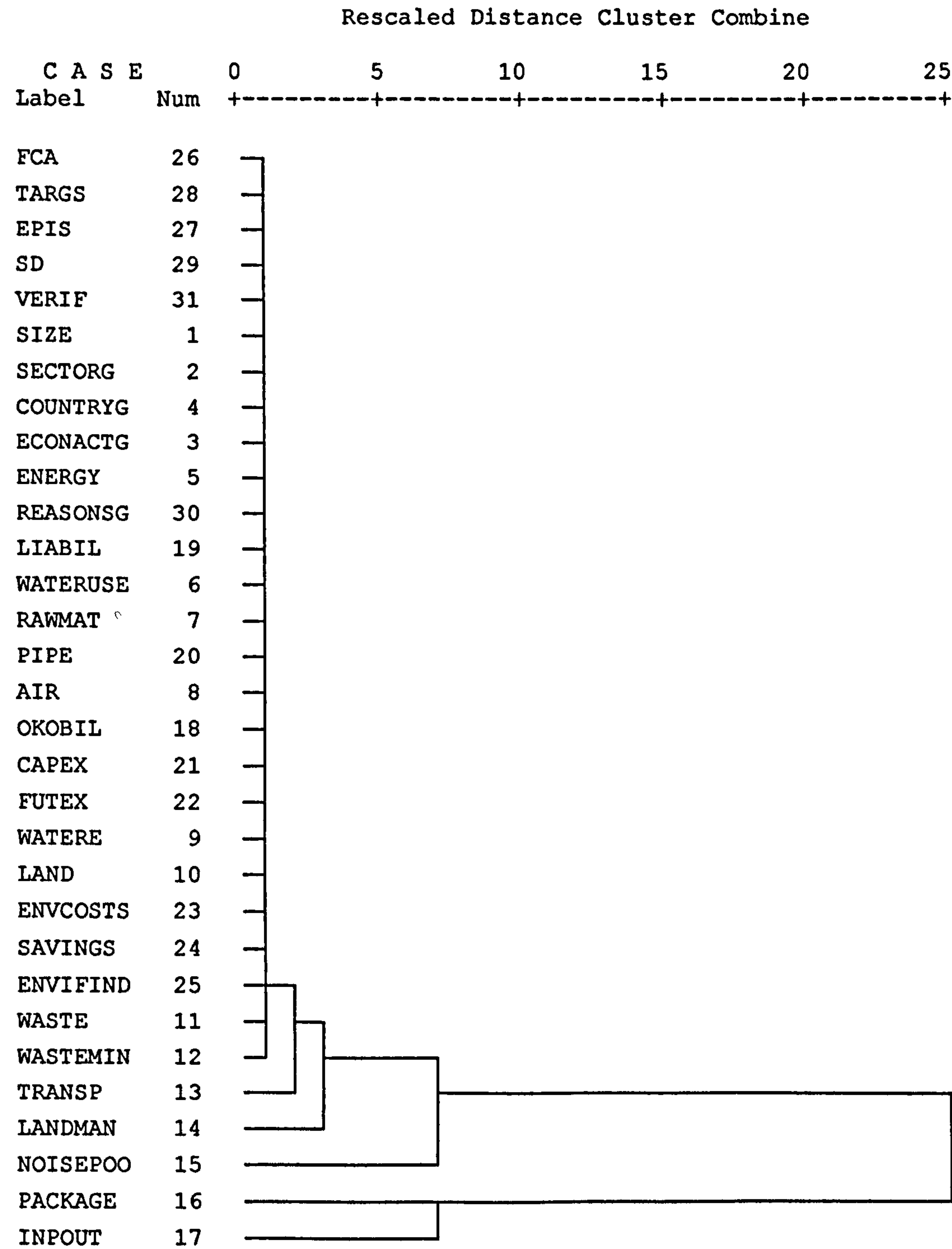


Test 4: Using complete linkage – furthest neighbour procedure

Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	26	28	1.285	0	0	2
2	26	27	2.815	1	0	3
3	26	29	3.501	2	0	4
4	26	31	3.863	3	0	6
5	2	4	4.097	0	0	7
6	1	26	4.630	0	4	7
7	1	2	5.108	6	5	9
8	5	30	5.678	0	0	10
9	1	3	5.984	7	0	10
10	1	5	7.609	9	8	12
11	8	18	8.540	0	0	16
12	1	19	17.926	10	0	13
13	1	6	20.108	12	0	14
14	1	7	47.668	13	0	15
15	1	20	64.027	14	0	16
16	1	8	138.006	15	11	17
17	1	21	205.089	16	0	18
18	1	22	371.728	17	0	19
19	1	9	662.555	18	0	20
20	1	10	1223.195	19	0	21
21	1	23	1785.357	20	0	23
22	24	25	1792.361	0	0	23
23	1	24	3513.610	21	22	24
24	1	11	6637.785	23	0	25
25	1	12	16413.035	24	0	26
26	1	13	47026.285	25	0	27
27	1	14	122474.492	26	0	29
28	16	17	271838.406	0	0	30
29	1	15	273567.594	27	0	30
30	1	16	1095445.13	29	28	0

Dendrogram using Complete Linkage



APPENDIX B

B.1: Questionnaire

The Role of Environmental Accounting: Business Responses

Company

Contact: Name

Position in Company

Date

Environmental Actions/Activities

1. There is usually a public perception of the environmental profile and track record of a company, to what extent is this important to your company?
- 2a. If this is important to your company, what is the company doing to enhance their environmental image?
- 2b. In particular, is your company involved with any of the following:
 - the operation of environmental management systems, in particular BS7750 or the EU EMAS scheme.
 - environmental auditing of any or all sites
 - environmental impact assessments for new sites
 - environmental reporting

- environmental accounting, either in the form of a Mass-balance or as notes to the annual accounts or in some other form

3. How does the company ensure the integration of environmental best practice throughout the company, is this the responsibility of one individual in particular or is the responsibility split between several individuals? What are their positions within the company?

4. Does the company have a separate budget for environmental spending, especially where this applies to environmental protection and monitoring or is this spending integrated into product/site budgets throughout the company?

4a. Do you have any idea of how much, in total, your company currently spends on environmental measures/ issues?

4b. Do you see this increasing or decreasing over the next five years, if so by how much?

4c. Has there been much increase in such environmental spending over the past five years?

Environmental Accounting

5. One way of focussing on such environmental spending, in order to assess its effectiveness or extent or both, is to construct environmental accounts. What form does any environmental accounting, currently undertaken by the company, take?

5a. Why did the company choose this particular method?

6. Do you see this evolving in any particular way in the future? For example, do you see yourselves constructing more than one type of environmental accounts?

6a. Can you envisage the development of a particular set format for financially orientated environmental accounts?

7. What have been the problems that you have encountered in producing what environmental accounts/figures you have done to date?

7a. Do you think that the problems encountered can be overcome or are there issues such as commercially sensitive information which make these problems insurmountable?

8. How relevant are environmental accounts to individual businesses? Have you had any need to disaggregate them down to an individual business level or do you feel that they are of more use as a company level tool?

9. If you were to look at environmental accounts for individual businesses, would you be more likely to construct a Mass-balance or some sort of financial set of accounts?

9a. Where the answer is that you would be more likely to construct a Mass-balance, is that because there are particular health or pollution issues in particular localities and this is a way of proving to the community that, despite what they may think, your business is not a major polluter of their local environment?

Environmental Accounting & Management Accounting

10. How important are the environmental accounts figures in the management accounting process?

10a. What form does this importance take? Is this solely a question of taking account of emission levels and their containment or is it a question of taking account of the financial figures or both?

11. Do you feel that environmental spending distorts investment decisions due to the necessity to meet particular standards or regulations? Is, therefore, accounting for the environment something of a distortion of the management accounting process or is it no worse than anything else that the outside world has done and is likely to throw at you?

12. Do you take account of the potential savings as a result of environmental spending, such as savings from recycling? Is this built into the accounting process in terms of the environmental figures?

13. In considering 'environmentally friendly' investments a company may take account of a number of factors. Can you rank the following for their importance to your company on a scale of 1 to 5, where 5 is very important and 1 is unimportant:

Available technology

Available capital

Impact on the 'bottom line'

Existing and projected legislation

Other factors

Change within the company as a result of environmental debate

14. Has the environmental debate that has taken place within your company, produced different types of investment than might otherwise have been undertaken?

14a. In this context, what has been the main impact or the major difference?

15. Has there been an increase in your company's R & D spending as a result of the 'environmental debate'?

16. There are particular measures which companies can take in order to solve many environmental issues. Which of the following has your company addressed over the past five years, is currently addressing or is likely to look at within the next five years:

Recovery and recycling of inputs from waste

Other waste reduction/reuse measures

Any other waste treatment measures

Measures to reduce inputs for the same outputs

Emission reduction measures (whether to air/water/subsoil/etc)

Use of more 'environmentally friendly' inputs

Any other production/process measures

Design of products for ultimate ease of disassembly/reuse/recycling/etc i.e. end-of-life product design

Commercial gains

17. Do you think that your company has gained commercially as a result of any environmental measures which you have taken and the public reporting of these?

18. Do you see environmental issues as a commercial opportunity both now and in the future?

18a. Specifically, can you see your company as a result of what it is currently doing and what it is planning to do:

Gaining market share

Creating new market niches

Creating new markets/reviving old ones

Creating new products

18b. Do you think these opportunities will be:

National

European

Global

and in which areas will they be of the categories mentioned in 16a?.

Sources of pressure on your company

19. The questions so far have related to financial and commercial pressures. What do you regard as the greatest single source of pressure on your company to institute change with regard to existing and new environmental measures?

20. Pressures to institute environmental measures and institute change can come from a number of different sources. Which of the following do you feel has influenced your company in this respect in any way:

Public/pressure groups e.g. Greenpeace

Non governmental organisations

The media

The City, in particular the Institutional Investors

Customers

Employees

Other stakeholders

Local Authorities

Central government

The EU

Global developments/organisations

21. Do you feel that any of these groups have exerted influence in this respect in an unfair or unreasonable way?

22. What do you think has led them to try to exert such influence on you?

23. Do you think it is issues such as global warming that have raised public consciousness and made them more aware of what companies may be doing to the environment?

24. What do you understand by the term 'sustainability'?

Government/EU influence

25. What do you think are the government's environmental priorities? How has this become apparent to you?

26. Does environmental legislation affect your company significantly? Is this national legislation or do you feel that you are affected more by EU legislation than national legislation?

27. Is there any dialogue between your company/industry association and the government?

27a Do you feel that the government understands the needs of businesses in the environmental context?

28. If governments have to intervene to introduce environmental legislation what type of measure do you prefer, direct regulation, indirect regulation via such measures as discriminatory taxation of your product, market based schemes such as pollution permits or some other measure?

B.2: Summary of companies surveyed

TABLE 9: GRID SUMMARY OF COMPANIES SURVEYED

Company	Sector	Size	Ownership	Activity	Environmental Issues
<i>Oil exploration, extraction and distribution (1)</i>	P	L	UK/Dutch	Oil (& gas) extraction and refining.	Waste reduction and treatment. Emissions. Efficient use of inputs. Plastics recycling. Effects on local communities and landscapes.
<i>Gas extraction company (2)</i>	P,T	L	UK	Gas exploration and extraction. Sells gas technology abroad and also has responsibility for international downstream business.	Energy efficiency. Waste recovery/recycling. Emissions.

Company	Sector	Size	Ownership	Activity	Environmental Issues
<i>Water company</i> - newly privatised, ex public utility (3)	P,T	M	UK	Water extraction, processing and supply. Water and waste water/sewage technology.	Processing of customers waste, especially where this is industrial customers with discharge to sewers consents. Excavated waste and backfill going to landfill. Odour control. Energy usage for pumping, treatment and other purposes and for transport. Depletion of a renewable resource, i.e. water.
<i>Speciality chemicals company</i> (4)	S	M	UK	Chemicals: speciality and those for wood treatment etc.	Emissions: to air, water and subsoil. Waste reduction/minimisation. Disposal of treated timber at end of life.

Company	Sector	Size	Ownership	Activity	Environmental Issues
<i>Fine chemicals manufacturer (5)</i>	S	S/M	UK	Chemicals: speciality, for example, the company that makes the ingredient for a well-known household disinfectant/antiseptic worldwide.	Waste water. Waste minimisation. Accidental spills (especially to water courses). Recycling.
<i>Supplier company to DIY market and interior decoration and flooring companies. (6)</i>	S	S	UK	Plastics coatings for wall and floor coverings.	Emissions. Odour. Waste minimisation and recycling. Efficient use of inputs; use of recycled inputs.
<i>Polymer manufacturer (7)</i>	S	M	Norwegian	Production of polymer for the plastics industry.	Emissions. Waste reduction/minimisation. Environmentally friendly inputs. Recycling/end use of plastic products.

Company	Sector	Size	Ownership	Activity	Environmental Issues
<i>Manufacturer of household goods (8)</i>	S	L	US	Manufacture branded and packaged goods, primarily home and personal care products.	Emission reduction, especially the issue of chlorine. Waste minimisation. Design of products for recycling, biodegradability. Energy efficiency. Packaging.
<i>Manufacturer of household goods (9)</i>	S	L	UK/Dutch	Manufacture of branded and packaged goods, primarily foods and home and personal care products.	Emissions: CFCs in refrigeration; Aerosols; phosphates in detergents Efficient water and energy usage. Waste minimisation/reuse. Design for biodegradability in sewage systems.
<i>Bed manufacturer (10)</i>	S	S	UK	Manufacture of beds.	Water and energy efficiency. Waste reduction/reuse; recovery and recycling of inputs from waste. Emissions.

Company	Sector	Size	Ownership	Activity	Environmental Issues	
<i>Construction company</i> (11)	S	M	UK	Construction - motorway junctions, housing association housing, shopping centres etc.	Waste disposal Noise pollution Dust and other particulate pollution Recycling of construction materials Control of water run off Energy usage and efficiency	
<i>Electricity company</i> (12)	S,T	L	US	Electricity distribution. Retailing of electrical goods. Electricity generation.	Recovery and recycling of waste. Waste minimisation. Emission reduction-especially oil, and issue of electro- magnetic fields.	
<i>Integrated energy generation and distribution, energy technology and retailing company.</i> (13)	S,T	M	UK	Energy generation. Electricity distribution. Retailing of electrical goods. Energy technology.	Emissions Waste management. Risk assessment.	

Company	Sector	Size	Ownership	Activity	Environmental Issues
<i>Computer manufacturer</i> (14)	S,T	L	US	Manufacture and retail of various sizes of computer.	Emissions from manufacture. Waste reduction/reuse and treatment. Design of products for end of life recycling.
<i>Food company - both retail and manufacturing</i> (15)	S,T	S	UK	Food processing/manufacturing and cafe/restaurant outlets.	Emissions: noise and others. Waste reduction and treatment. Efficient use of inputs and use of environmentally friendly ones
<i>Music production and retailing company</i> (16)	S,T	L	UK	CD manufacturing. Recording studios. Retailing.	Emissions. Packaging. Energy usage. Waste reduction.

Company	Sector	Size	Ownership	Activity	Environmental Issues	
<i>Retailer -high street chain store. (17)</i>	T	L	UK	Retailing	Energy efficiency. Packaging. Waste reduction/reuse (especially with respect to food). Dying and finishing treatments of suppliers, also integrated crop management.	
<i>Retail chain (18)</i>	T	S	UK	Retailing	Energy efficiency. Waste reduction/reuse. Packaging. Sale of environmentally friendly products.	
<i>Financial services sector (19)</i>	T	L	UK	Banking	Energy efficiency. Waste management. Emission reduction - for the printing plant. Water usage. Waste management.	

Company	Sector	Size	Ownership	Activity	Environmental Issues
Healthcare business (20)	T	M	UK-Public sector	Health care and treatment of all types, including CUES, CRUES, mental facilities for all ages, community hospitals, etc.	Clinical waste disposal. Waste disposal of other types of waste. Energy efficiency Emissions, for example, accidental mercury spillage. Packaging.

Key

Under sector:

P = Primary sector

S = Secondary sector

T = Tertiary sector

Under size:

S = small

M = medium

L = large

APPENDIX C

C.1: Abbreviated questionnaire results

TABLE 10: ABBREVIATED QUESTIONNAIRE RESULTS

Company	1	2	3	4	5	6
Q1	Critical	Very. 'Fat cats' phase has not helped them.	Yes, but currently positive public perception of the company. ACCA award has helped.	Very important.	Very important locally. Also important to customers.	Important with respect to local community and immediate neighbourhood only.

Company	1	2	3	4	5	6
Q2a	Company is both improving performance and improving communication of this performance	Environmental review since 1991. Latest includes hard data.	Environmental policy since 1990. Has conservation partnerships with various bodies, many applicable to Agenda 21. Participates in award schemes.	Improving performance. Annual improvement programme for measuring and monitoring environmental issues.	Liaison group with local community. EGAS registration. Leaders in EMS for chemical industry. ISO 14001 before official; standard. In initial scheme for verification procedure for BS7750	Dialogue with local people and also with local Environment Office

Company	1	2	3	4	5	6
Q2b (EMAS)	Own EMS which is compatible with EMAS & BS7750. Currently piloting EGAS	EMAS and own EMS	No Own EMS. ISO 9000 for clean water division. ISO 9000 based system for sewage system.	IERS. Under this scheme if reach certain level can go for EMAS registration.	Yes – EMAS etc.	No. Own EMS
Q2b (audit)	Yes	Yes – majority of sites	No	Yes	Yes	No but use of everything logged.
Q2b (EIAs)	Yes	Yes	Yes for all major sites plus pipeline installations.	Yes	Yes	N/A
Q2b (reports)	Yes – both at corporate and site level	Yes - from 1991	Yes	Yes	Yes	No

Company	1	2	3	4	5	6
Q2b (a/cs)	Yes – mass balance. Financial accounts show up in contingencies	Limited work on Mass balance.	Yes – notes to annual accounts.	Yes – notes to accounts in annual report and accounts.	Mass balance (for internal consumption only) MD puts environmental note to the annual statement.	No but beginning to look at Mass balance

Company	1	2	3	4	5	6
Q3	Is line management responsibility. Advised by various general managers	Line management job, with advice from specialists/professionals	Board Environmental Committee, plus Environmental Working Group serving Board, plus Conservation & Policy Group + Environmental Learning Days.	Responsibility of each MD of each operational unit. Can take advice from central unit or Safety Officer for unit concerned. Essentially line responsibility.	15/16 key positions identified in manual. Due to shift system this accounts for up to 30 people. But is part of line management's job.	MD, Factory Manager & Technical Manager, beyond this responsibility pushed down the line.

Company	1	2	3	4	5	6
Q4	Is a mixture. Projects have separate budgets but that budget may not cover all the environmental aspects	Integrated but small central fund related to environment.	Yes – small Environmental Initiatives Budget. Other monies integrated.	Integrated but capital spending is split into component parts, some of which may be environmental.	No integrated. But are a couple of small budget allocations for environmental purposes.	Integrated
Q4a	£33m+ other environmental expenditure	No	Ref. Environmental Reports	See Environmental Report.	Grey area. Difficult to separate out environmental spend.	No
Q4b	Increasing. 1998 will be £59m	Yes – increasing	Steady	Increasing	Slight decrease.	Yes, increasing.

Company	1	2	3	4	5	6
Q4c	Up	Yes	Ref: environmental Reports	Yes	Increase due to IPC	Has increased substantially.
Q5	Mass balance. (But when accounting for projects, discount rates for environmental projects often 0%)	None	Financial figures. Problems with attempting Mass Balance.	Financial operate absorption costing system with environmental costs charged properly to that product.	Mass balance – for internal use only.	Just starting to look at Mass balance

Company	1	2	3	4	5	6
Q5a	Pragmatic way. Should be based on production rates. Easier.	N/A	Easier	Using present method of costing rather than introducing new system. Easier.	Partly for compliance, partly for looking at efficiencies.	Environment Agency requirements.

Company	1	2	3	4	5	6
Q6	Financial numbers. Needs to be based on risk assessment.	May evolve in future.	Difficult to predict.	Financial – from cost/accounting system. Material balances – as a result of looking at wastes.	Complex situation. Mass balance is one of several drivers for environmental projects. Cannot say about evolution of environmental accounts as other environmental drivers.	Can see themselves broadening Mass balance to look at whole business not just one section. Need to recode financial figures before can extract environmental spend.
Q6a	No. Too difficult to separate out.	No	No.	Yes	Insufficient known.	No

Company	1	2	3	4	5	6
Q7	N/A	N/A	Provision of data. Separating out environmental figures.	Data gathering. Consistency of approach.	Getting data from people. Cultural change problems of persuading people to give date. Data no gives returns, product does.	Devising a programme or format; extracting figures; coding figures in a useful way.
Q7a	No – the question is the driving force	N/A	Yes, but commercial sensitivity could be an issue.	Much bench marking within chemical industry so commercial sensitivity is not a problem.	More and more has been overcome with cultural change as people have accepted need for figs.	Yes, commercially sensitive information as yet not involved.

Company	1	2	3	4	5	6
Q8	Not used for management purposes.	N/A	Need both.	Are a factor but different for different businesses.	N/A	N/A
Q9	Both	Mass balance but will look at financial figures.	Financial	Financial	N/A	Bits of both
Q9a	Must do a mass balance as impacts must be known.	Company is merely seeking to be top performer and follow best practice.	N/A	Under IPC what is discharged has to be measured. Probably need to produce something for one site.	Might but will never come to stage of issues with local communities. Really N/A	Yes have local odour and pollution problems. But figures produced are not for public consumption.

Company	1	2	3	4	5	6
Q10	Not at all – except for projects.	Low importance.	Increasing importance, Now have an environmental accountant doing CBA.	As important as anything else.	Not really as cannot be disentangled.	Not at present
Q10a	N/A	Top management now keen to see hard performance data on emissions etc.	Unsure	Both	N/A	Figures are important for compliance purposes, especially where it applies to compliance obligations.

Company	1	2	3	4	5	6
Q11	No, part of and integral to the investment process.	No	Need holistic approach. Note: the effects of the urban waste water directive.	Environmental spend just one of many. Just another cost needing management.	No, if capital is needed it is needed for whatever reason.	Yes - may make investment decisions would not do otherwise.
Q12	Yes, as would be with any other investment decision.	No, but probably are savings in the long term.	No. But note the effects of the recent Landfill Tax increase.	Yes	Difficult to put accurate figure on this.	Yes, try to recycle as much as possible.
Q13 (tec)	4	3 or 4	2	5	?	5
Q13(cap)	5	3	4	5	?	5
Q13 (bl)	3	?	5	5	?	5
Q13 (lw)	5	4	3	?	?	5

Company	1	2	3	4	5	6
Q13 (?)	5: licence to operate; impact of operations; public perceptions; future liabilities; bench marking	-	1	-	?	?
Q14	Yes	Yes	Yes, especially in terms of design of sewage treatment works. Also engineering aspects.	Yes	Chicken and egg. Route company has taken knew there would be expenditure.	Yes, e.g. more end of pipe technology.

Company	1	2	3	4	5	6
Q14a	Licence to operate	Either from projects or reconsidering to take account of environmental effects.	Greater emphasis on suppliers and supplies.	Infrastructure – have spent more money on this.	Due to various environmental issue, employees awareness has improved. Also have improved relationships with local community. Also benefit to customers, especially those for whom they are synthesis manufacturers.	Monitoring inputs of spirits and other potentially polluting inputs. Waste minimisation measures.

Company	1	2	3	4	5	6
Q15	Yes	No	Yes, but has always been a high R & D spend.	Yes	R & D is % t/o. As goes up, R & D goes up.	No
Q16a	Yes	Yes	Yes – reuse of water. Sewage effluent treated and put in rivers and sea	Yes, always	Yes	Yes
Q16b	Yes	Yes	Yes – leakage detection and good maintenance	Yes	Yes	Yes
Q16c	Yes	Yes	Reduction in packaging, landfill and transport.	Yes (discharges and consents)	Yes	Yes

Company	1	2	3	4	5	6
Q16d	Yes	Yes	Metering scheme and energy efficiency drive	Yes	Yes	Yes
Q16e	Yes	Yes	Are reviving odour control practices.	Yes	Yes	Yes
Q16f	No	Yes	Purchasing tries to ensure this. Also CHP plants. Use of renewable power where possible.	Yes (note timber treatment division).	Yes	Yes
Q16g	No	Energy efficiency	No	Yes	Yes	Yes

Company	1	2	3	4	5	6
Q16h	Yes	N/A	Yes, their green, clean compact technology, e.g. 'black box' sewage works.	Yes - in relation to wood.	yes	No
Q17.	In terms of direct commercial advantage, no; indirectly, yes.	Yes -especially in terms of international operations.	Yes - leakages	Yes, in particular as a result of 3Es initiative (see Environmental Reports) which has saved 60,000 tonnes of water per annum.	Yes, company is regarded within the chemical industry as a clean company. Also highly regarded by customers.	No public reporting and do not necessarily have gained from environmental measures.

Company	1	2	3	4	5	6
Q18	Can be but this is not huge. Petrol is and essential product.	Yes	Yes	Yes	Yes	Yes
Q18a(i)	Yes	Yes (see Q17)	Yes, at corporate level.	Yes	Yes	N/A
Q18a(ii)	Yes	N/A	Yes, corporate level.	Yes	Yes	N/A
Q18a(iii)	?	Yes	New markets created by legislation.	Yes	Yes, e.g. sister company near Cambridge	N/A
Q18a(iv)	Yes	N/A	Have done through R & D	Yes	Yes, MD currently looking for anything that could be new product.	N/A

Company	1	2	3	4	5	6
Q18b(i)	Yes	Yes	Yes	Yes	Yes	N/A
Q18b(ii)	Yes	-	Yes	Yes	Yes	N/A
Q18b(iii)	Yes	Yes	Yes	Yes	Yes	N/A
Q18b(iv)	In all but new markets	Yes in all categories	As a result of sales of new technology, e.g. their 'black box' technology to New Zealand	Whole chemical industry is global anyway.	All areas and all markets.	N/A

Company	1	2	3	4	5	6
Q19	Pressure from NGOs. Changing external environment and changing expectations of the public as expressed by the NGOs.	General pressure. public pressure. Peer pressure in industry sector.	1. Regulators 2. Customers 3.Stakeholders	The law and prosecutions. Neighbourhood where these exist. Peer pressure – much peer pressure in chemical industry not to have accidents etc. as blackens whole industry.	Environment Act	Legislation
Q20(PPG)	Yes	Yes	Not really	No	No	No
Q20(NGOs)	Yes	Yes	Work with them	No	No	No
Q20(media)	Yes	Yes	Yes – especially leakage	Yes	No	No

Company	1	2	3	4	5	6
Q20(City)	No	No	No	No	No	No
Q20(customers)	Yes/no	Yes	Yes	Yes	No	No
Q20(employees)	Yes	Yes	Yes	No	Yes	Mainly concerned with internal environment
Q20(stakeholders)	No	Yes	Lesser extent	Yes	No	No
Q20(LAs)	Yes-reg.	Yes	Not really	Not much	Yes	Yes
Q20(govt)	Yes-reg.	Yes	Yes	No	No	No
Q20(EU)	Yes-reg.	Yes	Yes	No	No	No
Q20(global)	No	Yes	Little effect	No	No	No
Q21	Yes, NGOs, in particular Greenpeace.	NGOs and media (both sometimes)	Yes, media as this has affected customers. EU through legislation.	Media is, at times, unfair	No	No

Company	1	2	3	4	5	6
Q22	They need a big 'win' in order to maintain their customer base.	Style of doing business	Privatisation process	New factor	N/A	N/A
Q23	Local issues, such as river pollution.	Some sections of the public only.	Yes, especially via transport issues	No, but drought & water restrictions have alerted general public to issues such as global warming.	These issues have often put environment into limelight but are false issues.	Not particularly

Company	1	2	3	4	5	6
Q24	<p>Ref: environmental report. Gummer definition. Based on social, economic and eco-efficiency.</p>	Brundtland	Brundtland	<p>Should pass on to future generations that which has been passed on to us.</p>	<p>Trying to ensure that future generations have at least the equivalent amount of natural resources as ourselves or preferably more.</p>	<p>Maintaining standards throughout a period.</p>

Company	1	2	3	4	5	6
Q25	Govt. Has mixed views and conflicting policies.	Higher environmental priorities than previous government.	Govt. has been driven rather than the driving. E.g. Rio Convention & Agenda 21	Not much different.	Not apparent yet and will not become easily so unless changes to legislation.	Too soon
Q26	EU prescriptive rules.	EU	Yes, major source is EU but both Water Resources & Environment Acts were both UK.	Yes, EU	National Environment Act	EU. UK is just following EU

Company	1	2	3	4	5	6
Q27	Yes, both	Yes	Bit of both. Works through WSA	Yes, CIA	Via EMAS registration talk to DOE. Otherwise, actively involved in CIA.	No
Q27a	Yes	Yes	Yes, views are requested and time and space are given for compliance.	Have given lots of advice, if not taken, chemical industry cannot be blamed.	Could do better.	Too soon

Company	1	2	3	4	5	6
Q28	Depends on type of pollution. For NOx and Sox tradeable permits work. Landfill tax works. Regulation can enhance freedom of action for companies, but company does not like prescriptive regulation.	Company would like to extend voluntary approach to safety and risk assessment issues to environment.	Market based schemes. E.g. EMAS/ISO 14000. In some instances direct regulation is necessary.	Direct regulation as can manage this via own initiatives and inventiveness. Taxation is unfair and cannot be managed.	N/A. Voluntary agreements or initiatives such as EMAS are useful	Direct taxation on products

Company	7	8	9	10	11	12
Q1	Important strategic factor for company	Very important	Of increasing importance. Note: effect of Marine Stewardship Council initiative	Not particularly	Top of the list, very important	Important, but is not necessary in order to mitigate negative publicity.

Company	7	8	9	10	11	12
Q2a	Corporate level – Environment Report. At main site, External Environmental Affairs Manager. Product stewardship. Join in on industry initiatives. Locally involved with community projects.	Have environmental policy for 30 years. Particular interest in water quality. Participated in industry's voluntary agreement to stop surficants. More from less philosophy.	Produces an environmental report. Senior managers are beginning to develop platforms on sustainability and environmental issues. Active in WBCSD	N/A	One company just certified to ISO 14001 (first construction company in Europe/world wide). Produce environmental brochure. 2 pages on environment in annual report and a/cs	Promoting good relationships with, e.g. National Parks Authority. Training environmental auditors, conducting EIAs, empowering employees.

Company	7	8	9	10	11	12
Q2b (EMAS)	SHERS. Evaluating ISO 14001 & EGAS will probably go for EGAS next year.	No, own EMS	Own EMS but can easily convert to ISO14001	EMAS & ISO14001		All measures currently leading towards ISO14001
Q2b (audit)	Yes – at every level.	Yes – own	Yes	Yes	Yes	Yes
Q2b (EIAs)	Yes	Yes, always	Yes	Yes	N/A	Yes
Q2b (reports)	Yes	Yes	Yes	Yes	Yes	Yes
Q2b (a/cs)	Yes – mass balance	No	Own type of Mass balance known as OBIA	Yes – financial	Indirectly	Mass balance

Company	7	8	9	10	11	12
Q3	At local level have HSE Manager. Also corporate steering structure and cross divisional meetings of those with environmental responsibility.	Top level support for environment from CEO down. World wide they have an environmental quality organisation headed by a VP. Environment is integrated into all jobs.	Ref: Environmental Report. Science & Technology Director has specific responsibility for the environment and everything flows down from him.	Is split, there is and Environmental Performance Committee consisting of 9 people.	Lead by Environmental Manager, then responsibility delegated down to site agents and project managers	Environmental Manager has overall responsibility. Is also an environmental committee consisting of representatives from all the component companies. Responsibility pushed down the line.

Company	7	8	9	10	11	12
Q4	Yes	Integrated	At corporate level, some environmental spend available for some teas and also for environmental research. Each company and business group then has own environmental spend. Also some central services of environmental nature, e.g. ecotoxicology	Integrated	Small central budget, the rest is integrated.	Integrated plus small budget for environmental projects outside the company.

Company	7	8	9	10	11	12
Q4a	No Difficult to segregate and not a big spend.	No	Ref: Environmental Report	£2-£3,000	£50K for central budget	No, are working on coding system so that they can extract this information.
Q4b	Same	See full notes	Yes, given that work previously done for other business reasons is now done for environmental ones.	Same	Yes	Slight increase.
Q4c	Not really.	Yes	Unknown, unsure	A lot when setting up system, since then steady	No	Increase

Company	7	8	9	10	11	12
Q5	No financial, but have a Mass balance.	N/A	This is done purely through an LCA approach and they are building on this.	Financial – it is cumulative totals for environmental targets	N/A	None – have looked at mass balance techniques
Q5a	To find out where everything goes and also for purposes of material efficiency.	N/A	Because it is a scientifically rigorous approach to managing environmental impact.	Originally done to raise company profile. Then saw savings and want to do it anyway.	N/A	Simpler and more production orientated. Is good way of picking up issues and engineers cannot hide figures.

Company	7	8	9	10	11	12
Q6	No	May become standardised in the way that financial accounts have become standardised.	They use an overall impact analysis and are now interested in focussing down on main areas of impact.	No	Can see some evolution but unclear as to what	Can see mass balance being constructed for public consumption. Can also see financial format emerging over the next 5 years.
Q6a	No	N/A	No	No	Yes – unknown	US format, as subsidiary of US group
Q7	N/A	N/A – systems are undeveloped	N/A	No	N/A	Management resistance

Company	7	8	9	10	11	12
Q7a	N/A	Would have to overcome problems	N/A	N/A	N/A	Problems relatively easy to overcome as just a question of coding. Figures are not especially commercially sensitive.
Q8	N/A	N/A at the moment	To achieve individual business figures have started at product level and then aggregated up. Have taken indicator products.	N/A	N/A	For public consumption, figures for the whole company. For internal consumption will have figures for individual businesses.

Company	7	8	9	10	11	12
Q9	N/A	See answer to 6	Mass balance	Financial	Don't know	Mass balance first, then progress to full financial accounting for the environment
Q9a	Mass balance for material efficiency. No plans to do environmental accounts	Would have done it already as part of hazard and risk assessment.	Company wants to help themselves understand why they need to take action. Is for internal understanding as much as for external purposes.	N/A	N/A	More likely to go for Mass balance, but pollution not an issue as they are not major polluters.

Company	7	8	9	10	11	12
Q10	N/A	N/A	N/A	Fairly important	They are not a feature	Unimportant. Not yet right mind set in management structure.
Q10a	Emissions	N/A	N/A	Question of taking account of the figures. If not showing a profit would not go down the environmental route	N/A	N/A

Company	7	8	9	10	11	12
Q11	No significant distortion but under continual pressure from the regulators.	Where regulation/procedures are just for the sake of a piece of paper, no point. Only cost for no gain, so do not undertake voluntary initiatives where in this category.	?	Any environmental system saves money and this helps with investment. Certainly helps with Institutional Investors	Don't know	Slight distortion due to need to meet standards. Also some anticipation of need to meet standards in investment decisions.
Q12	Recycling is an expense not a saving.	Yes, e.g. refill packs which are at lower cost to consumer, as cost less to produce and they pass this saving on. Also use some post use, recycled plastic in their bottles.	No	Yes and yes	Yes, but not separately reported	Yes -- proving paybacks are fundamental to getting environmental spend. (Company looks for 2 years or less in payback).
Q13 (tec)	-	5	?	4	5	4

Company	7	8	9	10	11	12
Q13 (cap)	-	5	?	5	2/3	4
Q13 (bl)	-	5	?	5	5	5
Q13 (lw)	-	5	?	5	1	4
Q13 (?)	-	5: consumer acceptance	?	-	-	5: management attitude
Q14	No	Yes, their technology has evolved to take account of the environment. E.g. products which are energy and resource efficient in manufacture.	To some extent	Yes	Not different types of investment but have been investing in things which would not normally.	No, due to type of investment but have been investing in things which would not normally.

Company	7	8	9	10	11	12
Q14a	N/A	Driven by consumer, e.g. compact powders	Refridgeration – removal of CFCs. Aerosols. Detergents – phosphates have been an issue here.	Examples are that all lighting is on sensors and have made water and energy savings.	Looking at environmental technologies which are away from their core businesses	Looking at environmental technologies which are away from their core businesses.
Q15	Yes in terms of product R & D rather than process R & D.	Cannot be that specific. Overall company spends \$1.3bn on R & D	Ref: Environmental Report	No	No	No
Q16a	Yes	Yes	Yes	Yes	No	Yes
Q16b	Yes	Yes	Yes	Yes	Yes	Yes
Q16c	Yes	Yes	Yes	Yes	Yes	No
Q16d	Yes	Yes	Yes	Yes	No	Yes
Q16e	Yes	Yes	Yes	Yes	N/A	Yes
Q16f	Yes	Yes	Yes	Yes	Yes	Yes

Company	7	8	9	10	11	12
Q16g	No	Yes	Yes	Look at use of recycled materials where possible	Yes	No
Q16h	No	Yes	Yes	Currently being looked at as part of management of programme	No	Yes
Q17	Yes, both in product and process.	Yes – lead for 18 months in compact soap powder market. Also leading in diapers.	If they had not have done would have lost out commercially.	On very small scale, if at all	Yes – has helped to win contracts	Yes – has helped to win big contracts.

Company	7	8	9	10	11	12
Q18	Yes	Yes – but initiatives not issues	Some businesses – yes. Ref. Marine Stewardship Scheme. Not done for commercial reasons but my have commercial impact. Company does not use the environment for advertising purposes.	Yes	Yes	Yes
Q18a (i)	Yes	Yes	?	Yes	Yes	Yes
Q18a (ii)	Possibly	Yes	?	Yes	Yes	Possibly
Q18a (iii)	Reviving old ones	Yes	?	Yes	Yes	Yes

Company	7	8	9	10	11	12
Q18a (iv)	Yes	Yes	?	Yes	No	Yes
Q18b (i)	Yes	-	All)	Yes	Yes	Yes
Q18b (ii)	Yes	-	Businesses)	Yes	Yes	Yes
Q18b (iii)	Yes	Yes	Global)	Yes	In the longer term	Yes
Q18b (iv)	In all categories	All, e.g. developments in old eastern bloc countries	Any	In all categories	All	Any area and for any product
Q19	Greenpeace – which does not like chlorine or its derivatives.	Need to have long term, sustainable business.	Industry peer pressure. Opinion formers.	Legislation	Legislation	Legislation
Q20 (PPG)	Yes	Yes – but have dialogue	Yes	No	No	Yes
Q20 (NGOs)	No	Yes – but dialogue	Yes	No	No	Yes
Q20 (media)	Not really	No	No	No	No	No
Q20 (City)	No	Not in the UK	No	No	Yes	No – but used to be yes
Q20(customers)	No	No	Yes	Slightly	Yes	Yes

Company	7	8	9	10	11	12
Q20(employees)	No	Yes	Yes	Slightly	Yes	Yes
Q20(stakeholders)	Shareholders (Norwegians)	Yes	Yes	No	No	No
Q20 (LAs)	No	Yes – over regulation	Yes	Yes	Yes	Yes
Q20 (Govt.)	No	Yes	Yes	Yes	Yes	Yes
Q20 (EU)	Yes	Yes	Yes	Yes	Yes	Yes
Q20 (global)	Only by global NGOs	No	Yes	Yes, indirectly	No	Yes
Q21	Yes, Greenpeace which is disgraceful and disreputable.	Yes, some extreme environmental groups use perception rather than science. Difficult to fight as is an appeal to emotion, rather than use of logic.	Perhaps some pressure groups such as Greenpeace, where position on chlorine is not helpful. Some NGOs on endocrine disruptors.	No	Central govt. – not in a fully considered way, in a wrong way.	Greenpeace have been out of order on occasions and to their own detriment. With other groups have dialogue which is not confrontational.

Company	7	8	9	10	11	12
Q22	Have targeted chlorine. Goes to back campaign against DDT. They see chlorines and dioxins as a negative. They pick up issues without understanding them.	Desire to develop own profile. Company is an easy target.	Is a question of lack of progress with the political and legislative system. Have not been able to get the environment high enough up the agenda, so campaigning against business is an alternative to this.	N/A	Lack of attention to detail.	N/A
Q23	Maybe at a general level, but the environment is not especially high on the public's agenda.	Is part of it but environment forms very small part of what is reported and what people are interested in.	May be lack of awareness	Yes, media has made it something that everyone understands	Yes, but muted and media driven	Yes, but not always of significance, depends what else is in the news.

Company	7	8	9	10	11	12
Q24	Ability to sustain society recognising the use and management of finite resources.	The resources needed to run the business will be available to the business and will be available at the right price to enable the business to be a business.	Ref: Company on sustainability	Anything used is replaced	Trying to continue to live at no extra cost.	Loose meaning different things to different people. John Elkington definition.
Q25	Nothing apparent so far.	Personal view – governments tend to have big priorities not little ones, e.g. focus on packaging. Latter is addressed at big issues rather than transport.	Transport	Labour has higher profile than Conservatives	Don't know.	Energy policy and energy efficiency – Labour pro active.

Company	7	8	9	10	11	12
Q26	EU is the driver.	EU driven	EU	National legislation	National, significantly affected by this.	Yes, EU and national legislation are one and the same so not affected by one more than the other.
Q27	Yes through industry association.	Always and by both routes	Are active in the packaging area -- instrumental in setting up VALPAK. Also involved in eco-label debate and various areas of ecotoxicology (for which have research labs).	Yes, industry association	Yes, via a number of different bodies but recently lobbied direct over one issue.	Yes, good dialogue.

Company	7	8	9	10	11	12
Q27a	Probably not.	Yes, but too soon to say	Unsure	Don't know	Yes, appreciate industry's needs but do not necessarily understand them.	No, tend to pay lip service to needs of industry.
Q28	Market based schemes, better for competitive business especially as company takes these things very seriously anyway. Market based measures can be effective. E.g. Landfill tax.	Prefer voluntary initiatives and perhaps a light touch of regulation. Feel that pollution permits encourage end of pipe technology and better to have good integrated practice, rather than end of pipe technology.	No formulated view on this.	Indirect measures. If tax, public know that it is subject to tax and it is their choice whether or not to buy.	Direct regulation – for a level playing field	Mix, depends on issues involved. Must be flexibility and must be mix of options public understands and accepts.

Table 9 continued...

Company	13	14	15	16	17	18
Q1	Important, it is at the heart of their strategy	Very important	Very important	Fairly important, want to have a good reputation.	Important	Very important
Q2a	Doing nothing but specifically involved in a number of environmental actions because they want to be.	Production of Stakeholders Report	Not bothered about image, only about doing	Environmental Report annually. Accredited to various recognised EMS systems. Supplier awareness for manufacturing.	Nothing proactive	To keep up with what they are doing in terms of making sure products they sell meet the environmental criteria of their customers.
Q2b (EMAS)	Have BS7750	ISO14001	No	EMAS – Holland. BS7750 at 2 sites, ISO14001 in Japan	No	No

Company	13	14	15	16	17	18
Q2b (audit)	Yes	Yes	Yes	Informal audit everywhere annually	Yes	No
Q2b (EIAs)	Yes, for all major overhead lines and power stations etc.	Yes	Yes	Yes, when material	Yes	N/A
Q2b (reports)	Yes	Yes	No	Yes	Yes, but not formalised	Yes
Q2b (a/cs)	Yes, financial	No	No	Mass balance at one factory. Some financial figures but unaudited.	2 page entry in report and accounts	Combination of environmental and social accounting

Company	13	14	15	16	17	18
Q3	Everyone's responsibility	Split between several people. In general responsibilities are linked with what individuals are doing/are responsible for anyway.	Part of duties of all managers and staff. Also have an Environmental Project Officer.	Very committed Chairman. Director of Environmental Affairs is the one with the responsibility. Various sub-sections have individuals with responsibility.	One of joint MDs has environment as his responsibility, under him is Board member, then cascades down to junior directors, regional directors and certain key managers. Integrated approach to management of the environment.	Director overall responsibility. Individual managers have own responsibilities in own locations.

Company	13	14	15	16	17	18
Q4	Integrated but is a separate budget for the central unit which co-ordinates everything.	For manufacturing, is integrated but also identifiable.	Integrated. It is very difficult to disentangle environmental from other spend.	Integrated	Fully integrated	No
Q4a	Started including figures in the 1995/96 Environmental Report and have continued to do so subsequently	No	No	Capital + operating = £1.6m	No	Ref: published Environmental Accounts
Q4b	Increase	Steady or decreasing	Increasing	Small increase	Increasing and significantly	Decreasing if anything

Company	13	14	15	16	17	18
Q4c	Increased – due to legislation (as they are generators + Environment Act)	Decrease	Yes, especially noise and other emissions.	Not sure	Yes	Ref: published Environmental Accounts
Q5	Financial	None done	No	Financial	Not really	Have tried to amalgamate environmental accounts with financial and social (if anything are financial).

Company	13	14	15	16	17	18
Q5a	As value system operating within economics and finance	N/A	N/A	Useful way to capture information	N/A	Because they neede to examine their aims. For this they needed a new set of company aims and objectives. Then needed to maesure these against environmental and fair trade issues.

Company	13	14	15	16	17	18
Q6	Is inertia in the business system plus problem of what you account for.	Yes	Not sure	Not a mass balance. In time financial accounts may be integrated into management accounts.	Current sets of measures and management tools could be brought together to present information in a more public way.	Is evolving at present.
Q6a	Depends which organisation is in the ascendancy. May have several systems.	Maybe figures for energy	Unsure	Yes	No	No

Company	13	14	15	16	17	18
Q7	Lack of coding system to identify environmental spend separately.	N/A	These are integrated but have not been produced.	Interpretation of guidelines, e.g. counting in of waste. People ignoring the from. Inability to audit the information received.	N/A	Time involved – took Director’s time so impact on sales.

Company	13	14	15	16	17	18
Q7a	Yes, what is commercially sensitive would probably not be regarded as environmental. Problems of grey areas, e.g. is flue gas desulphurisation, is this environmental spend or compliance.	N/A	N/A	Yes	N/A	No problem of commercial sensitivity. Director's time is a problem which will be overcome by only producing environmental accounts every 3 years.

Company	13	14	15	16	17	18
Q8	Implicit in business decision making. Is important to individual units but have to get them to recognise this and separate it out.	N/A	N/A	Information comes in individually, is no disaggregation. But is also need for figures at business wide level.	Are an integrated part of the picture and this is how environmental issues are regarded.	No relevance
Q9	Financial. Company is looking at other methods though.	Financial set of accounts	Not sure	Financial mass balance would only apply to manufacturing side of the business	Financial	Easier to do financial accounts.

Company	13	14	15	16	17	18
Q9a	Will be a mix of techniques of whatever will deliver to the local community.	N/A	N/A	N/A	N/A	N/A
Q10	Not very yet.	N/A	Not at present	Not at all. Currently under consideration.	Are taken seriously but not put together in separate form	N/A
Q10a	Important in terms of IPC and in helping to produce corporate profile.	N/A	N/A	N/A	Is prioritisation process and of process attaching cost benefit to it.	N/A

Company	13	14	15	16	17	18
Q11	Everything reduced to finance, but now increasing concerns about considering societal and environmental impact values. Environmental spend is increasingly part of changing societal values.	No. Having some figures for energy might persuade the company to invest more in energy conservation.	It is difficult to disentangle environmental spend from ordinary spend.	N/A	Yes, does distort patterns of trade	N/A. Could have an effect but on the whole does not apply to them.

Company	13	14	15	16	17	18
Q12	Yes but savings often unrecognised. Money is spent on risk avoidance.	Not at local level. Are mechanisms for separating out money obtained for recycling	Taken into account in project evaluation.	Capture savings in information in annual exercise. For capital request, environmental figures have to be captured as part of the submission.	Yes	Ref: Environmental Report. Are savings but these are not the reason for the introduction of environmental accounts.
Q13 (tec)	Important -4	N/A	4	5	3	0.5
Q13 (cap)	Very important -5	N/A	3	5	-	2
Q13 (bl)	?	N/A	4	5	5	3
Q13 (lw)	?	N/A	5	5	5	2
Q13 (?)	-	N/A	-	4: a wish to reduce impacts	5: opportunities provided by the environment to be slicker, faster and better than anyone else	?

Company	13	14	15	16	17	18
Q14	Yes	No	No	Yes	No	Yes, but is very core to the business anyway.
Q14a	Implementation of EMS and reporting on progress. Also 'green tariff', renewable energy projects, risk assessment.	N/A	N/A	Choice of refrigerants in air conditioning. Energy efficiency. Investment in VOC reduction systems. Investment in waste water systems.	N/A	Main difference -- type of product sold.

Company	13	14	15	16	17	18
Q15	Has refocussed some R & D spending	Yes, in process (cleaner) technology and product also.	Probably cannot substantiate	No	Yes	N/A. More time already spent on researching new materials than would be in most other companies.
Q16a	Yes	Yes	Yes	Yes	Yes	Yes
Q16b	Yes	Yes	Yes	Yes	Yes	Yes
Q16c	Yes	Yes	No but yes now	Yes	Yes	No
Q16d	Yes	Yes	Yes	Yes	Yes	Yes
Q16e	Yes	Yes	Yes	Yes	Yes	Yes
Q16f	Yes	Yes	Yes	Yes	Yes	Yes
Q16g	Yes	Yes	-	No	No	No
Q16h	Not really applicable. Have tried looking at fringe areas.	Yes	Yes	Will do so	Not in a big way	Yes

Company	13	14	15	16	17	18
Q17	Have not lost out.	Yes	Probably but do not separate out environmental care and concern from general commitments. Do inone or two instances.	Not particularly	Yes, but for commercial reasons not been used to market products.	Yes
Q18	Yes –possibilities	Yes	Commercial necessity not opportunity.	Future – perhaps more in classical area	Yes	Yes
Q18a (i)	Intend to	Yes	-	Might	Yes	Yes
Q18a (ii)	Yes	Yes	Yes	N/A	Yes	Yes
Q18a (iii)	Yes	Yes	Yes	N/A	Possibly	Yes
Q18a (iv)	Yes	Yes	Yes	No	Not sure	Yes
Q18b (i)	Yes	Yes	Yes	N/A	Yes	Yes
Q18b (ii)	Yes	Yes	Yes	N/A	Yes	Yes
Q18b (iii)	Yes	Yes	Yes	N/A	No	Yes

Company	13	14	15	16	17	18
Q18b (iv)	All	In all categories	Environmentally friendly inputs	N/A	Most	In all areas
Q19	Customers – as they can choose who they go with. Regulators, NGOs, legislation	Legislation	Moral	Initially corporate “you will do”, now they are more committed within company.	Internal within company. Is issue of picking this up from outside world and investigating but main dynamic is from within.	Self generated, in particular by MD.
Q20 (PPG)	Not directly	Not in UK but in USA	Yes	Yes	No	No
Q20 (NGOs)	Work with them	No	No	Yes	No	No
Q20 (Media)	No	Yes – globally	No	No	No	No
Q20 (City)	Yes	No	No	No	Partly	N/A
Q20(Customers)	Yes	Yes	Yes	No	Yes	Yes
Q20(Employees)	Yes	Yes	Yes	Yes	Yes	Yes
Q20(Stakeholders)	Yes	Yes	Yes	Yes	Yes	Yes
Q20 (LAs)	Yes	Yes	Yes	No	No	N/A

Company	13	14	15	16	17	18
Q20 (Govt.)	Yes	Yes	No	Yes	Partly	N/A
Q20 (EU)	Yes	Yes	No	Yes	Partly	N/A
Q20 (Global)	Yes	Yes	Yes	Yes	No	No
Q21	No	No	No	No	No, but PVC campaign may be unreasonable. Large enough to ignore them.	N/A
Q22	Individuals	N/A	N/A	N/A, although has been some impetus from FOE who wrote to them about ozone depleting substances.	They pick up on issues without understanding them, e.g. Greenpeace and PVC	N/A

Company	13	14	15	16	17	18
Q23	Most people driven by utility and NIMBY	Yes, but a number of issues involved here	Man needs crises to prompt social action, otherwise selfishness and inertia rule. Only legislation can keep the pot boiling between crises.	To an extent, local issues as well as headline grabbing incidents	Yes -- generally	Yes

Company	13	14	15	16	17	18
Q24	Welford definition	Brundtland definition	Does not have much to do with the environment, much more to do with global economics and social organisation and population control.	Gummer's definition. Brundtland definition. Living off interest rather than assets. Finding a way forward in terms of economic growth with social equity and ecological stability.	Making things sustainable so that they are infinitely repeatable without depleting resources. But now people talk about improvement as opposed to replenishment.	Negatives do not exceed the positives. Difficult to define need time to think.

Company	13	14	15	16	17	18
Q25	Not certain.	Spending time convincing everyone they are interested in the environment but concentrating on fringe items at the moment.	Hope integrated transport policy will become a priority.	Potentially higher on the agenda. Environmental stands a chance of being treated as a core value.	Whatever the government, the issue is attaching taxes to environmentally unfriendly things. Issue here is link to jobs.	Unknown
Q26	Yes, both	Both, most national legislation in this area is now from EU	Yes, EU	Not significantly, EU	Yes, same difference	No. Possibly in longer term, costs of waste and rubbish disposal – due to Landfill Tax and lack of landfill sites.
Q27	Yes, both	Yes, direct	Yes, e.g. Food Manufacturers Association	Yes – marginal	Yes, both but mainly directly.	No

Company	13	14	15	16	17	18
Q27a	Too soon	Over past few years, yes	Not sure	N/A	Yes	Unknown. Wait and see.
Q28	Voluntary agreements allow flexibility. Legislation – prescriptive. Tradeable permits better than taxation.	Company is against any mechanism which would allow free riders, so may be better to have legislation. Market based measures can be effective, e.g. Landfill Tax.	All essential but need global co-ordination. National/EU legislation will destroy the economics.	Favour a mix of indirect regulation and market based schemes. Maybe regulatory environment is needed.	Depends on issue. Some issues better dealt with on a voluntary basis, e.g. eco-labelling; for others direct regulation may be better. Best way is to influence the particular point in the supply chain that needs influencing.	Unknown. Different methods for different situations.

Table 10 continued...

Company	19	20
Q1	Environmental management is business priority for Group. Has been publicly stated at Board level.	Do not rely on public perception. They would be naturally concerned if they thought the public thought that they were getting anything other than secure HSE environment.
Q2a	Environmental Reports. New Website	N/A. Have insufficient funding to spend money on environmental image. If were spending on this would be mis-spent.
Q2b (EMAS)	Developing a financial EMAS with EU	Monitoring EMAS. Several different EMS systems.
Q2b (audit)	Own EMS – audited and externally verified.	Several different audits, no one single one.
Q2b (EIAs)	Yes – for customers as well	N/A
Q2b (report)	Yes	No
Q2b (a/cs)	Notes to financial statements	Physical quantities.
Q3	Starts at top with CEO reporting to Board. Each business head has individual responsibility. Plus group of advisers.	Is management responsibility supported by an advisory team.

Company	19	20
Q4	Integrated plus a non integrated discretionary blue sky budget.	Is integrated into budgets other than for soem types of waste.
Q4a	Environmental Unit costs <£1m per year. Savings from Unit's policies are £12m	Some types of waste treatment cost £260,000 per annum
Q4b	Increasing but not significantly	Decreasing
Q4c	Yes, due to numbers of staff involved.	Steady
Q5	Reports on environmental targets but these are product rather than finance based.	None
Q5a	Adopted 1992, only method available then.	N/A
Q6	Yes, more than one type.	N/A
Q6a	Ref: ACBE. If financial EMAS will use.	No
Q7	Managing expectations.	Before they computerised their system for tracking waste had no idea on facts and figures. Now have a more or less complete knowledge.
Q7a	Commercial sensitivity is not an issue -- are looking at impacts rather then customers.	N/A

Company	19	20
Q8	At individual level have been used to create peer pressure; are motivational tool. For reporting purposes, for consistency, are used at company level only.	N/A
Q9	Financial	Mass balance.
Q9a	N/A	Mass balance – these figures are driven by compliance requirements. Their waste disposal contractor is the main driver here in terms of figures for quantities, mainly as they have more legal responsibility than themselves.
Q10	Not important	Very important in terms of the size of the bill, due to financial restrictions on income to themselves.
Q10a	N/A	Waste figures.
Q11	Needs to be explained on an LCA basis.	No
Q12	See answer to 4°	Yes
Q13 (tec)	3	3
Q13 (cap)	1	N/A

Company	19	20
Q13 (bl)	5	3
Q13 (lw)	3 or 4	5
Q13 (?)	-	?
Q14	Yes, e.g. use of solar panels and photo voltaic investment.	Yes
Q14a	Embracing new technologies.	De-commissioning of the incinerator and contracting out of waste disposal and boiler maintenance.
Q15	Has been refocussing, e.g. pressure for integrated building design. Latest computer centre is naturally heated and cooled.	No
Q16a	Yes	Yes
Q16b	Yes	Yes
Q16c	Yes	Yes
Q16d	Yes	N/A
Q16e	Yes -- for print unit	Yes
Q16f	Yes	Yes
Q16g	No	No

Company	19	20
Q16h	No	N/A
Q17	Not specifically	N/A
Q18	Yes	N/A – they operate a not for profit system. Any gains go back into the system. Cannot be seen to be seeking any sort of commercial advantage.
Q18a(i)	Yes	N/A
Q18a(ii)	Yes	N/A
Q18a(iii)	Yes	N/A
Q18a(iv)	Yes	N/A
Q18b(i)	Yes	N/A
Q18b(ii)	Yes	N/A
Q18b(iii)	Yes	N/A
Q18b(iv)	Any or all	N/A
Q19	Is pressure to meet/achieve all aspirational targets in company policy statements.	Legislation ,
Q20 (PPG)	No	No
Q20 (NGOs)	Yes	No

Company	19	20
Q20 (media)	Minimal	No
Q20 (City)	No	No
Q20 (customers)	No	No
Q20 (employees)	Yes	No
Q20 (stakeholders)	Yes	No
Q20 (LAs)	No	Yes
Q20 (Govt.)	Yes	Yes
Q20 (EU)	Yes	Yes
Q20 (global)	Yes	No
Q21	No	No
Q22	N/A	N/A
Q23	Mainly starts with issues such as recycling. Resource efficiency is the driver.	Yes, has raised general awareness.
Q24	Brundtland definition. Treating the earth as though we intend to stay. Living off the interest rather than the capital. Note: difference between sustainability and sustainable development.	Is about maintaining the earth's resources for the future, about not destroying things for our children or grandchildren or leaving behind things that they have to put right.

Company	19	20
Q25	Too soon to say	Present government would seem to be planning to move faster.
Q26	Both. Note particularly the effect of EU Packaging legislation, which has had a major effect on their customer base.	National - legislation is of varying significance to them but waste legislation is main one.
Q27	Yes, both	Yes, at national level.
Q27a	Not entirely, and would rephrase it "business drivers" rather than 'needs'.	Too soon to say
Q28	Mix of all but would tend to favour market instruments and indirect regulation.	They are used to direct regulation. (Local community are more of a consideration than any legislation etc.).

TABLE 11: CATEGORISATION OF QUESTIONNAIRE RESPONSES

C.2: Categorisation of questionnaire responses

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
1	3: high importance; low importance; no importance.	4: very important; important; fairly important; not important	Not important	Important	For most companies. See section 4.4.1 for quote from Company 19.	4.4.1

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
2a	5: CER; environmental policy; local action; other activities; none	10: CER; dialogue with local communities; accreditation to recognised EMS ; conservation work ; adoption of clearly stated environmental policy ; participation in award schemes; production of stakeholder report; establishment of website; involvement in WBCSD; none	N/A	CER Website	For most companies in order to inform the responses and to understand the dynamics of these.	4.4.2

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
2b(EMAS)	2: yes; no	9: own EMS; EU EMAS (special financial in development); ISO 14001; own EMS + EU EMAS; EU EMAS + ISO14001; EU EMAS + ISO14001 + BS7750; BS77750; IERS/SHERS; none.	EMAS & ISO14001	EU EMAS (special financial in develop-ment)	For all cos. to ensure accurate categorisation. E.g., Company 19, refers to their talks on development of special EU EMAS at invitation of EU Commission, in process of which they will be coordinating 6 EU banks.	4.2.1

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
2b(audit)	2: yes; no	2: audit at least 1 or all sites; none	Yes	Yes	Cos. 6, 12, 13, 16, 19, 20	4.2.1
2b(EIAs)	2: yes; no	2: yes; N/A	Yes	Yes	Cos. 3, 12, 13, 19	4.2.1
2b(reports)	2: yes; no	2: yes; no	Yes	Yes	1, 17	4.2.1
2b(accounts)	2: yes; no	3: yes; yes but of limited nature; no	Yes “yes, financial”	Yes, but limited “There are notes to the financial statements but no mass balance at present.”	For cos. 1, 2, 3, 4, 5, 6, 9, 12, 16, 17, 18, 20.	4.2.1

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
3	4: Board member; line function; everyone; no one	5: Chairman + Director with environmental responsibility; Board member + formal structure; fully integrated into all jobs; MD each unit with responsibility; Environmental Performance Committee	Environmental Performance Committee	Chairman + Director with environmental responsibility	Necessary for all companies as some replies complex, especially for Company 10 see 4.3.3	4.3.3
4	2: integrated; separate	3: integrated; separate; mixture	Integrated	Integrated (Integrated + separate small 'blue sky' budget)	Not complex, Table 10 used for reference.	4.2.5

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
4a	4: large; medium; small; none	5: <£10K; >£10K & <£100K; > £100K<£500K; >£500K <£1m; >£1m	£2-3,000	>£500K <£1m	Not complex, Table 10 used for reference	4.2.5
4b	2: increasing; decreasing	4: increasing; decreasing; steady; unsure	Steady	Increasing	Not complex, Table 10 used for reference	4.2.5
4c	2: increased; decreased	4: increased; decreased; steady; unsure	Increased	Increased	Not complex, Table 10 used for reference	4.2.5

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
5	3:Mass balance; financial; none	4: Mass balance; financial; none; mixture	Financial	Mixture	Reference made for cos. 1, 3, 4, 6, 9, 18. Co. 10 spoke of cumulative totals for environmental targets and Co. 19, reports on environmental targets; product not financial base. Co. 19 was difficult to classify.	4.2.2

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
5a	3: easier; expertise available; other	8: easier; useful for efficiencies; compliance; 5 individual responses	Individual category	Easier	Reference for Companies 1, 4, 5, 6, 7, 9, 10, 12, 13, 16, 18, to ensure correct classification. Cos. 7, 10, 13, 16, 19 emerged as individual responses, see Table 10	4.2.2

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
6	4: yes, mass balance; yes, financial; yes, mixture; no	5: yes, mass balance; yes, financial; yes, mixture; unsure; no	No	Yes, mixture	Reference made for cos. 4, 5, 6, 12, 13, 16, 17 to be certain of classification. See Table 10	4.2.3
6a	2: yes; no	4: yes; no; maybe; unsure	No	Yes	Reference to Table 10 only as responses not complex.	4.2.3

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
7	4: none; provision of data; format; people	8: N/A; none; provision of data ; devising a suitable format; separating out the environmental data; management resistance ; managing expectations; lack of available time..	None	Managing expectations	Reference for Cos. 3, 5, 6, 12, 13, 16, 18, 19 Company 5: “ <i>data gives no returns product does</i> ”	4.2.6
7a	2: yes; no	3: yes; no; N/A	N/A	Yes “ <i>commercial sensitivity is not an issue</i> ”	Transcripts and Table 10 checked against each other for accuracy, then Table 10 used.	4.2.6

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
8	3: yes; no; both levels	3: yes, no, both levels; other reasons	No	Both levels “ <i>at an individual level it is used to create peer pressure</i> ”	Reference made for cos. 9, 12, 13, 19	4.2.7
9	2: mass balance; financial	4: mass balance; financial; mixture; cannot comment	Financial	Financial	Table 10 used as not complex.	4.2.7

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
9a	2: other issues; health/pollution issues;	6 individual answers	N/A	N/A	Transcripts consulted for companies giving individual answers.	4.2.7
10	2: important; unimportant	4: important; fairly important; N/A; unimportant	Fairly important	Not important	Table 10 used as not complex.	4.3.1
10a	4: emissions; both financial; none	5: emissions; financial; both; unsure; N/A	Financial	N/A	Table 10 used as not complex.	4.3.1

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
11	3: distort; no distortion; unsure	5: distort; no distortion; N/A; unsure; other	No distortion: see Table 10	Other: Needs to be explained on an LCA basis	Reference made to transcripts for Cos. 3, 4, 8, 13	4.3.1
12	2: yes; no	2: yes, no	Yes	Yes	Reference made to transcripts for Cos. 3, 7, 12, 13, 16, 19	4.2.8
13(technology)	Scale: 1-5	Scale 1-5 + N/A; unsure	4	3	Table 10 used as not complex	4.3.2
13(capital)	Scale 1-5	Scale 1-5 + N/A; unsure	5	1	Table 10 used as not complex	4.3.2
13(btm. line)	Scale 1-5	Scale 1-5 + N/A; unsure	5	5	Table 10 used as not complex	4.3.2

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
13(legislation)	Scale 1-5	Scale 1-5 + N/A; unsure	5	3 or 4	Table 10 used as not complex	4.3.2
13(other)	Scale 1-5	6 individual categories on a Scale 1-5	-	-	Reference to transcripts for accuracy but see Table 10 for individual responses to this question part for Companies 1, 8, 12, 16, 17.	4.3.2

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
14	2: yes; no	8: no; yes + 6 individual responses	Yes	Yes, " <i>the use of solar panels and photo voltaic investment</i> ".	Reference to transcripts for Cos. 3, 5, 6, 8, 11, 19. See Table 10	4.4.12
14a	4: emission reduction; savings; better community relations; impact on customers	N/A; + 15 different responses (see Table 10)	Water and energy savings	Embracing new technologies	Reference made to transcripts for Cos. 1, 2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 16, 18, 19, 20	4.4.12

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
15	2: yes; no	3: yes; no; unsure	No	Yes “a refocusing” See Table 10	Reference to transcripts for Cos. 5, 8, 12, 14, 18, 19	4.4.12
16a	2: yes; no	2: yes; no	Yes	Yes	Table 10 used as not complex	4.4.10
16b	2: yes; no	1: yes	Yes	Yes	Table 10 used as not complex	4.4.10
16c	2: yes; no	2: yes; no	Yes	Yes	Table 10 used as not complex	4.4.10
16d	2: yes; no	2: yes; no	Yes	Yes	Table 10 used as not complex	4.4.10
16e	2: yes; no	2: yes; N/A	Yes	Yes	Table 10 used as not complex	4.4.10

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
16f	2: yes; no	2: yes; no	Yes	Yes	Table 10 used as not complex	4.4.10
16g	2: yes; no	2: yes; no	Yes. See Table 10	No	Table 10 used as not complex	4.4.10
16h	2: yes; no	2: yes; no	Yes. See Table 10	No	Transcripts used for Cos. 3, 4, 10, 13	4.4.10
17	2: yes; no	4: yes; probably; no; N/A	Yes “ <i>but on a very very small scale if at all</i> ”	No “ <i>not specifically</i> ”	Reference to transcripts for Cos. 1, 2, 4, 5, 6, 7, 8, 10, 11, 12, 15, 19	4.4.11

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
18	2: yes; no	2: yes; N/A	Yes	Yes	Table 10 used as not complex but reference to transcripts for Cos. 9 & 20	4.4.11
18a(i)	2: yes; no	3: yes; no; unsure	Yes	Yes	Table 10 used as not complex	4.4.11
18a(ii)	2: yes; no	3: yes; no; unsure	Yes	Yes	Table 10 used as not complex	4.4.11
18a(iii)	2: yes; no	3: yes; no; unsure	Yes	Yes	Table 10 used as not complex	4.4.11
18a(iv)	2: yes; no	3: yes; no; unsure	Yes	Yes	Table 10 used as not complex	4.4.11
18b(i)	2: yes; no	2: yes; no	Yes, England	Yes	Table 10 used as not complex	4.4.11

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
18b(ii)	2: yes; no	2: yes; no	No	Yes	Table 10 used as not complex	4.4.11
18b(iii)	2: yes; no	2: yes; no	No	Yes	Table 10 used as not complex	4.4.11
18b(iv)	3: all categories; some; none	2: any or all; none	All	Any or all	Table 10 used as not complex	4.4.11

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
19	4: legislation; media; pressure groups; other	9: Legislation; non governmental organisations (NGOs); generated from within the company; peer pressure from within the industry; general public pressure; moral pressure; regulators; customers; stakeholders.	Legislation	Internal pressure “generated within the company”	Table 10 used but cross reference to transcripts for Cos. 2, 3, 4, 9, 13, 16, 17, 19	4.4.5
20(PPG)	2: yes; no	3: yes; no; some	No	No	Table 10 used as not complex	4.4.5
20(NGOs)	2: yes; no	2: yes; no	No	Yes	Table 10 used as not complex	4.4.5

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
20(Media)	2: yes; no	3: yes; no; some	No	Some	Table 10 used as not complex	4.4.5
20(City)	2: yes; no	3: yes; no; some	No	No	Table 10 used as not complex	4.4.5
20(Customers)	2: yes; no	3: yes; no; some	Some	No	Table 10 used as not complex	4.4.5
20(Employees)	2: yes; no	3: yes; no; some	Some	Yes	Table 10 used as not complex	4.4.5
20(Stakeholder)	2: yes; no	3: yes; no; some	No	Yes	Table 10 used as not complex	4.4.5
20 (LAs)	2: yes; no	3: yes; no; some	Yes	No	Table 10 used as not complex	4.4.5
20 (Govt.)	2: yes; no	3: yes; no; some	Yes	Yes	Table 10 used as not complex	4.4.5

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section 4 headings
20 (EU)	2: yes; no	3: yes; no; some	Yes	Yes	Table 10 used as not complex	4.4.5
20 (Global)	2: yes; no	3: yes; no; some	Yes	Yes	Table 10 used as not complex	4.4.5
21	2: yes; no	2: yes; no	No	No	Table 10 used but reference to transcripts for Cos. 3, 4, 7, 8, 9, 11, 12, 17 as four sub groups emerged for the ‘yes’ category	4.4.6

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
22	4: type of industry; environmental incident; principles; unsure; N/A	11: N/A + 10 individual answers. See Table 10	N/A	N/A	Table 10 with reference to transcripts for Cos. 1, 7, 9, 16, 17	4.4.6
23	2: yes; no	3: yes; no; some	Yes	Yes	Reference to transcripts for all companies. For qualifications to answers see Table 10.	4.4.7

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
24	2: Brundtland; other	9: Brundtland; Gummer, Elkington; + 6 individual responses	Anything used is replaced.	Brundtland	Reference to transcripts for all companies. Especially for Cos. 7, 8, 10, 15, 17, 18. See Table 10.	4.4.3
25	3: emission reduction; transport; unsure	10: unsure; no change; transport; external factors; + 6 other responses	Higher profile than previous government	Unsure	Reference to transcripts for all companies. See Table 10 for other responses.	4.4.8

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
26	3: yes, national; yes, EU; no	4: yes, national; yes, EU; yes, both; no	Yes, national	Yes, both. See Table 10 for extended answer	Table 10 used as not complex	4.4.8
27	3:yes, company; yes, industry assoc.; no	4: yes, company; yes, industry; yes, both; no	Yes, industry association	Yes, both	Table 10 used as not complex	4.4.9

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
27a	3: yes; no; unsure	5: yes; no; unsure; cannot say; could do better	Unsure “ <i>Don’t know</i> ”	Could do better “ <i>Not entirely, and would rephrase the question to “business drivers” rather than “needs”</i> ”	Reference to transcripts for Cos. 4, 11, 12, 19. Otherwise Table 10 used	4.4.9

Question No.	Original number of categories	Final number of categories	Category: Company 10	Category: Company 19	Reference to interview transcripts	Relation -ship to Chapter 4 section headings
28	4: direct regulation; indirect regulation; market based scheme; other	6: direct regulation; indirect regulation; market based schemes; voluntary approach; no view; mixture	Indirect regulation	Mixture: Mix, would tend to favour market instruments and indirect regulation	Table 10 used and cross checked against transcripts for all companies to ensure accuracy of analysis.	4.4.9

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