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SMEs and Environmental Taxation: A Mixed Methods Analysis

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The aim of the study is to understand the perceptions of small and medium-sized enterprises (SMEs) towards environmental taxation in UK. The study is based on the premise that environmental taxes are applicable to SMEs just as they are applicable to larger businesses because SMEs operate in almost all sectors of the economy. However, given the unique characteristics of SMEs including constraints of resources and often managed by one owner-manager, it remains to be seen how SMEs cope with the challenges of environmental taxation.

An extensive literature review is undertaken to provide a clear background to the research aim and objectives. The literature review discusses environmental taxation as an instrument to mitigate climate change and also in reference to SMEs. The review of literature also provides details into the unique characteristics and the environmental behaviour and attitudes of SMEs. Hypotheses are developed from the literature review and are tested through this study.

The researcher chose mixed methodology to do justice to the overall research aim. Data was collected from the chosen sample using surveys and interviews. The study undertakes survey to collect primary data to test the hypotheses. Interviews are also conducted to lend further insights into the survey data findings. To identify the sample, preliminary input-output analysis using UK input output tables is undertaken.

The research attempts to make a valuable contribution in understanding environmental taxation from the perspective of the SMEs and is a ready source of reference for literature on the same. The study also makes methodological contribution through the use of input-output tables in the sampling process for the main study.

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ACKNOWLEDGEMENT

DEDICATION

With all my love and adoration I dedicate this thesis to my Ma and my late Baba.

DECLARATION

I declare that no material contained in the thesis has been used in any other submission for an academic award.

Signed…………………………………..   Date………………………..

     Sukanya Ayatakshi

LIST OF ABBREVIATIONS

ALSF – Aggregate Levy Sustainability Fund

ANOVA – Analysis of Variance

APD – Air Passenger Duty

BAA – British Aggregates Association

BCC – British Chamber of Commerce

BIS – UK Department for Business, Innovation and Skills

CAC – Command-and-Control Regulations

CCA – Climate Change Agreements

CCL – Climate Change Levy

CFC – Chlorofluorocarbon

CH_4 – Methane

CHP – Combined Heat and Power

CIOT – Chartered Institute of Taxation

CO_2 – Carbon Dioxide

CRC – Carbon Reduction Commitment

DECC – Department of Energy and Climate Change

DEFRA – Department for Environment, Food and Rural Affairs

EB – Environmental Body

EC – European Commission

ECA – Enhanced Capital Allowances

EIUG – Energy Intensive Users Group

EMAS – European Union's Eco-Management and Audit Scheme

EMS – Environmental Management Systems

ENDS – Environmental Data Services

ETR – Environmental Tax Reform

EU – European Union

EU ETS – European Union Emissions Trading Scheme

EUR - Euro

GDP – Gross Domestic Product

GHG – Green House Gases

GOS – Gross Operating Surplus

HMRC – HM Revenue and Customs

IO - Input Output

IPCC – Intergovernmental Panel on Climate Change

KW – Kruskal-Wallis

LCA – Life Cycle Assessments

LTCS – Landfill Tax Credit Scheme

MEC – Marginal External Cost

MNPB – Marginal Net Private Benefit

MVC – Marginal Variable Cost

MVR – Marginal Variable Revenue

MW – Mann-Whitney

NIC – National Insurance Contribution

NO_x – Nitrogen Oxide and Nitrogen Dioxide

OECD – Organisation for Economic Co-operation and Development

ONS – Office of National Statistics

PPP – Polluter Pays Principle

RO – Renewables Obligation

SCEEMAS – Small Company Environment and Energy Management Assistance Scheme

SIC – Standard Classification Code

SME – Small and Medium-sized Enterprise

SO_2 – Sulphur Dioxide

SPSS – Statistical Package for the Social Sciences

SUTs – Supply-Use Tables

TA – Trade Association

TFL – Transport for London

UK – United Kingdom

VAT – Value Added Tax

VED – Vehicle Excise Duty

1 Introduction

1.1 Introduction

Small and medium-sized enterprises (SMEs) have come under increasing attention lately due to their overall impact on the environment. Although largely heterogeneous (Wilkinson, 1999), this business sector has been the focus of research lately mainly due to its typical characteristics, for example, personalised management style, sectoral differences and resource constraints (Spence and Rutherfoord, 2003; Hillary, 2000; Curran and Blackburn, 2001). The unique characteristics of SMEs set them apart from larger businesses. However, often the policies and regulations that are designed for larger businesses are applied to SMEs without considering their unique characteristics and resource constraints. The environmental policy instrument 'environmental taxation' is one such policy that affects almost all businesses that operate in sectors that are subject to environmental taxes and as such are equally applied to both larger businesses and SMEs. Larger businesses are expected to have the capabilities and resources to understand and act accordingly to such taxes but there is a dearth of literature on the effects of environmental taxation on SMEs.

SMEs account for nearly 70% of total global pollution (Smith and Kemp, 1998) and 60% of total carbon emissions (Marshall Report, 1998). The sum total of SMEs' environmental impacts outweighs the combined environmental impact of large firms (Hillary, 2000). With nearly 99% of all businesses in United Kingdom (UK) being SMEs, understanding the impact of environmental taxes on SMEs is of paramount importance because SMEs function in almost all sectors that are liable to environmental taxes. Given the large number of SMEs in UK sectors that are affected by environmental taxes, it remains to be seen how SMEs react to the levying of these taxes.

Proponents of environmental tax hail it as an instrument to encourage and motivate pro-environmental attitudes and behaviours. Environmental taxes have become popular tools of environmental policy for many countries thereby reinforcing the belief that taxes create

stronger incentives than regulation (O'Riordan, 1983; Pearce, 1976; Pearce et al, 1989; Turner et al, 1994). There are several motives behind the implementation of environmental taxes. Firstly the government benefits from the revenue generated through these taxes (Pearson and Smith, 1990). Secondly they provide a continuous incentive for innovation to develop less polluting products or processes (Verbeke and Coeke, 1997) and thirdly they are designed to motivate people towards pro-environmental behaviour.

Environmental taxes are designed to a) generate revenue for the government and b) chane behaviour to pro-environmentalism. For businesses, environmental taxes allow managerial choice (Verbeke and Coeke, 1997), that is, firms can choose to pay the taxes to compensate for the costs of pollution they create or they can choose to reduce the level of pollution and thereby avoid paying environmental taxes. This is particularly relevant in the case of SMEs as they are known to have limited resources (Revell and Rutherfoord, 2003; Revell and Blackburn, 2005; Rutherfoord et al, 2000). So this means that if they choose to pollute and pay increased taxes then that would limit their own business profitability. On the other hand, if they choose to invest in, say, energy efficient technologies then whether that is cost effective or not is also a cause of concern to them. Although environmental taxes allow managerial choice for SMEs, the technological investments that need to be made in order to reduce pollution may be quite expensive and therefore may not be affordable to them.

Understanding the attitudes of SMEs towards environmental taxes is likely to give answers to how they are meeting the demands and challenges of these taxes. SMEs are characterised by a lack of resources, expertise and understanding of many issues including environmental issues due to lack of time and money. And the priorities for SMEs are often short-term survival and profits (Spence and Rutherfoord, 2003; Revell and Rutherfoord, 2003). Limited resource of money means that any extra burden, through newer taxes or increased taxes, is likely to put a strain on SMEs' already limited resources. On the other hand, there may be a

situation where some SMEs are not even aware of the extra levy they are paying (e.g. CCL[1] on electricity) which might result in SMEs not paying attention to changing their environmental behaviour and attitudes (BCC, 2008).

Most SMEs are owner-managed and the owner-manager is the main decision-maker within the business and is responsible for prioritising different business objectives (Spence and Rutherfoord, 2000; Revell and Rutherfoord, 2003; Simpson et al, 2004). So it can be expected that the environmental attitudes of SMEs may stem from the environmental attitudes of SME owner-managers. Also, individual behaviour is believed to be affected by underlying attitudes and beliefs (Tilley, 1999; Tilley, 2000) and it is therefore expected that those who are concerned about the impact of their business on the environment will be more likely to change their behaviour accordingly.

Previous studies on environmental awareness and SMEs (Rutherfoord and Blackburn, 2001; Hillary, 2000; Revell and Rutherfoord, 2003; Friedman et al, 2000; Revell and Blackburn, 2007; Gunnigham, 2002) have thrown light on the attitudes of SMEs towards the environment in general. For example, the environment is not seen as a key business concern and paybacks from energy-saving technologies are not considered worth the initial investment to buy new equipment. But most of the studies are dated and also none have focussed on environmental taxes which have become a key economic instrument for environmental protection in the UK (Snape and Souza, 2006). Much of the policy decisions for businesses in terms of economic measures for climate change have been criticised for being developed for larger businesses and therefore are not well suited for the smaller ones, who do not possess the resources to integrate them. It is from this that the main aim of the study stems. To engage the SMEs in a discussion about environmental taxes the first step would be to elicit the level of awareness and understanding about environmental taxes in SMEs.

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[1] Climate Change Levy (CCL) CCL is a tax on the taxable supply of specified energy products (taxable commodities) for use as fuels that is for lighting, heating and power, by business consumers

The study also aims to research the influence of various variables such as business size, sector, their membership of a trade associations and the information they receive (about environmental policy) on their perceptions of environmental taxes. Firms may incur- due to environmental taxes- indirect cost effects through behavioural effects, that is, behavioural effects that produce indirect costs to the firms as they may induce technological changes or product innovation for energy efficiency (Verbeke and Coeke, 1997). As mentioned above, behaviour may be affected by underlying attitudes and beliefs and so understanding the attitudes of SMEs towards environmental taxes will shed light on the potential behavioural impacts of environmental taxes on SMEs. The researcher believes that it is worthwhile to conduct an empirical study through formalised research in the area of SMEs in relation to environmental taxes in the UK. This study will enable increased understanding of how SMEs are coping with the challenges of environmental taxation thereby engaging SMEs in the wider climate change discussion because SMEs are the backbone of any economy. Therefore, it is of great significance to embark upon this study.

1.2 Aim and objectives of the study

1.2.1 Research aim

The aim of the study is to investigate how Small and Medium-sized enterprises (SMEs) perceive environmental taxation in order to examine how, as an incentive tax, environmental taxation can achieve its environmental objectives. The research sets out to make a contribution to the literature on SMEs with regard to environmental taxation and it seeks to achieve the following purpose:

"*To investigate how SMEs perceive environmental taxation in the UK and to ascertain whether the differences inherent within SMEs- business sector, size, their membership of a a trade association and the environmental information they receive- have any influence on their understanding of and attitudes towards environmental taxation*"

1.2.2   **Research objectives**

The research objectives are designed to achieve the overall aim of this study. The research objectives are subdivided into theoretical and analytical objectives. The theoretical objectives set out the background process that carries the research forward to the stage where the analytical objectives attempt to achieve the research aim.

1.2.2.1   Analytical objectives

- To identify the potential sample selection using input-output analysis and SME Statistics in order to target, through surveys and interviews, those business sectors that are energy intensive and SME dominant;

- To explore the awareness and attitudes of SMEs towards environmental issues through SME owner-managers;

- To explore the awareness and attitudes of SMEs towards environmental taxation through SME owner-managers; and

- To explore the influence of the unique characteristics of SMEs including business sector, size, membership of a a trade association and their access to environmental information on their general environmental attitudes and their attitudes towards environmental taxation.

1.2.2.2   Theoretical objectives

- To discuss relevant literature on SMEs and their unique characteristics, their perceptions of environmental issues and their attitudes towards the environment including discussion of the literature linking attitudes and behaviour;

- To discuss relevant literature on environmental taxation and its significance as an instrument to mitigate climate change;

- To highlight the policy implications of the research findings; and

- To make recommendations in order to generate a better understanding of how climate change initiatives can benefit from an enhanced understanding and participation of SMEs in the wider discussion about climate change issues.

1.3 Significance of the study

The findings of the study provide empirical evidence of the impact of environmental taxation on SMEs in the UK. The recommendations of the study are expected to provide policy makers, local government agencies and the Government enough evidence to take into account the importance of considering the policy implications for SMEs. This is also expected to generate increased awareness of the need to engage SMEs in the wider discussion about climate change. The results of the study are expected to be of interest to SMEs which are directly affected by environmental taxation in helping them to understand the purpose of environmental taxation and how they can cope with it through generating better understanding and awareness of it. The results should also be of interest to the policy makers who work on the development of environmental policies such as environmental taxation by providing them with the empirical evidence to understand the barriers - such as poor attitudes of SMEs towards environmental taxation - that may become impediments in achieving the full potential of environmental taxation. The research findings are expected to be of interest to future researchers in pursuing newer avenues of research ideas that have emerged through this study.

1.4 Research questions

The study addresses the following research questions through the primary data collection:

- Are SMEs aware of climate change issues?

- What are SMEs' perceptions of environmental issues?

- What are the attitudes of SMEs towards environmental issues?

- Are SMEs aware of environmental taxation?

- What are the SMEs' perceptions and attitudes towards environmental taxation?

- Are there any influences by factors such as business sector, size, membership of a trade association and access to environmental information on SMEs' perceptions and attitudes towards environmental issues and environmental taxation?

- Are there any links between SMEs' attitudes towards environmental issues and environmental taxation to their environmental behaviour?

1.5   Scope of the study

This study investigates the impact of environmental taxation on SMEs in the UK. There are 92 counties in the United Kingdom and in England there are 9 geo-political areas, namely, North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, London, South East, and South West. SMEs are present in almost every sector of the economy in the UK and are present in varying numbers across different regions. The South of England - predominantly the South West - is chosen as the main area of primary data collection in the study due to the presence of the businesses the researcher chose to target and also due to considerations of time and financial resources. All respondents to the study are owner-managers within the SMEs targeted in the South of England.

1.6   Study Constraints:

The potential difficulties facing the study are:

- There is a dearth of up-to-date SME databases and the researcher is concerned that this might pose a difficulty in generating a proper sample;

- The primary data collection is targeted towards SME owner-managers but usually SMEs are run by one owner-manager who is involved in numerous contemporaneous tasks so it might be difficult for the research in the sense that the owner-manager might not have enough time to complete a questionnaire or give an interview;

- SMEs, in the literature, are usually perceived to have a poor attitude towards issues surrounding environmental matters because they do not consider it a business priority. This might result in the primary data being influenced by such opinions.

1.7   Structure of the study

This research study is divided into eight chapters including the current one. Chapters 2 and 3 discuss the relevant literature including:

- SMEs and their characteristics;

- the SME owner manager;

- SMEs and environmental issues;

- literature on environmental tax; and

- A brief overview of the literature on the link between attitudes and behaviour. This brief overview is undertaken because through the primary data the researcher is interested in understanding if SME attitudes and perceptions towards the environment and environmental taxation have an association with their environmental behaviour.

The literature review sets out the contextual background for this particular study by drawing inferences from key findings in the literature.

In Chapter 4 the research methodology is discussed which includes the research strategy, sampling strategy, instruments of data collection and methods of data analysis, and considerations of validity and research ethics. The research methodology chapter also justifies the need for a mixed methods approach to this study as the study has concepts that require both quantitative and qualitative approaches. A literature review on input-output analysis as a quantitative methodological choice for the study is provided in this chapter. This chapter discusses the methodology of input-output analysis and also the choice between parametric and non-parametric statistical tests in analysing the quantitative data collected through the survey. This chapter also informs the population choice for the primary data

collection through the identification of SME dominant sectors that are high users of those inputs that are liable to environmental taxation. In this regards this chapter uses 2008 SMEs statistics to supplement the analysis.

In Chapter 5, the researcher shows the formulation of the hypotheses that are derived from the literature review. This chapter sets out the hypotheses that are tested in this study to answer the research questions. The tests that are conducted on the hypotheses are primarily based on the responses to the survey questions.

Chapter 6 is the first of the two chapters that deal with the analysis of the primary data. This chapter discusses the analysis of the quantitative data collected through survey questionnaires and presents the results of the tests of all the hypotheses through the use of statistical tests using SPSS18. The chapter is illustrated with the use of tables and graphs in order to report the raw data and the findings in their entirety.

Chapter 7 deals with analysis of the qualitative interview data. The researcher partially uses QSR Nvivo 9 and mostly manual thematic analysis of the interview data. The purpose of the chapter is to lend more insights into the survey findings and as such it is structured in a way that the themes from the literature discussed within the chapter are linked to the hypotheses. Due to the exploratory and qualitative nature of this data, this chapter helps to engage with the quantitative data in a more detailed and personal way and also to corroborate some of the findings of the survey data.

Chapter 8 covers the conclusions and recommendations the researcher posits based on the findings of this study. In this regard this chapter highlights the potential implications of this research on academia through its contributions to the literature, to the business world through implications on managers and to the policy makers by enhancing their understanding of the impacts of environmental taxation on SMEs. Within this chapter areas of further research are also identified. This chapter also retrospectively discusses the limitations of the study and highlights areas of further research.

1.8   Summary
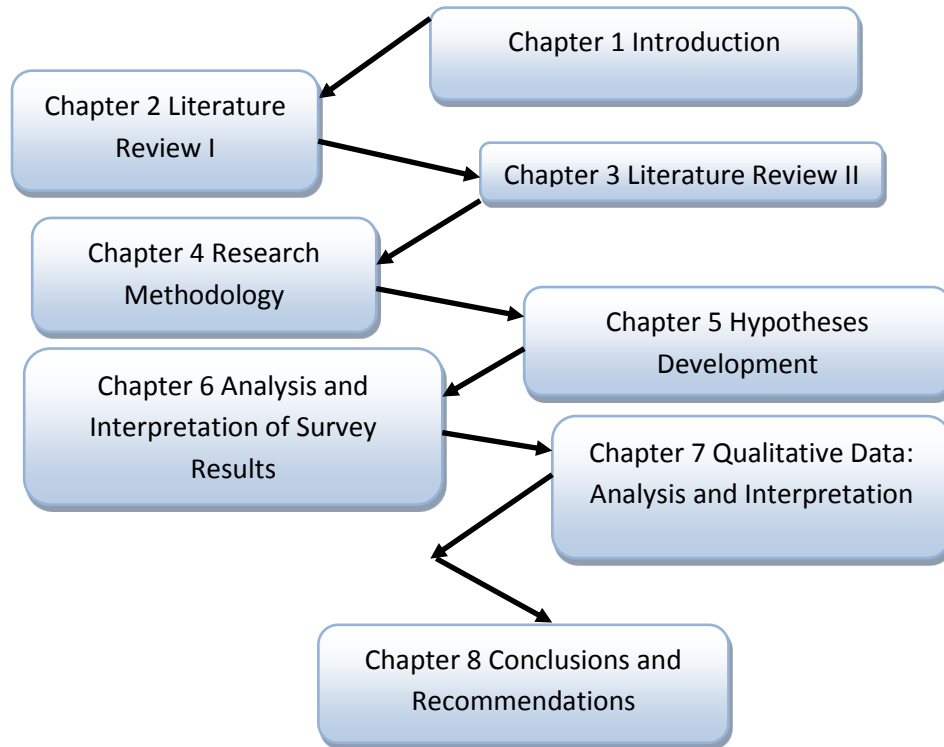
Figure 1 : Schematic Diagram of the Structure of Thesis

The schematic diagram Figure 1 above represents the structure of the research report. The chapter sets out the background of the research and discusses the aims and objectives of the study. The chapter also sets out the research questions, the scope of the study and highlights the structure of the thesis with a brief overview of each chapter.

2 Literature Review I

2.1 Introduction

The previous chapter set out the background to the research and the research aim and objectives. The current chapter is the first of the two literature review chapters and discusses the relevant literature on small and medium-sized enterprises (SMEs) and throws light on relevant literature on links between attitudes and behaviours and the discussion thereof.

The main vein of the research topic is SMEs and the impact of environmental taxation on them. So the literature on SMEs takes paramount importance and in this regard the researcher, in order to focus attention on the research topic, presents a summary of the literature review surrounding the relevant areas of SME research in the current chapter. This chapter discusses the general literature on SMEs, their unique characteristics, and previous studies on this business group and environmental issues. Literature on problems in undertaking primary research on SMEs is further highlighted in Chapter 4 Research Methodology. Following the literature review of SMEs this chapter also discusses the theoretical literature surrounding attitudes and behaviours because a) a key objective of environmental taxation is behaviour change and b) the study seeks to understand the attitudes of SMEs towards environmental taxation and environmental issues.

2.2 Small and Medium-sized Enterprises

The author feels that the term 'Small and medium-sized enterprises' (SMEs) conveys a paradoxical message that a particular business is both small and medium in size but that is far from the real meaning of SMEs. SMEs are a category of businesses that are defined along numerous parameters, the most common of which are size and turnover. SMEs constitute the

'backbone' of the European economy (EC, 2003) with more than 25 million SMEs in the European Union which account for nearly 99% of all enterprises.

2.2.1 Definition of Small and Medium-sized Enterprises

There are numerous definitions of SMEs and the most common ones include numbers employed and turnover. Although it varies between regions and countries (Aiyub et al, 2009), those are the most widely accepted criteria for defining a SME. According to European Commission (EC) definition (2003), the category of micro, small and medium-sized enterprises (SMEs) is made up of enterprises which employ "fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million.

Within the SME category, a small enterprise is defined as an enterprise which employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million. A micro-enterprise is defined as an enterprise which employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million" (European Commission (EC, 2003, article 2). Medium enterprises are ones with 50-249 employees and account for 0.6% in contrast to the small firms which account for 99.3% of the total 4.7 million businesses in UK. SMEs have been distinguished from larger enterprises by criteria of turnover, numbers employed and ownership (Curran and Blackburn, 2001). SMEs are now recognized world-wide to be a key source of dynamism, innovation and flexibility in advanced industrialised countries, as well as in emerging and developing economies. "They are responsible for most net job creation in OECD countries and make important contributions to innovation, productivity and economic growth" (OECD, 2006, p.16). SMEs have grown in importance over the last 30-40 years. While much literature has focused on what is a small firm it 'depends' upon a number of factors (Deakins and Freele, 2009, p.29) such as industry sector and market in which a given firm operates.

According to the Bolton Committee's economic definitions, Small firms are those which have a relatively small share of their marketplace; are managed by owners or part-owners in a personalized way and not through the medium of a formalized management structure; and are independent, in the sense of not being part of a large enterprise. (Deakins and Freele, 2009, p.30; Keasey and Watson, 1993). However, this focuses only on small firms. The European Commission (EC) focused on size to describe Small and Medium enterprises i.e., Small enterprises are those of between 10-99 employees (11-50 as of February 1996) and Medium enterprises are those of between 100-499 employees (51-250 as of February 1996) (Deakins and Freele, 2009). The EC definition still treats the small firm sector as a homogeneous whole and is essentially a measure of convenience (Deakins and Freele, 1996).

As to why SMEs have gained importance in the UK, it began with the remarkable increase in the extent of small firm employment over the late 1970s and the 1980s. In the UK the increase in the number of businesses and employment in SMEs took place in most sectors of the economy (Keasey and Watson, 1993). For the current study SMEs will be defined by size, i.e. numbers employed 0-249, in accordance with the EC definition. The population for the current study will focus on SMEs with employees 0-249. Further details on sampling strategy are discussed in Chapter 4 Research Methodology.

2.2.2 **Why SMEs are important**

There are 4.5 million businesses in the UK and of all the private sector enterprises, 99% are SMEs (BCC, 2008). In the European Union (EU), SMEs are socially and economically important since they represent 99% of all enterprises in the EU and provide around 65 million jobs, contributing to entrepreneurship and innovation (EC, 2003). At the start of 2007 of which SMEs together accounted for 99.9 per cent of all enterprises, 59.2 per cent of private sector employment and 51.5 per cent of private sector turnover (BIS, 2011; BCC, 2008).

The Department of Business, Innovation and Skills (BIS) puts employment in SMEs at 13.5 million at the beginning of 2008 which was an increase from 13.2 million in 2006 and a £83 billion increase in turnover to £1,440 billion 2006 (BIS, 2011). Of all the private sector enterprises in the UK, 32% of all enterprises are in London and the South West. The current study will target SMEs in south-west England because of issues of convenience, proximity etc. Also, for south-west England, SMEs account for more than 70% employment. Almost all of these enterprises (99.3 per cent) were small (0 to 49 employees). Only 27,000 (0.6 per cent) were medium-sized (50 to 249 employees) and 6,000 (0.1 per cent) were large (250 or more employees) (BIS, 2011).

The above statistics show that SMEs constitute the largest section of the private sector in the UK. Also, they are the largest providers of employment. While being a very important sector of the economy, SMEs produce around 70% of the total global pollution, 60% of the total carbon emissions, and the sum total of SMEs' environmental impact outweighs the combined environmental impact of large firms (Hillary, 2000; Smith and Kemp, 1998; Marshall Report, 1998). Although the individual environmental impact of SMEs may be small, their overall impact exceeds that of larger businesses (Gunningham, 2002). Worthington and Britton (2006) discuss come causal factors in the rapid growth of SME importance in the UK which include the change in the industrial structure in the UK with a shift from manufacturing to services sector firms, most of which are small. But this does not fully explain the growth of small firms even in the manufacturing sector (Worthington and Britton, 2006, p.247).

Other factors include the increase in interest in the role of the Small firm in regenerating the economy and providing more jobs (Bolton Report, 1971) and downsizing by organizations to reduce costs (Worthington and Britton, 2006). SMEs are also seen to innovative in ideas due to the close involvement and motivation of the owner-manager and have an advantage over the larger businesses in that many of them operate in smaller markets which larger firms would not enter (Worthington and Britton, 2006). In the context of the current study, SMEs

are highly important because not only are they at the forefront of job-creation and growth in the UK economy, but they are the most vulnerable to the impact of climate change and taxation (Crichton, 2006).

Since most SMEs are owner-managed, it is assumed that their attitudes and opinions towards, say, environmental issues, have a strong influence on the environmental behaviour of the business, so targeting SME owner-managers to understand SME behaviour has been the widely accepted strategy in research involving SMEs (Revell and Rutherfoord, 2003; Revell and Blackburn, 2007; Rutherfoord et al, 2000; Spence, 1999).

2.2.3   **What do we know?**

This section will discuss key findings in the SME literature on issues of environment, owner-manager characteristics, response to regulation, and barriers to environmental performance. The discussion will help the researcher to draw some inferences from the literature. Table 1 below summarises the key characteristics of the SME in the literature.

Key findings in Literature	Authors
Increasing attention is now being given to reducing environmental impacts of SMEs	Patton and Worthington, 2003; Petts et al, 1999; Simpson et al, 2004
Often SME defining characteristic is size	Wilkinson, 1999
Heterogeneous size and working structure	Spence, 1999
Different in nature not just size	Holliday, 1995

Owner managed	Spence and Rutherfoord, 2000
Dominated by personal relationships	Southwell, 2004
Entrepreneurial orientation and innovation	Hitt et al, 1991
Entrepreneurial SMEs are more adaptive	Goffee and Scase, 1985,p.18
Lack of time, money, skilled expertise in regulations	Spence, 2000
Vast business sector differences	Curran and Blackburn, 2001; Baylis et al, 1998
Long term survival is also a key priority	Spence and Rutherfoord, 2000
Environmental and social management is mock compliance	Holliday, 1995
Majority believe they SHOULD pay attention to environmental responsibilities	Spence and Rutherfoord, 2000; Holliday, 1995
"Ignorant of environmental impacts…oblivious to importance of sustainability… cynical of benefits of self-regulation…. Difficult to reach, mobilise or engage in any improvements to do with environment"	Hillary, 2000, p.18
Subject to market dynamics determined by large companies, which in many cases they supply	Enderle, 2004; Spence and Lozano, 2000

SMEs with the most proactive strategies had better financial performance	Aragon-Correa et al, 2008

Table 1: Key Characteristics of SMEs

2.3   Small and Medium-sized Enterprises

The above section gives an overview of the statistical significance of SMEs in terms of their numbers in the economy, their contribution to employment, pollution, and turnover. This section will throw light on characteristics that define SMEs and also separate them from larger businesses.

SMEs are different in nature from larger firms not just in size (Holliday, 1995, p.2). Size of an enterprise is seen as a major factor in influencing perceptions of a business case for sustainability (Smith and Kemp, 1998). SMEs are often reported to have limited resources; limited understanding and awareness of issues associated with business sustainability (Jenkins, 2004, 2006; Wilkinson, 1999; Spence, 1999; Spence and Rutherfoord, 2000) and are largely motivated by the profit and survival of the business.

There has always been a tendency amongst policy-makers to design policies for larger businesses and then fit them to the SMEs (Jenkins, 2004). But SMEs are not just different from larger businesses in size but they are also heterogeneous (Wilkinson, 1999) not only in their size but also in their working structures (Spence, 1999) and there are remarkable sector differences (Curran and Blackburn, 1994). SMEs have a very wide range of forms. They operate in almost every sector of the economy.

As there is widely acknowledged sector diversity in SMEs (Curran and Blackburn, 1994) sector differences are very crucial to the study of SMEs (Curran and Blackburn, 1994). For

example, a study by Baylis et al (1998) on manufacturing SMEs in South Wales and Humberside found that sectoral context was very important for understanding the firm's responses to environmental issues. The findings revealed that firms' orientation to environmental issues is much dependent on the sector they are in. For instance, the study identified SMEs which, in the environmental context are "lead" (e.g. chemical and electronic industries) and "laggard" (e.g. metal and metal processing industries).

Spence recommends, ''*SMEs should be...... owner-managed and independent*'' (1999, p. 169). SMEs are mostly owner-managed with a personalised management style (Spence and Rutherford, 2000; Spence, 1999, Curran and Blackburn, 2001). The entrepreneurs and owner-managers come from different genders and/or a wide range of cultural, ethnic and educational backgrounds and from every age group. Some are sole owners while others run the business with partners. While some start their own businesses from scratch, others inherit or buy an ongoing business (Curran and Blackburn, 2001; Storey, 1994). SME owner-managers are also attributed with having entrepreneurial orientation and the younger owner-managers are seen as being innovative and more environmentally aware (Petts et al, 1999) although many SME owners believe that they have little impact on the environment (Lee, 2000; Rowe and Hollingsworth, 1996).

SME behaviour is often understood in terms of the characteristics of the owner-manager (Jenkins, 2004; Spence, 1999; Gibb, 2000; Burns, 2001). SMEs have reactive attitudes towards regulations (Vickers et al, 2005) but attitudes and motivations can range from avoidance to proactive stances. A majority of SMEs believe that they should pay significant attention to environmental responsibilities. Although there is individual concern for the environment (Bansal and Roth, 2000), there has often been a gap between attitudes and behaviour in terms of environment (Tilley, 1999; 2000).

It has been argued that improvements in environmental management practices can result in a multitude of benefits to SMEs including reduction in waste, cost savings, increased customer

satisfaction, higher employee commitment, improved products, better public relations and competitive advantage (Simpson et al, 2004). Being able to demonstrate that the organization is environmentally responsible can be a competitive advantage to maintain or increase market share and to differentiate the organization from its competitors. Therefore, there could be a number of motivating factors behind increased environmental engagement including a perception that it may garner more profits and differentiate the organization and therefore strengthen its marketing strategy (Gadenne et al, 2009). However, it is not a common perception because most SME managers find environmental responsibility and improvement as a financial cost and many SME owners believe that they have little impact on the environment (Simpson et al, 2004; Lee, 2000; Rowe and Hollingsworth, 1996).

The following sections will discuss in more detail each aspect mentioned above, namely SME environmental attitudes, owner-manager characteristics, SME and environmental regulation etc. For the purpose of this study, it is necessary to ascertain the key findings from SME literature with particular attention to environmental issues and owner-manager characteristics.
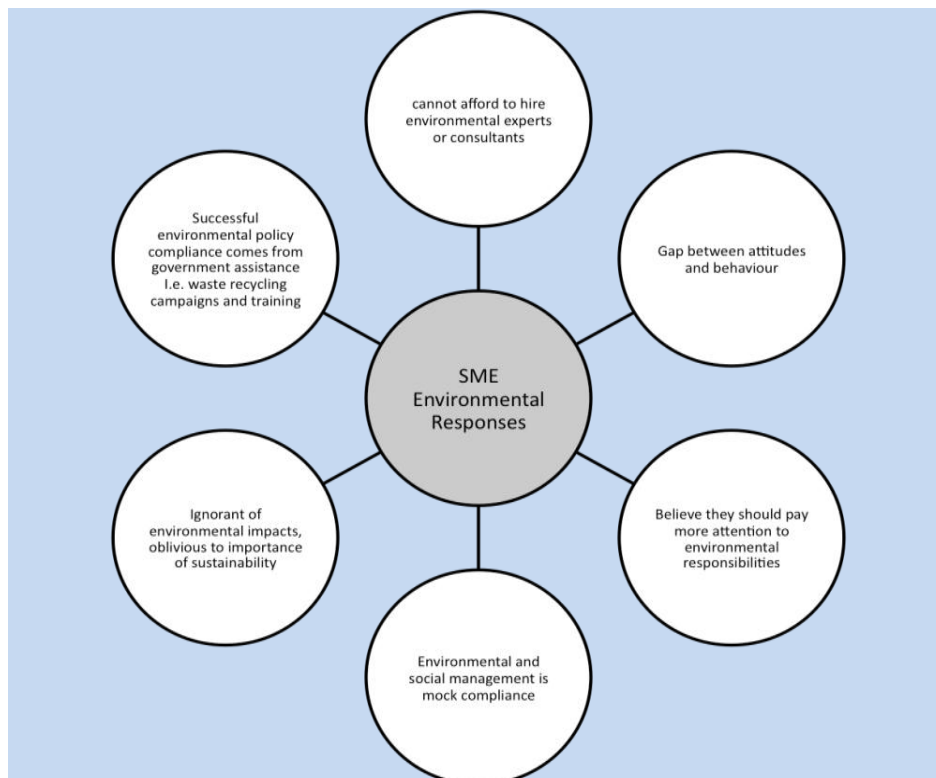
Figure 2: SME Environmental Responses

2.3.1 **SMEs and the Environment**

Figure 2 above shows the general environmental responses of SMEs from the literature. The literature shows that there is a gap between environmental attitudes and behaviour in SMEs and while some SMEs feel that they should become more environmentally aware, they are driven mostly by financial concerns and regard environmental activities such as investing in energy efficient technologies etc. as a financial burden and are largely ignorant of their overall impact on the environment (Friedman et al, 2000).

SMEs are under increasing pressure to address environmental issues from a range of sources including legislation, supply chain, trade associations and customers (Friedman et al, 2000). However, due to lack of time, resources and environmental expertise, addressing environmental issues is a complex issue for SMEs. Also, most of the actions such as recycling waste and changing purchase policy to benefit the environment are found to be driven by financial considerations, not environmental impact (Friedman et al, 2000, p.335). SMEs do not see the environment as a key business concern (Revell and Blackburn, 2007) and paybacks from energy-saving technologies are not considered worth the initial investment to buy new equipment.

SMEs have unique characteristics which may cause barriers in the application of conventional environmental measures (Gunningham, 2002) including a lack of environmental awareness and expertise. A lack of receptivity to environmental issues occurs because SMEs are usually unable to integrate environmental management decisions into their business decisions (Merritt, 1998). Also given the large number of businesses within SMEs creates a situation where it is very difficult for regulators to check all SMEs' environmental actions which allows them to slip through unnoticed (KPMG, 1997). Although it is largely accepted that SMEs lack the resources to implement proactive

environmental strategies, a study of SMEs in the automotive sector in southern Spain found that SMEs undertake a range of environmental strategies from regulatory compliance to proactive environmental leadership (Aragon-Correa et al, 2008). So it seems that generalising that SMEs are environmentally unaware and ignorant is not always correct. But this may be because SMEs are greatly influenced by sector differences so environmental knowledge and attitudes may be dependent on which sector they belong to.

A study by Bradford and Fraser (2008) discusses the role that local authorities can play in providing not only valuable support and advice to make SMEs more energy efficient but also in taking concrete action to implement policies to reduce SME GHG emissions. The study presents a framework of localized policy initiatives to help reduce energy usage by SMEs in the light of the fact that other than power generation, SMEs operate in every sector of the economy. Taking into consideration the factors of sector, turnover and size of the SME, the study analysed the behaviour of the respondents based on these three variables. Of the sample of 295 chosen randomly, the study only received back 55 complete responses thereby highlighting again the potential troubles in researching SMEs through primary data collection methods.

However in the absence of much secondary information on SMEs such as the absence of quantified information about the energy consumption of SMEs in the Digest of United Kingdom Energy Statistics , no data on pollution produced by SMEs, even in the European Union, and the omission of SMEs in the 2006 UK energy review primary data collection methods seem to be the only, albeit difficult way to reach SMEs. Also the purpose of the study determines the method and in this particular study by Bradford and Fraser, as in the current study by the researcher, SME attitudes and behaviours are under consideration and therefore quantified secondary data will not suffice to answer the research questions. The small number of SMEs studied by Bradford and Fraser (2008) were aware of the assistance of local authorities in helping SMEs improve their environmental performance. They argue

that local authorities need to serve as a centre for assistance and/or work in partnership with local and national business support organisations (Rowe and Enticott, 1998).

2.3.2 SME response to different environmental policy instruments

Economic instruments give SMEs greater flexibility than command and control regulation in tailoring their responses to their individual circumstances and achieving least-cost solutions (Gunningham, 2002). Traditional command and control is seen as weak because it is not credibly enforced or effectively communicated (Petts et al, 1999). Fig. 3 below summarises the responses of SMEs to direct environmental regulations.
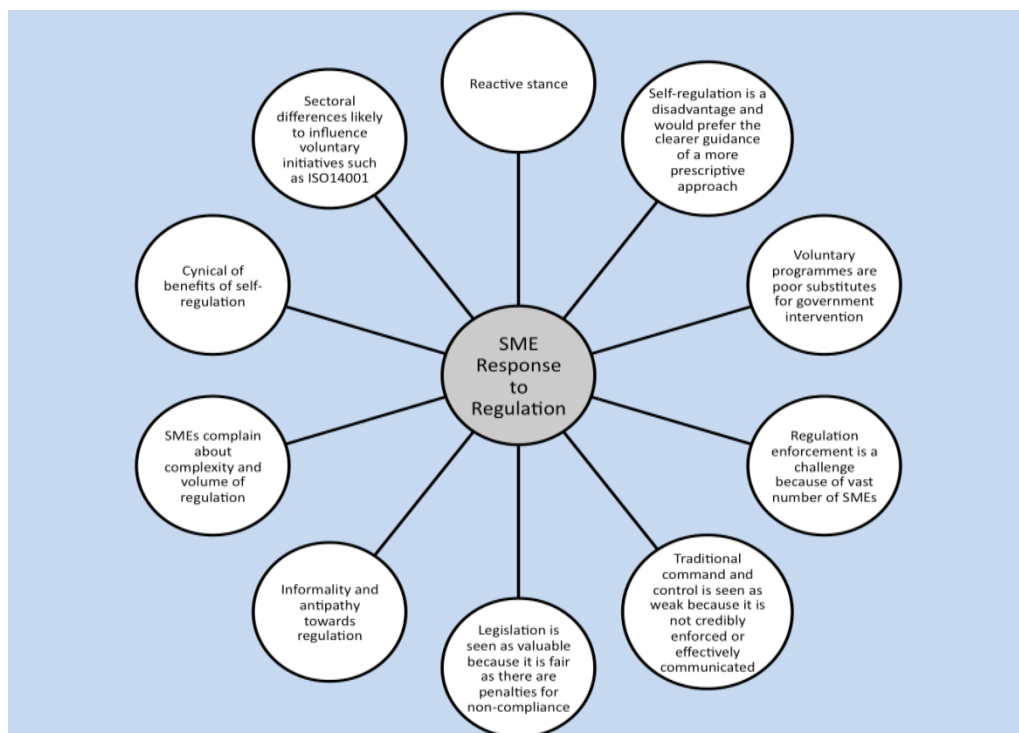
Figure 3: SME Response to Regulation

SMEs have been found to be highly susceptible to reactive stances towards regulations. There are a number of drawbacks in enforcing regulations on SMEs. Direct regulations mostly require a minimum compliance but due to the large number of SMEs in UK, it is

often difficult to enforce and check whether SMEs are complying with the required standards or not. SMEs have a strong antipathy towards regulations because traditional command and control regulations are thought to be weak because of the lack of clearer communication. Many SMEs do not favour voluntary self-regulation either because they seem to prefer a clearer approach which has a penalty for non-compliance.

A study on health and safety regulations and attitudes of SMEs to it found that SMEs have limited awareness and understanding of statutory regulations. Their attitudes to regulatory compliance ranges are often a reactive stance (Vickers et al, 2005). They are less likely to be proactive in the absence of regulatory measures (Petts, 1999; Simpson et al, 2004) and the only motivation to comply with regulations is the fear of penalty (Vickers et al, 2005). This also implies that self-regulation is a disadvantage due to lack of expertise, understanding and motivation, and SMEs would prefer the clearer guidance of a more prescriptive approach (Wright, 1998). A study of environmental innovations in SMEs found that new regulations encouraging the use of cleaner technologies and self-regulation have had limited success in increasing the uptake of environmental innovations and technologies within SMEs, even where there is strong evidence of environmental and commercial benefits (Hansen et al, 2002). Previous studies analysing the environmental performance and perceptions of SMEs found that regulations had only a limited effect on SMEs (Petts et al, 1999). They also found that self-regulation or changes that occur as a result of regulations are only at the surface level and not real and that small firms complain about volume and complexity and are uncomfortable with regulatory attention (Patton and Worthington, 2003; Mir and Feitelson, 2007).

There is an attitude of informality and antipathy towards regulation (Vickers et al, 2005). From the government point of view regulation enforcement is a challenge because of the vast number of SMEs (Gunningham, 2002). SMEs complain about the complexity and volume of regulation (Aiyub et al, 2009) and are cynical about the benefits of self-regulation (Hillary, 2000; p.18). As environmental regulation becomes stricter, larger companies are able to

invest in new technologies to comply with the legal requirements (del Brio and Junquera, 2003). With increasing complexity and demands of newer regulations, one of the disadvantages for SMEs is the technological complexity and experience effect (Porter, 1980; Scherer and Ross, 1990). This is the complexity arising due to businesses having to cope with the new technological, administrative and legal challenges and this complexity results in a higher cost per unit to the SMEs (Monty, 1991).
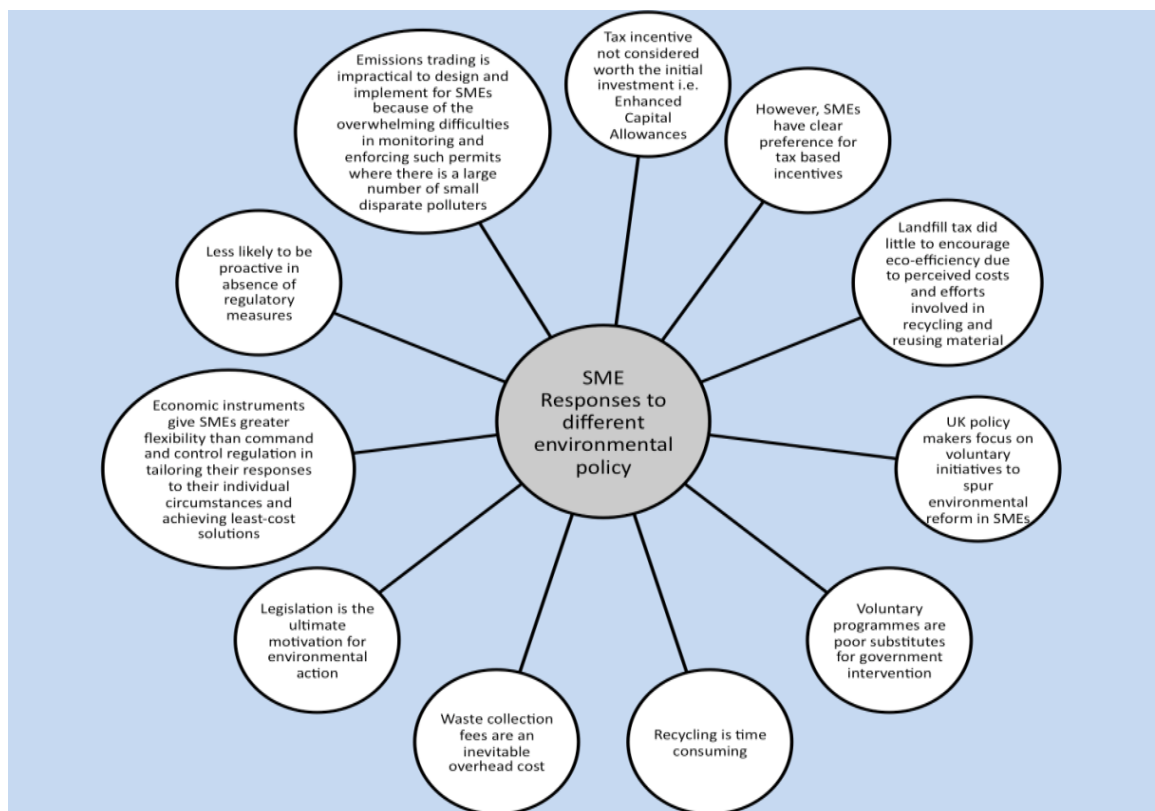
Figure 4: SME Response to Different Environmental Policies

Fig. 4 above shows the responses of SMEs to the various environmental policy instruments. Economic instruments such as emissions trading are impractical to design and implement for SMEs because of the overwhelming difficulties in monitoring and enforcing such permits where there is a large number of small disparate polluters (Gunningham, 2002).

Although it was earlier thought that SMEs have a clear preference for tax-based incentives (Gunningham, 2002), tax incentives such as Enhanced Capital Allowances[2] (ECA) are not considered worth the initial investment (Revell & Blackburn, 2005). By internalising many of the environmental externalities in the price of goods and services, environmental taxes are a way of making the business case of sustainability clearer to firms (Revell and Blackburn, 2005). Environmental taxes such as the landfill tax do little to encourage eco-efficiency due to perceived costs and efforts involved in recycling and reusing material, and measures such as recycling and waste collection fees are often seen as time-consuming and a financial burden respectively (Revell and Blackburn, 2005).

SMEs do not favour direct regulations but despite this, paradoxically, SMEs tend to view direct legislative action as the only way to ensure that businesses change their orientation towards environmental issues (Rutherfoord and Spence, 1998). In a study of regulatory compliance in employment and environmental regulations of SMEs, Hansford et al (2004) found that in the case of environmental regulations the SMEs surveyed cited factors of cost, complexity and ambiguity of the regulations as being barriers to compliance. UK SMEs expressed feelings of frustration and confusion - although they considered environmental regulations to be better administered than employment regulations - and complained about the ambiguity of the language used in environmental regulations (Hansford et al, 2004).

Often, UK policy-makers focus on voluntary initiatives to spur environmental reform in SMEs (Revell & Blackburn, 2005). Voluntary programmes are poor substitutes for government intervention (Revell and Blackburn, 2005). Although some form of voluntary initiative such as ISO 14001[3] certification can lend credibility to the SME, sectoral differences are likely to influence voluntary initiatives such as ISO14001 (Revell & Blackburn, 2005; Aiyub et al. 2009; Enderle, 2004). Voluntary initiatives are also found to

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[2] Enhanced Capital Allowances (ECAs) enable a business to claim 100% first-year capital allowances on their spending on qualifying plant and machinery.

[3] ISO 14001 was first published in 1996 and specifies the actual requirements for an environmental management system.

be more effective in dirtier sectors such as the chemical industry (Revell and Blackburn, 2005). Many SMEs are suppliers to larger businesses and might be required to obtain such voluntary certification to prove their environmental credentials.

Legislation is the ultimate motivation for environmental action (Hillary, 1995; Rowe and Hollingsworth, 1996; Petts et al, 1999). Legislation is seen as valuable because it is fair as there are penalties for non-compliance (Tilley, 1999). Although legislation remains the main driving force to implement environmental awareness in SMEs (Hillary, 1995; Rowe and Hollingsworth, 1996; Petts et al, 1999), personal environmental concerns are always becoming motivators for pro-environmental action. O'Laoire and Welford (1998) also contend that legislation is a main factor that is the driving force for environmental management in SMEs. Most SME owner-managers are found to be unaware of the extent to which environmental legislation affects them (Mir and Feitelson, 2007). Legislation is also often inconsistently and poorly enforced due to the high costs of enforcement and given that most SMEs only pay attention to their environmental practices when risking being penalised, this policy is seen as weak (Patton and Worthington, 2003; Mir and Feitelson, 2007).

2.3.3 Environmental taxation-compliance and SMEs

Environmental taxation is a policy that applies to all businesses irrespective of their size. Having to face such challenges and faced with a lack of resources to meet demands of environmental policy such as environmental taxation (Berends et al, 2000), one of the consequences might be of non-compliance behaviour due to a lack of capacity. A second consequence, which is more positive, is for SMEs to adapt to these challenges by changing their behaviour. But for this to happen, SME resource constraints need to be considered because as literature shows, SMEs often have positive environmental attitudes which do not translate into positive environmental behaviour due to a number of mitigating factors, including lack of money (Azzone et al, 1997a and 1997b; Azzone and Noci 1998a, 1998b), expertise, manpower, time and source of information etc.

In trying to understand the burden of taxation on SMEs we have to take into consideration the burden of costs, administrative complexity and complexity of tax laws, all of which impinge upon the compliance with taxation within SMEs (James and Alley, 2002). In understanding the issue of tax compliance it is necessary to mention here that, unlike the standard neoclassical economic approach- which focusses on the rational choice of profit maximisation as being the key concern of businesses- taxpayers' decisions are not just about a cost-benefit calculation in deciding whether or not to pay the taxes but also the attitudes of the taxpayers and their beliefs about the tax compliance policy-makers can affect the issue of tax compliance(James and Alley, 2002).

In the rational neoclassical economic approach tax compliance is seen as a matter of economic rationality (James and Alley, 2002) in individuals who carefully consider the financial gains or losses related to compliance or non-compliance. Alley (1999) provided a comprehensive definition of tax compliance based on the concept of 'tax gap' which is the difference between the actual revenue collected and the amount that would be collected if there were 100% compliance. However the concept is quite simplistic for practical purposes in the sense that compliance should be made willingly and if taxpayers comply due to fear of being penalised then it cannot be called full compliance (James and Alley, 2002). However the tax gap concept is also too narrow in understanding environmental taxation policy. In case of environmental taxation, compliance could be seen from the perspective of issues of tax evasion and tax avoidance. Tax avoidance is reducing taxation by legal means and tax evasion is attempting to reduce tax liability by illegal means. The purpose of environmental taxation is to change behaviour in order to 'avoid' or 'lessen' the tax burden so the intention of the tax is that it is avoided (James and Alley, 2002).

Any changes in behaviour, say, increasing energy efficiency through investing in newer technologies in manufacturing SMEs, would lead to tax avoidance but this is one of the objectives of environmental taxation so the 'tax-gap' method of viewing compliance is not applied in such cases (James and Alley, 2002). James and Alley (2002) put emphasis on the

issue of 'willingness' of the taxpayers in discussing the issue of tax compliance while a definition of tax compliance comprising *"willingness of individuals and other taxable entities to act in accordance…"* (p.32) is unable to be measured, but such a definition is both simple and accurate (p.32). Using the behavioural approach, there are suggestions that factors of attitudes, age and gender etc. have influenced the degree of motivation of taxpayers regarding compliance (Meier and Johnson, 1977).

The issue of compliance with taxation is particularly challenging for smaller businesses because tax law is rather complex and while it is desirable to simplify those laws to reduce tax compliance costs, simplification is not easy to achieve (EC, 2007). Taxpayers and the government do not always agree on what is owed by taxpayers (Bergman, 1998). The problems for SMEs arise from the fact that tax laws do not, in principle, make any distinctions between SMEs and larger businesses. So tax laws are drafted to be applied to businesses irrespective of their size and therefore their capabilities to deal with the complexities of cost and other administrative burdens associated with compliance (James and Alley, 2002). The complexity of the tax law can have an impact on the willingness of the taxpayer to comply with the taxes. Such increased costs hamper the process of tax compliance by generating a negative impact on the taxpayers and a cascade effect on the cost of the tax system for tax administration (EC, 2007).

The total resource costs to a business of any given tax system consists of two parts: the amount of money that taxpayers need to pay to the government to meet their tax liabilities and the amount of administrative resources, the so-called tax compliance costs (OECD, 2007), which include recording transactions and maintaining accounts etc. Some of the main reasons for high tax compliance costs for small businesses are identified in the *Simplified Tax Compliance Procedure for SMEs* report by the European Commission Expert Group (2007). This report includes frequent changes of tax laws coupled with the complexity of those laws; existence of different tax administrators; incomprehensible language of tax laws; short and inflexible deadlines for tax payments and costs of tax consultants (EC, 2007, p.6).

The European tax survey 2004 found that European SMEs have a cost to tax revenue ratio of 30.9% - the ratio between total tax-related compliance costs and paid taxes - whereas larger companies have a cost to tax revenue ratio of only 1.9% (EC, 2007).

The two factors responsible for this are a) compliance costs are mostly fixed so for larger businesses compliance costs do not increase just because more figures are entered into the forms (James and Alley, 2002) and in relative terms (e.g. measured per employee or compared to turnover) small companies bear a disproportionate regulatory burden but in absolute terms b) larger businesses are more efficient in dealing with tax compliance and higher absolute costs justify the employment of specialists and also investment in the systems i.e. software, to increase efficiency (EC, 2007; p.5). Therefore tax compliance is a cost factor that cannot be underestimated especially in the case of financially constrained SMEs. Compliance costs also possibly affect the competitive position of the firms by affecting their business growth (OECD, 2008; James et al, 1998) and these costs tend to increase with the number of taxes that a business is subject to. Studies on compliance costs to SMEs conclude that although total business costs are higher for large companies, as a percentage of sales these costs are significantly higher for SMEs (Ariff et al, 1997; Sandford and Hasseldine, 1992; James et al, 1998).

There may be other negative impacts associated with the costs of tax compliance including lack of knowledge of SME owner-managers; lack of external help and also tax avoidance (James and Alley, 2002; EC, 2007). Since frequent changes in tax laws are identified by the experts as one of the greatest difficulties for SMEs to comply with tax laws, information and assistance from external sources - perhaps local authorities - is required. The European Commission report 2007 calls for the need to disseminate information on taxation-related issues through channels such as e-mail; seminars and training sessions to SMEs to simplify their tax compliance burdens. But it is worth keeping in mind that often smaller businesses are run by one man or woman who is the owner and manager at the same time and is lacking in time in addition to the lack of other resources. And the researcher feels that perhaps it is

more effective to communicate to SMEs through electronic means such as e-mail to inform them of where they can go to seek information and assistance.

Reducing tax compliance costs would lower the overall tax burden on SMEs and would encourage adherence to tax laws. Environmental taxation, as mentioned before, is designed with the purpose of encouraging change in behaviour but if the compliance costs are high and coupled with limited or lack of understanding and/or awareness, this taxation will fail to achieve one of its key objectives. However, in the context of environmental taxation, compliance is not the primary goal, instead, behaviour change and a consequential reduction in tax is the goal.

2.3.4 SME Owner-manager perceptions

The logic of focussing on the owner-manager is to access potentially the strongest influence within the firm (Spence and Rutherfoord, 2000). Fig. 5 summarises the key literature findings on SME owner-manager attitudes.
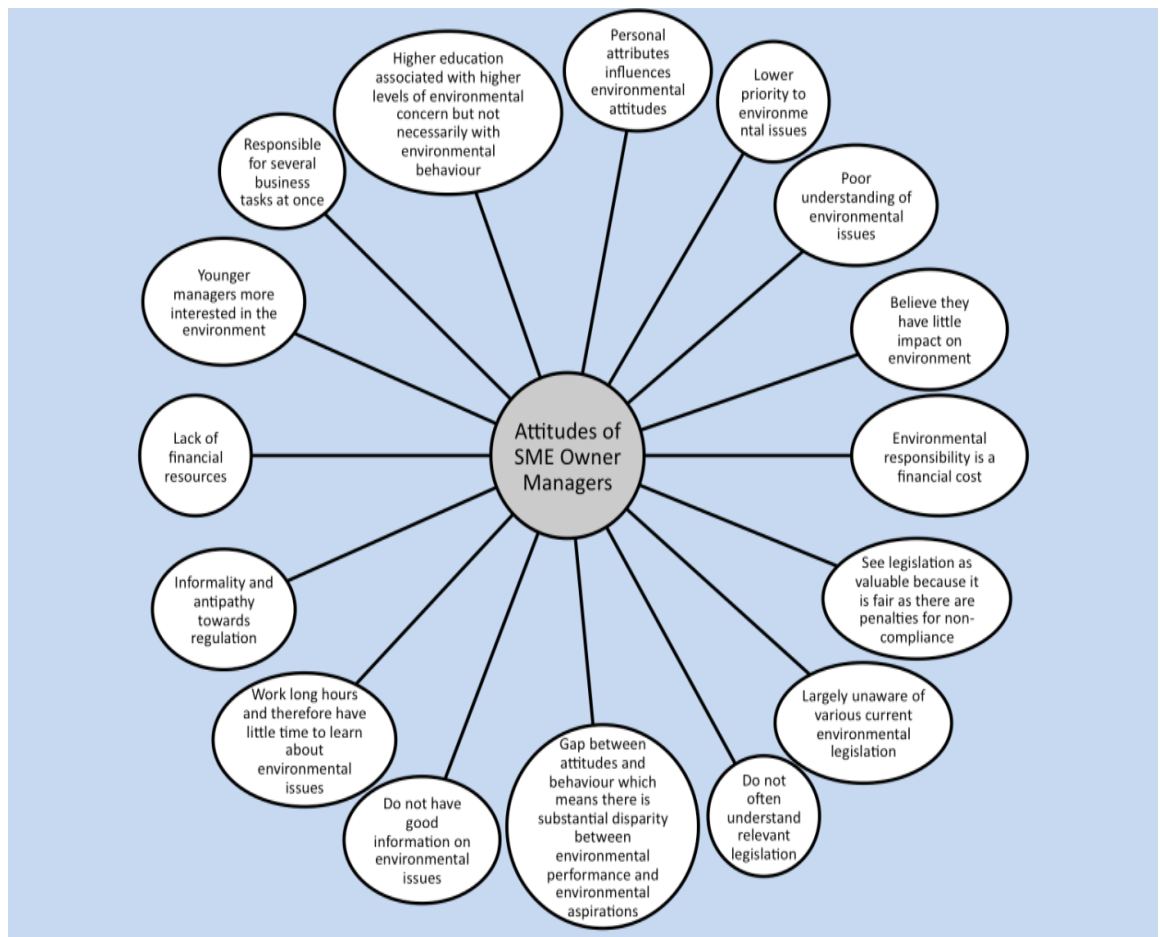
Figure 5: SME Owner-managers and their perceptions of environmental issues

Personal attributes of SME owner-managers are thought to influence environmental attitudes of the business (Hines et al, 1986). Hines et al (1986) proposes a model based on responsible environmental behaviour which is based on attitudes, sense of personal responsibility, cognitive and personality factors, intention to act and context such as financial constraints (Mir and Feitelson, 2007; p.390). SME owner-managers give lower priority to environmental issues (Guber, 2003) and have poor understanding of environmental issues (Revell and Rutherfoord, 2003). They believe they have little impact on environment (Rowe and Hollingsworth, 1996) and they see environmental responsibility as a financial cost (Simpson et al, 2004). Environmental pressures on SMEs are now considered equally important as say, financial and/or operational pressures (Perez-Sanchez et al, 2003), and so the owner-managers are expected to become more environmentally responsible and conscientious (Montabon et al, 2000).

Although SME owner-managers see legislation as valuable because it is fair as there are penalties for non-compliance (Tilley, 1999), they are known to be largely unaware of various current environmental legislation (Gerrans and Hutchinson, 2000; Simpson et al, 2004). Also, they do not often understand relevant legislation (Williamson and Lynch-Wood, 2001). The gap between attitudes and behaviour (Tilley, 1999; Gunnigham, 2002)) means there is substantial disparity between environmental performance and environmental aspirations. Owner-managers do not see the potential savings from investing in energy efficient technology to be sufficient to warrant time, effort and resources to pursue them (Revell and Blackburn, 2005).

They do not have good information on environmental issues (Tilley, 1999) because they work long hours, are responsible for several business tasks at once (Spence, 1999) and therefore have little time to learn about environmental issues (Friedman et al, 2000; Hillary, 1999: Rutherfoord et al, 2000). Lack of financial resources (Hillary, 1999; Tilley, 1999: Gerrans and Hutchinson, 2000) is another factor for their lack of interest in learning about environmental issues as they see it as a financial cost. SME owner-managers are depicted as being time poor and do not have the time to collect vast amounts of information available to them or even attempt to understand the impact of such environmental information and surprisingly such lack of knowledge exists despite an abundance of information (Hitchens et al, 2006).

Younger managers are more interested in the environment. They have higher education associated with higher levels of environmental concern but not necessarily with environmental behaviour (Petts et al, 1998; Smallbone and North, 1995).

It has been found that entrepreneurial SMEs are more adaptive, swiftly changing trading modes and behaviour according to changing market opportunities (Scase and Goffee, 1995, p.18). More engagement of the owner-manager with issues of environment and social concerns have been attributed to the entrepreneurial type of management with shorter lines

of communication (Aragon-Correa et al, 2008). Although owner-managers have a general opinion that environmental measures are a drain on resources (ENDS, 1998; Baylis et al, 1998), entrepreneurial owner-managers have been found to be more innovative and enthusiastic, seeking information on environmental issues. All owner-manages are not entrepreneurs but almost all entrepreneurs would be owners or managers or both in a business (Chell et al, 1991).

So how does an entrepreneur behave in relation to a non-entrepreneurial SME owner-manager? The more an entrepreneur learns about the business and its wider environment the more that knowledge is likely to modify his behaviour (Frank, 1988). The owner-manager of a SME who takes a business-like approach to running the firm (Smith, 1999) is more likely to act in a way that takes preventive rather than reactive courses of action.

Although SMEs are thought to be motivated and able to quickly identify and respond to customer needs (McKeiver and Gadenne, 2005; Kuratko et al, 2001), in the context of environmental matters the accepted notion is that SMEs are more reactive than proactive and the SME owner-manager's resource of time constraints makes the SME a much more reactive entity (Mintzberg, 1980). The focus on the environmental impact of the business is a more reactive than proactive approach to environmental problems (Kappler and Moore, 1999). Since the SME owner-manager cannot manage all aspects of the business he or she often prioritizes critical urgent concerns while ignoring less crucial concerns (Jawahar and Mclaughlin, 2001). Thus it is important to determine if SME owner-managers perceive environmental issues as a critical concern. Research has found that SME owner-managers do not focus on issues such as administration until they perceive that such issues are critically important to the firm (Cooper et al, 1997; McCarthy et al, 1990).

How is being proactive of any relevance to his attitudes towards climate change? It is because if one is proactive one will put in place measures and steps to mitigate the ill-effects

of environmental degradation and thereby can be expected to engage in the discussion of environmental taxes.

2.3.5   SMEs and barriers to environmental compliance

Tilley (1999) discussed the attitudinal obstacles on the part of SMEs to improving their environmental performance. They range from underestimating the impact of their activities on the environment; a narrow view of the relationship between business performance and the environment; the entrenched idea that protecting the environment is associated with technical complexity, burdens and costs; and a high resistance to organizational change (Gunningham, 2002) (Fig. 6 below).

There are macro factors attributed to tax and regulatory burden which are seen as major inhibitors of growth in the SMEs. 69% SMEs surveyed in 2007 (BCC, 2008) felt they were under a lot of tax and regulatory burden which was not being eased by government support in terms of better information and communication. One of the biggest challenges of SMEs being proactive in environmental strategies and issues is because the costs of doing so are up-front and the benefits are long-term (Hillary, 2000, p.115) coupled with the fact that almost invariably no SMEs have any environmental specialists (Hillary, 2000).
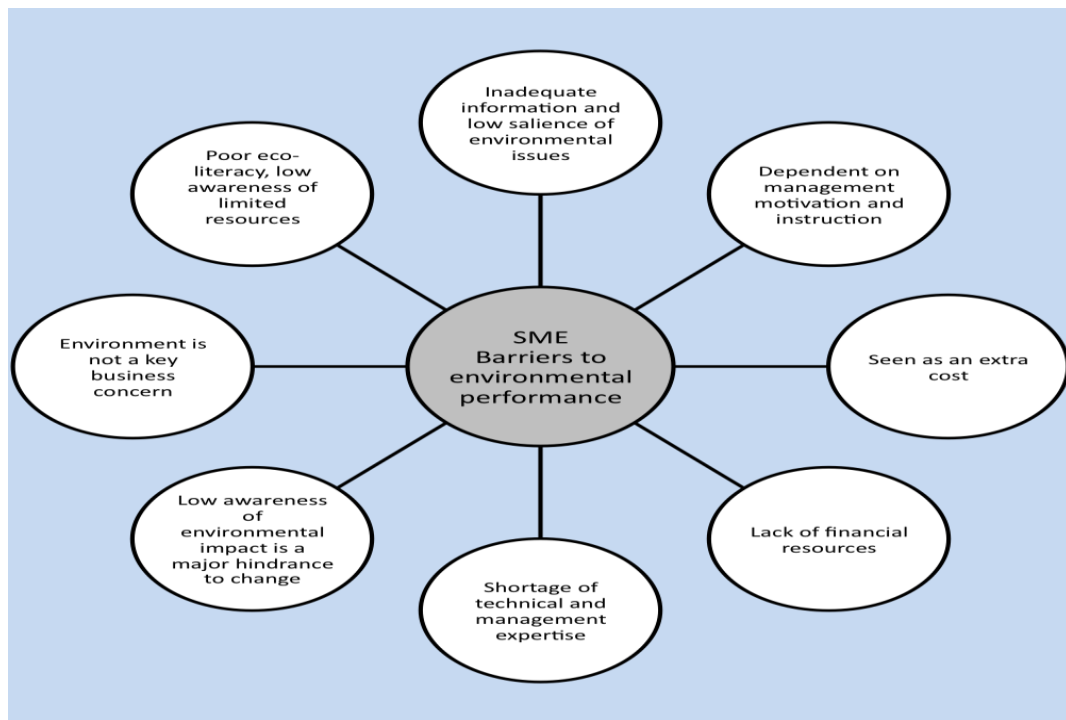
Figure 6: SME Barriers to Environmental Performance

Most SMEs lack the internal resources and motivation to overcome the environmental challenges that impact them. Lack of financial resources (Hillary, 1999; Tilley, 1999: Gerrans and Hutchinson, 2000), shortage of technical and management expertise (Gunningham, 2002), inadequate information (Lepoutre and Heene, 2006), low salience of environmental issues (Guber, 2003) and dependence on management motivation and instruction (Murphy, 1998) are important factors.

Factors such as low levels of awareness of environmental impact (Hillary, 1995; Rutherfoord et al, 2000), poor eco-literacy and low awareness of limited resources (Aiyub et al, 2009) are also major barriers to change. So there is a strong argument to provide information and education to SMEs to modify their behaviour and attitudes (Gunningham, 2002). However, evidence suggests that there is considerable difficulty in convincing SMEs to act upon environmental information (Sheldon cited in Gunningham, 2002). For example, in the United Kingdom, the Department of Environment's Small Company Environmental and Energy Management Assistance Scheme (SCEEMAS) provided a 50% subsidy for the costs

of consultancy fees in the implementation of the European Union's Eco-Management and Audit Scheme (EMAS). Despite a comprehensive national advertising campaign and supporting material such as case studies, guides, videos, newsletters and leaflets sent to thousands of SMEs, a subsequent review revealed that only 136 individual SMEs had participated in SCEEMAS[4] (Gunningham, 2002).

2.4 Attitudes and Behaviour

One of the main objectives of environmental taxation is to encourage behaviour change. Environmental taxation works by incentivising polluters to pollute less or pay more taxes. It sounds fairly straightforward but changing behaviour is not as easy as it sounds, especially in the context of the SMEs. The barriers to SMEs becoming more environmentally friendly have been discussed in the above sections. One of the key findings from the literature is that often SMEs have poor attitudes towards the environment and they are fairly oblivious to their environmental impacts. However the studies that were conducted to make these conclusions are dated and the researcher feels that it is essential to understand what the attitudes of SMEs are towards environmental issues in addition to their attitudes towards environmental taxation.

This study also seeks to understand SME environmental behaviour and see if there is any link between the attitudes of SMEs and their environmental behaviours. Previous studies such as Tilley (1999) have shown that positive environmental attitudes do not translate into positive environmental behaviour and the researcher would like to test this using hypothesis H6 (Chapter 8) to find any link between the two in order to understand the behaviour changing potential of environmental taxation. In this regard the researcher would briefly like to discuss the literature on attitudes and behaviours to throw some light on the discussion.

2.4.1 Attitudes

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[4] This scheme was subsequently stopped.

To understand what could be possible links between attitudes and behaviours in the environmental context let us begin with understanding what the construct 'attitude' means.

"A *mental and neural state of readiness, organised through experience, exerting a directive or dynamic influence upon the individual's response to all objects and situations within which it is related*" (Allport, 1954a; p.45).

Ajzen (1988) says that attitude is a "*disposition to respond favourably or unfavourably to an object, person, institution or event*" (p.4) and is inferred from measurable responses which can be verbal or non-verbal such as body language. Attitudes are thought to have two sub-components which are beliefs and values, the first of which is the assumption or belief about the existence of something which has certain characteristics and the latter is what a person wants to be true (Rollinson, 2008). The difference between the two is that beliefs do not involve emotional reaction to the object but for values there is a strong emotional connection and that determines whether the particular object is considered desirable (George and Jones, 1997).The current study seeks to understand the general attitudes towards environmental taxation and environmental issues and in this regard is not focussed on the underlying values of beliefs that result in the expressed attitudes.

Many authors talk about attitude as being a construct of three components within it; namely, cognitive, affective and the behavioural component. The cognitive component deals with the perceptions, beliefs and thoughts about an attitude object. For example, this could result in having a positive attitude towards the current environmental policies of the Government because of the belief that the Government is focussed on protecting the interests of the businesses. The affective component deals with feelings of likes or dislikes about the attitude object so for example, verbal responses towards climate may express disgust and horror about it and therefore it can be assumed that a business or a person who claims to be horrified by climate change will hold a favourable response towards the implementation of environmental policies such as environmental taxation to mitigate it. This second component

has subjective feelings attached to it and attitudes can be inferred from evaluations of and feelings towards the attitude object. And finally, the behavioural (or cognitive) component focuses on the tendency to act towards the attitude object in a consistent and characteristic way. For example, is the respondent's behaviour consistent with his/her attitudes, that is, if he speaks favourably about government environmental policies, does he demonstrate good environmental behaviour too through recycling and vice versa that demonstrates that behaviour is consistent towards the attitude object (Rollinson, 2008; Ajzen, 1988)? The following Table 2 reproduced from Ajzen (1988) shows the response mode and its connection to the three components of attitudes as discussed above.

Response Mode	Cognition	Affect	Conation
Verbal	Expressions of beliefs about the attitude object	Expressions of feelings towards the attitude object	Expressions of behavioural intention
Non-verbal	Perceptual reactions to attitude object	Physiological reactions to attitude object	Overt behaviours with respect to attitude object

(Source: Ajzen, 1988)

Table 2: Responses and Three Components of Attitudes

Attitudes serve a number of functions including helping people to adjust to their world (Adjustment function); helping people to defend their self-image (Ego defensive function); allows people to derive satisfaction by expressing their attitudes which reflect their values (The Value-Expressive function); and helping people to structure their world to make it more understandable (The Knowledge function) (Katz, 1964). In the broadest sense attitudes facilitate adaptation to the environment (Eagly and Chaiken, 1993). Attitudes are thought to be formed as a result of experiences in life through direct experiences of say, events; being

more positively predisposed towards familiar things; and through socialisation and social learning (Moreland and Zajonc, 1979; Ajzen, 1988; Rollinson, 2008).

2.5 Relationship between behavioural and environmental economics

Environmental taxation is designed to facilitate behaviour change and given that SMEs operate in almost all sectors of the economy they are liable to environmental taxes through their use of energy, disposal of waste and other business activities. Behaviourally-based changes that reduce polluting behaviour have major advantages, one of which is that the benefits can be very fast (Cabinet Office, 2011) and cost-effective. A UK Government Report on Behaviour Change and Energy Use (Cabinet Office, 2011) highlights the need to apply behavioural insights to overcome barriers to being more energy efficient and understand how people or businesses can be encouraged to become more 'green', that is, energy efficient.

Although there are obvious benefits of becoming more energy efficient, the report also discusses that behaviours of individuals are not always rational and that the rational choice model - in which people weigh up the costs and benefits of undertaking something like investment into making their homes or businesses more energy efficient - is insufficient in explaining why many businesses or homes are unable to undertake such investments. Social[5], behavioural and cognitive factors are cited as possible ways of explaining this disconnect between the normative and the descriptive.

There is a dominant view in the literature that behavioural economics will advance the understanding of environmental and resource economics (James et al, 1998; Shogren and Taylor, 2008; Cabinet Office, 2011) and behavioural economists continue to attempt to introduce more psychology into economics (Rabin, 1998). In environmental economics, when thinking about environmental protection and sustainability, there has been a focus on

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[5] People are often influenced by what others are doing so social norms can encourage the adoption of green behaviours.

market failure as the key source of economic inefficiency. The idea that economic theory can correct market failure through say, internalising the external costs of pollution through Pigouvian taxes and other market based incentives, is based on the premise that people make consistent and systematic choices in line with rational behaviour. Most insights of environmental economics are based on the standard neoclassical model or rational behaviour (Cabinet Office, 2011; Bergh et al, 1998) so in the context of environmental taxation people are expected to make rational decisions. That is, they are incentivised to have pro-environmental behaviour as a result of not wanting to pay environmental taxes and so the desire to not pay increased taxes would render them more environmentally friendly and behave accordingly.

But this is not often the case, especially for SMEs, due to their unique circumstances or resource constraints and heterogeneous businesses. SMEs, even if they have positive environmental attitudes, are unable to translate them easily into positive environmental behaviour. One of the main areas of research in environmental economics is the theory of environmental regulation where efficiency is the key to selecting environmental policies. The neoclassical model is seen to be responsible for generating the wrong impression about environmental policy-making (Costanza, 1991). In environmental policy theory there is a focus on market-based/price-based instruments (Baumol and Oates, 1988) and leaving the neo-classical behavioural assumptions of profit maximization means that the relative importance of these price-based instruments would lessen (Bergh et al, 1998). Many other empirical studies have also shown that thinking of rational choice is not appropriate especially in the context of environmental economics (Kahnemann and Tversky, 2000). Nyborg (2010) discussed the potential of environmental taxation in undermining an individual's moral motivation. Many researchers including Frey (1994; 1999) have argued that financial incentives such as environmental taxation undermine individuals' intrinsic motivation to contribute to environmental protection. Nyborg (2010) uses the theories of

cognitive dissonance, self-image/duty orientation and cognitive evaluation to discuss the potential of environmental taxation in 'crowding-out' the moral motivations of individuals.

The Homo Oeconomicus model assumes that individuals care only about themselves and in the context of say, environmental protection; one would contribute only up to the point where the benefits of contributions exceed costs. Gneezy and Rusticini (2000a) found in a study that when day care centres imposed a fine on parents when they would be late in collecting their children. Parents automatically arrived late perhaps because the notion that they would have to pay the fine made them think that it was acceptable to be late. This shows the crowding out effect of economic incentives on intrinsic moral motivations and this finding has been reiterated in many other studies including Brekke et al (2003); Mellstrom and Johannesson (2008). Cognitive evaluation theory shows that if the external monetary incentive is substantial enough then the performance of the individuals improves, but not so in the case of low economic incentives. So does this mean that if the environmental taxation is set at a very high rate then it would be more effective?

A study on the effectiveness of landfill tax (Martin and Scott, 2003) finds no significant change in waste disposal behaviour. However, this can be understood if we think of how the incentive is perceived by the individual and in the context of this study, the SME. If the incentive is perceived as controlling, it is seen to undermine intrinsic motivation (Deci and Ryan, 1985) but the incentive reinforces the intrinsic motivation through acknowledging it. So if the environmental tax, say, a climate change levy, is seen as a penalty by SMEs or a form of control exerted by the regulators on them, then it is assumed that it will undermine the businesses' intrinsic motivation to behave in a more environmentally friendly fashion. However, if SMEs view this particular tax as a form of encouragement for them to engage in and learn more environmentally friendly behaviour, then this would reinforce their intrinsic motivation to do better for the environment.

Nyborg (2010) also refers to the self-image approaches to understand if and how economic incentives can have counterintuitive effects on moral motivations. This approach, popularised by Benabou and Tirole (2003), assumes that individuals do not know their moral values well and although people prefer to have a self-image of a responsible individual (Brekke et al, 2003), the presence of the economic incentive suppresses one from striving towards one's idea of good behaviour (Mellstrom and Johannesson, 2008). For example, suppose a SME owner-manager is very conscientious about waste disposal in his business. He recycles everything he can and makes a voluntary contribution to set up more facilities for businesses like his to recycle more and also puts extra care into learning about newer things that he can use in his business to become more environmentally friendly. And then suppose an extra environmentally-related charge is introduced. Is it possible to assume that this SME owner-manager will still make those voluntary contributions as he did before the introduction of this new charge? But is this also an argument against environmental taxes?

The researcher does not believe so and agrees with Nyborg (2010) that it is insufficient to rely on intrinsic motivations and acts such as voluntary contributions are always second best but where environmental taxes are not applicable or in place then the importance of relying on intrinsic motivation rises. On the other hand economic incentives such as environmental taxes are also seen to support moral motivation. Using the theory of cognitive dissonance Ostling (2009) proposes that an individual's perception of the moral value of an act is determined to a large extent by the cost of it. So if the cost of recycling is less than that of paying the landfill tax then it can be assumed that SMEs would choose to recycle and so by imposing an environmental taxation government can be seen to be encouraging SMEs to be environmentally friendly at a lower cost. Environmental taxes apply to all businesses irrespective of their size and also their intrinsic motivations and the principle behind such taxes are to make polluters pay.

2.5.1 Prediction of Behaviour

The ability of attitudes to predict overt behaviour and behavioural intentions has been the focus of a vast amount of research. In the early days of attitude research the dominant thought was that behaviour was guided by social attitudes. Previous studies including DeFleur and Westie (1963); Corey (1937); Bernberg (1952); Vroom(1964) found that using attitudes to predict behaviour was a very weak method, so in light of the literature on lack of utility of the attitude construct (Blumer; 1955; Festinger, 1964; Campbell, 1950), Wicker (1969) called to abandon the attitude construct owing to the inconsistencies between attitudes and behaviour. Wicker critiqued the attitude-behaviour link by saying that, based on empirical evidence, attitudes do not seem to bear any relevance to behaviour and that "…*little evidence to support the… existence of stable underlying attitudes within the individual which influence both his verbal expressions and his actions*" (p. 75). However Kelman (1974) argued that Wicker's review focussed on experimental studies and not on survey data and that the latter is able to provide much stronger evidence for attitude-behaviour consistency. An explanation that was offered to explain the failure of attitudes to predict behaviour was that most attitude measurement techniques resulted in a single score that expressed the respondent's total positive or negative reaction to the attitude object (Ajzen and Fishbein, 1980).

However, the argument that the assessment of the three components, especially the behavioural rather than the affective component, would predict behaviour better (Katz and Scotland, 1959; Triandis, 1964) could not solve the problem and other studies such as Ostrom (1969) on church and Kothandapani (1971) on birth control attempted to solve it by using the Likert, Thurston and the Guttman scales separately to sets of cognitive, affective and conative items. The studies found attitudes predicted behaviour better in the birth control study than in the church study and this can be due to the fact that Kothandapani(1971) assess attitudes towards the behaviour of using birth control whereas Ostrom (1969) assesses general attitudes to predict specific behaviours.

A recent study by Cassells and Lewis (2011) on whether actions reflect attitudes in relation to environmental responsibility within SMEs found that SMEs with a positive attitude towards the environment did not necessarily have any greater likelihood of engaging in environmental practices. The only area where positive attitude did appear to influence action was in the area of environmental management and the adoption of waste management practices was the most prevalent expression of environmentally positive behaviour amongst the sample. The current study uses the study by Cassells and Lewis (2011) as a key paper in testing Hypothesis H6 (see Chapter 8 for more details).

Many theorists have argued the links between attitudes and behaviour and Katz (1960) contends that sometimes, in order to protect our egos, we develop attitudes that legitimise behaviour which contradicts our values. This can be linked to Festinger's Theory of Cognitive Dissonance by theorizing that dissonance arises when behaviour towards an object is not consistent with the attitude towards it. But sometimes people change their attitudes because it is useful to do so and the general viewpoint is that attitude change conforms to the consistency principle in order to maintain consistency between affective, cognitive and behavioural components (Rollinson, 2008). Fishbein and Ajzen (1975) provide the most extensive exploration of the link between attitudes and behaviour in a theory summarised as:

$$A_o = \Sigma\, b_i e_i \qquad\qquad \text{(equation 1)}$$

(i= 1 to n)

Where A_o is attitude towards object O and b_i is the belief that i is an attribute of 'O' and e_i is the evaluation of attribute I and n is the number of beliefs about 'O'.

So here attitude is seen as a sum of all positive and negative feelings about the different attributes of an object. For example, suppose we want to identify an individual's attitudes towards climate change and the climate change policies of the government and determine (through his verbal responses) what identifiable beliefs he has about them, that is, that climate change is:

a) manmade;

b) not a business responsibility;

c) a scam for the government to justify taking more tax from businesses;

d) a cause of concern for mankind but is preventable.

The behaviour changing potential of environmental taxes can be determined through calculating the attitude towards object 'O' (in this case O= tax as an instrument to mitigate climate). From the above example it is unlikely that the respondent believes that all of these attributes are equally true. A subjective probability of something between 0 (untrue) and 1 (true) can be placed against each one. In terms of evaluations 'e' represents the general goodness or badness of an attribute, which is usually estimated as somewhere between +3 (good) or -3 (bad). This gives us the attitude:

[**Belief that climate change is] ['b' subjective probability that belief is true] ['e' goodness or badness of attribute] [b x e]**

[*Man made*]   [0.4]   [-1] [-4.0]

[*Is not a business responsibility*]   [0.8]   [+1]

[*Is a scam for the government to justify taking more tax from businesses*] [0.9] [-2][-1.8]

[*Is a cause of concern for mankind but is preventable*]   [0.2]   [-2]   [-4.0]

Therefore, it is overall a moderately strong negative attitude   [-9.8]

A person's (say, in this case the SME owner-manager's attitudes) important beliefs about the object are necessary in understanding the accurate picture of the person's attitude towards the object. It goes without saying that personal beliefs would vary between individuals. For example, one SME owner-manager from say, the manufacturing sector, might consider the most significant impact of climate change to be global warming while another from, say, the transport sector, could view the effect of climate change on survival of mankind as the most

significant impact. The most significant use of Fishbein and Ajzen's theory above is in determining the link between attitudes and behaviours.

One of the theories they postulated is the Theory of Planned Behaviour which was originally expressed as the Theory of Behavioural Intentions as a framework to explain the behaviour-changing potential of environmental taxes. The main idea underpinning the model is that behaviour is more predictable when focussed on specific behavioural intentions rather than attitudes in isolation so using this theory it is possible to predict/state general propositions about the strength of the attitude-behaviour link (Fishbein and Ajzen, 1975). According to this theory intentions to behave are influenced by attitudes towards the behaviour, subjective norms and perceptions of behavioural control and people act in accordance with their intentions and perceptions of control over the behaviour (Ajzen, 2002a; p.43). It is also postulated that general attitudes do not predict specific behaviours and attitude often can perhaps predict the intention to behave but not the actual behaviour itself.

Also sometimes a person can have both a positive and negative feeling about an attitude object at the same time. This would have an effect on behavioural outcome of attitude because it is assumed that the behaviour will depend on whichever belief is uppermost in a person's mind at the time. For example, an attitude of dislike towards global warming may result in a resolve to use a company car less but, if one day he/she has to rush somewhere, the belief in convenience of cars will take over and temporarily cloud over emission concerns. Literature shows that this theory has been extensively tested empirically and is capable of predicting a wide range of intentions and behaviours (Connor and Armitage, 1998; Sheeren and Orbell, 1998; Webb and Sheeren, 2006; Fife-Schaw et al, 2007). The theory of planned behaviour was the successor of the theory of reasoned action.

In Fishbein and Ajzen's definition, attitude concerns the behaviour instead of the object as mentioned above. Eagly and Chaiken (1993) contend that this definition of attitude is more likely to be connected to behaviour than the other definition that concerns attitudes towards

objects. Fishbein and Ajzen's Theory of Reasoned Action (1975; Ajzen and Fishbein, 1980) postulates that a person's overt behaviour is a function of the intention to perform the behaviour so a SME is likely to recycle more of its commercial wastes if it intends to do so and in this context attitude is seen as the degree to which one has a positive or negative evaluation of the behaviour (Albarracin et al, 2001). This theory can be represented as

$$O \approx I \qquad\qquad \text{(equation 2)}$$

Where O is the overt action and a function of the intention I

The subjective norm is the perception of how one should behave in accordance with the behaviours of the important others around, for example, it can be expressed through statements such as "*My business community thinks it is important to recycle*" so in a way it can be a force for good. So formally it can be represented as

$$I \approx A_{Ow1} + SN_{Ow2}, \qquad\qquad \text{(equation 3)}$$

Where I is the intention to perform behaviour O, A_O is the attitude toward performing behaviour, B and SN_O is the subjective norm concerning behaviour O and w1 and w2 are weights for A_O and SN_O, respectively. Also the assumption is that the attitude towards the behaviour is a function of the individual's beliefs that performing the said behaviour in question will lead to various outcomes and the evaluative aspects of those beliefs (i.e. the evaluations of the outcomes) (Ajzen, 2002a). Attitude can be represented by the equation 1 above. The predictive validity of the theory of reasoned action has been tested in many studies including Ajzen and Fishbein (1970); Sheppard et al (1988) and while this theory assumes that behaviours are influenced only by intentions, literature evidence shows that attitudes and past actions or habits can only influence future behaviour (Fazio, 1986; Bentler and Speckart, 1979).

Both the theories of planned behaviour and of reasoned action are comprehensive theories of many behaviours that discuss a limited number of psychological variables that can influence

a behaviour, namely; intention; attitude towards the behaviour; subjective norm; perceived behavioural control; and behavioural, normative and control beliefs (Albarracin, 2001; p.142).

While the discussion within this section has thrown some light on the theories of planned behaviour and reasoned action, these theories are not being used in the context of this study in analysing or interpreting the primary data collected. Instead these theories are discussed with the sole purpose of presenting a brief overview of the extensive literature within the attitude-behaviour discussion and the researcher has suggested future areas of research (Chapter 10) which will attempt to utilise such theoretical constructs.

Previous studies including Worthington and Patton (2005); del Brio and Junquera (2003); Lepoutre and Heene (2006) have attempted to explain the motivations behind the choices of environmental practices of SMEs and various drivers including financial drivers (Vernon et al, 2003); compliance to regulations (Patton and Worthington, 2003) and also personal motives. That is, values and attitudes of the SME owner-manager (Collins et al, 2007) have been identified as being key to understanding the environmental motivations of SME owner-managers. As discussed before the attitude of the SME owner-manager has been identified as being key to understanding the attitude of the business and Dewhurst and Thomas (2003) contend that the degree to which environmental behaviours are expressed in the SME, the business's engagement with environmental issues and even the intensity of the commitment to the environment of the SME are found to be related to the individual owner-manager's attitude.

Literature has shown us on numerous occasions that given the unique informal, personalised, hands-on management style practised within most SMEs (Aragon-Correa et al, 2008), it is hardly surprising that the owner-manager's attitude is of such significance within the firm. Previous studies have sought to explain the often referred to 'gap' between environmental actions and attitudes of SME owner-managers by arguing that while owner-managers may be

willing to act responsibly, they often feel that the responsibility towards the environment lies with the government and regulators (Dewhurst and Thomas, 2003). This is because regulation is seen to be preferable as it does not require anything beyond minimum compliance and the cost for non-compliance is less than that of implementing environmental practices within the firm (Revell and Blackburn, 2007). And also if SME owner-managers think of environmental issues as only a business matter and do not have strong feelings attached to them (i.e. do not have personal values and beliefs about protecting the environment), then they are seen to be less environmentally active (Williamson et al, 2006).

This highlights the complicated nature of environmental issues within the SME context and shows that there are discrepancies in the link between positive responses to certain attitude statements and the corresponding environmental action of certain areas.

2.5.2   Attitude measurement

In this study, the attitudes of SME owner-managers towards environmental taxation and environmental issues are ascertained through verbal responses to questions on their perception, beliefs and feelings towards the environmental matters discussed and also their environmental behaviour in relation to their general attitudes. In a study by Sivacek and Crano (1982) which explored the effects of vested interest on attitude-behaviour relation, a seven-point Likert scale was used to assess attitudes of college students towards raising the drinking age to 21. Lord et al (1984) used a ten-point Likert scale to measure attitudes towards homosexuals while Chaiken and Yates (1985) used two single items and an eleven-point Likert scale to measure attitudes towards capital punishment and censorship. In directly assessing attitude through verbal responses to questionnaire items a single item is the simplest way to ask a respondent directly about their own attitudes and/or personality traits (Ajzen, 1988). Other studies such as Mouson et al (1982) studied introversion-extroversion personality traits through attitude measurement. One of the problems in using attitude measurement scales is the question of reliability which is the extent to which repeated

assessments of the same trait or attitude produce equivalent results or even mistakenly putting a tick in the wrong place can produce unreliable results.

Verbal responses are also used to indirectly infer attitudes towards an object or event through the use of statements of beliefs and behavioural intentions where respondents are asked to indicate their agreement or disagreement with each statement. This study uses a five-point Likert scale and also single item questions to determine perceptions, beliefs and feelings about environmental issues and environmental taxation. Likert (1932) proposed a five-point format as a part of his attitude scaling method which includes Strongly Agree, Agree, Undecided, Strongly Disagree and Disagree. In selecting the domain, for example if the researcher wants to measure attitudes towards climate change, then s/he could decide to restrict the definition of the domain to air pollution only. Alternatively the researcher can define the object of the attitude in more broad terms to include atmospheric pollution through emissions and other environmental impacts through emissions, discharge and also injudicious use of resources. Once the domain is clearly defined one can proceed with the construction of the items that explore the various aspect of the domain. See Chapter 4 for more details on construction of questionnaire and items in it for this study.

Attitudes can be inferred from cognitive, affective or conative responses to the attitude object and many theorists such as Katz and Scotland, 1959; Smith, 1947) believe that within each category of responses, based on the distinction between these three components, a different "theoretical component" of the attitude construct is expressed. Other social psychologists prefer to define an attitude in affective terms only (Brehm and Kassin, 1996) and define attitudes in terms of a positive or negative evaluation of any given object at a certain level of intensity (Dick and Ellis, 2006). It is also believed that the evaluations expressed through each component are different.

For example, an SME owner-manager might feel cynical about the purpose of environmental taxation. That is, s/he may have negative feelings with regard to environmental policy but at the same time believe that most businesses are unaware of their environmental impacts thus displaying positive perceptions/ beliefs (cognitive component) and so agree to change their business waste disposal behaviour (i.e. favourable conative component). This hierarchical model of attitude postulates that favourable or unfavourable reactions towards an object or an event predispose cognitive, affective and conative responses. Therefore it can be inferred that individuals who display positive attitudes towards, say, environmental policies, would be expected to display positive attitudes through favourable responses with respect to environmental taxation and vice versa.

In conclusion, favourable or unfavourable attitudes of an individual towards an object or an event can be determined from the verbal or non-verbal responses to the object of the attitude and the responses obtained can be either of the cognitive nature, that is, expressing perception or beliefs; of the affective nature expressing the feelings of like or dislike towards it; or of the conative or behavioural nature indicating how a person would act.

2.6   Summary

The above discussion on SMEs highlights their significant aggregate environmental impact. Given the fact that SMEs account for almost all enterprises in the UK and the EU and that they are responsible for a high percentage of employment and turnover within the UK it is crucial that SMEs improve their environmental actions if existing and emerging environmental issues are to be addressed. In order to facilitate wider acceptance and success of environmental taxation, SMEs need to be understood in the context of environmental taxation; what their attitudes towards environmental taxation are; what their perceptions about such taxes are and how they are coping with these taxes. SME attitudes are often understood from the perspective of the SME owner-manager and in this regard an SME owner-manager's relative importance within the firm is discussed in this chapter. The

chapter also provides a few insights into SME reactions towards different environmental policy instruments and throws further light on the link between attitudes and behaviour. Since one of the key objectives of environmental taxation is to encourage behaviour-change it remains to be seen whether attitudes towards such taxes have any impact on environmental behaviour and in this context the chapter also veers towards the suggestion for the inclusion of behavioural economics in environmental economics to enhance it further. Finally, a brief discussion on possible measurements of attitudes are undertaken here in this chapter and further details on how attitudes are measured in the context of this study are provided in Chapter 6 'Analysis and Interpretation of Survey Results'.

3 Literature Review II

3.1 Introduction

The previous chapter highlighted the relevant literature on small and medium-sized enterprises (SMEs) and also discussed a brief overview of the literature on the link between attitudes and behaviours.

The current chapter is a continuation of the literature review and discusses the relevant literature on environmental taxation as an economic instrument to mitigate climate change. This chapter also provides a discussion on climate change and the Kyoto Protocol to provide the background to environmental taxes in the UK.

3.2 Business and climate change

Climate change has the potential to impose enormous costs on society and the economy (Hillary, 2000). Climate change refers to any change in climate over time, whether due to natural variability or as a result of human activity (IPCC, 2007a). The researcher uses the term climate change and not global warming because the implications of a changing climate can be manifold including global warming and natural disasters such as tsunami etc. Businesses impact and are impacted upon by the wider environment in which they operate (Sriramesh and Vercic, 2003; IPCC, 2007a). On the one hand, businesses generate employment, revenue and make a society economically robust, and on the other hand, they generate emissions, use energy and resources, and are the largest sources of pollution in the world. The essence of the climate change challenge is to develop products and services with less reliance on carbon-based energy. The climate change challenge can appear daunting for the individual company. The most practical way to engage many businesses is therefore

likely to be on a sectoral basis because each business sector is affected by climate change in a different way (Hillary, 2000).

Much of the debate on climate change has shifted from its scientific certainty to the appropriate policy responses to it (Reddy and Assenza, 2009). Much has been debated on the impact of human activities on climate change (IPCC, 2007a/b) with opposing views from supporters and sceptics (Reddy and Assenza, 2009). Supporters accept that human activity causes and accelerates climate change and the sceptics refute this by saying that it is a natural phenomenon and nothing to do with human activity et al (Reddy and Assenza, 2009). However, there is an agreement for a strong case for sustainable development to mitigate climate change and this has come about after decades of arguments over the scientific basis for the changing climate of our planet. Most scientists argue that human economic activity is the main reason for global warming and the Earth's average temperature will rise between 5 and 10 degree Fahrenheit. The likelihood of climate change impacts, as well as the cost and difficulty of adaptation, are expected to increase with magnitude and speed of the global climate change (Stern, 2007). The speed at which climate change is occurring and the uncertainty of the exact nature or timing of the impacts means that a flexible and responsive approach to climate preparation is needed (IPCC, 2007a, b).

The climate change problem is different to any other environmental problems because the problem is global. For e.g. the air-pollution problem in an Indian city need to be addressed at the regional/local level and this dirty is of no direct consequence to say, a city in the U.S. With climate change it is the emissions of all sources in all nations that determine the concentration of greenhouse gases (GHGs) in the atmosphere. Therefore, the climate change problem is inherently a public goods problem (IPCC, 2007). So the climate that everyone enjoys is the product of everyone's behaviour. As no single individual or nation can determine the composition of the atmosphere, similarly, individuals and nations acting independently will provide, together, fewer resources than all individuals and nations would

if they acted together. This characteristic of the climate change problem provides an important motivation for collective, global action.

The IPCC further adds that the multiplicity of decision makers also implies that there are limits to collective actions. Decisions at global governmental organizations, nation states, regional governments, private individuals, multinational firms, local enterprises–all matter (IPCC, 2007). The global nature of the problem also implies that a diversity of policy responses is needed because policy responses that are effective and appropriate in one social context may be completely inappropriate in another.

Climate change has numerous economic and political consequences for businesses (Wittneben and Kiyar, 2009; Reddy and Assenza, 2009) including diminished natural resources such as petroleum products, increased costs of raw materials and risks of flooding or droughts etc. Being aware and responsive to climate change is economically advantageous for businesses. Businesses have to take into account the financial costs of dealing with the consequences of climate change-related risks and opportunities. This has direct implications for financial business investments. The wider society in which the business operates is looking for solutions from businesses to mitigate the ill effects of their detrimental effects on the environment. Companies are responding by sustainability reports that disclose their greenhouse gas emissions. In any business, once the management is aware of the role of its business operations in the climate system, it can take steps to mitigate climate change (Hoffman, 1991).

It is obvious that emissions and consequences are heterogeneous around the world. This adds to the basic public goods nature of the global climate change problem. Countries around the globe are distributed across a spectrum of high emitters to low emitters and high impacts to low impacts. On one hand, those who cause low emissions and have high impact have more reasons to want to mitigate the problem but the capability is not present and on the other hand, developed countries such as the U.S who have high emissions but the impact is low

have insufficient incentive to do so (IPCC, 2007). The same is also true for the differences between businesses in their capabilities and sizes. Until now, there have been more studies in understanding the environmental impacts of larger companies than SMEs (Wittneben and Kiyar, 2009). SMEs in the UK account for more than 60% of industry's carbon dioxide emissions and commercial waste. Despite such estimates, the environmental impacts of SMEs are a relatively under-researched area (Revell and Blackburn, 2007; Marshall report, 1998; Environment Agency, 2003).

Studies (Hillary, 2000; Smith and Kemp, 1998; Rutherfoord et al. 2000, Revell and Rutherfoord, 2003; Baylis et al., 1998) show that despite a concerted attempt by policy-makers to present the 'business case for sustainability' by portraying 'eco-efficiency' measures as cost-reducing, most SME owner-managers view environmental measures as expensive to undertake and therefore tend to be highly resistant to voluntarily improving their environmental performance. A survey of over 1000 UK SMEs by the Environment Agency (2002) found that 86% of respondents in these firms did not believe they had an impact on the environment. The study found sectoral differences in the number of SMEs introducing practical measures to safeguard the environment. For instance, only 29% of small firms in the hotel and restaurant sector had measures in place, compared with 70% of firms in the chemical sector (Environment Agency, 2002).

The economic costs and implications of climate change are not fully understood by the small business community (BCC, 2008). It is important that advice and assistance available to business is directed towards SMEs which, without dedicated staff, are limited in time, resources and education (BCC, 2008; Hillary, 2000, Rutherfoord and Spence, 1999). The British Chamber of Commerce (BCC) undertook an SME and environment survey in 2008 and found that although SMEs accounted for 50% of current business energy use in the UK, there was little focus directed at this sector (BCC, 2008). The survey also found that in these economically challenging times; environment was a low priority for most businesses (BCC, 2008).

Paradoxically, the survey by BCC (2008) found that the greater proportion of larger businesses within the SME sector (i.e. 50 employees or more) agree that climate change may become a significant issue for their businesses. Furthermore, SMEs in the agriculture, utilities and recycling sectors indicate that climate change is a significant issue for them (BCC, 2008). The survey also found that the most popular step that businesses have undertaken to reduce their environmental impact and energy usage is to recycle. However, a much smaller proportion of businesses say that they provide employee training, or put in place Environmental Management Systems (EMS) or give out customer information or environmental reports (BCC, 2008). This shows that although there is the intention of engaging in preventing climate change, SMEs want more increased support in terms of information and other resources from government to cope with climate-change challenges.

86% of businesses indicate that one of their prime motivations to reduce their environmental impact or energy usage is lower energy bills. For 47% of businesses, lower taxes are a prime motivation, such as Landfill Tax, Climate Change Levy and Fuel Duty (BCC, 2008). Social responsibility (60%) is a stronger motivation than environmental taxes. The survey found that manufacturing, engineering and construction SMEs are more influenced by environmental taxation than media or leisure SMEs (BCC, 2008). Is it because they see taxes as a fair and easier method to reduce their environmental impact? This leads to the further question of how they might feel if taxes are increased ever year.

3.2.1 **Background**

Under the Kyoto Protocol the UK has made a commitment to reduce greenhouse gas emissions by 60% by 2050, as measured against a baseline of the 1990 emissions level. Within this overall 8% EU abatement target, the UK is required to achieve a 12.5% emissions reduction. In addition, however, the UK has had unilaterally stated a policy goal of reducing CO_2 emissions to 20% below 1990 levels by 2010. The UK is projected to exceed its 12.5% reduction target by 7.5% through a combination of policies and measures including

the purchase of emissions credits from projects in third world countries (EC, 2010). The UK was expected to achieve a 20% reduction in emissions by the end of 2010 compared to its 1990 levels. In 2010 UK emissions were 19.4% below 1990 levels not including emissions trading and 22% below including trading.

The Kyoto Protocol was drawn up in 1997 to implement the United National Framework Convention for Climate Change. It came into force in 2005. As of September 2011, 191 states had ratified and signed the protocol. Under the protocol, Annex-I countries (including EU) which have ratified the protocol are committed to reducing their greenhouse gas (GHG) emissions to targets below 1990 levels. Developing counties are not required to reduce emissions levels unless developed countries fund their technological development in emissions reduction. The 2009 UN Climate Change Conference that took place in Copenhagen, Denmark, was convened with an intention to establish an ambitious global climate change agreement from 2012 when the first commitment period of Kyoto protocol expires. Although the conference did not achieve any binding post-Kyoto agreement, a political accord was negotiated for new and additional resources for developing countries through investments of around USD 30 bn for the period 2010-2012.

The Kyoto protocol has been criticized on the grounds that the costs of Kyoto outweigh the benefits. Critics feel that given the large costs of the protocol it might be better for it to be redesigned along the lines of a global carbon tax; also there is a controversy about carbon tax. Critics point out that additional curbs on carbon emissions are likely to cause significantly higher costs making the argument of the precautionary principle[6] somewhat redundant. The researcher feels that the Kyoto protocol has not only set binding targets, thereby forcing governments to sit up and take notice of climate change, but has also heightened the international debate and discussion about climate change. However, the

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[6] The precautionary principle states that if an action or policy has a suspected risk of causing harm to the public or to the environment then in the absence of scientific consensus that the action or policy is not harmful, the burden of proof that it is *not* harmful falls on those who advocate taking the action. In some legal systems, as in the law of the European Union, the application of the precautionary principle has been made a statutory requirement.

protocol does not put binding limits on the emerging economies of China and India although both these countries are generating a large amount of GHG emissions through rapid industrialisation. Although India signed and ratified the treaty, it is exempt from the framework and expects to gain from the protocol in terms of technology and related foreign investments. The first commitment period of the Kyoto Protocol ended in 2012 and the Intergovernmental Panel on Climate Change (IPCC) has clearly indicated that a new international framework needs to have been negotiated and ratified that can deliver the stringent emission reductions.

We use environmental resources to produce goods for our consumption and release the waste back into the environment and this economic system cannot operate without the support of the biosphere. In economic terms, the external costs of pollution (O'Riordan, 1983) translate as the loss of human and social wellbeing due to damages (e.g. health damage) related to environmental pollution. Pigou (1920) pioneered the distinction between the private costs of production and consumption activities (i.e. fuel, raw materials, labour costs etc.) and the full social costs (Pearce, 1992; Pearce, 1976; Turner et al, 1994; Turner, 1993; O'Riordan, 1983), suggesting that the social costs of economic processes (i.e. of production and consumption) are made up of private costs plus pollution-generated external costs. Pigou's pollution tax was based on the idea that polluters should face a charge/tax based upon the damage caused by their emissions. Known as the 'Pigouvian' tax, the ideal tax was expected to reflect the costs of pollution at the margins (Pearce and Turner, 1990; Turner et al, 1994; Pearce, 1976).

The basic tenet of the Polluter Pays Principle (PPP)[7] (Hahn, 1998; Pearce and Turner, 1990) arises from the Pigouvian tax concept of internalising the external costs of pollution by reflecting the total costs of production including the costs of all resources used such as those arising from air, water, land-based emissions and discharge as well as labour and raw

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[7] The price of a good or service should fully reflect its total cost of production, including the cost of all the resources used. PPP seeks to rectify the market failure by making polluters internalize the costs of use and degradation of environmental resources.

materials. Pollution is also seen to be the evidence of poor and inefficient use of resources (Porter and van der Linde, 1995).

Ideally businesses would use resources to produce up to where marginal private cost equals marginal revenue but marginal private cost is lower than marginal social cost. but, for example, say a firm A producing cement uses extra energy input to increase the output. The energy will certainly be dependent on coal, gas, oil or nuclear fuel. If, say, the firm uses more electricity generated from coal the energy cost incurred by the firm will only be the electricity bill. The energy bill of the business does not show the environmental damage of producing electricity from coal which generates Green House Gases (GHGs) such as NO_x, CO_2, SO_2[8] etc. In the absence of environmental instruments such as taxes, such environmental damages are not reflected in the costs faced by the firm. Disposal of sewage, increased use of energy and strategies to increase profitability by exploitation of environmental resources have costly implications on the environment and society. Such damage, also known as external costs, do not affect the private firm through its internal costs as reflected in the firm's marginal variable cost MVC[9]. For example, if the cement-producing firm continues to dispose of its solid and liquid waste in a nearby lake, in the absence of instruments such as taxes, this will cause an un-priced environmental implication for which the firm does not incur any internal costs (i.e. its MVC doesn't increase).

The primary rationale for the use of environmental taxes is the argument based on internalising the external costs of pollution (Leicester, 2006). Since the 1980s, UK environmental policy has, at least in principle, been favourably disposed towards the case for employing market mechanisms. The choice of environmental instrument depends upon considerations of efficiency, administrative ease, low information requirements and dependability, that is, the effectiveness of the scheme should be as reliable as possible. The

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[8]No_x is a generic term for mono-nitrogen oxides NO and NO_2 (nitric oxide and nitrogen dioxide, CO_2 is carbon dioxide and SO_2 sulphur dioxide respectively.
[9] Marginal cost is the cost incurred by a firm for producing one unit of its products. Costs accrued to the producer are made up of two costs: fixed costs and variable costs where the former does not change as the output changes for e.g. costs of building, land. But the latter change with the level of production for e.g. number of workers employed.

instrument should continue to encourage environmental improvements and technical innovations beyond policy targets where feasible (Turner et al, 1994; Pearce, 1992). Economic instruments such as taxes, charges or emissions permits provide an incentive to the polluter to reduce pollution and are expected to influence environmental behaviour and thereby increase economic efficiency (Hahn, 1998; 2000). The incentives can take the form of product charges, emissions charges or market creation (i.e. emissions trading). As opposed to direct regulations, economic instruments give the polluters the incentives to reduce polluting behaviour. For example, businesses can choose to pay more tax or reduce pollution and pay less tax. Environmental taxes and emissions trading are the two most prominent economic instruments in UK environmental policy (OECD, 2007; OECD, 2009).

3.3   Environmental tax

An environmental tax is defined as

'*a tax whose base is a physical unit such as a litre of petrol, or proxy of it, for instance a passenger flight, that has a proven specific negative impact on the environment'*

(Eurostat, a statistical guide, 2001; p.9)

Accepted by both the Statistical Office of the European Communities (Eurostat) and the Organisation for Economic Co-operation and Development (OECD), this definition enables analysis based on the effects of the environmental taxes. Therefore if the aim of environmental taxation is to raise revenue rather than mitigate environmental problems 'this above mentioned definition does not preclude it from being defined as an environmental tax' (Gazley, 2006; p.15).

This above definition, which is the current European Commission definition in use, is solely focussed on the impact on the price of the physical unit. So the motive of the tax legislation is not taken into consideration. The OECD/EC guideline (2001) considers the impact of costs and prices:

"*the environmental effect of a tax comes primarily through the impact it has on the relative prices of environmentally related products and activities, in combination with the relevant price elasticities (OECD, 2000, p.8). with this in mind, the definition of environmental taxes used in the statistical framework puts emphasis on the potential effect of a given tax in terms of its impact on costs and prices*".

The OECD EEA database provides details for economic instruments related to the environment. Part of this database discusses taxes and the definition it uses for environmental taxes is modified as following:

"*This database defines environmentally related taxes as any compulsory, unrequited payment to general government levied on tax-bases deemed to be of particular environmental relevance. Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments*".

This is similar to the European Commission (2003) definition above in that the purpose of the legislator is not the main focus. The database further explains that " *the focus is instead on the potential environmental effects of the given tax, which is determines by the tax impacts on the producer and consumer process in question, in conjunction with the relevant price elasticities*".

The OECD database uses the term ' environmentally related taxes' which means that a more broader view of is taken of what is an environmental tax. An example of this is seen in the inclusion of all resource taxes[i] within the database whereas the EC definition excludes these taxes. Although it is significant to consider how to solve this differences in definition to include resource taxes in the EC definition too, as resource extraction causes environmental problems, but the current one in use is the European Commission 2003 definition .

Although the international bodies such as the OECD and Eurostat, as discussed above, define environmental taxes *not* according to the *intent*, but on whether the tax encourages pro-environmental *outcomes* or *behaviour*. On this basis, the Office of National Statistics

classified taxes such as Fuel Duty and Air Passenger Duty (See 3.3.5 below) as environmental taxes whereas the Treasury does not. In July 2012 the HM Treasury published a long awaited definition of environmental taxation stating that the following criteria must be fulfilled for a tax to be referred to as an environmental tax:

- The tax must be explicitly linked to the Government's environmental objective (for e.g. the CRC Energy Efficiency Scheme because the primary objective of the Scheme is to help the UK meet its biding target of reducing greenhouse gas emissions by at least 34% by 2020 and at least 80% y 2050).

- The primary objective of the tax is to encourage positive behavior change (for e..g the landfill tax which is currently £72 per tonne (as of 1st April 2013) and set to increase to £80 per tonne in 2014).

- The tax is structured in relation to environmental objectives and the more polluting the behavior the greater the tax levied.

HM treasury identifies the following as environmental taxes- CRC Energy Efficiency Scheme, Aggregates Levy, Landfill Tax, EU ETS, Climate Change Levy, Carbon Price Support. The taxes that are considered to be primarily revenue raising and whilst they have some environmental benefits are not considered as environmental taxes are- Vehicle Excise Duty (VED), Fuel Duty, Air Passenger Duty (APD).

The researcher explored the impact of environmental taxes in the UK on the profits of the producers (Webster & Ayatakshi, 2012) (attached in Appendix 6), using Input-Output Tables, to provide evidence that, if an economy is small, and open to international trade then it is unable to influence market prices. Evidence is provided to show that the way to incentivise businesses or producer is through the effect environmental taxes have on their profits i.e. an equivalent profit tax. In this paper the taxes that were not taken into consideration are VED, Fuel Duty and APD due to a) the difficulty in using them in the input-output context and b) the degree to which they are purely environmental taxes as opposed to being transport taxes.

Environmental taxation is a flexible instrument to achieve the environmental goals of a government (ESRC, 1998). The Economic and Social Research Council suggests that

'*Environmental taxes designed in the right way can send messages which permeate throughout the economy, encouraging a wide range of appropriate responses; changing production methods; switching to less polluting inputs; and reducing demand for goods that have significant negative impacts throughout all stages of production. Taxes can also ensure that different people are exposed to the same price signal, leading to more cost-effective ways of achieving a given environmental goal.*' (ESRC, 1998, p. 2).

Environmental economists have long argued that environmental policy should be based more firmly on the use of market-based mechanisms, such as environmental taxes and tradable permits, which integrate the environmental costs of pollution clearly into the economy (Pearce et al 1989; Pearce & Barbier, 2000; Pearce & Turner, 1990; Pearce, 1976).

Figure 7 below shows the demand and supply curve and the effect of an environmental tax, say, a carbon tax, on the prices. Before the imposition of the tax the equilibrium is at A, the point of intersection between the supply and the demand curves for emissions releasing products and price is Po and the production of goods will generate emissions equal to Q_0. When a carbon tax x is added it raises the costs of production for companies that produce carbon intensive products by the amount of the tax per ton and the equilibrium shifts to B and the supply curve shifts upward to S*. This results in prices being increased to P_1 as costs are passed on to the end consumers through increased prices and the quantity produced is reduced to Q_1 as emissions fall to Q_1. If the demand curve D is inelastic or relatively insensitive to changes in prices then the increase in price as a result of the imposition of the tax will be almost equal to the amount of tax x. In the case of this carbon tax the government collects the revenue but if the output is capped at Q_1 then the difference between the price the consumers pay at B and the costs of suppliers to produce at Q_1 allows the producers to

produce one unit of output and collect a profit equal to the difference between the selling price and the cost of production.

Carbon tax
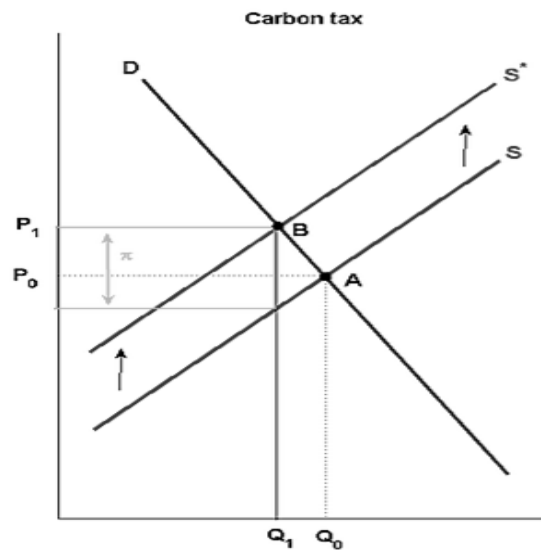
Figure 7: Effect of Environmental taxation on supply and demand curve

Environmental taxes are regressive in the sense that they are applied across all businesses and many taxes across households too without taking into consideration the capacity of the taxpayers to pay or deal with them. The researcher feels that in the context of SMEs this blanket approach to environmental taxes may cause feelings of mistrust and resentment about these taxes as SMEs are usually resource-constrained and the nomenclature of a tax that is called a 'levy' or a 'charge' coupled with the fact that it is a tax can reduce support for this tax (Leicester, 2006). To build greater trust in and support for these taxes, Leicester (2006) calls for more dissemination of information regarding the meaning and purpose of such taxes which might increase support for them.

It is often assumed that both pollution reduction and the financial goals of the government would be achieved through environmental taxes. But this assumption is valid only when both revenue goals and behavioural effects from the paying firms are achieved. For example, in SMEs, in the immediate period following the levying of environmental taxes, the business

will incur direct cost effects (Verbeke and Coeke, 1997). Later on behavioural effects may be observed if the SME invests in pollution reduction technology. While this all seems to be desirable consequences, if the government is expecting steady revenue then behavioural effects can result in the unintended consequence of reduced revenue. To mitigate this, if the government increases the tax then the environmental policies may begin to lose their credibility (Verbeke and Coeke, 1997) and high rates of tax may also potentially drive the SME out of business.

(Source: Pearce and Turner, 1990)

Figure 8: Optimal Pigouvian tax compared to fixed regulations

Figure 8 shows how an optimal Pigouvian tax would work vis-à-vis fixed standard regulations where T* is the tax level; P is the penalty for non-compliance to fixed standard regulations; Q is the output produced by the firm; W is the pollution produced by the firm; MEC is the marginal external costs and MNPB is the marginal net private benefit or marginal profit[10].

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[10]MEC is the change in the total cost incurred by businesses or households associated with a unit-change in the consumption or output of other households or businesses. Marginal profit is the excess of marginal revenue MR over marginal cost MC. If MR=MC then marginal profit is zero. If MR<MC then there will be marginal loss and total profit will reduced

Let's suppose that a firm X produces cement (Figure 8) and emits pollution in the form of CO2. The firm would want to maximize profits by producing outputs which have MNPB>0, that is, by expanding output to Qm. If Qs is the socially optimum output level then an environmental tax which is equal to the cost of pollution MEC at Qs can reduce the output. Here T* is the ideal Pigouvian Tax. However, MEC=MNPB at Qs so if firm X produces any output in excess of Qs then MNPB<T*. Therefore the firm has incentive to restrict output to Qs which in turn reduces emissions from Wm to Ws. Now, say, fixed standard emissions Wf is set below optimal pollution level at Ws. Then the quantity of output reduces to Qf from Qs. But if this value is greater than the pollution cost then that is again a loss incurred by society. Also, if the breach of the imposed fixed standard at Qf incurs only a low penalty then firms will only cut back on those units of production where penalty>MNPB. Now, due to the low level of penalty for non-compliance the firm will continue to make marginal profit on all units up to Qp in excess of this penalty. So whereas T* gives the firm X an incentive to reduce pollution (Pearce and Turner, 1990; Turner et al, 1994) to the optimal level, Ws penalty only gives a weak incentive to reduce pollution from Wm to Wp. And the firm continues to make more money than the cost of fine on all units from Qf to Qp.

Environmental taxes have certain features that make them more desirable than say, regulatory command-and-control, by incentivising polluters to reduce their pollution levels to the point where the costs of reduction are higher than environmental tax-related costs (Leicester, 2006). Also they generate revenue by taxing the 'bads' (i.e. pollution) instead of other distortionary taxes such as labour, income etc. which tax the goods (Pearce et al, 1989; Ricardo, 1926; O'Riordan, 1983). It gives a business the choice to decide the costs and benefits of its environmental behaviour.

For example, cement manufacturing involves using very high temperatures for the calcination reaction to convert calcium carbonate limestone to lime calcium oxide which is a necessary component of cement. So, as a result, there are very high emissions of CO_2. Investments in energy-saving equipment and CO_2-reducing processes and technology are

possible solutions. However, say that manufacturer A finds that although there are environmental benefits of investments in newer technologies, it is less costly to pay the environmental tax. On the other hand manufacturer B may choose the environmental solutions of investing in energy-saving technologies thereby polluting less and paying less tax as a result. As long as the tax level is set at a level which makes the price of CO_2 emissions reflect the environmental costs of using it, taxation would allow more increased cement production than direct regulation with the same environmental consequences.

3.3.1 Classification of environmental taxes

Taxes may be classified in many different ways. Based on the nature of administrative arrangements for assessment and collection of the tax, a direct tax, for example capital gains tax, is assessed on and collected from the individuals who are intended to bear it (James and Nobes, 2011; p.11). An indirect tax, for example VAT[11], is a tax which has an incidence on consumer prices and this tax on consumers is collected from businesses. An indirect tax is levied on the taxpayer with the intention that it is passed on. Environmental taxes may be classified as indirect taxes like VAT where the tax may have an incidence on the final price of the product or service for the consumer if the producer or seller is able to pass on the increased costs due to the tax through an increase in the prices of the products.

But the researcher proposes in appendix 6 that under certain conditions where a country is open to international trade at world prices and faces domestic environmental taxation, the key mechanism to bring about change in the short to medium-term is through having an effect on the profit incentives for producers and not through customer prices. The effect is deemed to be of short to medium-term only because if in the long run a global environmental taxation policy is adopted, then the incidence of tax may change and fall on the end consumer through increased prices. For example, although VAT is imposed on businesses it is passed on to the final consumers through increased prices. In thinking of environmental

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[11] VAT is the value added tax which is collected from all business involved in the production and distribution of a good for a final consumer.

taxes, which may also be classified as indirect taxes, if, say, the climate change levy which is imposed on businesses on their commercial uses of energy is able to be passed on to the final consumers, then the objective of behaviour change will not be achieved. So, as shown in appendix 5 it is perhaps more interesting to think of the effect of environmental taxes as being on the profit incentives for the producers. This is based on the premise that the tax is a domestic one and that the businesses are unable to influence world prices. Now it is also important to note here that SMEs do not often trade in international markets so the analysis in appendix 6 is not extended to SMEs and as such, not included in the main study here.

Taxes may also be classified according to the tax base, for example, environmental taxes are levied on tax base of something that has a proven negative impact on the environment when used. As mentioned before taxes may also be *ad valorem* which are based on the values of the tax base (VAT) or specifically based on the weight or the size of the tax base for example, excise duty, and therefore classified on the basis of the relationship of the amount of tax to the size of the tax base (James and Nobes, 2011).

For the purpose of this study the classification that perhaps explains the concept of environmental taxation best is the one which distinguishes between the incentive and revenue raising functions of the taxes and between the main uses to which the revenues can be directed (CIOT, 2009; Leicester, 2006; Maatta, 2006). Incentive environmental taxes are created in order to encourage the behaviour of polluters and their revenue raising is of secondary importance (Maatta, 2006). So in other words the tax is levied purely with the intention of changing environmentally-damaging behaviour without any intention to raise revenues. In setting the level of an incentive tax, if both the costs of the environmental damage and the economic benefit deriving from it per unit (i.e. the marginal damage cost and the marginal benefit) can be calculated, then the tax should be set at the level at which the marginal cost and benefit are equal (Maatta, 2006; CIOT, 2009).

If, however, the marginal cost and marginal benefits are unable to be calculated then the tax, according to the standard pricing approach (Baumol and Oates, 1971), may be used to achieve the environmental objectives set according to other criteria. A 'standard pricing' incentive tax can be the UK landfill tax.

Also the intention behind a particular tax will determine at what level the tax should be set (Maatta, 2006). An incentive tax may, however, be so successful that it may end up raising substantially less revenue than was anticipated. Environmental taxes can also be classified as revenue-raising taxes. Generating revenue through environmental taxes is desirable for the government to shift the burden away from other taxes on labour etc. (Ekins and Speck, 2008). It may happen that the tax will not only encourage behaviour change but at the same time generate a substantial amount of revenue for the government and so the primary purpose of the tax is not to change behaviour but to raise revenue. The UK road fuel duty is an example of a revenue-raising tax.

The other aspect to consider is how far the tax provides incentives to the taxpayers to bring about some potential change in their behaviours in terms of investing in say, energy- saving technology for SMEs? Incentives may be thought of as an aspect of efficiency (James and Nobes, 2011). Instead of introducing new environmental taxes the existing environmental taxes can be used to provide incentives for environmentally friendly behaviour. This can be done through providing profit incentives to producers to encourage them to shift to more environmentally friendly sectors [12](Webster and Ayatakshi, 2011). Also the CIOT (2009) suggests that, given the complexity of the tax system, the incentives approach may reduce the burden of these taxes, especially on small businesses. Incentive taxes can also encourage businesses and people to accept these taxes more.

The other type of tax according to this classification is that of the cost-covering charges which include general land remediation charges in the UK or the aircraft noise charges in various countries. Cost-covering charges are of two types: use charges where the charge is

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[12] See appendix 5

paid for a specific environmental service and earmarked charges where the revenue from the tax/charge is spent on related environmental projects but not directly on the taxpayer (CIOT, 2009: Maatta, 2006). Such a tax needs only to cover the costs of related environmental regulations and policies. These three types of taxes mentioned above are not mutually exclusive because a cost-covering charge and/or a revenue-raising tax may have an incentive effect and similarly the revenue generated from the revenue-raising taxes may be earmarked for environmental purposes.

But this classification is made because a) it clarifies the main objective of a particular tax which may be designed to have an incentive effect which is over and above the general environmental improvement objective of environmental taxes, and b) the intention behind a particular tax, whether it is to raise revenues or to provide incentive to change behaviour will determine the level at which the tax needs to be set.

Environmental taxes are often supported on the basis that they tax the 'bads' such as environmental pollution as opposed to the 'goods' such as labour etc. Smith (1776) proposed four canons of taxation, namely, equity, certainty, convenience and efficiency. Equity is concerned with the notion of fairness with respect to tax contributions; certainty is about the lack of uncertainty about tax liabilities; convenience is with respect to the timely manner of payments; and efficiency is about understanding how a particular tax might affect the economic efficiency and would it create distortions in the price mechanisms which would affect the behaviour of consumers and producers.

James and Nobes (2011) say that environmental taxes which are designed to discourage pollution may offset an existing distortion. The other grounds of efficiency of an environmental taxation instrument are its administrative costs and compliance costs, that is, how expensive it is to administer and comply with such taxes. Chapters 6 and 7 on the findings shows that the barriers to compliance with such environmental taxes within SMEs are the compliance costs. This is exacerbated by poor perception of this taxes, because

SMEs, owing to their limited resources, are unable to invest in or make, for instance, process changes within the firm to reduce their burden of environmental taxation.

In understanding whether the tax is fair or not it is to a large extent a matter of opinion (James and Nobes, 2011) but in order to be effective, environmental taxes need to be straightforward so that taxpayers understand the behavioural implications or the signals that are inherent within these taxes. Environmental taxes need to be seen as fair so there can be more support gathered for these taxes. In the current mix of environmental taxes in the UK the complexity of it all undermines the effectiveness of these taxes in securing behavioural changes. Businesses cannot be expected to change their behaviour if they do not understand the purpose of these taxes and/or if they are not even aware of these taxes. The Mirrlees Review (2011) of the tax system concluded that the current range of environmental policies and emissions sources is so complex that it is difficult to decide on effective tax rates for, say, carbon emissions.

Environmental taxes can also be classified as energy, transport, pollution and resource taxes (Gazley, 2006). Energy taxes are levied on energy products and can be sub-divided into energy products for transport purposes such as petrol and diesel and energy products for stationery purposes including coal, gas, and electricity. Energy taxes also comprise those that are levied on the emissions of carbon dioxide (CO_2) instead of pollution taxes because firstly, CO_2 taxes are often integrated with energy taxes and also they are '*partly introduced as a substitute for other energy taxes'* (Gazley, 2006, p.16). Transport taxes comprise those taxes that are related to use and ownership of motor vehicles such as the vehicle excise duty (VED) which is a recurrent annual road tax or a tax related to the sales or import of motor vehicles which would be a one-off tax (Gazley, 2006). Pollution taxes are those that include taxes on measures or estimated pollution to air, water, management of solid waste and noise (Gazley, 2006) such as the landfill tax which is taxed per tonne of disposal of waste at landfill sites. And finally, resource taxes are levied on the commercial exploitation of natural

resources such as water and minerals (excluding oil and gas) and forestry such as the aggregates levy which is levied on the commercial exploitation of aggregates in the UK.

3.4 Tax Incidence

As mentioned above the four canons of a good tax system also consider the criterion of equity. Under the criterion of equity, the matter of tax incidence and fairness of the tax are highly relevant.

Economists make the distinction between the impact of taxes from the incidence or burden of taxes. The incidence of tax is the study of who bears the burden of the tax. So this has a simple implication that the person who is the taxpayer or has the legal obligation to pay the tax may not be the one who is actually bearing the burden of the tax. The issue is that a tax initiates an entire chain of general equilibrium market effects that can change consumer and producer prices (Fullerton and Metcalf, 2002). The incidence or burden of a tax incorporates both the initial impact of the tax and the gains and losses associated with the general market equilibrium market reactions to the tax. This is because the change in prices generates welfare losses and gains in the economy. Thus, the issue of the incidence of taxation is of crucial interest in understanding the normative or positive distributional theory of taxation.

For example, if a business is able to pass on its increased costs as a result of the climate change levy to its end consumers through increased prices, then there would be no real impact of the tax on the business. Instead the burden of the tax will lie with the final consumers. But this is only applicable if the firm is able to influence market prices and thereby pass on the tax to consumers. The possibility of incidence of tax falling on the producer due to conditions that prevent the business from being able to influence market prices is discussed in more detail in the attached paper in Appendix 6.

Tax incidence is the analysis of the effect of a particular tax on the distribution of economic welfare (Fullerton and Metcalf, 2002). Tax incidence is said to 'fall' upon the group that, at the end of the day, bears the burden of the tax. The key concept is that the tax incidence or tax burden does not depend on where the revenue is collected, but on the price elasticity of demand and price elasticity of supply. Incidence of tax can be thought of as statutory incidence which refers to the distribution of tax payments based on the legal requirement to pay taxes to the government. Tax incidence can also be understood from the economist's perspective as economic incidence which measures the changes in economic welfare in society resulting from a tax. This issue of economic incidence is the one that is utilised in Appendix 6 for the analysis of the effects of environmental taxes on profit incentives for producers (Webster and Ayatakshi, 2011). Economic incidence of tax may affect the prices of products which can have an effect on the purchase of the particular product so the total output of the firm/producer reduces and uses fewer inputs.

So the economic incidence will try to measure how those prices - including the net price of each input - change and how those changes affect the people and/or businesses involved. Figure 7 above shows the increases in prices from P_0 to P_1 when a tax x is introduced. The partial equilibrium diagram shows the loss of producer surplus resulting from a tax (Fullerton and Metcalf, 2002). This shows the impact of the taxes on the consumers as opposed to the producers. In analysing the distributional effects of taxes on groups it is important to note that the incidence of taxes can also fall on the producers. They are unable to pass on the increased costs through increased prices in the case of a perfectly elastic supply curve under conditions that world prices are not amenable by domestic producers who are affected by domestic taxes such as national environmental taxes. However this assumption holds true if and only the tax policy, in the case of environmental taxes, is not global. In such a scenario - as discussed in attached paper in Appendix 6 - the effects of taxes fall on the profits of the producers.

Figure 9 below produces a modified version of the diagram produced in Chamberlain (2009) to illustrate the economic effects of a carbon tax, itself closely based on standard economic analysis (Webster and Ayatakshi, 2011). The figure shows domestic demand (D) and supply (S) for an import competing sector and an export sector. In Chamberlain's analysis the tax shifts the supply curve inward to S* and raises prices from P_0 to P_1 in each case. In other words the tax shifts the consumer prices up for these products with a simple per-unit tax and cap-and-trade shifts the prices up through regulatory quantity restriction (Chamberlain, 2009).

The modified version below differs in that world supply curve S_w that is perfectly elastic. In international economics this is known as the *small country assumption* – that domestic prices are determined in relation to given world prices. This phrase 'small country' is misleading since the country does not need to be 'small' in any normal sense (Webster and Ayatakshi, 2011). It is only necessary that the country faces given world prices for the world supply curve to be horizontal.
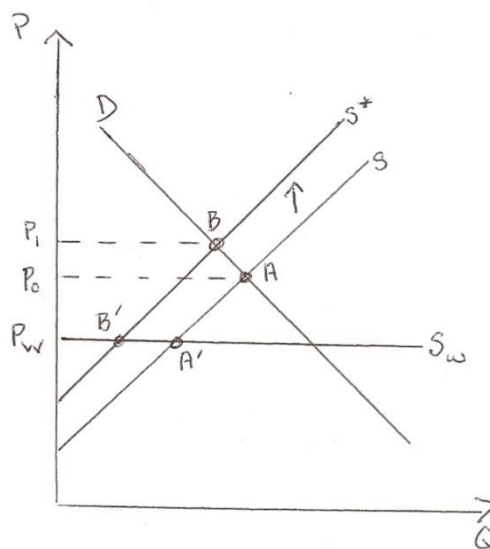
(a) Import competing sector   **(b) Export sector**
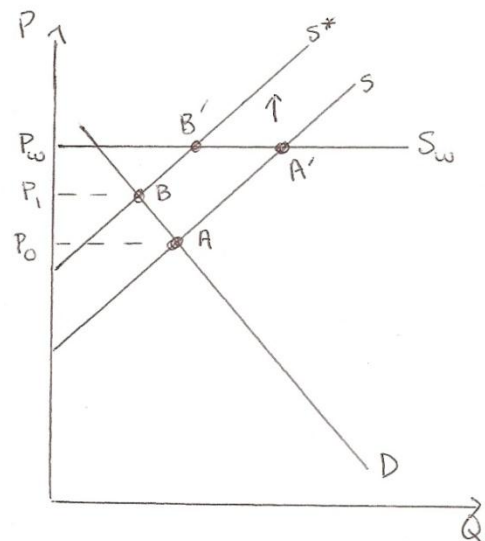
(Source: Webster & Ayatakshi, 2011)

Figure 9: Supply and Demand Curve: Impact of Environmental Tax

The implication of assuming that the sector concerned is a) traded and b) faces given world prices, is to change the incidence of the tax. Tax incidence is the concept of who bears the economic burden of a tax (Fullerton & Metcalf, 2002). In other words the incidence of tax is shifted to consumers if the costs are to be passed on to the final consumer through increased prices. Economic incidence measures the changes in economic welfare in society resulting from a tax (Fullerton & Metcalf, 2002). Fullerton and Metcalf (2002) say that if consumers buy less of taxed product then firms would produce less and buy fewer inputs which would change the net price of each input (p.1). However this holds true if the tax is able to be passed on to the end consumer through increased prices which results in the tax being 'passed forward' (Fullerton and Metcalf, 2002, p.2) and the consumers bear the burden.

3.4.1 Tradable permits

Tradable permits are market-based instruments and their fiscal properties are closely related to environmental taxes. Both tradable permits and environmental taxes can raise revenue. Where permits are auctioned, tradable permits are very closely substitutable with environmental taxes (Fullerton and Metcalf, 2001; OECD, 2009). Since these two instruments have the same environmental and fiscal properties, the policy choice between them is made on the basis of considerations of administrative costs and competitiveness of the permit market (OECD, 2009).

Figure 9 below shows the equivalence of a cap-and–trade approach to environmental taxes using a supply-demand graph. In the figure, if the government caps emissions at Q_1 and no matter how high the price, the quantity remains fixed at Q_1 then the new supply curve S* is vertical at the equilibrium B and the price increases to P_1. Cap-and-trade operates like a quantity restriction that transforms the supply curve into a vertical line S* at the new equilibrium B. So output is reduced and it raises prices just like a carbon tax. If the permits are auctioned off the price will increase by x and the government gains the revenue. In this case cap-and-trade and a carbon tax are equivalent in terms of same prices, same quantities

and the government generates revenues equal to the rectangle in the graph. However, if the permits are initially given away free of cost to polluters then the profits lie with the emitters.
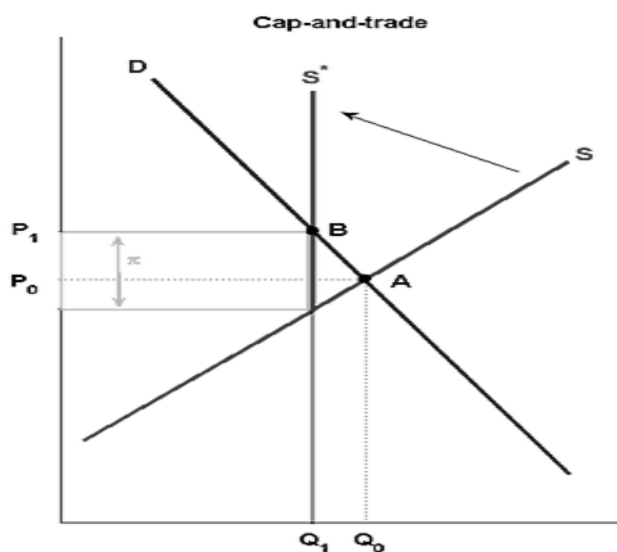
(Source:tax

foundation)

Figure 10: Effect of cap-and-trade on supply and demand curve

The market-based approach underlying tradable permits consists of the following steps. Once the level of pollution is decided upon as some allowable concentration of say, Chlorofluorocarbons (CFCs), or an allowable emissions level of say, CO_2, then permits are issued for the level of emissions up to the allowable level (Turner et al, 1994, p.181). Permits may be issued through auctioning or 'grandfathering'. There is an economic case for auctioning allowances/emissions trading allowances. While grandfathering distributes them free of charge to polluters, the principle argument for auctioning is the value of revenues. The auction of the permitas can reduce the rates of distortionary taxes which is basically the efficiency argument of the weak double dividend hypothesis[13].

Another important feature of auctioning is that it ensures that all firms, existing and new entrants face the same allowance cost per unit of emissions. Regular auctioning may also

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[13] This hypothesis asserts that revenue should be used to reduce rates of distortionary taxes such as labour, income tax etc.

ensure that potential purchasers have the opportunity to buy and firms trade where trading results in cost savings without concern about the effects on future allowance allocations[14], whereas allocation of permits though grandfathering (i.e. free initial issuing of permits based on past emissions) would result in foregoing the revenue. Grandfathering of permits allows the right to pollute based on past emission levels and any polluter achieving lower pollution than the numbers of permits they possess receives a tradable credit which they then can trade with other polluters. Even a grandfathered permit trading system provides an equal incentive at the margin to abate emissions, that is, if for firm X reducing pollution by a unit is cheaper than the price of selling permits is equal to 2 units then this benefits firm X. So a firm that finds it easier to abate pollution will profit from selling its permits to a polluter who finds it expensive to abate pollution (Turner et al, 1994; Pearce and Turner, 1990). Therefore firms benefit and it provides them with an incentive to trade (OECD, 2008).

Businesses with an intention to trade permits need to obtain information about prices and with numerous costs including costs of obtaining the information and costs of finding suitable trading partners, infrequent participants may find it hard to establish credibility and overcome the costs (OECD, 2009; Johnston, 2003; Kerr and Mare, 1997). For example, the EU ETS requires companies to submit a number of allowances for cancellation corresponding to their actual CO_2 emissions[15] (Snape and d'Souza, 2006). However, there are costs of transactions and administrating the system.

First, there are costs for application procedures for allocation of permits, service charges for the accounts in registry, costs for monitoring, verification and reporting of CO_2 emissions (Snape and d'Souza, 2006). Also, to gain from emission trading, businesses need to find trading partners, develop emissions abatement strategies and conduct analysis etc. Since costs are not proportional to company size they are often a burden for SMEs. The high transaction costs coupled with the extensive administrative process makes emissions trading

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[14] There are legal implications and advantages of auctioning over grandfathering and future literature update will include further discussions on this.
[15] This is particularly important as since the criteria for installations to be included in EU ETS as given in Annex I imply that a vast majority are SMEs (OECD, 2007)

unsuitable for SMEs. Also an environment survey by the British Chamber of Commerce in 2008 found that 33% SMEs view environmental tax as the most suitable environmental policy instrument to motivate environmental behaviour whereas businesses employing 250 or more view emissions trading as a better environmental policy instrument.

3.4.2 Command and control regulations and voluntary agreements

Economists contend that regulatory instruments such as standards and command and control (CAC) regulations aimed at directly controlling and regulating polluters and setting limits on the discharge of certain pollutants or restrictions through standard settings, are not as efficient as market-based instruments (Hahn, 1998; Turner et al, 1994; Young, 1999). The main feature of direct regulations is that they force the polluters to comply with the standards to be met, often in the form of some specific technology to be adopted, or pay a penalty (Snape and d'Souza, 2006). Therefore they are costly and inflexible and have been widely criticised by economists. Regulations in the form of say, minimum norms to be complied with, have the disadvantage that unless these norms are constantly adjusted, these polluting firms do not have any incentives to reduce their pollution levels below the legal requirement. Setting environmental standards through regulations is beset with lobbying by polluters to seek favourable regulations (Turner et al, 1994) and although the CAC approach is favoured for its relative administrative simplicity it provides no incentives for innovation or improvement beyond the set targets. Other measures such as voluntary agreements reduce government intervention (ENDS, 1998a) but they lack certainty and without legally binding obligations businesses are not compelled to make any changes.

For SMEs, direct regulations mostly require a minimum compliance but due to the large numbers of SMEs in the UK, it is often difficult to enforce and check whether SMEs are complying with the required standards. SMEs have a strong antipathy towards regulations because traditional command and control regulations are thought to be weak through the lack of clearer communication. SMEs do not favour voluntary self-regulation either because they

seem to prefer a clearer approach which has a penalty for non-compliance. A study on health and safety regulations and attitudes of SMEs to them found that SMEs have limited awareness and understanding of statutory regulations. Also, due to a lack of skilled experts, they are often known to resort to measures to gain competitive advantage (Vickers et al, 2005).

Their attitude to regulatory compliance is often reactive (Vickers et al, 2005) and is less likely to be proactive in the absence of regulatory measures (Petts et al, 2000; Simpson et al, 2004). The only motivation to comply with regulations is the fear of penalty (Vickers et al, 2005). In another study on corporate social responsibility of South Asian SMEs in the UK, Worthington et al (2006) found, in understanding the drivers and barriers to involvement in ethical and environmental initiatives, that government regulations had a small impact on matters such as waste disposal but most SMEs felt very little pressure from regulations other than those regarding minimum compliance. This also implies that regulation and/or self-regulation is a disadvantage due to lack of expertise, understanding and motivation and SMEs would prefer the clearer guidance of a more prescriptive approach. There is an attitude of informality and antipathy towards regulation (Vickers et al, 2005).

3.4.3 **Discussion**

Figure 11 below summarises the environmental instruments and their potential outcomes. It shows an *influence diagram* that illustrates a number of environmental policy instruments (indicated by rectangular boxes), a number of potential outcomes (indicated by ovals), and the utility of each outcome (indicated by diamond shaped boxes). The potential outcomes have uncertainty values attached to them since it is difficult to perfectly model all the variables in the economy.

The effectiveness of any environmental policy largely depends on how polluters respond to it (Pearce, 1991). To realize the effects offered by, say, economic instruments, polluters need information about costs, benefits, abatement costs, and technology-related information etc.

(Fullerton and Metcalf, 1997; Fullerton and Metcalf, 2001). The existing organisation structure of SMEs is not always well-suited to deal with all these issues. Often managed by the owner, SMEs do not always have the resources to make changes such as newer investments or organisational adjustments. Responses to imposed regulations also require that businesses have an informed understanding because lack of information or understanding may lead to non-compliance. Another category of instruments is often used in conjunction with a regulatory or economic one – that of internalizing environmental awareness and responsibility into individual decision-making by applying pressure and/or persuasion either directly or indirectly, (e.g. in negotiations) aimed at *voluntary agreements* or covenants between industry and governments, on environmental issues.
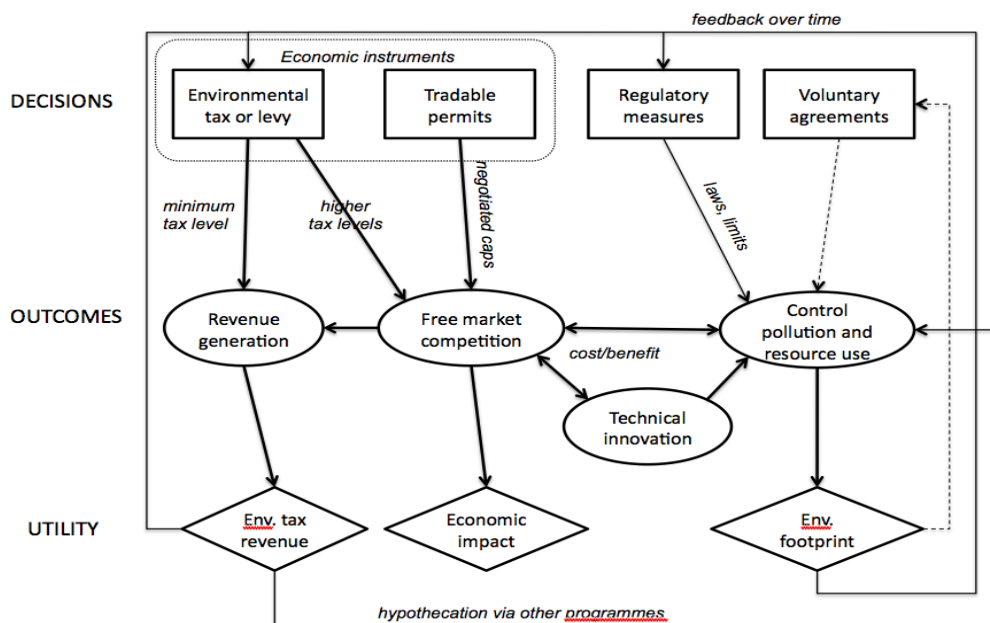
Figure 11: Environmental instruments and probabilistic outcomes

Voluntary agreements are not an economic instrument as such although some financial or economic penalty may be applied if no agreement is reached. In the case of emissions trading its efficiency for SMEs may get reduced due to issues of transaction costs and inefficient pricing of allowances (OECD, 2009, Hansford et al, 2004; Kerr and Mare, 1997; Johnston, 2003).

Although economic instruments are often contrasted with a regulatory command and control approach, in practice they complement each other. For example, the UK Climate Change Programme[16] requires the reduction of GHGs. To meet the targets, tools such as the carbon reduction commitment (CRC)[17] are used which employs tradable emissions allowances and regulatory legislation such as the Climate Change Act etc. In a sense, therefore, through a combination of legislative and market-based instruments the economy can be made more environmentally efficient (Blowers and Glasbergen, 1996) and no single instrument has been found be 100% effective on its own (Hansford et al, 2004). It has been stated that non-regulatory economic instruments are most effective when used in conjunction with regulatory instruments (Barbier, 1992, p.7; OECD, 1994, p.18).

However finding the right mix of regulatory and economic instruments in a dynamic economy is a difficult decision-theory problem. The rich 'influence network' between the above entities in Fig. 11 and that too, over a wide variance of time-scales, makes the problem of determining the 'optimal mix' of instruments for optimum utility (some desirable function of environmental footprint, tax revenue, and economic growth) a difficult one. However such a framework allows a researcher or policy maker to look at all the tools at his/her disposal and the cause-effect based correlations between them before making informed decisions. These influence diagrams are well known in both theoretical and applied decision theory and are amenable to qualitative as well as quantitative reasoning.

Going back to the example of cement manufacturers A and B, direct regulations might specify that the cement manufacturers are only allowed to emit so much CO_2/tonne cement produced in which case the production output might suffer even though the manufacturer is

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[16] The United Kingdom's Climate Change Programme was launched in November 2000 by the British government in response to its commitment agreed at the 1992 United Nations Conference on Environment and Development (UNCED). The aims of the programme are to cut all greenhouse gas emissions by the agreed 12.5% from 1990 levels in the period 2008 to 2012 (the international Kyoto commitment).

[17] The Carbon Reduction Commitment (CRC) is a proposed mandatory cap and trade scheme in the UK that will apply to large non energy intensive organisations in the public and private sectors. It is anticipated that the scheme will have cut carbon emissions by 1.2million tonnes of carbon per year by 2020. The UK government first committed to cutting UK carbon emissions by 60% by 2050, compared to 1990 levels, then in October 2008 changed the commitment to 80% by 2050.

prepared to pay for the consequences of the pollution he causes. But environmental tax gives the polluter incentives for innovation to invest in or develop less polluting procedures whereas regulation, by merely encouraging minimum compliance, provides no incentive to either firm A or B to reduce more CO_2 emissions than the specified amount. Therefore environmental taxes allow managerial choice, although some firms may not have the resources to invest in newer technologies even if they have positive environmental intentions. Although there is a wide body of literature (Beder, 1996; Baranzini et al, 2000; Jones, 1999; Goddard et al, 2006) that argues that since businesses, especially SMEs, typically base their major investment decisions on total costs, the incentive effects of market-based instruments such as taxes may fail to achieve their objective of behaviour change.

Also, in the case of emissions trading, although the permits are flexible and they can control and identify levels of pollution, there is uncertainty about the costs, implementation and disproportionate effects trading permits may have on SMEs. Any trading scheme requires a system for the monitoring and verification of trades which can be difficult for SMEs. For example, the Energy Intensive Users Group (EIUG) suggests that tradable permits result in a cap on growth and UK Steel considers them to be 'complicated to administer and an unpredictable gamble with the potential of unforeseen risks and damaging outcomes' (ENDS, 1998a, p.32).

As mentioned above the ideal Pigouvian tax seeks to reflect the exact pollution costs of the margin. But it is not always practical to tax pollution precisely and so a number of proxy solutions are adopted (Turner et al, 1994 p.166). The purchase or use of inputs such as gas and electricity etc. to the production process generating pollution may be the only possible tax point. Also it is difficult to correctly evaluate the relationship between pollution and inputs (Pearce and Turner, 1990; Young, 1992; Turner et al, 1994) since it is often difficult to measure exact emissions, that is, difficult to assess exact costs in which case tax levels should be set at a level that encourages changes in behaviour and the government should prioritize the behaviour impact of environmental taxes more than its financial goals.

The development of tax policy and proposals relating to particular taxes and rates of taxes is a complex process, one that depends on many factors including aspects of the tax system, government expenditure programs, non-economic as well as economic variables and the economic, social and political environment (James and Edwards, 2008; p.35). It is not simply identifying a single problem- e.g. the costs of pollution- and a single response- e.g. a tax reflecting the external costs of that pollution (James and Edwards, 2008). Tax systems exist not only to raise revenue but with other policy objectives as well such as, pro-environmental behaviour, in the case of environmental taxes. So a range of factors need to be taken into consideration when developing policy with respect to all aspects such as compliance and tax simplication (James and Edwards, 2008, p.36). The complexity of tax laws is often considered a huge barrier to tax compliance (James and Alley, 2002). As discussed in figure 8, the theory of optimal pigouvian taxes provides some help in understanding the needs for a more comprehensive approach to tax reform.

The general theory of the second best is linked to the fact that the variables in an economic system interact. So changing one part will have effects on other variables that are not directly involved in the initial change. It states that "*is not true that a situation in which more, but not all, of the optimum conditions are fulfilled is necessarily, or is even likely to be, superior to a situation, in which fewer are fulfilled*" (Lipsey and Lancaster, 1956, p.12).

In the case of environmentally related taxes, it is suggested that the taxes should be imposed to internalise the external effects of pollution (Pigouvian taxes). Now this applies if and only if the external effect- i.e. pollution- causes the price to give the wrong economic signal about the full costs. James and Edwards (2008) say " *the tax could be used to represent the social cost in the market which would then be guided in the right direction. This is not the only possibility though. It may be that existing distortions have already pushed the price in this direction and, if tax policy makers have not considered all aspects of the change before implementing it, the resulting tax might move the price further rather than closer to the optimum position*" (p.37).

Literature (Barde, 1997; Ekins, 1999: Ekins and Speck, 2000; Dresner et al, 2006) suggests that if revenue generation through environmental taxes becomes a primary objective of the government then it may lead businesses to devise tax evasion strategies in the long run if taxes are increased progressively to maintain revenue levels, which will reduce the credibility of the taxes, even though business behaviour shifts towards environmental protection. Through redistribution of tax revenue environmental taxes can be made revenue neutral, that is, they have no impact upon tax revenues but they continue to encourage pro-environmental behaviour. Also it is important for policy makers to explain the rationale of, say, environmental taxes to businesses to generate enhanced understanding and cooperation from businesses.

3.4.4 Review of current environmental taxes in UK

Below is a brief description of all the current environmental taxes in the UK, both from the ONS and HMRC:

3.4.4.1 Duty on hydrocarbon oils

Duty on hydrocarbon oils includes oils used in road vehicles, the main ones being ultra-low sulphur petrol and ultra-low sulphur diesel. Different rates apply to: the manufacture of biofuels, blend biodiesel or bioethanol with other oils; other fuel substitutes and fuel additives; fuel used in your road vehicles, excluding excepted vehicles; gas used in vehicles, or that which is stored or sold; motor and heating fuels; and anyone intending to sell or deal in marked rebated gas oil (red diesel) (HMRC, 2011). Also known as fuel duty or fuel tax, duty on hydrocarbon oil is the excise duty levied on oils viz. road vehicle fuels. The affected environmental domains addressed by this instrument are air pollution, climate change, energy efficiency and transport (OECD, 2010). The rates of this duty are as follows (OECD, 2010):

Specific tax base	Tax rates	Last update to information
Aviation gasoline	0.2884 GBP per litre	07/02/2007
Biodiesel	0.2835 GBP per litre	05/02/2009
Bioethanol	0.2835 GBP per litre	07/02/2007
Fuel oil and light oil delivered to approved persons for use as a furnace fuel	0.1007 GBP per litre	22/06/2009
Gas for use as road fuel	0.1081 GBP per litre	07/02/2007
Gas oil (marked red)	0.0769 GBP per litre	-do-
Higher sulphur diesel	0.5468 GBP per litre	-do-
Leaded petrol (only available by special license)	0.5768 GBP per litre	-do-
Road fuel gas other than natural gas (e.g. liquefied petroleum gas, LPG)	0.1221 GBP per litre	-do-
Ultra low sulphur diesel (50 ppm or less)	0.4835 GBP per litre	-do-
Ultra low sulphur petrol (50 ppm or less)	-do-	-do-
Unleaded petrol	0.5152 GBP per litre	-do-

Table 3: Duty on Hydrocarbon Oils

Exemptions to this duty are as follows (OECD, 2010):

Exemption Type	Type of Link	Sector
Exemption for exports	Industrial	Manufacture of coke, refined petroleum products and nuclear fuel
Exemptions for navigation	-do-	-do-
-do-	-do-	Sea and coastal water transport
-do-	Households	Passenger transport by sea and inland waterway
Exemptions for diplomats	Industrial	Public administration and defence; compulsory social security
-do-	-do-	Manufacture of coke, refined petroleum products and nuclear fuel
Product or activity	-do-	Manufacture of coke, refined petroleum products and nuclear fuel
-do-	-do-	Air transport
-do-	Household	Passenger transport by air

Table 4 : Exemptions to Duty on Hydrocarbon Oils

3.4.4.2   VAT on duty

This is calculated as a fixed proportion, of the duty paid on hydrocarbon oils. In practice much of this VAT will be reclaimed by business, but it could be argued that the total will eventually be paid when the final product or service is purchased.

3.4.4.3   Carbon Reduction Commitment (CRC)

Started on 1st April 2010, CRC is a mandatory scheme aimed at improving energy efficiency and cutting emissions in large public and private sector organisations. Using a range of financial, behavioural and reputational drivers, this scheme aims to encourage organisations to develop energy management strategies that promote a better understanding of energy usage (DECC, 2011).

3.4.4.4 Carbon Floor Price

The Chancellor announced in the Budget 2011 the introduction of a Carbon Floor Price from 1 April 2013. This is the first step to wider reform of the electricity market. From April 1st 2013, firms generating electricity will be required to pay at least £16 per tonne of CO_2 they produce. The UK is the first country in the world to introduce a Carbon Floor Price.

3.4.4.5 Climate Change Levy (CCL)

CCL is a tax on the commercial use of energy in both industry and the public sector. The aim of CCL is to encourage businesses to become more energy efficient and reduce their greenhouse gas emissions. It applied to industrial and commercial energy supplies to the industrial, commercial, agricultural, public and private sectors. Energy subject to CCL includes natural gas, electricity, and petroleum and hydrocarbon gas in liquid form, coal, lignite and coke. All revenue raised through this levy is recycled back to the businesses through a 0.3% cut in employers' national insurance contributions.

CCL is a key instrument in the control of air and atmospheric pollution (Snape and d'Souza, 2006). A tax on commercial and industrial users of energy, CCL was announced in the 1999 Budget, and took effect from April 2001. It is imposed at the time of supply to energy users in industry, the public sector and agriculture, at varying tax rates per unit of energy, depending on the fuel type. The levy is 'downstream', that is, paid by energy users not extractors or generators, is levied on industry only, with households and transport being exempt, and is structured so as to encourage renewable energy but not nuclear power (users of nuclear electricity pay the tax) (Snape and d'Souza, 2006). Fuels supplied for transport, for non-fuel uses, for electricity generation and to the household sector are exempted from the tax.

CCL is collected on a physical unit with a proven negative impact on the environment, such as the combustion of fossil fuels (Gazley, 2006). Households are exempt from all parts of CCL. 100% revenue generated from this levy is earmarked for being recycled to business through a reduction in employers' National Insurance Contributions (NICs) in 2001-2002

and additional Government support for energy efficiency measures (OECD, 2010). Industrial exemptions include: export from the UK of the re-sale of taxable commodities other than gas or electricity; supplies used in some forms of transport via railways, other land transport and air transport; supplies used to produce taxable commodities other than electricity, that is, most of manufacturing including the manufacture of coke, petroleum, basic metals, chemicals etc; supplies (other than self-supplies) to various categories of electricity producers including CHP (Combined Heat and Power)[18] schemes (i.e. steam and hot water supply, production, transmission and distribution of electricity); and supplies of electricity from renewable sources. The tax rates are as follows (OECD, 2010):

Tax base	Tax rates	Last update to information
Coal consumption (ordinary rate)[19]	12.8 GBP per tonne	28/01/2010
Coal consumption (reduced rate)[20]	2.6 GBP per tonne	28/01/2010
Coke consumption (ordinary rate)[21]	12.8 GBP per tonne	28/01/2010
Coke consumption (reduced rate)[21]	2.6 GBP per tonne	28/01/2010
Electricity consumption (ordinary rate)[22]	4.7 GBP per MWh	28/01/2010
Electricity consumption (reduced rate)[21]	0.9 GBP per MWh	28/01/2010
Liquid petroleum gas used for heating purposes (ordinary rate)[23]	10.5 GBP per tonne	28/01/2010

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[18] Combined Heat and Power (CHP) is the simultaneous generation of usable heat and power (usually electricity) in a single process. Through the use of an absorption cooling cycle, trigeneration or Combined Cooling Heat and Power (CCHP) schemes can also be developed. CHP is a highly efficient way to use both fossil and renewable fuels and can therefore make a significant contribution to the UK's sustainable energy goals, bringing environmental, economic, social and energy security benefits.

[19] Solid fuels for households and mining of coal and lignite, extraction of peat and all or most manufacturing for industries (OECD, 2010)

[20] This reduction to 20% of the full rate applies to supplies to energy intensive facilities covered by climate change levy agreements negotiated with the Ministry of Environment (OECD, 2010)

[21] Manufacture of coke, refined petroleum products and nuclear fuel (OECD, 2010).

[22] Industrial Production, transmission and distribution of electricity and all, or most, of manufacturing (OECD, 2010)

Liquid petroleum gas used for heating purposes (reduced rate)[21,24]	2.1 GBP per tonne	28/01/2010
Natural gas consumption (ordinary rate)[24]	1.6 GBP per MWh	28/01/2010
Natural gas consumption (reduced rate)[21,25]	0.38 GBP per MWh	28/01/2010

Table 5: Climate Change Levy

At the time of its introduction, CCL was regarded as the 'UK's most significant green tax to date' (Andrew, 2000) and was estimated to raise £1 billion in revenue and save 2 million tonnes in carbon dioxide emissions per year by 2010 (Hansford and McKercher, 2008). CCL has had a significant influence on the behaviour of business (HM Treasury, 2006). By adding a small – but visible – amount to firms' energy costs, the levy has reduced business energy demand compared with what it would otherwise have been. This, in turn, has helped to reduce carbon emissions.

As part of the CCL package, the Government also introduced other measures to help business raise energy efficiency levels, including climate change agreements (CCAs) and enhanced capital allowances (ECAs) for energy-saving technologies (HM Treasury, 2006).

In 2003, Cambridge Econometrics undertook an independent review of the levy and their report published in Budget 2005 estimated that CCL would reduce overall energy demand in the economy by 2.9% by 2010 (HM Treasury, 2006). This reduced energy demand leads to reduced carbon emissions from a decline in the burning of fossil fuels for electricity generation as well as from the CCL-paying sectors directly. The reduction in energy demand, together with the NICs cut, has also led to a reduction in costs for business as a whole. Cambridge Econometrics estimated that the CCL/NICs package would reduce overall unit

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[23] Households Liquid fuels ;Industrial Manufacture of coke, refined petroleum products and nuclear fuel and steam and hot water supply (OECD, 2010).

[24] Industrial manufacture of gas; distribution of gaseous fuels through mains and extraction of crude petroleum and natural gas, and incidental service, ex. surveying

costs for business by 0.13 per cent by 2010, compared with a situation where the package was not in place (HM Treasury, 2006).

The independent evaluation carried out by Cambridge Econometrics showed that CCL is achieving its objectives. It is an effective instrument to incentivise business to reduce energy consumption and has delivered cumulative savings of over 16 MtC so far and is forecast to deliver savings of over 3.5 MtC a year by 2010 (HM Treasury, 2006). CCL continues to encourage business to adapt to the conditions and challenges it faces through improvements in energy efficiency (Snape and d'Souza, 2006).

3.4.4.6 Climate Change Agreements (CCA) and the Enhanced Capital Allowances (ECA)

In order to protect the competitiveness of the most energy-intensive sectors of industry, climate change agreements (CCAs) were introduced as part of the CCL package. CCAs provide an 80 per cent discount from the levy for energy-intensive sectors, provided they enter into agreements to meet energy efficiency targets (HM Treasury, 2006). CCAs are negotiated agreements aimed at improving energy efficiency and are restricted to 'energy intensive' processes as set out in FA 2000 and SI 2000/1973 – that is, regulations relating to the Integrated Pollution Prevention and Control (IPPC) (Hansford et al, 2004). This makes the participating business eligible for an 80% reduction in its CCL.

Access to CCAs was originally restricted to companies covered by the IPPC regulation (DEFRA, 2010). In practical terms, this meant that not all companies belonging to affected trade associations were eligible to join CCAs (Bailey, 2002). Also, CCAs lead to highly complex and costly management systems (Hansford et al, 2004) and result in SMEs being less likely to participate in CCAs.

There are merits to signing CCAs. For instance, UK cement manufacturers have signed a Climate Change Levy Agreement with government to deliver an overall energy efficiency improvement across their sector of 26.8% by 2010 against a base year of 1990. The industry has already achieved a 27.5% improvement in energy efficiency (MPA, 2009). Although

CCAs lead to highly complex and costly management systems (Hansford et al, 2008) and result in SMEs being less likely to participate, the above example shows that there are merits for SMEs to join their sector-specific trade associations (See Section 2.2.3.3). For instance, members of the British Ceramic Confederation can get access to direct negotiations with DEFRA, information updates and a point of contact for all questions relating to CCAs etc.

Similarly, the ECA scheme can bring significant financial savings, with an immediate cash flow boost and longer term energy efficiency and costs but is not always suitable to SMEs (Revell and Blackburn, 2005) as SMEs do not consider the payback worth the initial investment.

Capital allowances allow the costs of capital assets to be written off against a business's taxable profits, and first-year allowances (FYAs) is the name given to specially increased rates of allowances. FYAs allow a greater proportion of the cost of an investment to qualify for tax relief against a business's profits for the period during which the investment is made. The ECA scheme, which was introduced in April 2001 alongside the rest of the CCL package, provides 100% FYAs for spending on designated energy-saving technologies and products (HM Treasury, 2006) in the same tax year as the purchase. This means a business paying corporation tax at 28% will receive 28p tax relief for every £1 invested in energy-saving products. This enables a business to write off the whole cost of the investment, which can provide a helpful cash flow boost. It is therefore an integral part of the CCL package.

As well as the added tax incentive, investing in energy-saving equipment could reduce a company's energy bills, as it has lower running costs. This will also reduce a company's CCL.

There are 15 designated technologies including boilers and heat pumps etc. and 54 sub-technologies that comprise the ECA scheme to see which items are on the Energy Technology List (HM Treasury, 2006). The ECA scheme is dynamic – the energy technology list is kept under review and technologies can be added or removed and the

detailed energy-saving criteria amended to reflect technological progress and market changes.

The disadvantage SMEs face in terms of limited financial resources would cause them to be unable to afford newer technologies. In SMEs, paybacks from energy-saving technologies are not considered worth the initial investment to buy new equipment (Revell and Blackburn, 2005).

3.4.4.7 EU Emissions Trading Scheme (EU ETS)

EU ETS was introduced across Europe in 2005 to tackle the emissions of carbon dioxide and other greenhouse gases and to combat the serious threat of climate change. This is to help the EU meet its greenhouse gas emissions target of 8% below 1990 levels under the Kyoto Protocol. Each member state is required to develop a National Allocation Plan approved by the European Commission. This sets an overall cap on the total emissions which is then converted into allowances (one allowance equals one tonne of $CO_{2)}$ which are then distributed by member states to installations covered by the system. At the end of each year, installations are required to surrender allowances to account for their actual emissions. This scheme covers electricity generation and the main energy-intensive industries.

3.4.4.8 Renewable energy obligations

This places an obligation on licensed electricity suppliers to source a specified and annually increasing proportion of their electricity sales from renewable sources or pay a penalty. In 2010 the revenues from this tax were around £470 million. The Renewables Obligation (RO) is the current main mechanism for supporting large-scale generation of renewable electricity.

3.4.4.9 Air Passenger Duty (APD)

Introduced in 1994 APD applied to the carriage from a UK airport of chargeable passengers on chargeable aircraft and is applied at different rates. APD is calculated according to the distance travelled. Other factors such as type and age of aircraft, duration of flight and weight of aircraft are not taken into consideration. The UK budget 2011 highlights this tax as being severely limited. Emissions from air transport have a proven negative impact on the

environment (Gazley, 2006). It is an environmental tax in the sense that it is a single stage indirect excise duty charged on carriage of passengers flying from a UK airport on an aircraft that has an authorized take-off weight of more than ten tonnes and more than 20 seats for passengers (HMRC, 2008). Introduced in 1994, and controversially doubled in 2007, the environmental domains this duty addresses are air pollution, climate change and noise pollution (OECD, 2010). There are different rates for this tax as follows (OECD, 2010):

Specific tax base	Current tax rate	Last update to information
The carriage, from a UK airport, of chargeable passengers on chargeable aircraft to EEA destinations - higher classes of travel	20 GBP per passenger	07/02/2007
The carriage, from a UK airport, of chargeable passengers on chargeable aircraft to EEA destinations - lowest class of travel	10 GBP per passenger	07/02/2007
The carriage, from a UK airport, of chargeable passengers on chargeable aircraft to other destinations - higher classes of travel	80 GBP per passenger	07/02/2007
The carriage, from a UK airport, of chargeable passengers on chargeable aircraft to other destinations - lowest class of travel	40 GBP per passenger	07/02/2007

Table 6: Air Passenger Duty

3.4.4.10 Vehicle Excise Duty (VED)

VED is paid by owners of motor vehicles and can be paid either six-monthly or annually. There have been various changes to this duty over recent years. From 1 May 2002, private cars, taxis and light goods vehicles registered before 1 March 2001 with an engine size up to and including 1549cc are subject to lower tax than cars with engine sizes greater than 1549cc. The same vehicle types registered on or after 1 March 2011 are taxed according to the level of carbon dioxide emissions. This is now broken down by payments from businesses and households. From June 1999, an annual VED differential was introduced to favour cars with small engines; this now applies only to vehicles registered before March 2001 (HMRC, 2008). For cars first registered after 1 March 2001, VED has been graduated according to the CO2 emissions performance of the vehicle model. Charges are made in seven bands (see Appendix 1).

The lowest band (A) is zero and payable for vehicles with an emissions performance of less than 101g CO2/km, whilst the highest band (G) is payable for vehicles with an emissions performance of more than 225g CO2/km (though the highest band G rate applies only to vehicles registered since 23 March 2006). In 2007, only 544 vehicles were sold in the lowest emissions band, though sales of alternative fuel and hybrid vehicles were over 16,600 in total. Budget 2008 proposed to increase the number of bands to 13 from April 2009 with a top rate for vehicles emitting more than 255g CO2/km of £440. It also proposed a 'showroom tax' – a VED which is different in the first year than subsequent years and which would be higher for the most polluting vehicles (up to £950 in the first year for cars in the top band M) (HMRC, 2008).

Exemptions from this tax include vehicles of any class in private use constructed before 1st January 1973 and vehicles used by people in receipt of certain disability living allowances. The tax is refunded for full months of unused duty for household personal transport and industrial land transport (OECD, 2010). The use of a vehicle has a negative environmental impact through the generation of atmospheric emissions. Since 2001, VED has been a

graduated tax based on the level of CO_2 emissions (Gazley, 2006). The rates for vehicles registered before March 2001 and with an engine size <1,550cc is £120pa; for engine size ≥1,550cc it is £185pa. Vehicles registered in or after March 2001 attract rates of £0 – £400 per year for vehicles registered after 23 March 2006 and £0 - £210 for vehicles registered earlier (HMRC, 2008). The detailed breakdown of tax rates is in Appendix1.

3.4.4.11   Aggregates Levy

Aggregates Levy is the key regulatory instrument in relation to mineral extraction (Snape and d'Souza, 2006). This is a tax on primary sand, gravel and rock that is dug from the ground or dredged from the sea up to 12 nautical miles off the coast (Snape and d'Souza, 2006). The Aggregates Levy was established to make the price of aggregates better reflect the environmental costs of quarrying, encouraging the use of recycled aggregates and alternative materials (OECD, 2007). The levy has been a significant factor in reducing sales of virgin aggregates in England by around 18 million tonnes between 2001 and 2005, with an estimated increase in the use of recycled aggregate of nearly six million tonnes (HM Treasury, 2009).

The Aggregates Levy was frozen at £2.00 per tonne in 2010-11 to ease pressure on the sector facing difficulties under the downturn of the construction market. For the purposes of the Aggregates Levy, the chargeable person is the person responsible for subjecting aggregates to commercial exploitation (Finance Act 2001, s.16 (3) cited in Snape and d'Souza, 2006), a concept which includes 'the removal of the aggregate from the quarry in question, its sale, its use for construction purposes or its mixing, other than in permitted circumstances, with any substance other than water'. This means that the person primarily liable for Aggregates Levy will be the quarry operator (Snape and d'Souza, 2006; p.50-51).

The quarrying industry has two main trade associations, the Quarry Products Association MPA and the British Aggregates Association. The latter was involved in an unsuccessful challenge to the legality of the Aggregates Levy in April 2002. The UK quarrying industry

has approximately 230 independent businesses that generate thousands of jobs all over the country.

Currently taxed at 2GBP per tonne of aggregate production of virgin sand, gravel and crushed rock which is subject to commercial exploitation in the UK - including that dredged from the seabed within UK territorial waters– the Aggregates Levy was introduced in the UK in 2002. 100% of this tax is earmarked to be returned to businesses through 0.1% point cut in employer's NIC and a new Sustainability Fund to deliver environmental benefits. Exemptions include industrial manufacture of other non-metallic mineral products, mining of coal and lignite, extraction of peat, mining of metal ores, other mining and quarrying, production, transmission and distribution of electricity, manufacture of basic metals, extraction of crude petroleum and natural gas and incidental services (e.g. surveying). Other industrial exemptions include sewage and refuse disposal, sanitation and similar activities, construction, any aggregate necessarily arising from the dredging of marine navigation channels and inland waterways, road construction and building construction.

Aggregate resources produced from sand and gravel deposits, crushed rock or dredged from the sea, contribute to the economic and social wellbeing of the UK. and their production and supply has environmental effects.

The outline of the aggregates showed the government commitment to the ideas of recycling of revenue:

' to further the government's aim of shifting the burden of taxation from 'goods' to 'bads'

the revenues from the levy will be fully recycled to the business community through a 0.1%

point reduction in employers' NICs and a new Sustainability Fund. The Government will be

consulting shortly on how this fund can best be used to deliver local environmental

improvements'

 (Snape and d'Souza, 2006, p.247).

The Aggregate Levy Sustainability Fund (ALSF) has provided funding to undertake work to minimize and mitigate these effects. Since its launch in 2002 the ALSF has made a significant contribution to knowledge and practice in how to produce aggregates in a sustainable way. It has invested nearly £40m in over 360 research and development projects covering an enormous range of topics.

The British Aggregates Association (BAA) has been fighting the levy for a long time now. It argues that the tax constitutes state aid because it penalises some UK operators financially but not others, therefore inhibiting competition and intra-community trade. The BAA was concerned that the tax was selective and seemed to unfairly advantage competitors within the industry. It noted, for example, that certain aggregates had no effective substitutes made from recycled material and that excluding the tax from exports was unfair to non-exporting members.

The BAA asked the Commission to investigate the tax on the grounds that it amounted to an illegal state aid under European competition law. In 2002, the Commission decided the levy was not a state aid because its scope, including the exemptions, was justified by the tax's logic and nature.

3.4.4.12 Landfill Tax

The UK's first explicit environmentally-related tax, introduced in 1996, Landfill Tax is a tax on waste delivered to landfill sites, set at a level based on an assessment of the external costs of landfill use (Davies and Doble, 2004). Landfill Tax operates in the area of waste management, now being intended to assist in reducing the amount of waste being sent to landfill (Snape and d'Souza, 2006). The UK's Landfill Tax is charged per tonne of commercial, industrial and municipal (household) waste delivered to landfill sites.

There are two principle objectives of the tax:

(1) It is intended to apply proper pricing to the disposal of waste by landfill. It is considered that the cost of landfill is very low in comparison with other European

countries and that this cost failed to internalise the social costs of environmental impacts.

(2) It is intended to encourage sustainable waste management. Increasing the cost of landfill would stimulate the demand for alternatives such as recycling, re-use and waste minimisation. The tax was therefore intended to shift waste management up the hierarchy (See Figure 11 below) minimizing waste arising and altering the life-cycle of waste in ways that encourage recovery of value.
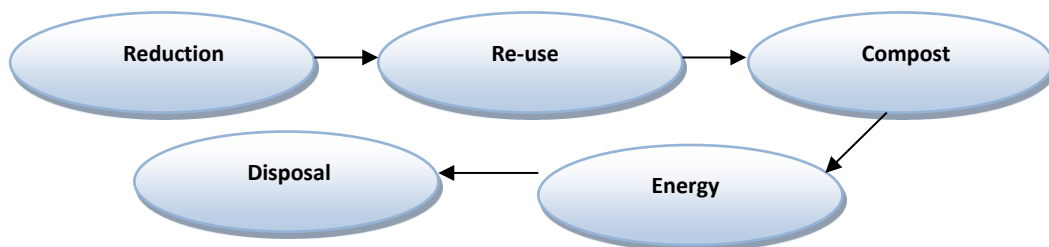
(Adapted from: DETR, 1999a)

Figure 12: Waste management Hierarchy

Landfill Tax remains a cornerstone of waste management policy in the UK. By increasing the costs of sending waste to landfill, the tax encourages use of, and investment in, sustainable alternative treatment options, such as sorting machinery, recycling and anaerobic digestion. Budget 2009 announced that the standard rate of landfill tax would continue to increase by £8 per tonne on 1 April each year from 2011 to 2013, so that the tax continued to incentivise investment in more sustainable alternatives to reduce reliance on landfill, delivering emissions savings equivalent to 0.7 MtCO2 per year. Budget 2009 also announced that the lower rate applying to inactive wastes would be frozen at £2.50 per tonne for 2010-11.

Two different components of the waste stream are taxed at different rates. The standard rate applies to active (biodegradable) waste, and a reduced rate applies to 'inert' waste, such as building rubble, etc. (OECD, 2009). The rates of Landfill Tax have risen steadily since its

inception. The lower rate for inert wastes is £2.50 per tonne from 1 April 2010 to 31 March 2012.

The standard rate is £56 per tonne from 1 April 2011 to 31 March 2012 and will increase to:

- £64 per tonne on 1 April 2012

- £72 per tonne on 1 April 2013

- £80 per tonne on 1 April 2014

The inert waste is confined to waste that does not physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution. Substances entitled to the lower rate include ceramic or concrete materials, furnace slags and naturally-occurring rocks and soils etc.

The steady acceleration in the standard rate of Landfill Tax reflects increasing concern about the inability of the UK to reduce its use of landfill as the predominant means of waste disposal (Snape and d'Souza, 2006). Under the EU Landfill Directive (1999/31/EC), the UK is required to meet quantitative targets for reductions in the quantity of biodegradable municipal waste sent to landfill (Snape and d'Souza, 2006). Judged against the levels in 1995, the UK must reduce its landfill use by 25% by 2010, 50% by 2013 and 65% by 2020 (OECD, 2009). Currently about 43% of all UK waste and approximately 64% of the UK's municipal waste is sent to landfill. Landfill plays an essential role in the safe disposal of certain wastes, but most wastes could instead be recycled, composted or used to generate energy.

Landfill tax is partially offset and earmarked for the purpose(s) that when the tax was introduced revenue would permit the rate of NICs of registered landfill site employers to be cut by 0.1%. This was done from 1 April 1997. The Landfill Communities Fund (formerly the Landfill Tax Credit Scheme) enables landfill site operators to claim tax credit for contributions they make to approved environmental bodies for spending on projects that benefit the environment (OECD, 2010).

Exemptions to this instrument include waste from the reclamation of contaminated land; mining and quarrying waste; waste from dredging of harbours and inland water ways; disposal at pet cemeteries; and inert wastes used in the restoration of landfill sites. The affected environmental domains addressed by this tax are waste management and climate change.

Landfill is the least sustainable option in waste management (Morris et al, 2000). The options of recycling, reduction or minimising at source, or reuse to prevent discharge of effluent, are all more sustainable than disposal of waste in landfill (Figure W1) (Morris et al, 2000). However, SMEs are not recycle-conscious and see recycling and waste separation as time-consuming practices (Revell and Blackburn, 2005). Because of the perceived higher cost and effort involved in recycling and reusing, SMEs had little or no behavioural impact from landfill tax to encourage eco-efficiency (Revell and Blackburn, 2005). However, the BCC Environment Survey (2008) found that the larger businesses within the SME sector (i.e. with more than 50 employees) liked the idea of recycling and did so actively.

Although there is a lot of emphasis on recycling, currently about 43% of all UK waste and approximately 64% of the UK's municipal waste is sent to landfill. Since landfill sites are few and reducing in number, so there is a strong incentive for the government to promote alternative waste management methods.

The goals of Landfill Tax are '*to internalise the environmental costs of landfill'* (Snape and d'Souza, 2006, p.248). The tax gives better price signals for alternatives to landfill and the tax is chargeable on taxable disposals of materials as waste, by way of landfill, at landfill sites (Snape and d'Souza, 2006, p.249). Although the revenue from such a tax could be hypothecated, that is, used for specific environmentally-related expenditure, it is in fact used to reduce other taxes, namely national insurance paid by employers. The revenue from the tax is recycled via the Landfill Tax Credit Scheme (LTCS).

The LTCS enables landfill operators to claim a credit against their landfill tax payment if they make a voluntary contribution to an approved environmental body (EB) for an approved project that comes within one of the categories of objects listed in Regulation 33(2) of the Landfill Tax Regulations. These include research, development and dissemination of information and education on waste management practices, reclamation, remediation, restoration of land, maintenance and repair of public parks and religious buildings. Up to 90% of the contribution can be reclaimed, but the total credit in any 12-month period must not exceed 20% of the total landfill tax bill (Snape and d'Souza, 2006).

The objectives of the scheme are twofold. First, it is intended to contribute to the objective of the Landfill Tax, that is, to stimulate more sustainable management of waste through recycling, reuse and waste minimization. Second, the LTCS aims to fund local environmental improvements that compensate communities for loss of amenity resulting from nearby landfill sites (Martin and Scott, 2003).

It appears that many landfill operators are reluctant to fund recycling (Snape and d'Souza, 2006) and certain new technologies such as anaerobic digestion, because they see little benefit to themselves. Although landfill operators cannot benefit directly under the LTCS, nevertheless their contribution to EBs engaged in certain high profile projects can favourably promote their image.

The rates of tax are reviewed annually and went up again in March 2011. It is difficult to avoid the conclusion that landfill tax rates are such as to suggest that the tax is more in the nature of '*environmental penalty*' (Snape and d'Souza, 2006, p.250) than an environmental tax:

'*from a starting point of seeking to internalize the externalities and incentivise sustainable waste management, policy considerations have changed the focus… [the increases in the rate of tax]…have been driven by an acceptance that landfill tax must be increased to achieve behavioural change, through closing the cost gap on methods of diversion from*

landfill and ultimately to contribute to the incentive to achieve diversion to meet EU Landfill

*Directive targets on municipal wast*e' (Davies and Doble, 2004, p.77).

The tax represents too small a cost to force a change in behaviour and additional disposal charges are not tightly linked to the weight of waste produced. Thus again there is insufficient incentive for waste minimisation Martin and Scott, 2003). The Landfill Tax has been largely ineffective in changing the behaviour of SMEs in especially the non-construction sector because the impact of the waste is not seen as much as in the construction sector (Martin and Scott, 2003). It is concluded that, with the exception of construction waste, at present the Landfill Tax is an ineffective measure that has made a very limited contribution to environmental sustainability.

3.5   Revenue from environmental taxation

Government generates revenue from environmental taxes. Although the primary purpose of environmental taxation is to encourage more environmentally-friendly behaviour and less reliance on polluting resources, revenue generation from environmental taxes is also a key objective of such taxes (Ekins, 2011). Environmental tax receipts in the UK increased in 2010 (ONS, 2011), compared with 2009, viz.

- energy taxes increased by £1.3 billion to £32.2 billion;

- road vehicles taxes increased by £0.1 billion to £5.7 billion;

- other environmental taxes – Air Passenger Duty, Landfill Tax, and Aggregates Levy – increased by £0.5 billion to £3.5 billion.

The interpretation of environmental taxes needs care (Gazley, 2006). This is because if one particular tax is generating very high revenues, it would not be entirely correct to interpret it as being highly successful or more important because the high revenues can result from high rates of taxes or 'high levels of environmental problems which can lead to a large tax base' (Gazley, 2006; p.15). The Figure 12 below shows the government revenue generated from environmental taxes in the UK. In this graph, reproduced from the Office for National

Statistics (ONS, 2012), the other environmental taxes include Air Passenger Duty, Landfill Tax and Aggregates Levy.
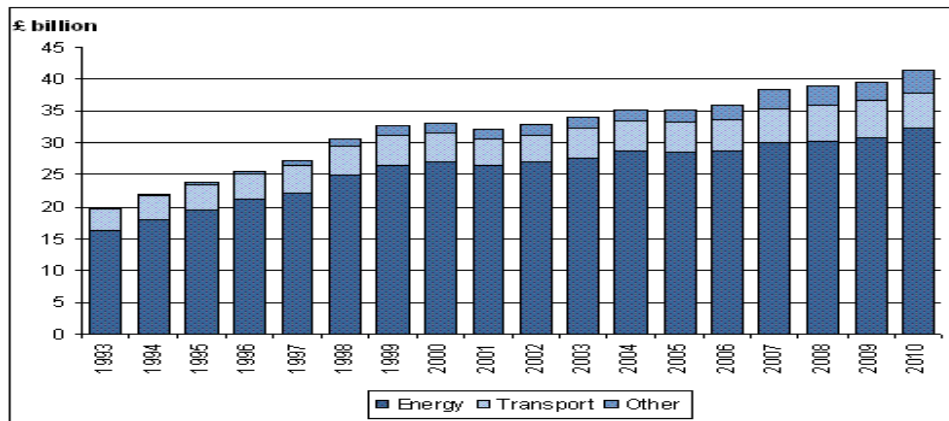
Figure 13: Government Revenue from Environmental Taxes

Of all the environmental taxes in the UK, energy taxes contribute more than 80% of the total revenue generated followed by transport taxes at nearly 18%, of which the most significant one is VED. Resource and pollution taxes such as the Aggregates Levy and the Landfill Tax are relatively small in terms of their total contributions. It is worth mentioning here that of the total contributions from environmental taxation, in the year 2003, nearly 52% was generated from households and this was followed by the transport and communication industry at nearly 20%.

All values in £ billion	2001	2002	2003	2004	2005	2006	2007	2008	2009
Energy									
Duty on hydrocarbon oils	22046	22070	22476	23412	23346	23448	24512	24790	25894
including									
Unleaded petrol [1,3]	1906	-	-	-	-	-	-	-	-
Leaded petrol/LRP [2]	650	103	70	67	20	15	13	10	9
Ultra low sulphur petrol	10117	12624	12098	12160	11688	11274	11313	11114	11305
Diesel [3]	65	-	-	-	-	-	-	-	-
Ultra low sulphur diesel	8492	9029	9457	10168	10829	11203	12146	12284	12734
Vat on duty	3858	3862	3933	4097	4086	4103	4290	4287	3884
Fossil fuel levy	86	32	-	-	-	-	-	-	-
Renewable energy obligations [4]	-	195	345	373	369	450	465	478	470
Gas levy	-	-	-	-	-	-	-	-	-
Climate change levy	585	825	828	756	747	711	690	717	699
Road vehicles									
Vehicle excise duty	4102	4294	4720	4763	4762	5010	5384	5524	5630
Other environmental taxes									
Air passenger duty	824	814	781	856	896	961	1883	1876	1800
Landfill tax	502	541	607	672	733	804	877	954	885
Aggregates Levy	-	213	340	328	327	321	339	334	277
Total environmental taxes	**32 003**	**32 846**	**34 030**	**35 257**	**35 266**	**35 808**	**38 440**	**38 960**	**39 539**
Environmental taxes as a % of:									
Total taxes and social contributions	8.6	8.7	8.6	8.3	7.8	7.3	7.5	7.5	8.2
Gross domestic product	3.1	3.1	3.0	2.9	2.8	2.7	2.7	2.7	2.8

Table 7: Breakdown of Environmental Taxes 1

(Source: ONS, Department of Energy and Climate Change)

Table 7 above shows that of all the environmental taxes, government revenues from energy taxes are the highest with duty on hydrocarbon oils such as petrol and diesel accounting for more than $25bn of the total tax receipts in the year 2009. As a percentage of total taxes and social contributions, environmental taxes account for nearly 8.2% and nearly 3% respectively of the total UK GDP in 2009. The graph below shows that environmental taxes as a percentage of GDP was fairly consistent between 2006-2009 but had a higher percentage of total taxes and contributions in 2001-2002 which fell in 2006 and gradually increased again in 2008-2009.
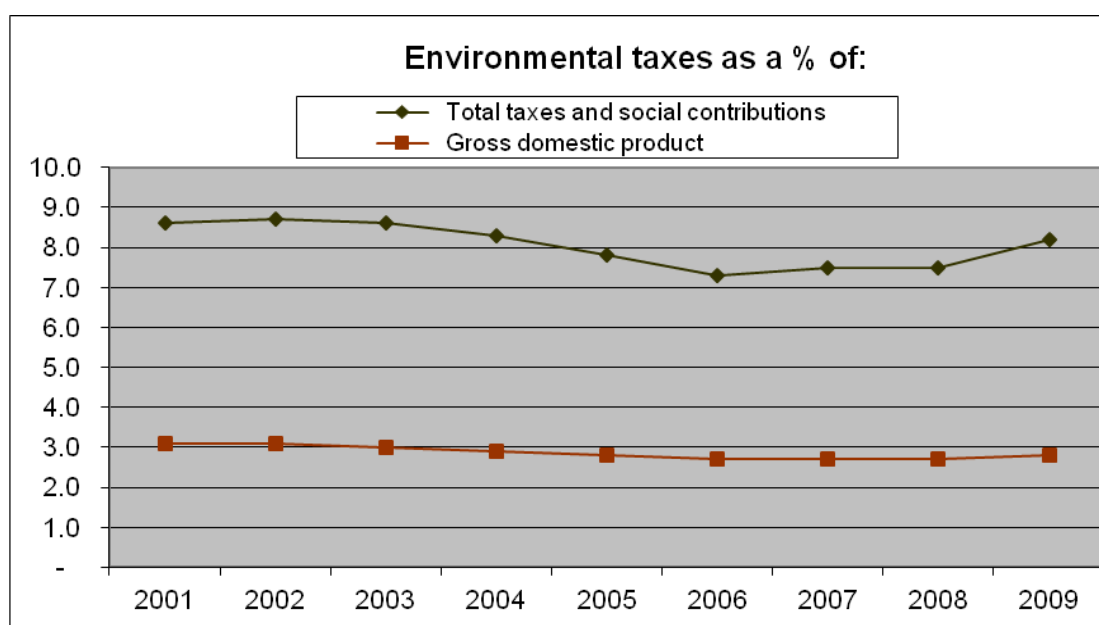
Figure 14: Environmental Taxes as Percentage of UK GDP

3.6   Earmarking of revenues from environmental taxes

The above section 3.3.1 highlighted that environmental taxes can be classified according to the particular objective of each of the taxes. Therefore some of the taxes can be classified as revenue-raising taxes while others may be classified as incentive taxes, the latter intended to encourage behaviour change. Environmental taxes, the researcher reiterates, have been advocated on the basis that they internalise the external costs of pollution by holding polluters accountable. Usually the support for environmental taxation also stems from the

idea that the revenue generated can be used to shift the burden of taxes to the polluting 'bads' from the taxed 'goods' such as labour, income etc. However, the House of Commons Environmental Audit Committee report on environmental taxes in Budget 2011 identified that the two main political obstacle to a significant environmental tax shift including the effects on competitiveness of say, energy intensive sectors as follows. The first one is the international competitiveness of some vulnerable business sectors (energy intensive industries) and, secondly, the effects on poorer households who pay proportionally the greatest percentage of their income on energy.

One of the responses to concerns over the environmental tax effect on business competitiveness has been revenue recycling in the form of measures that would reduce business tax burdens for example, reductions on payroll taxes. Depending on the way environmental revenues are used, they can generate an environmental and economic double dividend; the former is a reduction of global and local emissions and the latter is environmental pollution abatement with a reduction of distortionary taxes. There have been many debates about the benefits of this because many feel it is government's way of earning more money as the revenue is not always directed back directly to environmentally- related expenditure (Helm, 2004).

 The Chartered Institute of Taxation contends that that the Government needs to be clear about whether for each tax the environmental objectives or the revenue-raising objectives are most important (CIOT, 2009). An environmental tax that raised no money at all could be a success simply because it has changed the behaviour it was targeting (The Mirrlees Review, 2011).

Many of the environmental taxes introduced in practice have been used primarily for revenue-raising (Opschoor and Vos, 1989), generally to raise earmarked revenues for particular public expenditure related to environmental protection. Environmental taxes of this sort have been used to recover the costs of administering environmental regulation and

to pay for public or private expenditure on pollution abatement. The environmental effects of these taxes themselves may be limited. In some cases, their link to the environment is solely through the use of their revenues (OECD, 2009; Mooij and Bovenberg, 1998). Many environmental taxes in the UK are earmarked for various purposes such as specific reductions in employers NICs. Also known as recycling of revenue this process generates a 'double dividend' (Pearce, 1991; Opschoor and Vos, 1989; OECD, 2005) by reducing the burden of distortionary taxes such as labour tax. Through such reductions it has the capacity to substantially eliminate the costs of additional environmental tax burdens. Since the tax remains in place, although on energy, it encourages a reduction in energy consumption and hence taxes. By reducing the taxes on labour, it can also encourage employment as labour becomes cheaper.

Hypothecation is defined as the earmarking of taxes for a specific purpose. It may be a clever way to get around public hostility to paying more in taxation by convincing them that a share of the tax will go towards funding, for example, the care for the elderly, or education etc. One of the drawbacks of hypothecation is that there is no fixed path for the revenue to be hypothecated, that is, revenue generated from, say VED, may or may not go towards the same area but may be reserved and used for other government priorities (e.g. healthcare etc.). Leicester (2006) argues that taxation and spending decisions should be driven by the overall effectiveness of the taxation programme rather than by hypothecation. While hypothecation of revenues can encourage people to believe and accept these taxes, hypothecation restricts spending flexibility.

For the UK, with the exception of Landfill Tax which is partially offset and earmarked, the other earmarked environmental taxes use 100% of their generated revenue for reducing employer's NICs. Most revenues from the CCL are 'recycled' back to the CCL-paying industry in the form of reductions in employer contributions to social security taxation. These taxes are effectively taxes on labour employed.

Tax	Type	Purpose
Aggregates Levy	Tax	100% all the revenues will be returned to business through a 0.1% point cut in employer NICs and a new Sustainability Fund to deliver environmental benefits.
Charge on water resources	Fee/charge	100% for recovery of government costs of managing water resources
CCL	Tax	100% On introduction, all revenue raised is being recycled to business through a reduction in employers' NICs in 2001-2002 and additional Government support for energy efficiency measures
Landfill Tax	Tax	Partially offset and earmarked. It was announced when the tax was introduced that revenue would permit the rate of NICs of registered landfill site employers to be cut by 0.1%. This was done from 1 April 1997. The Landfill Communities Fund (formerly the Landfill Tax Credit Scheme) enables landfill site operators to claim tax credits for contributions they make to approved environmental bodies for spending on projects that benefit the environment.

Table 8: Earmarked UK environmental taxes

The above Table 8 shows that most of the revenue generated from environmental taxes in the UK is recycled back in the form of a reduction in other taxes such as NICs. This recycling of revenues is done on the basis that it offers offsetting benefits by reversing the effect of

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distortionary taxes (Terkla, 1984). The idea is that businesses that have environmental taxes levied on them would change their behaviour and thereby reduce the burden of environmental taxes on themselves. This recycling of revenues generates what is referred to as the 'double dividend' of reduced environmental damage and increased efficiency of the tax system (Leicester, 2006). If the concept of double dividend meant that environmental taxes could be implemented at null or zero or even negative overall economic costs, then it would justify their use over and above the argument about internalising the external costs of pollution.

But Bovenberg and de Mooij (1998) argue that environmental taxes raise the price of energy through say, the CCL, and therefore ultimately increase prices for the consumers as energy is an essential input in almost all sectors of the economy. This will have an impact on wages and therefore labour supply in any competitive economy (Bovenberg and de Mooij, 1998; Leicester, 2006). This so-called 'tax-interaction effect' is a negative welfare impact (Parry, 1999) produced by increasing the prices of polluting goods by the application of environmental taxes. Also at the same time, there is a positive welfare impact generated by the recycling of revenues through cuts in marginal tax rates, for example, the 0.3% NICs cuts due to CCL revenue recycling. So this revenue recycling effect partially offsets the tax-interaction effect. There may, however, be other uses of the recycling of revenues other than reducing the marginal tax rates of existing taxes for example, to increase government spending etc. Different methods of revenue recycling can have very different efficiency consequences (Parry et al, 1998; 1999). If, however, the tax revenues from environmentally-related taxes are reverted back through revenue recycling as lump-sum tax cuts then it will not have any offsetting impact on the negative welfare effect of tax-interaction.

If the revenue that is generated through these taxes is reverted back to the businesses in the form of reduction in NICs, does it provide significant incentives to cause changes in behaviour? The researcher provides empirical evidence in Chapter 6 that if an industry has domestic environmental taxes levied on its activities and uses of energy, and it is unable to

pass on its increased costs - as a result of these taxes - through increased prices to its consumers, then the effect of these taxes on the profits provides sufficient incentives to shift to more environmentally-friendly sectors and resources. But if the business is able to pass on its increased costs to its consumers, then where is the incentive to make any changes? Similarly if the revenue is reverted back to the sector it is generated from then how does this provide strong enough incentives to encourage businesses to make any changes?

In addition, is the idea of revenue recycling more beneficial to businesses that are more labour than energy intensive? And are SMEs aware of revenue recycling? Revenue recycling also has disadvantages, both at sectoral and industry levels (OECD, 2005). A recent study (Dresner et al, 2006a, 2006b) on the responses from businesses to Environmental Tax Reforms (ETR) policies and proposals found that SMEs are unaware of environmental tax reform and there is no information on the attitudes of non-energy intensive SMEs which would ideally benefit the most from recycled revenues that reduce, say, labour taxes. It may reduce the amount of pollution abatement achieved, especially in cases where there are few opportunities for pollution reduction through changes in production technology within a sector, and where the main way in which the sector can reduce pollution is by reducing output.

This may happen to SMEs in sectors such as manufacturing. Also, the basis on which revenues are returned to taxpaying firms may be distortionary (Baranzini et al, 2000). Firms may change their behaviour in anticipation of the return of revenues, with the aim of maximizing their entitlement (OECD, 2009).

3.7   Summary

The current chapter highlighted the literature on relevant subject areas of environmental taxation with the intention of providing a ready source of reference on relevant information and to further clarify the need to study environmental taxation in the context of SMEs. Environmental taxes are a key element in the environmental policy portfolio of the UK

government to meet their objectives of climate change protection. Several environmental taxes have been highlighted in this chapter. The chapter further discusses the issue of how the recycling of revenues generated from environmental taxes is being used in the UK context. A brief overview of the various classifications of environmental taxation is provided within this chapter and environmental taxes are compared with other policy instruments such as tradable permits and command-and-control regulation to demonstrate their effectiveness and suitability to the SMEs.

4 Research Methodology

4.1 Introduction

The previous chapter discusses the literature on environmental taxes, their significance within the UK environmental policy portfolio and their significance in relation to small and medium–sized enterprises (SMEs). Chapter 3 also discusses the various types of environmental taxes within the UK and provides an overview of the classification of such taxes. Discussing the climate change issue in relation to business activities, the chapter attempts to highlight the need for governments, businesses and all individuals to take on the climate change battle in order to create a sustainable society through the use of market-based instruments such as environmental taxes. In this regard the previous chapter provides a ready source of reference for information on environmental taxation in the UK and its significance in relation to other instruments such as tradable permits, command and control regulation etc.

The current chapter outlines the methodology used for the research study. Methodology and methods are distinguished on the basis that whilst methodology provides justification for choosing a particular research path, methods consist of the path itself and other intrinsic elements within the research (Clough and Nutbrown, 2007, p.23). In this regard the chapter explains the methodology chosen for this study. This will ultimately allow the attainment of the aims and objectives set out in Chapter 1. This chapter discusses the research methodology '*ex post facto*' because the processes discussed here have already taken place. The methodology begins with a discussion of the research philosophy and then presents the research approach and the methods used. Literature has highlighted the numerous problems

associated with SME research. This chapter also discusses the problems of SME research and how the researcher attempted to mitigate them and the results thereof.

4.2   Philosophical perspective

The researcher's philosophical perspective is rooted in pragmatism (Creswell, 2009). The researcher believes that the impact of environmental taxes on SMEs should be evaluated using pluralistic approaches to derive knowledge about it (Creswell, 2009). This philosophical perspective focuses on emphasizing the research problem and using all approaches available to understand the research problem instead of focussing on methods (Creswell, 2009, p.10). Pragmatism applies to mixed methods research in that individual researchers are free to choose the methods, techniques and procedures of research based on intended consequences. Both quantitative (e.g. questionnaire survey) and qualitative (e.g. semi-structured interviews) methods informed the results and conclusions. The methodology, strategy and data collection techniques adopted reinforce and reiterate the pragmatic perspective to research.

The research methodology, also referred to as strategies of enquiry (Mertens, 1998) are the types of qualitative, quantitative and mixed methods designs that provide specific direction for procedures in a research design (Creswell, 2009). It is worth noting that a mixed methods approach incorporates elements of both qualitative and quantitative approaches and qualitative and quantitative approaches should not be viewed as polar opposites; instead they represent different ends on a continuum (Newmann and Benz, 1998). Mixed methods combine multiple approaches to data collection such as combining instruments (qualitative data) with traditional surveys (quantitative data). Since it is widely accepted and recognised that all methods have limitations, the researcher feels that triangulating data sources could neutralize the biases inherent in methods used individually (Creswell, 2009). Table 9

summarises the research strategies of quantitative, qualitative and mixed methods approaches.

Quantitative	Qualitative	Mixed
Experimental designs	Narrative research	Sequential
	Phenomenology	
Non-experimental designs such as surveys	Ethnography	Concurrent
	Grounded theory	
	Case study	Transformative

(Source: Creswell, 2009)

Table 9: Research Strategies

Although less well known than either the qualitative or quantitative approaches, the multiple approaches to data collection through mixing of methods can serve numerous purposes such as results from one could identify participants or questions for another (Tashakkori and Teddlie, 2003). Results from both the qualitative and quantitative data can be used to reinforce each other (Creswell, 2009, p.14). There are three general mixed methods strategies used. Sequential mixed methods procedures expand on the findings of one method with another (Creswell, 2009, p.14). This may be achieved by using, say, qualitative interviews followed by a quantitative survey with a large sample with the view to generalising the results to the whole population. Or it may be quantitative theory/hypothesis testing followed by exploration through qualitative interviews. The latter procedure does not lay emphasis on the generalisability of results as the purpose is to explore with a few participant/respondents.

Concurrent mixed methods procedures integrate both the qualitative and quantitative data, which is collected concurrently to make the analysis more comprehensive and this is the approach adopted in this study as justified below in Section… The third mixed methods strategy is the transformative procedure in which the researcher uses a '*theoretical perspective within a design that contains both qualitative and quantitative data*' (Creswell, 2009). Within these three general strategies lie several variations such as concurrent triangulation strategy, concurrent embedded strategy and concurrent transformative strategy with the concurrent triangulation approach having the advantage of using both quantitative and qualitative methods as means to offset the weaknesses inherent within one method (Creswell, 2009. p.213). Table 10 summarises the different variations of the concurrent approach[25].

Concurrent Triangulation Strategy	Concurrent Embedded Strategy	Concurrent Transformative Strategy

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[25] Creswell, 2009, p.213-215

Collects both quantitative and qualitative data concurrently and then compares to check for convergence, differences or some combination. Priority may be given to one phase over another. Discussion section first provides quantitative statistics followed by qualitative quotes that support or disconfirm the quantitative results. Advantages: familiar; can result in well validated and substantiated results; shorter data collection time. Limitations: efforts and expertise; difficult to compare the results using data of different forms.	Simultaneous data collection Primary method guides the project and secondary database provides supporting role. Secondary data may seek information at a different level; addresses a different question to primary method. Discussion section integrates information and compares one data source to another. Advantages: gain broader perspective as a result of using different methods; qualitative data could be used to describe an aspect of a quantitative study that cannot be quantified. Limitations: unequal priority to both methods can result in unequal evidence.	May take on design features of either a triangulation or an embedded approach. Guided by the researcher's use of a specific theoretical perspective as well as the concurrent collection of both qualitative and quantitative data.

Table 10: Types of Mixed Methods Approaches

Mixed methods need to establish a purpose for the mixing, a rationale for why quantitative and qualitative methods need to be mixed in the first place, and largely based on the consequences of where the research is intended to go (Creswell, 2009). In the current study, the researcher uses survey questionnaires to test the significant differences in groups within SMEs in relation to their opinions, perceptions and attitudes towards environmental issues and environmental taxation. This quantitative statistical data is further supplemented with semi-structured interview data that was collected concurrently and seeks deeper insights into understanding and exploring the responses given in the questionnaire. In this regard the strategy adopted fits concurrent embedded strategy where the statistical data is primary because a) a much larger 750 sample is surveyed and b) it tests the hypotheses. The

interview data here is secondary because a) it is a smaller sample of thirty semi-structured interviews and b) it lends further insights into the survey findings without attempting to prove or disprove the survey findings. The basic structure of this approach is shown below:

QUAN ⟷ QUAL ⟶ QUAN ⟵ QUAL
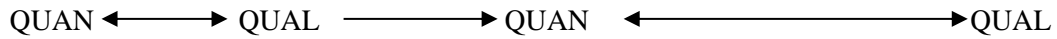
Data collection   Data collection   Data analysis & interpretation   Data   analysis & interpretation.

The purpose of concurrent strategy is to use the quantitative and qualitative data to enhance the findings of each other and their results assist in the interpretation of the quantitative findings (Creswell, 2009, p.211).

4.3   Research design

Collis and Hussey (2003, p.113) consider research design as 'the science (and art) of planning procedures for conducting studies so as to get the most valid findings'. It is the process involved in conducting the research. In determining the research design the following factors were considered.

4.3.1   Survey study

Using a survey the researcher attempted to gauge the differences between perceptions of environmental issues and environmental taxation in groups within SMEs (See Chapter 5 for hypotheses development). The purpose of conducting a survey was to test the hypotheses with data gathered through questionnaires, and the quantitative survey provided a quantitative description of attitudes and opinions of a population through its sample (Creswell, 2009). A large scale survey of 750 SMEs was undertaken and the data collected were analyzed using SPSS 18 software. More details of the survey are found in the sections below. It is necessary to mention here that given the normally low response rates to large scale postal questionnaires, especially to SMEs, the researcher adopted the approach taken

by Worthington and Britton (2006) and decided on a design that was inclined to be more qualitative than quantitative. The intention behind this was to be able to provide a meaningful overview of current attitudes within SMEs. Spence (1999) contends that such an approach is particularly relevant to such exploratory research on SMEs.

4.3.2 Qualitative study

In order to gain further insights into the perceptions, awareness and attitudes of SMEs to environmental issues and environmental taxation, the researcher chose to use semi-structured face-to-face interviews with SME owner-managers within the sectors surveyed as a further means to explore the impact of environmental taxation on SMEs. To answer the overriding research question the researcher believes that qualitative exploration through interviews is very useful to gauge the subjective perceptions and attitudes of SMEs towards environmental issues and environmental taxation.

The qualitative interviews explored the larger themes which were generated from the literature findings in Chapters 2 and 3 which informed the hypotheses developed in Chapter 8. The researcher believes that - given the findings within the literature on attitudes of SMEs being understood largely through the attitudes of their owner-managers - conducting personal interviews with SME owner-managers would gauge their subjective perceptions and '*qualitative methods…provide important contextual information that supplements the findings from a larger quantitative study'* (Bryman and Bell,2003; p.486).

4.3.3 Access to potential respondents

Prior to sending survey questionnaires and conducting face-to-face interviews the researcher had to establish contact with potential respondents. In the absence of an up-to-date SME database (Curran and Blackburn, 2001), the researcher had to create the database and the process took nearly a month to undertake. Generating sampling frame[26] was painstakingly done by using business directories from the local chamber of commerce and other business

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[26] sampling frame for any probability sample is a complete list of all cases in the population from which your sample will be drawn (Saunders et al, 2009; p. 214)

directories. However, to check that the sample met the selection criteria of a) it is an SME; b) it is within the chosen manufacturing and transport sector; and c) it was within the South of England for convenience purposes alone, the researcher had to call each business and then ask a couple of questions to ascertain whether the potential respondent fit the sample requirement or not (Curran and Blackburn, 2001; Revell and Blackburn, 2005).

But this was a laborious and highly time-consuming process. Also, there was the risk that if the researcher did not have quick concise questions at that stage, this could have ended up causing the business to show no interest in the research (Curran and Blackburn, 2001). Also, SMEs are often not members of the trade associations of the particular sector they are in which made it difficult to reach and access them (Hillary, 2000; Rutherfoord et al, 2000).

During this initial contact the researcher also asked if the business would be willing to participate. This selection and checking of data of potential respondents rendered only 750 useful businesses within the 850 business-long databases. Some businesses categorically asked not to be contacted for research purposes and also there were others who refused interviews but said they would be willing to fill in the questionnaires instead. Many respondents requested a report after the study was completed. Once the initial contact was established the researcher sent out survey questionnaires in envelopes containing questionnaire, postage-paid return envelope, letter on university letter headed paper, signed by the researcher explaining the purpose of the survey and confirming that any requests for anonymity would be respected. If the respondent so desired, a brief report on the survey findings would be sent to the interested businesses and a pen and a small greeting card wishing them a happy new year because survey questionnaires were sent out in the second week of January 2011.

The researcher also sent out letters to thank the respondents once survey questionnaires started coming back. For the personal interviews the researcher travelled to different towns and counties within the South of England to conduct interviews and all interviewees were

asked for their permission to record the interview on an audio recorder. Prior to the interview the researcher clarified the purpose of the interview and showed them a letter of declaration about the interview purpose, aspects of confidentiality and also asked if they were willing to receive a brief report on the findings and any other requests they had. Most interviewees requested a brief report on the study once it was completed.

4.4   Ethical, health and safety issues

The researcher was mindful to observe ethical codes of conduct at all times throughout the research journey. Confidentiality of respondents is respected and codes are used to indicate the respondents instead of their real identities. Participants in both interviews and survey were asked for their permission with full disclosure of the purpose of the study. There were not any significant health and safety implications of the primary data collection processes given the nature of the study but the researcher took utmost care in ensuring that any sensitive question was handled with care and if an interviewee was getting increasingly agitated at being asked about environmental issues the researcher kept very calm and let the interviewee talk at length to express his opinions. The researcher took reasonable steps to ensure her own safety by providing the School with details of her contact telephone number and email. In order to achieve the highest standards of health and safety the researcher did not take any undue risks in the course of the research and adhered to Bournemouth University guidelines on health and safety issues at all times.

4.5   Analytical and descriptive research

The study is primarily analytical in that it seeks to use quantitative data such as the questionnaire survey to analyze the perceptions of SME owner-managers and data within IO tables regarding the impact of environmental taxation. With regard to the primary data, it is descriptive in the sense that the qualitative data gathered through the interviews lend further insights into the themes that were generated from the literature. The researcher chose to

present the qualitative data in a rather raw and verbatim form thereby reducing researcher bias without analysing in great detail the qualitative findings. In addition, she only used that data to explore further the perceptions and attitudes of SME owner-managers. The study is also descriptive in that it is designed to give an account of the current environmental taxes in the UK and a review of those taxes (Chapter 3) and of the literature on the SMEs (Chapter 2).

4.6 Analytical tools

The study used a number of analytical tools. IO analytical tables and SME statistics were used to identify the sample. The quantitative survey data were analyzed using SPSS 18 and the semi-structured interviews were digitally recorded and then analyzed thematically and manually.

4.7 Sampling strategy

This section will discuss the sampling strategy that was used to decide about the sample for the mixed methods study and the sample size. In this section, the choice of potential sample for the main study and the reasons behind it will be explained. To address the objectives of the study, following the IO analysis, the researcher chose the manufacturing and transport sectors as the targets for primary data collection through questionnaire survey and interviews due to factors discussed below:

4.7.1 Use of Input-Output Analysis in Sample Selection

The sample was chosen using SME statistics 2009 and UK input-output tables 2003 and 2007. This was done in order to target those SME dominant sectors in the region who are the highest payers towards those inputs that are liable to environmental taxes in the UK[27].

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[27]See appendix 5 for more details on input-output tables and the analysis undertaken to select the sample with I-O tables

The analysis (as shown in Appendix 5) were undertaken with the purpose to identify SME dominant sectors am0ongst those to inform the population choice for the main study. In this regards, two sectors, namely, manufacturing and transport are identified as being the most suitable sectors- in terms of their expenditure towards inputs that are liable to environmental taxes and the number of SMEs within them- to gather the primary data from within the South of England. The following discussion explains the reasons thereof.

The UK manufacturing sector is a very diverse sector that includes many different industries. The manufacturing sector, in 2009, was the third largest sector [28]in the UK economy in terms of share of UK Gross Domestic Product (GDP), generating £140bn in gross value added, representing over 11% of the UK economy and employing around 2.6 million people, representing over 8% [29]of total UK employment (BIS, 2010). Within the sector there is a high degree of interdependence owing to the fact that the output of one industry can be an input for another (BIS, 2010. The manufacturing sector comprises the following sub-sectors according to the Standard Industrial Classification (SIC) 2007 codes, namely:

- Food and beverage and tobacco products

- Textiles and textile products

- Wood and wood products

- Pulp, paper and paper products

- Publishing and printing

- Coke, petroleum products and man-made fibres

- Rubber and plastic products

- Other non-metallic mineral products

- Basic metals and fabricated metal products

- Other machinery and equipment

- Electrical and optical equipment

- Transport equipment

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[28] National Accounts, Blue Book, Office of National Statistics (ONS, 2010, 2011)
[29]Labour Force Statistics, ONS, 2010. Statistics relate to September 2009

- Other manufacturing

The transport Sector I comprises of:

- Land transport

- Water transport

- Air transport

- Supported and auxiliary transport activities; activities of transport agencies

- Post and telecommunications

The transport sector's contribution to the UK economy is substantial in terms of the sector's contribution to UK GDP and employment levels. However, it is also a sector that is easily affected by rising fuel prices and unexpected weather, such as heavy snow in the winter of 2011. In terms of its impact on the environment the transport sector accounted for estimated emissions of nearly 120.6 million tonnes of CO_2 in 2010 (DECC, 2011), 3.9 thousand tonnes of methane, and 3.8 thousand tonnes of nitrous oxide (DECC, 2011). Also, being highly reliant on fossil fuels this sector is liable to environmental taxes including both energy and transport taxes. The researcher chose transport and logistics sub-sector within the transport sector because transport and logistics are growing sectors that play a major role in the UK and global economy. There are a large number of transport and logistics businesses in South-West England owing to the presence of ports such as Southampton, Portsmouth and Poole Harbour.

4.7.2 **Population**

The first step to data collection is to specify the population and the sample from which information is to be derived. In a mixed methods approach, sampling can be either sequential, that is, sampling from the first phase informs the second (Tashakkori and Yu, 2007), or concurrent, that is, quantitative probability and qualitative purposive sampling are used jointly (e.g. survey with both closed and open-ended questions) or combined as independent sampling procedures (Creswell, 2009, p.218). Table 11 below summarises the five types of mixed methods sampling strategies developed by Teddlie and Yu (2007). In this

study concurrent sampling is utilised as the sample is generated from the sampling frame created by the researcher.

The population consists of businesses that are defined as SMEs according to size by numbers employed (EC, 2003) and only SME owner-managers (Chapter 2) were targeted to understand their perceptions towards the issues discussed. Sampling was concurrent in that the choice of respondents for both the interviews and the survey were selected from the same database that was generated by the researcher. In qualitative data collection, purposive sampling allows those individuals who are directly involved in the situation/concept to be selected for the sample

Of the 850 SME database created, the researcher chose 750 for survey and 30 for interviews. The 30 chosen for the interviews was on the basis of the first 30 businesses who confirmed they were happy to be interviewed The choice of the interview sample was purposive in that only those who fit the criteria of the sample were included together with those who were within a short travelling distance from the researcher. For the survey, each business within the 850 SMEs database was contacted to a) check their details and b) request them to fill the questionnaire survey. During this process more than 70 SMEs refused to take part citing time as the reason. The remaining 780 businesses were happy to participate but 30 of them said that they can only fill the surveys after spring but they would be happy to have a face-to-face interviews. However it is worth noting here that the database was created purposively with only those SMEs included who fulfilled the following criteria of the population to reduce the chances of targeting 'wrong' businesses.

Basic	Sequential	Concurrent	Multilevel	Combination

Combining qual and quant sampling e.g. purposive random and stratified random sampling	Sampling from first phase informs the second phase	Quantitative probability and qualitative purposive sampling are used jointly (e.g. survey with both closed and open-ended questions) or combined as independent sampling procedures	Sampling occurs in two or more levels or units of analysis	Any combination of the foregoing strategies

Table 11: Mixed Methods Sampling Strategies

The population of the study consists of all SME owner-managers within the manufacturing and transport sectors in the South of England for the following reasons:

- There has been a 9.2% increase in the number of enterprises in the South-West from 2007- 2008 (BIS, 2008) which is the largest increase in the whole of the UK.

- SMEs account for more than 70% of all employment in the South-West (BIS, 2008).

- SMEs in these two sectors are highly energy intensive.

- SMEs in these sectors are present in large numbers in the region and also have a high percentage of employment and turnover.

Historically, the manufacturing sector has played an important role in the UK economy. Generating more than £150 bn a year it contributed to 66% of GDP in 2002 and currently 13% of GDP. The manufacturing sector accounts for nearly 20% of the national economy and it (SIC 2003 code D) is the second largest SME sector in the UK (Aiyub et al, 2009). SMEs within this sector account for more than 99% of all enterprises, 61.6% of all employment and 37.4 of total turnover in the South of England (BIS, 2008). The sector generates large amounts of effluents and emissions (BCC, 2008). Manufacturing firms were found to be most aware of their obligations to reduce GHG emissions and to monitor their energy use and preferred an incentive programme to encourage energy efficiencies (Bradford

and Fraser, 2008). Also, climate change is found to be a relatively important issue to the manufacturing sector (BCC, 2008).

The Department of Environmernt, Food and Rural Affairs (DEFRA) reports that the transport sector makes the largest contribution of nearly 22% to the overall GHG emissions in the UK. The transport sector (SIC 2003 code I) is relatively under-researched; it depends on 97% fossil fuels and the demand for freight transport in the EU grew on average by 2.7% per year. The transport sector as a whole has been found to be relatively concerned about the impact of climate change on their business within the next five years (BCC, 2008). It produces more than 21% of total domestic greenhouse gas emissions (GHG) (TFL, 2009) and a major contributor to UK emissions is the growth of road transport. All the businesses within the transport sector targeted for primary data collection belong to logistics and transport (road haulage) businesses. They were targeted because a) the transport and logistics sector is a growing sector (Propects, 2011): b) one in twelve working people work within this sector and it comprises mostly SMEs while the UK logistics industry is worth £74.45 billion to the UK economy and employs around 2.3 million people in over 196,000 companies of which most are SMEs (Skills for Logistics, 2010); and c) SMEs within Sector I Transport account for more than 99% of all businesses within that sector in the South of England; nearly 45% of total employment within this region and around 42% of total turnover (BIS, 2008); it accounts for 3% of total employment in Europe; overall transport is a small company sector; within this sector the land transport is the largest sub-sector and within this sub-sector 88.2% employees are within land transport.

- Both manufacturing and transport sectors have significant environmental impact due to the high use of materials, fuels and processes that result in environmental emissions and release of effluents.
- SMEs' environmental attitudes and behaviours are generally understood from the perspective of the owner-manager.

- Due to limited financial resources and time constraints, accessing businesses and collecting data in the region will be more convenient.

The survey questionnaires were used to test the hypotheses for significant differences in groups within SMEs and the qualitative interviews explored the themes generated from the literature. Randomly selecting the sample within the database gives each individual an equal probability of being selected. Also, with randomization, a representative sample from a population provides the ability to generalise to a population (Creswell, 2009, p.148). Usually it is recommended for a larger sample to be surveyed for the results to be generalised. The larger one's sample, the more likely that answers truly reflect the population. Using confidence intervals and confidence levels[30] together shows how sure one is that the true percentage of the population is between say, X% and Y%. The wider the confidence interval the more certain one can be that the answers of the whole population are within that range. Factors that affect confidence interval in a confidence level are sample size and population size (e.g. how many people are there in the group that the sample represents). This may be the number of businesses within SMEs in the chosen region or the number of SMEs within a specific sector in the region etc. Often it is not quite possible to know the exact population size but it is not a problem unless the size of the sample exceeds that of the population (Robson, 2002; Marsh, 1982; Creswell, 2009).

4.7.2.1   Random sampling

Such probability sampling is most commonly associated with survey-based research strategies 'where you need to make inferences from your sample about a population to answer your research question(s) or to meet your objectives' (Saunders et al, 2009, p.214). Probability sampling allows one to generalise from a sample of a population and the larger

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[30] Confidence interval is the + or − figures reported in, say, poll results. For e.g. if one uses a confidence interval of 5 and 50% sample picks an answer then the researcher can be sure that if he/she had asked the question of the entire relevant population between 45% (50-5%) and 55% (50+5%) would have chosen that answer. Confidence level tells us how sure we can be. Expressed in % it represents the true percentage of population who would pick an answer lies within the confidence interval 95%. Confidence level means one can be 95% certain. Most researchers use 95% confidence levels. Page 219-Saunders et al. 2009.

the sample the lower the likely error in generalising (Marsh, 1982; Robson, 2002). The broader the scope of the study the longer it takes to reach saturation (Davies and Doble, 2004; Robson, 2002; Creswell, 2009; Morse, 1997). In qualitative designs it is difficult to pre-specify the number of interviews needed in such a design and data needs to be collected to the point of saturation that is, when any further data collected adds nothing more significant to what has already been collected. So the sample size for the interviews was limited to 30 with two pilot interviews before embarking on to the main study.

Although Davies and Doble (2004) recommends that qualitative data collection through interviews should ideally have a sampling size of 20 for the core sample, using semi-structured interviews and producing small amounts of information per question would require a larger number of participants of between 30-60 (Robson, 2002; Creswell, 2009). In this context, the attitudes of the core sample (i.e. SME owner-managers), are a key source of information to understanding SME attitudes as a whole because literature has shown that SME attitudes largely depend on the owner-managers' attitudes. Therefore, SME owner-managers are the target interviewees. Also, literature confirms that if data produced are precise and information rich, then fewer participants are needed for the interviews (Robson, 2002; Creswell, 1998; 2009).

4.8 Types of data and sources of data

The data analysed consist of primary and secondary data including:

- Primary data
  - o These include data collected through survey questionnaires and interviews. These data are collected from businesses that were targeted using the database the researcher generated.
- Secondary data
  - o IO analytical tables 2003-2008 for UK downloaded from the Office of National Statistics

SME statistics for UK and regions dataset 2008 from Department of Business Innovation and Skills (BIS) 2008 statistical release.

4.9 Instruments of data collection

Research methods involve data collection, analysis and interpretation (Creswell, 2009). Depending on the research strategy the instruments of data collection can be one or more than one. Data collected on the chosen instrument(s) (e.g. surveys, interviews, focus groups etc.) provide understanding of the research problem. Collecting both open-ended qualitative data and closed-ended quantitative data is useful when one single approach by itself is inadequate (Creswell, 2009). To develop a detailed view of the meaning of a concept/phenomenon for individuals (e.g. questions about attitudes towards climate change) and then generalise the findings to the whole population, the mixed methods researcher first explores generally to learn 'what variables to study and then studies those variables with a large sample of individuals (Creswell, 2009, p.18). The researcher used both survey questionnaires and interview schedules to collect primary data for the study.

Philosophical Assumption	Strategies of Inquiry	Methods	Research practices used by the researcher

Pragmatic knowledge claims	Sequential, concurrent and transformative	Both open and closed-ended questions and both qualitative and quantitative data and analysis.	collects both qualitative and quantitative data develops a rationale for mixing them integrates the data at different stages of inquiry Employs the practices of both quantitative and qualitative research.

Table 12: Mixed Methods Approach

Data analysis in mixed methods research occurs both within the qualitative approach (e.g. description and text analysis) and the quantitative approach (e.g. descriptive and inferential numeric analysis) (Creswell, 2009, p.218). In the concurrent embedded strategy, themes and specific statements generated from the literature review are used as themes to analyse the interview data and the data from survey is analysed with SPSS 18 statistical software. Another aspect of data analysis in mixed methods research is the steps taken to ensure both accuracy of qualitative findings and the validity of quantitative data.

4.9.1   **Collection of quantitative data**

The main feature of surveys is that they collect a small amount of data in standardised form from a number of individuals (Robson, 2002, p.230). However large scale surveys such as population censuses may generate a large amount of data from the entire population of a region or nation. Used primarily as an instrument in fixed quantitative design, the reliability and internal validity of survey data depend largely on comprehensive and unambiguous survey questions design. Generalisability or external validity problems may arise due to faulty sampling. Also generalising from the survey data is also fraught with problems of external validity. For example there is often a gap between people's attitudes and behaviour (Tilley, 1999). Reducing this threat to generalising, on the basis of what people say and what they actually do, is possible by asking all respondents the same standardised questions,

carefully worded after piloting it is possible to obtain high reliability of response (Robson, 2002. p.231).

Surveys may be self-completing ones where the respondents fill in the answers themselves and are usually posted or mailed to them. Surveys can also be face-to-face or telephone interviews. To ensure higher response rates of surveys, an initial contact through telephone or email or a covering letter about the purpose of the survey and the respondent's suitability for it can help to establish the credibility of the researcher and his/her study and this may ensure higher response rates to the surveys. Also, survey questionnaires sent through email or post should not be too long and must be simple to understand and ensure ease of response (Robson, 2002; Marsh, 1982). The language should be kept simple with short questions and leading and double-barreled questions should be avoided at all costs (Robson, 2002, Marsh, 1982). Follow up letters or emails and telephone inquiries can expedite the response time and help to emphasise the importance of the study and the value of the respondent's participation. Table 12 above summarises the mixed methods approach (Creswell, 2009, p.17).

4.9.2 Design of questionnaire

Questionnaires are particularly useful for descriptive or explanatory research (Saunders et al, 2009) and they are suitable for questions that are designed in a way to be interpreted in the same way by all respondents (Robson, 2002). For this study the researcher designed a postal self-administered questionnaire to be filled in by the respondents without the presence of the researcher. The design, structure and rigour of pilot testing of the questionnaire determines to a large extent the validity and reliability of the data collected and the response rate one can achieve (Saunders et al, 2009).

The researcher pre-tested the questionnaire with four business owner-managers to seek feedback a month prior to actual dissemination of those questionnaires. The feedback received confirmed to the researcher that the language of the questions made it easy for

respondents to understand and also they all interpreted the questions similarly. Also, the pilot respondents gave valuable feedback about layout of the questionnaire. The cover page of the questionnaire was designed with the title of the survey; Bournemouth University logo; a brief statement on what the survey was for, assurances of confidentiality, and contact details of the researcher (Appendix 3). The questionnaire was divided into four parts with headings for each part to guide the respondent. The first part of the questionnaire elicited information on understanding, opinions, perceptions and attitudes (on a Likert scale) to environmental issues. The second part followed a similar structure but the questions were geared towards eliciting information on environmental taxation.

The third section sought information on waste management behaviour through questions focused on waste disposal and recycling to gauge their environmental behaviour at a simplistic level because the researcher feels that recycling is one of the basic ways in engaging with environmentally-friendly behaviour. And the final part of the questionnaire sought information on demographics including business sector, size, membership of a trade association, date of birth and educational qualifications. The back cover of the questionnaire provided space for further comments and a note of thanks and request to post back the completed questionnaire to the return address which was again repeated on the back cover. The questionnaire was so designed that a set of questions relating to a particular hypothesis were put under each section of the questionnaire. The nature of most of the questions was closed with only a couple of them open-ended due to the nature of the information elicited. For example, in seeking information to elaborate on the choice of environmental policy the researcher had to leave the question open-ended to eliminate the bias of providing responses that might not be reflective of the subjective reasons of the respondents.

4.9.2.1   Analysis of questionnaire

Quantitative data in a raw form before being processed and analysed convey very little meaning to most people (Saunders et al, 2009; p.414). Quantitative data is often divided into exploratory or confirmatory data (Robson, 2002, P.399). SPSS software is useful for

confirmatory data analysis and not particularly oriented to exploratory data analysis but it is possible to use it to generate box plots and other data displays. Robson (2002; p.393) argues that quantitative data analysis is ' *a field where it is not at all difficult to carry out an analysis which is simply wrong, or inappropriate for your purposes. And the negative side of readily available analysis software is that it becomes that much easier to generate elegantly presented rubbis*h'. To avoid such pitfalls it is essential to understand why the particular tests are to be carried out and how the tests relate to the hypotheses being tested. The researcher exercised great caution while engaging in data input and determining the tests needed for each hypothesis. The researcher used SPSS18 software to test the hypotheses. Tests were conducted in order to ascertain whether there were any significant differences in groups within SMEs on the responses provided. The choice of tests was dependent on the response rate and the requirement of the hypothesis.

The data collected from the questionnaire fall mostly within two distinct groups: categorical data, that is, data whose values cannot be measured numerically but can be classified into sets (categories) according to the characteristics that identify or describe the variable (Berman Brown and Saunders and Berman-Brown, 2008) and ordinal data, for example, where a respondent is asked to rate how strongly he/she agrees with a statement on a scale of say 1 to 5. Missing data are assigned code 0 to indicate that the data represent that the respondents did not know the answer or did not have an opinion (Saunders et al, 2009). The researcher also needed to code the data to input it into SPSS and assigned numerical codes to categorical data arbitrarily. The following flowchart depicts the data analysis process undertaken in this study.

```
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│ Quantitative    │     │ Categorical data│     │ Coding of data  │
│ data collected  │ ──> │ and ordinal data│ ──> │                 │
│ through         │     │                 │     │                 │
│ questionnaire   │     │                 │     │                 │
└─────────────────┘     └─────────────────┘     └─────────────────┘
                                                          │
                                                          v
┌─────────────────┐     ┌─────────────────┐     ┌─────────────────┐
│ Statistical     │ <── │ Checking for    │ <── │ Data input into │
│ tests           │     │ errors          │     │ SPSS 18         │
└─────────────────┘     └─────────────────┘     └─────────────────┘
         │
         v
┌─────────────────┐
│ Presenting and  │
│ interpreting    │
│ findings        │
└─────────────────┘
```
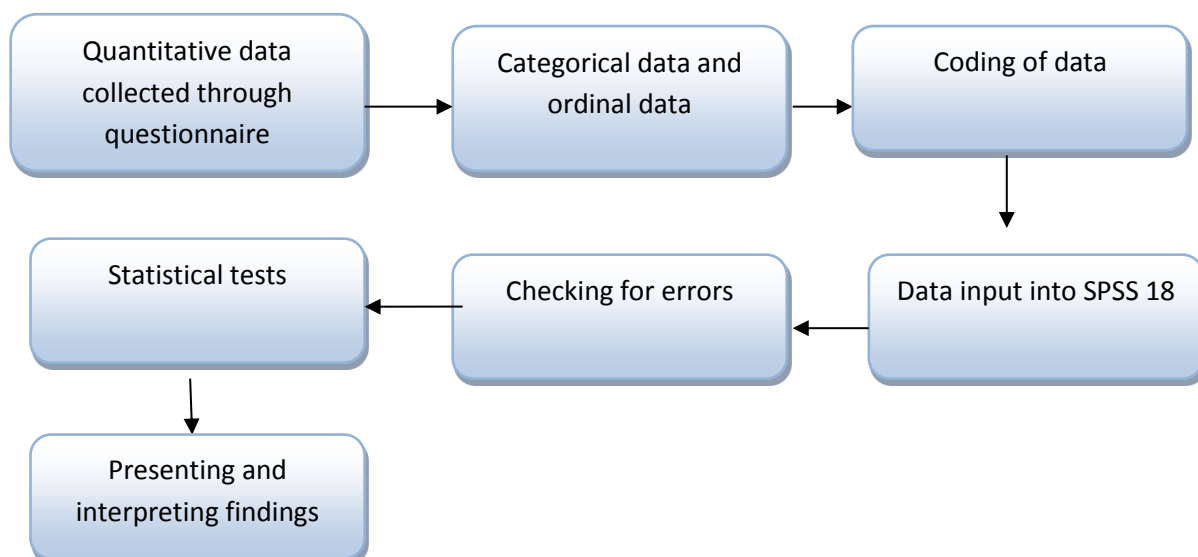
Figure 15: Quantitative Data Analysis

Other studies that have used similar methods include Cassells and Lewis (2011) and Petts et al (1998). Patton and Worthington (2003) adopted similar methods of analysis. Cassells and Lewis's (2011) study on whether SME environmental actions reflected their attitudes was a key paper for the researcher to find support for using the tests employed within the study because especially for Hypothesis 5 and Hypothesis 6 the researcher had to split the hypothesis and test for differences step wise instead of using something like logistic regression which would have been the preferred choice given the nature of the hypothesis (see Chapter 6). However, limitations of data meant that the researcher had to use simpler statistical tests to reach the conclusions and the researcher tested the link between attitudes and actions through examination of the interrelationship between environmental attitudes and perceptions and environmental practice through evidence of waste management behaviour (Cassells and Lewis, 2011).

4.9.2.2   Validity and reliability

Reliability refers to consistency (Saunders et al, 2009). Although for a questionnaire to be valid it needs to be reliable (Field, 2005, p.12), there may arise other problems such as the respondents may not understand the question in the context in which it is asked and therefore

the robustness determines how reliable it is (Saunders et al, 2009; p.373). Also, issues of external and internal validity will need to be addressed. External validity problems arise due to low response rates and such low response rates have an impact on the data quality (Fox et al, 1998; Newby et al, 2003). Section 4.11 below highlights the steps taken by the researcher to reduce the potential problems - as found in the literature - associated with SME research.

The potential threats to validity may arise from internal validity threats such as experiences of participants that might threaten the researcher's ability to draw correct inferences from the data (Creswell, 2009). Participants may be selected who have certain characteristics that predispose them to have certain outcomes (Creswell, 2009). To overcome these potential pitfalls the researcher adopted the following techniques:

a) To ensure that the questionnaire was valid the researcher used a number of sources of already existing environmental surveys in order to design the questionnaire for this study. The researcher strongly believes that the nature of the research aim of this study is one that cannot be addressed through using only one source to generate the questions for the survey. And therefore multiple sources were consulted as described below to make the questionnaire valid.

One of the key sources used was the NetRegs SME Environment Survey 2009 UK, a survey designed to elicit information on environmental good practice in SMEs within the UK. The NetRegs survey - administered online - sought information on what measures SMEs put in place to reduce their harm to the environment; the awareness of SMEs regarding environmental issues and legislation; what were their sources of environmental help and information; what are the kinds of information they require further to become more environmentally proactive; and also measured the level of awareness regarding environmental issues based on size and grouping them into 'unaware' and 'aware' categories. The researcher based the questions on awareness of environmental issues and legislation and SMEs' information requirements issues based on the NetRegs survey.

The researcher felt that given the research aim that deals with not only seeking information regarding SME environmental awareness but also their awareness and attitudes towards environmental taxation, it was only relevant that the questions seek such information too. In this regard, the researcher generated questions with the help of the British Chamber of Commerce (BCC) Energy Efficiency survey (2008) which sought information from SMEs regarding their views and concerns about the Government's energy efficiency objectives. The BCC survey asked questions, mostly categorical, about how to make SMEs more energy efficient; their level of awareness; their sources of information regarding energy efficiency; benefits, if any, of energy efficiency; what kind of support the government could provide to the SMEs; how effective are the current energy efficiency schemes and the reasons thereof.

This particular survey provided the researcher with clear questions such as Question B6 (QB6) which asks about the effectives of various environmental policies; and QC6 about what kind of support SMEs hope to receive to become more environmentally friendly. Only one question within the BCC survey was an ordinal variable tested on a Likert scale type question so the researcher adopted similar steps because only using Likert scale type questions and/or one source of question generation would not have elicited the required information. Also the number of questions within the BCC survey was fourteen and this helped the researcher decide on a shortened survey questionnaire because respondents prefer not to fill in longer questionnaires.

The third source for designing questions for the survey was the study on Corporate Social Responsibility in the UK South Asian small enterprises by Worthington et al (2006) which included understanding of and attitudes to social responsibility within SMEs; drivers of and barriers to, involvement in social, ethical and environmental initiatives and also evidence of the scope of socially responsible behaviour. The study by Worthington et al (2006) focused on a fairly small sample size and undertook a structured questionnaire survey followed by semi-structured questions. The researcher

treated the Likert scale type questions within the study by Worthington et al (2006) as a proxy in designing questions seeking to elicit attitudes and opinions towards environmental issues and environmental taxation in the current survey. Questions to elicit information on evidence of environmental behaviour were also informed by the study by Worthington et al (2006). The fourth crucial source was a study by Cassells and Lewis (2011) who studied SMEs and environmental responsibility and the link between attitude and action through examination of interrelationships between awareness of environmental impact, attitude towards environmental issues and environmental practices. This study asked a mix of both Likert scale type questions and categorical questions, and the analysis is very similar to that undertaken by the researcher in this study. Finally the AXA Insurance firm survey on Climate Change and Its Effects on Small Businesses in the UK by Crichton (2006) also helped inform the design of the questionnaire.

The researcher would like to reiterate here that through the use of the multiple sources that informed the design of the survey questionnaire, validity of the questionnaire was ensured.

b) One of the ways to assess reliability is the test re-test (Mitchell, 1996). A test re-test is undertaken by administering the same questionnaire twice to the respondents at different times to see if the responses are consistent. However, given the difficulties associated with primary data collection from SMEs (Section 4.7 below) the researcher could not undertake this process and Saunders et al (2009) agree that test re-test is not the most suitable method and should only be used to supplement other methods. The researcher, however, undertook four pilot questionnaire tests with four business owner-managers and asked them to give suggestions on how to improve the language, the structure of the questionnaire keeping in mind the requirements of the data and any other comments they might have. Three of the four owner-managers gave detailed feedback on the design of the questionnaires. Their criticisms were

taken into consideration and necessary changes were made to the questionnaire before dissemination.

c) The researcher selected the potential respondents randomly from the database so that characteristics have the probability of being equally distributed (Creswell, 2009).

d) Threats to validity could also arise due to statistical conclusion problems which might happen when researchers draw inaccurate inferences from the data because of inadequate statistical power (Creswell, 2009, p.164). This threat was overcome by understanding various statistical methods and also cross-checking with peers and other academics within the university who have statistical expertise (Rugg and Petre, 2007).

4.9.2.3   Advantages of survey questionnaire

Saunders at el (2009) gave the details of how to design a survey questionnaire in the best possible way to maximize the return rate and also to seek appropriate responses. Surveys are often low cost; they are clearly worded due to mostly pre-coded closed questions; they save the respondent a lot of time because all they have to do is tick the most suitable response they think best matches their views. Surveys are easy to administer and easy to input the data as it is mostly pre-coded and therefore subsequent analysis is facilitated.

4.9.2.4   Limitations

One of the problems the study faced was with low response rates and although this has been reiterated time and again within the SME literature as an issue related to SME research, the study adopted numerous strategies to overcome this problem but with little success (Section 4.11 below). Survey questionnaires, due to their very nature, are limited to gauging deeper insights into the respondent's reason(s) for their choice of responses; their subjective perceptions which could be very different from the pre-coded closed 'tick-box' options provided; and also ensuring that respondents do actually fill the questionnaire. For postal self-administered questionnaires time is a crucial factor too as the researcher experienced,

due to an unprecedented snowfall in January 2011, postal services were greatly delayed; many businesses had to shut down and the researcher had to wait longer than expected for the questionnaires to be returned and to follow-up. Also, survey is an instrument where after it is administered; the researcher has no control on who is filling it in or when it is filled in. Another limitation of the survey instrument is that because it uses multiple sources of information to design the questionnaire, so it has a mix of both categorical and ordinal variables. As a result of this the test of reliability such as the Cronbach's Alpha[31] (α) could not be calculated because of the nature of the statements, even within the Likert scale type questions which was further compounded by low response rates. The nature of the research questions demanded that the questions were asked within each section of the questionnaire. In terms of low response rates, the nature of the study is such that it seeks information on environmental issues and environmental taxation from SMEs. SMEs have been found to be inherently suspicious of anything to do with environment and this could have been a major factor contributing to the low response rates.

4.9.3 Collection of qualitative data

Interviews can be structured; semi-structured or unstructured depending upon the degree of flexibility of structure of the interview and the rigidity of the questions asked. Interviews work very well in combination with other methods in a multi-method approach (Robson, 2002). Based on the degree of structure of the interview, a structured interview has fixed pre-decided, pre-ordered questions; and at the other end of the continuum is an unstructured interview where the respondent is largely free to talk without much prompting or signposting from the researcher. Semi-structured interviews contain pre-determined questions but if newer or more interesting themes emerge during the course of the interview, the interviewer can steer the interview in that direction to probe further (Daymon and Halloway, 2002; Strauss and Corbin, 1990; Creswell, 2009). This kind of interview is most appropriate when

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[31] A measure of internal consistency or reliability of scale, α is calculated as the number of items squared multiplied by the average covariance between items divided by the sum of all the elements in the variance-covariance matrix. Cronbach's α is not robust against missing data.

exploratory work is needed before a quantitative survey can be carried out (King et al, 1994, p.16-17). In the current study, examining the impact of environmental taxes on SMEs will use qualitative semi-structured interviews to identify and explore the range of different types of impacts which a subsequent quantitative survey can use as themes and address. Also, semi-structured interviews are highly suitable when individual perceptions (e.g. SME perceptions of understanding of and attitudes towards environmental tax through the attitudes of owner-managers) are to be studied (King et al, 1994; Robson, 2002). Semi-structured interviews are flexible and adaptable and if done face-to-face, these interviews offer the possibility of picking up non-verbal cues to enhance the verbal messages.

4.9.4 Interview schedule

As previously mentioned, the interview themes were derived from the literature inferences that lent support to hypotheses developed for quantitative analysis and therefore the questions within the questionnaire and the interview schedule were fairly similar with the exception of one or two. Such exceptions arose because a) the nature of semi-structured interviews meant that the researcher could probe any new or interesting emerging idea during the course of the interview and b) some ideas could not possibly be tested through closed-ended questions such as the question 'How do you think the government can help SMEs to become more environmentally active and aware?'. This question elicited information better through the interviews than it could have through survey. Interview themes were generated from the literature review to explore, qualitatively, interviewee thoughts and opinions. The methodological choice of semi-structured interviews allowed for a flexible interview style during which the researcher was free to explore emerging themes.

The interview guide was to ensure that the researcher was able to cover all the themes and pose the questions that were designed from those themes without letting the interview veer out of context. The choice of themes discussed during the interviews allowed the interviewees to talk about their opinions and their perceptions without any hesitation.

Through covering themes such as opinions on environmental taxation, the researcher was able to gain a thorough understanding of how the SMEs felt about such taxes and what could be done to make them feel more confident and reassured. Throughout the data collection phase, especially after the pilot interviews, questions were updated and modified, even during the interview, to help the respondent understand the question correctly and allow enough time for them to speak their minds until saturation, albeit theoretical, was reached (Bryman,2001; p.101) and no new themes emerged.

4.9.5   **Analysis of interviews**

Interviews were digitally recorded and transcribed verbatim to allow for full qualitative analysis. In preparation for analysis, these were imported into the qualitative software analysis package QSR NVivo 9. Qualitative software packages such as QSR Nvivo 9 initially organised the data to enable efficient exploration and interpretation of the data but although the researcher is proficient in using this software due to system requirements, the software did not run properly and the researcher, after inputting the data, had to resort to manual analysing and presentation. Qualitative data analysis began with collection of the data through interviews and then proceeding to analyse it for themes or perspectives and reporting the themes (Creswell, 2009). Qualitative researchers used different approaches to analyse their data. The Miles and Huberman (1994) approach provides a valuable framework for conceptualising qualitative data analysis. This approach is realistic in the sense that it provides an essentially quantitative researcher the support he/she needs while undertaking qualitative research.

This view of analysis consists of three steps of data reduction, data display and conclusion drawing and verification. Preparing the raw data for analysis begins with transcribing interviews and arranging the data according to the sources of information. This step of data reduction if a part of the analysis and involves making summaries, abstracts, coding and writing memos. Coding may be first and second level, that is, the first level is concerned

with attaching labels to groups of words and the second level groups the initial codes into a smaller number of themes and patterns. To facilitate the qualitative analysis of the data, the researcher adopted template analysis which is a combined deductive/inductive-based analytical procedure based on thematic analysis (King, 2004). This combines the inductive and deductive approach in the sense that codes can be predetermined (Saunders et al, 2009).

Although King (2004) says that template analysis resembles a grounded theory approach[32], the latter is purely inductive and is highly structured whereas template analysis is similar to the data display and reduction technique proposed by Miles and Huberman (1994) and is flexible enough to amend its use to suit the research project (Saunders et al, 2009). Within this analysis, data are coded and analysed to identify and explore themes. It is a combination of both deductive and inductive approaches, in the sense that themes identified from the literature were used as the main themes to explore through the interview data collection and any newer themes were probed to discuss any emerging ideas or thoughts. This process also has the advantage of formulating an audit trail, being explicit about analytical decisions which are grounded in the literature and with full transparency about the steps undertaken. Within this analytical process there are numerous steps undertaken as set out in the flowchart below:

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[32] Grounded theory approach is used to build an explanation or to generate a theory around the core or central theme from the data. It is a structured and systematic approach (Strauss and Corbin, 2008)
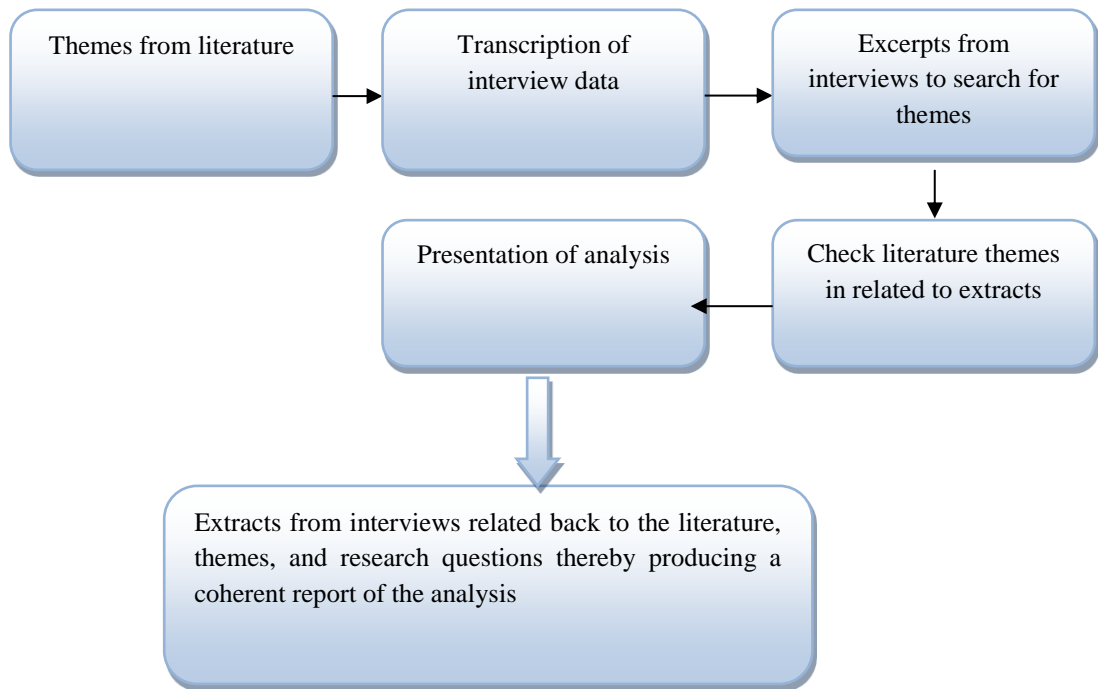
Figure 16: Analysis of qualitative data

Thematic analysis[33] aims to identify and report recurring themes from the data collected by linking the data back to the themes within the literature and provides a greater flexibility. There are a number of advantages of using thematic analysis because a) the findings are presented in a summarised form to the readers without losing the depth and quality of the data and b) it provides a useful tool to explore and generate newer themes. This is also suitable for this study because template thematic analytical studies usually have 20-30 participants. The first step is to obtain a sense of the information by going through the transcripts and noting down general ideas and thoughts along the margins. Coding will follow next to organise the material into chunks of information before interpreting the meaning of this information (Rossman and Rallis, 1998, p.171). This will involve categorising data and labelling the categories.

The next step is to use the coding process to generate a description of the categories and themes for analysis (Creswell, 2009, p.189). Coding the descriptions will generate a small

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[33] This approach of thematic analysis is very close to grounded theory approach but without the structure and theoretical affiliations that the latter demands (Strauss and Corbin, 1990)

number of themes of categories which are often the main findings of a qualitative research (Creswell, 2009). The process of summarising the data while reducing it also displays it. Data can be displayed through the use of matrices (i.e. tables and networks of boxes of information linking them) - this explores and describes the data while others may explain and predict. The final step is to interpret the data to generate meaning from the information through comparison with findings from the literature. In this way, the findings may reinforce past information or produce information that does not confirm the literature findings.

4.9.5.1 Verification, validity and reliability

Qualitative validity is checking the accuracy of findings through procedures such as checking transcripts for errors and confirming the definition of codes during coding etc. (Yin, 2003). In the qualitative phase, validity issues will be addressed as follows.

Saunders et al (2000) maintain that ethical concerns are of paramount importance in research. Participation of respondents will not be coerced. The interviews will be recorded with prior permission of the respondents. To ensure the trustworthiness of the qualitative study, the researcher has to ensure that the study is credible, transferable, dependable and confirmable (Daymon & Halloway, 2002). To ensure that the study is credible enough for the participants in it to be able to relate the findings to their social context, justification of use of the utilised research methods will be the first step. Also, 'member check' (Daymon & Halloway, 2002, p. 93) will be done (i.e. cross- checking the data with the respondents), by 'summarising, repeating or paraphrasing their words and asking about their veracity and interpretation' (Daymon & Halloway, 2002, p.95). Risk of researcher bias will be minimised by adopting a thoroughly professional approach to the interviews and the researcher's subjective opinions will not be expressed to the respondents (Robson, 2002). The researcher will ensure dependability by being totally transparent about the methods employed, the limitations encountered and any other lacunae in the study. Dependability can also be ensured by keeping a detailed record (transcripts of interviews, log of all communication) of

the decisions made before and during the research and a description of the research process called the 'audit trail' (Daymon & Halloway, 2002, p.10).

4.9.5.2   Limitations

Methodologically, all qualitative research suffers from the criticism of being subjective and that the findings are not generalisable and not representative of the population. However being a part of a mixed methods approach these inherent qualitative research problems do not affect this study very much because the researcher believes that the purpose of this qualitative process is to lend insights into the quantitative findings and as such the purpose is not to generalise or be representative of the population that is sampled. While the collected data through the interviews are limited due to a small sample size the researcher made careful considerations in presenting the data in their totality and interpreting them only when the data had something to discuss and not detailing every aspect of them in the analysis. Due to software-related problems the analysis had to be undertaken manually after spending a good amount of time inputting and organising data within QSR Nvivo9 but the researcher did not allow that obstacle to impact on the quality of the analysis and techniques employed within this study facilitate effective data analysis and management.

4.10   Statistical tools and analysis procedures

To make decisions regarding the statistical tools to be applied, the researcher considers whether the sample size is small or reasonably large. When the sample size is large the use of parametric statistics are highly recommended for data that is normally distributed which requires four assumptions to be met for the test to be accurate: a normally distributed sampling distribution[34], homogeneity of variance[35], interval [36]or ratio data[37] and

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[34] A probability distribution of a random variable that is known to have certain properties. It is perfectly symmetrical (has a skew of 0) and has a kurtosis of 0 (Field, 2009; p.790) where kurtosis measures the degree to which scores cluster in the tails of a frequency distribution. A positive kurtosis>0 has too many scores in the tails and is too peaked whereas a negative kurtosis<0 has too few scores in the tails and is quite flat (Field, 2009;p.788).

[35] The assumption that the variance of one variable is stable (i.e. relatively similar) at all levels of another variable.

independence[38] (Field, 2009, p.791). Parametric tests 'compare sample statistics with population parameters but can only be used on data which has a normal distribution' (Collis and Hussey, 2003; p.196). If however, the sample size is fairly small (i.e. in this study the survey respondent sample size is only 99), the researcher is able to use non-parametric statistics tests to analyze the data. Non-parametric tests are sometimes known as assumption-free tests because they make fewer assumptions about the type of data which can be used. It is also assumed that non-parametric tests make no assumptions about the distribution of the data but in fact they do, although they are less restrictive than the parametric tests (Field, 2009; p.54) and 'they are more general and can be used on skewed data; that is, data which is not normally distributed…used on ordinal data' (Collis and Hussey, 2003; p.196). In ascertaining the statistical significance of the data obtained in response to self-completion questionnaires, the researcher applied a number of non-parametric tests, namely, chi-square test, Mann-Whitney test and Kruskal-Wallis test.

4.10.1 Pearson's chi-square test

To test the relationship between two categorical variables, for example, does the sector have any association with choice of environmental policy; the researcher uses Pearson's chi-square test (Fisher, 1922). This test is based on the idea of comparing the frequencies one observes in certain categories to the frequencies one might expect to get in those categories by chance (Field, 2009; p.688). While reporting the test results it is necessary to report the value of the test statistic (X^2) with its associated degrees of freedom[39] and the significance value and the contingency table.

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[36] Data measured on a scale along the whole of which intervals are equal.
[37] Interval variable but with additional property that ratios are meaningful.
[38] Assumption that one data point does not influence another. When data come from people it means that behaviour of one person does not influence the behaviour of another (Field, 2009;p.787).
[39] Number of entities that are free to vary when estimating some kind of statistical parameter. It has a bearing on significance tests for many commonly used test statistics and determines exact form of probability distribution for these test statistics (Field, 2009; 784).

4.10.2 **Mann-Whitney Tests**

To test the differences between two conditions and if different participants are used in each condition then the Mann-Whitney test (Mann & Whitney, 1974) can be used which is a non-parametric test to compare the medians[40] of the two groups where scores are converted to ranks. For the Mann-Whitney test we need to report only the test statistic which is denoted by U, the equivalent z, its significance and also the medians. If the asymptotic significance (2-tailed)[41] is less than 0.05 then the two groups are significantly different. To determine the exact (one-tailed)[42] significance the value of 2-tailed significance is divided by 2 (the number of tests undertaken between groups).

4.10.3 **Kruskal-Wallis Test**

This is a non-parametric test used to compare two groups in which the grouping variable has more than two categories, for example the size of an SME has three categories of micro, small and medium, and compares it with an ordinal variable. This test compares several conditions when different participants take part in each condition. If the value of the asymptotic significance is less than 0.05 then the groups are significantly different. This test, if found significant, is followed up by Mann-Whitney tests between pairs of conditions but they are significant only below 0.05 divided by number of tests.

4.10.4 **Choice of statistical techniques/methods**

In choosing the statistical tools and techniques for data analysis the researcher considered the use of correlation and regression analyses and did not find them suitable given the small sample size of the respondent data gathered. Therefore, non-parametric tests were chosen to test the hypotheses. The researcher is mindful that where non-parametric or parametric tests

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[40] The middle score of a set of ordered observations. When there is an even number of observations the median is the average of the two scores that fall either side of what would be the middle value.
[41] A statistical model that tests a non-directional hypothesis.
[42] A statistical model that tests a directional hypothesis is called a one-tailed test.

are conducted, descriptive statistics such as mean and pictorial illustrations of data are essential and are considered in the Chapter 6.

The above sections discussed the choice of methodology and the analytical tools applied to the study. The researcher made very careful considerations in choosing the appropriate tools and methodology and has been transparent about the quality of primary data gathered and the issues inherent within. The following Section 4.11 below highlights the problems discussed within the literature about the issues encountered in SME research and also highlights how the researcher attempted to thwart those potential problems and the outcomes thereof.

4.11 Problems in researching SMEs

This section discusses the problems in researching SMEs - as found in the literature - including the problems of sampling SMEs and the problems of defining SMEs and links it to this research study ex-post facto.
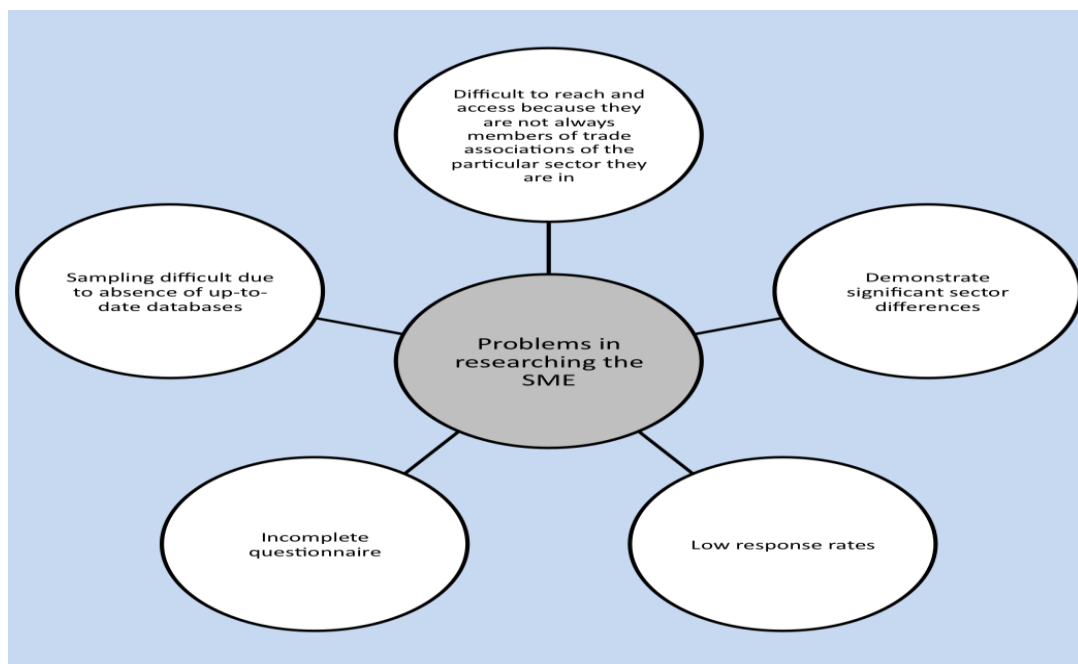
Figure 17: Problems in researching SMEs

Figure 16 above summarises the problems inherent in researching the SME. Researching the small enterprise is often a challenge because it is quite difficult to access or construct the representative sample of a small business for research. Also, a small business is at the

intersection of so many disciplines and areas of professional practice, it is easy to overlook previous work (Curran and Blackburn, 2001).

Sampling is difficult because there are rarely up-to-date lists available of relevant small businesses from which to recruit a convincingly representative sample. SME owner-managers are busy people and they may not be too sympathetic to requests from researchers for time. Thirdly, some business owners are sceptical about the relevance of research, especially academic research (Curran & Blackburn, 2001). Sampling is difficult to do in SME research because of the absence of up-to-date databases (Curran and Blackburn, 2001). Generating a sampling frame can be done painstakingly by calling each business from, say, a local business directory and then asking a couple of questions to ascertain whether it fits the sample requirement or not (Curran and Blackburn, 2001; Revell and Blackburn, 2005). But this is a time-consuming process. Also, if the researcher does not have quick concise questions at this stage he/she may well end up causing the business not to show any interest in the research (Curran and Blackburn, 2001). Also, SMEs are often not members of the trade associations of the particular sector they are in, which makes it difficult to reach and access them (Hillary, 2000; Rutherfoord et al, 2000).

Despite the increase in interest in the small business in the UK, its importance in the economy is often underestimated (Storey, 1994). It is difficult to estimate the number of small businesses in the UK and this is compounded by the question of what should be seen as a 'small' business. There are many ways of defining a small and medium enterprise. The EU approach is based on the number of employees (Curran and Blackburn, 2001). The Department of Trade and Industry estimates that there has been a considerable growth in the number of SMEs in the UK due to a range of influences such as technological changes, outsourcing by larger enterprise and a rise of entrepreneurial culture (Curran and Blackburn, 2001).

Given all the above potential difficulties encountered in small business research, it becomes necessary to define SMEs along certain criteria suited for a particular project. The problem of what a small business is has raised many problems for research in this area. Definitions based on numbers employed in the enterprise are the most popular choice due to their obvious simplicity and quantitative nature. But one of the biggest disadvantages of selection on the basis of numbers is that employment measurement is sector-specific. A measure of size is difficult to use where part-time, casual and temporary labour is not evenly spread across the size distribution of the businesses (Storey, 1994).

Definitions based on financial turnover have much the same problems as the above. Turnover, like employment, has sector characteristics. Another big problem is finding out firms' turnovers. Unless a business is registered as a company and it is estimated that over half are not (DTI, 2003), there is no requirement to make accounts public. Owner-managers themselves may not even have precise data on their annual turnover and may not be able to provide accurate information (Curran and Blackburn, 2001). A further problem with turnover-based definitions is dealing with the problem of inflation but this is applicable only and if only the analysis compares firms over time.

Often it is felt that small businesses would be simpler to research because they have relatively fewer people, simpler organisational structures and fewer activities. However the apparent simplicity of the small business is quite misleading because a small number of people engaged in a common endeavour can create very complex, subtle interactions (Curran and Blackburn, 2001). The motivations of those involved can be wide and complex. Also, because activities may lack clear structures and procedures, measurement is much more difficult and propositions more difficult to test (Curran and Blackburn, 2001).

Another problem is that SME research is often marred by low response rates especially to postal questionnaires (Rutherfoord et al, 2000). They also suffer from incomplete questionnaire responses (Gadenne et al, 2009). Many studies have reported the difficulties

encountered in receiving a relatively higher response rate to questionnaires in SME research with one survey of 875 SMEs receiving only 15 responses (Gunner, 1994 cited in Gunnigham, 2002).

SMEs have a very wide range of forms. They operate in every sector of the economy which makes it even more difficult to generalise the findings (Curran and Blackburn, 2001). The entrepreneurs and owner-managers come from different genders and/or a wide range of cultural, ethnic and educational backgrounds and from every age group. Some are sole owners while others run the business with partners. While some start their own businesses from scratch, others inherit or buy an ongoing business (Curran and Blackburn, 2001; Storey, 1994).

A high proportion of small firms have two or more owner-managers/partners/directors (DTI, 2003; Scott and Rosa, 1996). This means that even at the owner-manager level, investigating managerial strategies and practices in SMEs will be complex. Each owner- manager will have his or her personal goals as well as goals for the business and differing managerial skills and practices (Curran and Blackburn, 2001).

Generalisation of findings of research will also be problematic for small business research. A study of one kind of small enterprise such as a 'family small business', however well conducted, will always offer conclusions whose wider applicability will be easy to challenge (Curran and Blackburn, 2001).

Despite the importance of sector, it is not always easy to classify a business as being in one sector rather than another; for instance, firms producing a range of products or services may operate in more than one 'sector' depending on how 'sector' is defined. Curran and Blackburn suggest referring to past studies on SMEs to ascertain how researchers have defined SMEs for the purpose of their research. One particular study by Aragon-Correa et al (2007) on the environmental strategy and performance in small firms in the south of Spain

selected the sample at random from automotive garages. For the mentioned study, the sector was the criterion for selection as this specific sector was hugely targeted by legislation.

4.11.1 Steps taken to minimize SME research problems and the outcomes

To address the issues identified with SME research in the above section the researcher adopted the following strategies to overcome some of those problems. This section discusses those strategies and the results of implementing them.

First of all, the researcher believes that the term 'SME' in itself is a paradox because it comprises businesses which may be run by one person alone, for example, a corner shop or larger manufacturing businesses which has more than a hundred employees, operates out of different locations and has a potential to engage in even international trade. This has implications of impact of size on the kind of data collected. For the current study the researcher adopted the strategy chosen by many previous studies (Patton & Worthington, 2005; 2003; Cassells and Lewis, 2011) and chose to treat SMEs as a group in data collection and did not make any conscious decisions to choose a certain number of potential respondents within each of the micro, small and medium categories. But for the purposes of survey data analysis, size of the business was treated as an independent variable and statistical tests tested for significant differences in groups based on size within SMEs.

SMEs are often defined by size and/or turnover (section 2.2.1 Chapter 2). Here too the researcher chose to use size, by numbers employed, as the simple definition of SMEs in line with other the European Commission definition (2003). For the purpose of this study, SMEs are defined according to their size which is the accepted EU definition (EC, 2003). According to this definition SMEs are businesses with 0-249 employees.

SMEs are present in almost all sectors of the economy. This is not a problem per se in any SME research but it is often useful to target two or more sectors and undertake tests to check for differences in groups based on sector. This also facilitates generation of a sampling frame

and targets the data collection instrument more precisely. The main problem of the absence of an up-to-date database was addressed by generating, painstakingly, a SME database from local business directories and member directories in local chambers of commerce. To overcome the issues of sampling problems in SME research, two sectors (i.e. manufacturing and transport), that were found to be SME- dominant and high users of those inputs that are liable to environmental taxes - through IO analysis - were used to generate the sampling frame.

SME research has often been marred by low response rates to questionnaire surveys (Curran and Blackburn, 2001). To overcome this, a large number of questionnaires (750) were sent out to ensure high response rates and the researcher included within the pack, a postage-paid return envelope, a pen, and a letter from the university stating the purpose of the research and assuring confidentiality. Also the researcher called each business within the 750 surveyed before sending them the questionnaire to request that they complete it. The questionnaire was printed on both sides of A4 paper with enough spaces in between the questions to make it a structured and clear document with few pages and the letter was printed on a coloured letterhead with permission of the university. The researcher undertook follow-up techniques and called up potential respondents to request them to fill in the surveys after a four week wait for the turnaround time (Saunders et al, 2009). These strategies are supported in the literature too as ways to stimulate questionnaire returns and high response rates (Newby et al, 2003).

The letter from the university with the logo on a letterhead (Greer and Lohtia, 1994), assurances of anonymity (Kanso, 2000; Tyagi, 1989), using shorter and double sided questionnaires (Jobber, 1989), follow-up techniques (Dillman, 1978; Kanso, 2000; Westhead and Cowling, 1998), non-monetary incentives (Hansen et al, 1983) and the pen, are some of the strategies advised within the SME research literature. However, even after adopting all these strategies the response rate to the questionnaire survey was very low and only 99 out of 750 (13.2%) SMEs surveyed filled in the questionnaires. This affected the findings greatly

and therefore also the statistical test results (see Chapter 6). However this is just over the accepted response rate of 10 % and therefore used in statistical tests although with sufficient caution.

A previous study by Newby et al (2003) tested the impact on data quality, response rates and cost-effectiveness of using some of the strategies mentioned above including telephone pre-notification and follow-up mail and found that follow-up mail was effective in increasing the response rates as did the pre-notification. However, for this study the researcher found no evidence of employing similar strategies on the response rate although Newby et al (2003) contend that their study was limited to SMEs within a particular geographical location and therefore those findings might not be applicable to other populations or countries (p.169). Resource constraints of time and money (Newby et al, 2003) also meant that the researcher could only undertake one follow-up and then had to use the available collected data to undertake the analysis. The researcher also made a promise of sending a report based on the results of the study but this did not seem to have any impact on the response rate either (Dommeyer, 1985).

4.12 Empirical Falsifiability

 Every hypothesis or theory that is asserted can possibly be contradicted by evidence. In the current study the hypotheses that have been derived from the literature in Chapter 8 are tested through the use of primary data in Chapter 9. As the results may indicate many of those hypotheses hold true. The refutability of the hypotheses within this study does not mean that the hypotheses are false or wrong instead it proves the scientific validity of the propositions. Karl Popper says, "*a theory which is not refutable by any conceivable event is non-scientific… irrefutability is not a virtue of a theory ... but a vice*" (Popper, 1965, p. 36). This idea of empirical falsifiability arises in response to the general problem of anomaly in any scientific endeavour or project. Anomalies, that is, facts that appear to be inconsistent with the proposed hypothesis or theory are omnipresent in any scientific enquiry. So if a

theory implies a phenomenon A and that phenomenon A is false then from a strict 'falsification' stance, the theory A must be given up as it is highly fallible.

However this is not plausible as a principle of methodology. This is where a researcher or someone engaged in scientific enquiry is faced with choices ranging from totally rejecting the theory; partially rejecting it to avoid the conclusion of A; modifying the theoretical perspective to avoid the conclusion A. So falsifiability refers to the logical possibility of refutability of any scientific hypothesis or theory through an empirical observation or testing. However the issue arises when one attempts to use the maxim of least harm[43] to reconcile the theory and observation thereby creating a situation where it potentially makes the theory irrefutable. The classical view is that it is the goal of science to prove hypotheses. The purpose of the idea of empirical falsification thus strives for questioning, for falsification, of hypotheses instead of proving them.

4.13 Summary

This chapter discusses the research methodology applied in this study. It highlights the research strategies employed, the design of the research, instruments of data collection and the tools and techniques of data analysis for both primary and secondary data. The chapter also considers ethical issues and highlights how the researcher ensured that the study conducted met the expected guidelines of the university. By discussing inherent SME research problems, this chapter brings to light the issues that affect SME research, the potential ways that were adopted to overcome the problems and the results thereof. The idea of empirical falsification is also visited in this chapter to present the possibility of the refutability of the propositions in this study which does not violate their scientific integrity instead strengthens them.

The following chapter shows the process of formulation of hypotheses.

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[43] to try to create a reconciliation that requires the least change (in the theoretical proposition)

5 Development of Hypotheses

5.1 Introduction

The previous chapter discussed the research methodology for the study. The chapter on methodology highlights the philosophical assumptions of the researcher, the research strategies adopted, the methods of data collection and the units of analysis etc. The purpose of the previous chapter was to detail the process undertaken in attempting to answer the research questions. In the current chapter the researcher sets out the hypotheses which are tested statistically in Chapter 6 in order to answer the research questions. The hypotheses are derived from literature as described in Chapters 2 and 3 Literature Review I and II. The statistical tests that are conducted to prove or disprove the hypotheses are primarily focussed on the responses to survey questions. Interviews were also conducted and interview data are used as further evidence to lend insights into the results of the survey in the following chapter.

5.2 Independent variables

An independent variable, in a statistical context, is a manipulated variable whose presence or degree determines the change in the dependent variable. However in many cases it may not be possible to manipulate the independent variable and it may be something that is fixed and something that a researcher uses to evaluate with respect to how it affects the dependent variable such as age, as an independent variable may have an effect on the dependent variable 'understanding of environmental issues'. The researcher has identified a number of factors that may influence the responses of the participants in the survey and may generate significant findings. Most of the research hypotheses in this chapter that are formulated from the literature review are tested on four independent variables - business sector, size of the business, SME membership of a a trade association and information received by SMEs on

environmental issues. The researcher chose to discard another possible independent variable ('age') and explains below the reasons for doing so.

This chapter will attempt to justify the choice of those independent variables that can also be classified as 'moderator variables' (Gadenne et al, 2009) in the context of some of the hypotheses. Baron and Kenny (1986) say '*In general terms, a moderator is a qualitative (e.g., sex, race, class) or quantitative (e.g., level of reward) variable that affects the direction and/or strength of the relation between an independent or predictor variable and a dependent or criterion variable. Specifically within a correlational analysis framework, a moderator is a third variable that affects the zero-order correlation between two other variables. In the more familiar analysis of variance (ANOVA) terms, a basic moderator effect can be represented as an interaction between a focal independent variable and a factor that specifies the appropriate conditions for its operation.*' (p. 1174).

In the context of Hypotheses 5 and 6 the independent variables may be viewed as moderator variables because they attempt to see the link between environmental attitude and environmental behaviours (within Hypothesis H6). However, due to primary data limitations the moderator variables could not be used in the context of a correlation analysis or logistic regression and as such they revert back to being independent variables that are tested to see their effects on the dependent variables (see Chapter 6). The following sections justify the choice of the independent variables used in the statistical tests of the survey data.

5.2.1   Independent variable 'Age'

Other than the four aforementioned independent variables, the researcher initially also considered 'age' of the SME owner-manager as an independent variable since the questionnaires were targeted at owner-managers. The literature shows that owner-managers' personal characteristics such as age (Petts et al, 1998; Schaper, 2002) have an impact on environmental awareness. Although the effect of age is difficult to discern, Petts et al (1998) note that based on methods of data collection, that is, surveys or focus groups, younger

people tend to be more interested in the environment. This finding was also confirmed by Olli et al (2001) who found that although younger people display more eagerness and interest in environmental issues, those older people who experienced more economic difficulty had a better attitude to the environment.

Also, the literature shows that younger owner-managers are more likely to seek information (Smallbone and North, 1995) thereby indicating that they may be more aware of current developments in environmental practices and more aware of environmental issues. But another study on the links between environmental attitude and actions in SMEs in New Zealand by Cassells and Lewis (2011) found that there were no significant differences in attitude relating to the age of the SME owner-manager. The researcher felt that in the context of the current economic crisis, age would have been a very interesting variable to test. However, it was discarded once the responses were received for two reasons - very few respondents (less than 2%) chose to disclose their age and after initial statistical tests there was found to be no significant effect of observed age, that is, there were respondents as young as 21 and as mature as 78 and so the researcher chose not to test this variable any further due to data limitations.

5.2.2 Independent variable 'Sector'

Literature shows that sectoral differences play an important role in SME attitudes and awareness of environmentally-related issues. As there is widely acknowledged sector diversity in SMEs (Curran and Blackburn, 1994), sector differences are very crucial to the study of SMEs (Curran and Blackburn, 1994). For example, a study by Baylis et al (1998) on the manufacturing SMEs in South Wales and Humberside found that sectoral context was very important for understanding a firm's responses to environmental issues. The findings revealed that firms' orientation to environmental issues is very dependent upon the sector they are in. For instance, the study identified SMEs which, in the environmental context are

'lead' (e.g. chemical and electronic industries) and 'laggard' (e.g. metal and metal processing industries).

Another study found that the type of business seems to have some effect on the knowledge of Environmental Tax Reform [44](ETR) and environmental taxes generally. Although this study found an association between awareness and sector, this did not seem to have any impact on their views on environmental taxes, except for the company within one sector (i.e. refinery sector) which lobbies in Brussels against carbon taxes (Dunne & Peter, 2003). The NetRegs SME environmental survey (2009) found some sector-specific variations in awareness of environmental issues and legislation which reiterates that the extent of the environmental impact of firms may vary from sector to sector (Petts et al, 1998, p.10). The researcher deliberately targeted manufacturing and transport sector SMEs for this study and 100% of all the respondents to the questionnaire survey replied to the question of which of the two sectors they belonged to (i.e. manufacturing or transport). Such a high response rate to this particular query facilitated statistical analysis of the significance of the impact of sector in the context of the hypotheses tested, but only in relation to one sector against another.

5.2.3   Independent variable 'Size'

The term 'Small and medium-sized enterprises (SMEs)' implies that there are huge differences in the size of businesses within this category. SMEs are heterogeneous in size which is often their defining characteristic e.g. micro 0-9; small-10-49 and medium- 50-249 (Wilkinson, 1999; Spence, 1999; Holliday, 2002) and size of an enterprise is seen as a major factor in influencing perceptions of a business case for sustainability (Smith and Kemp, 1998). Often the size of the business becomes a major constraint in their engagement with environmental issues. Being small businesses they are often run by one person who owns

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[44] ETR is a reform of the national tax system where there is a shift of the burden of taxation from conventional taxes, for example on labour, to environmentally damaging activities, such as resource use or pollution. The burden of taxes should fall more on 'bads' than 'goods' so that appropriate signals are given to consumers and producers and the tax burdens across the economy are better distributed from a sustainable development perspective (EEA, 2005, p.84)

and manages the company and therefore has limited inputs and understanding of many issues outside the day-to-day business survival. The size of the business is always understood to be an important factor in understanding the gap between values and actions in the environmental context for SMEs (Cassells and Lewis, 2011). Business size is seen to be a factor in influencing its environmental option (Azzone et al, 1997b) and other writers such as Russo and Fouts (1997) and Aragon-Correa (1998) also suggest that there should be different environmental strategy solutions according to business size. This is because while larger businesses have resources to adapt their environmental strategies, it is not always possible for SMEs to do so.

In addition, SMEs often ignore or conceal the environmental effects of their business activity (Brio and Junquera, 2003). The size of business within SMEs has been seen in the literature as a key factor in understanding SMEs - from their perspective on business support services (Boter and Lundstrom, 2005), as a driver of environmental behaviour in understanding the link between the company size and environmental attitude and behaviour (Worthington and Patton, 2005), and from an awareness of the impact of their actions on the environment (NetRegs, 2009). There has always been a tendency amongst policy makers to design policies for larger businesses and then fit them to the SMEs (Jenkins, 2004) which may have expensive distributional consequences (Fullerton, 2009) on the smaller businesses. Of the total responses received to the particular question in the questionnaire on what size (according to numbers employed) is the participating business, the researcher found that nearly 44% and 35% respondents belonged to micro and small business categories respectively and the rest to medium-sized businesses. So it becomes imperative to analyse SMEs taking into consideration the size of the business in the context of the hypotheses developed in this chapter.

5.2.4   Independent variable 'Membership of a Trade Association'

The NetRegs SME environmental survey (2009) found that nearly 20% of all SMEs used trade associations to discuss environmental issues. Although this finding differed across sectors, this put emphasis on the importance of trade associations in the dissemination of environmental information and as a platform for SMEs to engage with environmental issues. The NetRegs survey confirmed that there is a correlation between a lack of awareness of organizations such as NetRegs and low levels of awareness of potential harm to the environment (NetRegs, 2009). It appears that SME owner-managers are often unaware of many of the sources providing support and information for small businesses (Tilley, 1999). The researcher feels it is important to find out whether the SMEs surveyed in this study engage with such organizations and if yes, whether those that engage with them have any significant differences in their responses to those who do not. In this context, this independent variable is seen by the researcher as being highly relevant to this study.

The businesses surveyed in this study are within the manufacturing and transport sectors and there are numerous trade associations that are very sector-specific. There are also others such as the Federation of Small Businesses (FSB), Business Link and local authorities including the chambers of commerce. Of the total responses received to the particular question regarding membership of a trade associations there is a 65% 'yes' to membership. So in the context of the hypotheses developed this independent variable it is of high significance.

5.2.5   Independent variable 'Access to environmental information'

The literature shows that SMEs do not have enough good information on environmental issues (Tilley, 1999; Williamson and Lynch-Wood, 2001) because they work long hours and are responsible for several business tasks at once (Spence, 1999) and therefore they have little time to learn about environmental issues (Friedman et al, 2000; Rutherfoord et al, 2000; Hillary, 1999). Access to information is found to be a major factor in determining the extent of environmental awareness within SMEs (Lepoutre and Heene, 2006; Roberts et al, 2006;

Zutshi and Sohal, 2005a, 2005b).   A previous survey identified macro factors which can inhibit growth in SMEs that are attributed to tax and regulatory burden. 69% SMEs surveyed in 2007 (BCC, 2007;2008) felt they were under a lot of tax and regulatory burden which was not being eased by government support in terms of better information and communication.

One of the main reasons for the high costs of tax compliance within SMEs is seen to be the complexity of the language of the tax laws and the frequent changes to tax laws which result in increased costs of tax consultants (EC, 2007). Access to timely and relevant information is considered here to be the first step towards reducing the gap between those larger businesses which are aware and engaged with the climate change discussion and SMEs which are liable to pay similar environmental taxes but have less or no understanding of environmental issues and policies. Within the literature there is a strong argument for providing clear, relevant and timely environmental information to SMEs in order to modify their environmental attitude and behaviours (Gunningham, 2002). The expectation is that effective communication and information dissemination through the right channels that influence SMEs will ensure that the message is received adequately and successfully (Hillary, 2000). Revell et al (2010) found that lack of information was a barrier to SMEs becoming more environmentally-friendly. Of course information is not the sole strategy to influence SME behaviour in relation to the environment.

Research shows that despite the potential benefits of being more environmentally proactive and becoming more energy efficient, SMEs need more support and advice (Keenan and Boie, 2003). Dollinger (1984) has shown a positive relationship between the use of environmental performance and environmental information. Of the total responses received to the particular question of whether SMEs receive any information on environmental issues from relevant sources, more than 62% said they did not. This may very well be an indication of lack of access to information which can have a detrimental effect on SME attitude toward environmental issues and policies, in particular, environmental taxation. So the researcher

feels it is very important to ascertain the effects of this independent variable in the context of the hypotheses tested in this study.

The researcher would like to point out that although there may be other possible independent variables such as the education of SME owner-managers, the researcher chose only the above four to narrow the scope of the study to be able to test all the variables thoroughly in the context of the hypotheses. Although there is evidence in the literature that education has an effect on the environmental awareness within SMEs (Schaper et al, 2002) and higher education is found to be associated with higher levels of environmental concern (but not necessarily with environmental behaviour (Olli et al, 2001)), the researcher felt that including education in the independent variables would be too wide a range of responses to categorise as there can be many educational and other vocational qualifications. So in conclusion, the study will test the effect of the independent variables of sector, size, membership of a trade association (TA) and access to environmental information in the context of the developed hypotheses. The following sections discuss the formulation of the hypotheses tested through the survey data and derived from the literature review.

In the following sections the term 'groups' means a) business sector; b) business size; c) TA membership and d) access to environmental information.

5.3   Hypothesis 1: perceptions of environmental issues

The first hypothesis focuses on the perceptions of environmental issues in groups within SMEs. Literature shows that, in general, the barriers to environmental compliance in SMEs stem from their lack of understanding of their impact on the environment (Gunningham, 2002). This lack of understanding of environmental issues often translates into poor environmental behaviour. In Chapter 2 of this study, the SME business sector is discussed. The literature shows that factors such as low awareness of environmental impact (Hillary, 1995; Rutherfoord et al, 2000), poor eco-literacy and limited resources (Aiyub et al, 2009, Worthington and Patton, 2005) are also major hindrances to change.

SMEs are under increasing pressure to address environmental issues from a range of sources including legislation, supply chain, TAs and customers (Friedman et al, 2000). However, due to lack of time, resources and environmental expertise, addressing environmental issues is a complex issue for SMEs. Also, most of the actions such as recycling waste and changing purchase policy to benefit the environment are found to be driven by financial considerations, not environmental impact (Friedman et al, 2000, p.335). SMEs do not see environment as a key business concern (Revell and Blackburn, 2007) and paybacks from energy-saving technologies are not considered worth the initial investment to buy new equipment.

Although it is largely accepted that SMEs lack the resources to implement proactive environmental strategies, a study of SMEs in the automotive sector in southern Spain (Aragon-Correa et al, 2008) found that SMEs undertake a range of environmental strategies from regulatory compliance to proactive environmental leadership (Aragon-Correa et al, 2008). So it seems that generalising SMEs as being environmentally unaware and ignorant is not always correct. But this may be because SMEs are greatly influenced by sector differences so environmental knowledge and attitude may be dependent upon which sector they belong to.

A previous survey on environmental awareness of SMEs (NetRegs, 2009) found that SME environmental awareness increases with increasing size, that is, the SMEs within the 0-9 (by numbers employed) micro business group are significantly less environmentally aware than SMEs within the 50-249 medium business group. More than 90% of all SMEs surveyed by NetRegs believed that their actions had little or no impact on the environment and also that they did not undertake any environmentally harmful activities. In fact, many small business owners believe that they have little impact on the environment (Lee, 2000; Rowe and Hollingsworth, 1996). However, awareness of environmental impact and issues increases with the size of business.

Literature shows that although SME owner-managers believe that the environment is an important issue, awareness of formal environmental systems and laws is generally very poor and quite limited (Tilley, 1998; Petts et al, 1999; Hillary, 1997). SMEs are generally much less likely to begin environmental improvement programmes than large firms or even to have adopted a written environmental policy (Schaper, 2002).

An individual's beliefs and attitude are believed to have a strong impact on behaviour (Ajzen and Fishbein, 1980). Therefore it is expected that those who are aware of environmental issues and are concerned about the impact of their business on the environment will be more likely to act to reduce the impact of their business activities (Gadenne et al, 2009).

SMEs have a very high total impact on the environment, not least because almost 99% of all private sector businesses in the UK fall within the SME category. SMEs account for nearly 70% of total global pollution (Smith and Kemp, 1998) and 60% of total carbon emissions. The sum total of SME environmental impact outweighs the combined environmental impact of large firms (Hillary, 2000).

The above discussion demonstrates the perception that SMEs across all sectors and across different countries may not have a very high awareness of environmental and climate change issues. Given the literature findings it is assumed that the awareness of environmental issues within SMEs may be influenced by the independent variables. The following hypothesis is aimed at investigating this assumption.

H1: There is poor understanding of environmental issues in groups within SMEs.

5.4   Hypothesis 2: Attitude to environmental issues

The second hypothesis covers the attitude of SMEs to environmental issues. This hypothesis emerged from the literature findings in Chapter 2 that supported the view that SMEs do not always believe that they have any significant impact on the environment and often they tend

to see themselves as small businesses that individually have no such environmental impact that requires them to make any changes in their actions or even to think about it. Also, previous research has provided evidence that SMEs tend to be reactive to environmental issues (Schaper, 2002). How is being proactive of any relevance to SME attitude towards climate change? It is because if one is proactive one will put in place measures and steps to mitigate the ill-effects of environmental degradation and thereby can be expected to engage in the discussion of steps to combat environmental problems.

Hillary (2000, p.18) says:

'(SMEs are) ignorant of environmental impacts...oblivious to important of sustainability....cynical of benefits of self-regulation...difficult to reach, mobilize or engage in any improvements to do with environment'

It has been argued that improvements in environmental management practices can result in a multitude of benefits for SMEs (Simpson et al., 2004). Therefore, there could be a number of motivating factors behind increased environmental engagement including a perception that it may garner more profits and differentiate the organization and therefore strengthen its marketing strategy (Gadenne et al, 2009). However, it is not a common perception because most SME owner- managers find environmental responsibility and improvement as a financial cost and many SME owners believe that they have little impact. They do not have good information on environmental issues because they work long hours, are responsible for several business tasks at once and therefore have little time to learn about environmental issues. Lack of financial resources is another factor for their lack of interest in learning about environmental issues as they see it as a financial cost (Chapter 2).

Tilley (1999) discussed the attitudinal obstacles on the part of SMEs to improving their environmental performance. They range from underestimating the impact of their activities on the environment; a narrow view of the relationship between business performance and the environment; the entrenched idea that protecting the environment is associated with technical

complexity, burdens and costs; and a high resistance to organizational change (Gunningham, 2002)

There is a significant discrepancy between personal viewpoints and business activity within SMEs (Tilley 1998). The generally positive attitude of owner-managers towards the environment does not appear to be reflected in their actual business practices. Merritt called this paradox '… *the so-called SME problem in environmental management*' (1998, p. 91). Studies show that SME owner-managers have strong altruistic feelings towards the environment, with environmental issues seen as an important issue by 80-90% of respondents (Schaper, 2002). But paradoxically, studies also highlight a significant gap between attitude and behaviour where the barriers – for example perceptions that business has limited environmental impact - mean that their generally positive environmental attitude rarely translates into concrete action (Tilley, 1999; Schaper, 2002; Mckiever and Gadenne; 2005, Hitchens et al; 2005)

This hypothesis is somewhat linked to Hypothesis 1 in that it tends to share the literature on SMEs and environmental issues to form two hypotheses based on a) awareness/understanding of environmental issues and b) perceptions/attitude towards environmental issues. However, it is not the intention of the researcher to link the two hypotheses to demonstrate that one stems from the other. Previous studies have also treated perceptions to environmental issues and awareness of environmental issues as two separate entities (NetRegs, 2009; Cassells and Lewis, 2011) and that is the route the researcher is adopting here too. The researcher agrees with the view of Schaper (2002) and Spence et al (1998) that given the relatively poor environmental performance of SMEs many more opportunities exist for future research into understanding the attitude and views of SME owners-managers towards the environment. The 'SME gap' or 'SME problem' in environmental matters (Merritt, 1998) needs further investigation.

Given the literature findings, it is assumed that SMEs, in general, tend to be reactive towards environmental issues and there is still prevalent thinking within SMEs that they do not have a significant environmental impact. These literature findings may be highly relevant in the context of the independent variables. Business sector, size, and the information they receive on environmental issues and also their membership of a TAs may be highly relevant to their attitude towards environmental issues. These assumptions will be investigated through Hypothesis 2:

H2: There are poor attitudes towards environmental issues in groups within SMEs.

5.5   Hypothesis 3: Awareness of environmental taxation

The third hypothesis concerns SME awareness of the economic instrument environmental taxation. Chapter 3 has detailed discussion on environmental taxation as an economic instrument to mitigate climate change. It also discusses classification of environmental taxation and the different types of environmental taxation. Chapter 2 discusses SME responses to different types of environmental policy instruments. SMEs operate in almost all those sectors in the economy that are liable to environmental taxes. So it is imperative that they understand and know what these taxes are for, how they are being charged and to what end. One of the key objectives of environmental taxation is encouraging positive environmental behaviour but in the absence of awareness of environmental taxation the behaviour-change objective of environmental taxes will not be achieved successfully.

Economic market-based instruments such as taxes, subsidies and tradable permits have become increasingly popular policy tools for encouraging environmental change amongst producers and consumers. However, key to ensuring that instruments such as environmental taxes are effective is to set prices high enough to incentivize a behaviour change (Revell et al, 2010). For instance, studies have found that the UK landfill tax has failed to be a major driver of change in SME waste management practices because owner-managers find it easier

- and less costly - to pay the tax rather than change their waste practices (Revell, 2007, Simpson et al, 2004; Revell & Blackburn, 2005; 2007).

Although it is found that SMEs often tend to view the environment as an important business concern they are more often than not oblivious of environmental legislation affecting their business (Petts et al, 1999; KPMG, 1997).The NetRegs SME Environment Survey 2009 found that although about 61% of respondents were aware of environmental legislation, a very low percentage of respondents could actually name any. And there are differences in levels of awareness between different sectors and sizes of businesses within SMEs. The NetRegs survey concludes that low levels of awareness of environmental impact and specific environmental legislation could potentially mean that those businesses could engage in activities that cause harm to the environment.

This could also mean that in the absence of greater understanding or awareness of, say, environmental taxation, businesses would be more likely to keep paying the higher taxes and regard them as a penalty or charge but not make any such changes in their environmental behaviour that might lower the environmental taxes such as investing in energy-efficient technology, focus on waste management etc. The literature in Section 2.3.2 Chapter 2 highlights the impact of most environmental policy instruments on SMEs and discusses SME response to most of them such as SMEs are unable to engage with emissions trading schemes due to high costs and administrative hassles, Also, SMEs do not favour direct regulations but paradoxically, tend to view legislative action as the only way to ensure environmental responsiveness. But literature does not make any contributions, so far, into whether SMEs are aware of environmental taxation and what they think of it as they are undoubtedly affected by it.

Given the findings within the literature and the NetRegs environmental survey on SMEs, it is assumed that SME awareness of environmental taxation as a policy may be affected by the

independent variables mentioned above and the following hypothesis is aimed at investigating that:

H3: There is poor awareness of environmental taxation in groups within SMEs.

5.6 Hypothesis 4: Attitude to environmental taxation

This hypothesis covers opinions and attitude towards environmental taxation within SMEs. Now what do we mean by environmental attitude and how do we actually measure them? Individuals have positive, negative or perhaps neutral feelings about objects, issues and people etc. These feelings, albeit intangible, are what we understand as attitude. For the purpose of this discussion, attitude is understood as something intangible that is held towards something specific such as an object or a particular subject (Rollinson, 2008; Allport, 1954), that is, feelings about a particular subject which stem from a combination of beliefs and values (Rollinson, 2008), is relatively enduring and learned from experiences (Rollinson, 2008).

Attitude can affect our behaviour. How businesses feel about certain situations or matters can shape their behaviour towards them. As individuals, people can differ in their attitude and emotions (Rollinson, 2008) as can businesses as they are run by individuals and nowhere is this more relevant that in the case of SMEs where literature has shown that SME owner-manager attitude often translates into their business attitude (Chapter 2). Environmental taxes have been designed with the purpose of shaping positive environmental attitudes and behaviours. It does so by incentivising those who pollute less and therefore can pay lower taxes.

However if marginal abatement costs are high then it is perhaps likely that the polluter - in this case SMEs - will carry on polluting. It is often assumed that both pollution reduction and the financial goals of the government would be achieved through environmental taxes. But this assumption is valid when both revenue goals and behavioural effects from the paying firms are achieved. For example, in SMEs, in the immediate period following the levying of

environmental taxes, the business will incur direct cost effects (Verbeke and Coeke, 1997), while later on behavioural effects may be observed if the SME invests in pollution reduction technology. While this all seems to be desirable consequences, if the government is expecting steady revenue then behavioural effects can result in the unintended consequence of reduced revenue. To mitigate this, if the government increases the tax then the environmental policies may begin to lose their credibility (Verbeke and Coeke, 1997) and high rates of tax may also potentially drive the SME out of business.

It might prove too costly to the business to update its technology or engage in processes to reduce its impact on the environment. For SMEs, this situation is slightly more complicated. For an instrument to have a positive behaviour changing potential, there needs to be at least two factors - a) there is enough information regarding the tax instrument, its purpose and its implementation and b) that it is easy and affordable to change behaviour. Positive environmental attitude can only translate into positive environmental behaviour if the intentions can be translated into reality in a low cost way. The effectiveness of any environmental policy largely depends on how polluters respond to it (Pearce, 1991). To realize the effects offered by, say, economic instruments, polluters need information about costs, benefits, abatement costs and technology-related information etc (Fullerton and Metcalf, 1997; Fullerton and Metcalf, 2001). The existing organization structure of SMEs is not always well suited to deal with all these issues. Often managed by the owner, SMEs do not always have the resources to make changes such as newer investments and organizational adjustments.

Given the findings within the literature and the reiteration of the effect of the independent variables on awareness - as found through the NetRegs survey (2009) - it is assumed that awareness of environmental taxation is the first step towards integrating SMEs into the wider discussion of environmental taxes. Thus the effect of the independent variables needs to be understood and the following hypothesis is aimed at investigating that:

H4: There are poor attitudes towards environmental taxes in groups within SMEs

5.7   Hypothesis 5: Association of attitude to environmental issues and taxation

This hypothesis covers the association between SME environmental attitude and their attitude towards environmental taxation. Although there has not been any study in the past that attempts to find the association between the two, the literature findings within Chapters 2 and 3 provide an indication that there may be a relationship between these two variables. Bonifant et al (1995) contend that a proactive environmental position of an SME can lower the current and future costs of compliance. There is also an argument that regulatory influences, in the environmental context, do not appear to prompt environmental innovation except under particular circumstances i.e. when regulation was properly crafted(Porter and van der Linde, 1995a, 1995b).

This could indicate, by extrapolation for SMEs, that there is no direct association between their attitude towards other environmental policies and their adopting innovative steps and newer technology to mitigate their impact on the environment. On the other hand Hutchinson (1996) finds that environmental regulation encourages better environmental management practices. These findings are in the context of environmental regulation where on one hand the literature discussion has found that SMEs do not favour direct regulation and on the other hand they tend to see direct legislative action as the only way to ensure that businesses become more focused on their environmental impact (Rutherfoord and Spence, 1998). However this needs to be explored further to make any conclusive arguments about whether these arguments lend any support in the context of environmental taxation. Even the SME environmental survey conducted by NetRegs (2009) found that evidence linking sector, size, and information variables to SME awareness of environmental issues and environmental legislation did not attempt to understand if there is any link between attitude towards environmental attitude and attitude towards environmental legislation.

The researcher feels that this is a significant gap within the literature which this investigative hypothesis will attempt to answer. Although such exploration is best done through qualitative findings such as interview data, the researcher feels that the data gathered through the questionnaire survey has the potential to test this assumption and then further interview findings would lend more evidence towards this investigative hypothesis. Although this hypothesis is derived from the literature, the researcher is aware that the wording of the hypothesis needs to be carefully phrased so not to imply that this hypothesis has been tested through past studies or environmental surveys.

Given the above literature findings, the researcher makes a subjective assumption that SME environmental attitude can have an association or effect on SME attitude towards environmental taxation and the following hypothesis is aimed at investigating that:

H5: There is an association between attitude towards environmental issues and attitude towards environmental taxation in groups within SMEs.

5.8 Hypothesis 6: Attitude and behaviours

This hypothesis stems from the literature on the link between SME environmental attitude and their environmental behaviour. Literature in Chapter 2 shows that sometimes although SMEs have a positive attitude towards environmental issues, that is, they agree to take responsibility for the impact of their actions on the environment, there is a gap between that environmental attitude and their actual actions (Tilley, 1999; Rutherfoord et al, 2000). This gap can be attributed to barriers to better environmental behaviours within SMEs which include constraints of resources of time and money, business priorities, perceptions of costs versus benefits and short-term business survival focus (Worthington and Patton, 2005; Hillary, 1999; Gerrans and Hutchinson, 2000; Tilley, 1999; Friedman et al, 2000, Rutherfoord et al 2000). SMEs are marred by such constraints which prove to be a significant obstacle to changing their behaviour towards a better focus on environmental issues. Similarly, in the context of environmental policies, literature shows that SME actions

towards the environment such as recycling of waste are found to be driven by financial considerations and not environmental impact (Friedman et al, 2000, P.335). SMEs have a strong antipathy towards regulatory measures due to a lack of clear communication (Vickers et al, 2005) and their attitude towards compliance with regulations is usually from a reactive stance (Simpson et al, 2004; Vickers et al, 2005). They are cynical about the benefits of self-regulation (Hillary, 2000, p.18) and are known to complain about the complexity and burden of policy instruments (Aiyub et al, 2009). Other instruments such as trading schemes are not practical for SMEs as mentioned before and although SMEs view legislation as valuable, they are also largely unaware of the current environmental legislation (NetRegs, 2009; Gerrans and Hutchinson, 2000).

The gap between attitude and behaviour towards the environment means that there is substantial disparity between environmental performance and environmental aspirations and this could be owing to a lack of information on environmental issues. This is because SMEs are mostly owner-managed whose owners work long hours and are responsible for numerous concurrent business tasks and therefore have little time or money to learn about environmental issues or policies (Spence, 1999; Friedman et al, 2000; Hillary, 1999: Rutherfoord et al, 2000). However, this may be very relevant for smaller businesses within SMEs and as the NetRegs survey found, larger businesses within SMEs have more resources available to them to have more environmental understanding and awareness (Worthington and Patton, 2005).

Chapter 2 discusses the literature on the influence of attitude on behaviour. Ajzen and Fishbein (2005) distinguish between the two types of attitude, namely, a general attitude towards racial groups, physical objects, policies and events, and an attitude towards performing a specific behaviour with respect to an object or target, for example, an attitude towards putting recyclable waste in the right bin. Although the literature largely focuses on influence of attitude on behaviour it also says that there is no link between attitude and behaviour (Corey, 1937). Other authors such as Bernberg (1952); Vroom (1964), Himelstein

& Moore (1963), De Fleur & Westie (1958), Linn (1965), Freeman & Ataoev (1960), Dean (1958), Wicker & Pomazal (1971) support this. For anyone inclined to rely on attitude to predict behaviour, the results of the above studies were discouraging because they found that attitude was a poor predictor of actual behaviour.

Literature shows that there can be two different kinds of inconsistency between verbal attitude and overt behaviours (Schuman & Johnson, 1976) one of which is the contradiction between what people say they will do and what they actually do (LaPiere, 1934). This type of inconsistency which can stem from having the behavioural intention but failure to act accordingly is termed as literal inconsistency (Fishbein & Ajzen, 1975). The second type of inconsistency, known as evaluative inconsistency, is gauged through ascertaining a general broad attitude towards the object of behaviour through a survey or a questionnaire. In this type of inconsistency, people/participants do not expressly state their behavioural intentions (De Fleur & Westie, 1958; Himelstein & Moore, 1963; Wicker, 1969), rather the degree of inconsistency in attitude-behaviour was assumed to be influenced by factors such as the person involved and the conditions under which the general attitude is expressed. So in the context of SME environmental behaviour and their attitude towards environmental issues and policies, the researcher contends that the independent variables could be strong enough to influence this gap between attitude and behaviours.

Given the above literature findings it is assumed that the SME gap between environmental attitude and behaviours can be better investigated and explained through understanding the effects of the independent variables on them and the following hypothesis is aimed at investigating that:

H6: There is an association between a) attitude to environmental issues, b) environmental taxation and c) environmental behaviours in groups within SMEs.

5.9   Summary

The Figure 18 flowchart on the following page depicts the link between the hypotheses and the research questions for the study. In this chapter, the researcher sets out the six hypotheses which are tested in this study in order to answer the research questions. The hypotheses are formulated using excerpts from the literature review as set out in Chapters 2 and 3 and then tested and reported using survey responses and further explained through interview findings in Chapters 6 and 7 respectively. These hypotheses are the bases on which the findings of the study are presented. The purpose of presenting the process of deriving the hypotheses from the literature is to show the formulation of the testable hypotheses. The data collected from the survey are the data to test the hypotheses.
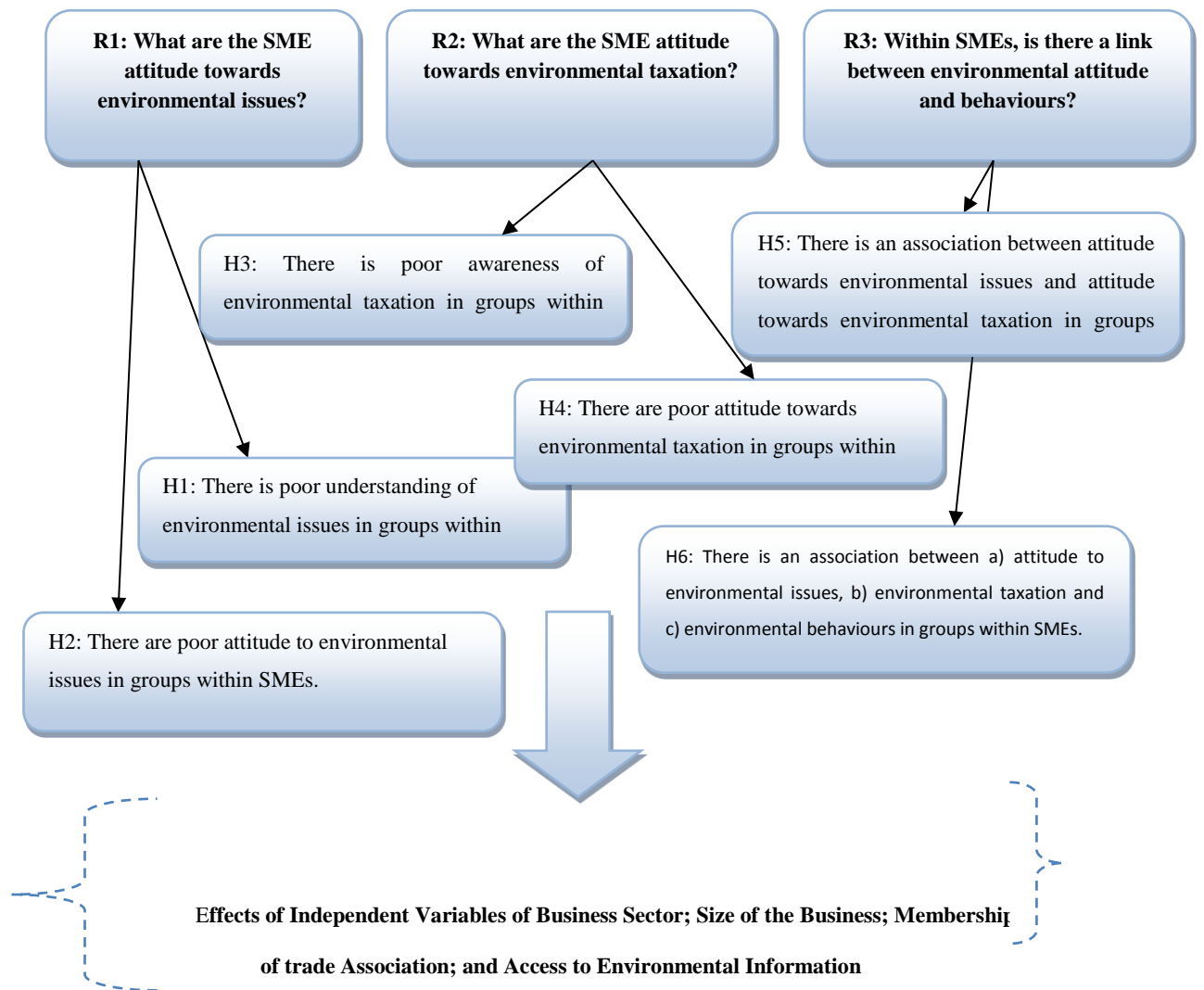
Figure 18: Research Questions – Hypotheses – Independent Variables

The Figure 18 above depicts the hypotheses 'tree' generated from the hypotheses formulated in this chapter and their link to the research questions. Within the chart 'R' stands for research questions and H stands for hypothesis. The following chapter presents the findings from the statistical tests of the hypotheses.

6   Analysis and Interpretation of Survey Results

6.1   Introduction

In the previous Chapter 5, the researcher set out the hypotheses which are tested in this study to answer the research questions. The hypotheses were derived from the literature review as shown in Chapters 2 and 3 and then tested using survey questionnaires and supported by semi-structured interviews. Statistical tests were conducted to test the hypotheses and were based primarily on responses to the survey questions. The study also used interview findings as further evidence to reinforce the results of the survey. The interview results are reported in the next Chapter 7.

In this chapter, the researcher presents an analysis of the primary data collected through self-completion questionnaires tested through a series of hypothesis tests. The chapter reports on the findings and also uses selective tables and graphs to illustrate the results from the statistical tests. All statistical tests were conducted using SPSS 18 software. The purpose of the tests conducted in this chapter is to gain support for or against the hypotheses that were developed in Chapter 5.

6.2   Hypotheses

In this chapter the six hypotheses that were formulated from the literature are tested with a series of statistical tests using the software SPSS 18. The hypotheses are summarised below:

Hypothesis H1: *There is poor understanding of environmental issues in groups within SMEs.*

Hypothesis H2: *There are poor attitudes to environmental issues in groups within SMEs.*

Hypothesis H3: *There is poor awareness of environmental taxation in groups within SMEs*

Hypothesis H4: *There are poor attitudes towards environmental taxation in groups within SMEs.*

Hypothesis H5: *There is an association between attitudes towards environmental issues and attitudes towards environmental taxation in groups within SMEs*

Hypothesis H6: *There is an association between a) attitudes to environmental issues, b) environmental taxation and c) environmental behaviours in groups within SMEs.*

6.3 Questionnaire and interpretation of categories

The questionnaires were self-completion questionnaires (see Appendix 3). The researcher has used, in some cases, terms such as 'definitely important', 'important', 'probably important', and 'no opinion'; while in other cases the term 'do not know' has been used similarly to 'no opinion'. In the context of Hypothesis 2 in research question 2 (R2H2) in QB8[45] (which asks respondents to rate the importance of environmental taxation as an instrument to mitigate climate change), the researcher believes that ratings such as 'no opinion' imply a 'lack of sufficient knowledge to form an opinion' which is similar to the term 'do not know' (QB9 in the context of R2H2). Consequently, 'no opinion' or 'do not know' responses to the importance and purpose of environmental taxation are considered inadequate to provide an understanding of the respondent's true feelings towards the use of environmental taxation as an instrument to mitigate climate change. However, the researcher is mindful of the possibility of 'no opinion' or 'do not know' responses being classified as being a lack of interest in the survey itself, but has chosen to interpret these two response categories as 'lack of sufficient knowledge to form a meaningful opinion' to ensure that responses falling within these categories are properly addressed.

6.3.1 Questions within the questionnaire

For the analysis of the survey data, the researcher used most, but not all, questions from the questionnaire. A few questions were redundant in relation to the final hypotheses adopted. For example, responses to questions regarding the age of SME owner-managers and their

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[45] QB8 is Question number B8 in section B of survey questionnaire.

annual turnover could not be used because there were not enough responses to those questions. These questions were included in the questionnaire to keep the scope rather wider than the precise hypotheses. A further few could not be used because of response rate and missing values, mostly due to the low response rate in this study. Questions such as B7 'Elaborate on the choice as indicated in B6' was an open-ended question which none of the respondents answered and therefore could not be used. Similarly for questions B12 'What kind of information do you receive?' and B13 'Please write the name of the agency or trade association (TA) that sends you the environmental information' were both open-ended and could not be used because there was no response to them. The researcher believes that while it is important to frame the questions with the intention of using all of them in the data analysis, this is by no means a limitation of the study because the analysed questions were sufficient on their own terms to fulfil the requirements for testing the hypotheses.

6.4   The respondents

6.4.1   Who are they and response rate

A total of 99 (13.2%) out of a sample of 750 responded to the self-completion questionnaire. A random sample of 750 manufacturing and transport SMEs, based on size (by numbers employed), was targeted out of a database of nearly 950 firms painstakingly created with the help of local business directories and local business organisations. In the absence of an available up-to-date database on SMEs in the region, the database generation took a considerable amount of time because it was necessary to check and re-check if the businesses included in the database met the criteria.

Non-response: Non-response bias refers to a situation in which people who don't return a questionnaire have opinions that may be different from the opinions of those do who return their surveys .In small business research low response rate to survey questionnaires have always been an issue (see Section 4.7). Of the 750 survey questionnaires sent out to small business owner-managers only 99 were filled and returned which rendered the response rate

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fairly low at 13.2%.The response rate after the first mailing was just under 52 questionnaires and after a second stage of follow up questions another 47 responded bringing the total up to 99. The standard way to test for non-response bias is to compare the responses of those who return the first mailing of a questionnaire to those who return the second mailing. Those who return the second questionnaire are, in effect, a sample of non-respondents (to the first mailing) and it is safe to assume that they are representative of that group. In this case, there were significant discernible differences between the responses of the first group of 52 and the second group of 47.

The survey questionnaires were specifically addressed to the owner-managers to access the potentially strongest influence within the firm (Spence & Rutherfoord, 2000)[46].

Manufacturing and transport SMEs were chosen for a number of reasons. Firstly, through IO analysis it was ascertained that these two sectors are high users of those energy inputs that are liable to environmental taxation (see appendix 5). Secondly, Supplementing that information with SME statistics 2009 (ONS, 2010), Table 13 below shows penetration of SMEs in the private sector in South West England by employment, turnover, and number of enterprises for each industry sector. SMEs account for more than 70% of all employment in the South-West (BIS, 2008) and between 2007-2008, the number of enterprises in this region increased by 9.2% which is the highest increase in the whole of the UK; employment increased by 0.9% and turnover increased by 2.4% (BIS, 2008).

The researcher also chose to send survey questionnaires to a random sample within these two sectors to see how the sector differences may or may not have any influence on responses.

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[46] For more details on SME owner-managers chapter 2.

Percentage	A,B[47]	C,E	D	F	G	H	I	J	K	M	N	O
Enterprises (%)	6	0	6	22	11	4	4	2	25	4	6	10
Employment (%)	4	2	13	12	17	7	5	6	19	2	7	6
Turnover (%)	3	6	22	11	28	4	5	-	16	1	3	3

Table 13: Businesses in South West England

The response rate confirmed the literature findings about the low response rates of SME surveys (see Section 4.11 Chapter 4). The researcher, in an attempt to increase the rate of response, sent follow-up questionnaires and made calls, and after a number of attempts the rate of response did not increase so the researcher decided to use the already-received responses and start the analysis.

6.4.2 Awareness of climate change and understanding of it

All respondents expressed the view that they were fully aware of the term/phrase 'climate change'. This was significant because it determined at the outset that climate change is not an alien concept to any of the SME owner-managers. However, their understanding of the meaning of climate change varied considerably.

- Sector differences (%)

- % responses to each meaning

Since the responses could only be within the categories given in the questionnaire, the researcher is aware that this could have been a potential limitation in the sense that respondents might have had a different answer to what climate change meant to them if it

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[47] Standard Industrial Classification Codes-A,B: agriculture, hunting, forestry, fishing; C, E: mining, quarrying; electricity, gas and water supply; D: manufacturing; F: construction; G: wholesale, retail, repairs; H: hotels and restaurants; I: transport, storage, communication; J: financial intermediation (excluding turnover); K: real estate, renting and business activities; M: education; N: health and social care; O: other community, social and personal service activities

was an open-ended question. However, to be able to statistically analyse the responses it was only possible to use close-ended responses. 100% respondents replied to this particular QA2 on 'What do you understand by the term climate change' thereby potentially demonstrating that respondents agreed to the response categories they were asked to choose from.

6.5   Hypothesis test

In this section, the six hypotheses developed in Chapter 5 are subjected to a series of significance tests, using data obtained from the questionnaire survey to test the dependent variables for differences among the categories of independent variables. For the responses to each question (considered relevant for each of the hypotheses) the researcher conducts, presents and discusses the following significance tests:

- Pearson's chi-square test is based on the concept of 'comparing the frequencies you observe in certain categories to the frequencies you might expect to get in those categories by chance' (Field, 2009, p.688). While a chi-square test does not assume that the data is continuously normally distributed[48] it has two important assumptions. The first is that each entity contributes to one corresponding cell in the contingency table (Field, 2009) and secondly that the expected frequencies should be greater than 5, otherwise it may result in loss of statistical power (Field, 2009; Howell, 2006) although in contingency tables larger than 2x2 it is acceptable to have 20% of the expected frequencies below 5.

- Mann Whitney test compares two conditions where different participants take part in each condition and the resulting data violate any assumption of the independent *t*-test (Field, 2009, p.551).

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[48] Categorical data cannot be normally distributed because they are not continuous (Field, 2009, p.691)

- Kruskal-Wallis[49] test compares several conditions where different participants take part in each condition and the resulting data violate an assumption of one-way independent ANOVA (Field, 2009, p.572). If the value of the *Asymptotic Significance* is less than .05 then the groups are significantly different.

6.5.1 Hypothesis 1
H1: There is poor understanding of environmental issues in groups within SMEs.

In addressing the above hypothesis, the researcher considered the responses to questions A1, A2, A3, A4, A5, B10, D1, D2, and D6 in the questionnaire. The questions elicited respondents' awareness (QA1) and understanding of climate change issues (A2), their perceptions of businesses' impact on climate change (A3, A4, A5) within groups of SMEs categorised by sector (D1), size (D2), their membership of a a respected trade association (TA) (D6) and whether or not they received any information on environmental issues (B10). The responses to these questions, when subjected to statistical analysis and interpretation, help decide whether there is support or otherwise for the hypothesis. Prior to conducting the hypothesis test the researcher would like to describe the independent variables using descriptive statistics to clarify what kind of variables these are and what is the frequency of responses to them because these variables will be used again and again for all the hypotheses tests.

6.5.1.1 Independent variables
As mentioned in Chapter 5, four independent variables of business sector, business size, business membership of a a trade association (TA) and information received on environmental issues, are the main groups within which significant differences would be tested for the other dependent variables. The independent variables were derived from the literature and information on them sought through questions in the survey questionnaire as shown below:

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[49] SPSS converts the Kruskal Wallis (KW) statistic to an equivalent chi-square statistic and reports the probability of the latter.

QD1: What sector is your business in?

QD2: How many people are employed in the business?

QD6: Are you a member of any TA?

QB10: Do you receive any information related to environmental issues and/or environmental policy?

The responses that the above questions yield are categorical nominal[50] variables. Questions D1, D6 and B10 provide the respondent with two options to choose one from and QD6 provides three options – 0-9[51]; 10-49; 50-249 – to choose one from. The researcher chose to treat the independent variable 'size' as a nominal one although it could have been translated into an ordinal[52] variable. The researcher decided to arbitrarily assign numbers 1, 2 and 3 to each of the categories within the size variable.

The following Table 14 reports the descriptive statistics for each of these variables.

	Count								
	Sector D1		Size D2			Membership of a TA D6		Information received on environmental issues B10	
	Manufacturing	*Transport*	*Micro*	*Small*	*Medium*	*Yes*	*No*	*Yes*	*No*
	62.6%	33.3%	44.4%	35.4%	14.1%	65.7%	32.3%	37.4	62.6

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[50] Numbers merely represent names and have no meaning.
[51] 0-9 is micro-sized enterprises; 10-49 small and 40-249 medium-sized enterprises. This definition of SMEs by size through numbers employed is that of the European Commission (2003)
[52] Data that tell us not only that things have occurred but also the order in which they have occurred. These data tell us nothing about the differences between values (Field, 2009, p.790)

Mode	1	1	1	2
	Valid= 95; Missing=4	Valid=93; Missing=6	Valid=97; Missing=2	Valid=99

Table 14: Frequency distribution of independent variables

It can be seen from the table above that of the total 99 responses received to the survey, almost all respondents replied to the questions which determine the independent variables. Within those questions, there are arbitrary values assigned to the categories to make the data usable statistically. Therefore 'manufacturing' is '1', 'transport' 2; 'micro' 1; small 2, 'medium' 3; 'yes to membership' is 1, 'no' is 2; 'yes to information received' is 1 and 'no' is 2. The above table also reports the mode which is the most frequently occurring score in a set of data (Field, 2009) and shows that for D1 'sector' the mode is 1 (i.e. manufacturing); for D2 the mode is 1 (i.e. micro-sized businesses); for D6 the mode is 1 (i.e. the group that has membership of a a TA); and for B10 the mode is 2 (i.e. those who do not receive any environmental information).

The following sections discuss the questions relevant to each hypothesis and present the test results and also the descriptive statistics.

QA2: What do you understand by the term 'Climate Change'?

The first question A1 sought information from the SMEs on whether they were aware of climate change. SME owner-managers - all the respondents - answered that they were aware of climate change in response to question A1 which asked if they had heard of/were aware of climate change. The climate change discussion has moved on from the debate between the skeptics and the others on whether it is real or a figment of our imagination to the view that it is a real threat to our planet and steps need to be taken to mitigate it (Stern Review, 2006). So it came as no surprise that all respondents said that they were fully aware of climate change. But QA2 tried to ascertain whether what SMEs understood by climate change was

varied, that is, whether there were influences of sector, size and the two other independent variables on their subjective perception of the meaning of climate change.

The responses were subjective only in the limited sense that the respondents were free to choose one from the categories they were asked to tick. This could potentially mean that there may have been other responses they would have chosen to give but were restricted in doing so. However, the researcher framed the question and the categories of responses within it such that it would potentially include all responses including those from both climate change believers and skeptics. Five categories of responses were provided and the respondents were asked to choose one that matched their opinion the most. Also all potential responses were worded separately in such a way that there was no overlap of meaning and that it would make it easier for respondents to clearly decide what response was the one they agreed with the most. Since the sample size targeted was 750, so the response categories were limited to only five for QA2 as it was expected that too many response categories would dilute the findings and make each category sample so small that it would render the statistical tests insignificant.

An SME owner-manager who agrees that climate change is a real concern and understands it from a scientific point of view, that is, that climate change is accelerated by human activity, will be the first step towards engaging him/her in the wider discussion on mitigation of climate change with the help of the economic instrument of environmental taxation. In this respect, if H1 is proved correct, the researcher expects to confirm the perception that poor understanding of climate change within SMEs is the reason behind their lack of active interest and participation in the climate change discussion. Given the fact that SMEs are responsible for more than 70% of total global pollution and more than 60% of total carbon emissions, it is only reasonable to expect that increased awareness would change their behaviour and attitudes towards climate change.

6.5.2   **Evidence from questionnaire**

About 60% responses were received from the manufacturing sector and 40% from the transport sector. To prove the alternative hypothesis H1, each categorical variable needs to be tested statistically to explore, and if extant, to establish the relationship. The numeric values that are attached to each category, such as '1' for manufacturing and '2' for transport sectors, are arbitrary and meaningless. When using categorical variables such as these it is only useful to analyse frequencies i.e. the number of entities in each combination.

For example, to test whether perceptions of climate change through subjective descriptions bear any relationship to the sector the business belongs to, there are two variables: sector and meaning of climate change. By combining categories we end up with six categories. Then we can count how many respondents (i.e. SME owner-managers) fall within each category. Then we can tabulate these frequencies in what is known as a contingency table (Field, 2009). The following Table 15 is a compilation of the cross-tabulation tables produced by SPSS which contains the number of cases that fall into each combination of categories and is very much like a contingency table.

QA2	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Natural permanent change...	29.3%	21	8	10	16	3	21	7	10	19
Man-made changes…	13.1%	7	6	8	5	0	10	3	3	10
Natural global warming…	22.2%	11	10	8	5	5	12	10	8	14
Both natural and	35.4%	23	9	18	9	6	22	12	16	19

manmade …											
Valid=99; Missing=0; Mode=4[53]											

Table 15: Sector; size; membership, information received, *meaning of climate change

We can see that of the total 62 manufacturing sector respondents for the question on 'meaning of climate change' 21 of them described climate change as '*Natural permanent change in global climate*' (33.8% of the total respondents from manufacturing) and 7 said 'man-made climate changes' (11.3% approx. of the total respondents from manufacturing), 11 said 'man-made changes in climate' (17.8% approx. of the total respondents from manufacturing) and 23 said 'changes in climate owing to both man-made and natural factors' (37.1% of the total respondents from manufacturing). Similarly, for the respondents who answered 'natural permanent change in global climate' 24% were from transport and 33.8% from manufacturing; for the second answer, only 9.7% were from transport and 11.3% from manufacturing; and for the third and fourth reply categories, 30.3% transport and 17.8% manufacturing, and 27.3% transport and 37.1% manufacturing. In summary, more respondents from manufacturing thought that climate change is a natural process and more respondents from transport thought that climate change is one and the same thing as global warming although a natural process according to them. The Figure 19 bar diagram below shows that of all the responses received, most of the respondents believed that climate change is a combination of both man-made and natural factors. So this means that while they agreed that man-made factors may accelerate the problem of climate change, they also thought that the planet is undergoing its own climate change over its life cycle.

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[53] Mode is the most frequently occurring score in a set of data.
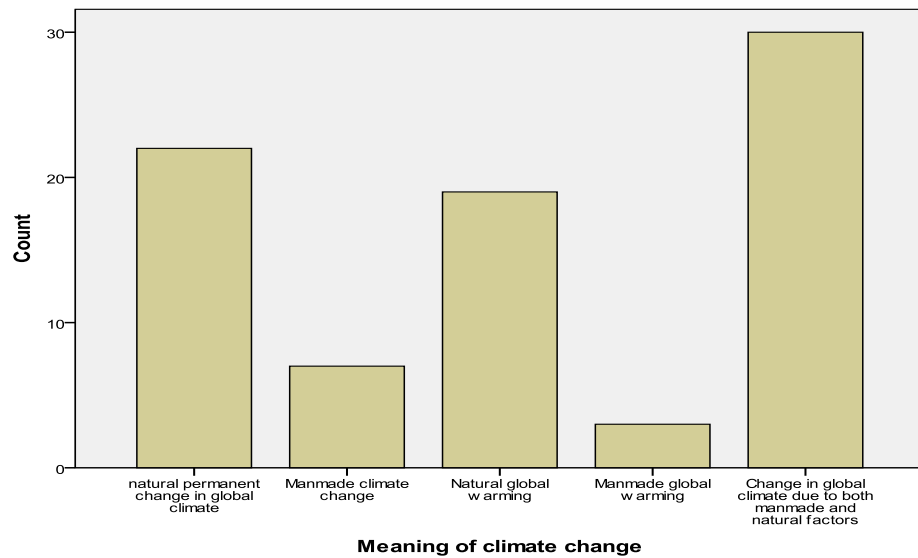
Figure 19: Distribution of responses to 'Meaning of climate change'

To see if there is sufficient evidence to reject the null hypotheses, chi-square tests were conducted. A series of other test results including the 'likelihood ratio', reported in the above table, confirms the findings of the main chi-square results and given the smaller size of sample, chi-square is the preferred test here (Field, 2009). The Table 16 below shows the set of null and alternative hypotheses for H1 and the statistical test results.

The statistical tests were necessary to see if there is any association between factors/variables of business sector, size (according to numbers employed) of the SME, business membership of a TA, environmental information dissemination by government agencies and SME subjective opinion on the meaning of climate change. The individual test results show no significance and therefore SME owner-manager responses to the meaning of the term climate change bear no relationship to these external variables.

Set of null and alternative hypotheses	H^{54}_0: Within SMEs, the meaning of the term 'climate change' is not associated with the sector the business is in H_1: Within SMEs, the meaning of the term 'climate change' is associated with the business sector	H_0 : Within SMEs, meaning of the term 'climate change' is not associated with the size of the business H_1: Within SMEs, the meaning of the term 'climate change' is associated with the size of the business	H_0 : Within SMEs, the meaning of the term 'climate change' is not associated with the business membership of a a TA. H_1: Within SMEs, the meaning of the term 'climate change' is associated with the business membership of a a TA	H_0 : Within SMEs, the meaning of the term 'climate change' is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, the meaning of the term 'climate change' is associated with information on environmental issues received by SMEs
Pearson's Chi-Square Test $\overline{x}$	$\overline{x}$ (3)[55]=3.556	$\overline{x}$ (6)=10.274	$\overline{x}$ (3)=3.014	$\overline{x}$ (3)=2.289
Asymp. Sig. (2-sided)	.314	11.768	3.015	2.349
Likelihood Ratio	3.507	.114	.389	.515

Table 16: Link between meaning of climate change and independent variables

In conclusion, it is found that although all respondents are aware of climate change, there is no association between subjective responses to the meanings of climate change and the independent variables.

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[54] Within the tables, H_0 and H_1 refer to the null and alternative hypotheses and this numbering is used throughout for all hypotheses H1, H2, H3, H4, H5 and H6

[55] (3) is the degrees of freedom: the number of entities that are free to vary when estimating some kind of a statistical parameter..has a bearing on significance tests for many commonly used statistics such as the chi-square and determines the exact form of the probability distribution for these test statistics (Field, 2009; p.784)

QA3: In your opinion, does business have any impact on climate change?

Gauging SME opinion on business impact on climate change may shed light on their inherent perceptions of their own actions on the environment and is seen by the researcher as a step towards eliciting a greater understanding of SME attitudes towards climate change. It is expected that an ideal business response would be not only to accept that business has a huge impact on climate change but also to know what kind of impact - through waste disposal, emissions, etc. - they cause, and consequently that could be a step towards encouraging thinking on how best to limit those impacts. In this respect, if H1 is proved correct then it would be expected to confirm the perception in the literature that SMEs are oblivious to their environmental impacts even though they cause a huge amount of pollution.

Evidence from the questionnaire

SMEs operate in almost every sector of the economy and there may be significant differences in perceptions of business impact across those sectors. Similarly there may be differences owing to the size of the business as smaller business such as a 1-2 person motor garage may have a significantly different understanding than a well-structured medium-sized manufacturer of motor parts. Similarly, differences may be observed for the other two variables, that is, membership of a a TA and whether or not information is received about environmental issues.

Table 17 below shows that the majority of respondents, nearly 71%, agreed that business has an impact on climate change. SME owner-managers are seen to be aware of the impact of businesses on climate change but this question does not conclusively explain what kind of impact they assume business has. QA4 explores that aspect of Hypothesis 1.

QA 3	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Yes	70.7%	45	21	27	24	13	42	28	27	43
No	26.35	14	12	15	11	0	20	4	9	17
Valid=96; Missing=3; Mode=1										

Table 17: Sector; size; membership, information received *Business impact on climate change

As seen from Table 18 below, no significant differences emerge in groups on the basis of sector or information received. But it shows that there is sufficient evidence to reject the null hypothesis for size and membership of a a TA. So this shows an association of responses to whether SMEs believe businesses have an impact on climate change or not and their size and the information on environmental issues that they receive.

Here for size, $\bar{x}$ (2) =6.344 and p is significant at 0.042 and for membership of a a TA $\bar{x}$ (1) =4.334 and p=.037. Table 17 above shows that those SMEs who are members of a TA are more likely to agree that their businesses have an impact on climate change and this could be due to interaction with other businesses through the TA and information they gain through such interactions which could have made them more aware. Also, a higher percentage of micro and small-sized SMEs agree that business has a significant impact on climate change. The following section on QA4 will attempt to elaborate on the differences within the group that have said 'Yes' to A3 on the basis of the moderating/independent variables.

| Set of null and alternative hypotheses | H_0: Within SMEs, perception of impact on climate change is not associated with the sector the business is in

H_1: Within SMEs, perception of impact on climate change is associated with the business sector | H_0 : Within SMEs, perception of impact on climate change is not associated with the size of the business

H_1: Within SMEs, perception of impact on climate change is associated with the size of the business | H_0 : Within SMEs, perception of impact on climate change is not associated with the business membership of a a TA.

H_1: Within SMEs, perception of impact on climate change is associated with the business membership of a a TA | H_0 : Within SMEs, perception of impact on climate change is not associated with the information on environmental issues received by SMEs

H_1: Within SMEs, perception of impact on climate change is associated with information on environmental issues received by SMEs |
|---|---|---|---|---|
| Pearson's chi-square test $\overline{x}$ | $\overline{x}$ (1)=1.666 | $\overline{x}$ (2)=6.344 | $\overline{x}$ (1)=4.334 | $\overline{x}$ (1)=0.127 |
| Asymp. Sig. (2-sided) | *P=0.197* | P=.042 | P=.037 | P=0.722 |
| Likelihood ratio | 1.636 | 9.886 | 4.719 | 0.127 |

Table 18: Linking perception of business impact on climate change and independent variables

So, in conclusion, the researcher found that the independent variables - size and membership of a a TA - have an impact on the business opinion on whether they have any impact on climate change.

QA4: What impact does business have on climate change?

The above section clearly showed that the numbers of SMEs that agree that businesses have an impact on climate change are much higher than those who don't agree. Within the group that agrees to that statement, responses to QA4 may assist in a better understanding of what kind of impact they believe they have. This could be an indicator in understanding how they think their or other businesses' actions are responsible and also shed light on what kind of replies they choose based on the categories provided in the questionnaire. The researcher is aware that similar to QA2 above, the responses here may have inherent limitations as they are categorised into 5 response categories and respondents were asked to choose one. While this facilitated statistical analysis, an open-ended question might have also encouraged other responses. In this respect if H1 is supported then it would be expected to confirm the perception in the literature that within SMEs there is limited understanding of the kinds of environmental impacts businesses have.

Evidence from questionnaire

The Table 19 below shows that there are many missing cases in the responses to this question and only 59.6% replied to this question. The table also reports the numbers of responses within each group to give an idea of how the responses are distributed which may have a significant impact on the tests.

QA4	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Depletion of natural resources	7.1%	5	2	1	4	0	4	3	3	4
Increased CO_2	30.3%	18	10	13	8	6	17	13	9	21

Emissions through energy use and waste	6.1%	4	2	3	3	0	4	2	1	5
All of the above	16.2%	11	4	5	7	4	11	5	9	7
Valid=59;Missing=40; Mode=2										

Table 19: Sector; size; membership, information received, *What impact does business have on climate change

Table 20 below shows that there is not sufficient evidence to reject the null hypotheses. There are no significant differences between the groups within SMEs on their responses to what kind of impact businesses have on climate change.

Set of null and alternative hypotheses	H_0: Within SMEs, perception of kinds of impact on climate change is not associated with the sector the business is in H_1: Within SMEs, perception of kinds of impact on climate change is associated with the business sector	H_0 : Within SMEs, perception of kinds of impact on climate change is not associated with the size of the business H_1: Within SMEs, perception of kinds of impact on climate change is associated with the size of the business	H_0 : Within SMEs, perception of kinds of impact on climate change is not associated with the business membership of a a TA. H_1: Within SMEs, perception of kinds of impact on climate change is associated with the business membership of a a TA	H_0 : Within SMEs, perception of kinds of impact on climate change is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, perception of kinds of impact on climate change is associated with information on environmental issues received by SMEs
Pearson's Chi-Square Test	$\bar{x}$ (3)=.415	$\bar{x}$ (6)=6.843	$\bar{x}$ (3)=0.766	$\bar{x}$ (3)=4.326
Asymp. Sig.	0.937	0.336	.858	.228

(2-sided)				
Likelihood Ratio	0.420	8.615	0.766	4.386

Table 20: Linking perception of business impact on climate change and independent variables

The Table 20 represents the results of Pearson's chi-square tests. So in conclusion, the test results show that there are no effects of these external variables on business responses to QA4. On the basis of this, the researcher accepts that these findings lend no support to Hypothesis H1.

QA5: In your opinion, why do you think business has no impact on climate change?

The significance of this particular question is that the responses to it show the reasons why the group that disagrees that there is an impact of businesses on climate change. Those who disagree would have reasons why they do not think their business or any other business has any impact and those responses may assist in understanding how the 'No' group of QA3 perceives climate change and also whether there are any influences of the external variables. In this respect, if these hypotheses are supported, they would be expected to confirm the perceptions that SMEs who are oblivious to their environmental impacts are so as a result of the effects of external variables.

<u>Evidence from questionnaire</u>

Table 21 below shows that there are nearly 77% missing responses and the large number of missing responses would adversely affect the statistical tests because it renders the number of cases in each group significantly small. There are no responses to this question from any business within the medium-sized business category.

QA5	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Climate change is natural	11.1%	6	5	5	6	-	8	3	4	7
Business impact is on environment not climate	1.0%	1	0	0	1	-	1	0	1	0
SMEs too small to have any impact	11.1%	6	5	8	3	-	8	1	3	8
Valid=23;Missing=76; Mode=1[56]										

Table 21: Sector; size; membership, information received, *No Impact? Why?

Table 22 below shows that there is insufficient evidence to reject the hypotheses. There are no significant differences between the groups within SMEs on their responses to why they perceive that business has no impact on climate change.

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[56] multiple modes exist. the smallest value is shown

Set of null and alternative hypotheses	H_0: Within SMEs, perception of why business has no impact on climate change is not associated with the sector the business is in H_1: Within SMEs, perception of why business has no impact on climate change is associated with the business sector	H_0: Within SMEs, perception of why business has no impact on climate change is not associated with the size of the business H_1: Within SMEs, perception of why business has no impact on climate change is associated with the size of the business	H_0: Within SMEs, perception of why business has no impact on climate change is not associated with the business membership of a a TA. H_1: Within SMEs, perception of why business has no impact on climate change is associated with the business membership of a a TA	H_0: Within SMEs, perception of why business has no impact on climate change is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, perception of why business has no impact on climate change is associated with information on environmental issues received by SMEs
Pearson's chi-square Test $\bar{x}$	(2)=.804	(2)=3.024	(2)=1.086	(2)=2.161
Asymp. Sig. (2-sided)	1.176	0.220	.586	.339
Likelihood ratio	.669	3.443	1.280	2.161

Table 22: Linking perception of no business impact on climate change and independent variables

The Table 22 above reports the results of chi-square and Kruskal Wallis tests which confirm that there is no statistical significance of differences between groups within SMEs. In conclusion, the researcher did not find any support for Hypothesis H1 from these findings.

Summary of tests conducted on Hypothesis H1

Table 23 below summarises the results of the statistical analyses conducted in deciding whether there is support or otherwise for Hypothesis H1 on responses obtained from the participants to Questions A1, A2, A3, A4, A5 in the questionnaire.

Question	Description	Finding
A1	Are you aware of the term 'Climate Change'?	Not supported
A2	What do you understand by the term 'Climate Change'?	Not supported
A3	In your opinion, does business have any impact on climate change?	Supported
A4	What impact does business have on climate change?	Not supported
A5	In your opinion, why do you think business has no impact on climate change?	Not supported

Table 23: Summary of Hypothesis H1

The analyses addressed the perceptions by SMEs of climate change, their subjective perceptions of the meanings of climate change; whether they believe or not that businesses have an impact on climate change; what kind of impact they might have and what reasons some of them have for not believing in the impact of business on climate change. Non-parametric statistical tests including chi- square and Kruskal Wallis tests were used to test the significance of the variables. The findings show partial support to Hypothesis H1 - **There is poor understanding of environmental issues in groups within SMEs -** in the light of

the results of the statistical analyses conducted from only QA3. On the basis of those findings the researcher concludes that these lend some support to Hypothesis H1.

6.5.3   **Hypothesis 2**
H2: There are poor attitudes to environmental issues in groups within SMEs.

In addressing the hypothesis, the researcher considered the responses received from the participants to Question A8 in the questionnaire and tested them against the independent variables. Question A8 is a group of nine Likert-type scale statements on a scale of 1 (Strongly Agree) to 5 (Strongly Disagree) to gauge respondents' opinions on those statements. The responses, when subjected to statistical analysis and interpretation, help to decide whether there is support or otherwise for the hypothesis.

QA8: Business and environmental issues

QA8 comprises nine statements as listed below:

A8.1   Business is the largest contributor to climate change

A8.2   Climate change is a huge challenge to mankind

A8.3   Climate change is a significant issue for my business

A8.4   Efficient energy use is important for my business

A8.5   SMEs are responsible for more than 70% of total pollution

A8.6   Pro-environmental attitudes do not always mean pro-environmental behaviour

A8.7   SMEs are highly suspicious of environmental policies

A8.8   In these economically-challenging times climate change has a low business priority

A8.9   My business has a responsibility to help manage the impact of climate change

In asking these statement questions the researcher attempted to gauge the attitudes of SMEs to environmental issues to contribute to the answer to the research question. Attitudes are best ascertained through Likert-type scale questions that help the respondent to decide how strongly he/she agrees/disagrees with this statement[57]. Previous environmental surveys on SMEs by Netregs (2009) and the British Chamber of Commerce (2008) used similar Likert-type scale questions to gauge environmental attitudes of businesses.

Evidence from questionnaire

Table 24 below presents the descriptive statistics including frequencies for QA8.The table shows that by and large, for most of the Likert-type scale statements within A8, more than 95% of respondents chose a response from the scale of Strongly Agree to Strongly Disagree.

		Frequency (%)						
QA8	Agree Strongly 1	Agree 2	Neutral 3	Disagree 4	Disagree Strongly 5	Median[58]	Total	Missing
A8.1	6.1	38.4	23.2	19.2	9.1	3.00	96.0	4.0
A8.2	9.1	64.6	16.2	1.0	5.1	2.00	96.0	4.0
A8.3	8.1	28.3	47.5	10.1	2.0	3.00	96.0	4.0
A8.4	40.4	44.4	11.1			2.00	96.0	4.0
A8.5	1.0	10.1	38.4	23.2	14.1	3.00	86.9	13.1
A8.6	10.1	56.6	25.3	2.0		2.00	93.9	6.1
A8.7	17.2	37.4	25.3	15.2	1.0	2.00	96.0	4.0
A8.8	1.0	32.3	31.3	25.3	6.1	3.00	96.0	4.0

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[57] For more details on how the questionnaire was constructed in please refer to Chapter…section…
[58] Median is the middle score in a set of ordered observations. When there is an even number of observations the median is the average of the two scores that fall either side of the what would be the middle value (Field, 2009, p.789)

A8.9	10.1	59.6	18.2	1.0	5.1	2.00	93.9	6.1

Table 24: Descriptive frequencies for statements within QA8

Each of the above statements in QA8 was tested statistically for significance with the independent variables and only the statistically significant test results are reported here. Comparisons between the groups within SMEs depending on the independent variables on the median responses to the dependent variable (i.e. A8.1-A8.9) are made using non-parametric Mann Whitney tests. Each table below reports the statistically significant findings for each of the independent variables.

Business sector: To compare between the groups within SMEs according to the sector they belong to on the median responses to the dependent variable (DV) opinion statements 'Business and Environmental Issues' were made using the Mann-Whitney U Test. Only in the case of two of the QA8 statements could the null hypothesis of equality of medians be rejected. These are as follows:

H_0 : Within SMEs, median response of the group which belongs to sector manufacturing= the median response of the group which belongs to sector transport on agreement with each statement in QA8

$\bar{x}$ M1= $\bar{x}$ M2 Where M1 and M2 are the groups of manufacturing and transport sector respectively

And $\bar{x}$ are the median responses to the dependent variable statements in QA8

H_1: within SMEs, median response of the group which belongs to sector manufacturing≠ the median response of the group which belongs to sector transport on agreement with each statement in QA8

$\bar{x}$ M1 ≠ $\bar{x}$ M2

where M1 and M2 are the groups of manufacturing and transport sectors respectively.

Table 25 below reports the significant test results of Mann Whitney tests conducted. Only in the case of two of the statements in QA8 (i.e. two dependent variables A8.1 and A8.9) could the null hypothesis of the equality of the medians be rejected. The table below confirms that the differences

Statistical test Results	*A8.1 Business is the largest contributor to climate change*	*A8.9 My business has a responsibility to help manage the impact of climate change*
Mann Whitney U	580.000	613.500
Equivalent-z	-2.830	-2.585
P(2-tailed)	0.005	0.010
Medians	Mdn1=2.00; Mdn 2=4.00	Mdn1=2.00; Mdn2=4.00

Table 25: Significant results for A8

between the responses of the SMEs within two sectors, manufacturing and transport, are statistically significant and therefore there is an impact of sector difference. Also there is a difference between the two sectors on their levels of agreement to the opinion statements. For example, SMEs in the manufacturing sector agree less strongly to the statement 'Business is the largest contributor to climate change' (Mdn1= 2.00) than SMEs within the transport sector (Mdn2=4.00) and similarly for the other statement A8.9 'My business has a responsibility to manage the impact of climate change'

In conclusion, it is found that sector differences affect the attitudes of SMEs towards certain environmental issues, if not all. On the basis of this argument the findings here lend some support to Hypothesis H2.

Business size: Size of business in terms of numbers employed. To compare between the groups within SMEs according to size by numbers employed (i.e. micro 0-9 employees;

small 10-49 employees and medium 50-249 employees) on the median responses to the DV opinion statements, 'business and environmental issues' were made using the Kruskal Wallis test. Only in the case of three of the DVs could the null hypothesis of equality of medians be rejected. These are as follows:

H_0 : *Within SMEs,the median response of the group which is in the category micro-businesses (M1) = the median response of the group small businesses (M2)= the median response of the group medium businesses (M3)*

$\bar{x}$ *M1=* $\bar{x}$ *M2=* $\bar{x}$ *M3, where M1, M2 and M3 are the groups according to size within SMEs and* $\bar{x}$ *is the median response to the dependent variables in A8.*

H_1: *Within SMEs, the median response of the group which is in the category micro businesses (M1) ≠ the median response of the group small businesses (M2) ≠ the median response of the group medium businesses (M3)*

$\bar{x}$ *M1 ≠* $\bar{x}$ *M2≠* $\bar{x}$ *M3*

The Table 26 below reports the significant test results of Kruskal Wallis tests conducted. Only in the case of three of the statements in QA8 (i.e. three DVs A8.5 and A8.6, A8.9) could the null hypothesis of the equality of the medians be rejected.

Statistical test Results	*Degrees of Freedom*	*A8.4 efficient energy use is important for businesses*	*A8.5 SMEs are suspicious of environmental policies*	*A8.9 My business is responsible for managing environment*
$\bar{x}$	2	20.654	19.363	7.774
P(2-tailed)		<0.001	<0.001	0.021

Table 26: Kruskal Wallis test results

In the case of significant Kruskal Wallis tests it is necessary to undertake pair wise Mann Whitney tests (MWs) to make pair wise comparisons amongst groups (see Hypothesis 5 below).

Table 27 below reports the significant findings of the pair wise MW tests which provide sufficient reasons to reject the null hypothesis.

test Statistical results	Micro (0-9) A8.4[59]	Small (10-49) A8.5[60]	A8.9[61]	Micro (0-9) A8.4[62]	Medium (50-249) A8.5[63]	A8.9[64]	Small (10-49) A8.4[65]	A8.5[66]	Medium (50-249) A8.9[67]
Mann Whitney U	325.500			165.00	73.500	151.00		80.5000	158.000
Equivalent-z	-4.354			-2.528	-4.281	-2.863		-3.761	-.2.205
P(2-tailed)	.000			.011	.000	.004		.000	.027
Median									

Table 27: Significant MW test results for pair wise comparison among groups

In conclusion, it is found that business-size differences affect the attitudes of groups within SMEs towards certain environmental issues, if not all. On the basis of this argument the findings here lend some support to Hypothesis H2.

Membership of a a TA: Comparisons between the groups within SMEs who are members of a TA and those who are not on the median responses to the DV opinion statements in

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[59] A8.4 Efficient energy use is important for businesses
[60] A8.5 SMEs are suspicious of environmental policies
[61] A8.9 My business is responsible for managing environment
[62] A8.4 Efficient energy use is important for businesses
[63] A8.5 SMEs are suspicious of environmental policies
[64] A8.9 My business is responsible for managing environment
[65] A8.4 Eefficient energy use is important for businesses
[66] A8.5 SMEs are suspicious of environmental policies
[67] A8.9 My business is responsible for managing environment

QA8 'business and environmental issues' were made using the Mann-Whitney U test. Only in the case of four of the DVs could the null hypothesis of equality of medians be rejected.

H_0 : *Within SMEs, the median response of the group which is a member of a TA = the median response of the non-member(TA) group with each statement in QA8*

$\bar{x}$ M1= $\bar{x}$ M2 where M1 and M2 are the groups of members and non-members of a TA respectively

And $\bar{x}$ is the median response to the dependent in A8.

H_1: *Within SMEs, the median response of the group which is a member of a TA $\neq$ to the median response of the non-member (TA) group on agreement with each statement in QA8*

$\bar{x}$ M1$\neq \bar{x}$ M2

The Table 28 below reports the significant test results of Mann Whitney tests conducted. Only in the case of four of the statements in QA8 (i.e. four dependent variables A8.2, A8.4, A8.5 and A8.6) could the null hypothesis of the equality of the medians be rejected. The Table 48 below confirms that the differences

Statistical test results	A8.2 Climate change is a huge challenge to mankind	A8.4 Efficient energy use is important for business	A8.5 SMEs are responsible for more than 70% of pollution	A8.6 Positive environmental attitudes do not always mean pro-environmental behaviour
Mann Whitney U	723.000	478.500	384.000	477.500
Equivalent-z	-2.450	-4.425	-3.804	-4.212
P(2-tailed)	.014	<.000	<.000	<.000

Medians	Mdn1=2.00;	Mdn1=1.00;	Mdn1=3.00;	Mdn1=3.00;
	Mdn2=2.00	Mdn2=2.00	Mdn2=4.00	Mdn2=4.00

Table 28: Differences within groups of SMEs based on membership and non-membership of a TA

between the responses of the SMEs within two groups, members and non-members of a TA, is statistically significant and therefore there is an impact of membership differences. Also there is a difference between the two groups on their levels of agreement with the opinion statements. For example, SMEs who are members of a TA agree less strongly to the statement A8.5 'SMEs are responsible for more than 70% of pollution' (Mdn1= 3.00) than non-members (Mdn2=4.00) and similarly for the other statement A8.9 'Positive environmental attitudes do not always mean pro- environmental behaviour'. The scope of the statistical tests does not extend the findings to why SMEs have such differences of opinion and what are possible reasons why some SMEs think, for example, that pro-environmental attitudes do not translate into pro-environmental behaviour. Interview findings would lend more insightful information to delve deeper and understand the underlying reasons and they are reported in the following Chapter 8.

In conclusion, it is found that membership differences affect the attitudes of SMEs towards certain environmental issues, if not all. On the basis of this argument the findings here lend some support to Hypothesis H2.

Information on environmental issues: To compare between the groups within SMEs according to whether or not they receive information about environmental issues on the median responses to the DV opinion statements 'Business and Environmental Issues' were made using the Mann-Whitney U Test. In the case of four of the DVs the null hypothesis of equality of medians could be rejected?

H_0 : *Within SMEs, the median response of the group which receives information = the median response of the group which does not receive any information with each statement in QA8*

$\bar{x}$ M1= $\bar{x}$ M2 where M1 and M2 are the groups of SMEs that receive and do not receive any environmental information.

And $\bar{x}$ is the median response to the dependent in A8.

H_1: *Within SMEs, the median response of the group which receives information ≠ the median response of the group which does not receive any information with each statement in QA8*

$\bar{x}$ M1≠ $\bar{x}$ M2

The Table 29 below reports the significant test results of Mann Whitney tests conducted. Only in the case of four of the statements in QA8 (i.e. four dependent variables A8.1, A8.2, A8.4 and A8.5) could the null hypothesis of the equality of the medians be rejected. The table below confirms that, the differences

Statistical test Results	A8.1 Business is the largest contributor to climate change	A8.2 Climate change is a huge challenge to mankind	A8.4 Efficient energy use is important for business	A8.5 SMEs are responsible for more than 70% of pollution
Mann Whitney U	650.000	770.000	643.500	1058.000
Equivalent-z	-3.375	-2.506	-3.610	-1.130
P(2-tailed)	0.001	0.012	<.000	.024

Medians	Mdn1=4.00;Mdn2=2.00	Mdn1=Mdn2=3.00	Mdn1=1.00;Mdn2=2.00	Mdn1=Mdn2=3.00

Table 29: Differences within groups of SMEs based on membership and non-membership of a TA

between the responses of the SMEs within two groups, the receivers and non-receivers of environmental information, is statistically significant. Also there is a difference between the two groups on their levels of agreement with the opinion statements. For example, SMEs which receive environmental information agree more strongly to the statement A8.1 that 'business is the largest contributor to climate change' (Mdn1= 4.00) than non-receivers (Mdn2=2.00). This is rather expected but surprisingly the group that receives information agrees less strongly on the statement 'efficient energy use is important for business' than the non-receivers (Mdn1=1.00; mdn2=2.00). The scope of the statistical tests does not extend the findings to why SMEs have such differences and what are the possible reasons behind the unexpected median differences for A8.4. This could be as a result of small sample size and/or missing responses.

In conclusion, it is found that environmental information causes differences within SMEs that affect the attitudes of SMEs towards certain environmental issues, if not all. On the basis of this argument the findings here lend some support to Hypothesis H2.

Summary of tests conducted on Hypothesis H2

Table 30 below summarises the results of the statistical analyses conducted in deciding whether there is support or otherwise for Hypothesis H2 on responses obtained from the participants to opinion statements in Questions A8 in the questionnaire.

Independent Variables	Opinion statements in QA8	Finding
Sector	**A8.1** Business is the largest contributor to climate	Supported for A8.1 & A8.9

		(MS)[68]	(MM)	(SM)
Size	change **A8.2** Climate change is a huge challenge to mankind **A8.3** Climate change is a significant issue for my business **A8.4** Efficient energy use is important for my business	Supported for A8.4	Supported for A8.4, A8.5, A8.9	Supported for A8.5 &A8.9
Membership of a TA	**A8.5** SMEs are responsible for more than 70% of pollution	Supported for A8.2, A8.4, A8.5 & A8.6		
Environmental information	**A8.6** Pro-environmental attitudes do not always mean pro- environmental behaviour **A8.7** SMEs are highly suspicious of environmental policies **A8.8** In these economically challenging times, climate change issues are a low priority **A8.9** My business has a responsibility to help manage the impact of climate change	Supported for A8.1, A8.2, A8.4 & A8.5		

Table 30: Summary of Hypothesis H2

The analyses addressed the attitudes of SMEs to business environmental issues and the differences between groups within SMEs based on the external variables. Non-parametric statistical tests including Mann Whitney U and Kruskal Wallis tests were used to test the significance of the variables. The findings lend some support to Hypothesis H2 - **There are poor attitudes to environmental issues in groups within SMEs,** in the light of the results of the statistical analyses conducted.

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[68] MS= Micro-Small; MM-Micro-medium; SM=Small-medium

6.5.4   **Hypothesis 3**

H3: There is poor awareness of environmental taxation in groups within SMEs.

In addressing the hypothesis, the researcher considered the responses to Question B3 (QB3) in the questionnaire. QB3 asked whether respondents had heard of the term 'environmental taxation'. This question elicited respondents' awareness of environmental taxation on the basis of whether they have or have not heard of it. The researcher believes that awareness and knowledge of environmental taxation is the first step towards increasing acceptance of environmental taxation and encouraging SMEs to engage in the wider discussion of climate change issues. This is because, as often happens, policies are designed to target larger businesses and then thrust them upon smaller ones without taking into consideration their level of awareness and their circumstances. The researcher believes that, in the absence of high awareness, the acceptance of environmental taxation as an instrument may be low. This may have an impact on the success of this instrument. It is expected that the responses to this question, when subjected to statistical analyses and interpretation, will help decide whether there is support for the hypothesis or otherwise.

QB3: Are you aware of the term 'environmental taxation'?

SMEs operate in almost all the sectors of the economy that are liable to environmental taxes. Environmental taxes work by providing incentives to pollute less and pay fewer taxes or pollute more and therefore pay more taxes. Environmental taxes are applied to usage of energy and disposal of waste etc., all of which are highly relevant to businesses. One of the key objectives of environmental taxation is to encourage behaviour change so businesses can work towards becoming more energy efficient, produce less emissions and waste, and work towards creating sustainable business activities. It is essential for all businesses, whether small or large, to engage in the wider discussion about environmental policies, especially environmental taxation, to be able to gauge the effectiveness of success of the instruments for environmental protection. Understandably, some business sectors would be more affected

by environmental taxes than others, depending on what kind of activities they are engaged in.

It has been argued in the literature that policies, especially environmental policies, are often designed for larger businesses that have more capability to understand and engage with them and then thrust upon smaller businesses that do not have the capabilities to deal with them. For instance, smaller businesses may find it increasingly difficult to change their technological capabilities or invest in energy efficient technology or less-polluting waste disposal and recycling activities and it might just be less costly for them to keep paying the taxes. Awareness and understanding may induce change and so it is essential to find out if SMEs are aware of the environmental taxation that affects them and whether they know that they pay such taxes as part of, say, their energy bills.

Since different sectors and different-sized businesses have different capabilities, it is also necessary to ascertain the effect of the moderating/independent variables on their awareness because it is expected that sector, size, information and perhaps membership of a a TA will have a causal effect on responses. Literature also shows that SMEs have poor attitudes towards environmental policies and that can easily stem from poor awareness and understanding. In this regard, if H3 is supported, the researcher expects to confirm the perception that poor awareness of environmental taxation exists in groups within SMEs that may have an impact on attitudes towards environmental taxation. This may have an adverse effect on fulfilling the objectives of environmental taxation, one of which is to change behaviour and become more environmentally conscious and thereby attract reduced taxes and be more sustainable.

Evidence from questionnaire

Table 31 below shows that there are more respondents – 51% - who are unaware of environmental taxation. For example, within the manufacturing sample, the highest level of awareness of environmental taxation is within the category 'Small (10-49 employees)'

businesses and those that are members of a TA which also receive environmental information. As expected, the lowest level of awareness of environmental taxation is within those SMEs which do not receive any environmental information. The table also shows that this particular group falls within 'Micro (0-9 employees)' businesses which is perhaps a reflection of the types of businesses surveyed. This micro category that has very low awareness of environmental taxation perhaps consists of respondents from only small garages or small transport businesses in the two sectors surveyed (i.e. manufacturing and transport).

QB 3	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Yes	42.4%	32	28	17	20	3	31	11	21	21
No	51.5%	10	19	23	15	19	28	21	16	35
Valid=93; Missing=6; Mode=2										

Table 31: Sector; size; membership, information received, *Awareness of environmental taxation

Table 32 below shows the set of null and alternative hypotheses for QB3 which were tested statistically against the independent variables. The test results show no sufficient reasons to reject the null hypotheses. To see if there is sufficient evidence to reject the null hypotheses the table below reports chi-square test results which confirm that there is no statistically significant difference between the responses of the groups within SMEs.

Set of null and alternative hypotheses	H_0: Within SMEs, awareness of environmental taxation is not associated with the sector the business is in H_1: Within SMEs, the awareness of environmental taxation is associated with the business sector	H_0: Within SMEs, awareness of environmental taxation is not associated with the size of the business H_1: Within SMEs, the awareness of environmental taxation is associated with the size of the business	H_0: Within SMEs, awareness of environmental taxation is not associated with the business membership of a TA. H_1: Within SMEs, awareness of environmental taxation is associated with the business membership of a TA	H_0: Within SMEs, the awareness of environmental taxation is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, the awareness of environmental taxation is associated with information on environmental issues received by SMEs
Pearson's chi-square $\overline{x}$	$\overline{x}$ (1)=2.788	(KW) $\overline{x}$ (2)=4.031	$\overline{x}$ (1)=2.755	$\overline{x}$ (1)=3.336
Asymp. Sig. (2-sided)	0.095	.133	0.097	.068
Likelihood ratio	2.826		2.792	3.343

Table 32: Link between awareness of environmental taxation and independent variables

In conclusion, it is found that none of the independent variables have any impact on SME awareness of environmental taxation and on the basis of that argument, the findings do not to lend any support to Hypothesis H3 - **There is poor awareness of environmental taxation in groups within SMEs** .

6.5.5   Hypothesis 4
H4: There are poor attitudes towards environmental taxes in groups within SMEs.

In addressing this hypothesis, the researcher considered the responses to questions B4 (QB4), B6, B8 and B9 in the questionnaire. QB4 tested what were the subjective perceptions of environmental taxation of the respondents. In QB4 respondents were asked to choose one option from the categories provided and so the responses were limited in the sense that there may have been other potential responses that were not taken into consideration. However, to facilitate statistical analysis, response categories were provided by the researcher instead. Questions B6, B8 and B9 elicited respondents' opinions on what they thought was the most suitable environmental policy, their perceived ratings on a scale on the level of importance of environmental taxation as an instrument to mitigate climate change, and their perceptions of the purpose of environmental taxation. The responses to these questions, when subjected to statistical analysis and interpretation, help to decide whether there is support or otherwise for the hypothesis.

QB4: In your opinion, what is environmental taxation?

The researcher believes that SME opinion, that is, their subjective perceptions of what environmental taxation is, contributes towards their attitudes to environmental taxation. Respondents' choice of answer reflects upon their perceptions and thoughts on what environmental taxation means to them. This question attempts to gauge not only respondents' understanding of environmental taxation but also whether they think it is a justifiable, good tax, or whether they attach negative connotations to it. The researcher also believes that the response choice of participants might be affected by independent variables or sector, size, trade organisation membership, and receipt of environmental information. SMEs are known to be heterogeneous with diverse differences caused due to factors such as sector and size especially. In addition to that, the researcher feels that there may also be a strong influence from the other two independent variables. In this regard, if H3 is correct then it lends support to the perception that there are poor attitudes towards environmental

taxation in groups within SMEs and this may impact upon achieving the full potential of environmental taxation.

Evidence from questionnaire

As seen from Table 33 below, the majority of respondents believed that environmental taxation is 'yet another business tax' and there were very few respondents who believed that environmental taxation is a 'tax to encourage good environmental behaviour' which would mean that there was lack of understanding of why environmental taxes are levied. However it is evident that there are a large number of missing cases which can affect the test results significantly.

QB4	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Another business tax	19.2%	16	3	7	10	1	14	5	9	10
Tax to encourage good environmental behaviour	13.0%	3	0	0	2	0	3	0	3	0
Taxing environmentally damaging activities	7.1%	5	2	3	3	1	5	2	5	2
Taxes on energy and waste	8.1%	5	3	4	3	1	6	2	1	7
Valid=37;Missing=62;										

Mode=1	

Table 33: Sector; size; membership, information received, *What is environmental taxation

In the questionnaire, the researcher provided six response categories in QB4 for respondents to choose one from. The researcher is aware that limiting the response choices to six categories has inherent potential limitations in that there may well have been other responses that could have emerged through open-ended questions and attempts were made to cover the whole gamut of possible responses through the six categories. However, due to a low response rate, the number of categories had to be reduced to four after all responses were coded into SPSS because there was a large number of missing responses and so sample size in each category was too small for statistical tests.
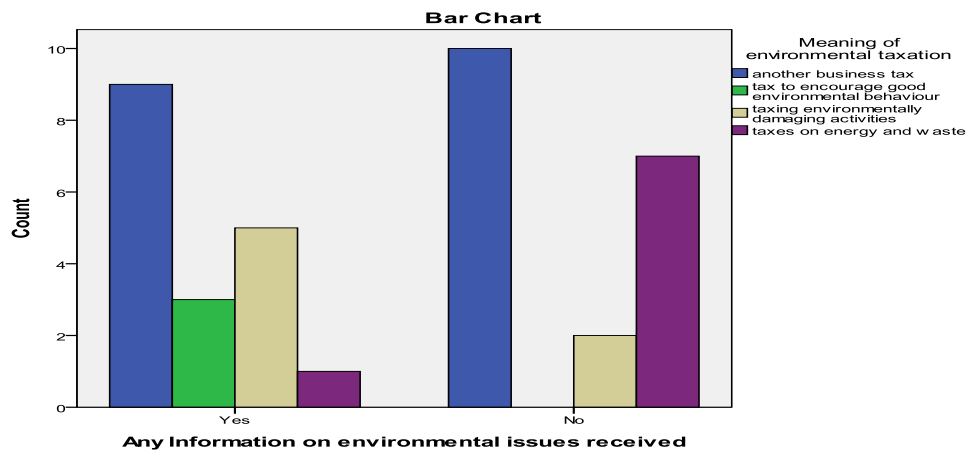
Figure 20: Meaning of Environmental Taxation * Information Receipt

Set of null and alternative hypotheses	H_0: Within SMEs, perception of environmental taxation is not associated with the sector the business is in H_1: Within SMEs, perception of environmental taxation is associated with the business sector	H_0: Within SMEs, perception of environmental taxation is not associated with the size of the business H_1: Within SMEs, perception of environmental taxation is associated with the size of the business	H_0: Within SMEs, perception of environmental taxation is not associated with the business membership of a TA. H_1: Within SMEs, perception of environmental taxation is associated with the business membership of a TA	H_0: Within SMEs, the perception of environmental taxation is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, the perception of environmental taxation is associated with information on environmental issues received by SMEs
Pearson's Chi-Square x^2	$x^2(3)=2.599$	$x^2(6)=3.172$	$x^2(3)=1.076$	$x^2(3)=8.818$
Asymp. Sig. (2-sided)	.458	.787	0.783	**.032**
Likelihood Ratio	3.099	3.928	1.781	10.575

Table 34: Link between perception of environmental taxation and independent variables

Table 34 above shows the set of null and alternative hypotheses for QB4 tested statistically. The test results show there is sufficient reason to reject the null hypothesis for 'environmental information received'. The table reports chi-square test results which confirm that there is only one statistically significant difference between the responses of the

groups within SMEs based on environmental information received where chi-square $x^2 (3) =$ 8.818 and p (2-tailed) < .05. Figure 30 shows that most respondents believe environmental taxation to be 'yet another business tax' and this particular response is highest within those SMEs, as expected, which do not receive any environmental information.

In conclusion, it is found that only one independent variable - 'environmental information' - has any impact on the perceptions of environmental taxation within SMEs. On the basis of this argument, that information dissemination on environmental issues has a significant impact on the responses, this finding lends some support to Hypothesis H4.

QB6: Which of the following government policies do you feel would be most effective in reducing the impact of climate change?

There are a number of environmental policies in the UK of which environmental taxation, as an economic instrument to mitigate climate change, has taken hold in the recent past although the idea has been around for a long time based on Pigouvian taxes (Chapter 3). Traditional command and control regulations such as cap-and-trade schemes and carbon reduction commitment (CRC) etc. are to name just a few. Literature has shown that SMEs are mistrustful of environmental regulations and other traditional command and control type policies and tend to disregard voluntary initiatives as a way forward. There is also an indication in the literature from the British Chamber of Commerce Environmental Survey 2008 that environmental taxation is one of the instruments that SMEs tend to trust more than others. However, there may be strong influences of the moderating/independent variables on this because it is expected that such factors would have an effect on the choice of responses.

The statistical tests conducted on this question attempt to find out if there are any such effects. The researcher believed that the response choice to this question would shed light on what SMEs tend to think of as the preferred instrument or path to mitigate the climate change problem. The researcher is aware that one of the limitations of this question is the number of response categories provided for the participants. The researcher intended to keep

the response categories low in number because of the limited sample size. There are numerous schemes and policy instruments related to environmental issues such as the CRC and Renewable Obligations (RO) that are not included in the response categories and this may have had an effect on the choice of responses. However, within the categories provided, if most respondents choose environmental taxation as the most suitable environmental policy, then this could potentially indicate that there is wide acceptance of environmental taxation in groups within SMEs. In this respect, if H3 is correct, the researcher expects to confirm that independent variables have a significant impact on what, according to SMEs , is the most suitable environmental policy, and this may impact on the levels of acceptance of environmental taxation as an economic instrument of environmental protection.

Evidence from questionnaire

There was a high (90%) response rate to this question. Table 35 below shows that the majority of respondents prefer 'Energy efficiency' to be the most suitable environmental policy.

QB6	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Do not know	21.2%	13	8	10	11	0	12	7	8	13
Environmental regulation	7.1%	7	0	0	2	1	4	3	4	3
Environmental taxation	18.2%	9	5	3	8	5	14	4	4	14

Energy efficiency	37.4%	30	7	4	15	15	24	13	15	22
Emissions trading	7.1%	2	5	5	2	0	6	1	2	5
Valid=90;Missing=9; Mode=3										

Table 35: Sector; size; membership, information received, *Most suitable environmental policy

21% of all respondents said they 'don't know' what is the most suitable environmental policy amongst the response categories provided. This could be interpreted in a number of ways. It could be that they felt limited by the response categories and would have expressed their choice perhaps better through an open-ended question. Table 36 below sets out the set of null and alternative hypotheses for QB6 tested statistically.

The test results show there are two statistically significant differences between the responses of the groups within SMEs based on size of business where chi-square $x^2(8) = 18.138$ and p (2-tailed) $< .05$ and based on the sector, the businesses belong to $x^2(4) = 11.939$ and p (2-tailed) <0.05. The table reports chi-square test results and the 'likelihood' statistic which confirms the chi-square findings.

Set of null and alternative hypotheses	H_0: Within SMEs, perception of the most suitable environmental policy is not associated with the sector the business is in H_1: Within SMEs, perception of the most suitable environmental policy is associated with the business sector	H_0: Within SMEs, perception of the most suitable environmental policy is not associated with the size of the business H_1: Within SMEs, perception of the most suitable environmental policy is associated with the size of the business	H_0: Within SMEs, perception of the most suitable environmental policy is not associated with the business membership of a a TA. H_1: Within SMEs, perception of the most suitable environmental policy is associated with the business membership of a a TA	H_0: Within SMEs, the perception of the most suitable environmental policy is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, the perception of the most suitable environmental policy is associated with information on environmental issues received by SMEs
Pearson's chi-square x^2	$x^2(4)=11.939$	$x^2(8)=18.138$	$x^2(4)=2.558$	$x^2(4)=3.336$
Asymp. Sig. (2-sided)	.018	.020	0.634	.503
Likelihood ratio	13.249	19.504	2.734	3.412

Table 36: Statistical test results for QB6

The Figure 21 below shows the distribution of responses about the suitability of environmental policies within the two variables that have significant test results (i.e. the business size and business sector). Across all business size categories, energy efficiency' is

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the most favoured response. There are no indications of any support for environmental taxation with the Micro (0-9) and Small (10-49) size categories in SMEs in the transport sector. This graph reflects the results of graph H1.12 A that 'energy efficiency' is seen to be the most suitable environmental policy from the SME perspective.

There are significant results from tests conducted on B6 for business sector and size with $\bar{x}$ (4) = 11.939; p(2-tailed) = 0.018 and $\bar{x}$ (8) = 18.138; p(2-tailed) = 0.020, respectively. This shows that there is an association between business sector and the choice of most suitable environmental policy and also business size and most suitable environmental policy. Table 55 above shows that the highest support for energy efficiency is from within manufacturing businesses across all sizes and there is limited support for environmental taxation. Environmental taxation is supported to a certain extent within both the business sectors as well as all the different sized businesses.
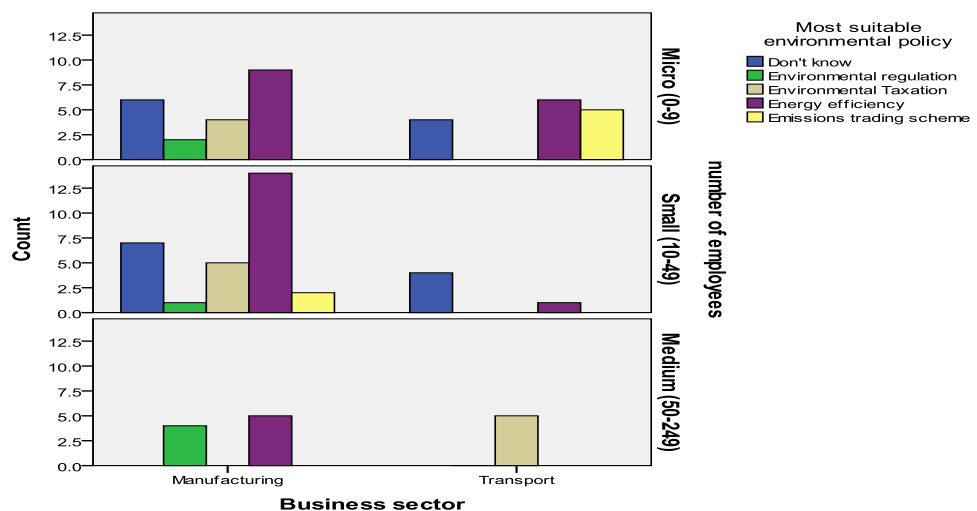
Figure 21: Most suitable environmental policy with sector and size considerations

In conclusion, the researcher has found that a significant number of respondents, nearly 90%, believe that 'energy efficiency' is the most suitable environmental policy and there is little support for environmental taxation in groups within SMEs. Also, the two independent variables 'business size' and 'business sector' have significant impact within SMEs on the

perceptions of the most suitable environmental policy within environmental taxation. On the basis of this argument these findings lend some support to Hypothesis H3.

QB8. Environmental taxation is an instrument to mitigate climate change. Do you agree?

SMEs in the UK operate in almost all those sectors in the economy that are liable to environmental taxation. Environmental taxes are designed with the purpose of shaping positive environmental attitudes and behaviours by incentivising those who pollute less and therefore can pay fewer taxes. Respondents rating of environmental taxation, on a scale of how important or unimportant it is, may assist in measuring the perception of how well environmental taxation is accepted and trusted and therefore can be expected to encourage positive environmental behaviours. An SME which rates environmental taxation as an 'important' instrument to mitigate climate change would be expected to have understood what this taxation is for and how it affects them and therefore can be expected to behave accordingly.

On the other hand, a business that feels that environmental taxation is 'not important' at all is in conflict with the core objective of this taxation (i.e. encouraging positive environmental behaviour). However, the questionnaire does not have the scope of allowing the respondents to elaborate on their choices and therefore puts a limit to understanding, say, why some respondents do not feel that environmental taxation is important at all. These differences may, however, be explained by the differences in groups within SMEs based on the four independent variables. In this regard, if H3 is correct, the researcher expects to confirm the perception that there are significant differences in groups within SMEs and this may have an impact on the attitudes towards environmental taxation.

Evidence from the questionnaire

Table 37 below shows that there were no missing responses to this question. The researcher found that a high percentage of respondents rated the importance of environmental taxation

as an instrument to mitigate climate change as being 'probably not important' and a very small number attached high importance to environmental taxation - only 3%. It shows that there was a lack of certainty about whether environmental taxation is important or not but at the same time there was a certain feeling of mistrust for environmental taxation as reflected from the majority of responses; 29.3% chose the option 'probably not important'. The researcher is aware the term 'probably' can be interpreted to be quite vague in the sense that it is not a definite choice and yet it has a certain implication, but in designing the scale of ordinal responses, such limitations are often inherent.

QB8	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
No opinion	21.2%	12	9	10	11	0	13	6	8	13
Definitely important	3.0%	3	0	2	0	1	1	2	1	2
Important	23.2%	18	5	8	9	4	17	6	9	14
Probably important	23.2%	7	16	11	3	5	15	8	10	13
Probably not important	29.3%	22	3	13	12	4	19	10	9	20

Table 37: Sector; size; membership, information received, *Effectiveness of environmental taxation

Set of null and alternative hypotheses	H_0: $\overline{X}$ M1 = $\overline{X}$ M2 where M1 and M2 are the groups of SMEs within the manufacturing and transport sector and $\overline{X}$ is the median response to the dependent variable 'environmental taxation is an instrument to mitigate climate change'. H_1: $\overline{X}$ M1≠ $\overline{X}$ M2	H_0: $\overline{X}$ M1= $\overline{X}$ M2= $\overline{X}$ M3 Where M1, M2 and M3 are groups according to size i.e. micro, small and medium businesses within SMEs and $\overline{X}$ is the median response to the dependent variable. H_1: $\overline{X}$ M1≠ $\overline{X}$ M2	H_0: $\overline{X}$ M1= $\overline{X}$ M2 where M1 and M2 are the members and non-members of TA and $\overline{X}$ is the median response to the dependent variable 'environmental taxation is an instrument to mitigate climate change'. H_1: $\overline{X}$ M1≠ $\overline{X}$ M2	H_0: $\overline{X}$ M1= $\overline{X}$ M2 where M1 and M2 are the groups of SMEs who do and do not receive environmental information and $\overline{X}$ is the median response to the dependent variable 'environmental taxation is an instrument to mitigate climate change'. H_1: $\overline{X}$ M1≠ $\overline{X}$ M2
Mann Whitney U	911.000	**Kruskal Wallis** $X^2(2)=1.348$	1016.000	1087.000
Equivalent-z	-.902		-.190	-.448
Asymp.sig(2-tailed)	0.367	P(2-tailed)= .510	.849	.655

Table 38: Link between attitudes to importance of environmental taxation and independent variables

Table 38 above shows the statistical tests conducted on QB8 to determine whether there are any significant differences within the groups. The table reports the results of three Mann Whitney and one Kruskal Wallis tests which confirm that there are no significant impacts of the independent variables on the level of importance the respondents attach to environmental taxation as an instrument to mitigate climate change.

So, in conclusion, there are no significant impacts of any of the independent variables so these findings do not lend any support to Hypothesis H3.

QB9. In your opinion, what do you think is the purpose of environmental taxation?

The researcher believes that the subjective perceptions of the purpose of environmental taxation would provide an indication of the feelings and contribute towards understanding the attitudes of SMEs to environmental taxation. Responses to this question may provide sufficient insights for the researcher to understand what SMEs think environmental taxation is for. Environmental taxes are designed in such a way as to make the polluters pay while incentivising those who make changes to pollute less.

Therefore it is widely recognised as being a more suitable environmental policy as opposed to perhaps the traditional command-and-control which does not provide any incentive to pollute less than is required. SMEs are known to be wary of environmental policies and so in order to engage them in the wider discussion of environmental taxation and help them understand how environmental taxation may work towards the climate change problem, it is necessary to give them the opportunity to express freely what their subjective opinions are about environmental taxation. The choice of responses may certainly have an impact of the independent variables and the researcher is interested to see what kind of effects the independent variables might have had. In this regard, if H3 is correct, it would be expected that the subjective perceptions of the purpose of environmental taxation in groups within SMEs have an impact on their attitudes towards environmental taxation.

Evidence from the questionnaire

There was a 97% response rate to this particular question and as can be seen from the following Table 39 most respondents, nearly 34%, believed that environmental taxation is yet another business tax for the government to make more money. This is closely followed by another 33.3% who believed that environmental taxation is a social cover-up for government greed.

QB9	Frequency	Sector		Size			Membership		Information	
		Manufacturing	Transport	Micro	Small	Medium	Yes	No	Yes	No
Do not know	6.1%	4	1	3	2	0	3	3	2	4
Raise government revenue greed	34.3%	22	12	16	14	4	23	9	15	19
Fines on polluting behaviour	12.1%	6	4	5	5	2	8	4	4	8
Incentivise favourable behaviour	12.1%	8	3	6	3	1	10	2	3	9
Social cover up for government greed	33.3%	21	12	14	9	7	19	14	13	20
Valid=97;Missing=2; Mode=1										

Table 39: Sector; size; membership, information received, *Purpose of environmental taxation

This reflects a viewpoint that the respondents were mistrustful of government intentions and while revenue generation is an objective of environmental taxation to reduce the burden on other taxes such as labour taxes, the researcher feels that this feeling of underlying lack of trust in government intentions in levying such taxes may be an impediment to fulfilling the behaviour-changing potential of this tax.

This particular question was left open-ended in the questionnaire because the researcher did not want to influence the subjective choice of the respondents at all, and was interested in allowing responses to be free to see what kind of patterns emerge in the absence of already categorised responses. Once all responses were gathered the researcher attempted to code them into categories to facilitate statistical analysis and five categories, as coded below, were created from the responses received.

0 = Do not know

1 = Another business tax to raise government revenue

2 = Fines on polluting behaviour

3 = To incentivise favourable environmental behaviour

4 = A social cover up for government greed

These categories reflected the entire range of responses received to this open-ended question. The researcher found it interesting to note that some of the respondents (6% approx.) replied that they did not know what the purpose of environmental taxation was. This could be interpreted as a reflection of a lack of information on environmental taxation or a lack of understanding of the nature of this taxation. Although the five categories created from the responses were far too many given the small sample size of the respondents, the researcher chose to retain those categories to reflect, in the statistical analyses, the real implications of the findings. Recoding them into fewer categories would have involved the researcher's

subjective bias which the researcher did not want to introduce and instead chose to faithfully report the findings in their original form.

Table 40 below presents the findings of the chi-square tests for QB9. The researcher did not find sufficient reasons to reject the null hypothesis and there is no significant impact of independent variables of sector, size, membership of a a TA and environmental information of the subjective responses on what is the purpose of environmental taxation.

Set of null and alternative hypotheses	H_0: Within SMEs, subjective perception of the purpose of environmental taxation is not associated with the sector the business is in H_1: Within SMEs, subjective perception of the purpose of environmental taxation is associated with the business sector	H_0: Within SMEs, subjective perception of the purpose of environmental taxation is not associated with the size of the business H_1: Within SMEs, subjective perception of the purpose of environmental taxation is associated with the size of the business	H_0: Within SMEs, subjective perception of the purpose of environmental taxation is not associated with the business membership of a a TA. H_1: Within SMEs, subjective perception of the purpose of environmental taxation is associated with the business membership of a a TA	H_0: Within SMEs, the subjective perception of the purpose of environmental taxation is not associated with the information on environmental issues received by SMEs H_1: Within SMEs, the subjective perception of the purpose of environmental taxation is associated with information on environmental issues received by SMEs
Pearson's Chi-Square x^2	$x^2(4)=0.914$	$x^2(8)=3.828$	$x^2(4)=3.843$	$x^2(4)=1.591$
Asymp. Sig. (2-sided)	.922	.872	.428	.810
Likelihood Ratio	.964	4.468	3.975	1.640

Table 40: Statistical test results for QB9

In conclusion, it is found that a high percentage of respondents believed that the purpose of levying environmental taxes is for the government to make some money and attributes this to

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government greed. However, there are no significant impacts of any of the independent variables on the subjective perceptions of the respondents and based on this argument, it can be confirmed that these findings do not lend any support to Hypothesis H4.

Summary of tests conducted on Hypothesis H4

Table 41 below summarises the results of the statistical analyses conducted in ascertaining whether there is sufficient evidence to support Hypothesis H4 on responses obtained from participants on Questions QB4, B6, B8 and B9 in the questionnaire.

Question	Description	Finding
B4	In your opinion, what is environmental taxation?	Supported for one variable: size of business.
B6	Which of the following environmental policies do you think would be most suitable in reducing the impact of climate change?	Supported for two variables: business sector and business size.
B8	Environmental taxation is an instrument to mitigate climate change. Do you agree?	Not supported
B9	In your opinion, what do you think is the purpose of environmental taxation?	Not supported

Table 41: Summary of Hypothesis H4

The analyses addressed the attitudes of groups within SMEs to: opinions on what is environmental taxation; which is the most suitable environmental policy to reduce the impact of climate change; how important is environmental taxation as an instrument to mitigate climate; and opinions on the purpose of environmental taxation. Non-parametric statistical tests, including Mann Whitney U, Kruskal Wallis and chi-square tests, were conducted to

test the significance of the independent variables. The evidence provides some support for Hypothesis H4 - **There are poor attitudes towards environmental taxes in groups within SMEs -** in view of the result of the statistical analyses conducted.

6.5.6 **Hypothesis 5**

H5: There is an association between attitudes towards environmental issues and attitudes towards environmental taxation within SMEs.

In addressing this hypothesis, the researcher considered the questions QA8, B4, B6, B8, and B9. QA8 elicited responses from participants, on a scale, to their attitudes towards environmental issues. Questions B4, B6, B8 and B9 attempted to elicit responses to attitudes towards environmental taxation in particular and in reference to the wider context of its suitability within the range of environmental policies. The questions drew forth respondents' attitudes and subjective perceptions of business and environmental issues through Likert-type scale statements within QA8 and attitudes towards environmental taxation's effectiveness as an instrument to mitigate climate change within the entire range of environmental policies in the UK.

In the hypothesis there is an implied causal direction but the small response rate and sample size proves an impediment here. As the data will not permit the testing of this hypothesis in the causal direction implied, the problem has to be approached by testing if the taxation variables (treated as IVs) can be shown to effect the attitude variables (treated as DVs). The first set of statistical tests treats the attitude questions to environmental taxation (i.e. B4, B6, B8 and B9) as independent variables and the attitude statements, in a Likert-type scale, in QA8 as dependent variables. For each significant test result, further statistical tests are undertaken to test for differences in groups within SMEs.

The researcher feels it is necessary to note here that although the same questions have been used in testing Hypothesis 4 before, they are still relevant in the context of Hypothesis H5 because without these particular questions H5 cannot be tested. Also, to identify differences

in groups within SMEs, the tests in H5 are more elaborate. The researcher feels it is not relevant to describe each of the questions here again and so chooses instead to mention the questions and report and interpret the statistical test result findings.

QA8: Business and environmental issues

QA8 comprises nine statements as listed below:

A8.1   Business is the largest contributor to climate change

A8.2   Climate change is a huge challenge to mankind

A8.3   Climate change is a significant issue for my business

A8.4   Efficient energy use is important for my business

A8.5   SMEs are responsible for more than 70% of the total pollution

A8.6   Pro- environmental attitudes do not always mean pro-environmental behaviour

A8.7   SMEs are highly suspicious of environmental policies

A8.8   In these economically challenging times climate change is a low business priority

A8.9   My business has a responsibility to help manage the impact of climate change

QB4: In your opinion, what is environmental taxation?

QB6: Which of the following government policies do you feel would be most effective in reducing   the impact of climate change?

QB8: Environmental taxation is an instrument to mitigate climate change. Do you agree?

QB9: In your opinion, what do you think is the purpose of environmental taxation?

The questions B4, B6, B8 and B9 are tested individually against QA8 and the findings are expected to lend further information on whether there are links between attitudes to environmental issues and attitudes to environmental taxation. The researcher reiterates the viewpoint that the success of an environmental policy, especially environmental taxation, will depend to a large extent on the acceptance of the particular policy by those who are affected by it because if a key objective of environmental taxation is to encourage behaviour change then the first step needs to be increased positive attitudes towards it. The researcher feels that there is a conspicuous absence of understanding from SME attitudes towards environmental taxation which is a potential impediment to the total success of this market-based instrument. Unless all those businesses that are affected by this taxation are understood there will remain a certain amount of cynicism and lack of trust in this environmental policy amongst SMEs. Consequently, SMEs may resort to wrong practices in regard to the environment and pay environmental taxes with a poor attitude towards it due to little understanding of how they might reduce their environmental impact. In this regard, if H5 is correct then the researcher expects to confirm the perceptions that in groups within SMEs there is an association between attitudes towards environmental issues and attitudes towards environmental policies.

The researcher would like to note that questions that are being used and tested in this hypothesis have been used in previous hypotheses in different contexts and they have been described with the help of descriptive statistics and as such they are not again described in detail in this hypothesis.

Evidence from questionnaire

This section is subdivided according to test variables.

H$_0$: Within SMEs, opinions about what is environmental taxation (B4) is not associated to attitudes towards environmental issues.

H$_1$: Within SMEs, opinions about what is environmental taxation is associated to attitudes towards environmental issues.

	Cross tabulation																																												
QB4	**A8.1**					**A8.2**					**A8.3**					**A8.4**					**A8.5**					**A8.6**					**A8.7**					**A8.8**					**A8.9**				
	A	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**	**A**	**B**	**C**	**D**	**E**
1	-	7	3	4	5	0	9	7	-	3	3	6	8	2	-	10	9	-	-	-	-	1	5	6	8	3	13	3	-	-	7	7	5	0	-	0	6	6	6	1	0	12	4	1	2
2	-	2	0	0	1	0	2	1	-	0	1	0	2	0	-	3	0	-	-	-	-	0	1	1	0	1	2	0	-	-	1	0	2	0	-	0	1	2	0	0	0	2	0	0	1
3	-	3	1	1	2	1	4	1	-	1	1	2	3	1	-	4	3	-	-	-	-	0	3	0	4	2	3	2	-	-	3	2	2	0	-	0	1	3	3	0	0	5	1	0	1
4	-	2	5	1	0	0	7	2	-	0	1	5	2	0	-	4	4	-	-	-	-	2	4	0	2	3	5	0	-	-	1	6	0	1	-	1	2	2	3	0	2	4	2	0	0

Valid= 37.4%; Missing= 62.6%

Table 42: Meaning of environmental taxation, *Attitudes to environmental issues

Table 42 above shows that there are a large number, nearly 62%, of missing cases which is likely to have an effect on the statistical test results. The table is just to display the raw data with the help of cross-tabulation tables for the meaning of environmental taxation B4 and attitudes towards environmental issues A8.

In the table above:

1= *Another business tax*

2= *Tax to encourage good environmental behaviour*

3= *Taxing environmentally-damaging activities*

4= *Taxes on energy and waste*

Table 43 below reports the findings of Kruskal Wallis statistical tests undertaken to test the effects of attitudes towards environmental issues on respondent opinions on what is environmental taxation (QB4). None of the test results provides significant reasons to reject the   null   hypothesis.

Test Statistics[a],[b]

	Business is the largest contributor to climate change	climate change is a huge challenge to mankind	climate change is a significant issue for business	efficient energy use if important for business	SMEs are responsible for 70% of pollution	Pro environmental attitudes do not always mean pro environmental behaviour	SMEs suspicious of environmental policies	climate change is a low business priority	Business is responsible for managing environment
Chi-Square	.745	2.909	1.422	2.497	3.511	2.635	.991	1.297	2.336
df	3	3	3	3	3	3	3	3	3
Asymp. Sig.	.862	.406	.700	.476	.319	.451	.803	.730	.506

a. Kruskal Wallis Test
b. Grouping Variable: B4_short

Table 43: KW test results

Therefore it shows that respondents' choices of replies to statements in A8 have no effect on their opinions on what is environmental taxation in QB4. On the basis of this finding the researcher notes that these findings lend no support to Hypothesis H5.

H$_0$: Within SMEs, opinion on what is the most suitable environmental policy (B6) is not associated with attitudes towards environmental issues.

H$_1$: Within SMEs, opinion on what is the most suitable environmental policy is associated with attitudes towards environmental issues.

	A8.1					A8.2					A8.3					A8.4					A8.5					A8.6					A8.7					A8.8					A8.9				
QB6	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
0	2	2	7	5	5	4	8	7	1	1	1	2	12	4	2	7	12	2	-	-	0	0	12	7	0	0	12	6	1	-	6	9	2	3	1	0	4	11	6	0	4	8	7	1	1
1	0	7	0	0	0	0	6	1	0	0	0	4	3	0	0	1	6	0	-	-	0	2	3	2	0	1	6	0	0	-	1	0	1	5	0	0	4	0	0	3	0	6	1	0	1
2	0	12	2	4	0	1	15	2	0	0	0	7	11	0	0	5	9	4	-	-	1	4	9	0	0	0	14	4	0	-	4	5	9	0	0	0	13	4	0	1	1	15	2	0	0
3	4	16	9	6	2	3	26	6	0	2	7	10	14	6	0	20	13	4	-	-	0	0	13	9	12	5	24	8	0	-	4	14	13	6	0	1	7	9	18	2	3	26	6	0	2
4	0	1	4	0	2	1	4	0	0	2	0	4	3	0	0	2	4	1	-	-	0	4	1	0	2	4	0	3	0	-	2	5	0	0	0	0	4	3	0	0	1	4	0	0	2

V=90　M=9　V=90　M=9　V=90　M=9　V=90　M=9　V=81　M=18　V=88　M=11　V=90　V=9　V=90　M=9　V=88　M=11

V=Valid; M=Missing

Table 44: Most suitable environmental policy, *Attitudes to environmental issues

Table 44 above shows that there high percentage, on average 89%, of responses to this which is likely to have an effect on the statistical test results. The table is just to display the raw data with the help of cross-tabulation tables for the most suitable environmental policy B6 and attitudes towards environmental issues A8.

In the table above:

0= Do not know

1= Environmental regulation

2= Environmental taxation

3= Energy efficiency

4= Emissions trading

Table 45 below reports the findings of the statistical test results for association of attitudes towards environmental issues with opinions of what is the most suitable environmental policy.

Test Statistics[a],[b]

	Business is the largest contributor to climate change	climate change is a huge challenge to mankind	climate change is a significant issue for business	efficient energy use if important for business	SMEs are responsible for 70% of pollution	Pro environmental attitudes do not always mean pro environmental behaviour	SMEs suspicious of environmental policies	climate change is a low business priority	Business is responsible for managing environment
Chi-Square	15.376	1.510	9.476	5.167	24.934	6.399	12.542	17.115	17.590
df	4	4	4	4	4	4	4	4	4
Asymp. Sig.	.004	.825	.050	.271	.000	.171	.014	.002	.001

a. Kruskal Wallis Test
b. Grouping Variable: Most suitable environmental policy

Table 45: KW test results

The table above shows several strong associations of attitudes towards environmental issues with regard to what respondents think of as the most suitable environmental policy. In the

case of significant Kruskal-Wallis test results, it is necessary to undertake pair wise Mann Whitney tests (MWs) to make pair wise comparisons amongst groups.

Adjustment of p-alpha to mitigate type 1 error: As there are five categories in QB6 so there are ten pair wise comparison tests amongst groups. In this case it is necessary not to use the usual p alpha $p<=0.05$ to decide if the test is significant. To mitigate the increased risk of rejecting H0 which arises from a set of non-independent tests in a set, it is necessary to make an approximation Bonferroni correction[69] to p alpha dividing the usual p alpha ($p<=0.05$) by the number of pair wise comparisons in the set. In this case p alpha becomes 0.005. However given the large number of ninety tests conducted here, this adjustment of p alpha makes the test weak at finding a significant effect even if it is quite large so the researcher agreed to make a compromise on a corrected p alpha of 0.01.

The following Table 46 shows the significant test results for Mann Whitney results amongst groups. Most of the MWs report both the asymptotic significance (see footnote) and exact probability too. In the case of smaller sample size, it is recommended to report the exact probability where it is provided so that is the one the table reports unless SPSS has only reported the asymptotic 2-tailed significance. The following numbers B6 (01;02;03;04;12;13;14;23;24) are used to denote the pairs in order to simplify the table. For example, with regard to A8.1, whether respondents' attitudes towards whether the business is the largest contributor to climate change has an association with their choice of the most suitable environmental policy, the table above shows that there are significant differences between groups on their responses to which environmental policy they think to be most suitable that is, group 0 'those who don't know' and those who believe environmental regulation is the most suitable environmental policy. Similarly, significant differences exist between groups '0' and '2' (see footnote), '0' and '3' and '1' and '2'.

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[69] A correction applied to the alpha-level to control the overall Type 1 error rate when multiple significance tests are carried out. Each test conducted should use a criterion of significance of the alpha-level (normally .05) divided by the number of tests conducted. This is a simple but effective correction but tends to be too strict when lots of tests are performed (Field, 2009, p.782)

Test results	A8.1 Business is the largest contributor to contributor to climate change				A8.3 Climate change is a significant issue for my business	A8.5 SMEs are responsible for more than 70% of total pollution			A8.7 SMEs are highly suspicious of environmental policies		A8.8 In these economically challenging times, climate change is low on our priority			A8.9 My business has a responsibility to help manage the impact of climate change		
	B6(01)[70]	B6(02)	B6(03)	B6(14)	B6(03)	B6(02)	B6(03)	B6(23)	B6(12)	B6(14)	B6(02)	B6(23)	B6(34)	B6(03)	B6(24)	B6(34)
Mann Whitney U	21.000	105.000	237.500	3.500	251.500	54.000	200.500	58.500	20.500	6.000	85.000	144.500	55.500	239.500	24.000	35.500
Equivalent-z	-2.872	-2.457	-2.520	-3.017	-2.345	-3.364	-2.455	-4.337	-2.691	-2.487	-3.165	-3.557	-2.509	-2.812	-2.895	-3.980
P alpha	Exact sig.(1-tailed)[71] 0.04[72]	1T .017	Asymp. Sig (2-tailed)[73] .012	1T .004	2T .019	1T .003	2T .014	2T $p<0.000$	1T .008	1T .017	1T .003	2T $P<0.000$	1T .015	2T 0.005	1T .017	1T .001

Table 46: Significant Mann Whitney Test Results in pair wise comparisons amongst groups

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[70] Iin QB6 : 0-Don't know; 1- Environmental regulation;2- Environmental taxation; 3-Energy Efficiency;4-Emissions Trading schemes
[71] Exact Sig. [2*(1-tailed sig.)] abbreviated here as 1T
[72] Not corrected for ties
[73] Asymp. sig. (2-tailed) abbreviated as 2T

So, in conclusion, it is found that there are some significant differences between groups on their responses to the most suitable environmental policy and their attitudes to business and environmental issues. On the basis of this argument, these findings lend some support to Hypothesis H5.

H_0: Within SMEs, opinion on how important environmental taxation is as an instrument to mitigate climate change (B8) is not associated with attitudes towards environmental issues.

H_1: Within SMEs, opinion on how important environmental taxation is as an instrument to mitigate climate change (B8) is associated with attitudes towards environmental issues.

Table 47 below shows that there is a high percentage, nearly 95%, to this which is likely to have an effect on the statistical test results. The table below is just to display the raw data with the help of cross-tabulation tables for the importance of environmental taxation as an instrument to mitigate climate change and attitudes towards environmental issues A8.

In the table above:

0= No opinion

1= Definitely important

2= Important

3= Probably important

4= Probably unimportant

	Cross Tabulation																																												
QB8	A8.1					A8.2					A8.3					A8.4					A8.5					A8.6					A8.7					A8.8					A8.9				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
0	2	2	5	4	5	2	10	5	1	0	1	2	12	2	1	8	9	1	-	-	0	0	8	7	1	1	11	2	2	-	7	6	0	4	1	0	1	10	7	0	3	6	3	1	5
1	0	3	0	0	0	0	2	1	0	0	0	1	2	0	0	0	3	0	-	-	0	2	0	1	0	0	3	0	0	-	0	0	1	2	0	0	0	0	0	3	0	0	1	0	0
2	0	16	3	4	0	1	21	1	0	0	2	12	8	1	0	10	13	0	-	-	1	4	9	4	5	3	18	2	0	-	1	11	8	3	0	1	10	6	5	1	2	21	0	0	0
3	3	4	5	10	0	5	16	1	0	0	1	8	8	5	0	8	10	4	-	-	0	4	9	9	0	5	8	9	0	-	0	11	11	0	0	0	11	7	4	0	1	12	9	0	0
4	1	13	10	1	4	1	15	8	0	5	4	5	17	2	1	14	9	6	-	-	0	0	12	2	8	1	16	12	0	-	9	9	5	6	0	0	10	8	9	12	4	20	5	0	0
V=95			M=4			V=95		M=4			V=95		M=4			V=95		M=4			V=86		M=13			V=93		M=6			V=95			V=4		V=95			M=4		V=93			M=6	
V=Valid; M=Missing																																												

Table 47: Importance of environmental taxation *Attitudes to environmental issues

Table 48 below reports the findings of the statistical test results for association of attitudes towards environmental issues with opinions of what is the most suitable environmental policy.

Test Statistics^{a ,b}

	Business is the largest contributor to climate change	climate change is a huge challenge to mankind	climate change is a significant issue for business	efficient energy use if important for business	SMEs are responsible for 70% of pollution	Pro environmental attitudes do not always mean pro environmental behaviour	SMEs suspicious of environmental policies	climate change is a low business priority	Business is responsible for managing environment
Chi-square	10.620	17.670	7.341	2.353	5.750	6.675	7.963	15.936	13.374
df	4	4	4	4	4	4	4	4	4
Asymp. Sig.	.031	.001	.119	.671	.219	.154	.093	.003	.010

a. Kruskal Wallis Test

b. Grouping Variable: Effectiveness of environmental taxation in mitigating climate change

Table 48: KW Test results

The table above shows several strong associations of attitudes towards environmental issues with regard to how important respondents think environmental taxation is. In the case of significant Kruskal-Wallis test results, it is necessary to undertake pair wise Mann Whitney tests (MWs) to make pair wise comparisons amongst groups. The Table 49 below shows the significant Mann Whitney tests for pair wise comparisons between groups based on their attitudes towards the importance of environmental taxation to their attitudes to environmental fact statements.

The table shows that, with regard to statements A8.1; A8.2; A8.8 and A8.9, there are differences within groups on their attitudes towards the importance of environmental taxation as an instrument to mitigate climate change.

Test results	A8.1 Business is the largest contributor to contributor to climate change	A8.2 Climate change is a huge challenge to mankind		A8.8 In these economically challenging times, climate change is low on our priority					A8.9 My business has a responsibility to help manage the impact of climate change	
	B8[74](02)	B8(24)	B8(34)	B8(01)	B8(03)	B8(12)	B8(13)	B8(14)	B8(23)	B6(34)
Mann Whitney U	111.500	199.000	158.500	.000	105.500	1.500	.000	3.000	148.000	35.500
Equivalent -z	-2.646	-3.045	-3.484	-2.937	-2.687	-2.759	-2.982	-2.7171	-3.084	-3.980
P alpha	2T .008	2T .002	2T P<0.00	1T .002	1T 0.011	1T .002	1T .001	1T .003	2T .002	1T .001

Table 49: Significant Mann Whitney tests

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[74] In QB8: 0- 'No opinion'; 1-'definitely important'; 2-'important'; 3-'probably important'; 4-'not important'

In conclusion, based on the argument that significant differences are found within groups based on their differences of opinion on the importance of environmental taxation as an instrument to mitigate climate change and their attitudes to other environmental issues, the researcher finds that some of the test results lend some support to Hypothesis 5.

H_0: Within SMEs, subjective opinion on purpose of environmental taxation (B9) is not associated with attitudes towards environmental issues.

H_1: Within SMEs, subjective opinion on purpose of environmental taxation (B9) is associated with attitudes towards environmental issues.

Table 50 below shows that there is a high percentage, nearly 95%, to this which is likely to have an effect on the statistical test results. The table below is just to display the raw data with the help of cross-tabulation tables for the importance of environmental taxation as an instrument to mitigate climate change and attitudes towards environmental issues A8.

In the table below:

0= No opinion

1= Another business tax to raise revenue for government greed

2= Fines on polluting behaviour

3= Incentivise favourable opinion

QB9	A8.1					A8.2					A8.3					A8.4					A8.5					A8.6					A8.7					A8.8					A8.9				
	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E	A	B	C	D	E
0	1	1	1	2	1	1	4	1	0	0	0	1	3	2	0	4	0	2	-	-	0	0	1	4	0	0	2	3	1	-	2	1	2	1	0	-	2	2	2	0	0	4	1	0	1
1	4	17	14	12	6	5	34	8	1	5	2	18	26	5	2	17	31	5	-	-	0	4	21	15	9	5	30	15	1	-	8	26	10	8	1	-	18	17	15	3	5	32	12	1	2
2	0	4	4	2	1	1	9	1	0	0	2	2	5	2	0	6	4	1	-	-	0	2	6	0	2	1	8	2	0	-	3	2	4	2	0	-	2	5	3	1	2	5	2	0	1
3	0	8	2	0	0	1	6	3	0	0	3	3	4	0	0	6	3	1	-	-	1	2	3	2	1	2	6	2	0	-	1	3	5	1	0	-	4	3	1	2	1	8	1	0	0
	V=80		M=19			V=80		M=19			V=80		M=19			V=80		M=19			V=73		M=26			V=78		M=21			V=80			M=19		V=80			M=19		V=78			M=21	

V=Valid; M=Missing

Table 50: Purpose of environmental taxation *Attitudes to environmental issues

Table 51 below presents the findings from the Kruskal Wallis test results on the subjective opinions on the effectiveness of environmental taxation in mitigating climate change and its association with attitudes towards other environmental issues. From the table it is evident that there is insufficient evidence to reject the null hypothesis.

Test Statistics^{a ,b}

	Business is the largest contributor to climate change	climate change is a huge challenge to mankind	climate change is a significant issue for business	efficient energy use if important for business	SMEs are responsible for 70% of pollution	Pro environmental attitudes do not always mean pro environmental behaviour	SMEs suspicious of environmental policies	climate change is a low business priority	Business is responsible for managing environment
Chi-square	5.077	1.103	3.784	2.877	3.479	1.323	.750	.543	1.040
df	2	2	2	2	2	2	2	2	2
Asymp. Sig.	.079	.576	.151	.237	.176	.516	.687	.762	.594

a. Kruskal Wallis Test

b. Grouping Variable: Purpose of environmental taxation

Table 51: KW Test Results

So, in conclusion, these findings do not lend any support to Hypothesis H5.

Summary of Hypothesis 5

Table 52 below summarises the results of the statistical analyses conducted to enable the researcher to decide whether there is support or otherwise for Hypothesis H5 on responses obtained from the participants to questions A8, B4, B6, B8 and B9 in the questionnaire. The questions elicited the respondents' attitudes towards environmental issues and their opinions on what is the purpose of environmental taxation, the most suitable environmental policy, the importance of environmental taxation in mitigating climate change and what they understood by 'environmental taxation'. Non-parametric statistical techniques comprising Mann-Whitney and Kruskal Wallis tests were used in significance tests of the variables. The evidence from the tests seems to support Hypothesis 5 - **There is an association between attitudes towards environmental issues and attitudes towards environmental taxation within SMEs** - in view of the results of the statistical analyses conducted. It is worth

reiterating that the causal direction implied in the hypothesis could not be tested due to data limitations and so the testing of the hypothesis was approached by testing if the environmental taxation variables in B4, B6, B8 and B9 could be shown to affect the other environmental issues variables in A8.

Question	Description	Finding
B4	In your opinion, what is environmental taxation?	Not supported
B6	Which of the following environmental policies do you think would be most suitable in reducing the impact of climate change?	Supported for variables A8.1; A8.3; A8.5; A8.7; A8.8; A8.9
B8	Environmental taxation is an instrument to mitigate climate change. Do you agree?	Supported for variables A8.1; A8.2; A8.8; A8.9
B9	In your opinion, what do you think is the purpose of environmental taxation?	Not supported

Table 52: Summary of Hypothesis H5

6.5.7 **Hypothesis 6**

H6: There is an association between a) attitudes to environmental issues, b) environmental taxation and c) environmental behaviours in groups within SMEs.

In addressing this hypothesis the researcher considered the responses to the questions A8,B4, B8, B9, C3, C4, C5, C6 and the independent variables of D1 (sectors), D2(size), D6 (membership of a a TA), B10 (access to environmental information received).

Question A8 elicited the respondents' opinions and attitudes to environmental issues through a series of Likert-type scale statements. Questions B4, B8 and B9 were primarily aimed at eliciting respondents' opinions and attitudes towards environmental taxation. Questions C3, C4, C5 and C6 sought information on their waste management/recycling behaviour and C6 purposefully asked a question on what would encourage SMEs to improve their

environmental actions. This question C6 does not directly demonstrate environmental behaviour but adds to it by being an indicator of what may perhaps encourage positive environmental behaviour and in this respect it is relevant to the hypothesis. The purpose for doing so is because one of the main objectives of environmental taxes is to induce behavioural change. But often, positive a pro-environmental attitude does not necessarily translate into pro-environmental behaviour (Tilley, 1999). For example, for SMEs, paying taxes may simply be a matter of accounting. Literature shows that SMEs are constrained by resource limitations. So, for a particular SME to want to invest in, say, energy saving equipment, it may not be feasible. Mitigating circumstances may result in a gap between attitudes and behaviour (Tilley, 1999).

The attitude questions are treated as very significant in the context of the current hypothesis because although attitude here, is necessary, it is not a sufficient condition for behaviour change and in the context of SMEs, there may be a number of other mitigating factors explaining their environmental behaviour or lack of it. In this context, the researcher chose to seek information on environmental behaviour through questions on their waste disposal or recycling behaviour because the researcher believes that this is the simplest indicator of engagement with environment. The researcher was also keen to understand if there exists a relationship between attitudes and behaviour, then whether this association is influenced by the groups (i.e. the independent variables). The responses to these questions, when subjected to statistical analysis and interpretation, help prove or disprove the hypothesis.

Choice of statistical tests

In the hypothesis there is an implied association between a) attitudes to environmental issues, b) environmental taxation and c) environmental behaviours in groups within SMEs. But the small response rate to the survey and sample size proves an impediment here. As the data does not permit the testing of this hypothesis using the expected regression models, the problem has to be approached by splitting the working hypotheses in such a way as to test in

separate sets the association between the environmental behaviour variables of C3, C4, C5, C6 and the attitude variables of A8, B4, B8, B9 and separately the environmental behaviours of C3, C4, C5, C6 and the grouping variables of D1, D2, D6, B10. The researcher is aware that this changes the inherent meaning within the hypothesis but being bound by data limitations the researcher feels this is the best approach to take. In undertaking such analyses the researcher's choice of tests necessitated by data, gains support from a study by Cassells and Lewis (2011) who explored the link between environmental attitudes and actions of SMEs in New Zealand through an examination of the interrelationship between attitudes, environmental practice adoption and environmental awareness (Cassells and Lewis, 2011, p.189) using simple yet effective Pearson chi-square and Kruskal-Wallis tests. It was important for the researcher to find support in the literature in deciding to split the hypothesis and test it using simpler tests for similar variables as tested by Cassells and Lewis (2011) and this proves that the approach adopted by the researcher is most appropriate under the circumstances.

The researcher feels it is necessary to note here that although some of the same questions (i.e. A8, B4, B8, B9) are used here too, they are still relevant in the context of Hypothesis H6 because without these particular questions on attitudes towards environmental issues and behaviours, H6 cannot be tested. Also, to identify differences in groups within SMEs the tests in H6 are more elaborate due to the necessary splitting of the working hypothesis.

The researcher feels it is not relevant to describe each of the questions here again and so chooses instead to describe only the questions on environmental behaviours (i.e. C3, C4, C5, and C6), mention the others and then proceed to report and interpret the statistical test result findings.

QA8: Business and environmental issues

QA8 comprises nine statements as listed below:

A8.1   Business is the largest contributor to climate change

A8.2   Climate change is a huge challenge to mankind

A8.3   Climate change is a significant issue for my business

A8.4   Efficient energy use is important for my business

A8.5   SMEs are responsible for more than 70% of the total pollution

A8.6   Pro-environmental attitudes do not always mean pro-environmental behaviour

A8.7   SMEs are highly suspicious of environmental policies

A8.8   In these economically challenging times climate change is a low business priority

A8.9   My business has a responsibility to help manage the impact of climate change

QB4: In your opinion, what is environmental taxation?

QB6: Which of the following government policies do you feel would be most effective in reducing   the impact of climate change?

QB8: Environmental taxation is an instrument to mitigate climate change. Do you agree?

QB9: In your opinion, what do you think is the purpose of environmental taxation?

QC3: Do you recycle?

The researcher believes that recycling is one of the first and simplest ways to demonstrate engagement with the environment and most businesses produce enough waste that is either sent to the landfill site thereby incurring a landfill tax on the disposal or, if possible, some if

not all waste is recycled, which may potentially reduce their landfill tax burden. Whether respondents recycle or not can help the researcher gauge the basic differences in groups within SMEs who do and do not recycle and their possible relationships with their environmental attitudes. In this regard, if the findings from the statistical tests of this environmental behaviour variable lend some support to H6, and if for instance they find that there is a significant association between recycling and environmental attitudes and recycling differences between groups within SMEs, then the researcher expects to confirm the perception that there are factors that impinge upon demonstration of environmental behaviour and make recommendations on the basis of the findings. Such findings could also lend understanding to how to encourage more environmentally friendly behaviours such as increased recycling by recognising the differences within the group(s).

Evidence from questionnaire

Table 53 shows the descriptive statistics including the mode for QC3 and the statistical test results. Previously the descriptive statistics for other variables have been presented through other hypotheses so they are not repeated here. Question C3 is a nominal variable asking if respondents recycle or not and assigns arbitrary binary codes of 1 and 2 to 'recycle' and 'do not recycle', respectively. This section is first subdivided according to the test variables.

H_0: Within SMEs, recycling behaviour bears no association to:

a) environmental attitudes as demonstrated through responses to QA8;

b) attitudes towards environmental taxation as demonstrated through responses to QB4, B8 and B9;

and c) differences in groups (by independent variables) within SMEs.

H_1: Within SMEs, recycling behaviour bears an association to:

a) environmental attitudes as demonstrated through responses to QA8;

b) attitudes towards environmental taxation as demonstrated through responses to QB4, B8 and B9;

and c) differences in groups (by independent variables) within SMEs.

QC3: Do you recycle? Yes=1; No=2												
Response received	**Frequency**	**Statistical tests**	**A8**					**B4**	**B8**	**B9**	**D1**	**D2**	**D6**	**B10**
Valid=93	Yes=84.8%	*Chi-Square*						Not computed*		$\bar{x}(3)=12.59;p=0.00$	$\bar{x}(1)=.062;$ p=.803	$\bar{x}(2)=3.659;$ p=.161	$\bar{x}(1)=9.705;$ p=0.003	$\bar{x}(1)=6.013;$ p=0.014
			A8.1	*A8.2*	*A8.3*	*A8.4*	*A8.6*	*A8.8*						
Missing=6	No=9.1%	*Mann-Whitney*	U=103.500; p<0.000;Mdn1=3.00;Md	U=206.500; p=0.008;Mdn1=2=2.00	U=208.000; p=0.024;Mdn1=2=2.00	U=97.000; p<0.000;Mdn1-2=3.00	U=119.500;p<0.000	U=195.000; p=0.019;Mdn1=3.00;Md					
Mode=1	Total=93.9%								U=215.000; p=.029;				

p is the asymptotic 2-tailed significance in Chi-Square tests and Mann-Whitney tests; * No measures of association are computed for the cross-tabulation of meaning of environmental taxation * Recycling behaviour. At least one variable in each 2-way table upon which measures of association are computed is a constant.

Table 53:Do You Recycle* A8, B4, B8, B9, D1, D2, D6, B10

The table above presents the results of the statistical tests conducted on recycling behaviour QC3. As can be seen from the table, nearly 85% of all respondents claim that they engage in recycling of their commercial waste. This is a high percentage and when tested for significant association with the other aforementioned variables, there emerged a number of significant findings. For QA8 attitudes to environmental issues, the tests found significant association in the case of six variables, namely, A8.1, A8.2, A8.3, A8.4, A8.6 and A8.8.

The results of Mann-Whitney tests show that not only are the test results significant (i.e. $p<=0.05$) but there are some interesting observations between the degrees of agreement to the statement. For A8.1, the group that recycles agrees more strongly to the statement 'business is the largest contributor to climate change' than the group that does not, and similarly for A8.8, the group that recycles agrees more strongly to the statement 'my business has a responsibility to help manage the impact of climate change' than the group that does not. However, there is no such difference between degree of agreement to statements A8.2, A8.3 and A8.4. And surprisingly there is an unexpected difference that emerged in the medians for A8.6 'pro-environmental attitudes do not always mean positive environmental behaviours' which shows that the group that recycles agrees less strongly to this statement than the group that does not. The only explanation for this difference could be the sample size and the missing values within A8.6 as shown in Table 53 above. The following bar charts show the significant findings for statements A8.1, A8.2, A8.3, A8.4, A8.6, and A8.8.
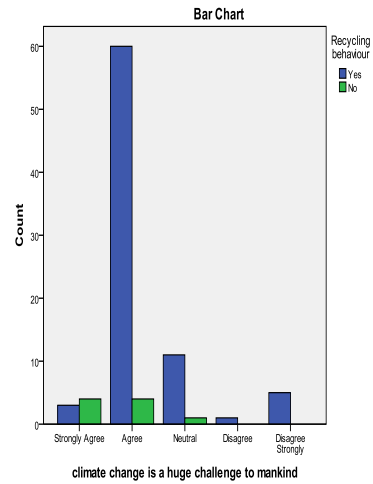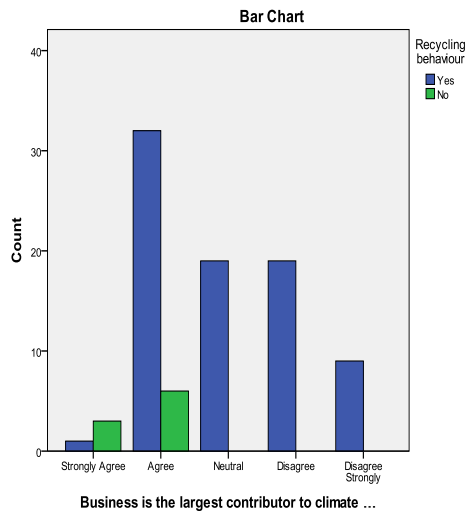
Figure 22: A8.1 and A8.2 and C3

The bar charts in Figures 22 above and 23 below show the variations in responses of the groups that do and do not recycle and their levels of agreement and disagreement with the attitude statements. As evident from the graphs there are many missing responses and that may be critical in understanding the lack of any patterns in the findings for A8.6 medians.

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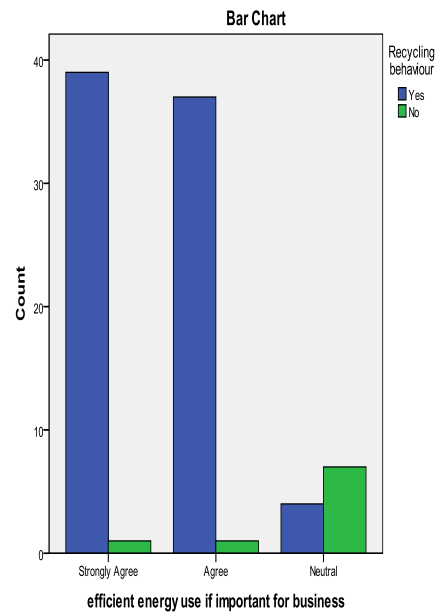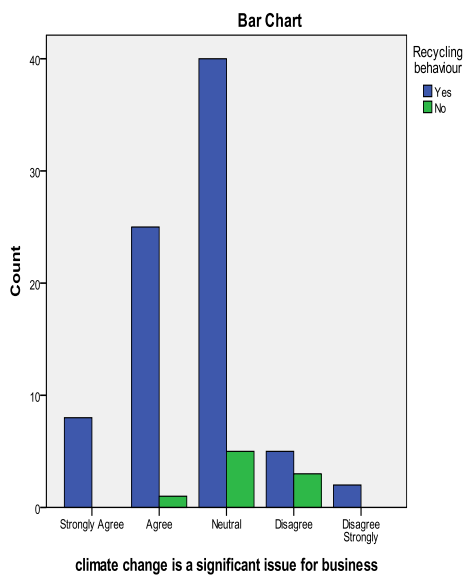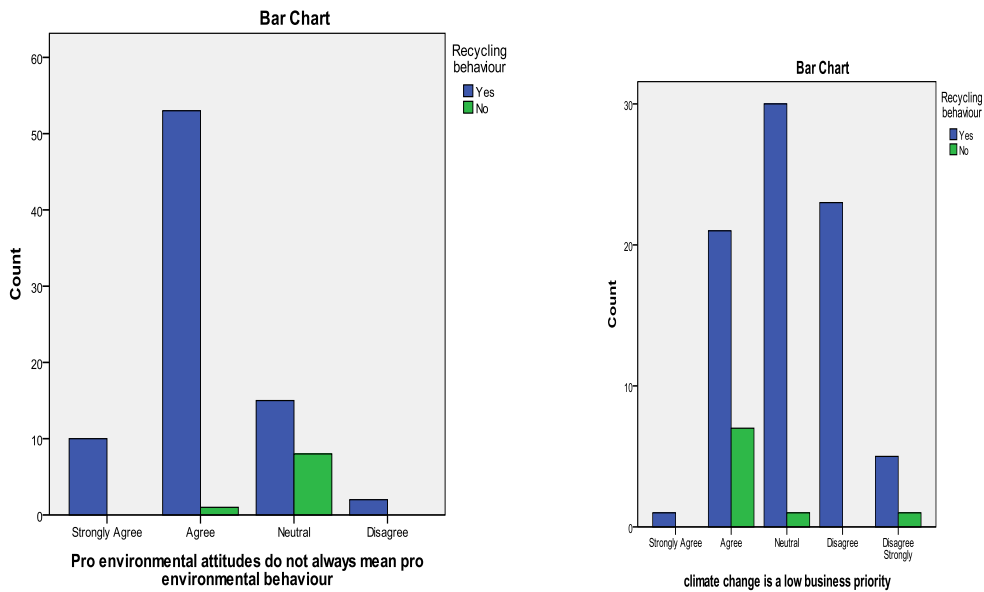
Figure 23: A8.3, A8.4, A8.6 and A8.8 with C3

Table 53 also reports the results of chi-square tests for variables for D1, D2, D6, D10, B4 and B9. For B4 no measures of association could be computed for the cross-tabulation of the meaning of environmental taxation B4* Recycling behaviour C3. SPSS reports that this is because at least one variable in each 2-way table upon which measures of association are computed is a constant. Only 37.4% of all respondents replied to B4 and 62.6% are missing. Of the ones who responded to this question, all the respondents said 'yes' to whether they recycle or not so there is only one category in the variable test and so it cannot be computed.

The chi-square statistic for the test for B9 'purpose of environmental taxation' yielded significant test results. $\bar{x}$ (3)=12.569 and p=0.006. From the Table 54 below we can see that there are very few cases within each category of responses for B9 and this can skew the results of the statistical test.

Category of responses	Recycling Behaviour	
	Count	
	Yes	No
Do not know	4	2
Another business tax to raise government revenue	49	1
Fines on polluting behaviour	10	1
Incentivise favourable behaviour	7	3

Table 54: A8.3, A8.4, A8.6 and A8.8 with C3

The chi-square test result for this variable B4 and the significant p (2-tailed) confirm that there is an association between perceptions of purpose of environmental taxation and recycling behaviour. But it is not sufficient to be interpreted as the whole truth on its own and would be much better analysed with regression models if the data permits. For the purpose of illustration the graph below confirms that there are too few cases to be able to make any significant conclusions although the test result is conclusive in its own right.
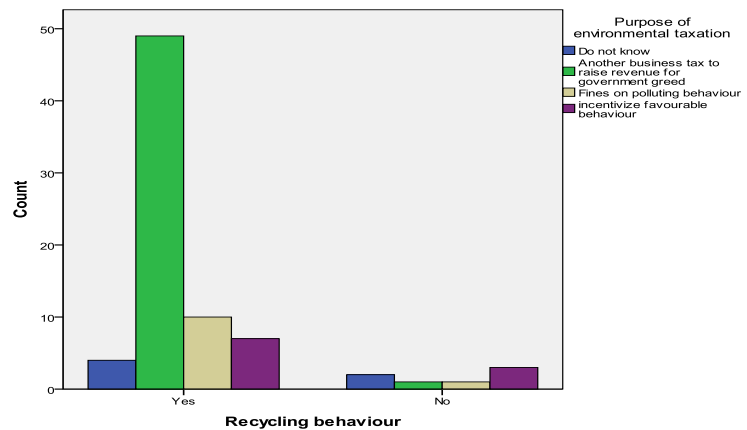
Figure 24: A8.3, A8.4, A8.6 and A8.8 with C3

Table 23 also reports the Mann-Whitney test results for B8 and finds significant association between attitudes to 'importance of environmental taxation as an instrument to mitigate climate change' and recycling behaviour. Here U=215.000 and p (2-tailed) = 0.029. There also emerges a significant difference between degrees of agreement to the B8 statement on the median responses of two recycling and non recycling groups. The test shows that the group that recycles agree less strongly with the statement than the group that does not recycle. The researcher contends that such unexpected median results can be explained due to the small sample size problem yet again, because if there are too few cases within each category, as shown in the table below, it affects the results adversely.

Category of responses	Recycling Behaviour	
	Count	
	Yes	No
No opinion	19	0
Definitely important	3	0
Important	22	1
Probably important	19	4
Probably not important	21	4

Table 55: Effectiveness of Environmental Taxation B8 * Recycling Behaviour C3

And finally, Table 53 also reports chi-square test statistics for the independent variables of sector D1, size D2, membership of a a TA D6 and access to environmental information B10. Only for two of the test variables are the findings significant (i.e. p<=0.05) and these are membership of a a TA and access to environmental information with $\overline{x}$ (1) =9.705 and p (2-tailed) =0.003 and $\overline{x}$ (1) =6.013; p=0.014. So this confirms that there is an association between the recycling behaviour and SME membership of a a TA and their access to

environmental behaviour. The researcher feels that this may be so because through access to information and membership those SMEs have more information and understanding of recycling and its advantages and this may influence them to do so. As Table 56 below shows those who are members of a TA and also those that receive environmental information recycle more than those who do not.

Recycling Behaviour	Count			
	Membership of a a TA		Environmental Information received	
	Yes	No	Yes	No
Yes	59	23	35	49
No	2	7	0	9

Table 56: Membership of a a TA; Environmental Information received * Recycling Behaviour C3

In conclusion the researcher finds that there are a few significant associations between variables of membership of a a TA, information received on environmental issues, attitudes towards environmental taxation as shown by responses to B8 and B9, and attitudes to environmental issues as demonstrated by A8.1, A8.2, A8.3, A8.4, A8.6 and A8.8 to the recycling behaviour nominal variable in QC3. On this basis of the test results these findings lend some support to Hypothesis H6.

QC4: How often do you recycle?

The purpose of asking this question was to elicit a pattern, if any, of recycling behaviour amongst SMEs. Household-recycled waste is collected, usually weekly, by most English county councils, but this is different for commercial recycling due to a) the nature of the waste they generate and b) the costs associated with hiring a waste management company for collecting and recycling the waste. The researcher was invited to attend and present at the

local chamber of commerce waste management workshop in summer 2011 and through interactions with other business attendees and the presentation there the researcher learnt that commercial waste recycling can be very costly and as such many small businesses resort to fly tipping[75] of even their highly toxic and recyclable waste. The researcher felt that understanding their recycling patterns through this question would shed more light on the recycling behaviour. In this question the researcher provided five categories of responses to choose from, namely, daily, weekly, fortnightly, monthly and any other. These responses were assigned arbitrary codes of 1, 2, 3, 4 and 5 respectively for data input purposes. In this regard, if the findings are significant then they can be expected to lend some support to Hypothesis H6.

Evidence from questionnaire

Table 57 shows that of the 84.8% responses received to QC4, nearly 44% said they recycle daily; 37.4% said they recycle weekly; there were no responses to the categories of fortnightly and/or monthly and the remaining 3.0% said 'any other'. This 'any other' category could indicate that their recycling pattern is anything other than daily or weekly so could potentially include even monthly or fortnightly or perhaps rare recycling patterns. But it is impossible to make such strong deductions from these frequencies and as such they are reported only as they are. Table 78 below shows the results of the statistical tests undertaken on C4 but none of the tests, chi-square or Kruskal-Wallis, report any significant findings thereby showing that there are no significant associations between recycling patterns and the respondents' attitudes towards environmental issues or environmental taxation in groups within SMEs.

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[75] Fly-tipping is the illegal dumping of waste on land that does not have a licence to receive it (Directgov, 2011)

Recycling Patterns	Count																					
	D1		D2			D6		B10		B4				B8					B9			
	1	*2*	*1*	*2*	*3*	*1*	*2*	*1*	*2*	*1*	*2*	*3*	*4*	*0*	*1*	*2*	*3*	*4*	*0*	*1*	*2*	*3*
Daily	28	16	17	16	9	33	10	21	23	9	0	4	4	-	-	-	-	-	2	25	9	2
Weekly	26	11	17	12	4	23	13	14	23	8	3	3	3	5	11	9	12	37	2	23	1	5
Any other	1	2	1	2	0	3	0	0	3	0	0	0	1	-	-	-	-	-	0	1	0	0

Table 57: D1, D2, D6, B10, B4, B9, * Recycling Pattern C4

In the above Table 57 the numbers used to denote the categories within the variables are arbitrary. So here D1 is sector - manufacturing (1), transport (2); D2 is size of business - micro (1), small (2), medium(3); D6 is membership of a a TA - 'yes' (1) and 'no' (2); B10 is environmental information received - 'yes' (1) and 'no' (2); B4 is the meaning of environmental taxation the categories of which are 'another business tax' (1), 'tax to encourage good environmental behaviour' (2), 'taxing environmentally damaging activities' (3) and 'taxes on energy and waste' (4); B8 is importance of environmental taxation - 'no opinion' (0), 'definitely important' (1), 'important' (2), 'probably important' (3), 'probably not important' (4); and B9 is purpose of environmental taxation in which the categories are 'do not know' (0), 'another business tax' (1), 'fines on polluting behaviour' (2), and 'incentive favourable behaviour (3).

The above table presents the cross-tabulation of responses between the variables, for example, 28 of all manufacturing respondents recycle daily and 16 of all transport respondents recycle daily. The purpose of this table is only to present the raw data in its nascent form. Since none of the statistical tests reported below show any significant findings, there is no further support from these tests to Hypothesis H6 thereby showing that there is no association between recycling patterns C4 and any of the other variables tested below.

QC4: How often do you recycle? Daily=1;Weekly=2;Fortnightly=3;Monthly=4;Any other=5																		
Response received	**Frequency**	**Statistical tests**	**A8**										**B4**	**B8**	**B9**	**D1**	**D2**	**D6**	**B10**
			1*	2	3	4	5	6	7	8	9	$\bar{x}$ (6)=6.899; p=.330		$\bar{x}$ (6)=7.667;p=0.264	$\bar{x}$ (1)=1.813; p=.404	$\bar{x}$ (4)=2.735; p=.603	$\bar{x}$ (2)=2.818; p=0.244	$\bar{x}$ (2)=3.031; p=0.220
Valid=84	1=44.4%; 2=37.4% 5=3.0%	*Chi-Square*																
Missing=15	Total=84.8%	*Kruskal-Wallis*	$\bar{x}$ (2)=5.164; p(2-tailed)=0.076	$\bar{x}$ (2)=0.361; p(2-tailed)=0.835	$\bar{x}$ (2)=1.439; p(2-tailed)=0.437	$\bar{x}$ (2)=50.157; p(2-tailed)=0.487	$\bar{x}$ (2)=1.146; p(2-tailed)=0.564	$\bar{x}$ (2)=1.146; p(2-tailed)=0.924	$\bar{x}$ (2)=1.149; p(2-tailed)=0.492	$\bar{x}$ (2)=.276; p(2-tailed)=0.871	$\bar{x}$ (2)=2.331; p(2-tailed)=0.312		$\bar{x}$ (2)=4.176; p(2-tailed)=.124					
Mode=1																		

p is the asymptotic 2-tailed significance in chi-square tests and Mann-Whitney tests; at least one variable in each 2-way table upon which measures of association are computed is a constant.* 1,2,3…denote A8.1,A8.2, A8.3….

Table 58: How Often Do You Recycle * A8, B4, B8, B9, D1, D2, D6, B10

QC5: Why do you not recycle?

From responses to Question C3 above it emerged that about 9.1% of all respondents claimed that they did not recycle. However the reasons why they did not recycle did not emerge from C3. The researcher feels that it is very important to understand why certain businesses choose not to recycle their commercial waste and so asked the question 'Why do you not recycle' targeting those who said they did not recycle. In this question the researcher provided four categories of responses to choose from as shown below. These responses were assigned arbitrary codes of 1, 2, 3 and 4 respectively for data input purposes. In this regard, if the findings are significant then they can be expected to lend some support to Hypothesis H6.

QC5: 1= *Costly*

2= *No local recycling facilities available for waste produced*

3= *Time consuming*

4= *Do not generate recyclable waste*

Evidence from questionnaire

Given that the responses to Question C5 are from the 9.1% respondents who said they did not recycle, so the responses within each category in the cross-tabulation table above are quite small in number. For example, 1 respondent from the manufacturing sector said it was 'costly' to recycle so he did not do so. There were only 9 valid responses of which most of them (4%) said it was rather costly so they did not recycle and some (3%) also said that there were no local facilities available and also that it was time-consuming (2%). None of them however said they did not produce any recyclable waste. The researcher believes that one of the biggest barriers to increased recycling for SME commercial waste is the cost factor and this finding has also emerged in the interviews where participants have said time and again that they require low cost, easily available recycling facilities. The cross-tabulation for B4

'what is environmental taxation' and C5 'reasons for not recycling' is empty, and also for

B10 'environmental information received' there are no responses within

the group that receives environmental information on their cross-tabulation to C4

Reasons for not recycling	Count																					
	D1		D2			D6		B10		B4				B8					B9			
	1	2	1	2	3	1	2	1	2	1	2	3	4	0	1	2	3	4	0	1	2	3
Costly	1	1	3	1	0	1	3	-	4	-	-	-	-	-	-	0	2	2	2	0	0	2
No facilities	2	1	2	0	1	1	2	-	3	-	-	-	-	-	-	1	2	0	0	2	0	1
Time consuming	-	-	1	0	0	0	2	-	2	-	-	-	-	-	-	0	0	2	0	0	2	0
Do not produce such waste	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 59: D1, D2, D6, B10, B4, B8, B9, * Reasons for not recycling C5

Table 60 below presents the findings of the statistical tests conducted for QC4 on each of the variables of A8, B4, B8, B9 and D1, D2, D6 and B10. None of the statistical tests undertaken found any significant values. So no association could be found between reasons for not recycling with the respondents attitudes towards: environmental issues (A8); attitudes towards environmental taxation (B4, B8, B9) and the business sector (D1); size they belong to (D2) or their membership of a a TA (D6) and/or the information on environmental issues they receive (B10). No measures of association could be computed for the cross-tabulation of 'any Information on environmental issues received' (B10)* reasons for not recycling (C5) because at least one variable (the category 'yes' in B10) in each 2-way table upon which measures of association were computed was constant.

QC5: Why do you not recycle? 1=costly; 2=no facilities; 3=time consuming; 4=do not generate recyclable waste																		
Response received	Frequency	Statistical tests	A8										B4	B8	B9	D1	D2	D6	B10
			1*	2	3	4	5	6	7	8	9	-**					$\bar{x}$ (2)=.804; p=0.669	Not computed"
Valid=9	1=4.0% 2=3.0% 3=2.0%	*Chi-Square*												$\bar{x}$ (6)=10.500p=.105	$\bar{x}$ (1)=.139; p=.709	$\bar{x}$ (4)=3.429; p=.489		
Missing=90 Mode=1	Total=9.1%	*Kruskal-Wallis*	$\bar{x}$ (2)=2.33; p(2-tailed)=.311	$\bar{x}$ (2)=4.53; p(2-tailed)=.104	$\bar{x}$ (2)=.562; p(2-tailed)=.757	$\bar{x}$ (2)=.832; p(2-tailed)=1.00	$\bar{x}$ (1)=0.000; p(2-tailed)=.659	$\bar{x}$ (2)=2.000; p(2-tailed)=.368	$\bar{x}$ (2)=5.25; p(2-tailed)=0.072	$\bar{x}$ (2)=.833; p(2-tailed)=.659	$\bar{x}$ (2)=2.00; p(2-tailed)=0.368		$\bar{x}$ (2)=4.733; p(2-ailed)=.092					

p is the asymptotic 2-tailed significance in chi-square tests and Mann-Whitney tests; At least one variable in each 2-way table upon which measures of association are computed is a constant.* 1,2,3…denote A8.1,A8.2, A8.3….**The cross-tabulation of Meaning of Environmental taxation * Reasons for not recycling is empty.

Table 60: Why Do You Not Recycle * A8, B4, B8, B9, D1, D2, D6, B10

QC6: In your opinion, what do you think the government can do to help SMEs improve their environmental behaviour? Please elaborate.

This question was aimed at eliciting information from the respondents about what measures they think would best encourage SMEs to become more environmentally conscious and active. This question does not directly indicate any information about SME environmental behaviour but is expected to provide an indication into what kind of support or measures can encourage increased engagement with the environment and therefore positive environmental behaviour. In this regard, the researcher felt it was necessary to keep this question open-ended so not to provide any biased categories of responses to choose from. From the responses gathered there emerged a repetition of responses based on which the researcher could categorise the open-ended answers into five categories. Taking into consideration what kind of support and measures SMEs require, this question is expected to provide information to understand SME environmental behaviour or the lack of it and in this regard, the findings from C6 would be expected to lend support or no support to Hypothesis H6.

Evidence from questionnaire

Question C6 generated five categories of responses as shown below and coded with numbers arbitrarily for purposes of data input:

1= Provide cost effective energy solutions

2= Increased communication from policy-makers and government agencies

3= Reduce environmental taxes

4= Provide free recycling bins to encourage recycling

5= Awards and other incentives for businesses which demonstrate good practice

These response categories were generated from all the open-ended responses obtained for this question. Table 61 below shows the results of the statistical tests conducted for QC6. There was a very high (96%) response rate to this question and most of the respondents, nearly 39%, said that they would like more communication from policy-makers and government agencies.

QC6: In your opinion, what can government do to help SMEs improve their environmental behaviour																		
Response received	**Frequency**	**Statistical tests**	**A8**									**B4**	**B8**	**B9**	**D1**	**D2**	**D6**	**B10**
			1*	2	3	4	5	6	7	8	9						$\bar{x}$ (4)=1.565; p=.815	$\bar{x}$ (4)= 3.785; p=.440
Valid=95	1=10.1% 2=38.4% 3=10.1% 4=24.2% 5=13.1%	*Chi-Square*										$\bar{x}$| (12) =8.889; p(2-tailed)=0.712		$\bar{x}$| (12)=17.306;p=.138	$\bar{x}$| (4)=6.644; p=.156	$\bar{x}$| (8)=7.975; p=.436		
Missing=4	Total=96%	*Kruskal-Wallis*	$\bar{x}$| (4)=3.767; p(2-tailed)=438	$\bar{x}$| (4)=2.063; p(2-tailed)=724	$\bar{x}$| (4)=3.038; p(2-tailed)=551	$\bar{x}$| (2)=3.804; p(2-tailed)=433	$\bar{x}$| (4)=2.627; p(2-tailed)=622	$\bar{x}$| (4)=6.189; p(2-tailed)=186	$\bar{x}$| (4)=3.155; p(2-tailed)=532	$\bar{x}$| (4)=11.333; p(2-tailed)=0.023	$\bar{x}$| (4)=1.799; p(2-tailed)=0.733		$\bar{x}$| (4)=2.421; p(2-ailed)=.659					
Mode=2																		

p is the asymptotic 2-tailed significance in chi-square tests and Mann-Whitney tests. *1,2,3…denote A8.1,A8.2, A8.3…

Table 61: What Can Govt. Do to Help SMEs Improve Environmental Behaviour * A8, B4, B8, B9, D1, D2, D6, B10

The researcher feels that the fact that a majority of respondents wished for increased communication shows that SMEs would like to be more involved in the climate change discussion and shows an indication of wanting to become more environmentally friendly. But owing to a lack of information, they do not have the know-how and this lack of awareness can translate easily into poor environmental behaviour. From Table 81 we can see that only in the case of A8.1 'climate change is a low priority in these economically challenging times' there emerged a significant test result for the Kruskal-Wallis test where $\bar{x}$ (4)=11.333 and p(2-tailed) is 0.023. For none of the other tests were there any significant findings. Given that the Kruskal-Wallis test shows significance it is important to undertake Mann-Whitney tests to conduct pair wise comparisons between groups.

Adjustment of p-alpha to mitigate type 1 error: As there are five categories in QC6 so there are ten pair wise comparison tests amongst the group. In this case it is necessary not to use the usual p alpha p<=0.05 to decide if the test is significant. To mitigate the increased risk of rejecting H_0 which arises from a set of non-independent tests in a set, it is necessary to make an approximation Bonferroni correction to p alpha dividing the usual p alpha p<=0.05 by the number of pair wise comparisons in the set. In this case p alpha becomes 0.005. However given the large number of ninety tests conducted, this adjustment of p alpha makes the test weak at finding a significant effect even if it is quite large. So the researcher agreed to make a compromise on a corrected p alpha of 0.01.

The following Table 62 shows the test results for Mann Whitney results amongst groups. Most of the MWs report both the asymptotic significance and the exact probability. In case of smaller sample size, it is recommended to report the exact probability where it exists, so that is the one the table reports. This is unless SPSS has only reported the asymptotic 2-tailed significance. The following numbers C6 (12;13;14;15;23;24;25;34;35;45) are used to denote the pairs in order to simplify the table. No significant differences emerge from the pair wise comparisons between groups. In this regard, these tests provide no support for Hypothesis H6.

Table 62: Significant Mann Whitney Test Results in pair wise comparisons amongst groups

A8.8 Climate change is low on our priority in these economically challenging times										
Test results	C6(12)[76]	C6(13)	C6(14)	C6(15)	C6(23)	C6(24)	C6(25)	C6(34)	C6(35)	C6(45)
Mann Whitney U	155.000	17.000	69.000	58.000	82.000	306.000	193.000	87.000	26.000	93.000
Equivalent-z	-.704	-2.413	-2.034	-.137	-2.391	-2.005	-.575	-.940	-2.103	-1.813
P alpha	Exact sig.(1-tailed)[77] 0.520[78]	1T .022	1T 055	1T .923	1T .022	2T[79] .045	2T .565	1T .414	1T .049	1T .090

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[76] (12; 13; 14…45) are pair wise groups of categories of responses within C6.
[77] Exact Sig. [2*(1-tailed sig.)] abbreviated here as 1T
[78] not corrected for ties
[79] Asymp. sig. (2-tailed) abbreviated as 2T

Summary of Hypothesis 6

Table 63 below summarises the results of the statistical analyses conducted to enable the researcher to decide whether there is support or otherwise for Hypothesis H6 on responses obtained from the participants to questions C3, C4, C5, C6, A8, B4, B, B9, D1, D2, D6, and B10 in the questionnaire. The hypothesis had to be split in order to test for association between SME environmental behaviour and environmental attitudes; attitudes towards environmental taxation and the association with the independent variables due to the small response rate. Non-parametric statistical techniques comprising chi-square, Mann-Whitney and Kruskal Wallis tests were used in significance tests of the variables. The evidence from the tests provides partial support for Hypothesis 6 - **There is an association between a) attitudes to environmental issues, b) environmental taxation and c) environmental behaviours in groups within SMEs** - in view of the results of the statistical analyses conducted for QC3 with respect to B4 (meaning of environmental taxation); B8 (importance of environmental taxation); B9 (purpose of environmental taxation); D6 (membership of a a TA); and B10 (Information on environmental issues received).

Question	Description	Findings
C3	Do you recycle?	Supported for B4; B8; B9; D6 and B10
C4	How often do you recycle?	Not supported
C5	Why do you not recycle?	Not supported
C6	What do you think the government can do to encourage SMEs to improve their environmental behaviour?	Not supported

Table 63: Summary of Hypothesis H6

6.6 Summary

This chapter used the primary data collected through survey questionnaires to test the hypotheses that were formulated in Chapter 5. The survey was conducted on 750 SMEs in the South of England. The purpose of the survey was to understand what SMEs thought and knew of environmental taxation and what kind of differences existed in their awareness and attitudes towards environmental issues and taxation in relation to their inherent heterogeneous nature owing to different sector, size etc. This chapter took into consideration four independent variables that were derived from the literature and tested for significant differences between groups within SMEs for all hypotheses except Hypothesis 5. Hypothesis 5 attempted to understand if there were any significant associations between environmental attitudes and attitudes to environmental taxation. The results of each hypothesis test are presented through tables. Other illustrations such as bar graphs and cross-tabulations are used to present the raw data.

The researcher feels that this survey was significant not only because of the emergent findings from the tests conducted on the data but also because through dissemination of questionnaires and contact with potential respondents the survey helped create awareness about the impact of SMEs on the environment. The questions sought information on SME environmental attitudes: what kind of policy they felt would be most significant to mitigate environmental issues; what was their environmental behaviour as demonstrated by their recycling behaviour; what they thought of environmental taxation; and what could the policy-makers do to make SMEs more environmentally friendly etc. Questions on environmental tax showed that more respondents were unaware of the term 'environmental taxation' than those who were aware of it. So this survey would have provided them with the knowledge and awareness of the existence of this instrument. Environmental taxation is levied on many sectors almost all of which have SMEs within them and it is crucial that these businesses understand what these taxes are for; why they are levied; and how they can lessen the burden of these taxes.

Otherwise the key objective of behaviour change through implementation of these taxes will not be fulfilled and environmental taxation will become 'yet another business tax' and this may potentially result in evasive behaviour. The survey was targeted to SME owner-managers within the two sectors of manufacturing and transport to not only see if there were any significant differences due to groups within SMEs but also to target the SME owner-manager who is seen as a key influence on business priorities within SMEs. If their awareness is raised and they become more engaged with the wider climate change issue then this would have very positive consequences on the success of any environmental policy that is implemented. The researcher believes that increased awareness and effective communication would lessen the gap between attitudes and actions and overcome, to a certain extent, the barriers that cause SMEs to not be fully engaged with the environment. In this regard, the researcher feels that the survey has had the multiple effects of not only trying to find significant associations between variables but has also become a tool of information dissemination by creating awareness.

The following chapter discusses the findings from the qualitative semi-structured interviews conducted with the SME owner-managers. The purpose of the interviews is only to lend some insights into the findings of the surveys not to try to test the hypothesis.

7 Qualitative Data: Analysis and Interpretation

7.1 Introduction

In Chapter 6 the researcher analysed the primary data collected through survey questionnaires through a series of statistical tests and presented the findings. The previous chapter included detailed discussion of the data, the use of suitable statistical tests illustrated with tables and graphs using the software SPSS18 and presented the findings of the hypotheses that are tested through the statistical tests. The chapter concluded with ascertaining, through statistical tests, whether there was any support for the hypotheses or otherwise and also discussed significant findings.

In the current chapter, the researcher presents the detailed analysis of the qualitative data gathered through face-to-face semi-structured interviews with the owner-managers of Small and Medium-sized Enterprises (SMEs). This chapter describes at the outset the interview process, the interview participants, the themes and the units of data analysis. The researcher interviewed thirty SME owner-managers in the South of England using semi-structured interview schedules to explore their understanding and attitudes towards environmental issues and environmental taxation using manual and software (QSR Nvivo 9) based thematic qualitative analysis.

The interviews are exploratory in nature and are intended to delve into the subjective perceptions of the participants about issues surrounding SMEs and their attitudes towards climate change and environmental taxation as an instrument to mitigate climate change. The researcher strongly believes that the nature of the research question determines the method(s) of data collection and in this regard, understanding SME owner-managers' subjective views on the issues discussed could only be achieved through semi-structured interviews[80] to

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[80] For more details on semi-structured interviews please see section 4.5.3 Chapter 4.

provide further insights into the survey findings. Using only quantitative methods such as survey questionnaires would be insufficient in understanding individual business attitudes (Petts et al, 1998). The researcher believes that in order to engage SMEs in the wider discussion of climate change and environmental taxation it is necessary to ascertain their subjective opinions on those issues. The nature of the data collected through the interviews is qualitative.

The data analysed and interpreted in this chapter along with the results obtained in the previous Chapter 9 provide the bases for policy recommendations and conclusions which are discussed in Chapter 11.

7.2   The Interviews

The researcher conducted thirty face-to face-interviews and three pilot interviews with SME owner-managers in the manufacturing and transport sectors. The researcher used semi-structured interview schedules to explore and delve deeper into understanding the subjective perceptions and attitudes of SME owner-managers towards climate change issues and environmental taxation. The manufacturing and transport sectors were targeted for the interviews to maintain consistency with the survey which also targeted only manufacturing and transport sector SME owner-managers in the south of England.

The purpose of conducting the interviews was to gain further insights into respondents' subjective perceptions which lend more support and reinforce the findings of the questionnaire survey. These interviews enable respondents to express their opinion at length which survey questionnaires are unable to do and are not intended to do. The interviews were conducted at the offices of the SME owner-managers. Permission to record the interview was sought before the interview commenced. The researcher sent request letters to potential interviewees to conduct interviews with them. All interviews were recorded using an Olympus DM-450 digital voice recorder and transcribed immediately after the interview and saved. Transcripts of audio or video recording provide a reliable record of the interaction which researchers can use to develop new hypotheses (Silverman, 2001).

To overcome the mitigating circumstances surrounding SME research such as the difficulty in undertaking interviews with busy owner-managers and the difficulty in generating a sampling frame etc. the researcher had to remain flexible in terms of not only the length of the interview but also remain prepared during the two month period between December 2010 and February 2011 to conduct interviews as and when the SME owner-managers could make time. As mentioned in Chapter 4 the south of England was chosen as the data collection region for reasons of proximity and ease of travel. The researcher was willing to travel to different towns and counties within this region to conduct interviews. In two cases longer journey times due to traffic rendered 40 minute long interviews down to 20 minutes as the interviewees were unable to give more time. However, the researcher was committed to seeking out as much information as she could and was willing to travel long distances even for a shorter interview.

The interviews were undertaken concurrently while survey questionnaires were disseminated (see Chapter 4). Although initially the researcher intended to undertake a Sequential Explanatory Strategy (Creswell, 2009) in which the first phase collects and analyses quantitative data (i.e. survey questionnaire) and the second phase collects and analyses qualitative data (i.e. semi-structured interviews). Then the quantitative results are explained and interpreted by analysing the qualitative data but this strategy could not be undertaken because as literature has shown SME research is marred by the difficulty in gaining access for interviews and low response rates. Due to such mitigating circumstances, the researcher chose to conduct the interviews as soon as the potential interviewees were available which meant that most interviews were undertaken while the researcher was awaiting the survey results. The researcher does not think that this is a shortcoming of the study at all. In fact the researcher believes that this concurrent data collection through two separate methods of survey and interviews ensured that the interview questions were not influenced by survey findings. Thus the researcher, in analysing the interview data, can analyse it independently and observe whether these data reinforce the survey findings or not and also to what degree

the data are insightful. Although the collection of data occurred fairly concurrently owing to circumstances, the analyses were undertaken sequentially with the survey results first analysed statistically followed by the qualitative analysis of the interview data. The researcher chose to do this because she felt that the interview data would lend further insights into whatever significant patterns were emerging out of the statistical tests of the survey data.

The following flowchart depicts the approach to qualitative data in this study:
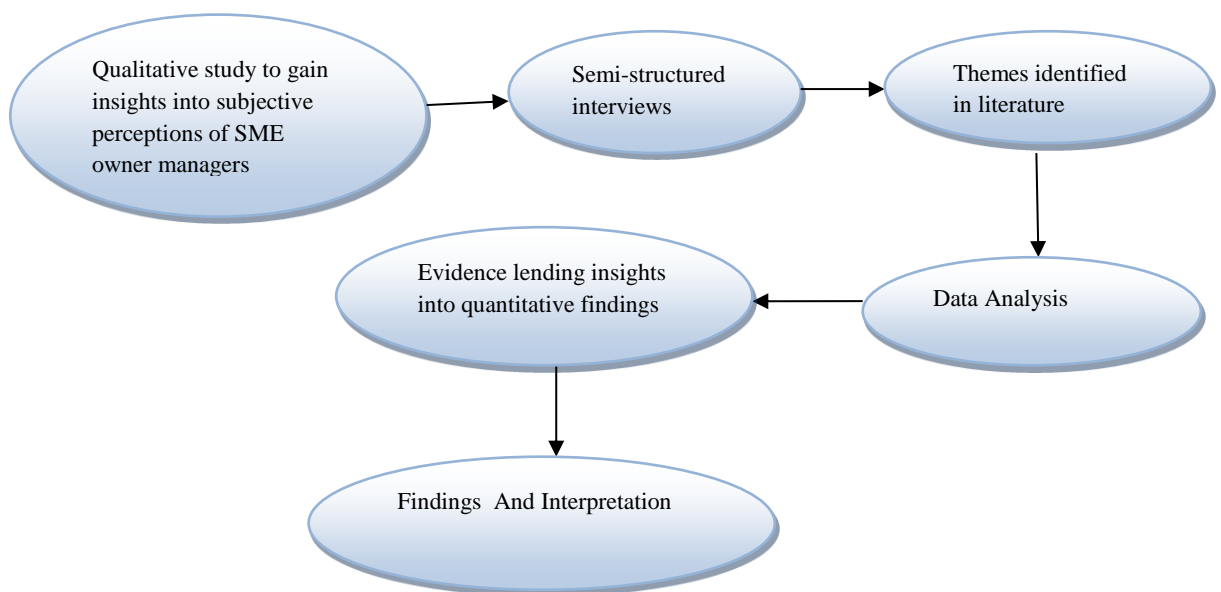
Figure 25: Schematic Approach to qualitative data

7.3   Interview schedule and themes

The questions in the interview schedule were a mixture of closed and open-ended questions (see Appendix). Some questions such as which sector - manufacturing or transport - and what size category - micro, small or medium - their business was within, had to be kept close-ended (see section 1.5 below). The researcher generated the interview schedule based on themes which are derived from the literature in Chapters 2 and 3. So the themes explored through the interview reflect those investigated through hypotheses tests in Chapter 6. Before the interview schedule or interview questions were generated, the researcher developed an interview guide to ensure that all themes were adequately covered and based on that guide

the questions were formulated. The reliability of the interview schedule and the representativeness of the sample are the two key concerns here (Silverman, 2001). The interview schedule was tested before the main study through three pilot interviews. The researcher conducted three interviews with a random sample of three SME owner-managers with whom the researcher had established contact for the purpose of data collection.

The three owner-managers offered suggestions for improving the questions and also were very kind in offering their time to further review the questions once the final interview schedule was designed. This provided much needed help to the researcher in ensuring the reliability of the interview schedule. During the course of the interview the researcher followed the interview schedule to the extent that if and when any interesting themes emerged the researcher chose to probe that and veered the conversation in that direction. For example, when asked about his opinion on environmental taxation from relevant sources one participant (I3[81]) seemed quite annoyed with what he referred to as the UK government's "*sentimental climate obsessed foolishness''*" which encouraged the researcher to ask the question why he felt that. The reasons he gave included "*do not believe in climate change being caused by human actions*" but also that he felt that his and similar businesses felt that climate change and the levying of environmental taxation was only to "*fool smaller businesses to look the other way while governments con their way into winning elections*". This was an example to show how important it is, within qualitative semi-structured interviews, to allow newer themes to emerge and be explored.

7.4 Data Analysis

Interviews collect qualitative data in the form of words, that is, language in the form of extended text (Miles and Huberman, 1994, p.9). The obtained data is unsuitable for analysis right away and raw data needs to be "corrected, edited, typed up; tape recordings need to be transcribed and corrected" (Miles and Huberman, 1994, p.9).

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[81] I3 is the identity assigned to interviewee number 3.

The researcher recorded all the interviews on a digital audio recorder and transcribed all the interviews immediately afterwards to ensure that all the important elements in addition to the spoken words, such as interviewee body language, the researcher's opinion on how the interview was progressing including other issues such as language and pace of conversation. Any other incidents could be recorded as they occurred. The researcher believes that in the case of semi-structured interviews it is crucially important to record all the elements that deal with seeking subjective perceptions of participants because they lend added information to understanding how and why the interviewee chose to say what s/he did. For instance, if a particular question was not phrased in a way that the interviewee could understand or if it was asking information on say, financial turnover of the business that the interviewee was unwilling to disclose, then the body language or even a grimace or an uncomfortable shifting in the seat could convey more information to the researcher than merely the spoken words.

Raw data-processing is in itself problematic because of the potential influence of researcher's values of what s/he thinks as right or wrong. Also interviews occur in a specific situation (location, time and circumstances) which has the potential to influence how the respondents think and how the researcher interprets. Once interviews are conducted, the data collected needs to be reduced through the process of selecting and simplifying the raw data by transcribing and transforming them into a usable format. This is not only done after the data is collected but also before data collection actually begins by setting out and deciding which conceptual frameworks to use, what research questions to be addressed through the data collection methods and which methods to use for the actual data collection. Data reduction is part of the analysis, not separate from it (Miles and Huberman, 1994).

The researcher observed meticulous care in dealing with the data obtained through the interviews. The purpose of the interviews had the sole consideration of obtaining further insights into the survey data as the researcher felt, very strongly, that the nature of the research questions demanded more detailed information that what could be successfully tested and obtained though quantitative survey findings. The researcher adopted a very

rigorous approach to the data analysis and immediately following transcription of the interviews, began collating the data according to the generated themes. This was done with the purpose of reducing the variability of responses to ensure consistency and comparability with the survey data. Figure 36 below summarises and links the interview themes with the hypotheses derived from the literature.

The researcher used QSR Nvivo 9 partially for the analysis of the qualitative data and would have preferred to use the software for the entire analysis but owing to technical difficulties had to resort to manual analysis of the data.

7.5   Interview Participants

At the outset the researcher would like to clarify that to protect the identity of the interviewees the participants are denoted by I1, I2 etc. meaning interviewee number 1, interviewee number 2 respectively.

The researcher adopted purpose random sampling in choosing the potential participants in the interviews. The sampling was purposive in that only the SME owner-managers within manufacturing and transport sectors were approached with requests for interviews. The criterion of selection for the interviews was that they should be the owner-managers with the SMEs in the sectors mentioned. Since most SMEs are owner-managed, it is assumed their attitudes and opinions towards, say, environmental issues, will have a strong influence on the environmental behaviour of the business, so targeting SME owner-managers to understand SME behaviour has been the widely accepted strategy in research involving SMEs (Revell and Rutherfoord, 2003; Revell and Blackburn, 2007; Rutherfoord et al, 2000; Spence, 1999). Also for purposes of convenience the researcher limited the data collection region to only the south of England counties of Dorset, Hampshire and Wiltshire. This ensured that the researcher could travel to conduct the interviews within the constraints of time and financial considerations. Proximity to interview locations also ensured that if an interviewee needed to change the time for the interview the researcher could be flexible with it to a certain degree.

SME owner-managers often have a large number of responsibilities and so finding time for an interview for academic study is not a priority for them. The researcher established contacts very early on in the research process to ensure that the potential participants were available and were aware of the purpose of the study and that they could commit the time for the interview. There were a number of instances when the time of the interview had to be shifted due to the participant's inability to do it at the aforementioned time and the researcher was flexible to the requirements of the participants.

All interviewees were male and this was not a deliberate choice but a result of the random process of sampling from the pre-generated sampling frame. This discarded the potential of exploring the differences in opinions of male and female respondents. However, the researcher discusses in Chapter 5 why the variable of age was discarded in the survey questionnaire responses and not being able to use this variable in the qualitative data only ensures more comparability and consistency of the data collected through both the methods. A separate sampling frame of over fifty potential interviewees was created from the same sources of local business directories and local chamber of commerce contacts to randomly select the interview participants. Of the fifty businesses approached, thirty agreed to the interview, ensuring a nearly 60% positive response rate. The researcher confirmed from the literature that the sample size of thirty interviews was adequate for the purpose of this study. There were eighteen participants from the transport sector and twelve from the manufacturing sector. This was again not a deliberate choice but a result of random sampling and acceptance of interview requests from potential participants.

The researcher also ensured that those who were sent survey questionnaires were not being approached for interviews because through initial phone conversations with a few potential respondents, while attempting to establish contact, it became very clear to the researcher that SME owner-managers have constraints of time and so care was taken to separate the participants of the survey from the interviewees. Also, although the study could have delved deeper into the survey participant's subjective perceptions on the issues discussed if the

participant agreed to take part in both survey and interview, the researcher felt that it would be more interesting to explore different participants' responses to the interview questions as that would increase the breadth of the sample explored through the study.

Consent from the participants to record the interviews was obtained prior to the interviews. Confidentiality and anonymity (where requested) was assured through a letter from the university which confirmed that the interviews were solely for academic research purposes. In qualitative research, authenticity is often a greater issue than reliability and interviewer-interviewee relationship is key to obtaining useful data. The researcher feels that all participants were very comfortable with the pace and nature of the questions asked and one of them remarked, after the interview, that the researcher skills at interviewing are '*good enough (skills) to be a television journalist (I2)'*. The researcher ensured authenticity of the data by transcribing it verbatim without interpreting it at that stage.

All interviews requested that their identity be kept confidential, not because the data was of a sensitive nature but because many of them said that they did not want to see their names or the names of the businesses disclosed in academic research. The researcher assured anonymity but enquired why they felt the need to remain anonymous and the response was that they did not want to get into trouble over their environmental practices and felt that since academic research is often the path to recommendations by policy makers, so disclosing their business identity could cause some trouble for them with relevant authorities. However, it is interesting to note that twelve of the interviewees were interested in finding out more about the results of the study and asked the researcher to send them a brief report on the study once it is completed. The researcher assured them of the confidentiality of their identities and agreed to send them a summary copy of the findings. The researcher feels that reading the findings of the study may encourage those businesses to engage more with discussion about environmental issues.

7.6   Interview data

The interview data, as mentioned before, was a mixture of open and close-ended questions as the researcher felt it was necessary to include information on which sector the interviewee was from and what was the size of the business. It is necessary to note that the purpose of the qualitative data was not to seek insights into possible differences between either sector or size and their responses to questions. That has already been tested statistically in Chapter 6. This information on sector and size was only asked by the researcher to make a note of how many participants from which sector and what size business took part in the interviews. The researcher is aware that one of the inherent limitations of the qualitative data is considering SMEs as a whole because there are huge variations in size and heterogeneity of nature within SMEs. However the researcher adopted the approach taken by many studies including Cassells and Lewis (2011), Worthington and Patton (2005), Petts et al (1999; 1998) etc. where SMEs were treated as a category without delving into the differences between them. The quantitative survey data however did take notice of size and sector and other moderating variables and tested for significance of group difference within SMEs. For the purposes of illustration alone, the researcher sought information on sector and size and found that 62.6% intervieweess belonged to manufacturing and 33.3% interviewees belonged to the transport sector. With regards to size of business, there were 44.4% participants from micro (i.e. 0-9 employees), 32.4% from small (i.e. 10-49 employees) and 16.1% from medium (i.e. 50-249 employees) size bands. The data gathered on size and sector of the business are not used in the data analysis because it is not essential to analyse this data as the purpose of the qualitative study is not to ascertain group differences.
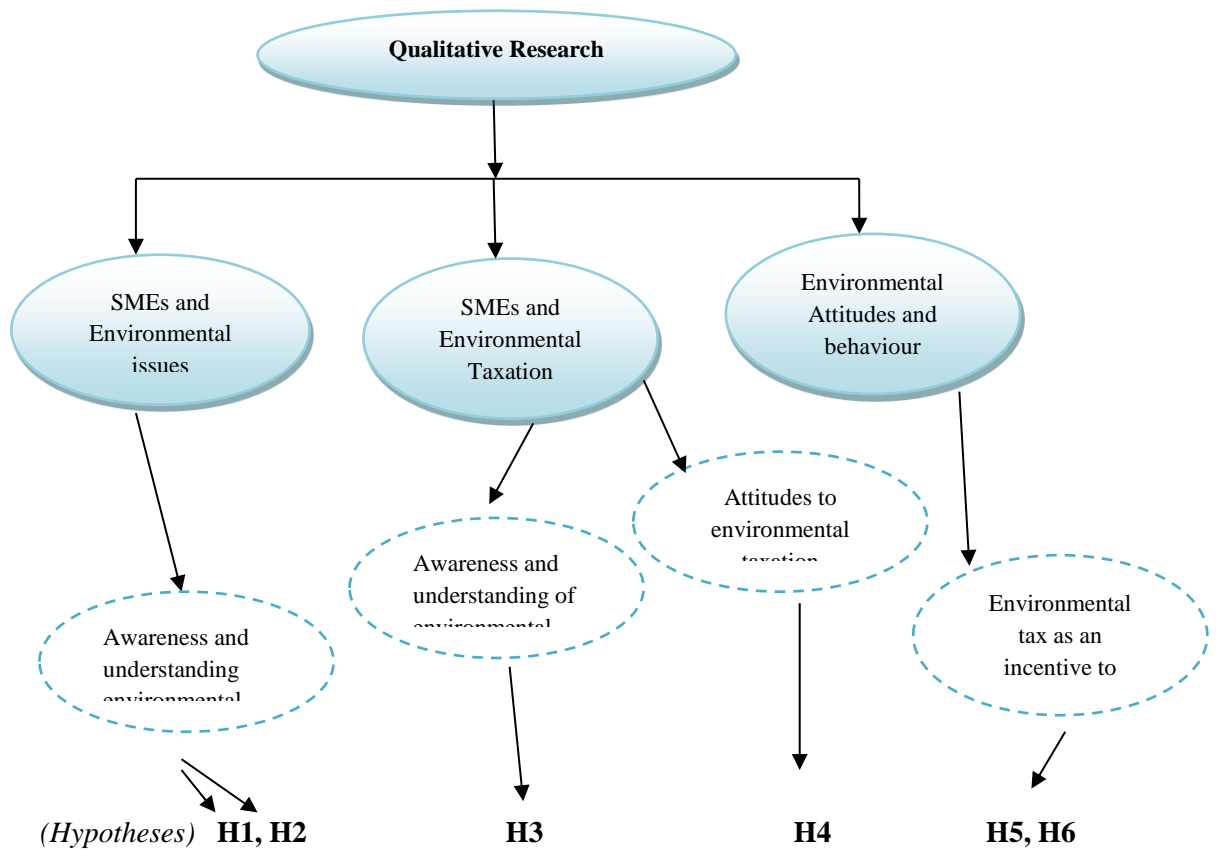
Figure 26: Qualitative Data Analysis

Figure 26 above shows the approach used in the qualitative data analysis. The dotted oval shapes denote the themes generated from the literature within the broader literature which are: SMEs and environmental issues; SMEs and environmental taxation and environmental attitudes and behaviour. It shows the linking of the themes generated from the literature to the hypotheses that were tested in Chapter 6 and displays the mapping of the qualitative data on the themes generated.

7.7   Evidence from the interviews

In the following sections, the researcher uses the themes derived from the literature review, verbatim quotes from the interviewees and the researcher's experience of being immersed in the interviews. This is to explore SME attitudes, perceptions and understanding of climate change issues and related instruments (i.e. environmental taxation), to lend deeper insights

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into the SME engagement or lack of it, with environmental concerns. The researcher makes attempts, in the following sections, to match the extracts from the interviews to the literature. The researcher would like to point out that one of the key differences between the survey and interview findings are that the survey findings attempt to seek out differences between groups within SMEs based on the moderating variables. In contrast, the qualitative data gathered through the interviews are only to lend deeper insights and explore the attitudes to add to the findings of the survey but not to repeat the same intergroup analyses. The researcher believes that the interview findings may be treated as 'under the surface' reasons due to which those differences between groups may or may not exist. In this regard, the language of the hypothesis is changed a little to reflect the absence of the variability of groups within SMEs. Figure 36 above shows the mapping of the qualitative data analysis and links it to the hypotheses that were formulated from the literature and re-worded slightly to reflect the true nature of the interview findings.

7.7.1 SMEs and Environment (Re Hypothesis 1 and Hypothesis 2)
H1: There is poor understanding of environmental issues in SMEs

H2: There are poor attitudes towards environmental issues in groups within SMEs.

SMEs are responsible for more than 80% of total global pollution and more than 60% of total waste generated in the UK. SMEs are present in large numbers across all sectors and more than 99% of all businesses in the manufacturing and transport sectors can be classified as SMEs. Given these facts it is important to understand the subjective perceptions of environmental issues in SMEs. Literature has shown that SMEs are ignorant and oblivious to their environmental impacts and they do not believe that they can cause as much harm to the environment as mentioned above (BCC, 2008; Lee, 2000; Rowe and Hollingsworth, 1996).

On the other hand, there are studies that have found that SME owner-managers are concerned about their environmental impacts (Tilley, 1999). It is expected that those SME owner-managers who are highly aware and interested in environmental matters will take

actions to mitigate the impact of their businesses on the environment (Gadenne et al, 2009). There may be a number of reasons for lack of environmental awareness and in the case of SMEs, resource constraints are often cited as the primary reason. SMEs are often run by one person who is responsible for numerous tasks and so environmental issues get lower priority than day-to-day business survival. Awareness of an issue can often be the first step towards resolving it. In this context, individual SME owner-managers' concern for the environment may become a strong motivation to do something about it and become more environmentally responsive (Bansal & Roth, 2000).

However it is not only necessary to be environmentally aware in order to protect our planet and ecosystem but there is, within the literature, a line of thought that good environmental understanding and engagement not only project the business as being sustainable and 'green' (Smith and Kemp, 1998; Welford, 1995; Aragon-Correa et al, 2008) but also make for good business strategy (Worthington and Patton, 2005; Hoffman, 1991). Businesses should consider environmental factors and issues as a major aspect in their strategy (Aiyub et al, 2009). However it is mostly the larger businesses which consider environmental performance or engagement as a strategic issue (Azzone et al, 1997a) but there is a dearth of research in the environmental responsiveness of companies in the context of the SMEs (Worthington and Patton, 2005)) and also in the context of the individual within the company, that is, the manager's attitudes towards the environment (Petts et al, 1998).

Although all respondents to the questionnaire survey said 'yes' to being aware of climate change, only 11.3% of the respondents felt that climate change may be caused by man-made factors and a much larger group of respondents (about 34%) contended that climate change is a purely natural process. The researcher believes that such a high percentage of respondents refuting scientific claims that man-made actions can accelerate climate change is a worrying finding to emerge. In addition to majority of respondents also claim that businesses do not have any significant impact on climate change. This is not a surprising finding given their already *'climate change is natural'* response. The researcher was

expecting that awareness and understanding of climate change issues would have changed since the previous studies by Tilley (1999;Hillary, 2000) who also found that SMEs were oblivious to their environmental impacts and did not believe they caused any harm to the environment.

Although a relatively recent environmental survey on SMEs by NetRegs (2009) opined that although certain environmentally-related behaviours such as recycling had become more widely accepted within SMEs, the overall environmental awareness of SMEs remained worryingly low with only 7% of businesses believing that their business activities could cause any harm to the environment. The survey findings, as reported in Chapter…, took into account the effect of the 'moderating variables' on the responses to see if there are any significant differences between groups within SMEs and similar to the NetRegs survey found that environmental awareness increased with increasing size of the business. This could be because the larger businesses within SMEs have more formalized management structures and processes in place and often many of them operate internationally so they need to be more engaged with environmental matters. Hillary (2000, p.18) said SMEs are "*ignorant of environmental impacts…oblivious to importance of sustainability… cynical of benefits of self-regulation…. Difficult to reach, mobilise or engage in any improvements to do with environment*".

Paradoxically Southwell (2004) found that a majority believes they should pay attention to environmental responsibilities but there is always a gap between the 'rhetoric' and the actions (Tilley, 1999). These seemingly conflicting findings within the literature are due to the fact that SMEs are heterogeneous not just in size but in nature (Holliday, 2002, p.2), in terms of the different sectors they are found in and the working style and attitudes of owner-managers (Spence and Rutherfoord, 2000). So the survey findings were tested statistically in light of the possible effects of the external independent variables as shown in Chapter 9.

From the interview transcripts it has emerged that there are various subjective perceptions and understanding of what is the environmental impact of business and what climate change has to do with business activities. The researcher notes here that, for more than seven interviewees, there seemed to be incongruence between the meanings of the terms '*environment*' and '*climate change*'. Previous studies by Petts et al (1998) found similarly that an open question about the state of the environment often elicited questions such as '*what do you include as environment*?' (Petts et al, 1998, p.719) which perhaps shows their confusion in understanding what is or is not environment. Also the interviews show the confusion about the difference between the meaning of climate and environment. In the discussion, the interviewees often related their understanding of environmental issues to their own personal experiences and did not talk about them in a wider sense. In that sense this finding is similar to the findings in a study by Petts et al (1998).

One of the respondents corrected the researcher - when the researcher asked 'what do you understand by climate change?' and then asked the respondent to reiterate (for cognitive pretesting[82]) the meaning of the question - that "*you are asking me about meaning of climate change but just now we were talking about environmental impact of business…these are two different matters… I throw waste and therefore pollute my surroundings… but I have no impact on the climate change… that is not my responsibility*" **(I18).** The researcher also found that when asked an open question about the environment, many respondents replied with a question such as "*Do you mean my impact on environment or climate change?*" It emerged from the interviews that for many respondents, climate change and environmental pollution are not related as strongly as the researcher might like to believe and while many of them agree they have an environmental impact "*in our business we produce a lot of waste plastic materials and so yes we pollute the environment…*" *(I5),* they vehemently denied that their business could have any impact on climate change. "*It is evident that there is a global weather change happening but it is not unnatural…climate change would occur naturally…*

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[82] The quality of data collected rests on, amongst other things, the notion that the meaning of the question as spoken by the researcher is consistent with the way respondents interpret it.

businesses have nothing to do with it… this are just governments trying to distract attention from real issues of unemployment etc.…" **(I2).**

On being asked their opinions on what they understood of climate change I1 said " *…it means nothing to me…all nonsense…where is climate change… it is already freezing… business cannot have any impact on climate change!"* I5 echoed this sentiment with the words *"…these things have come and gone…hot then cold… it is a way to distract attention from far more important issues such as high taxes and unemployment…"* and adding that *"developing countries cause more pollution….we have no more manufacturing businesses here in the UK".* I10 stated that *"this is rubbish…where is climate change…it is only getting colder…".* This response interests the researcher because, in the survey findings too, many respondents equated climate change with the concept of global warming and therefore their reaction to climate change seems to rely on whether it is getting hotter or colder. I14 believes that *"change in weather patterns… no reason to get so excited about all that… has been happening for millions of years quite naturally…we are made to believe we cause this problem so we can be charged even more… regulated even more…"* I21 believes that *"it is a lot of fuss over something that would happen naturally…businesses cannot be held responsible because it is a natural phenomenon…"* which I22 agrees to too while saying that *"yes there is change in weather patterns but are you telling me we cause this? No we don't this is a natural occurrence".* I28 feels very strongly that the climate change *"rhetoric is a political agenda,,,, there is a difference between climate change and environmental pollution.. my business is not capable of causing worldwide climate change…"* and while I30 believes that the changes in global weather patterns *"tsunamis, droughts, heating, cooling,… are indications of global climate change… but businesses are too small to have any significant impact… it must be a real natural phenomenon".* These responses echo the general opinions in the literature that SMEs are "ignorant of environmental impacts…oblivious to importance of sustainability… difficult to reach, mobilise or engage in any improvements to do with environment" (Hillary, 2000, p.18).

I6 contends that "it is scaremongering... climate change happens naturally....blame should not be on businesses completely...I am environmentally conscious ...yes business adds to it but can you have an economy without businesses?" I23 also has similar opinions *"yes my business has an impact on environment but what is the alternative? Am I supposed to shut down my business? Climate change happens naturally but yes there is an element of business contribution to it I accept that".* While I24 accepts that businesses cause an impact he asks *"how to reduce the impact... it needs to be managed effectively".* Similarly I25 adds that *"yes climate change is real.. yes businesses cause it but what alternatives are available to us? We are small businesses... cannot afford high cost energy efficient products and technologies... cannot change our processes overnight…"* to which I26 adds *"there needs to be viable low cost alternatives like green energy... I would drive bio fuel cars if one could afford bio fuel! It is not enough to take responsibility... I can say yes I am causing harm...but if I can't afford to change my actions...".* I27 adds *"we try to recycle what we can but there are limited facilities...".* I29 argues that *"business is what is driving the creation of cleaner and more efficient energy... so business is not all bad... climate change can be seen through the rapid global warming... but I say that while we are surrounded by a blanket of snow".* While some SMEs feel that they should become more environmentally aware, they are driven by financial concerns mostly and regard environmental activities such as investing in energy efficient technologies etc. as a financial burden and are largely ignorant of their overall impact on the environment (Friedman et al, 2000). Spence (2000) contends that these constraints of time and money often become significant obstacles for SMEs to be more environmentally responsible and many SMEs do not tend to see the environment as a key business concern (Revell and Blackburn, 2007).

I2 said "climate change is a global change which is caused by the actions of the people.... I believe the biggest cause is transport of any kind... and farming...I read a lot on it...but not all businesses pollute heavily… it is sector dependent". This feeling was also reiterated by I4 who said *"it is very encouraging that there is such focus on climate change... I don't read*

much but it is on TV a lot… makes people aware…to protect future generations…businesses are responsible for environmental degradation… economy will collapse without businesses…". I4 further added that that being aware now "*.will protect future generations…"* which is the whole premise on which combating climate change is built on to create a sustainable world in which future generations can flourish. I7 also had similar opinions on climate change saying that "*it is a result of industrial activity…all businesses use fossil fuels.. cause emissions and wastes…we need to think of this"* which is reiterated by I8 that "*pollution on our planet will affect our worldwide climate patterns… businesses cause an immense pressure on resources and produce pollution".*

I9 accepted that "*time has come to talk about climate change... even my business causes so much damage to the environment...we have a crisis".* I11 feels that "*it is a very positive reaction that we are talking about climate change… UK under Kyoto has certain obligations to fulfil… we need to lead the way… business is highly responsible for causing harm to the environment so we need to take responsibility….".* And I12 adds that businesses "*... have the ability to make small changes that will have bigger effect than individuals"* and strongly believes that "*we need to modify our behaviour if we want to leave anything for the future generations"* and while businesses cause pollution, it is "*unavoidable but can be lessened because climate change is real and happening now if we don't act weather will get warmer and wetter and there is danger of flooding and all sorts of weather changes".* I15 adds "*…not all businesses cause same amount of pollution…business will cause harm to environment…but we do much good too… we are the reason why newer technologies get invented…. climate change is a significant concern for me and every other business".*

But I1 states "*all businesses in all sectors have harmful impact on environment… we are responsible and should be held accountable".* This shows that some businesses feel that since they are a relatively small-scale business or perhaps a business that does not use or emit much pollution (say, a service business like a hairdresser) they can absolve themselves of the greater responsibility while others should be made accountable for it like

manufacturing businesses. So it is interesting that some interviewees acknowledge that, irrespective of sector, all businesses use heating, electricity, transport (i.e. fossil fuels etc.) and therefore should be accountable to the environment. *I17 says that "for far too long we have used the planet for our own needs without thinking of it… must help protect it… all businesses have responsibility and not just businesses every individual is responsible… see how many cars people have these days?"* and I19 adds to it saying "*unsustainable business behaviours are, mostly responsible for climate change… impact of modern life on world climate.."* which is also reiterated by I19 "*we are a transport company so our CO2 emissions are very high… use fossil fuels…rapidly changing weather patterns"* and a similar view is expressed by I20 too. Southwell (2004) says that the majority of SMEs believe they should pay more attention to environmental responsibilities and it is not always correct to generalize SMEs as being environmentally unaware. This lends support to the past findings of a study by Correa et al (2008) who found that there are SMEs who undertake a range of environmental strategies. Also, many SMEs claim to be highly aware and responsible towards the environment (Worthington and Patton, 2005).

Considering the responses of some interviewees who argued that while they cause environmental pollution they do not have any impact on climate change, these findings are very interesting to the researcher because the researcher feels that often the terminology 'environmental issues' can result in confusion because many SMEs tend to regard their surrounding environment and the global problem of climate change to be two separate entities. It seems difficult for some of them to understand how to equate, say, dumping waste and causing foul smells in the environment to the wider and greater problem of global climate change. There seems to be a lack of understanding of the linkages between individual/business activities which have direct impact on our immediate environment to the indirect impact on the wider society and planet.
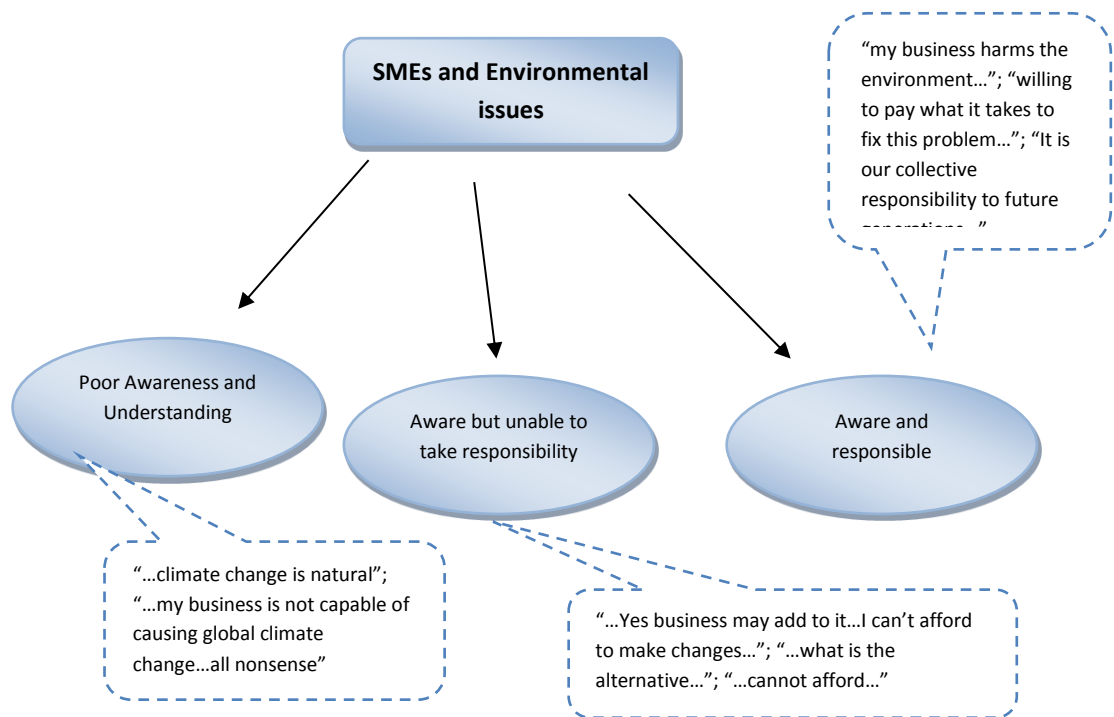
Figure 27: SMEs and Environmental Issues

The researcher finds, from the above discussion, that there is a mix of responses to what is climate change, how aware SMEs are of it and their acceptance or lack of it on business impact on climate change. The purpose of the qualitative data explored above is not to draw any conclusions based on how many interviewees said what; instead it is to throw light on to the deeper perceptions of understanding in SMEs of climate change issues in order to add to the quantitative findings. One way to represent all the findings within the theme of '*awareness of environmental issues*' the researcher displays the reduced data through the figure above to display the data for better comprehension. Given the responses, the researcher felt it would be interesting to organize the data in categories such as '*aware and aspires to be responsible*'; '*not aware and does not take responsibility*'; and '*partially aware and partially responsible*'. The researcher acknowledges that, given this is exploratory qualitative data, introducing such categories to organize and display the data introduces researcher bias. To reduce the researcher bias, the researcher has presented the findings verbatim without paraphrasing the interviewees' words and adds that using the term

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'responsible' in the context of the categories would mean 'agrees that business has a certain impact on the environment which makes him responsible for it'. On the basis of the findings that there remains low awareness and understanding of environmental issues and business impact on environment within the SMEs, the evidence from the interviews lends some insights into Hypotheses H1 and H2.

7.7.2   Further comments on SME owner-managers

As the literature indicated that SME owner-managers have a strong influence on what issues, say, environmental, get priority within the business, so the researcher interviewed SME owner-managers to understand their subjective perceptions and thereby understand the overall SME environmental awareness and understanding through them. The researcher did not have the opportunity to gauge what other people within the business felt about environmental issues and so the researcher could not make a comparison between SME owner-managers and others. Although that was not the purpose of the study, the researcher was quite interested in trying to understand, from the perspective of the SME owner-manager, the influence of their attitudes on others working within the business. So, as the interview was drawing to a close the researcher attempted to elicit from the owner-manager what his/her thoughts on this were by asking *"Do you believe that the environmental attitudes of SME owner-managers like yourself have an influence on the environmental attitudes of employees or others within your business?"* Given that the length of the question was quite long the researcher chose to undertake cognitive pretesting by asking the interviewees to reiterate in their own words what they understood by this question and then requested their responses to it. The researcher is aware that this question can have an inherent bias within it because the response is from the owner-manager himself/herself and that can be a biased response in that the owner-managers may assume that they are having a very positive influence on their employees and other people within the organization but the validity of that claim can only be tested by seeking opinions from the others. In this regard, this question has its limitations that the researcher accepts. However, in order to be completely transparent in reporting the primary data, the researcher feels it is necessary to

disclose this information and also present the findings which could lend some interesting insights into the owner-managers opinions about their influence. These findings can then be used as a starting point for further research into SME owner-managers' attitudes towards environmental issues and be compared with attitudes of others within the business.

As found from the interview transcripts, there emerged a range of responses to whether SME owner-managers think their environmental attitudes have or can have any impact on the environmental attitudes of their staff. For example, I1 said "*...no I don't think I have any influence because they won't even leave the doors closed in this winter… it is costing me a fortune…*" However, as we can see from the above discussion, I1 has poor attitudes towards environmental issues and therefore this response, when looked at with the previous responses of I1 makes the researcher think that perhaps the people working with I1's business are in fact emulating his attitudes without him being aware of it. So they are not overly concerned about their actions of leaving the doors open and letting the heat out. Such a sentiment is shared by I10 too who says that he does not believe his attitudes affect others at all. This link of poor environmental attitudes of owner-managers and poor environmental attitudes of their employees that emerged, serendipitously, from the interview with I1, gathers further evidence from I2 who displays, in his words, high awareness and responsibility towards the environment as evidenced from his previous responses and says "*…Yes significantly because I am very well aware of climate change and how serious this is … I hope and also witnessed that my employees try to emulate my behaviour and actions …*". I4 also lends further support to this interesting observation and says "*Yes I think it influences them very strongly because how I behave will be after all repeated by them. If they see me being interested in doing all the right things then that's what they will follow. I mean not just for environment but also for any other aspect of the business. I would say all employees try to copy the behaviour of the boss at work*".

This is a very straightforward admission of being responsible for others' actions when one is leading an organisation. And the researcher found, through the interviews, that there are

links between feelings of being responsible for others' environmental attitudes and behaviour at work and high awareness and good attitudes towards environmental issues. Those interviewees who, at the outset, expressed good high awareness and understanding of environmental issues display a strong sense of responsibility towards being good at helping others learn and also demonstrate faith in their employees' ability to do so. For instance, I8 feels that "(*my attitudes) will affect their attitudes… if they see me adopt a 'couldn't care less' attitude they will do the same… have to lead by example...*". This feeling is reiterated by I9 too who says similarly "*it is my responsibility to behave in a certain way so that they do too…*" and I12 "*…If my actions, environmental or otherwise are less than desirable then I cannot expect them to act in a good acceptable way...what I will do is what I would hope they do too..*". The same words are reiterated by I13 who says "*…I believe in leading by example….*" and I14 "*… I can only expect my employees to behave irresponsibly if I do so…*".

This feeling of being responsible for others' environmental actions is also expressed by I16 who feels that "*… (to have a positive influence).. They have to see me doing something positive… as the owner-manager I bear a huge responsibility…*" and I17 "*…I try very hard to be a good influence on others through my actions….* I19 too feels similarly and says "*…every business owner-manager is responsible for the behaviour and actions of his staff*" and interestingly also asks "*…but repeat behaviour can cause a significant shift in thinking?*" I24 who feels very strongly about environmental issues and believes we all need to do something to mitigate the problem feels that he has a very strong influence on his staff's environmental consciousness and says "*…actively emulated by people who work in my business.. I am happy to be a positive influence on them… I make an effort… and when they see me doing things they do similarly...*" The researcher feels it is encouraging that so many owner-managers feel this way; that they have a conscious responsibility towards encouraging others to behave more pro-environmentally. I25 also adds "*…if I behave in a responsible way they will be encouraged to behave accordingly…so the burden lies on me to*

(lead the way)..." as does I26 "*...those who lead an organisation are responsible for encouraging the right attitudes in regards to not only environment but also every other matter....all my employees are very conscientious people anyway...some of them walk 3-4 miles even on a freezing day like this to do their bit for the planet! Isn't that amazing?*" I30 says succinctly "*…lead by example not by penalty…*".

This idea of '*leading by example*' displays a sense of responsibility for the actions of others which the researcher hopes will generate more environmentally sensitive individuals within those businesses whose owner-managers feel this way and indicates that SME owner-managers themselves feel that their attitudes and actions are the key to understanding the SME environmental actions and attitudes (Jenkins, 2004; Spence, 1999; Gibb, 2000; Burns, 2001).

Also, there are some interesting findings that have emerged from the interviews which show that some owner-managers find it difficult to trust the environmental attitudes of their staff in their absence. It is interesting to note here that only those interviewees who displayed a lack of trust in their employees had either negative or mixed feelings about environmental issues. So these findings from the particular question could be indicators of their own doubts about environmental issues that they are perhaps projecting on to their employees, whereas their employees may be very environmentally conscious.

However, it is also equally possible that their opinions are truly reflective of their employees' attitudes, for example, I5, who initially did not agree that business had anything to do with climate change interestingly was untrusting of the attitudes of his employees and said "*I don't know what they are doing when I am not around to check ... I like to think they see me switching the lights off so they do the same or they see me put the cardboard bits in the recycle bin so they do the same…*".This is a an interesting finding which has support in other responses too, including I6 who had mixed feelings about environmental issues and had argued that although businesses cause pollution they are not solely responsible for

climate change and said, in the context of the current question *"maybe if they see me doing things in certain way they will follow suit...but mind you ...I am not in face-to-face contact with all the staff all the time..."*. I15 makes a very interesting observation *"... I think that although they may display good work behaviour but it is very difficult... to change a person's intrinsic attitudes..."* I20 and I21 also have similar opinions and say *"…I don't think it affects their attitudes..."* and … *"people have their own ways of forming opinions and I cannot be an influencing force here just because I am their employer... the argument for leading by example does not always work...doesn't change their attitudes"*.

This contradicts some responses as shown above from some interviewees who strongly believe in 'leading by example'. On the other hand I15 further says *"…this is something that is widely discussed... I mean the influence of attitudes on behaviour..?"* This was a very interesting revelation to the researcher who was surprised to discover that an SME owner-manager is aware of the gap between attitudes and behaviours which reiterates literature findings about the same (Tilley, 1999). Interestingly, I7 who displays high environmental awareness displays lack of trust in how his staff learns from him and says *"…no... they may do something that I find acceptable when I am around but I don't think my attitudes towards the environment will have any long lasting impact ..."*. Similarly I11 says *"…it may not be an attitude shift it may just be that they are copying my behaviour to be seen as environmentally positive at work but as soon as my back is turned they may not care…"*. I19 although agrees that it is very necessary for the owner-managers to lead the way but also says *"…I don't know...whether it will be a long term change in attitude..."* I22 and I23 feel unsure and I22 says *"…don't know...although I believe how I behave is how my staff will behave but I am not sure if it can cause an attitude shift... I feel people are most of the time just putting on an act…"*

I27 and I28 feel unsure too about whether there is a real attitude shift or if it is just *"…trying to please the boss…"*.This shows a lack of trust in what kind of environmental attitudes and behaviour staff will display when the owner-manager is not around. Interestingly, I18

displays a huge amount of trust in his staff with these words "…*they are very conscientious… I am not there always…they come to me and suggest ways to… become more sustainable…"*. He also adds that he believes "*… this is a testament to the fact that they realise I place a lot of importance on …environmentally sound behaviour"*. So this shows an admission that he considers himself as the key that determines how the people around him might think and act. I29 brings up a very interesting line of thought and says "*…yes I think there is a fairly strong influence…but it depends on the cost versus benefits…it is alright to adopt a positive attitude but for us small businesses it is not always possible to prioritise environmental issues especially given the current situation in the economy…we have long term plans but in the short term it is only business survival.. can only do anything for environment if my business is still here r*ight?" This echoes what the literature says about SMEs.

There is a range of obstacles to SMEs being able to improve their environmental actions and it is not always their environmental attitudes (Tilley, 1999). They not only include underestimating the impact of their activities on the environment; a narrow view of the relationship between business performance and the environment but also the entrenched idea that protecting the environment is associated with burdens and costs (Gunningham, 2002). One of the biggest challenges to SMEs being proactive in environmental strategies and issues is because the costs of doing so are up-front ,the benefits are long-term (Hillary, 2000, p.115) and the environment is often seen as an extra cost (Simpson et al, 2004). The researcher would like to refer here to the literature which also confirms this line of thought that owner-managers are critical in understanding SME environmental behaviours (Gibb, 2000; Spence, 1999).

These differences of opinion could also be attributed to different factors such as the age of the owner-manager and entrepreneurial styles and could be a further strand of research that has the potential to be explored in the future (see Chapter 8). Younger managers are often found to be more interested in the environment (Smallbone and North, 2005) and it has been

found that entrepreneurial SMEs are more adaptive, swiftly changing trading modes and behaviour according to changing market opportunities (Scase and Goffee, 1985, p.18). More engagement of the owner-manager with issues of environment and social concerns have been attributed to the entrepreneurial type of management with shorter lines of communication and involvement of owner-managers (Aragon-Correa et al, 2008). Although owner-managers have a general opinion that environmental measures are a drain on resources (ENDS, 1995; Baylis et al, 1998), entrepreneurial owner-managers have been found to be more innovative, enthusiastic and prepared to seek information on environmental issues. All owner-manages are not entrepreneurs but almost all entrepreneurs would be owners or managers or both in a business (Chell et al, 1991).

The researcher feels there is also potential for further research in comparing the attitudes of owner-managers and others about environmental issues with a larger sample. A previous study by Petts et al (1998) explores the links between management and non-management attitudes to the environment and organisational responses within SMEs found that 'what managers think they are doing does not seem to correspond with what non-management thinks is being done '(Petts et al, 1998, p.129).

7.7.3   SMEs and Environmental Taxation (Re Hypotheses H3 and H4)
H3: There is poor awareness of environmental taxation in groups within SMEs.

H4: There are poor attitudes towards environmental taxes in groups within SMEs

Small and medium-sized enterprises operate in almost all sectors of the economy that are liable to environmental taxes. So whether it is a manufacturing SME engaged in using high energy intensive production processes or a transport sector SME that runs a fleet of trucks, thereby consuming a high amount of petroleum fuel, SMEs will be subject to environmental taxes. Previously, in Chapter 2 the researcher showed the percentage of SMEs within each sector of the UK economy and also in Chapter 4 the researcher found evidence of SME

dominance within sectors manufacturing and transport which are liable to high environmental taxes due to their consumption of energy intensive inputs.

In the UK, environmental taxes are classified as energy, transport, resources and pollution taxes. SMEs account for more than 50% of all business energy use yet little focus is directed towards this sector (BCC, 2008). Environmental taxes are increasingly gathering more support in the OECD economies (OECD, 2011) as they provide clear incentives to polluters to reduce emissions and adopt cleaner alternatives or pay the taxes. Environmental taxes put a direct cost on environmental damage by internalizing the external costs of pollution. Also these taxes are highly transparent (OECD, 2011) allowing individuals and businesses to understand clearly their potential impacts. There is an argument that environmental taxes[83] stimulate the development and innovation of new technology (OECD, 2011). However it is not as simple for SMEs due to the resource constraints of time, money, expertise and understanding of environmental issues etc. that they face.

Previous surveys (BCC, 2007; 2008) found that there are macro factors attributed to tax and regulatory burden which are seen as major inhibitors of growth in the SMEs. 69% of all SMEs surveyed by the British Chamber of Commerce (2008) felt that they were under a lot of tax and regulatory burden which was not being eased by government support in terms of better information and communication. And perhaps owing to that lack of information support and their own resource constraints, SMEs are found to be less supportive of environmental taxation (BCC, 2008). Also, while they are heavily reactive to environmental regulatory measures and are cynical of the benefits of regulation (Aiyub et al, 2009; Hillary, 2000, p.18), they are, paradoxically, more supportive of direct legislation as the only way to ensure better environmental behaviour (Rutherfoord and Spence, 1998; BCC, 2008). Most policies are designed for larger businesses and then thrust upon SMEs without really taking into consideration the very huge differences between those two business categories.

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[83]For further details on all environmental taxes in the UK please refer to Chapter 3.

However, having said that, the researcher feels that since environmental taxes are an instrument that can create significant improvements to the climate change problem, their acceptance depends on awareness and attitudes towards those taxes. One of the key purposes of levying environmental taxes is to encourage behaviour change so businesses can innovate, engage with newer cleaner technologies or processes and thereby reduce their environmental impact. But to achieve that, awareness and understanding of environmental taxation instruments would be the first step. The researcher feels that although the survey questionnaire (Chapter 6) tried to elicit responses from SMEs regarding their awareness and feelings towards environmental taxation, owing to the nature of the survey instrument, the findings were limited to recognizing a) the differences of responses between groups within SMEs and b) the responses did not lend any insights as to why SMEs might have those opinions about environmental taxation. The interviews on the other hand, are solely intended to pursue exploration of those insights and shed more light on what SMEs possibly think or understand about environmental taxation. However it is worth keeping in mind here that the interviewees are only within the manufacturing and transport sectors.

However, the interview schedule can be used to explore other sectors too as the questions are not sector-specific and in this way the researcher ensures the validity and reliability of the data collection instrument. The researcher would like to clarify that the purpose of the interviews is not to gauge differences between groups within SMEs and in that regard the interview findings are treated as purely qualitative data to lend further evidence to quantitative findings. The researcher, during the process of the interviews, was conscious of allowing the interviewees enough time in their replies so they could feel at ease and open up to the researcher about their true opinions regarding environmental taxation. The researcher then asked four to five questions surrounding environmental taxes (see Appendix) to elicit enough information on how SMEs think about environmental taxation but also allowed for newer ideas to be probed if any such emerged in the course of the interviews. The following

discussion presents the interview findings on awareness and understanding of and attitudes towards environmental taxation in SMEs.

7.7.4 Awareness and understanding of environmental taxation

Economic instruments such as environmental taxes are designed to provide greater flexibility to businesses in reducing pollution by incentivizing them to pollute less and therefore pay fewer taxes or pollute more and pay more taxes. Economic instruments also provide greater flexibility to SMEs than command and control regulation in achieving least-cost solutions (Gunningham, 2002; OECD, 2011) by tailoring their responses to their individual circumstances. By internalising many of the environmental externalities in the price of goods and services, environmental taxes are a way of making the business case of sustainability clearer to firms (Revell and Blackburn, 2005). However, OECD (2011) says that incentives that are not fully realised can limit the scope for enhanced environmental performance (2011, p.11). This is very relevant where SMEs are concerned because although they are the ones who would be liable to pay the taxes as part of, say, their electricity bills, to achieve the environmental objectives, more information on the taxes needs to be provided (NetRegs, 2009; OECD, 2011) to overcome the possibility of information constraint resulting in low awareness (OECD, 2011).

The BCC (2008) environmental survey found that environmental taxation was a significant influence on SME response to climate change closely followed by energy bills. Literature often shows that environmental legislation raises general awareness which encourages SMEs to implement and establish environmental processes such as waste management within the firm (Gadenne et al, 2009) and this is similar to the expectations from environmental taxation (HMRC, 2011) that these taxes will encourage businesses to do the same.

In this regard, the researcher feels that, even where interviewees are completely unaware of environmental taxes, this study may act as a communication to them about environmental taxation and make them more aware of what it is and that it actually exists and affects them.

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For instance, I3 said "…*what environmental taxes? I don't pay any of them…*". But when the researcher asked about the business production processes and it emerged that I3's business uses a high amount of heating and electricity and therefore would be liable to pay environmental taxes the respondent was rather aghast and said "…*are you telling me I am paying more taxes that are well hidden in my (energy) bills?*". The researcher feels that this could potentially have made I3 aware of environmental taxes and from this startled reaction to the mention of these taxes, the researcher assumes that this would encourage I3 to seek out more information on it and perhaps encourage him to make those possible necessary changes to reduce his energy bills as he said "…*these increasing bills are killing my business… we are very small…no wonder so many businesses are leaving this country*".

It emerges from the interview transcripts that there is limited awareness and understanding of environmental taxation within SMEs. Most owner-managers interviewed were unsure of what this term means and because of the association of two words '*environment*' and '*taxation*' there was limited support for this instrument as evidenced from the interviews. Interviewee I1 said "*heard of it but don't know what it is actually...honestly speaking anything with the word environment in it is just yet another excuse for the government to make some money off us...*" I2 said he was aware of it because "*we were excavating a site and had to take the rubble to the landfill so we had to dispose of a lot of asbestos and that attracted a penalty*". This shows that I2 feels this tax is a penalty and this has been reiterated over and over again by many interviewees that they feel they are paying a penalty through these environmental taxes. Another interesting finding that emerged was that many of the interviewees, who had some idea about environmental taxation, associated it with the landfill taxes they have had to pay while disposing of commercial wastes. But many of them seemed unsure of the levy attached within their energy bills or the fuels they use in their vehicles. I3 said "*..it is the tax on the amount of waste you produce…but do I also pay on electricity*?".

Given that all the interviewees were from the manufacturing and transport sectors, so their usage of energy products was expected to be high and accordingly they would be paying

some level of taxes on those inputs. But it is surprising how little most of them know about these taxes with most interviewees expressing concern about what this taxation is all about. This contradicts the findings from the BCC SME and environmental survey which found that one of the prime motivations for SMEs in reducing their environmental impact or energy usage is to have lower energy bills. The BCC survey (2008) found that this was followed closely by the other prime motivations including social responsibility and environmental concerns. 47% of respondents claimed their prime motivation was to have lower taxes such as Landfill taxes, Climate Change Levy and Fuel Duty.

This indicates a high level of awareness of those taxes within the SMEs surveyed by the British Chamber of Commerce. Here in the transcripts it emerged that many interviewees felt that UK environmental policy involves doing very little "…*except taking money from us…so yet another tax then?*"(15). I7 said "*..it is unfair to tax us even mor*e..." and I8 agrees said "…*Ah! is that why all my bills are going up and fuels costs too…so they are hiding more taxes in those*?" I11 and I12, I13, I15, I19, I20, I22, I23, I25, I29 are more aware of these taxes and I11 said "…*we pay taxes on fuels, electricity, gas, road tax and also London Low Emission Zone…*" but then added "*we are losing a lot of money in business anyway these days and on top of it all these taxes… it is unfair on smaller businesses*". However there were others who were so frustrated with the idea of paying environmentally related taxes that they angrily objected to it saying "…*I don't know and I don't care to know either… they are going to run us out of business…it is a sham*!" (I14). I16 and I17 had similar views that these taxes are just for the government to make some money at the expense of small businesses and so they do not want to know anything, with I16 saying "…*and that's why I am considering moving abroad…*". This feeling that increased taxes would make the businesses collapse was expressed by many interviewees with the feeling that that was why many British businesses were leaving the country and that, they felt, would be worse for the economy.

The researcher feels that the lack of information and awareness of environmental taxation is creating this feeling of being cheated out of their money for something they do not know what it is, what it does and how it actually helps them become more sustainable. This calls for an immediate action of increased information because as one interviewee said "…*we don't have time to go look for more information… also isn't it their (government) job to keep us informed on policies… they are fooling us and we are suffering silently…*" The researcher feels that information and education about the environmental taxes and their contribution towards climate change mitigation, with special focus on how these taxes can actually work in favour of SMEs by providing them with practical help in becoming more sustainable, needs to be a priority in environmental decision-making.

7.7.5 SME attitudes to environmental taxation as an instrument to mitigate climate change?

Environmental taxation is gaining increased support within the OECD countries as a significant instrument to mitigate climate change (OECD, 2011). As an economic instrument environmental taxation incentivizes polluters to pollute less but this can occur successfully to the level where the costs incurred in reducing pollution become higher than the taxes. And this has been seen as an obstacle to how businesses, especially SMEs, may feel about this tax. However, environmental taxes also generate revenue by taxing the 'bads' (i.e. pollution) instead of distortional taxes such as labour, income etc. which tax the 'goods' (Pearce et al, 1989; Ricardo, 1926; O'Riordan, 1983). The researcher feels that for any public policy to be successful it needs to be accepted with full understanding (Ekins, 2011). Often, policies are designed for larger businesses (Schaper, 2002) and imposed upon smaller ones without really understanding their different circumstances. SMEs are found to be suspicious of issues related to the environment and do not always believe they have any impact on the environment (Lee, 2000; Rowe and Hollingsworth, 1996).

Owing to resource constraints and the current difficult economic times, any tax that has an environmental cause attached to it may generate negative feelings within SMEs regarding

such taxes. Literature has shown that SME owner-managers are largely unaware of various environmental laws (Simpson et al, 2004; NetRegs, 2009; Gerrans and Hutchinson, 2000). The researcher feels that it is of utmost importance to engage SMEs in the wider discussion of climate change given that just within the UK, SMEs, in 2009, caused more than 35% of total commercial and industrial waste (DEFRA, 2010). Since SMEs operate in almost all sectors of the economy they are affected by environmental taxation and a lack of understanding coupled with poor attitudes will become a potential obstacle in achieving the behaviour-changing potential of environmental taxation.

As seen from the interview transcripts, there seems to be a widespread lack of trust in the government's intentions in levying these taxes with many interviewees saying … "*making money at our expense....they create all these taxation departments...politicians don't know anything they don't understand business…*" (I1). I2 and I3 hope that this tax is genuinely for the good of the environment and not a "con" because they feel "*the government is never open with their policies...*" (I2). I4 clarifies that this tax is for the highest polluters and so does not feel it is a tax that should be imposed on smaller businesses that according to him are not capable of polluting much. Others such as I5, I6, I7, I8, I9 and I10 are very strong in their opinions that these taxes are a "*big con*"(I5) and will "*increase business costs*" (I6) which would affect the economy adversely if the businesses cannot survive and feel it is yet another example of "*rip off Britain*".

The researcher feels that such strong antipathy towards these taxes is an indication of their low levels of acceptance which perhaps is a consequence of lack of information about them. Some owner-managers who said they do know about these taxes also argue that "*…terribly confusing...it is hidden...and no clear information about how it might help us or the environment...*" (I12). The Environmental Audit Committee report on the UK Budget 2011 has called on HM Treasury to rebuild trust in these taxes saying that many businesses are unaware of the impact of the environmental taxes affecting them because of the increasing complexity of these taxes (PWC, 2011). The Committee's findings reiterate the need for

environmental taxes to be fair and straightforward because it is felt that public trust in these taxes is being undermined by the Treasury appearing to use them for revenue raising rather than as a tool for behaviour- change.   But there did emerge some positive feelings with I13 saying "*I think they are there for good reasons…*" but expressing his concern "*why are they hidden*"? I11 and I14 believe that the only purpose of these taxes is to generate some "*quick easy revenue*" and due to that reason they feel very strongly against those taxes.

Ekins (2011) says that while one of the main objectives of environmental taxation is to incentivize businesses to change behaviour, it is not unfair to raise revenue because that helps the government to reduce other taxes such as labour. However, the interview findings indicate that smaller businesses do not have the same opinions regarding this. Others said that they did not know enough about environmental taxes to have an opinion but contended that because they do not know what these are so they feel that a tax with an environmental differential attached to it will only "*encourage feelings of being conned…*"(I16). Interestingly, I17 said that he did not know enough about this tax to have an opinion on it but asked the researcher to tell him more about this tax "after the interview" so his answers are not influenced by it. This showed the researcher that the interviewee was taking the issue quite seriously and this is something that has emerged time and again in the interviewees that most SME owner-managers felt very strongly about environmental issues but due to lack of enough information and/or understanding feel unable to trust any policy that makes them pay taxes for the environment. The Environmental Audit Committee report on the 2011Budget also emphasizes that in order to build trust and support for environmental taxes. There is a need to clarify the objectives and rationale of these taxes, the basis on which the tax rates are set and to avoid using these taxes as a "*revenue-raising trick*" (Budget, 2011).
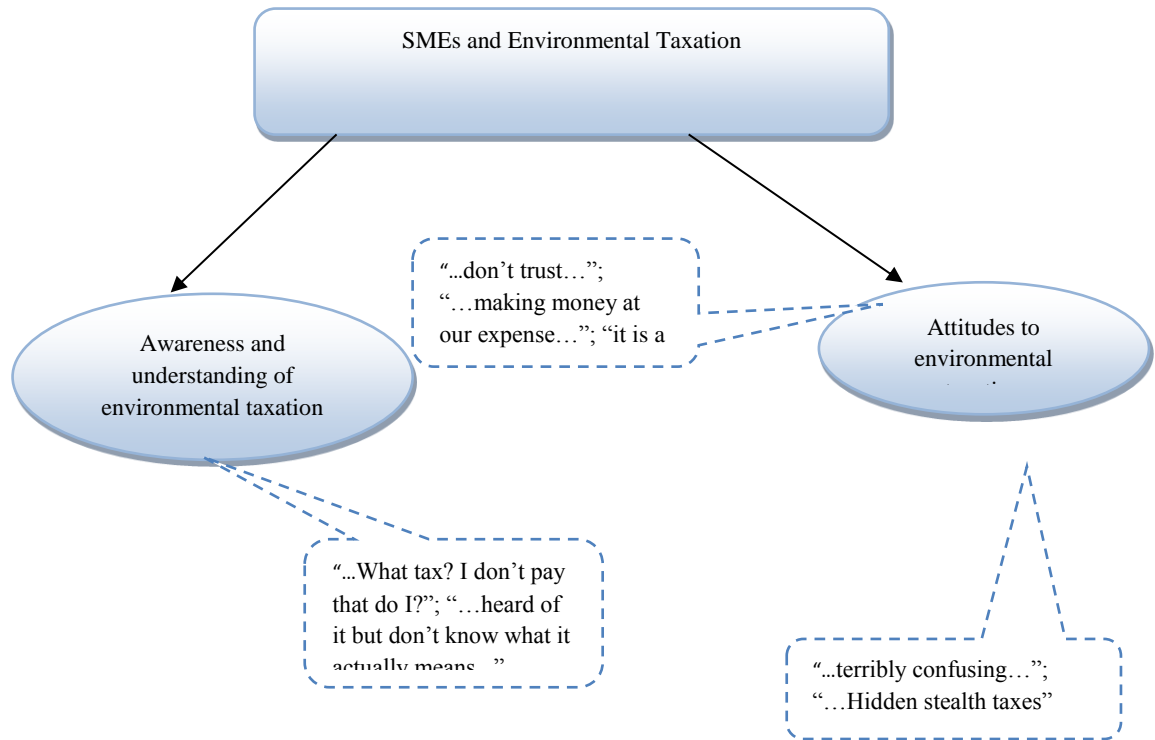
Figure 28: SMEs and Environmental taxation

The Figure 28 above illustrates the major findings from the interview transcripts about SMEs and their general attitudes and understanding and awareness of environmental taxation. It is not quite possible to use the figure above to represent all the findings so the researcher chose instead just to display excerpts from the interviews.

On the basis of the findings from the interviews, that there is a deep rooted suspicion of the government's intentions in levying environmental taxes and doubts about their purpose, the evidence from the interviews lends some insights into Hypotheses H3 and H4.

7.7.6 **Exploring the link between environmental attitudes and behaviours in SMEs (Re Hypotheses H5 and H6)**

H5: There is an association between attitudes towards environmental issues and attitudes towards environmental taxation in groups within SMEs.

H6: There is an association between a) attitudes to environmental issues; b) environmental taxation; and c) environmental behaviours in groups within SMEs.

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7.7.6.1 Environmental tax as an incentive to encourage behaviour change

Environmental taxes are said to be designed to encourage businesses to change their environmental behaviour and become more environmentally friendly by use of more green energy, waste recycling etc. It gives a business the choice to decide the costs and benefits of its environmental behaviour. It is often assumed that both pollution reduction and the financial goals of the government would be achieved through environmental taxes. But this assumption is valid only when both revenue goals and behavioural effects from the paying firms are achieved. For example, in SMEs, in the immediate period following the levying of environmental taxes, the business will incur direct cost effects (Verbeke and Coeke, 1997). Later on, behavioural effects may be observed if the SME invests in say, newer pollution reduction technology. While this all seems to be desirable consequences, if the government is expecting steady revenue then behavioural effects can cause the unintended consequence of reduced revenue. To mitigate this, if the government increases the tax then this environmental policy may begin to lose its credibility (Verbeke and Coeke, 1997) and high rates of tax may also potentially drive the SME out of business. Also, while within the SMEs the intention might exist to become more environmentally conscious and active, it is often unachievable due to resource constraints and so even positive environmental attitudes do not get translated into positive actions (Tilley, 1999; Drake et al, 2004; Redmond et al, 2008)).

A previous study by Gadenne et al (2009) found that although many SME owner-managers display high awareness that environmental practices can lead to future benefits for the business, very few are actually implementing environmentally sustainable practices, thus confirming one of the major obstacles for SME environmental behaviours identified in the literature, namely that positive environmental attitudes do not always translate into proactive behaviour (Tilley, 1999; Gadenne et al, 2009). Being environmentally aware and conscious is not only good for environmental sustainability but also makes good business sense through improved market image. This is achieved by building a better, 'greener' reputation; by providing more opportunities for businesses to identify newer market possibilities in the

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changing face of consumer demand for more environmentally sustainable goods and services; and also in helping to avoid future problems that may be encountered due to, for instance, stricter regulations for businesses with poor environmental records (Worthington et al, 2001).

Various factors have been identified that encourage SMEs to engage in environmentally responsible behaviour (Cassells and Lewis, 2011). Of these, reducing costs (Vernon et al, 2003; Lepoutre and Heene, 2006), not incurring penalties for non-compliance to regulations (Patton and Worthington, 2003) and SME owner-manager personal values and attitudes (Collins et al, 2007) have been identified as the key factors (Cassells and Lewis, 2011). SME behaviours and attitudes have often been understood from the perspective of the owner-manager as he/she is seen as the most influential entity within the organisation. Because it is often the owner-manager who is responsible for numerous tasks within the business, their priorities translate into the business priorities .

From the interview transcripts, it has emerged that there is a widespread lack of trust in the government's intentions behind levying environmental taxes as is evident from the following excerpt from I1 who says "…*It (tax) is a penalty that we have to suffer…. will not help anything except making money for the greedy government…tax should not exist…*". I5 and I6 feel similarly and I5 says " *we have no support whatsoever..we are in the middle of a recession… tax will never be an incentive… it is a punitive measure…this is unfair on us*" and I6 angrily adds "…*tax will cause businesses to either go bust or leave the country… how will that help the economy? It is a short sighted punitive measure*!" I7 accuses the government of being untrustworthy and says "…*SMEs need capital allowances to meet best standards…the London LEZ is an example of just how ridiculous these current environmental policies are… why should I get rid of perfectly serviceable trucks just to comply with a negligible change in emission standards? After all, the trucks will end up in Africa (still supposedly polluting!) and I will have to pay nearly £80k to replace them or pay Boris Johnson £200 per day just to go to London! In reality…will waste the £200 and the*

new £80k truck will never return the emission savings on its embodied energy…do you see how ridiculous this all is?"

I8 says he does not even know how these taxes work and wonders "*I don't know what behaviour this tax is supposed to be encouraging?...if I suddenly start recycling more does this mean that I don't have to pay any more taxes?... I am sure they will find yet another way to make money off us!*" I10 feels similarly when he says "*…another way of making money!...keep coming up with newer and more bizarre ideas to rip us off…*". I14 says *"…a burden on us… total nonsense…every year there are new additions…now in the name of environment we are being penalised?*" I20, I21, I22, I24, I25 and I30 all feel similarly that they do not trust taxes and being small businesses they are already struggling in these economically difficult times and feel that more environmental taxes will make businesses lose faith in the government and it is unfair to penalise further. I24, interestingly echoes Friedman et al (2000) when he says "*business of any business is to make profits…punitive measures like environmental taxes cause resentment and make people disgruntled…*" I25 hopes that the government will be "*more kind*" to small businesses and stop levying those taxes. The researcher observes here that there is a tendency amongst the respondents to refer to the policy makers (i.e. the government) as '*them*' and treat the levying of environmental taxes as a '*them versus us*' situation. Also, interviewees tend to think of environmental taxes as a '*penalty*' which in itself makes the researcher wonder how an instrument that is thought of as a punitive measure will induce any behavioural change? The researcher feels that such strong resentful feelings towards the intentions of the government in levying environmental taxes will be a significant impediment to their acceptance. This perhaps can be lessened through providing more support such as increased information (del Brio and Junquera, 2003) on how these taxes work, why they are levied and how they can work towards creating sustainable businesses.

Although there is a strong feeling of antipathy towards environmental taxation as seen from the discussion above, at the same time there are some SME owner-managers who feel that

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tax provides them with "*a monetary incentive…*" (I2) but at the same time state that it "*…is not often a practical solution and options such as recycling are so costly and although I would still bear that cost but there aren't enough facilities either (laughs)*" (I2). I4 echoes this sentiment "*…I cannot avoid disposing off wastes even though that increases my landfill taxes…not enough facilities to recycle…not happy to pay taxes…would happily pay to recycle instead*". I5 feels "*we are small businesses…we cannot wait 5 years to see the long term effect of paying taxes now… need to see immediate effect and that will possible induce change in behaviour…*"I6 adds that "*free recycle bins, more business funding support to invest in cleaner fuels etc …*" are needed in order to encourage change in behaviour, not environmental taxation. I9 says he is not much aware of what this tax is all about but feels that "*…attempt to make the polluter pay…don't know much about it…*"

The use of the term 'polluter pay' is an interesting choice of words because it directly links back to the Pigouvian tax concept (Pearce and Turner, 1990; Turner et al, 1994; Pearce, 1976) of Polluter Pays Principle (see Chapter 3) which basically seeks to rectify market failure by making polluters internalize the costs of use and degradation of environmental resources. I11, I12 and I28 feel that perhaps environmental tax could encourage behaviour change had it not been a "*stealth tax*". When asked why he feels it is a stealth tax I11 states "*…we have no information about this tax…we don't understand what it is all about… it is well hidden with energy bills and other costs…if not stealth tax what is it?*" This has links to the literature where it says that environmental taxes are unpopular because energy taxes have become regarded as '*stealth*' taxes and are regarded as unfair (Ekins and Speck, 2008; Ekins, 2009). I12 says that it is a "*very confusing tax because it is well hidden…that makes me suspicious…*" while adding "*it needs to be communicated effectively what it is, what it is for….if you are taking money from me what are you giving me back…there is no support…this tax will increase and then what happens to us? We need to know what we can do to pay fewer taxes why can't they understand this. This will only cause businesses to resort to cheating behaviour.*".

I13 is more trusting of government intentions and would like to believe "*there is an environmental reason behind these taxes*" but reiterates others' opinions when he says "*Won't work until there is clarity about what they are for and how we can lessen the burden of taxes on us*". While I15 feels environmental taxes are a burden but contends "*if I knew more about this maybe this would influence my behaviour…*" showing that there is an interest in knowing more about how they can a) pay less tax undoubtedly but also b) engage with the environment in a positive way. I16 and I17 both agree that these taxes can be a way to change business behaviour towards the environment but say at the same time "*tax has a lot of negative connotation attached to it…it makes people lose trust in government…so clear communication is necessary*"(I15). I17 and I18 have quite positive attitudes towards environmental taxes and both feel that in the absence of enough information these taxes will do more harm than good by making businesses more burdened and I18 clearly states what literature has always been discussing "*the government needs to take into account that it is costly for small businesses like us to switch to greener practices without enough financial support…we would like to change our environmental behaviours too…but help us do it*".

This shows a very welcoming and positive engaging attitude towards the environment that indicates to the researcher that individuals would do the right things under the right circumstances and lack of information creates a vacuum of interest that translates into poor attitudes. I19, I23, and I26 all see the potential in environmental taxes to help the climate change problem but state that "*it won't work to change business behaviour if there is not enough information on what it is all about so we don't feel conned*" (I23). Also I27 and I29 feel quite strongly that environmental taxes do provide sufficient incentives to encourage behaviour change and feel that it is only correct that the ones who pollute are the ones who should pay. I27, surprisingly enough, does still think of environmental taxation as a penalty but feels that it is an effective penalty which will make "*people change their ways*" and I29 feels that "*this is a solution the success of which will depend on how people perceive it*". This demonstrates the very objective views of I27 and I29 as to what the purpose of these

taxes are without both thinking about the burden of those taxes on their own businesses. It emerged from the interviews quite clearly that SMEs, in the absence of more information or any information on environmental taxation, have started feeling very negatively about them and this perception can be changed with perhaps more support in terms of information from the policy makers.

This might help the SMEs in feeling that their business interests are secure and environmental taxes are not a penalty but rather can be an incentive for them. However, having said that, the researcher is well aware that over and above information there needs to be more tangible and practical help provided to SMEs such as increased recycling facilities, free recycling bins and more business funding options for investing in say, cleaner technologies etc. The researcher feels that this general feeling within businesses that they are being conned out of their money is an impediment to the success of environmental taxation as an environmental policy and an indication that some respondents feel lack of clarity about environmental taxation will make businesses resort to cheating behaviour, for example, dumping waste illegally, which has been echoed in the literature. The literature on tax compliance highlights the need to emphasise assisting people in meeting their tax obligations (James &Alley, 2002).

In relation to environmental taxation too, there is an increased understanding that it is absolutely important to make tax laws less complex as tax laws are not always precise (James and Alley, 2002) and to provide full disclosure and information on the objectives, rationale and use of these taxes. James and Alley (2002) further state that the primary purpose of taxation is to benefit and not penalise citizens.

Bergman (1998) suggests that the officials expect that tax is legally owed by taxpayers but taxpayers, in this case the SMEs, do not always think the same and the extent to which there are differences between their interpretation can depend on a number of factors that may motivate taxpayers including attitudes (James and Alley, 2002). Attitudes towards the tax

authorities and the relevant taxation are very important in deciding if these are accepted and complied with (James et al, 1998). And nowhere is this more relevant than in the case of SMEs. Environmental taxation's purpose is to influence behaviour and therefore it can be argued that the intention is that this tax is avoided (James et al, 1998) and so explaining compliance to such taxes with the 'tax gap[84]' approach is too simplistic. James and Alley (2002) further argue that tax administration can only be called successful if taxpayers willingly comply without any need for threats or sanctions. A similar view is supported by the Environmental Audit Committee for Budget 2011 which says that the success of environmental taxes depends on the businesses willingly accepting them without feeling 'penalised'.

The following figure is an illustration, with excerpts from interviews, to highlight how the SME owner-managers feel about the potential of environmental taxation as being an incentive to encourage environmental behaviour. It has emerged that there is no discernible link to be found through interview evidence about the impact of environmental taxation on behaviour although it is worth noting here that these are purely qualitative data from a limited number of interviews and the purpose of the findings is not to be generalised to the entire population.

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[84] this represents the difference between the actual revenue collected and the amount that would be collected if there were 100 percent compliance(James& Alley, 2002)
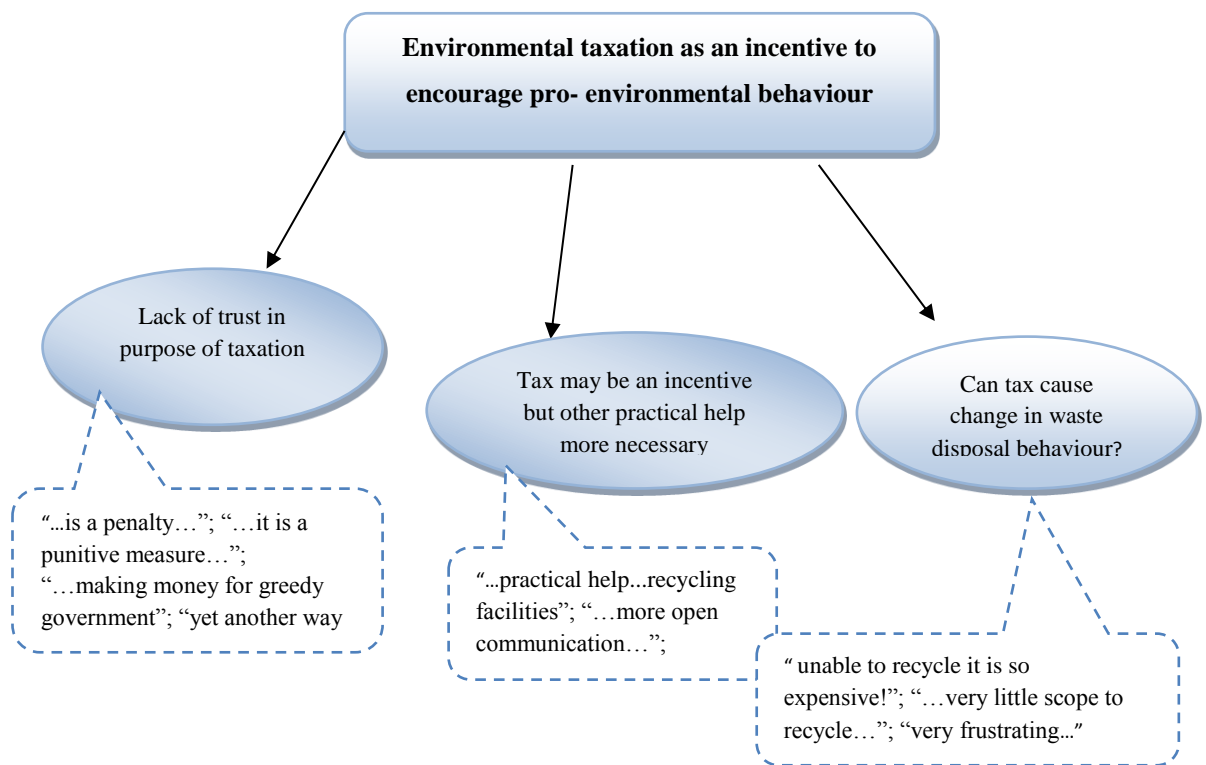
Figure 29: Environmental taxation as an incentive to encourage pro-environmental behavior

The researcher was interested in exploring, qualitatively, if there were any links between those who speak favourably of environmental taxation and those who do not with their environmental behaviour as displayed through their waste management systems within the business. The researcher is aware that this is a very limited way of ascertaining their entire environmental behaviour. But the waste management methods and reasons behind those could give an indication of whether there can be a 'qualitative' link, so to speak, between attitudes towards one aspect of environmental issues (i.e. the environmental taxation) and the behaviour it is designed to encourage (i.e. pro environmental behaviour). From the interview transcripts it has emerged that there seems to be no discernible link between how SMEs feel about environmental taxation and how they manage their waste. Most businesses interviewed said that one of the main reasons they are unable to recycle as much as they would like is because a) there are not many facilities around and b) it is quite costly for them to recycle so

they choose to dispose of their waste at the landfill site and for commercial waste, that costs them a fair amount of money.

Some SME owner-managers expressed their feelings of frustration at having to pay for recycling their commercial waste and feel it is contradiction that on one hand the government expects them to be environmentally responsible and on the other hand no one seems to be able to understand that costs associated with recycling can put a lot of financial burden on a smaller business. I2 said "…*very little scope to recycle… very expensive… frustrating that many wastes are non-recyclable…*" Most interviewees expressed that they recycle whatever waste they can and would like more facilities at low or no cost to be made available to them because they would not like to pay the increased charges at the landfill sites. The majority of interviewees felt that given practical help like reduced costs or free recycling and more facilities to recycle, they would choose to recycle more in order to save money on landfill site payments. This came across very strongly in the words of I15 who said "*I recycle my household waste but my commercial waste that causes so much more harm to the environment I don't recycle..why? because I can't pay anymore. we hired a waste management company…too expensive…in recession we lost a lot of business…so had to stop using the services…*" I17 said "*…council won't offer us a service….that is the problem with all these green initiatives…too much rhetoric but no real help…*"I26 felt the same that "*…strangely enough… there is intention to go good for the environment but… basic facilities like low cost recycling is not available…*" I28 angrily said…"*well… all my commercial waste is recyclable but do I recycle? No I don't because I can't pay so much.. I have to pay landfill sites but that is cheaper than paying recycling companies…*"

This clearly indicates whether the SMEs interviewed felt positively or negatively about environmental taxation but they are, at the same time, conscientious about not polluting their environment by disposing of waste but due to a lack of facilities such as free and/or low cost recycling and more facilities to recycle they choose to pay landfill taxes instead. This finding echoes the findings in the literature that says environmental taxes such as the landfill tax do

little to encourage eco-efficiency due to perceived costs. Efforts involved in recycling and reusing material and measures such as recycling and waste collection fees are often seen as time consuming and a financial burden respectively (Revell and Blackburn, 2005).

As discussed in the literature and corroborated by the interview findings above, environmental concerns are often not given priority in SMEs due to resource constraints. Although there is evidence that many SME owner-managers have positive attitudes towards environmental responsibility, those attitudes do not get translated into actions. The literature shows the importance of the owner-manager in SMEs. Therefore, understanding the attitudes of SME owner-managers is important. Eagly and Chaiken (1993) suggest that while it is the norm to define attitude as being a combination of affective, cognitive and behavioural components that are orientated towards a particular object (Fishbein and Ajzen, 1975; Rollinson, 2008), it is also suggested by other social psychologists such as Brehm and Kassin (1996) that attitude can successfully be explained in terms of the affective component only.

The affective component is the positive or negative feelings towards a given object such as 'mistrusting environmental taxation' or 'despising environmental taxation' or 'very much supportive' of environmental taxation. Rollinson (2008) states that not only does attitude to an object not predict behaviour as well as they predict the intentions to behave in a certain way but also general attitudes can seldom predict specific behaviours accurately because as Fishbein and Ajzen (2010) said, the context of the attitude is important. For example, the feeling of being 'supportive' towards climate change issues may result in a resolution to recycle more waste but if the costs of recycling substantially increase business costs then that attitude might shift and cause the business to dispose of their waste. In that context, attitude is a very difficult entity to grasp in its entirety. The study aims to understand the impact of environmental taxes on SMEs. The word 'impact' can be both behavioural impact and impact on the financial and resource dimension of a firm (Verbeke and Coeke, 1997). Attitudes and beliefs are expected to be manifested in external behaviour and one of the

ways to understand the underlying attitudes of SME owner-managers towards environmental taxation may be undertaken by observing their waste management systems and their energy efficiency etc. But this is not the most suitable approach because mere observation does not say anything about whether those change(s) have been as a result of environmental taxes or not and behaviour is not necessarily predictable from a stated attitude (Dick and Ellis, 2006). Fishbein (1980) says that the context is very important.

For example, a respondent might express an intention to be more environmentally responsible and commit to environmental protection but either cannot or does not do so. Also, previous studies have tried to understand attitudes through seeking opinions on issues and gauging the respondents' feelings and perceptions towards the attitude object. The term 'attitude' is somewhat slippery (Robson, 2002, p.292). It falls in the same area as opinions, beliefs or values but there are differing perspectives on how these terms are interrelated. Often used in a vague, 'fuzzy' (Robson, 2002, p. 293) way, this vagueness helps those who wish to use it by allowing them to tailor it to suit their own needs (Robson, 2002, p.293). There is substantial technology and associated mystique about attitude measurement (Robson, 2002, p.293). It is an accepted belief that attitude is something that cannot be assessed by a single instrument or statement (Robson, 2002. p.293).

For example, suppose someone strongly disagreed with the statement 'environmental tax will result in achieving environmental benefits'. By itself, this cannot be taken as indicating a rejecting attitude towards environmental tax. The respondent might feel that environmental tax would work in conjunction with other instruments, perhaps reducing rates of environmental tax will result in higher efficiency or perhaps increased government communication through direct mail, business events etc. would result in achieving the desired outcomes. So, attitude measurement on a scale coupled with open-ended and closed-ended questions can give richer and more valid information. In the survey questionnaire the researcher had used Likert scale type questions to gauge the attitudes of SMEs towards environmental taxation. The interview data are open-ended and more insightful thereby

lending more information on why SMEs feel the way they do about environmental issues and environmental taxation. The researcher also asked questions about what kind of waste they generate in their business and whether any or all of those are recyclable. If they are, then whether they recycle or not and why they do or do not recycle will help us to understand more about the differences between SMEs. This is expected to lend more insights into whether those SMEs that have a positive attitude towards environmental taxation are more encouraged in minimising waste disposal? And whether their positive attitudes towards environmental taxation has been instrumental in encouraging them to reduce their landfill tax payments even if the wastes generated are not substantial enough to be sent to the landfill.

In the survey, the researcher attempted to see if there were any differences between groups within SMEs due to the effect of the independent variables. The interview data is only to add depth to the understanding of those findings without taking into consideration the moderating variables and trying to understand the link between attitudes and environmental behaviour in SMEs. The researcher adopts the approach taken by Brehm and Kassin (1996) and chooses to explain the attitudes of SME owner-managers in the current context by delving into their positive or negative evaluation (Dick and Ellis, 2006) of environmental taxation as ascertained through their words. The researcher is aware that one of the inherent limitations of such a qualitative discussion is the attempt to simplify the attitude construct by trying only to ascertain how SMEs '*feel*' that is, the '*affective*[85]' and to a limited extent the '*cognitive*[86]' and the '*behavioural*[87]' components (Ajzen, 1988; Ajzen and Fishbein, 1980; see section 2.3 Chapter 2). But the purpose of these exploratory qualitative interviews was to lend more insights into the thoughts of SME owner-managers and in that respect the findings are valuable.

The above discussion indicates that there is a mix of responses to the potential of environmental taxation being able to incentivize behaviour change and there is an emphasis

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[85] Emotional feelings (likes and dislikes) about the attitude object.
[86] The perceptions and beliefs (thoughts and evaluations) about an attitude object.
[87] The tendency to act towards the attitude object in a consistent and characteristic way

on the need for more practical help such as low cost recycling facilities. SMEs are resource constrained and therefore these findings are fairly significant given the SME context. On the basis of these findings the evidence from the interviews lends further insights into Hypotheses H5 and H6.

7.7.7 Making SMEs more environmentally responsible: Their views

As the interviews were semi-structured it allowed the researcher to follow emerging themes and add more questions if required to probe further. One of the ideas that kept emerging in the interviews was that most SMEs kept reiterating the lack of support from government in encouraging them to be more environmentally friendly. However, there was not much indication, other than free or low recycling, what kind of support the SMEs were hoping for in order to make them more environmentally responsible. So the researcher decided to ask them at the very end of the interviews, a question on how and what kind of support they felt is required to make them more environmentally responsible and active. It emerged from the interviews that most SMEs are looking for practical help and support such as free and/or low recycling facilities, increased information from the government or trade associations about how they can minimize their environmental impact while saving on their expenses and more information on environmental taxation. The researcher found that almost none of the interviewees had ever received any information on environmental taxation and so it is not surprising that there emerged feelings of strong antipathy towards it.

The researcher feels that unless there is clear communication and detailed information provided there will always remain the '*SME problem'*, that is, the problem that SMEs are not environmentally conscious enough or interested and this huge business category that is responsible for a massive amount of pollution here and globally needs to be integrated in the policy-making discussions keeping in mind their unique characteristics and resource constraints. While interviewees want more information about environmental taxation, at the same time they do not want to pay any tax related to environmental issues. This was evident

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in what I1 said "*…no one likes paying taxes…lower taxes…practical help like cheaper solar panels perhaps…no hidden obscure taxes anymore…*". There was a demand for more information on environmental issues to educate SMEs. However, a few owner-managers said they did not have time to read through any information that comes in through the door so perhaps email communication would be better as well as "*visual…more images…make it attractive…time is an issue… so concise and precise information…*" (I2); "*make it easier to understand…there is a feeling that the more complicated something is the better it is…they do come up with ridiculously complicated policies…make them simple so we can understand*"(I12) and "*…we don't understand these complicated environmental policies…make it simple…and no taxation*!"(I3). More information is sought on environmental taxation although there is a strong feeling that such taxes should not exist for smaller businesses "*…tax is a penalty! Cut down on environmental taxes…stop hiding them within energy bills…*" (I6); "*…stop artificially taxing products out of existence…*" (I8).

The widespread feeling that environmental taxes are being 'hidden' within fuel bills etc. is seen to be a major cause of the lack of support towards it. I9 says "*…don't hide it inside fuel bills.. without clear communication it won't achieve its objectives…*". I11 says "*…stop levying stealth taxes and start fining people for littering recyclable waste…*" but also claims "*…to be honest…much as it annoys me (disposing of recyclable wastes) but there aren't many facilities and they cost us so much too… I still pay for it…but in this difficult times not many smaller businesses can I don't think…*". There is a lot of emphasis on the importance of receiving practical help such as free recycling facilities as is evident from I4 who says "*free bins will encourage recycling…*"; "*provide free bins for recycling…*" (I5). The same feeling is reiterated by more than twenty interviewees that it is absolutely necessary that they receive facilities for free recycling without which the government should not expect SMEs to become more environmentally responsible. There is an emphasis on wanting to receive increased information too although at the same time the demand is for the information to be concise and precise without any technical jargon and complicated policy language. This

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latter finding from the interviews finds support in the literature where it says that for SMEs, increased support in terms of information requirements is seen to be the missing factor that causes a lack of awareness and understanding of issues such as environmental issues. In addition, knowledge specific or general environmental knowledge has a positive impact on consumer's environmental attitudes and therefore environmental behaviours in relation to carbon specific behaviours (Polonsky et al, 2011; Gadenne et al, 2009).

7.8   Summary

This chapter discussed the findings from the interviews undertaken with SME owner-managers within the manufacturing and transport sectors in the South of England. The purpose of the qualitative interviews was to gain further insights into the findings of the quantitative survey without attempting to reinforce the survey findings. This chapter presents the detailed data found from the interviews and attempts to link it back to the literature, qualitatively. The interview data are not used to test for any differences within the groups and in this regard, although they are linked to the Hypotheses in Chapter 5, this analysis can be treated as an independent chapter. The analysis is done thematically partially using QSR Nvivo 9 and to a larger extent manual thematic analysis.

From the analysis the researcher found that SME attitudes towards environmental issues and environmental taxation are a mix of responses and while there is evidence of wanting to be more environmentally responsible, the lack of resources and often, understanding, prove to be major obstacles in changing their attitudes and also there are no qualitative links between attitudes towards environmental taxation and environmental behaviour. However, the findings are consistent with the previous research findings, namely that there are barriers to environmental proactive behaviours for SMEs. There is an indication that increased knowledge has a positive impact on environmental attitudes which may translate into environmental behaviour; and that SMEs are by and large interested in doing their part in helping the environment but are unable to due to the constraints. SMEs have a low

understanding of environmental policies and are mistrustful of any such policy that regulates them (Worthington and Patton, 2005; Hillary, 1999; Petts et al, 1998; Schaper, 2002; Gadenne et al, 2009; Garma et al, 2009; Williamson et al, 2006). This chapter and the previous chapter on survey findings are the bases on which the recommendations and conclusions are made in the following chapter.

8 Conclusions and Recommendations

8.1   Introduction

In Chapters 6 and 7 the researcher presented the empirical evidence and the results of the quantitative and qualitative data analysis conducted within this research.

This chapter discusses the research conclusions and links those to the hypotheses and the related literature as well as the empirical evidence. This chapter discusses the findings in relation to the research objectives, related literature, limitations of the research, areas of further research and policy recommendations. The conclusions presented within this chapter are based entirely on the outcome of the research conducted.

8.2   Research conclusions

In this section the researcher links the hypotheses that were tested in Chapter 6 to the empirical evidence in order to draw conclusions from them.

H1: There is poor understanding of environmental issues in groups within SMEs

The first hypothesis focused on measuring the understanding and awareness of environmental issues in groups within SMEs. In Chapter 2 Literature Review I, the issues surrounding SMEs and the environment are discussed. The literature shows that, within SMEs, there is a widespread lack of understanding of their environmental impact which becomes an impediment in their environmental compliance (Gunningham, 2002) and good environmental conduct. There are other factors that prove to be barriers to changing their environmental actions which include low awareness of environmental impact, poor eco-literacy and resource constraints (Worthington and Patton, 2005; Hillary, 1995; Rutherfood et al, 2000; Aiyub et al, 2009). Literature also shows that past studies have shown that there is an impact of business size on the environmental awareness of SMEs (NetRegs, 2009; Lee, 2000).

Given the above facts, it is envisaged that SME awareness and understanding of environmental issues may impinge upon their environmental actions. In addition, there may be an influence of independent variables of business sector, size, membership of a trade association and access to environmental information on their level of environmental awareness and understanding.

In order to test Hypothesis H1, in Chapter 6, the researcher obtained the results of the analyses of the respondents' subjective understanding of the meaning of the term 'climate change'; whether or not they believed businesses have an impact on climate change; what kind of impact business has, if any, on climate change; and those that do not believe businesses have an impact, why do they think so. Chi square tests were conducted to test the significance of the variables. The evidence generated through the statistical tests provides partial support for hypothesis 1. From the face-to-face interviews with SME owner-managers there is some evidence of a little confusion regarding the terms '*environment*' and '*climate change*', with many interviewees expressing that '*we have an effect on our environment…but too small to have an impact on climate change*'. So it seems that climate change is seen to be a global problem that has, according to them, little to do with SMEs. But overall the interview analysis found that many respondents agreed that business has an impact but also asked '*…so what can I do? I cannot afford to buy green fuel… too expensive…*'. So the interview data provides deeper insights into the survey findings and shows that there is a mix of responses regarding the understanding and awareness of climate change and its business impact and in this regard it corroborates some of the findings of Hypothesis H1.

In conclusion, it is found from the survey that there is no discernible significance of the differences between groups within SMEs based on sector, size, membership of a trade association (TA) and access to environmental information (AEif) on all dependent variables except opinion on the business impact of climate change thereby providing partial support to hypothesis H1. However, through the detailed interview data it has emerged that there is a mix of responses regarding the meaning of climate change and the understanding of the

impact of business on climate change with many respondents expressing high awareness of their impact on climate change. Some were oblivious to it thereby creating sub-groups within SMEs but not on the basis of any of the independent variables but according to kinds of responses.

H2: There are poor attitudes to environmental issues in groups within SMEs.

Hypothesis H2 covered attitudes towards environmental issues within SMEs. Previous research has shown that SMEs tend to be fairly reactive towards environmental issues (Schaper, 2002) and they are ignorant and oblivious to the environmental issues (Hillary, 2000). But literature also highlights that while many SMEs are oblivious to their environmental impact, at the same time the majority of them display positive thinking and attitudes towards the environment which do not often translate into pro-environmental behaviour owing to constraints of resources that often plague SMEs (Tilley, 1999). This paradox between the generally positive environmental attitudes of SMEs - understood through the attitudes of SME owner-managers - results in problems in environmental management within SMEs (Merritt, 1998).

Given the above literature key inferences, it is assumed that there may be significant differences between the attitudes of groups within SMEs towards environmental issues based on the differences due to sector, size, TA and AEif.

In order to test hypothesis H2 the researcher analysed the responses of SME owner-managers on their attitudes to environmental issues on a set of Likert scale type statements, gauging their opinions and attitudes on a five-point scale of strongly agree to strongly disagree. Non-parametric statistical tests including Mann-Whitney tests were conducted to test the significance of influence of independent variables on the attitudes of SMEs. The results provide evidence that there is strong support for Hypothesis H2 with significant differences emerging between groups within SMEs. The interviews found more evidence linking the findings to the literature in the sense that many respondents expressed that while they

consider themselves highly aware of their impact on the environment, at the same time they are unable to do anything about it because of many difficulties including considerations of costs ('*yes my business causes a lot of emissions…but what is the alternative.. I cannot afford it*'). Another respondent said '*all businesses have a responsibility towards the environment…but provide us with support to modify our environmental behaviour…We have no information…no money…*'.

This seems to support Tilley (1999) and Merritt (1998) who state that there is a gap between environmental attitudes and those translating into good environmental behaviour due to mitigating circumstances in SMEs.

In conclusion, the study seems to show that there are significant differences in SMEs' attitudes towards environmental issues based on sector, business size, membership of a TA and their access to environmental information. Also, there remains a gap between how they think about the environment and what they do or are able to do about the environment.

H3: There is poor awareness of environmental taxation in groups within SMEs.

The third hypothesis covers SME awareness of environmental taxation. Environmental taxation, as an economic instrument to mitigate climate change, has gained popularity in the UK's environmental policy by virtue of its potential to incentivize polluters to pollute less and pay fewer taxes or continue polluting more and therefore pay increased taxes. SMEs operate in almost every sector of the economy and are therefore liable to paying environmental taxes. One of the key objectives of environmental taxation is to encourage change in environmental behaviour through providing incentives to polluters. However, while it may be easier for larger businesses to change their production processes and use more 'green' resources, for many SMEs, resource constraints prove to be a major obstacle in achieving such objectives. Keeping this in mind it is expected that understanding how much knowledge and awareness SMEs have about environmental taxation will provide an indication of how best to engage SMEs in accepting this instrument. There is also the

potential for SMEs to make changes that not only lower their tax burden but also help them engage with the wider discussion about climate change through changing their environmental behaviour.

Literature has shown that SMEs are often oblivious to any kind of environmental legislation affecting their business (Petts et al, 1998; KPMG, 1997) and while that has changed over the years and more SMEs seem to be aware of environmentally- related legislation, they are unable to name any (NetRegs,2009). The literature is conspicuous by the absence of any information on whether SMEs are aware of and understand environmental taxation or not and this study attempts to contribute to this particular gap assuming that SME awareness of environmental taxation may be affected by the independent variables. Also, past studies have shown that environmental taxes such as landfill tax has failed to cause any positive effect in changing waste management practices within SMEs because SMEs find it easier and less costly to just pay those taxes instead of changing their waste disposal and management practices (Revell, 2007; Simpson et al, 2004).

Given the above facts, it is expected that awareness of environmental taxation may be the first step in raising awareness about this environmental policy and therefore its increased acceptance and success as a key tool in the environmental policy portfolio of the UK government. In this regard, Hypothesis H3 is aimed at understanding the significant differences in awareness of environmental taxation in groups within SMEs based on sector, size of business, membership of a TA and their access to environmental information (AEiF).

In order to test Hypothesis H3, the researcher analysed the question seeking responses to an awareness of environmental taxation from SME owner-managers using Chi square statistical tests conducted using SPSS 18. The test found no significant differences between levels of awareness of environmental taxation in groups within SMEs and most respondents reported that they were unaware of environmental taxation. From the interviews too it emerged that most respondents were unaware of environmental taxation with many expressing surprise

asking '*what environmental taxes?... I don't pay that do I*?' and another interviewee saying *'are you telling me I am paying taxes on environment? What does this mean? And for what do I pay those taxes...?*' So it is found through both the survey and the interviews that most SME owner-managers are unaware of environmental taxes and many expressed their surprise and asked what such taxes were. The researcher feels that although the awareness of environmental taxation is low, through the interviews and survey the study has been able to raise awareness and curiosity about environmental taxes. Therefore the researcher is hopeful that this would encourage those businesses to find out more about this and feels that knowledge is often the first step to positive change.

In conclusion, the study highlights the low awareness of environmental taxation within SMEs and finds that there are no significant differences in groups within SMEs. In this regard the study highlights the need to raise awareness of environmental taxation within SMEs because without increased awareness there will be poor understanding and therefore low acceptance which will not be conducive to the success of this instrument.

This study, through statistical analysis, has disaggregated SMEs into sub-sectors based on industry sector, size, membership of a trade association and access to environmental information. It has demonstrated that there are significant differences between SMEs' perceptions and attitudes towards environmental issues and environmental taxation which vary according to the sub-groups.

H4: There are poor attitudes towards environmental taxes in groups within SMEs

This hypothesis covers opinions and attitudes of SMEs towards environmental taxation. Businesses can have positive or negative or even indifferent feelings towards a particular policy such as environmental taxation but where the purpose of this instrument is raising environmental awareness and changing behaviour so a positive attitude is more desirable in achieving the objective. Literature has highlighted that the effectiveness of any environmental policy depends on how polluters respond to it (Pearce, 1991) and nowhere is

this more relevant than in the case of environmental taxation where the instrument works by incentivizing polluters to pollute less and pay fewer taxes rather than pollute more and pay more taxes. The existing organizational structure of SMEs with their often one man owner-manager management team is not well suited to understand and learn about the implications and the potential advantage of environmental taxation. In this regard the hypothesis assumes that there may be poor attitudes towards environmental taxation in groups within SMEs owing to the differences inherent due to differences in sector, size etc.

SMEs are found to be highly mistrustful of any regulations relating to the environment (BCC, 2008). Also, in terms of compliance to taxation, literature highlights that increased support in understanding tax laws and reducing the complexity of tax may reduce cheating behaviour including tax evasion (James and Alley, 2002). This can hold true for environmental taxation because a tax that helps the environment may encourage negative feelings within SMEs on the grounds that it is another business tax. In terms of understanding the effects of the independent variables on the attitudes to environmental taxation, a previous study by NetRegs (2009) found strong associations between awareness of environmental legislation and size of business and in this regard this hypothesis is justified in testing for significant differences in groups within SMEs.

Given the above inferences from the literature, it is expected that SMEs may possibly harbour poor attitudes towards environmental taxation and there may emerge significant differences between attitudes owing to heterogeneity of groups within SMEs.

In testing Hypothesis H4, the researcher analysed the responses to questions seeking information on what SMEs understood by the term 'environmental taxation'; which environmental policy of UK government they thought is best suited in reducing the impact of climate change; the level of agreement on a five-point Likert scale on whether environmental taxation is an instrument to mitigate climate change; and their subjective perceptions of the purpose in levying environmental taxation. The tests included Chi square, Mann Whitney

and Kruskal Wallis tests and the results of the survey data analysis showed some support for Hypothesis H4 in finding significant differences in influence of group differences on attitudes of SMEs towards environmental taxation. Most respondents had negative attitudes towards environmental taxation and they believed that it is yet another business tax which puts an undue burden on their limited resources.

The researcher feels that this is due to a lack of information and knowledge about these taxes. There is a difference of opinion as to what environmental taxation is, based on the differences between a group of SMEs that receives environmental information and one that does not. Given that most respondents felt it is another business tax, it is interesting to find that environmental taxation gained about 18% support of being potentially the most suitable environmental policy and there emerged significant differences in the level of support owing to differences between sector and size of business. As regards the possible importance of environmental taxation as an instrument to mitigate climate change, there were no significant differences in opinions due to the independent variables. Most respondents contended that it was unimportant. And finally, with regards to what respondents' opinions were about the purpose of levying environmental taxation, most respondents believed that using the word 'environment' in association with a tax is a mere cover up for government greed and is only to raise easy revenue for the government.

However there emerged no significant differences on these responses due to the independent variables. From the interviews, it emerged that most SMEs were unsure of what environmental taxation was and many argued '*honestly speaking anything with the word environment in it is just yet another excuse for the government to make some money off us…*'. Many SMEs felt that this tax is a '*penalty*' and this was repeated over and over again by a majority of all interviewees. An interesting finding was that those interviewees who were aware of environmental taxation thought of it only as being associated with disposal of waste and were surprised to hear that such taxes are part of energy use too. There emerged a strong antipathy towards government intentions with many interviewees saying *'they are*

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fooling us… and we are suffering silently'; '*…it is a con… in these economically difficult times how do we pay more taxes…*' The feeling was that the '*government is never open with their policies*' and that it is a '*hidden…stealth tax…*'. Some positive feelings emerged about environmental taxes with some interviewees saying that '*perhaps the intention is good… but why hide them… why aren't we told about them*?'

In conclusion, the above findings clearly show that there is a lack of information and understanding about these taxes which is contributing towards feelings of negative resentment towards the government and these taxes which will undoubtedly affect the acceptance and therefore the effectiveness of these taxes. The researcher feels that with increased support and more information, such attitudes towards these taxes may be change and will help SMEs more.

H5: There is an association between attitudes towards environmental issues and attitudes towards environmental taxation within SMEs

This hypothesis covers the association between SME environmental attitudes and their attitudes towards environmental taxation. Literature has shown that a proactive environmental SME can reap the benefits of low costs associated with compliance (Bonifant et al, 1995) and that while environmental regulation is thought to encourage better environmental management practices (Hutchinson, 1996), there is a counter argument that regulatory influences do not appear to encourage environmental innovation (Porter and van der Linde, 1995).

The literature is seen to indicate that there exists an association between environmental regulation and environmental management within SMEs and the researcher extrapolates from this conclusion that such association may exist in the context of environmental taxation too. In this regard this hypothesis attempts to test whether this association exists or not. In Chapter 6 the researcher names Hypothesis H5 as an exploratory and investigative hypothesis in the context that there is no direct indication in the literature that environmental

attitudes in SMEs are associated with attitudes to environmental taxation. But past studies have found that environmental legislation seems to have a direct impact on the environmental awareness and attitudes of SMEs (Rutherfoord and Spence, 1998).

Given the findings within the literature, it is expected that there may be an association of attitudes towards environmental issues and attitudes towards environmental taxation in SMEs. This hypothesis does not imply a directional causal effect.

In order to test Hypothesis H5 the researcher analyses the responses to questions that address:

- the attitudes towards environmental issues;

- the subjective opinions on what is environmental taxation;

- opinion about which is the most suitable environmental policy in the UK;

- level of agreement on whether environmental taxation is an instrument to mitigate climate change; and

- Subjective opinions of the respondents on what they think are the purposes of environmental taxation.

The tests undertaken include Chi square, Mann Whitney and Kruskal Wallis tests. The results show several strong associations between attitudes towards environmental issues with regard to what respondents think of as the most suitable environmental policy. The results also find strong associations between attitudes towards environmental issues with regard to how important respondents think environmental taxation is. So the findings of the survey test results provide some evidence to support Hypothesis H5. From the face-to-face interviews with SME owner-managers it emerged that there are wide ranging differences between responses regarding attitudes towards environmental issues and attitudes towards environmental taxation.

A majority of respondents displayed a significant lack of trust in government intentions in levying these taxes and the potential of these taxes to mitigate climate change saying '*it is a*

penalty…will not help anything but the greedy government…'; '*tax will make the business go bust…'* and '*we are being penalized in the name of environment… this greedy governments…'*. On the other hand, there was a group of interviewees who displayed positive attitudes towards environmental taxation saying it provides them with a 'monetary incentive' but at the same time conclude that ' *it is not enough… we need practical help such as free and/or low cost recycling facilities…'* A third category also emerged, that of respondents who displayed strong feelings of support and positive attitudes towards environmental taxation by saying that although this tax is a '*penalty*', it is a '*positive penalty'*, one which will encourage businesses to think of their impact on the environment and make some changes.

The researcher would like to state here that through the qualitative interviews it was only possible to ascertain the association between attitudes to environment and attitudes to environmental taxation in a very simplistic way by looking at those responses from interviews which showed positive attitudes towards environmental taxation and then checking the responses to attitudes to environmental issues from the same interviewees. In this regard the interview findings are able to establish a so-called '*qualitative link'* between the environmental attitudes of SMEs to their attitudes to environmental taxation.

In conclusion, the above findings show that there exists an association between SME attitudes towards environmental issues and environmental taxation which confirms the perception within the literature that there is an impact on environmental attitudes and direct legislation and this hypothesis extrapolates this literature finding to environmental taxation and finds support for it through the primary data.

H6: There is an association between a) attitudes to environmental issues, b) environmental taxation and c) environmental behaviours in groups within SMEs

Hypothesis H6 emerges from the literature as a link between SME attitudes towards the environment and their environmental behaviour. Literature has identified that a gap exists

between environmental attitudes and behaviours in SMEs owing to barriers such as resource constraints, perceptions of business priorities and focus on business survival etc. (Tilley, 1999; Worthington and Patton, 2005; Gerrans and Hutchinson, 2000; Hillary, 1999). In the context of environmental policies, literature shows that SME actions are often found to be driven by financial considerations (Friedman et al, 2000) and SMEs are cynical of environmental regulations.

SMEs contribute to more than 80% of total global carbon dioxide emissions and more than 60% of total UK commercial waste. As mentioned before, one of the main objectives of environmental taxation is to encourage behaviour change but no such study has been conducted to see how SMEs are reacting to environmental taxation and whether there is any link between their attitudes to environmental taxation and environmental issues and their environmental behaviour. The literature on the link between attitudes and behaviour shows that attitudes are often poor predictors of actual behaviour (Fishbein and Ajzen, 1975; Himelstein and Moore, 1963; Dean, 1958; Wicker and Pomazal, 1971). The researcher proposes the hypothesis based on the premise that although attitudes are often poor predictors of behaviour, the inconsistencies between attitudes and behaviours may be attributed to the influence of external factors such as the variables of sector, size, membership of a TA and access to environmental information. Tilley (1999) has found that there is a gap between SME environmental attitudes and their environmental actions and this hypothesis aims to explore that finding by understanding the influence of the independent variables.

In order to test Hypothesis H6, the researcher analysed the responses to questions in the survey questionnaire that elicited information on attitudes towards environmental issues; attitudes and opinions towards environmental taxation; evidence of environmental behaviour through understanding their waste management practices, including whether they recycle; how often; and if they do not recycle then why not. Information from the questionnaire also sought opinions on what SMEs thought the government can do to help them improve their

environmental behaviour. The tests undertaken include Mann Whitney and Kruskal Wallis tests. The survey test results show that there are strong associations between attitudes towards environmental taxation and whether or not businesses recycle their commercial waste.

There are significant differences in the recycling behaviour of SMEs based on whether or not they receive any environmental information and whether they are members of a TA or not. The findings show that a majority of respondents who believe in the responsibility and impact of business on climate change engage in recycling their commercial waste even though it costs them money. But those that recycle the most do not necessarily believe in the motives of the government in levying those taxes and the majority of that group contend that while environmental taxation is an important instrument to mitigate climate change, the government is '*greedy*' and therefore these taxes are yet another business tax. From the interviews, however, there emerged no discernible link between attitudes to environmental issues and environmental taxation and SME environmental behaviour. The interviewees cited reasons such as cost and lack of availability of more facilities as reasons why they could not engage in recycling their waste but claimed that if they were provided with more practical help and support they would certainly do what is necessary to help the environment.

In this regard the qualitative findings of the interviews support the literature in that there is a gap between environmental attitudes and environmental behaviour within SMEs as Tilley (1999) found. Also, the literature shows that attitudes are poor predictors and/or indicators of actual behaviour. The researcher also sought responses on what the SMEs thought the government could do to make them improve their environmental behaviour and it emerged that the majority of all SMEs ask for practical help and support such as low cost recycling facilities, increased information about policies such as environmental taxation and low cost energy alternatives. There was a demand for increased information and the need for the government to be clear and open with their policies and to engage SME opinions in the formulations of the policies. The dominant opinion was that in the absence of clear

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information there will always be a lack of trust in government intentions and the researcher believes that this is a huge impediment in the success of environmental taxation and in encouraging SMEs to become more environmentally active. The respondents say that they would like more information and also information that is easy to understand without much technical jargon and this reflects the finding in the literature that the complexity of tax laws is often a barrier to tax compliance (James and Alley, 2002).

In conclusion, the study finds that there is an association between attitudes to environmental issues and especially environmental taxation and SME environmental behaviour but that association is not very strong in that it does not find support from all the tests of all the variables but only partial support. The interviews do not seem to corroborate the findings of the survey and in this regard it can be said that there is weak support for Hypothesis H6.

8.2.1   Further comments on SME owner-managers

The primary data that was collected through survey questionnaire and semi-structured face-to-face interviews were targeted only on the SME owner-managers within the sample. The reason for doing so was to reach the person who is seen to be the crucial factor in understanding SMEs because most SMEs are owner-managed so the attitudes of owner-managers translate into the attitudes of the SMEs (Jenkins, 2001; Spence, 1999; Gibb, 2000; Burns, 2001). The researcher chose to ask the interviewees if they thought that their attitudes had an influence on the attitudes of people who worked for them and found a range of response including '*yes I have a responsibility to encourage the right attitudes towards environment within my business*' to '*of course not! People can pretend to copy my behaviour or attitude but they will do what they like as soon as my back in turned*'. So there emerged different ideas within these responses which showed that some SME owner-managers are very trusting of the ability of their employees to do the right thing and feel it is their responsibility to inculcate the right attitude in them through their own actions while others

display a lack of trust in their employees and refute the argument that they might have a responsibility to encourage positive environmental attitudes and/or behaviour.

The researcher concludes that the above conclusions from the study provide bases for further research as discussed below.

8.3   Research contribution

This research is the first of its kind to study environmental taxation and SMEs in the UK using a mixed methods approach and thus provides a ready source to gain an understanding of the SME situation with regard to environmental taxation.

8.3.1   Contribution to literature

This research studied the impact of environmental taxation on SMEs. SMEs, by definition, are a heterogeneous category of businesses and are very different from larger businesses, not just in size but also in the way they:

- have mostly informal management structures;

- are present in almost every sector of the economy;

- account for more than 99% of all enterprises in the EU; and

- are responsible for more than 60% of total commercial waste and more than 80% of total emissions of carbon dioxide.

SMEs operate in those sectors of the economy that are liable to environmental taxes but so far there has been little research on how SMEs are coping with the challenges of environmental taxation in the sense that it is unknown whether they understand these taxes and why they are implemented. The effectiveness of any environmental instrument depends on how polluters respond to it (Pearce, 1991) and a past study on landfill taxes found that businesses chose to pay the taxes instead of paying for costly waste management companies. One of the key objectives of environmental taxation is to encourage positive environmental behaviour and in this regard this study sheds some light on how SMEs react to such taxes.

The study is undertaken in different stages and the first stage uses IO tables to ascertain the expenditure of businesses towards these taxes and identifies SME dominant sectors in the UK economy that are liable to environmental taxes. This helps inform the sample choice.

The study makes a contribution to the literature on SMEs and environmental taxation by providing empirical evidence to show the attitudes of SMEs towards environmental taxation and attitudes and understanding of environmental issues and SME environmental behaviour. The study also makes an attempt to contribute to the wider discussion on the link between attitudes and behaviour by providing some evidence for SMEs and their environmental behaviour in relation to their attitudes towards environmental taxation. The researcher believes that the study makes a significant contribution in providing a source of information on SMEs and the impact of environmental taxation on them and in this regards attempts to fill that gap in the literature.

8.3.2 Methodological contribution

The researcher uses input output (IO) methodology to ascertain the sample choice for the main study (see Appendix 5).

In collecting and analysing the primary data this study uses survey and interviews to gauge the opinions and attitudes of SME owner-managers towards environmental taxation and environmental issues. Such approaches in studying SMEs have been undertaken in the literature including a study by Cassell and Lewis (2011) who uses a large scale survey of SMEs in New Zealand to understand whether their environmental attitudes encourage their environmental actions and identifies the barriers. In the current study the researcher not only uses survey to gather the quantitative data to test the hypotheses but also uses face-to-face semi-structured interviews to corroborate and lend more insights into the survey findings.

8.4   Research implications

As this research has focussed on investigating the impact of environmental taxation on SMEs the implications of this research are not only the contributions of the study but also implications for managers in SMEs; implications for policy makers and regulators.

8.4.1   Implications for literature

The study provides a ready source of reference to various areas including: environmental taxation; the historical development of environmental taxation; the different types of environmental taxation and the review and critical analysis of environmental taxation in the UK. The study also provides a source of reference to SME literature discussing: the unique characteristics of SMEs; SMEs and their environmental issues; and, the SME owner-manager and his/her significance. The study also discusses literature on the link between attitudes and behaviour and finally it is a source of reference for literature on IO methodology and its various applications through a brief literature review of the same.

8.4.2   Implications for managers

This study targets SME owner-managers in seeking responses to survey and interview questions to gauge the attitudes and opinions of the most influential entity within a SME, as literature suggests. In this regard the findings of this study have implications for managers, not only within the manufacturing and transport sectors that were surveyed, but also for other SMEs in other sectors in providing them with an understanding of how SMEs are reacting to the levying of environmental taxation. The findings also make them aware of environmental taxation and its potential, thereby encouraging potential positive action from them. Many of the respondents of the study have requested a brief report after the completion of the study and many have expressed interest in learning how to minimise their costs and how to learn more about such taxes, therefore possibly making necessary changes to cope with the challenges of environmental taxation for them.

8.4.3 Implications for practitioners

The study looks at the impact on SMEs of environmental taxation under the premise that policies are often designed for larger businesses but imposed upon the smaller ones without taking into consideration their unique circumstances. In this section, policy makers and local government bodies are referred to as 'practitioners'. SMEs operate in almost all economic sectors and therefore are liable to many different environmental taxes. Other than generating revenue to reduce the effect of distortionary taxes such a labour taxes, one of the main purposes of environmental taxation is to encourage behaviour change by incentivising polluters to make changes in their businesses and thereby pollute less or pay more taxes. However, in the case of SMEs this is not as easy as it sounds. SMEs are unique in many ways and they have certain barriers including: limited resources; one man or woman owner-managed businesses; lack of expertise; and, often a lack of interest in environmental issues which can cause a major obstacle in achieving the behaviour change purpose of environmental taxes. This study highlights the attitudes of SMEs towards such taxes and towards environmental issues in the hope that policy makers may benefit from the findings and recognise the need to engage SMEs in the wider discussions to understand their mitigating circumstances and to help them help the policy of environmental taxation succeed. The study has implications for local government bodies such as local chambers of commerce or other trade associations in using the findings of this study to recognise the increased information needs of SMEs. The findings should also keep SMEs abreast of the latest developments in environmental policies, how they will affect SMEs, where SMEs can find more information and who they can access for support. It is crucial to recognise that in the absence of increased awareness and acceptance of environmental taxation as a key economic instrument to mitigate climate change within SMEs, this instrument will not be able to achieve its full potential.

8.5   Areas for further research

The study shows the significance of using a mixed methods approach in ascertaining the impact of environmental taxation on SMEs. From the study many strands have emerged which can provide directions for future research.

8.5.1   Research Idea I

There are numerous perspectives the researcher can adopt to look at the research problem. One of the main lines of enquiry in this study is dealing with changing behaviour. The 'impact' of environmental taxation can be both behavioural impact and impact on the financial and resource dimension of a firm (Verbeke and Coeke, 1997).The literature shows the importance of the owner-manager in SMEs. Therefore, understanding the attitudes of SME owner-managers is important. Attitudes and beliefs are manifested in external behaviour. To understand the underlying attitudes towards say, an issue, product, service, employee etc. the behaviour towards that particular entity can be examined/analysed. The owner- manager is the key decision-maker in an SME, as highlighted through the literature.

Social psychological theories of behavioural change can be used as lenses to understand the attitudes and behaviours of SME owner-managers towards the environmental issues of climate change and the economic instrument of environmental tax. Understanding attitudes and behaviours is step one in attempting to bring about a change to pro-environmental behaviour. The theory of bounded rationality (Simon, 1957) assumes that decision-making - unlike the neo- classical economics assumption (human beings make decisions by calculating costs and benefits of different options and choosing the option that maximises their expected net benefits) - is not always rational, that is, human beings do not always take decisions based on rational analysis to optimize the least cost option. Often there are effects of cognitive limitations, emotions, moral values and habits etc. on the decision process. Habit is one of the key challenges of behavioural change policy because much

environmentally significant behaviour has this routine character (Cognitive Psychology model).

Human behaviour consists of moral, social and altruistic behaviours as well as simply self-interested ones. Simon (1957) argues that because decision-making results in a consequence in the future (near or far), there are therefore uncertainties attached to it about the benefits as well as the costs of acquiring information so to do. There is social psychological evidence that behaviours need not necessarily show underlying attitudes. This line of thought contends that attitudes are inferred from behaviour. This has important implications for motivating environmentally sustainable behaviour because it suggests that behaviours can be changed without necessarily changing attitudes first (Jackson, 2005) and these behavioural changes can be instrumental in changing people's environmental attitudes. Environmental issues in particular raise these kinds of uncertainty because the effects are not often immediate and also they are more cumulative of many firm's actions than individual. This poses the risk of a particular firm not acting 'environmentally efficiently' because the consequences are in the distance. The uncertainties attached to the issue limit the extent of rational decision-making. Looking at the SME, the literature has shown they often suffer from difficulty in acquiring enough information due to resource (both human and material) constraints so the decision-making, in terms of environmental actions and behaviour, may be limited by individual emotions and moral grounds.

It could be rational in the sense that the decision-making may involve a careful analysis of a firm's financial resources and allocation to what the manager prioritizes. Going back to the overriding research question of what the attitudes of SME owner- managers are to climate change, the theory of bounded rationality, if used as a lens to view this question, can be useful in explaining the reasons and motivations for environmental based decision-making by the managers. An interesting extrapolation on bounded rationality theory is the Expectancy-Value Attitude Theory which basically states that consumer attitudes towards an idea, object, or service is the sum of the beliefs about the characteristics of the idea weighted

by the evaluations of those characteristics. This is often used empirically to test and predict consumer attitudes. For instance, in testing attitudes towards environmental tax, questionnaires can be designed to ask the respondent to express their belief about the characteristics of say, effectiveness (on a scale ranging from not effective to most effective) and easy to understand etc. together with their evaluation of those characteristics (on a scale ranging from 'not at all important' to 'very important' etc). The theory of planned behaviour is often used in the literature to explore pro-environmental behaviour. Applications of this model to what is often environmentally significant behaviour (Stern, 2000) include attempts to use it to understand specific environmental behaviour such as recycling and the use of alternative energy sources etc. Most of these social psychological behaviour models focus on measuring the relationship between attitudes and behaviour but not so much on measuring actual behaviour (although exceptions include the above Expectancy Value Attitude Theory).

8.5.2   Research Idea II

Further research could also look at motivational theories. Motivational theories such as the incentive theory of motivation can help explain why people, in this case, respondents, behave as a result of certain reward incentives. The assumption that more stringent environmental regulations result in increased innovation, thereby increasing a firm's competitiveness, has been critiqued extensively on the grounds that stringent regulations often do not mean efficient regulations (Wagner, 2003). Wagner (2003) critiqued the Porter Hypothesis arguing environmental tax and certificates are instruments that generate enough incentive to induce technological changes in the firm which are reflective of decisions made by the management.

Wagner (2003) used the criteria of efficiency, dynamic incentive effects, structural and regional effects and distortions of competition and environmental effectiveness to analyse the instruments of command and control, taxes and certificates. He found that except for environmental effectiveness, that is, the ability of an instrument to achieve an environmental

target, the other three criteria supported the use of environmental tax over command and control. For instance, the dynamic incentive effect criterion shows which instrument has the highest incentive to induce technological changes in the firm. This is where tax as an instrument proves more effective too. Although tax has been shown to have uncertain environmental effectiveness, the factor of dynamic incentive effect must be taken into consideration because an instrument with higher incentive effect will lead to an increased reduction in emissions level in the long term (Wagner, 2003). From the assessment Wagner (2003) argues that the effectiveness of taxes is more suited to bring about the effects as proposed in the Porter Hypothesis, unlike emissions standards. Empirical studies based on the Porter Hypothesis show that the hypothesis can be tested under regulation that has shown to have economic efficiency such as systems of environmental taxes and certificates (Porter and van der Linde, 1995).

They emphasise the importance of the instrument's clear goals used with flexible approaches and incentives for innovation as being the criteria to assess the efficiency of the instrument. Behavioural economics is a fresh way to understand the literature. Behavioural economics has been summarised into a set of seven principles by the New Economics Foundation (2007). They looked at the literature in the field of behavioural economics and psychology and compared and contrasted it with neoclassical economics. One of the principles, in summary, is that people are not always motivated to do the right thing, that is, sometimes financial incentives can have a perverse effect and increase wrong behaviour (Gneezy and Rustichini, 2000a; Verbeke and Coeke, 1997).

If we extrapolate this to environmental tax as an incentive to change behaviour, we can assume that increasing tax can result in resistance to changes in behaviour as it may be seen as being a penalty rather than an incentive towards pro-environmental behaviour. Further research can focus on whether stringent environmental policies would damage SME business prospects and survival. If environmental taxes are increased progressively, even if they are causing behaviour change, firms may begin to lose respect and support for environmental

policies which would turn these taxes into yet another corporate tax and lose credibility (Barde, 1997; Ekins, 1999: Ekins and Speck, 2000; Dresner et al, 2006).

8.5.3 Research Idea III

Using Integrated Theories of consumer behaviour such as Stern's Attitude Behaviour Model ABC model which says that there are internal and external antecedents of behaviour that is, motivations, attitudes, values, contextual and situational factors, habits, social influences and personal capabilities. Stern (2000) contends that making sense of behaviour needs to take into account these multidimensional views of internal and external elements. Schwartz's norm activation theory (1977) argues that personal norms (intentions to behave in a certain way) are activated by two variables: awareness of consequences of one's actions and an assumption of personal responsibility for those actions. For example, awareness of consequences of pro-environmental behaviour may reinforce that action and will translate into a personal norm of environmentally sustainable behaviour. Behavioural change is perhaps the most desired potential outcome of climate change policy. How to persuade people to change behaviour has been the subject of numerous consumer behaviour studies.

The 'elaboration likelihood model' proposed by Petty and Caccioppo (1981) suggests that lasting behavioural changes come as a result of conscious engagement with the subject matter, that is, in terms of environmental behaviour it can result from effective persuasion (Persuasion theory, Hovland et al, 1953). Information campaigns have been seen to have a low effect rate (Jackson, 2005) but "*INCENTIVE*" can be an effective persuasion method or tool. Incentives are seen as rewards which can lead to repeat behaviour to reap more rewards thereby creating a cyclic chain of habit formation towards the desired behaviour. A key ingredient to changing environmental behaviour is to renegotiate habitual behaviours (Field Theory, Lewin, 1951). Although the term 'consumer behaviour' is used loosely here, in the

context of pro-environmental behaviour change it can be construed as 'consumer behaviours' in the sense of behaviour that affects resource consumption.

8.5.4   Research Idea IV

The current study uses four independent variables of business sector, size, and SME membership of a trade association and SME access to environmental information to find significant differences in groups within SMEs. The study targets SME owner-managers because the literature highlights that SME behaviour and attitudes are often understood through the owner-manager (Hillary, 2000). Spence recommends, ''*SMEs should be......* *owner-managed and independent''* (1999, p. 169). SMEs are mostly owner-managed with a personalized management style (Spence and Rutherford, 2000; Spence, 1999, Curran and Blackburn, 2001). The entrepreneurs and owner-managers come from different genders and/or a wide range of cultural, ethnic and educational backgrounds and from every age group. Some are sole owners while others run the business with partners. While some start their own businesses from scratch, others inherit or buy an on-going business (Curran and Blackburn, 2001; Storey, 1994). SME owner-managers are also attributed with having entrepreneurial orientation and the younger owner-manages are seen as being innovative and more environmentally aware (Petts et al, 1999) although many SME owners believe that they have little impact on the environment (Lee, 2000; Rowe and Hollingsworth, 1996).

SME behaviour is often understood in terms of the characteristics of the owner-manager (Jenkins, 2001; Spence, 1999; Gibb, 2000; Burns, 2001). It has been found that entrepreneurial SMEs are more adaptive, swiftly changing trading modes and behaviour according to changing market opportunities (Scase and Goffee, 1985, p.18). More engagement of the owner-manager with issues of environment and social concerns has been attributed to the entrepreneurial type of management with shorter lines of communication and involvement of the owner manager (Correa et al, 2008). Although owner-managers have

a general opinion that environmental measures are a drain on resources (ENDS, 1995; Baylis et al, 1998), entrepreneurial owner- managers have been found to be more innovative, enthusiastic and seeking information on environmental issues. All owner-managers are not entrepreneurs but almost all entrepreneurs would be owners or managers or both in a business (Chell et al, 1991).

So how does an entrepreneur behave in relation to a non-entrepreneurial SME owner-manager? The more an entrepreneur learns about the business and its wider environment, the more that knowledge is likely to modify his behaviour (Frank, 1988). The owner-manager of a SME who takes a business-like approach to running the firm (Smith, 1999) is more likely to act in a way that is more preventive rather than reactive to a given course of action. A small business owner-manager can lend insights into understanding their attitudes and motivations. Entrepreneurs or SME owner-managers have been discussed in literature with distinctions being drawn and obliterated between the two. Deakins and Freele (2009) put forward three approaches to entrepreneurship. The first one is the economic approach on the role of the entrepreneur in economic development and the application of economic theory (p.2).

The second is the psychological trait approach on personality characteristics of the entrepreneur and the third is a social-behavioural approach which stresses the influence of the social environment as well as personality traits. For the purpose of this area of research the second approach is of interest. However, Deakins and Freele (2009) say that the value of this approach is more controversial because there is dispute over whether 'entrepreneurial' traits or characteristics can be identified at all (p.2). One of the key aims of the study is to understand and identify the attitudes of SME owner-managers. So keeping in mind the limitations of the second approach, understanding who or what an entrepreneur is and what the distinction and similarities are to an SME owner-manager, is of crucial importance at this juncture. To begin to do so the researcher includes the table put forward by Deakins and

Freel on economic approaches to the role of the entrepreneur (Table 84 Reproduced from Deakins and Freele, 2009, p.3).

Writer	Key Role of Entrepreneur	Additional Insights
Say	Organiser of factors of production	Catalyst for economic change
Cantillon	Organizer of factors of production	Catalyst of economic change
Kirzner	Ability to spot opportunity	Entrepreneur's key ability is 'creative' alertness
Schumpeter	Innovator	Entrepreneur as 'hero' figure
Knight	Risk taker	Profit is reward for risk-taking
Casson	Organizer if resources	Key influence of the environment
Shackle	Creativity	Uncertainty creates opportunities for profit

Table 64: Economic approaches to the role of the entrepreneur

The authors of the above table contend that as attention has become more focussed on the importance of the small and medium sized enterprise sector for economic development and job creation, so greater attention has also been directed at theories of entrepreneurship. Knight's entrepreneur is a risk-taker which is often the commonly held view of the

entrepreneur. Following Knight, one of the characteristics of entrepreneurs could be considered to be the responsibility for one's own actions. If a manager assumes this then he or she is performing some entrepreneurial functions. However, what is a risk for the SME is often different for large firms. Jenkins (2006) argues that the main risk for SMEs is survival and that takes precedence over other inherent risks such as consumer pressure and damage to public reputation. The relative weight of the other risks depends on the managerial style of the owner-manager.

If survival is the only main risk for SMEs then Galbraith's idea that large firms are and will continue to be more successful than small firms in technology-based industries has a sound basis. This argument has merit only due to the fact that SMEs possess limited resources - financial and otherwise and technological expertise. Casson's idea of the entrepreneur is one who can make judgements and coordinate scarce resources thereby allocating and organising resources to prioritise tasks (Deakins and Freel, 2009). Casson's view is closer to that of Knight than to other writers. This view of entrepreneurs is also closely related to the idea of SME owner-managers in that change is seen as an accompaniment to entrepreneurship and the pace of change provides opportunities for the entrepreneur to choose which one to back. However, coming back to the idea of the SME owner-manager vis-à-vis the entrepreneur, let us look at Schumpeter's idea of entrepreneurs as innovators. This concept differs from other writers who have distinguished entrepreneurs from other small business owners who have no ambition to develop or expand their business or who wish merely to remain self-employed.

However, the Schumpeterian innovator is a person who wishes to manage change or initiate change in some way (Deakins and Freel, 2009; p.5). This idea is relevant to my study as it discourages subjective exclusion of some potential sample based on initial ideas of who has or has not the ambition to initiate change in their firms. To engage SME owner-managers in the mainstream discussion of environmental taxes, it is necessary to understand and elicit data from the apparently ambitious initiator and the apparently passive survivor (in terms of business management style).

McClelland (1961) identified the key competencies of successful entrepreneurs, a few of which I will mention here: being proactive; initiative taking; assertive;,committed to others; visionary; calculated risk-taker; and innovative (Chell et al, 1991). To complement this, let us glance at Meredith et al (1982), their few core traits of the entrepreneurs which are flexibility and the need for achievement etc. One of my key concerns is to find out what motivates SME owner- managers and these concepts of characteristics can be very useful in this regard. However, there are critiques of using these concepts as the final word which argues that it is inappropriate to attribute one single characteristic as being a distinctive identity of the entrepreneur.

In addition, this approach ignores the role of the learning, dynamic process of entrepreneurship. So while it is useful to use these concepts as guidelines, they are not sacrosanct. For instance, although entrepreneurs are seen here as proactive, SMEs are seen to have reactive attitudes towards regulations (Vickers et al, 2005) but attitudes and motivations can range from avoidance to proactive stances (Jenkins, 2006; Spence, 1999; Gibb, 2000; Burns, 2001). Entrepreneurs are also identified as reactive and being agents of adjustment (Binks and Vale, 1990). Although entrepreneurial types consist of only a small minority of all small firm owner-managers (Keasey and Watson, 1993), the evidence suggests (Burrows and Curran, 1991) that as well as personality traits being an important influence on whether an individual becomes an owner-manager, a number of background factors are also important. Keasy and Watson (1993) discuss a number of factors such as socio-economic background and situational factors.

Burrows and Curran (1991) say that the self-employed are more likely to come from a family that has included some form of self-employment and that social marginalisation and ethnic origin are important determinants of self-employment.

The above socio-economic criteria may be of interest in future research. With regard to situational factors, it can be argued (Keasey and Watson, 1993) that while socio-economic

factors and personal characteristics are key in determining latent entrepreneurship, environmental opportunities and constraints are also critical to turning this latency into actuality (Keasey and Watson, 1993, p.11).

SMEs and entrepreneurship are now recognised world-wide to be a key source of dynamism, innovation and flexibility in advanced industrialised countries, as well as in emerging and developing economies. They are responsible for most net job creation in OECD countries and make important contributions to innovation, productivity and economic growth. SMEs have grown in importance over the last 30-40 years. While much literature has focussed on what is a small firm it 'depends' upon a number of factors (Deakins and Freele, 2009, p.29) such as the industry sector and market in which a given firm operates. The UK Committee on Small Firms (Bolton Committee) distinguished between statistical and economic definitions of Small firms. While statistical definitions include information such as the manufacturing sector with 200 employees or less and wholesale trades with turnovers of £200000 or less, the economic definitions sound more suitable for the purpose of the study. According to the Bolton Committee's economic definitions, Small firms are those which have a relatively small share of their marketplace; are managed by owners or part-owners in a personalized way and not through the medium of a formalized management structure; and are independent, in the sense of not being part of a large enterprise. (Deakins and Freele, 2009, p. 30; Keasey and Watson, 1993). However, this focuses only on Small firms. The European Commission (EC) focused on size to describe Small and Medium enterprises, thus,,Small enterprises are those of between 10-99 employees (11-50 as of February 1996) and Medium enterprises are those of between 100-499 employees (51-250 as of February 1996) (Deakins and Freele, 2009). Financial criteria are also used in the EC definition. However, the EC definition still treats the Small firm sector as a homogeneous whole and is essentially a measure of convenience (Deakins and Freely, 1996).

As to why SMEs have gained in importance in the UK, it began with the remarkable increase in the number of Small firm employees over the late 1970s and the 1980s. In the UK the

increase in the number of businesses and employment in SMEs took place in most sectors of the economy (Keasey and Watson, 1993). So a future strand of research would look at different managerial styles and make a comparison between different types of entrepreneurs and their attitudes towards environmental taxation in order to identify the ones who can be the 'leaders' in generating more positive attitudes and understanding of environmental taxation amongst other SMEs in their sector or region.

8.6   Limitations of the research

Research studies often suffer from unforeseen limitations. SME research is marred by numerous problems (Chapter 4) and this study faced a number of them including the following:

- The sample surveyed was 750 SMEs of which the responses received only amounted to 99. This has affected the quality of the statistical tests of the hypothesis. The low response rate caused some hypothesis tests to be done in a simplistic way by splitting the hypothesis instead of being able to use tests such as logistic regressions which would have been more applicable, especially in the context of Hypothesis 6.

- The data collection through survey and interviews took much longer than expected owing to problems in accessing potential respondents and also weather problems associated with heavy snowfall at the end of 2010.

- Use of IO methodology suffers from certain limitations including the inherent characteristics of IO in assuming: homogeneity; that there is no substitutability of inputs and that there is a stable trading pattern among sectors and between them and the rest of the world; aggregation of different products in one sector; and that the economy operates in such a way that any increase in final demand would be fulfilled by an increase in sectoral output. Also it is not possible to analyse all environmental taxes in the IO context.

- The data analysed is a mix of quantitative survey data and qualitative interview data, the latter one being significant in lending further insights in corroborating the survey findings. However it is worth noting that using more variables and different targeted sectors may produce different results.

8.7 Recommendations

In this section, the researcher makes some recommendations based on the findings and conclusions of the study and believes that if these recommendations are implemented then the challenges that SMEs face regarding environmental taxation can be reduced to some extent.

- The study finds that SMEs require increased information on environmental taxation and the purposes of such taxes, the way they are implemented and the resultant effect on businesses, and how businesses, especially SMEs, can cope with them. In this regard the researcher would like to suggest that government agencies disseminate information to SMEs regularly using various channels such as leaflets, email communication and brochures to keep them well informed and engaged. Also, information on where SMEs can go in order to seek consultation on how to lessen the effects of these taxes on them should be put in place to facilitate and encourage an increased dialogue between SMEs and the government bodies and/or trade associations.
- The study shows that there is low awareness and understanding of environmental taxation and many SMEs tend to view government environmental policies with great mistrust and cynicism and refer to the environmental taxes as 'penalty' and ' a con' and allege that it is 'to cater to government greed'. This highlights a lack of understanding that needs to be addressed immediately if environmental taxation as an economic instrument to mitigate climate change is to succeed. The researcher would like to suggest that the policy makers take into consideration these findings

and try to engage the huge SME population in policy level discussions by seeking their opinion and through local councils and chambers of commerce to make SMEs feel they have a platform for expressing their opinions and for asking questions which would be answered well.

- SMEs are resource-bound and are mostly run by one person who is engaged in many concurrent activities and has limited expertise. Therefore they are unable to go through complex tax laws and tax documents to understand the implications of such taxes on them. James and Alley (2002) contend too that complexity of tax language and legislation causes problems with tax compliance. In this regard the researcher would like to recommend that any information or update on environmental taxes be easier to understand in a language that non tax experts can follow too.

- It emerged from the study that due to practical difficulties such as the cost of recycling, many SMEs are unable to undertake such actions even though they have the intentions of doing so. Also, they wish to have widely available recycling facilities which are low cost. Given the difficult economic times now for the SMEs and all other businesses, the researcher would like to recommend that commercial waste recycling be made available through local councils at subsidised rates to encourage more recycling and therefore better waste management behaviour and less disposal of waste at landfill sites. In the absence of such practical help and support and increased costs of landfill sites, smaller businesses may resort to illegal waste dumping activities such as fly –tipping.

- The study highlights the need of SMEs for alternatives to their current ways of operation, for instance, their production processes. Many SMEs argue that although they would like to change their environmental behaviour, the cost of basic things such as installation of solar panels and access to green fuels is so great that they are unable to afford them. Although such support is available to smaller businesses through schemes such as Enhanced Capital Allowances (ECA), the cost of initial investment is not seen by many as being worth the trouble. The researcher would

like to recommend that the government makes available more avenues for SMEs to find cleaner fuels, cleaner and more technological advanced production machinery, for instance, at lower costs, and to put in place funds that SMEs can request from local government bodies to be able to make such investment decisions. Also it is required to send clear and detailed information on these to the businesses about where and how they can access such support.

8.8 Summary

The study seeks to understand SME perception of environmental taxes within the UK. This research provides the readers with a ready source of reference to literature on environmental taxation, SMEs and input output (IO) methodology. Discussion on the link between attitudes and behaviour is also undertaken to the extent that it is relevant to the study. The study uses IO analysis in the first stages to identify the potential sample-those that are SME dominant and high users of those inputs liable to environmental taxes- in order to gather primary data from them. Following this the study gathers data through quantitative survey and qualitative interviews to answer the research questions.

Environmental taxation has been in the environmental policy portfolio of the UK government in response to being a signatory to the Kyoto Protocol. Environmental taxes operate by incentivising polluters to internalise their external costs of pollution by polluting less or paying more taxes. Often policies are designed for larger businesses and imposed on smaller ones without taking into consideration the very different characteristics of the SMEs. SMEs operate in all sectors of the UK economy and are therefore liable to environmental taxes but until now no such study has been conducted which has attempted to understand the perceptions and opinions of SMEs towards these taxes and also towards environmental issues in general.

The researcher believes that this study sets in motion the need to engage SMEs in the wider discussion of environmental taxes in order to achieve their full potential and this study also

paves the way for further studies which are highlighted above. In this regard this study is of significance in not only making a valuable contribution to the literature but also in creating a platform where SMEs could express their opinions which, if implemented by policy makers, can result in positive acceptance of these taxes and therefore result in increasing the effectiveness of this instrument to mitigate climate change.

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Appendices

Specific tax base	Tax rates	Definition of specific tax base
The use of 2 axled tractive unit used with any semi-trailers, weighing between 12,000 and 16,000 kg	460 GBP per year	Goods vehicles are taxed according to their "Revenue Weight". This is the confirmed maximum weight (i.e. gross weight or gross train weight) for vehicles subject to plating and testing.
The use of 2 axled tractive unit used with any semi-trailers, weighing between 16,000 and 20,000 kg	520 GBP per year	Goods vehicles are taxed according to their "Revenue Weight". This is the confirmed maximum weight (i.e. gross weight or gross train weight) for vehicles subject to plating and testing.
The use of 2 axled tractive unit used with any semi-trailers, weighing between 20,000 and 23,000 kg	810 GBP per year	Goods vehicles are taxed according to their "Revenue Weight". This is the confirmed maximum weight (i.e. gross weight or gross train weight) for vehicles subject to plating and testing.
The use of 2 axled tractive unit used with any semi-trailers, weighing between 23,000 and 28,000 kg	1190 GBP per year	Goods vehicles are taxed according to their "Revenue Weight". This is the confirmed maximum weight (i.e. gross weight or gross train weight) for vehicles subject to plating and testing.
The use of 2 axled tractive unit used with any semi-trailers, weighing between 28,000 and	1740 GBP per year	-do-

31,000 kg		
31,000-33,000kg	2530GBP per year	-do-
33,000-38,000kg	5170 GBP per year	
38,000-44,000kg	5170 GBP per year	
The use of a private car registered before March 2001 -- cylinder volume 1549 cc or less.	110 GBP per year	
The use of a private car registered before March 2001 -- cylinder volume 1550 cc or more	175 GBP per year	
The use of a private diesel-driven vehicle registered after March 2001, emitting between 101 and 120 g CO_2 per km.

Emitting between 121 and 150 g CO_2 per km.

emitting between 151 and 165 g CO_2 per km

emitting between 166 and 185 g CO_2 per km

emitting between 186 and 225 g CO_2 per km

emitting more than 225 g CO_2 per km | 50 GBP per year

110 GBP per year

135 GBP per year

160 GBP per year

195 GBP per year

215 GBP per year | |
| The use of a private petrol-driven vehicle registered after March 2001, emitting between 121 and | 100 GBP per year | |

150 g CO2 per km	125 GBP per year	
emitting between 151 and 165 g CO2 per km	150 GBP per year	
emitting between 166 and 185 g CO2 per km	190 GBP per year	
emitting between 186 and 225 g CO2 per km	210 GBP per year	
emitting more than 225 g CO2 per km		
The use of a private vehicle registered after March 2001, emitting less than 100 g CO2 per km	0	Tax rate from 23.03.06
The use of a trailer weighing between 4,000 and 12,000 kg	150 GBP per year	Where the drawing vehicle has a weight of over 12,000 kg and draws laden trailer over 4,000 kg, this additional trailer duty is payable
The use of a trailer weighing more than 12,000 kg	410 GBP per year	
Use of agricultural machines	40 GBP per year	
The use of buses, 17-35 seats	210 GBP per year	
36-60 seats	320 GBP per year	
9-16 seats	160 GBP per year	
More than 61 seats	480 GBP per year	
The use of electric motorcycles / tricycles	15 GBP per year	
Use of electric vehicles	40 GBP per year	

The use of motorcycles with cylinder volume 150 ccm or less 150-250ccm More than 250 ccm	15 GBP per year 40 GBP per year 60 GBP per year	
The use of rigid and articulated goods vehicles weighing between 3,500 and 7,500 kg. between 7,500 and 12,000 kg between 12,000 and 13,000 kg between 13,000 and 14,000 kg between 14,000 and 15,000 kg between 15,000 and 17,000 kg between 17,000 and 44,000 kg	160 GBP per year 300 GBP per year 470 GBP per year 650 GBP per year 840 GBP per year 2320 GBP per year 1320 GBP per year	Goods vehicles are taxed according to their "Revenue Weight". This is the confirmed maximum weight (i.e. gross weight or gross train weight) for vehicles subject to plating and testing.
use of rigid goods vehicles with 3 axles weighing between 17,000 and 19,000 kg between 19,000 and 21,000 kg Between 21,000 and 23,000 kg between 23,000 and 25,000 kg between 25,000 and 27,000 kg between 27,000 and 44,000 kg	850 GBP per year 1020 GBP per year 1470 GBP per year 2.23 GBP per year 2340 GBP per year 2340 GBP per year	-do-
The use of rigid goods vehicles with 4 or more axles weighing between 12,000 and 21,000 kg	350 GBP per year	-do-

between 21,000 and 23,000 kg		
between 23,000 and 25,000 kg	510 GBP per year	
between 25,000 and 27,000 kg	830 GBP per year	
between 27,000 and 29,000 kg	1.7 GBP per year	
between 29,000 and 31,000 kg	2320 GBP per year	
between 31,000 and 32,000 kg	3360 GBP per year	
	4400 GBP per year	
between 32,000 and 44,000 kg	4400 GBP per year	
The use of tricycles with cylinder volume 150 ccm or less	15 GBP per year	
more than 150 ccm	60 GBP per year	

Appendix 1: Vehicle Excise Duty Rates UK

Name	Type	Specific Tax Base	CurrentTax rate GBP	Units	Current Value of Tax Base	Units	% Tax by Value
Duty on hydrocarbon oil	Tax	Unleaded Petrol	0.5795	£ per litre	135.86	pence per litre	41.95
Duty on hydrocarbon oil	Tax	Heavy Oil	0.5795	£ per litre	221.2	pence per litre	26.2
Duty on hydrocarbon oil	Tax	Biodiesel	0.5795	£ per litre	n/a	n/a	n/a
Duty on hydrocarbon oil	Tax	Bioethanol	0.5795	£ per litre	n/a	n/a	n/a
Duty on hydrocarbon oil	Tax	Light oil (other than unleaded petrol or aviation gasoline)	0.6767	£ per litre	112.4	pence per litre	60.2
Duty on hydrocarbon oil	Tax	Aviation gasoline (Avgas)	0.377	£ per litre	106.15	pence per litre	35.8
Duty on hydrocarbon oil	Tax	Light oil delivered to an approved person for use as furnace fuel	0.107	£ per litre	143.7	pence per litre	7.45
Duty on hydrocarbon oil	Tax	Marked gas oil	0.107	£ per litre	170.3	pence per litre	6.29
Duty on hydrocarbon oil	Tax	Fuel oil	0.114	£ per litre	112.4	pence per litre	10.15
Duty on hydrocarbon oil	Tax	Heavy oil other than fuel oil, gas oil or kerosene used as fuel	0.107	£ per litre	221.2	pence per litre	4.84
Duty on hydrocarbon oil	Tax	Kerosene to be used as motor fuel off-road or in an excepted vehicle	0.114	£ per litre	141.2	pence per litre	8.07
Duty on hydrocarbon oil	Tax	Biodiesel for non-road use	0.114	£ per litre	n/a	n/a	n/a
Duty on hydrocarbon oil	Tax	Biodiesel blended with gas oil for non-road	0.114	£ per litre	n/a	n/a	n/a
Duty on hydrocarbon oil	Tax	Road fuel natural gas (NG), including biogas	0.247	£ per kg	n/a	n/a	n/a
Duty on hydrocarbon oil	Tax	Road fuel gas other than NG – e.g. liquefied petroleum gas (LPG)	0.3161	£ per litre	77.3	pence per litre	40.9
Climate Change Levy	Tax	Electricity	0.485	pence per KWh	8.55	pence per KWh	5.67
Climate Change Levy	Tax	In Great Britain, gas supplied by a gas utility or any gas supplied in a gaseous state that is of a kind supplied by a gas utility	0.169	pence per KWh	2.299	pence per KWh	7.35
Climate Change Levy	Tax	Gas supplied by a gas utility or any gas supplied in a gaseous state that is of a kind supplied by a gas utility for burning in Northern Ireland.	0.059	pence per KWh	2.299	pence per KWh	2.57
Climate Change Levy	Tax	Any petroleum gas, or other gaseous hydrocarbon, supplied in a liquid state.	10.83	pound per tonne	54	pence per litre	1.004
Climate Change Levy	Tax	Any other taxable commodity.	1.321	pence per kg	142.7	pence per kg	0.93
Landfill Tax	Tax	The disposal of waste to landfill - standard rate	56	GBP per tonne	80	GBP per tonne	70
Aggregate levy	Tax	Aggregate production	2	GBP per tonne	33.03	GBP per tonne	6.06

Specific Tax Base	CurrentTax rate GBP	Units	Current Value of Tax Base	Units	% Tax by Value
Diesel	0.57	£ per litre	141.5	pence per litre	40.28
Biodiesel	0.57	£ per litre		pence per litre	n/a
Bioethanol	0.57	£ per litre		pence per litre	n/a
Fuel oil and light oil delivered to approved persons for use as a furnace fuel	0.11	£ per litre	111.4	pence per litre	9.88
Gas for use as road fuel	0.24	£ per litre	161.9	pence per litre	14.82
Gas oil (marked red)	0.11	£ per litre	69.13	pence per litre	15.91
Leaded petrol and other light oils	0.67	£ per litre	n/a	pence per litre	n/a
Road fuel gas other than natural gas (e.g. Liquefied petroleum gas, LPG)	0.31	£ per litre	77.3	pence per litre	40.103
Unleaded petrol	0.57	£ per litre	135.86	pence per litre	41.95
Heavy oil other than fuel oil, gas oil or kerosene used as fuel	0.107	£ Per Litre	221.2	pence per litre	4.84
Kerosene to be used as motor fuel off-road or in an excepted vehicle	0.1114	£ Per Litre	60.41	pence per litre	18.44
Biodiesel for non road use	0.1114	£ Per Litre	n/a	pence per litre	n/a
Biodiesel blended with gas oil for non road use	0.1114	£ Per Litre	n/a	pence per litre	n/a
Road fuel natural gas (NG), including biogas	0.247	£ Per Litre	n/a	pence per litre	n/a
Road fuel gas other than NG – e.g. liquefied petroleum gas (LPG)	0.3161	£ Per Litre	77.3	pence per litre	40.89
Aviation gasoline	0.38	£ per litre	106.15	pence per litre	35.8
Coal consumption - ordinary rate	13.21	£ per tonne	149.8	pence per kg	0.89
Coal consumption - Reduced rate	4.62	£ per tonne	149.8	pence per kg	0.317
Coke consumption - ordinary rate	13.21	£ per tonne	142.7	pence per kg	0.93
Coke consumption - Reduced rate	4.62	£ per tonne	142.7	pence per kg	0.323
Electricity consumption - ordinary rate	4.85	£ per MWh	8.55	pence per KWh	5.68
Electricity consumption - reduced rate	1.68	£ per MWh	8.55	pence per KWh	1.97
Liquid petroleum gas used for heating purposes - ordinary rate	10.83	£ per tonne	54	pence per litre	1.004
Liquid petroleum gas used for heating purposes - Reduced rate	3.79	£ per tonne	54	pence per litre	0.351
Natural gas consumption (GB) - ordinary rate	0.169	£ per tonne	2.299	pence per KWh	7.36
Natural gas consumption (NI) - ordinary rate	0.059	£ per tonne	2.299	pence per KWh	2.57
Natural gas consumption - reduced rate	0.059	£ per tonne	2.299	pence per KWh	2.57

Appendix 2: Percentage Tax by Value OECD and HMRC

Survey on Small and Medium Sized Enterprises and Climate Change

Please enter company name and postcode

This survey, which is being conducted as part of PhD research at the Centre of Finance and Risk, Bournemouth University, will produce findings about the attitudes of Small and Medium sized enterprises (SMEs) towards climate change issues which should benefit you and others by generating a better understanding of how climate change initiatives can benefit from an enhanced understanding and participation of SME owner managers.

Please complete the survey below. If you wish to comment on any questions or qualify your answer, please use the space provided on the back cover. When completed please return in the FREEPOST envelope by **05 March 2011**.

All responses will be treated in confidence. The information collected is not intended to be used by any person or body to damage or harm the reputation of your company. Individual respondents will not be identified in any reports or other outputs produced as a result of the survey.

Should you require assistance in completing the survey please contact :

Sukanya Ayatakshi

Centre of Finance and Risk

EBC, Bournemouth University BH8 8EB

Tel: 077735076406

Email:sayatakshi@bournemouth.ac.uk

Return Address:

Executive Business Centre
Bournemouth University
89 Holdenhurst Road
Bournemouth
Dorset BH8 8EB

A. Climate Change

A1. Are you aware of the term climate change?

(Please tick one box)

Yes ☐ Go to A2

No ☐ Go to A3

A2. What do you understand by the term 'climate change'?

Natural permanent change in global climate ☐

Manmade climate change ☐

Natural global warming ☐

Manmade global warming ☐

Change in global climate due to both manmade and natural factors ☐

A3. In your opinion, does business have any impact on climate change?

(please tick one box)

Yes ☐ Go to A4

No ☐ Go to A5

A4. What impact does business have on climate change?

Depletion of natural resources ☐

Increased levels of CO_2 ☐

Emissions through energy use and waste diposal ☐

Environmental pollution ☐

All of the above ☐

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A5. In your opinion, why do you think business has no impact on climate change?

Climate change is a natural phenomenon ☐

Business has impact on environment not climate ☐

Too small to have an impact ☐

Climate change is not a business consequence ☐

A6. In SMEs, do you think owner managers have any influence on the environmental attitudes and behaviour of the business?

Yes ☐ Go to A7

No ☐ Go to A8

No Opinion ☐ Go to A8

A7. How strong do you think that influence is?

(Please indicate by circling the number that best represents your answer)

Very strong	Fairly strong	Not very strong
1	2	3

A8. Below is a list of statements about business and environmental issues. *(Please indicate whether you agree or disagree with each statement by circling the number that best represents your answer).*

	Strongly Agree 1	*Agree* *2*	*Neutral* *3*	*Disagree* *4*	*Disagree Strongly* *5*
Business is the largest contributor to climate change	1	2	3	4	5
Climate change is a huge challenge to mankind	1	2	3	4	5
Climate change is a significant issue for my business	1	2	3	4	5
Efficient energy use is important for my business	1	2	3	4	5

SMEs are responsible for more than 70% of the total pollution	1	2	3	4	5
Pro environmental attitudes do not always mean positive environmental behaviours	1	2	3	4	5
SME are highly suspicious of environmental policies of the government	1	2	3	4	5
In these economically challenging times climate change is low on our priority	1	2	3	4	5
My business has a responsibility to help manage the impact of climate change	1	2	3	4	5

B. UK Environmental Policies

B1. Are you aware of UK government's environmental policies?

(Please tick one box)

     Yes   ☐   Go to B2

     No   ☐   Go to B3

B2. Please name some of UK's environmental policies and initiatives

……………………………………………………………………………………………………
………………………………………………………………………… …………………………………

B3. Are you aware of the term 'environmental taxation'?

(please tick one box)

     Yes   ☐   Go to B4 and B5

     No   ☐   Go to B6

B4.In your opinion, what is environmental taxation?

Another business tax ☐

Tax to encourage good environmental behavior ☐

Polluter pays concept ☐

Taxes on energy ☐

Taxes on wastes ☐

Taxing environmentally damaging activities ☐

B5. Please cite a few examples of the different environmental taxes in UK.

…………………………………………………………………………………………………
…………………………………………………………………………………………………
…………………………………………………………………………………………

B6. Which of the following government policies do you feel would be most effective in reducing the impact of climate change?

(Please tick one box)

Environmental regulation ☐ Environmental Taxation ☐ Energy Efficiency ☐

Emissions trading schemes (cap and trade) ☐ Don't know ☐

B7. Please elaborate on your choice as indicated in Question B6

…………………………………………………………………………………………………
……………………………………………………………………………………..………………
…………………………………………………………………………………………………

B8. Environmental taxation is an instrument to mitigate climate change. Do you agree?

(Please tick the box that best represents your answer)

Definitely important ☐

Important ☐

Probably important ☐

Probably not important ☐

No opinion ☐

B9. In your opinion, what do you think is the purpose of environmental taxation?

Another business tax to raise government revenue ☐

Fines on polluting behaviour ☐

To incentivize favourable environmental behaviour ☐

A social cover up for government greed ☐

Do not know ☐

B10. Do you receive any information related to environmental issues of policy from government or trade agencies?

(Please tick one box)

Yes ☐ Go to B11, B12, B13

No ☐ Go to Section C

B11. How often do you receive such information?

Weekly ☐

Monthly ☐

Quarterly ☐

Annually ☐

Any other ☐

B12. What kind of information did you receive?

……………………………………………………………………………………………………
…………………………………………………...

B13. Please write the name of the agency or trade association that sent you the information.

……………………………………………………………………………………………

C.Business Waste

C1. What kind of wastes do you produce in your business?

……………………………………………………………………………………………………
………………………………………………….

C2. Are any or all of the wastes recylable?

(please tick one box)

    Yes   ☐   Go to C3

    No   ☐   Go to C4

C3. Do you recycle?

(please tick one box)

    Yes   ☐   Go to C4

    No   ☐   Go to C5

C4. How often do you recycle?

Daily	☐
Weekly	☐
Fortnightly	☐
Monthly	☐
Any other	☐

C5. Why do you not recycle?

Costly ☐

No local recycling facilities for wastes produced ☐

Time consuming ☐

Do not generate recyclable wastes ☐

C6. In your opinion, what do you think the government can do to help SMEs become more environmentally aware and active? Please elaborate.

Provide cost effective energy solutions ☐

Increased communication from policy makers and government agencies ☐

Reduce environmental taxes ☐

Provide free recycling bins to encourage recycling ☐

Awards and other incentives for business who demonstrate good practice ☐

C7. The following items are listed as recyclable, reusable or disposable.

(Please tick the box that best represents your answer)

⇒Items ⇓	Car Batteries	Used Engine	Tyres	Wood &timber	Hardcore and rubble	Garden waste	Paper	Cardboard	Plastic bottles	Mixed glass	Food and drinks cans	Asbestos	Gas bottles	Electrical	Lrg. [88] appliances	Bldg[89] . materials
Recyclable																
Reusable																

---

[88] Lrg.= Large
[89] Bldg.=Building

Disposable															

D.Demographic details

D1. What sector is your business in?

(Please tick one box)

Manufacturing ☐

Transport ☐

D2. How many people are employed in the business?

(Please tick one box)

0-9 ☐

10-49 ☐

50-249 ☐

D3.How long have you had this business for?

………………………………………………………………………………………..

D4. In the past year what was your annual business turnover?

(Please tick one box)

< EUR 2 mil ☐

2m-10 m ☐

EUR 10m-43m ABS[90] or EUR 10-50m Annual turnover ☐

Do not wish to disclose ☐

---

[90] ABS- Annual Balance Sheet

D5. What is your estimated energy bill, annually?

……
………………………………………………………………………...…

D6. Are you member of any trade association?

(Please tick one box)

Yes ☐ Go to D7

No ☐ Go to D8

D7.What is the name of the trade association you are member of?

……
…………………………………………………………….……

D8. Why are you not a member of any trade association?

Do not know about them ☐

No relevant support obtained from such membership ☐

Costly membership fees ☐

Not interested ☐

D9. Please state your date of birth

DD   MM   YYYY

☐☐ ☐☐ ☐☐☐☐

D10. Please state your educational qualifications below.

……
………………………………………………………………….………

D11. The following information will not be used in any part of the published study results but is simply intended to provide appropriate up-to-date contact information.

Would you like a copy of the results when they become available?

No ☐ Please turn to the back cover

Yes ☐ Please complete D12 or enclose your business card

D12. Contact person

…………………………………………..

 Phone

………………………………………….

Your address for mailing purposes

…………………………………………..

………………………………………….

Postcode: ☐☐☐☐ ☐☐☐

If you have any comments you would like to make about this survey, about climate change issues, or the SME sector, please write them on this page.

Your contribution to this survey is very greatly appreciated. Please return your questionnaire in the reply paid envelope provided. If the envelope has been mislaid, please forward to:

Sukanya Ayatakshi

Executive Business Centre
Bournemouth University
89 Holdenhurst Road
Bournemouth
DorsetBH8 8EB

A Copy of the report compiled from this survey will be sent to all participating companies upon request

Appendix4 Interview Questions Guide

- Please tell me about your business.

- Are you aware of the term 'climate change'?

- What do you understand by it?

- Why do you think there is so much discussion about climate change these days?

- In your opinion, does business have any impact on climate change?

- Are you aware of the UK's government's environmental initiatives?

- Are you aware of environmental taxation?

- Coming back to environmental taxation, would you please tell me how important you think environmental taxation is, as an instrument for climate change

- Being a business owner-manager do you think your attitudes towards the environment can influence your employees or others within your business?

- What kind of wastes do you produce in your business?
    - Are they recyclable?

- Do you think that taxation can incentivise businesses to change their behaviour?

- What do you think will help businesses change their behaviour and attitudes towards the environment?

- Do you receive any information related to environmental issues of policy from government or trade agencies?

- Are you member of any trade association?

- In your opinion, what do you think the government can do for SMEs to encourage them to become more environmentally aware and active?
- Questions on demographic information
    - Business sector, size

Appendix 5: Overview of Input-Output Analysis and Sample identification

IO analysis is applied to domestic industry Supply-Use (SU) data to estimate energy and emissions resulting from each sector. IO tables are compiled using data from national accounts as well as other national economic sources to show economic transactions between all product sectors of the national economy (Acquaye and Duffy, 2010). IO analytical tables are increasingly used in environmental analysis, for example, to measure the direct and indirect pollutants produced by industrial sectors. Environment is extended to IO models by way of the entry of environmental commodities (Pearce, 1976) which cause a consequence of emissions and effluent release to the environment. For example, an intermediate consumption of energy source, say, refined petroleum; by a business producing bicycle tyre tubes will produce pollutants in the form of emissions of CO_2 and others. A change in the final demand for the product of this sector will have an effect on the industrial activity and hence on demands for energy inputs, waste and emissions discharged. IO analysis is applied to the domestic industry sector supply and use data to estimate the nationally arising GHG emissions and energy intensities (Acquaye and Duffy, 2010).

Monetary IO tables which give insight into the value of economic transactions between different sectors in an economy can be extended to the environment with related information for each sector, such as emissions and primary inputs use (Proops, 1977; Tukker et al, 2006). Essentially, environmentally extended IO analysis distributes the (known) total environmental impacts generated by a production-consumption system over different final expenditure categories (Leontief, 1970; Pearce, 1976; Tukker et al, 2006).

One of the biggest advantages of environmental IO analysis is that it takes into account the environmental inputs both directly and indirectly. Unless an operation is a primary production, for many businesses the emissions of, say, GHGs, take place within complex supply chains rather than directly from fuel or energy consumption (Berners-Lee et al, 2011). Recently, environmentally extended IO tables have been used in various applications including hybrid life cycle assessments

(LCA)[91], using primary data from main process chains where life cycle impacts of smaller inputs of these process chains are estimated on the basis of monetary value and environmentally extended input output analysis (Suh and Huppes, 2005). Also, IO tables have been developed which represent industry structure and the related monetary flows between sector changes over time as a result of technical progress, for example, Wilting et al (2001). Numerous other studies such as Labandeira and Labeaga (1999) employed an IO demand model followed by micro simulation of household data to assess the environmental and economic effects of the introduction of a hypothetical carbon tax on Spanish households.

Prior to the introduction of environmental taxes such as the climate-change levy etc. in the UK, Symons et al (1994) undertook a simulation analysis of the effects of a carbon tax on the purchasing power and economic behaviour of households. This was done on the assumption of its complete incidence on final demand including consumers that is, assuming that carbon taxes would affect the prices of fossil fuels and thus UK consumer prices both directly from fuels and electricity and indirectly from manufactured goods. The study by Symons et al (1994) assumes - without fuel substitution in the short and medium term - that the increased production costs as a result of carbon tax will be passed on to the consumer in terms of price increases. Our study differs in the assumption that price increases, as a result of environmental taxation, will not be passed on to the consumer but be borne by the businesses themselves through the effect on profits (i.e. an equivalent 'profit' tax).

Environmentally-enhanced IO tables can be used to support environmental and other policy purposes too (Tukker et al, 2006; Pearce, 1976), including analysis of the causes of environmental problems such as use of such resources that result in emissions and environmental pollution and the prospective effect analysis of policies.

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[91] Life Cycle Assessment (LCA) is a tool that can be used to assess the environmental impacts of a product, process or service from design to disposal i.e. across its entire lifecycle, a so called cradle to grave approach. The impacts on the environment may be beneficial or adverse. These impacts are sometimes referred to as the "environmental footprint" of a product or service

To identify the energy intensive sectors, the IO analysis method used quantifies the interrelationships amongst the sectors of the UK economy[92]. An IO table describes the flow of goods and services between all individual sectors of a national economy over a stated period of time, say, a year (Leontief, 1986, p.19-20). Each sector's production structure describes, quantitatively, the inputs it used and the outputs it produces (Lin and Francis, 2004). Breaking the economy down to display transactions of all goods and services between industries and final consumers (Lin and Francis, 2004) the IO table used here describes the UK national economy.

The industry analysis of environmental taxes is primarily based on information compiled for the annual IO SUTs (Input-Output Supply-Use Tables). The methodology used to allocate environmental taxes is based on unpublished tax information contained in the UK IO analyses that in turn use information from the annual IO SUTs (Lin and Francis, 2004). Information on the use of products is generally used as a proxy for allocating environmental tax payments (Lin and Francis, 2004). Although the intersectoral flow as represented by an IO table can be thought of as being measured in physical units, in practice most IO tables are constructed in value terms (i.e. £million). Such IO tables expressed in value terms can be interpreted as a system of national accounts (Leontief, 1986, p.21).The structure of IO SUTs used here is as follows:

SUPPLY TABLE						USE TABLE									
Industry						Industry		Final demand at purchaser's prices							
PRODUCT	Domestic supply at basic prices	Imports goods and services	Distributor's trading	Taxes less subsidies	TOTAL SUPPLY	Intermediate demand at purchasers prices / Total intermediate	Total intermediate demand	Households final consumption	NPISHs FCe[93]	General govt	Gross fixed capital	valuables	Change in inventories	Exports of goods/services	total demand

---

[92] Input-Output have also been used as a tool for national and regional economic planning and are as relevant in studying regional economies as the structure of national economies.

[93] NPISHs FCe represents non-profit institutions serving households final consumption expenditure

						consumptio n								
						Taxes less subsidies on production								
						Employee compensati o								
						GOS								
TOTA L OUTP UT						TOTAL OUTPUT								

(Source: ONS, 2006)

The IO model can be divided into four quadrants. The first quadrant is exchange of goods and services which are both produced and consumed in the process of current production. This is usually referred to as the inter-industry flows or intermediate demand/intermediate consumption. The second quadrant is the final demand for the output of each producing sector. Final demand is the demand, use or consumption of products and services by, say, households. In the third quadrant, primary inputs to the productive sectors are represented. These are not part of the output of current production as defined by the first quadrant. These are the taxes, subsidies, employee compensation etc. The fourth quadrant represents the primary inputs that go directly to the final demand sectors. In an IO table the total value of output for each productive sector (i.e. the row total) is always equal to its total expenditure on inputs (i.e. the column total (O'Connor and Henry, 1975)). However, no such equality is imposed on the final demand sectors or on the primary input sectors (Ciaschini, 1988; There is supply and demand of emissions causing energy factors. For instance, for electricity, emissions per

KWh produced can be reduced through greater energy efficiency and reduced use of fossil fuels (Tarancion et el, 2010). On the demand side, a reduction in electricity consumption by households and industrial sectors can be attained through energy efficient technologies (Tarancion et al, 2010). There is considerable demand for energy factors (i.e. electricity, gas, petroleum etc.) by industrial sectors which results in emissions.

Taxes on energy and pollution affect the prices of energy products (i.e. gas, electricity, hydrocarbon oils etc.). These price changes will, in turn, affect the effective consumption/purchasing power of businesses. Businesses purchase fossil fuels and energy directly and this carries the pollution/energy tax (Symons et al, 2002); this purchasing of fuels constitutes the direct consumption demand. Secondly, businesses also use inputs of goods the production of which has used energy inputs such as hydrocarbon oils. This constitutes indirect consumption demand and carries with it a certain incidence of environmental tax . The ideal tool to identify the demand/use of energy by production sectors is IO analysis (Gay and Proops, 1992). The effect of an environmental tax will raise the cost of inputs for intermediate consumption.

The primary energy consumed by firms in each sector is calculated by converting the energy expenditure (£m) to primary energy (GJ) using the relevant energy tariffs and primary energy factors. The primary energy factor is the primary energy (resource energy e.g. gas etc.) divided by delivered energy where primary energy is that required to supply one unit of delivered energy of the same type taking account the energy used (Ciaschini, 1988; O'Connor and Henry, 1975) for any operational requirements. At this stage the sectoral energy intensities/expenditures (GJ/£m) were determined for each sector using IO analysis and dividing the sectoral energy primary energy consumed by total expenditure. The energy expenditure comprises the sum of (total intermediate consumption of resource energy at purchaser's prices + taxes less subsidies + employee compensation). The total energy consumed by each sector is the sum total of each energy consumption expenditure.

This section estimates, using IO analysis, the energy expenditure of all industrial sectors in the UK. The UK IO table consists of energy products and services supply sectors, namely:

- Coke ovens, refined petroleum and nuclear fuel (Input 1);

- Electricity production and distribution (Input 2);

- Gas distribution (Input 3); and

- Sewage and sanitary services (Input 4).

A limitation of IO analysis is the aggregation of many different products into one sector in the national IO tables (IEA, 2000 cited in Acquaye and Duffy, 2010) thus reducing its applicability to a specific product or product sector (Acquaye and Duffy, 2010). For example, in the UK IO SUTs, some energy supply sectors are aggregated together, namely, coke ovens, refined petroleum and nuclear fuel (SIC code 35 for 2003). To address this, a disaggregation constant (Wissema, 2006) is introduced to separate the energy supply sectors into individual energy sources which enables individual energy factors to be used instead of average values of two or more aggregated energy supply sectors. But in this present analysis, a disaggregation constant has not been applied.

The total energy expenditure of each sector was calculated by identifying the energy products (i.e. electricity, gas etc.) that have an environmental consequence of emissions, both direct and indirect, associated with their use. Direct emissions would mean emissions caused by activities by a particular sector, say fishing, for example, the use of fuel on a fishing boat. Indirect emissions would mean emissions associated with the use of energy in fishing- related activities necessary for, but preceding the actual activities (for example, energy used to build fishing equipment etc.) (Acquaye and Duffy, 2010). Therefore the total emissions through use of energy would include the sum of direct and indirect emissions (Acquaye and Duffy, 2010).

For each industry sector, energy expenditure for each sector (Ej), in relation to total cost is the input (i.e. energy product (Ei) supply) divided by the sum of total value of goods and services consumed as inputs in production, including raw materials, services and other operating expenses.

Therefore, it can be represented by the equation

$$E_j = E_i / (\sum X + \sum Y + \sum Z)$$

where j is the sector; E_i is the primary energy product/service that is required to produce one unit of emissions through energy use (Acquaye and Duffy, 2010); X is the total intermediate consumption at purchaser's prices which includes the value of goods and services consumed as inputs in production, including raw materials, services, and other operating expenses; Y is Taxes less subsidies on production; and Z is the compensation of employees.

For each industry sector, energy expenditure for each sector (T_j), in relation to total Gross Operating Surplus (GOS) is the input (i.e. energy product (E_i) supply) divided by the Gross Operating Surplus and Mixed income (M).

Therefore, it can be represented by the equation

$$T_j = E_i / \sum M$$

In order to calculate the expenditure of say, agriculture, towards say, the fertiliser sector, in relation to its total cost, the expenditure is calculated as:

[{input value of fertilisers for agriculture (in £million)}/ {(total intermediate consumption at purchaser's prices) + (taxes less subsidies on production) + (compensation of employees)}]

This is calculated in the 2007 IO table for all the potential sectors and the total expenditure in relation to total cost is calculated by adding them all together.

Expenditure of the agriculture sector on fertilisers in relation to total gross operating surplus is calculated by:

[{input value of fertilisers for agriculture (in £million)}/(Gross Operating Surplus)]

Total energy expenditures, in relation to total cost and total GOS were calculated as the sum of the sectoral energy costs arising from each energy product or service input into it. The following Table 13

is an excerpt from the actual analysis using IO table 2003.O'Connor and Henry, 1975; Leontief, 1951; 1986).

	Industries' intermediate consumption in 2003 The 'Combined Use' matrix	£ million				
		1	2	3	4	5
	Product	Agriculture	Forestry	Fishing	Coal extraction	Oil and gas extraction
35	Coke ovens, refined petroleum & nucle	729	31	130	73	73
85	Electricity production and distributior	206	10	29	44	137
86	Gas distribution	14	4	15	8	135
119	Sewage and Sanitary services	14	-	11	1	15
	Total intermediate consumption at pu	10 636	504	642	578	6 655
	Taxes *less* subsidies on production	- 411	4	10	17	53
	Compensation of employees	3 039	178	69	314	1 542
	Gross operating surplus and mixed in	6 502	127	289	141	17 857
	Gross valued added at basic prices	9 130	309	368	472	19 452
	Total output at basic prices	19 766	813	1 010	1 050	26 107
	in relation to total cost					
35	Coke ovens, refined petroleum & nucle	5.50%	4.52%	18.03%	8.03%	0.88%
85	Electricity production and distributior	1.55%	1.46%	4.02%	4.84%	1.66%
86	Gas distribution	0.11%	0.58%	2.08%	0.88%	1.64%
119	Sewage and Sanitary services	0.11%	0.00%	1.53%	0.11%	0.18%
	In relation to GOS					
35	Coke ovens, refined petroleum & nucle	11.21%	24.41%	44.98%	51.77%	0.41%
85	Electricity production and distributior	3.17%	7.87%	10.03%	31.21%	0.77%
86	Gas distribution	0.22%	3.15%	5.19%	5.67%	0.76%
119	Sewage and Sanitary services	0.22%	0.00%	3.81%	0.71%	0.08%

Due to the magnitude of the size of tables of the analysis using 2003 IO they are not attached here. The analysis shows the annual sectoral total energy intensity/expenditure for 2003 in relation to total cost, and also present the total energy costs, in percentage terms, of each energy product or service. The graphs also show the annual sectoral total energy expenditure for 2003, in relation to total GOS.

Table 14 below summarises the 11 highest ranked sectors in terms of energy expenditure from the 2003 analysis. They are coded as x/xy/xyz where x is the industry sector, xy is the industry division and xyz is the industry group. These codes are derived from Standard Industrial Classification (SIC) codes 2003.

Industrial Division SIC code 2003	*In relation to total cost* Total energy expenditure	Industrial Division SIC code 2003	*In relation to total GOS* Total energy expenditure
Electricity production and Distribution E/40/401	52.44%	Coal Extraction C/10/101	89.36%

Gas Distribution E/40/402	**28.89%**	Railway transport I/60/602	**82.74%**
Fishing A,B/05/050	**25.66%**	Manufacturing D (Average)	**80.1%**
Sewage and Sanitary services O/90/900	**24.55%**	Air Transport I/62	**77.37%**
Air Transport I/62	**16.78%**	Water transport I/61	**76.99%**
Oils and Fats processing D/15/154	**16.01%**	Fishing A,B/05/050	**64.61%**
Coal Extraction C/10/101	**14.25%**	Other Land Transport I/60	**63.41%**
Industrial Gases and Dyes D/18/183	**11.59%**	Forestry A, B /02	**35.43%**
Other Land Transport I/60	**11.51%**		

Table A: Summary of IO analysis

The above table shows those sectors with the highest energy expenditure of some of the sectors in the UK economy from the IO table 2003 both in relation to total cost and total *gross operating surplus (GOS).* The use of energy is very high within manufacturing D (SIC code 2003) and undoubtedly within electricity production, coal extraction and gas distribution sectors. In relation to total GOS, the transport sector shows a very high intensity of energy expenditure and land transport including railway transport, and other land transport shows high energy usage too. The researcher also looked at the average of the manufacturing sub-sectors, all of which are highly energy intensive and found that the average across the manufacturing sector is very high energy expenditure too, at nearly 80%.

From the above analysis it shows that the sectors most likely to be adversely affected by environmental taxes are Electricity production and Distribution E/40/401 52.44%; Gas Distribution

E/40/402 28.89%; Fishing A,B/05/050 25.66%; Sewage and Sanitary services O/90/900 24.55%; Air Transport I/62 16.78% in relation to total costs. Sectors which are most likely to be affected, in relation to total *Gross Operating Surplus* (GOS) are Coal Extraction C/10/101 89.36%; Railway transport I/60/602   82.74%; Manufacturing D (Average) 80.1%; Air Transport I/62 77.37%; Water transport I/61 76.99%; Fishing A,B/05/050 64.61%; Other Land Transport I/60   63.41%; Forestry A, B /02 35.43%.

 Other sectors that are also affected less than 2%, in relation to their total cost include Private Owning and dealing in real estate 0.29%; Letting of dwellings 0.35%; Estate agent activities 0.55%; Office machinery & computers 0.65%; Construction 0.76%; Transmitters for TV, radio and phone 0.79%; Architectural activities & Tech. Consult 0.84%; Accountancy services 1.15%; Computer services 1.19%; Ancillary Transport services 1.22%; Tobacco products 1.27%; Aircraft and spacecraft 1.28%. This shows a disproportionate impact of energy taxes on some seemingly high energy usage and high polluting sectors such as transport services, real estate activities and even aircraft and spacecraft sector. One of the reasons for this is, perhaps, that the current analysis only looked at the predominant primary energy inputs barring the sewage and sanitary sector input.

Other sectors that are affected less than 2%, in relation to their GOS, include Letting of dwellings 0.12%; Owning and dealing in real estate 0.24%; Estate agent activities 1.04%; Legal activities   1.94%. In this case sectors such as aircraft and spacecraft and transport services have a significant high expenditure towards the inputs that are liable to environmental taxes at 12.04% and 12.87% respectively. So perhaps the previous disproportionate finding was owing to the fact that these sectors are unable to pass on their increased costs to the end consumers through increase in prices. This is because they are unable to influence market prices internationally- if they are engaged in international trade- so the effect of the expenditure towards these environmentally taxable input commodities falls on the profits of the user industries or the producers. This idea is further explored in Chapter 6 in which the researcher uses UK input- output tables from 2004-2008 to argue that the key mechanism by which environmental taxes can bring about change is not by changing consumer prices

but by affecting producer profits. This will provide the producers enough incentives to shift to more environmentally friendly sectors or resources and/or techniques.

SME-dominant energy-intensive Sectors

SMEs, by definition, are businesses which employ 'fewer than 250 persons and which have an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million' (EC, 2003). SMEs are distinguished from larger enterprises by the criteria of turnover, numbers employed and ownership (Curran and Blackburn, 2001). SMEs are very significant to the UK economy because of the 4.5 million businesses in the UK and of all the private sector enterprises, 99% are SMEs (BCC, 2008). While being a very important sector of the economy, SMEs produce around 70% of the total global pollution, 60% of the total carbon emissions, and the sum total of SMEs' environmental impact outweighs the combined environmental impact of large firms (Hillary, 2000; Smith and Kemp, 1998, Marshall Report, 1998).

The above statistics show that SMEs constitute the largest section of the private sector in the UK. Also, they are the largest providers of employment. SMEs are different in nature from larger firms, not just in size (Holliday, 1995, p.2). The size of an enterprise is seen as a major factor in influencing perceptions of a business case for sustainability (Smith and Kemp, 1998). SMEs are often reported to have limited resources; limited understanding and awareness of issues associated with business sustainability (Jenkins, 2006; Wilkinson, 1999; Spence, 1999) and are largely motivated by profit and survival of the business.

There has always been a tendency amongst policy-makers to design policies for larger businesses and then fit these to the SMEs (Jenkins, 2006). But SMEs are not just different from larger businesses in size but they are also heterogeneous (Wilkinson, 1999), not only in their sizes, but also in their working structures (Spence, 1999) and there are remarkable sector differences between SMEs of similar size (Curran and Blackburn, 2001). SMEs have a very wide range of forms. They operate in every sector of the economy.

As mentioned above, following the IO analysis to identify those sectors that are high users of energy inputs that are liable to environmental taxes, the analysis is supplemented with SME statistics 2008 to identify the SME-dominant energy intensive sectors.

For the purpose of this study, SME statistics for the whole UK with an industry summary is taken into consideration to supplement the findings from IO analysis.
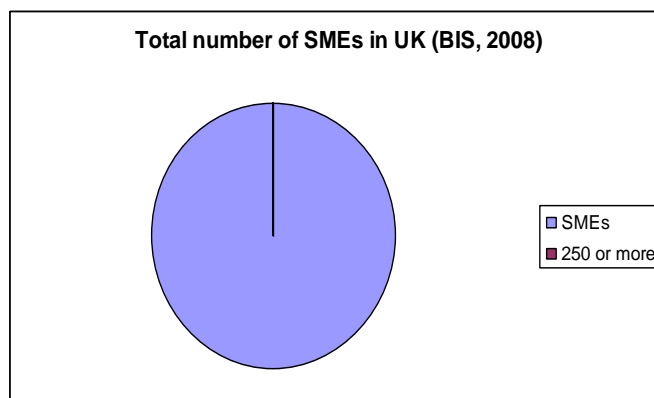
Figure: Total number of SMEs in UK

Figure 19 shows that SMEs account for the majority of all private sector enterprises in the UK at the start of 2008. In the entire UK, SMEs account for 99.9% of all private sector enterprises in the UK, 59.2% of total employment and 51.5% of total turnover. Due to reasons of convenience and proximity the researcher chose the South West of England as the main area of data collection. In South-West England SMEs account for 99.9% of all private sector enterprises, 73.3% of all employment and 60.5% of the total turnover at the start of 2008.

The high percentages of SME presence nationally and in this region show how important SMEs are to the UK national economy. SMEs can be further broken down into micro, small and medium enterprises by numbers employed. For the purpose of the study, the definition of SMEs used is in accordance with the EU definition based on numbers employed. Figure 20 shows that 91% of all

SMEs in the UK are micro enterprises[94]; 7.1% are small businesses[3] and 1.8% are medium-sized[3] enterprises.
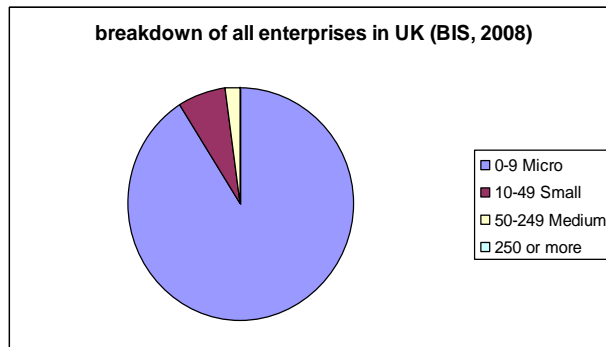
Figure: Breakdown of all UK enterprises

To understand the level of penetration of SMEs in the UK economy and South-West England, let us look at the tables detailing industry summaries of all enterprises in the UK and this region.

UK				South-West England		
Sector[95]	Enterprises (%)	Employment (%)	Turnover (%)	Enterprises (%)	Employment (%)	Turnover (%)
A,B	100	94.4 (data unavailable for SMEs with numbers	86% (un50-249)	100	95.5(un100-249)	90.7

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[94] Micro enterprises have 0-9 employees; small have 10-49 and medium have 50-249 employees according to EU definition of SME by numbers employed.
[95] SIC Codes 2003
A,B: Agriculture, Hunting, Forestry, Fishing
C, E: Mining, Quarrying; Electricity, Gas and Water supply
D: Manufacturing
F: Construction
G: Whole sale, retail, repairs
H: Hotels and restaurants
I: Transport, storage, communication
J: financial intermediation (excluding turnover)
K: real estate, renting and business activities
M: Education
N: Health and Social Care
O: Other community, social and personal service activities

		employed 50-249)[96]				
C,E	99.5	16.8	13.3	97.6	0 (un50-249)	Un0-249
D	**99.5**	**55.7**	**35.9**	**99.6**	**61.6**	**37.4**
F	100	84.3	70.8	100	87.4 (un200-249)	80.2(un200-249)
G	99.8	45.9	49.3	99.8	68.9	36.5
H	99.8	56.7	56.8	99.8	77.9 (un0,200-249)	69.3(un0,200-249)
I	**100**	**41.4**	**38.9**	**99.8**	**45.5(un20-249)**	**44.1(un0,100-249)**
J	99.5	22.9	Unavailable[39]	99.7	10.4(un50-99)	Unavailable[39]
K	99.9	78.3	68.8	100	79.3	72.9
M	99.9	57.6(un10-49)	68.4(un50-249)	100	89.2(un200-249)	Unavailable
N	99.9	77.5	83.9	100	96.5(un200-249)	68.5(un0,20-249)
O	99.9	74.9	43	100	85.3(un200-249)	28.6(un0,10-249)

Table B: SMEs (%) in the UK and South-West England by size

Table 15 shows the sector breakdown of SMEs in the whole of the UK and South-West England. From the above table, it shows that the numbers of nearly all the private sector enterprises in all industry sectors are dominated by SMEs (BIS, 2008). Their corresponding employment and turnover

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[96] Abbreviated in rest of the text as 'un50-249' etc.

figures are substantial enough to be of importance to affect the UK economy. Table 15 shows that almost all sectors of the economy are SME-dominant by number of enterprises. Sectors such as sewage and sanitary services, all manufacturing and construction are nearly 100% SMEs by number of enterprises. The statistics on turnover are often unavailable due to disclosure issues. Usually size is used as a defining characteristic of any SME and the above table shows that, by size (numbers employed) nearly all manufacturing, construction and service sector businesses are classified as SMEs.

Percentage	A,B	C,E	D	F	G	H	I	J	K	M	N	O
Enterprises (%)	6	0	**6**	22	11	4	**4**	2	25	4	6	10
Employment (%)	4	2	**13**	12	17	7	**5**	6	19	2	7	6
Turnover (%)	3	6	**22**	11	28	4	**5**	-	16	1	3	3

Table C: Businesses in South-West England

Table 16 shows penetration of SMEs in the private sector in South-West England by employment, turnover, and number of enterprises for each industry sector. The above Tables 15 and 16 show that SMEs account for more than 70% of all employment in the South West (BIS, 2008) and between 2007-2008, the number of enterprises in this region increased by 9.2% which is the highest increase in the whole of the UK. Meanwhile, employment increased by 0.9% and turnover increased by 2.4% (BIS, 2008).

As mentioned above, four inputs are used in the IO analysis across all economic sectors - coke ovens, refined petroleum and nuclear fuel (Input 1); electricity production and distribution (Input 2); gas distribution (Input 3); sewage and sanitary services (Input 4). To identify the sectors with higher costs of one energy source and input in relation to others, the following information is collated and displayed - for each input i.e. Inputs 1, 2, 3 and 4 - in Tables 17, 18, 19 and 20 are derived from the

2003 IO analysis. For each Input 1, 2, 3 and 4 the highest 5 to 8 user sectors are used to identify the highest energy users for each input. Only the significantly high figures for each input are shown in the tables below.

Sub-sector	In relation to total cost	In relation to total GOS
122 Other service activities (Sector O)	33.33%	100%
3 Fishing (Sectors A,B)	18.03%	64.1%
96 Air transport (Sector I)	16.01%	-[97]
94 Other land transport (Sector I)	**10.72%**	-
10 Oils and fat processing (Sector D)	9.50%	115.91%
35 Coke ovens, petroleum & nuclear fuel (Sector D)	-	375.92%
54-56 Iron, steel, non-ferrous metals, metal casting (Sector D)	-	281.21%

Table D: Input1   Coke ovens, refined petroleum & nuclear fuel

From the above Table 17, we can see that, in relation to total cost, 'Other service activities' has the highest energy expenditure of 33.3% from 'Coke ovens, petroleum and nuclear fuel'. This sector is largely dominated by businesses in dry cleaning, hairdressing, funeral and related activities. This is followed by 'Fishing' at 18.03% and 'Air transport' at 16.01%. These high energy costs can be associated with high fuel consumption for transport associated with activities in these sectors. In relation to total GOS, 'Iron, steel, non-ferrous metals and metal casting' is significantly high at 281.2 % as well as 'Other service activities' at 100%. As mentioned before, the purpose of the IO is to identify and quantify energy-intensive sectors in the UK. From Table 17 we can see that Sector D 'manufacturing' is energy-intensive in relation to input 1. Also Sector O 'Other service activities' is

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[97] Blanks are for total cost values that are, in comparison with others, significantly low so has not been used in the analysis.

quite high in its total energy cost too. In the case of Sector O in particular, it is worth noting that the high figures of total energy expenditure are dominated by equal inputs from all energy products and services, that is, 33.33% for each.

Similarly, for inputs 2, 3 and 4, Tables 18, 19 and 20 are as follows:

Sub-Sector	In relation to total Cost	In relation to total GOS
122 Other service activities (Sector O)	33.33%	100%
85 Electricity production and distribution (Sectors C,E)	38.29%	152.31%
86 Gas distribution (Sectors C, E)	13.42%	82.41%
87 Water supply (Sectors C,E)	6.49%	-
36 Industrial gases and dyes (Sector D)	6.22%	-
32 Pulp, paper and paperboard (Sector D)	5.71%	45.45%
54-56 Iron, steel, non-ferrous metals, metal castings (Sector D)	-	338.79%
78 Shipbuilding and repair (Sector D)	-	85.06%
35 Coke ovens, petroleum and nuclear fuel (Sector D)	-	58.37%
58 Metal boilers and radiators (Sector D)	-	42.86%

Table E: Input2 Electricity production and distribution

Table 18 shows that for Input 2 'Electricity production and distribution', Sector O 'Other service activities' and Sector D 'Manufacturing' are yet again high in their total energy related expenditure. Also Sector E 'Electricity, gas and water supply' has higher energy costs. The cost to this particular

sector is most likely associated with the energy consumption related to electricity production and gas and water distribution. 'Other service activities' include businesses in hairdressing. Dry cleaning, recreation (i.e. leisure centres) and funeral- related activities are significant consumers of electricity as an energy source and in Sector D the sub-sectors mentioned in the table are high users of electricity (Tarancion et al, 2010) through welding, metal repairs machinery and plant operations etc. Production and consumption of electricity is a major source of CO_2 emissions in Europe and elsewhere (Tarancion et al, 2010).

Sector	In relation to total cost	In relation to total GOS
122 Other service activities (Sector O)	33.33%	100%
54-56 Iron, steel, non-ferrous metals, metal casting (Sector D)	-	140.61%
86 Gas distribution (Sectors C,E)	14.92%	91.64%
85 Electricity production (Sectors C,E)	8.56%	34.05%
51-52 Structural clay, cement, lime, plaster (Sector D)	6.42%	22.8%
36 Industrial gases and dyes (Sector D)	2.75%	16.76%
32 Pulp, paper and paperboard (Sector D)	-	40.18%
49 Glass and glass products (Sector D)	-	25.34%
21-23 Textile fibres weaving (Sector D)	-	29.93%
37-38 Inorganic chemicals, organic	-	28.57%

Sector		
chemicals (Sector D)		
15 Sugar (Sector D)	-	20.11%
39-41 Fertilizers, plastics, synthetics (Sector D)	-	19.28%
59 Metal forging and pressing (Sector D)	-	18.32%
78 Shipbuilding and repair (Sector D)	-	14.94%

Table F: Input 3 Gas distribution

For Input 3, Sector D and O, and E are dominant in their use of this energy factor.

Sector	In relation to total cost	In relation to total GOS
122 Other service activities (Sector O)	33.33%	100%
119 Sewage and sanitary services (Sector O)	22.54%	118.49%
3 Fishing (Sectors A,B)	1.53%	-
32 Pulp, paper and paper board (Sector D)	1.36%	10.85%
54-56 Iron, steel, non-ferrous metals, metal casting (Sector D)	-	15.15%
8 Meat processing (Sector D)	-	12.16%
21-23 Textile fibres, weaving (Sector D)	-	10.95%
78 Shipbuilding and repair (Sector D)	-	10.34%

Table G: Input 4 Sewage and Sanitary services

From the above four Tables 17, 18, 19 and 20 we can see that Sectors D, O and for the first three inputs Sector E are very high energy intensive sectors. One can assume, from these findings, that these two sectors are responsible for a large amount of emissions given the large numbers in which they are present in the UK. Supplementing these findings with the data from Table B above we can see that Sector D accounts for 6% of the total number of private sector enterprises in the UK, 13% of all private sector employment and 22% of the total private sector turnover. Sector O has significant presence at 10% of the total number of enterprises, 6% employment and 3% turnover while Sectors C, E have 4% employment and 6% turnover.

Although from the above tables it emerged that Sectors D and O, 'Manufacturing' and 'Other services', respectively, are most energy intensive but if we look at the SME statistics it emerges that within the region chosen for the data collection, Sector Transport I is very SME-dominant and energy intensive too.

Table 15 shows that SMEs in the UK account for nearly all businesses (within the private sector) across all sectors. The same holds true for South-West England too. The manufacturing sector is undoubtedly energy intensive with its total expenditure of energy inputs of nearly 81% in relation to its GOS. SMEs within Sector D manufacturing account for nearly 62% employment in the region; 55% employment nationally and nearly 38% turnover in the region and 36% turnover nationally. Sector I 'Transport' is highly energy intensive and SME- dominant too with nearly 12% expenditure in relation to its total cost and 63.41% expenditure in relation to its total GOS. SMEs within the transport Sector I account for nearly 100% of all enterprises within this sector; 42% of all employment and 39% of total turnover of this sector nationally; and regionally it accounts for nearly 99.9% of all enterprises; 45.5 % of all employment and 44% of total turnover. This shows the relative importance of these sectors in this region.

The other dominant sectors, in this respect, are Sector O 'Other services' in which SMEs are nearly 100%, that is, all businesses within this sector are SMEs with 75% employment nationally, 85% employment regionally, and 43% and 29% turnover nationally and regionally, respectively. Sectors C

and E which are two sectors aggregated together (i.e. Sector C 'Mining and quarrying' and Sector E 'Electricity, gas and water supply') have data for the SME percentage together (i.e. as Sector C, E). There is no employment of turnover data available for this sector for SMEs in the region but nationally SMEs in this sector account for 99% enterprises, 16.8% employment and 13.3% turnover. Given the relative size of the Sectors D, O, and C, E in recent years in South-West England and nationally, it is highly likely that their energy use and emissions are significant.

So from the above analysis the researcher decided to choose two sectors 'Manufacturing' D (SIC code 2003) and 'Transport' I to conduct the primary data collection through surveys and interviews. The other main reasons for choosing these sectors were the fact that these sectors were SME-dominant and were present in large numbers in the region in which the data was collected. The other dominant reasons for choosing these two sectors as the data collection targets include the fact that they are both obviously high users of energy sources - land transport would be expected to use high amounts of fuel as would most manufacturing processes – and make a significant contribution to the UK economy.

The following section uses UK IO output Table 2007 to undertake a similar analysis and report the findings below.

Analysis II

The purpose of this section is to identify, from the UK IO Table 2007, the sectors that are liable to be affected, in relation to their total costs and in relation to their total GOS, by environmental taxes. Previously, data was analysed with the 2003 table with only four inputs that are currently liable to environmental taxes and this is the updated analysis taking into consideration all the other inputs that have current environmental taxes attached to them.

The purpose of using the IO table to identify the current environmental taxes and potential taxes in the UK is to understand which sectors are and will/may be liable to have higher costs through increased taxes and therefore understand the cost implications and behavioural implications (through semi-structured interviews) of such environmentally related taxes.

This section will consist of the following:

A. Analysis of 2007 UK IO Table for current environmental taxes

This section estimates, using 2007 UK IO tables, the expenditure of all economic sectors in the UK on those inputs that are liable to current environmental taxes such as:

- Sewage and sanitary services

- Railway transport

- Electricity production and distribution

- Ancillary transport services

- Construction

- Motor vehicles

- Air transport

- Water supply

- Other land transport

- Gas distribution

The previous 2003 analysis did not take into account most of the above input sectors apart from sewage and sanitary services and electricity production and distribution and therefore the researcher chose to only look at the remaining input sectors in the 2007 analysis.

Analysis of 2007 UK IO Table for current environmental taxes

The data used in this analysis are derived from the Supply-Use Table 2007. The main data sources used are IO Supply-Use Table 2007, Industries Intermediate Consumption and the 'Combined Use' matrix. The 'Combined Use' matrix provides detailed analysis of the production account for the whole UK economy, on an annual basis at current prices. The IO Supply-Use table is supplemented with information contained in SME statistics for the UK and regions dataset 2008 from the Department of Business Innovation and Skills (BIS) 2008 statistical release. IO tables are compiled using data from national accounts as well as other national economic sources to show economic transactions between all product sectors of the national economy (Acquaye and Duffy, 2010).

Pollution and other external effects of production or consumption activities should for all practical purposes be considered part of the economic system. IO analysis is applied to domestic industry Supply-Use data to estimate energy and emissions resulting from each sector. The industry analysis of environmental taxes is primarily based on information compiled for the annual IO SUTs At the time of writing this the latest available IO SUTs covered periods up to and including 2007. Information on the use of products is generally used as a proxy for allocating the environmental tax payments (Lin and Francis, 2004). Although the intersectoral flow as represented by an IO table can be thought of as being measured in physical units, in practice most IO tables are constructed in value terms (i.e. £ million). Such an IO table expressed in value terms can be interpreted as a system of national accounts (Leontief, 1986, p.21).

At the intermediate consumption stage there is a supply and demand for products and services that fall in the sectors which are liable to environmental taxes. The percentage of revenue from each sector that features in the consumption of such products and services gives us an idea of the cost impact of the environmental taxes on the businesses. If we assume that the supplying (i.e. 'From') sectors are large businesses then we can assume that for an environmental tax such as the Climate Change Levy such big businesses will be exempt from the tax by signing the Climate Change Agreement (CCA).

Also let us assume that the larger businesses are able to pass on their increased costs due to taxes down to the user sectors, for example, the Fossil Fuel Levy which is a tax on sales of electricity from fossil fuels and was used to compensate companies producing electricity from non-fossil fuel sources such as nuclear or renewable energy. Tax is paid by electricity suppliers where the generation source is non-renewable, such as fossil fuel. This is then passed on to consumers through their electricity bills, both to businesses and households. But the user (i.e. 'To') business sector may or may not be a large business and may fall well within the definition of a SME. In such a case then the SME will be liable to pay increased costs due to the tax which is passed on to it from the supplier sector.

Now considering that a business, say SME A, is unable to pass on its increased tax costs down to its own consumers then there is a cost impact of the tax on the SME which may be disproportionate to its

capacity in terms of total output produced and hence the profits generated. One particular sector can be used as an example here. The Sewage and Sanitary Services sector has two aggregated sectors a) the sanitary services which largely provide sanitary bins, collect sanitary waste periodically (i.e. weekly, fortnightly etc.) and b) sewage services such as sewage treatment etc. Now all sanitary services charge their consumers[98] and in turn pay the sites where they dispose of the waste. Also if using incinerators etc. to treat waste, they use energy and release emissions such as greenhouse gases (GHGs). Similarly all water companies discharge GHGs such as methane (CH_4) as a result of sewage treatment and CO_2 as a result of energy consumption.

Businesses wishing to discharge industrial effluents into sewers have agreements called Trade Effluent Consents which are charged appropriately for the level of treatment required at sewage treatment sites. In the UK ten water and sewerage companies dominate the structure of the water industry in England and Wales. And there are only about 12 smaller water supply companies which fall within the definition of medium-sized enterprises. But water and sewerage companies are used by one and all businesses and therefore tax on this product/service is of interest in the discussion about environmental taxes.

The following graph represents the values, in percentages, of the technical input coefficients of different user sectors for their intermediate consumption of those products and services inputs which are liable to environmental taxes. Therefore, this graph is a representation of values (in £million converted to percentage) associated with current environmental taxes which are seen as a proxy for allocating environmental tax payments (Lin and Francis, 2004). This graph has been generated from the 2007 UK Supply-Use Table IO analysis. By calculating the percentage of total output from the purchase and use/consumption of products and services from sectors that are liable to environmental taxes, the purpose of this analysis is to identify the costs incurred by businesses due to environmental taxes and therefore identify sectors that are vulnerable to the high cost impact of environmental taxes. Also the analysis is aimed at identifying the SME-dominant sectors within the economy to focus the

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[98] In this instance consumers are used to refer to business consumers as this study is focussing on the business impact of environmental taxes.

study.
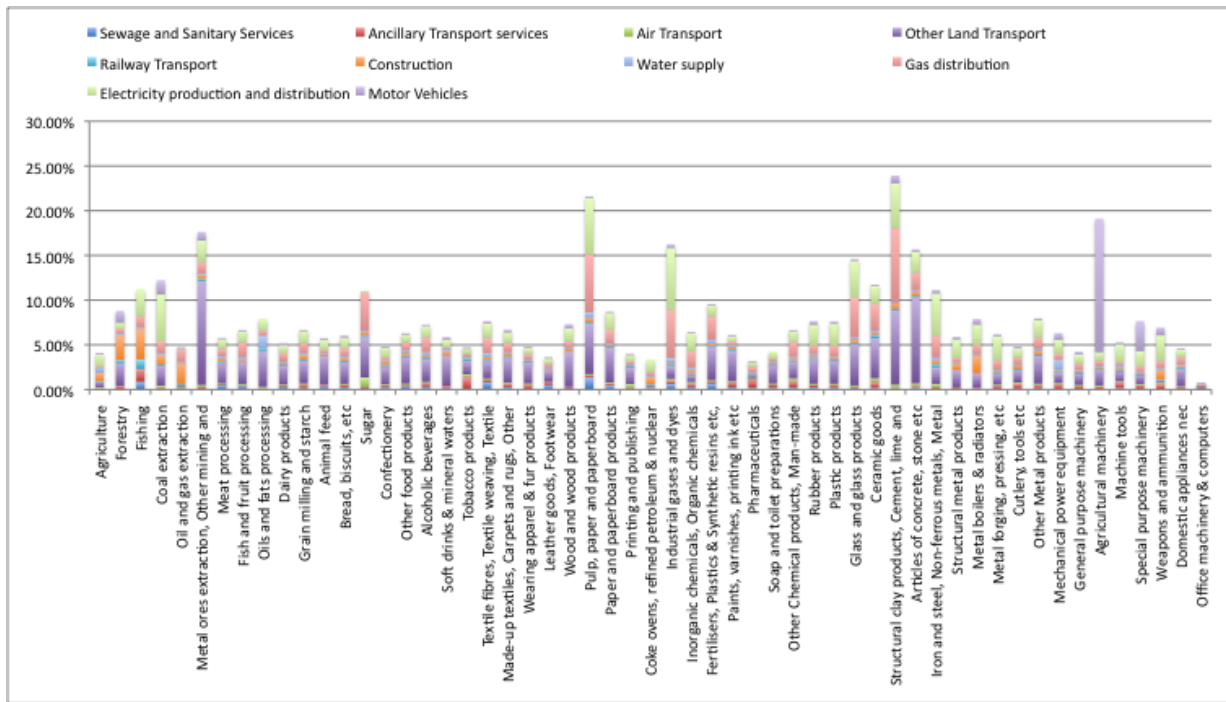
Figure: : First half of data
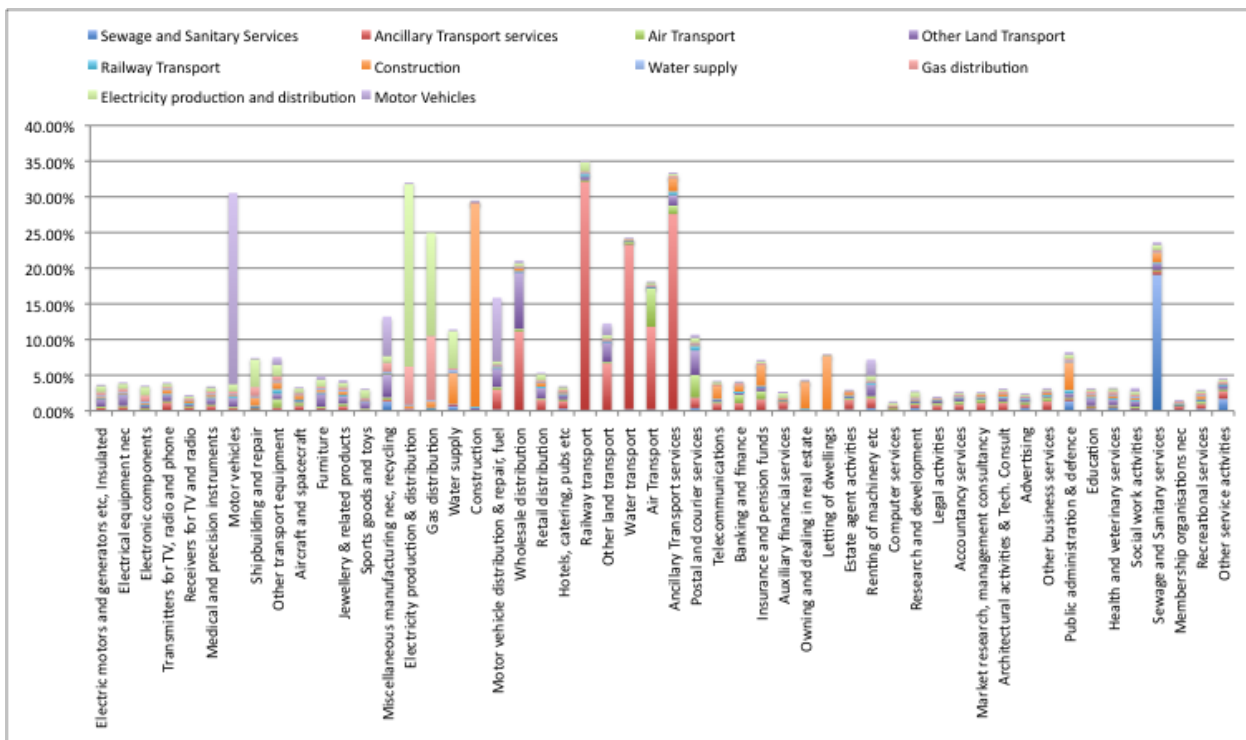
Figure: Second half of data

The researcher uses Agriculture sector as an example to explain the analysis. In the actual analysis conducted within Excel spreadsheet the values such as 9.11%, 0.00%, etc. in the first column represent the technical input coefficients for the agricultural sector. The technical coefficients determine how large the total annual outputs of agricultural goods must be if they are to satisfy not only the given direct demand (for all the different kinds of goods and services) by the final users (i.e., the households), but also the intermediate demand depending in its turn on the total level of output in each of the productive sectors.

The business sectors which are the highest users of such products or services that have an environmental impact - consequent on the environment as a result of their use - are identified through the IO analysis. Assuming that almost all the supplier sectors are larger businesses that are able to bear the brunt of environmental taxes or able to get exemptions[99] from those taxes owing to the size of the businesses, it is likely that the costs incurred by such larger businesses are not as significant as those incurred by the smaller, say user, businesses. So if we assume that the supplier businesses are able to pass on their costs such as the Fossil Fuel Levy to the intermediate consumers such as smaller energy intensive businesses, then the cost implications on smaller businesses are significant given that smaller businesses (i.e. SMEs) are already known to have resource constraints. Also this takes into consideration the assumption that most of the user businesses fall within businesses that are defined as SMEs. This will be further discussed below when the findings of IO analysis are amalgamated with SME statistics to find the SME-dominant businesses which are high users of such sectors (products/services) for their intermediate consumption and are therefore liable to high environmental taxes.

If we look closely at the kinds of environmentally-related taxes in the UK, we can see that almost all businesses within, say the manufacturing sector, will be liable to pay environmental taxes such as

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[99] For example: larger businesses are able to sign Climate Change Agreements which give them 80% exemption on Climate Change Levy. SMEs are not as well equipped to do so as CCAs incur a lot of administrative costs and time (See section 4.2.1.3.1 in chapter 4).

CCL on energy use, VED on vehicles used for business, hydrocarbon duty on fuel used and so on. So to make the current analysis concise it is limited to sectors that are directly taxable such as electricity production and distribution and gas distribution etc. While there is an environmental consequence associated with the use of any such product that will cause pollution or emission, it is imperative for this study to be contained within certain boundaries.

Table 7 shows that energy taxes in the UK are the highest sources of revenue. Of the energy taxes, Duty on Hydrocarbon Oils[100], in 2009, accounted for nearly 65% of all environmental tax revenue (ONS, 2010). This, combined with the transport tax VED[101], the second largest revenue source of all environmental taxes, are based on the CO_2 emissions related to the use of hydrocarbon oils and vehicles through the use of energy-related products. Taxes on pollution (landfill tax) and resources (aggregates levy) are still relatively small and currently account for less than 3 per cent of total environmental tax revenue according to 2005 data (Gazley, 2006).

Sectors	% of Annual Output to Inputs linked with Environmental taxes
Railway transport	35.10
Ancillary transport	33.44
Electricity production and distribution	32.01
Motor vehicles	30.54
Construction	29.50
Gas distribution	24.94
Water transport	24.31
Structural clay products, cement, lime and plaster	23.94

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[100] Duty on hydrocarbon oils (including unleaded petrol, diesel, ultra-low sulphur diesel, ultra-low sulphur petrol, leaded petrol)

[101] Since 2001 Vehicle Excise Duty has been a graduated tax (different bands) based on the level of CO_2 emissions/km for both business and households.

Sewage and sanitary services	23.65
Pulp, paper and paperboard	21.61
Wholesale distribution	21.11
Agricultural machinery	19.11
Air transport	18.19
Metal ores extraction, other mining and quarrying	17.62
Industrial gases and dyes	16.24
Motor vehicle, distribution and repair, fuel retail	15.86

Table H: Top 16 Highest user sectors of products/services liable to environmental taxes

The input sectors that are liable to current UK environmental taxes as shown in Graph 4d are Sewage and sanitary services 11; Ancillary transport services 97; Air transport 96; Other land transport 94; Railway transport 93; Construction (88); Water supply (87); Gas distribution (86); Electricity production and distribution (85); and Motor vehicles (77). For example, water supply uses energy and most of the time these companies have sewerage services which also use energy for treatment. Businesses use inputs from these sectors and are therefore liable to environmental taxes. The Table 21 above, collated from the analysis shows the top 16 sectors which have the highest percentage of their total annual output given to these primary inputs. Of this, Transport sector I[102] is the highest, followed by Construction F and Manufacture D.

Another purpose of this analysis is to focus on the SME-dominant sectors within UK businesses that are high users of the above primary inputs. To identify such businesses, information from SME statistics 2008 is used. This study will focus on SMEs in South-West England due to the following reasons:

- In South-West England SMEs account for 99.9% of all private sector enterprises, 73.3% of all employment and 60.5% of the total turnover at the start of 2008.

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[102] SIC code 2003 is I for transport and D for manufacture and F for construction.

- SMEs account for more than 70% of all employment in the South West (BIS, 2008) and between 2007-2008, the number of enterprises in this region increased by 9.2% which is the highest increase in the whole of the UK; employment increased by 0.9% and turnover increased by 2.4% (BIS, 2008).
- Proximity to researcher

Previously, IO analysis was undertaken for 2003 UK SUTs and the results were combined with detailed analysis of the SME statistics 2008 to describe why South-West England is chosen as the area of study. So this section will only refer to the previous one without going into the detailed description again. The following Table 23 is an excerpt from Table 15. As the updated analysis identified Sectors D Manufacturing, I Transport and F Construction as the highest users of primary inputs related to environmental taxes, the table below shows the concentration of SMEs in such sectors regionally in South-West England. The previous 2003 analysis had identified Sectors D 'Manufacture' and O 'Other services' as being the priority sectors but this analysis has changed it to include Sectors I 'transport' and F 'construction' too. SMEs within the three sectors manufacturing (SIC D), transport (SIC I) and construction (SIC F) sectors are present in large numbers in the region. Therefore businesses within these three sectors are the focus of the sampling choice for the main study, as elaborated in above.

UK			South-West England		
Sector	Enterprises (%)	Employment (%)	Enterprises (%)	Employment (%)	Turnover (%)
D	99.5	55.7	35.9	99.6	61.6	37.4
I	100	41.4	38.9	99.8	45.5(un[103]20-249)	44.1(un0,100-249)
F	100	84.3	70.8	100	87.4 (un200-	80.2(un200-

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[103] Un= unavailable for businesses with 20-249 employee size.

					249)	249)

Table I: SMEs (%) in the UK and South-West England by size

The Effect of Energy Taxes on Profit Incentives for Change in an Open Economy: Evidence from the UK

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ABSTRACT

This paper argues that the underlying supply and demand analysis of energy taxes needs to be re-considered when a country (a) introduces national rather than supra-national l taxes and (b) is open to international trade but only at given world prices. We provide evidence that these conditions is realistic for many sectors in the UK. A key implication is that the effects of energy taxes should not be felt in final good prices, since these are determined in world markets, but in terms of underlying profitability. These changes in underlying profits provide two key incentives for producers – to change to more environmentally friendly production techniques and to switch resources to less environmentally harmful ones. Using input-output techniques we provide evidence for the UK to show how existing energy taxes have affected underlying profitability. The evidence shows quite strong profit incentives to shift resources from a small number of energy intensive industries to others. Finally, we simulate the effects of a series of hypothetical new environmental taxes. This shows that such taxes have the potential to impact on a quite narrow range of economic sectors, thereby providing strong profit incentives for producers to reallocate productive resources accordingly.

Keywords: Energy Taxes; Input-Output Analysis; Profit Incentives.

1. INTRODUCTION

This paper is in the tradition of those which use input-output techniques to analyse energy taxes. We put forward the view that, for a country which is open to trade at given world prices and adopts national energy taxes, the key mechanism for bringing about change in the short and medium term is not through prices and, ultimately, consumer decisions but through profits and producer decisions. This mechanism provides incentives for producers to substitute more energy conserving production techniques and to switch productive resources from energy intensive goods to less energy intensive ones.

We produce evidence to show that the UK is almost certainly open to trade at given world prices for a wide range of economic activities. Using this as a working assumption we examine the impact of current environmental taxes in the UK on profitability for a wide range of economic sectors. We then simulate the likely effects of some purely hypothetical new taxes to assess how sensitive profit incentives are to energy taxes in relation to other possible environmental taxes. In general we find that energy taxes do introduce significant variations between sectors in the profit incentives to switch productive resources away from energy intensive activities.

2. BACKGROUND

For the purposes of this paper it is useful to divide the existing empirical literature on the effects of energy taxes into three broad categories – (a) econometric estimates of the impact on demand (b) analysis using a quantitative model and (c) input-output based analysis. Econometric studies would, for example, include those by Ghalwash (2007), Agnolucci (2009) and Kim et al (2011). Typically these use demand models to identify the effects of taxes on prices. These studies

are unquestionably both valid and useful but this paper makes the case that, by considering the effect on prices, such studies are not covering all possible relevant circumstances. In particular, we provide evidence that, for the UK, many industries are sufficiently open to international trade that it must be presumed that the prices involved are world not domestic prices. The implication of this is that purely domestic taxes cannot affect (world) prices of highly traded goods in a country with a small share of world trade. Where such conditions apply national taxes affect profits not prices and, hence, the incentives for producers to change behaviour rather than prices and the incentives for consumers to change behaviour. By considering how taxes affect producer incentives when the sectors concerned are highly traded internationally our analysis is intended to complement rather than contradict econometric studies of prices and demand. These issues are addressed in more detail in the following section.

Recent examples of empirical research using a modelling approach to assess the effects of energy taxes include Sterner (2007) and Hennessy and Tol (2011). Our approach is, again, dealing with different circumstances to this body of research in that we consider the situation where the incidence of the tax does not fall on prices but profits. In terms of the questions addressed (but not methodology) this paper shares much common ground with Bassi et al (2009), who use a modelling approach to analyse the impacts of energy prices on the competitiveness of individual sectors. The approach of this paper differs in that it sees competitiveness in highly traded sectors as more the ability to be profitable at prevailing world prices. In this respect, our analysis has even more in common with that of Baksi and Green (2007) who see production changes arising from two

sources – (a) a shift in production from energy intensive to other sectors and (b) an increase in energy efficiency of individual sectors.

In terms of methodology the approach adopted in this paper is in line with the long standing and continued tradition of using input-output tables to analyse the effects of energy or environmental taxes. Recent work in this tradition includes, for example, Wang et al (2011), who use input-output analysis to examine the effects of carbon taxes on sector competitiveness in China, Llop (2007) and Llop and Pie (2008), who use input-output analysis to identify the effects of carbon taxes on price competitiveness in Catalonia. Our paper owes much to these studies in that we also use an input-output based methodology to identify effects on the competitiveness of sectors in the UK. The main distinction is that this paper uses a different concept of "competitiveness" – the ability to be profitable at given world prices. Other work, for example that of Chamberlain (2009) has used traditional input output techniques to assess the household burden and economic impact of aspects of US environmental policy. Our approach in this paper is broadly similar to that of Chamberlain (2009) except that we consider the case where the goods and services are internationally traded at given world prices.

The theoretical development of environmental input-output (I-O) analysis took place with Leontief's development of the I-O framework (Leontief, 1951) and then by developing I-O tables with environmental extensions (Leontief and Ford, 1970). I-O models were first extended to cover environmental effects by including environmental commodities (Pearce, 1976). These were defined to be those that cause emissions and release of effluents into the environment. Monetary input-output tables which give insight into the value of economic transactions between different sectors in an economy can be extended to the environment with related

information for each sector, such as emissions, primary inputs use (Proops, 1977; Tukker et al. 2006). An introduction to IO and its application to environmental problems can be found in articles by Leontief & Ford (1970) and Proops (1977). Cornwall and Creedy (1996) used IO analysis to estimate the price effects of carbon taxation in Australia. Proops, Faber and Wagenhals (1993) produced a comparative study of I-O in the UK and Germany.

Environmental I-O analysis takes into account environmental inputs both directly and indirectly. For many businesses the emissions of, say, GHGs, take place within complex supply chains rather than directly from fuel or energy consumption (Berners-Lee et al, 2011). However, this is quickly complicated when the relevant inputs are internationally traded. Recent environmentally extended IO tables have been used in various applications including hybrid life cycle assessments (Suh and Huppes, 2005). Numerous other studies such as Labandeira and Labeaga (1999) employed an IO demand model followed by micro simulation of household data to assess the environmental and economic effects of introduction of a hypothetical carbon tax on Spanish households. Prior to the introduction of environmental taxes, such as the climate change levy etc in the UK, Symons et al (1994) undertook a simulation analysis of the effects of a carbon tax on the purchasing power and economic behaviour of households on assumption of its complete incidence on final demand including consumers i.e. assuming that carbon taxes would affect the prices of fossil fuels and thus UK consumer prices both directly from fuels and electricity and indirectly for manufactured goods.

Environmentally enhanced input-output tables can be used to support environmental and other policy purposes too (Tukker et al, 2006; Pearce, 1976) including analysis of causes of environmental problems such as use of such

resources that result in emissions and environmental pollution and prospective effect analysis of policies. The literature suggests that for the analysis of effects of environmental policies environmentally enhanced I-O tables with detailed sector resolution are desirable in order to properly capture the effect on environmental inputs and their costs. However, it is only possible to work with available data – the UK input output tables for the years 2004-2008 in this case. It is partly due to these data limitations and partly because our emphasis is on the impact of energy taxes on the underlying profit incentives at the level of sectors that we use standard rather than environmentally enhanced I-O tables in this paper.

APPROACH

A key point made by this paper is that, for the UK at least, it can be shown that (a) many sectors are highly traded internationally and (b) the UK is sufficiently small in international trade so unlikely to be able to influence world prices. Under these circumstances the sectors concerned face prices which are determined by given conditions in world markets and are not affected by domestic conditions in the UK. This is not to suggest that studies that consider the impact of energy taxes are flawed – they are not. It is, however, to suggest that they do not cover all possible circumstances. When sectors are not highly traded or when energy taxes are sufficiently widespread internationally to affect world prices, then the impact on prices is wholly appropriate. In contrast, when it is reasonable to suppose that domestic prices are determined in relation to given world prices then it is necessary to consider channels other than price by which national energy taxes affect economic behaviour. In this paper we consider the effects of carbon taxes on the underlying incentives affecting production decisions in the form of profits.

The implication of assuming that the sector concerned is (a) traded and (b) faces given world prices is to place the incidence of energy taxes wholly on the producer. Under these assumptions prices do not change as a result of the tax because domestic taxes do not change world prices. Output falls by a larger amount than where there is no international trade because prices do not rise and the incidence of the tax falls only on firms, who cannot pass on the increased costs in higher prices. In making these arguments we draw on basic economic analysis. We are also conscious that not all readers are trained economists. Accordingly, in Appendix 1, we provide a modified version of the supply and demand analysis in Chamberlain's (2009) paper to further explain how, for sectors facing given world prices, energy taxes would behave in such a framework.

In the following section we provide some evidence to suggest that these assumptions are at least of some relevance for the UK – that international trade is important for most goods sectors and some service sectors and that the UK is sufficiently small in overall world trade that it is unlikely to be able to significantly affect world prices.

Given these assumptions our analysis focuses on seeking to identify the way in which environmental taxes affect the costs and, ultimately, the profits of domestic producers. In this respect it owes much to the literature on the effects of indirect taxes on the profit incentives to undertake foreign direct investment. Recent literature on inward investment, such as the paper by Devereux and Griffith (2003), has emphasised the role of indirect taxes in empirical studies of underlying profit incentives. Work by, for example, Fernandes (2007) has shown that profits can be very sensitive to trade taxes. Our paper is closest in approach to that of

Guisinger (1989) who develops measures to assess how various different taxes and similar measures affect profit incentives for investment.

Our approach is to take a set of environmental taxes and to calculate, in effect, the impact of these on gross profits for different sectors of the UK economy. In short, we translate one or more environmental taxes on inputs into what is essentially an equivalent "profit tax". Thus, the net incentive effect for industry j (NIE_j) is given as:

$$NIE_j = - (\Pi_j - \Pi^*_j)/ \Pi^*_j \qquad (1)$$

where Π_j are "profits" with the environmental taxes applied and Π^*_j profits without these taxes applied. Thus, to measure the effect of actual taxes Π_j are reported "profits" and Π^*_j is calculated from input output data, with inputs revalued to "tax free" prices. For simulations of possible new taxes Π^*_j are reported profits and Π_j are calculated by revaluing inputs to reflect the higher cost of the simulated taxes. We also note that the concept of "profit" is one open to a variety of different definitions. For the purposes of our analysis we are constrained by available data and our working definition is *gross operating surplus*, as defined in the UK input-output tables.

Our analysis can be interpreted as applying to the short and medium term rather than the long run. The object of, for example, taxes on energy is to reduce carbon use. There are two main mechanisms by which this can be achieved in the long run – by users developing less carbon intensive production techniques and by producing less of carbon intensive goods and services. In the first instance, the fall in profits for producers of carbon intensive goods signals both a need to substitute other inputs for carbon and a need to switch productive resources into less carbon

intensive goods and services. Our focus is two-fold: to identify these profit incentives and to use the effect on profits in one sector relative to another to assess the incentives to switch production from one good to another.

The analysis that we present is also short term in another sense. We assume given world prices and that a national UK policy of taxation will not change these. However, the adoption of genuinely global policies to reduce, say, carbon emissions would affect world prices. In this respect our key assumptions can be seen as a "leader" problem. That is, we consider a country which faces given world prices and imposes a national policy of environmental taxation without a sufficient number of other countries following suit to result to have a short run effect on world prices. At first glance it might seem that our analysis provides sustenance for the types of argument that have been made in the context of World Trade Organisation (WTO) – that weaker environmental policies in certain countries gives them an "unfair" advantage. Certainly the results of our analysis do suggest that, in the short run, a purely national policy would provide strong incentives to switch from, say, carbon intensive industries to other ones. But, if such changes are inevitable in the longer term at the global level then there may be much to be gained from being one of the first to make the necessary changes rather than one of the last, perhaps from the development of scale economies or from learning by doing effects.

3. **HOW FAR IS THE UK A "SMALL" OPEN ECONOMY**

The assumptions that the UK faces given world prices is at the core of our analysis. This can be broken down into two subsidiary assumptions: (a) that a

significant proportion of economic sectors in the UK are open to international trade and (b) that it has a sufficiently small share of global markets that it is unlikely to affect world prices. This section presents evidence on both of these.

Table 1 presents two standard indicators of the importance of trade to any individual sector. Firstly, *import penetration*, measures the percentage of domestic consumption accounted for by imports, in effect an import "market share". Secondly, *export to sales ratios* measure the percentage of domestic production which is exported. It should be noted that it is not necessary for both indicators to be substantial for a good to be regarded as "traded". Much trade theory would predict that goods tend to be either exported or imported, not both.

The results presented in Table 1 show that almost all goods sectors in the UK are substantially traded and, in many cases, are highly exposed to international trade. The few exceptions, arguably, include printing and publishing, building materials and metal forging and pressing. For utilities and services the picture is different. The majority of service sectors exhibit no or low exposure to international trade but there are some important exceptions. These include water and air transport, wholesaling, computer services, research and development, and other business services.

Table 1: Indicators of Tradeability by Sector, UK, 2004-2008				
Input-output sector	Import penetration %		Export to sales ratio %	
	2008	Average 2004-2008	2008	Average 2004-2008
Agriculture	23.5%	23.8%	6.7%	6.2%
Forestry	15.5%	15.9%	5.0%	5.7%
Fishing	18.9%	17.8%	31.4%	33.4%
Coal extraction	72.6%	61.6%	12.8%	6.7%
Oil and gas extraction	37.3%	31.5%	39.4%	37.0%
Metal ores extraction, Other mining and quarrying	45.7%	43.5%	82.9%	83.1%
Meat processing	19.4%	18.4%	9.3%	7.3%
Fish and fruit processing	27.3%	24.9%	15.9%	14.2%
Oils and fats	44.3%	32.3%	38.6%	26.3%
Dairy products	16.6%	15.8%	11.1%	11.2%
Grain milling and starch	17.4%	14.3%	17.5%	16.2%
Animal feed	9.2%	9.4%	11.3%	10.0%
Bread, biscuits, etc	11.8%	10.3%	7.2%	6.4%
Sugar	24.5%	22.7%	19.8%	15.7%
Confectionery	15.4%	13.9%	13.1%	12.2%
Other food products	25.1%	20.5%	19.1%	16.1%
Alcoholic beverages	18.9%	18.2%	58.2%	51.1%
Soft drinks and mineral waters	13.7%	13.1%	7.1%	5.9%
Tobacco products	10.0%	9.9%	23.9%	25.5%
Textile fibres, Textile weaving, Textile finishing	26.6%	27.8%	49.3%	51.4%
Made-up textiles, Carpets and rugs, Other textiles,	30.3%	28.1%	46.4%	41.7%
Wearing apparel and fur products	30.7%	29.4%	84.6%	70.6%
Leather goods, Footwear	40.5%	39.2%	85.6%	91.4%
Wood and wood products	28.9%	29.0%	4.7%	5.1%
Pulp, paper and paperboard	50.3%	49.8%	62.2%	52.4%
Paper and paperboard products	10.2%	9.0%	11.6%	10.8%
Printing and publishing	7.0%	6.5%	9.1%	8.5%
Coke ovens, refined petroleum & nuclear fuel	24.9%	20.4%	60.6%	52.4%
Industrial gases and dyes	18.8%	18.4%	31.0%	31.9%
Inorganic chemicals, Organic chemicals	36.5%	35.7%	63.4%	60.2%
Fertilisers, Plastics & Synthetic resins etc, Pesticides	37.4%	32.7%	64.4%	58.2%
Paints, varnishes, printing ink etc	16.2%	14.6%	36.2%	30.9%
Pharmaceuticals	31.6%	32.4%	101.6%	92.9%
Soap and toilet preparations	17.1%	15.4%	63.2%	54.4%
Other Chemical products, Man-made fibres	41.1%	37.1%	96.4%	93.6%
Rubber products	36.9%	33.3%	49.9%	45.6%
Plastic products	22.9%	21.1%	23.7%	21.7%
Glass and glass products	23.1%	21.4%	23.4%	22.8%
Ceramic goods	29.8%	27.3%	38.5%	36.9%
Structural clay products, Cement, lime and plaster	4.7%	4.7%	5.7%	5.9%
Articles of concrete, stone etc	10.2%	9.5%	9.7%	9.9%
Iron and steel, Non-ferrous metals, Metal castings	40.5%	36.0%	101.5%	80.1%
Structural metal products	9.4%	7.7%	9.6%	8.6%
Metal boilers and radiators	26.7%	23.7%	18.6%	16.1%
Metal forging, pressing, etc	0.0%	0.0%	0.0%	0.0%
Cutlery, tools etc	35.6%	33.7%	56.9%	59.5%
Other metal products	30.3%	27.8%	41.8%	36.2%
Mechanical power equipment	42.1%	39.9%	90.6%	81.3%
General purpose machinery	33.2%	31.6%	47.1%	44.5%
Agricultural machinery	43.7%	36.5%	78.7%	66.6%
Machine tools	49.1%	47.5%	93.8%	82.4%

Table 1 (continued): Indicators of Tradeability by Sector, UK, 2004-2008				
Input-output sector	Import penetration %		Export to sales ratio %	
	2008	Average 2004-2008	2008	Average 2004-2008
Special purpose machinery	34.5%	34.8%	87.3%	80.7%
Weapons and ammunition	17.3%	14.7%	16.2%	18.6%
Domestic appliances nec	32.6%	29.3%	33.1%	27.0%
Office machinery & computers	52.9%	53.1%	118.6%	122.2%
Electric motors and generators etc, Insulated wire and	37.9%	35.3%	69.3%	59.8%
Electrical equipment nec	36.5%	33.7%	60.8%	56.4%
Electronic components	47.6%	51.6%	57.8%	99.0%
Transmitters for TV, radio and phone	60.4%	67.9%	97.2%	228.2%
Receivers for TV and radio	34.8%	35.1%	95.8%	103.4%
Medical and precision instruments	35.3%	34.0%	77.6%	73.0%
Motor vehicles	38.1%	38.2%	63.5%	57.3%
Shipbuilding and repair	17.7%	22.2%	39.3%	38.5%
Other transport equipment	22.4%	21.6%	19.3%	18.9%
Aircraft and spacecraft	46.2%	44.4%	71.7%	75.9%
Furniture	23.5%	21.3%	12.4%	10.9%
Jewellery and related products	42.2%	42.2%	413.2%	333.6%
Sports goods and toys	20.7%	18.3%	100.1%	79.7%
Miscellaneous manufacturing nec & recycling	14.7%	14.1%	9.7%	10.3%
Electricity production and distribution	1.0%	1.0%	0.5%	0.5%
Gas distribution	0.1%	0.1%	0.0%	0.0%
Water supply	0.3%	0.2%	2.4%	2.6%
Construction	0.5%	0.3%	0.0%	0.0%
Motor vehicle distribution and repair, automotive fuel ret	0.5%	0.5%	0.5%	0.6%
Wholesale distribution	21.9%	46.5%	4.8%	2.1%
Retail distribution	1.6%	1.4%	0.9%	0.8%
Hotels, catering, pubs etc	12.8%	12.5%	1.3%	1.2%
Railway transport	8.3%	9.0%	0.5%	0.4%
Other land transport	4.6%	4.5%	1.0%	1.1%
Water transport	21.6%	25.1%	0.3%	0.3%
Air Transport	29.4%	32.4%	0.1%	0.1%
Ancillary Transport services	2.8%	3.3%	0.7%	0.7%
Postal and courier services	4.9%	4.5%	0.3%	0.2%
Telecommunications	8.4%	7.3%	1.4%	1.3%
Banking and finance	8.6%	8.6%	0.5%	0.6%
Insurance and pension funds	1.1%	1.0%	7.3%	6.9%
Auxiliary financial services	6.6%	6.1%	4.6%	4.2%
Owning and dealing in real estate	0.0%	0.0%	5.6%	4.5%
Letting of dwellings	0.8%	0.8%	0.7%	0.7%
Estate agent activities	0.5%	0.6%	11.6%	10.0%
Renting of machinery etc	5.0%	4.5%	48.9%	42.3%
Computer services	5.1%	4.3%	51.9%	58.4%
Research and development	20.5%	17.9%	0.4%	0.3%
Legal activities	2.2%	1.9%	0.0%	0.0%
Accountancy services	3.0%	2.8%	0.7%	0.7%
Market research, management consultancy	2.4%	1.8%	2.2%	1.9%
Architectural activities and technical consultancy	4.8%	4.9%	0.5%	0.6%
Advertising	7.1%	5.8%	0.0%	0.0%
Other business services	17.5%	15.8%	0.0%	0.0%
Education	0.5%	0.5%	0.0%	0.0%
Health and veterinary services	1.4%	1.4%	0.4%	0.4%
Social work activities	0.0%	0.0%	4.5%	4.0%
Sewage and Sanitary services	2.2%	1.8%	1.2%	1.1%
Recreational services	11.6%	11.2%	1.6%	1.5%
Other service activities	1.0%	1.0%	0.6%	0.7%

The results presented in Table 1 show much of UK economic activity to be exposed to foreign competition either in domestic markets or export markets or both. The next issue to address is the extent to which world prices are given from the perspective of the UK. Ideally this question would be directly addressed by an analysis of prices. However, such analysis is lengthy, complex and fraught with both data limitations and conceptual difficulties. As an alternative we adopt a simpler but less precise approach. For a sample of some 50 commodities we measure the share of the UK in total world exports. Our sample consists exclusively of goods, not services, for reasons of data availability. Thus, we take a small market share to imply that it is unlikely (but not certain) that the UK exerts an influence over world prices.

The results of this analysis are presented in Table 2. For only two of the products in our sample did the UK exhibit a share of world exports greater than 10% (annual average 2004-8) – in beverages and in printed matter. For the vast majority of our sample it is possible to assert with some confidence that it is unlikely that the UK exerts any significant influence over world prices. The share of the UK in total world exports rarely exceeds 3% for most of our sample. There are, no doubt, some special cases where such a low market share might lead a country to be a price maker rather than a price taker but special cases, by definition, do not apply systematically. We conclude, therefore, that our evidence is sufficient to suggest that the assumption that UK prices are driven by world prices that are, in turn, given represents a significant part of economic activity in the UK.

Taken overall our findings support our working assumption that (world) prices are not likely to respond in the short or medium term to national taxes imposed by the UK. This conclusion does not apply universally. It applies in particular to the vast majority of production sectors but only to a minority of service sectors.

Table 2: Share of the UK in total World Exports of Selected Products		
Product Name	2008	Average 2004-2008
Meat and edible meat offal	1.79%	1.75%
Fish & shellfish	2.50%	2.80%
Dairy products; eggs; natural honey	2.18%	2.70%
Edible vegetables and certain roots and tubers.	0.98%	1.08%
Edible fruit and nuts	0.37%	0.43%
Cereals	0.97%	1.12%
Animal and vegetable fats & oils	1.05%	1.44%
Sugars and sugar confectionery.	2.67%	2.83%
Cocoa and cocoa preparations.	2.55%	2.97%
Beverages, spirits and vinegar.	9.64%	10.72%
Tobacco and manufactured tobacco substitutes	2.60%	3.96%
Salt; sulphur; earth & stone; plastering materials	1.92%	3.06%
Mineral fuels, oils & their products	2.56%	3.03%
Inorganic chemicals	1.98%	3.81%
Organic chemicals.	4.29%	4.80%
Pharmaceutical products.	8.02%	8.65%
Fertilisers.	0.35%	0.65%
Soap, organic surface-active agents, washing preparations	4.98%	5.84%
Albuminoidal subs; modified starches; glues; enzymes	2.39%	3.36%
Explosives; pyrotechnic products; matches	1.49%	4.24%
Photographic or cinematographic goods.	5.94%	5.98%
Plastics and articles thereof.	2.62%	3.10%
Rubber and articles thereof.	2.30%	2.88%
Articles of leather; saddlery/harness; travel goods	1.62%	1.85%
Wood and articles of wood; wood charcoal.	0.62%	0.72%
Pulp of wood and of other fibrous cellulosic material	2.26%	2.14%
Paper & paperboard; articles trhereof	2.65%	2.85%
Printed books, newspapers etc	9.65%	11.96%
Man-made filaments.	1.57%	2.46%
Man-made staple fibres.	1.78%	2.84%
Wadding, felt & nonwoven; yarns; twine, cordage,	2.49%	3.05%
Carpets and other textile floor coverings.	3.28%	3.46%
Knitted or crocheted fabrics.	0.91%	1.24%
Apparel & clothing accessories, knitted	1.60%	1.81%
Apparel & clothing accessories, not knitted	2.00%	2.02%
Other made up textile articles	2.16%	2.25%
Footwear	1.42%	1.47%
Ceramic products.	2.14%	2.68%
Glass and glassware.	2.35%	2.76%
Iron and steel.	2.64%	3.17%
Articles of iron or steel.	2.44%	2.98%
Copper and articles thereof.	1.82%	1.92%
Aluminium and articles thereof.	2.77%	3.12%
Tools, implements, cutlery, of base metal	3.07%	4.59%
Electrical machinery	2.13%	3.58%
Aircraft, spacecraft, and parts thereof.	0.02%	4.81%
Ships, boats and floating structures.	1.57%	1.73%
Optical, photographic, measuring, precision instruments	3.98%	4.54%
Clocks and watches and parts thereof.	1.37%	1.60%
Musical instruments; parts and access of such art	1.64%	2.02%
Arms and ammunition; parts and accessories thereo	1.60%	7.97%
Furniture; bedding, mattresses etc	1.90%	2.18%
Source: United Nations COMTRADE database		

4. **THE EFFECTS OF EXISTING UK TAXES ON "PROFITS"**

In this section we consider how existing UK environmental taxes have affected gross profits and, in particular, how they have affected profit incentives to produce one good or service rather than another. As noted previously our definition of "profit" is determined by the available data and is *gross operating surplus* as defined by the UK input-output tables.

Table 3 presents estimates of the effect of existing UK taxes on the environment, mainly on energy, on gross operating surplus for our sample of sectors. The taxes involved are:

- duty on hydrocarbon oils, and

- the climate change levy (affecting coal, gas and electricity)

- Landfill tax

- Aggregates levy

Appendix 1 provides further details on these taxes. These are not the only current environmental taxes in the UK. There are taxes - vehicle excise duty and air passenger duty (see Appendix 1) - whose origins lay in transport rather than environmental policy but which have taken on an environmental aspect. An obvious difficulty with these is to decide how far they are environmental as opposed to transport policies. Even were they to be fully environmental taxes their ultimate effects on user industries would still be hard to measure.

The method of calculation was to calculate a net incentive effect (see equation 1) based on the difference between actual gross operating surplus and that estimated without the presence of these taxes on energy. Those sectors for which our "open economy" assumption (that the sector is sufficiently open to international

competition to be trading at world prices) is dubious are included for completeness but marked by an asterisk.

Unsurprisingly, there are considerable variations in the effects of energy taxes on the gross operating surplus. Some of the most strongly affected sectors are obvious –iron, steel, non-ferrous metals , sewage and sanitary services, and coke ovens , for which energy taxes are equivalent to a "profit" (gross operating surplus) tax of 34.9%, 30.66% and 51.27%. Other strongly affected sectors are, air and water transport and land transport (29.7%, 23.1% and 20.6%) and other, perhaps, less immediately obvious. These include fishing (17.26%), oils and fats (29.7%), basic chemicals (22.9%), structural clay products (15.8%), fertilisers, plastics and pesticides (17.17%), coal extraction (22.59%), dairy products (15.78%), construction (9.95%) and shipbuilding (14.55%). Other sectors are much less strongly affected. Those for which current UK energy taxes are equivalent to a tax on gross operating surplus of 2% or less include confectionery, tobacco products, printing and publishing, leather goods, pharmaceuticals, office machinery, precision instruments, jewellery, real estate activities, banking and finance and computer services.

These results suggest that the effect of current UK energy taxes is broadly equivalent to introducing a "profit" tax which varies by economic sector. For example, our estimates suggest that it would be roughly equivalent to taxing profits by 22% for basic chemicals but only by 0.81% for office machinery and computers. There can be little doubt, therefore, that they provide significant profit incentives for investors to divert resources and, hence, future production from one sector to another. They also provide strong incentives for the most energy intensive sectors to adopt more energy efficient techniques or to perish. The

downside, however, is that this provides little incentive for the majority of less energy intensive activities to do likewise. Our finding that the burden of energy taxes falls disproportionately on a small number of energy intensive industries supports the findings of the effects of other energy policies on sector competitiveness reported in Hourcade et al (2007) and Grubb et al (2009).

The likelihood of the contraction of several key sectors is not in itself a problem. Indeed, as discussed earlier, a key route by which energy taxes work in reducing overall carbon usage is to reduce production in those sectors which make most intensive use of carbon. Altering profit incentives is an effective way to get producer to re-allocate resources accordingly. Nor do the authors believe that creating profit disincentives for the usage of carbon is necessarily a problem if other countries do not do likewise. If such changes happen later then there may be advantages in being one of the first to make the necessary changes.

Table 3: Energy Taxes as a % of Gross Operating Surplus		
Input-output sector	2008	Average 2004-8
Agriculture	8.98%	6.59%
Forestry	12.00%	12.18%
Fishing	15.15%	16.56%
Coal extraction	22.67%	23.20%
Oil and gas extraction	0.47%	0.45%
Metal ores extraction, Other mining and quarrying	7.88%	9.66%
Meat processing	12.02%	9.74%
Fish and fruit processing	5.98%	4.12%
Oils and fats processing	22.24%	29.99%
Dairy products	17.34%	14.36%
Grain milling and starch	6.82%	5.39%
Animal feed	15.68%	10.53%
Bread, biscuits, etc	10.45%	6.81%
Sugar	20.35%	12.71%
Confectionery	2.47%	1.90%
Other food products	5.28%	3.52%
Alcoholic beverages	4.44%	3.49%
Soft drinks & mineral waters	3.18%	2.27%
Tobacco products	0.26%	0.28%
Textile fibres, Textile weaving, Textile finishing	9.01%	6.91%
Made-up textiles, Carpets and rugs, Other textiles, Knitted goods	4.19%	4.05%
Wearing apparel & fur products	6.62%	5.00%
Leather goods, Footwear	0.47%	0.67%
Wood and wood products	6.21%	6.12%
Pulp, paper and paperboard	7.31%	8.10%
Paper and paperboard products	11.36%	8.96%
Printing and publishing	1.25%	1.01%
Coke ovens, refined petroleum & nuclear fuel	45.86%	51.18%
Industrial gases and dyes	8.59%	8.28%
Inorganic chemicals, Organic chemicals	22.99%	22.48%
Fertilisers, Plastics & Synthetic resins etc, Pesticides	17.15%	14.65%
Paints, varnishes, printing ink etc	3.01%	2.68%
Pharmaceuticals	0.42%	0.63%
Soap and toilet preparations	1.44%	1.69%
Other Chemical products, Man-made fibres	11.79%	10.37%
Rubber products	16.00%	9.14%
Plastic products	8.77%	7.24%
Glass and glass products	9.21%	7.91%
Ceramic goods	12.16%	8.71%
Structural clay products, Cement, lime and plaster	20.16%	15.57%
Articles of concrete, stone etc	10.72%	8.69%
Iron and steel, Non-ferrous metals, Metal castings	38.51%	35.53%
Structural metal products	7.21%	5.16%
Metal boilers & radiators	6.24%	6.53%
Metal forging, pressing, etc	6.92%	6.14%
Cutlery, tools etc	2.16%	2.07%
Other Metal products	8.22%	5.07%
Mechanical power equipment	9.56%	5.43%
General purpose machinery	6.34%	5.55%
Agricultural machinery	10.59%	9.28%
Machine tools	2.87%	2.53%

Table 3 (continued): Energy Taxes as a % of Gross Operating Surplus		
Input-output sector	**2008**	**Average 2004-8**
Special purpose machinery	3.60%	3.87%
Weapons and ammunition	2.37%	2.39%
Domestic appliances nec	3.99%	4.41%
Office machinery & computers	1.07%	0.86%
Electric motors and generators etc, Insulated wire and cable	5.21%	5.70%
Electrical equipment nec	6.55%	3.67%
Electronic components	1.49%	1.31%
Transmitters for TV, radio and phone	1.64%	1.57%
Receivers for TV and radio	0.41%	0.54%
Medical and precision instruments	1.23%	1.34%
Motor vehicles	7.97%	4.18%
Shipbuilding and repair	21.55%	17.01%
Other transport equipment	7.50%	13.14%
Aircraft and spacecraft	5.17%	3.33%
Furniture	4.44%	4.12%
Jewellery & related products	0.48%	0.57%
Sports goods and toys	2.17%	2.25%
Miscellaneous manufacturing nec, recycling	6.97%	6.00%
Electricity production & distribution	21.85%	18.14%
Gas distribution	13.15%	12.31%
Water supply	1.29%	1.19%
Construction	1.29%	1.17%
Motor vehicle distribution & repair, fuel	4.81%	3.95%
Wholesale distribution	7.29%	7.13%
Retail distribution	2.70%	2.69%
Hotels, catering, pubs etc	4.27%	4.15%
Railway transport	10.47%	10.85%
Other land transport	21.36%	20.49%
Water transport	28.80%	22.65%
Air Transport	31.58%	29.59%
Ancillary Transport services	2.67%	3.01%
Postal and courier services	7.21%	6.78%
Telecommunications	1.33%	1.25%
Banking and finance	0.60%	0.68%
Insurance and pension funds	1.87%	1.90%
Auxiliary financial services	1.82%	1.66%
Owning and dealing in real estate	0.15%	0.11%
Letting of dwellings	0.03%	0.03%
Estate agent activities	0.23%	0.19%
Renting of machinery etc	1.79%	1.74%
Computer services	1.04%	1.11%
Research and development	3.71%	2.90%
Legal activities	0.44%	0.43%
Accountancy services	0.60%	0.66%
Market research, management consultancy	2.04%	1.38%
Architectural activities & Tech. Consult	1.62%	1.73%
Advertising	0.86%	0.63%
Other business services	1.03%	0.95%
Education	3.86%	4.16%
Health and veterinary services	1.15%	1.18%
Social work activities	6.54%	6.32%
Sewage and Sanitary services	4.10%	4.22%
Recreational services	1.30%	1.19%
Other service activities	0.92%	0.94%
Source: Supply Use tables 2004-2008, UK National Accounts Blue Book 2010, ONS		

5. SIMULATED EFFECTS OF POSSIBLE FUTURE ENVIRONMENTAL TAXES

In this section we simulate the effects on 'profits' of possible environmental taxes that might be adopted in the future, using the same sample of UK I-O sectors. We simulated the effect of a 20% (by value) environmental tax on each of the following inputs: forestry, fishing, metal ores, other mining and quarrying, water supply, sewage and sanitary services, fertilisers and pesticides. These simulations were undertaken for the hypothesised package of environmental taxes on their own and in conjunction with existing UK energy taxes. The purpose of these simulations is to assess how important energy taxes would be within a broader programme of environmental taxes. There are, of course, very many possible packages of environmental taxes that could be applied. However, we believe that our simulations of a single scenario are sufficient to demonstrate that energy taxes are likely to remain a very important component of any broader strategy of environmental taxation.

The results are presented in Table 4. Taken across all sectors the imposition of 20% taxes on quite a wide range of environmental inputs has a disproportionately small impact on profits, resulting in an equivalent effect, on average, to a profit tax of a little in excess of 3%. When combined with existing environmental taxes the average effect rises to just over 10%. This suggests that current environmental taxes have a substantially more powerful effect on profit incentives than the package of hypothetical taxes that we put forward.

The package of hypothesised environmental taxes, like current UK environmental taxes, differs considerably between one sector and another in their effect on gross operating surplus ("profits"). A small number of sectors – forestry, mining, fish

and fruit processing, ceramics, concrete articles, iron and steel and sewage services – are faced by an effect equivalent to a profit tax of 20% or greater. The vast majority of sectors are affected by 2% or less. This suggests that hypothesised environmental taxes would provide significant incentives for production to be switched away from the small number of heavily affected sectors but would only provide minor distortions to profit incentives for the rest of the economy.

In combination with existing environmental taxes the overall effect is strong for a much wider range of sectors (more than 20% of profit) including sugar, oils &fats, various chemical industries and various transport sectors. There are also very many fewer sectors for which the overall effect on profits is equivalent to a tax of 2% or less. The effects of current environmental taxes are, therefore, not just more powerful than the other possible environmental taxes considered but also much more widespread in their impact on profit incentives.

Input-output sector	Simulated 20% taxes		Simulated taxes + combined environmental taxes	
Table 4: Effects on Gross Operating Surplus of Simulated 20% "Environmental" Tax				
	2008	**Average 2004-2008**	**2008**	**Average 2004-2008**
Agriculture	4.13%	3.64%	12.39%	9.77%
Forestry	32.30%	32.77%	38.45%	38.97%
Fishing	8.32%	7.02%	21.80%	22.13%
Coal extraction	1.29%	1.11%	22.91%	23.25%
Oil and gas extraction	0.03%	0.03%	0.65%	0.65%
Metal ores extraction, Other mining and	7.24%	10.00%	18.62%	23.82%
Meat processing	6.04%	5.28%	18.75%	16.14%
Fish and fruit processing	29.84%	25.77%	33.17%	28.51%
Oils and fats processing	4.75%	6.33%	24.92%	32.80%
Dairy products	5.33%	4.72%	22.28%	19.05%
Grain milling and starch	3.16%	2.01%	9.75%	7.15%
Animal feed	3.48%	2.36%	18.99%	13.05%
Bread, biscuits, etc	1.95%	1.33%	12.29%	8.21%
Sugar	2.03%	1.33%	22.40%	14.24%
Confectionery	0.56%	0.49%	2.98%	2.48%
Other food products	2.37%	1.64%	8.13%	5.60%
Alcoholic beverages	0.94%	1.03%	5.42%	4.74%
Soft drinks & mineral waters	0.80%	0.62%	4.16%	3.05%
Tobacco products	0.07%	0.10%	0.24%	0.37%
Textile fibres, Textile weaving, Textile	9.03%	5.66%	20.49%	14.13%
Made-up textiles, Carpets etc, Other textiles,	1.07%	1.14%	5.39%	5.47%
Wearing apparel & fur products	0.59%	0.69%	7.08%	5.69%
Leather goods, Footwear	0.33%	0.50%	0.99%	1.46%
Wood and wood products	4.87%	4.78%	10.37%	10.28%
Pulp, paper and paperboard	3.87%	4.65%	11.07%	13.03%
Paper and paperboard products	3.38%	2.74%	14.02%	11.18%
Printing and publishing	0.34%	0.36%	1.54%	1.40%
Coke ovens, refined petroleum & nuclear fuel	1.63%	2.00%	45.94%	51.70%
Industrial gases and dyes	9.03%	7.46%	15.75%	14.24%
Inorganic chemicals, Organic chemicals	2.82%	2.76%	25.12%	24.54%
Fertilisers, Plastics & Synthetic resins etc,	13.98%	12.14%	29.18%	25.66%
Paints, varnishes, printing ink etc	2.70%	2.03%	6.81%	5.78%
Pharmaceuticals	0.19%	0.32%	0.68%	1.08%
Soap and toilet preparations	0.59%	0.86%	2.13%	2.75%
Other Chemical products, Man-made fibres	2.05%	1.90%	13.31%	11.95%
Rubber products	4.12%	2.08%	18.61%	10.39%
Plastic products	1.34%	1.26%	8.92%	7.63%
Glass and glass products	3.03%	3.02%	12.24%	11.33%
Ceramic goods	9.11%	7.80%	23.18%	19.24%
Structural clay products, Cement, lime and	3.25%	2.79%	21.69%	17.78%
Articles of concrete, stone etc	9.14%	8.31%	23.13%	20.72%
Iron and steel, Non-ferrous metals, Metal	39.82%	31.62%	55.78%	49.24%
Structural metal products	1.20%	0.75%	7.62%	5.31%
Metal boilers & radiators	0.63%	0.58%	7.04%	7.13%
Metal forging, pressing, etc	0.85%	0.94%	6.60%	6.19%
Cutlery, tools etc	0.22%	0.28%	2.16%	2.28%
Other Metal products	1.71%	1.30%	8.59%	5.83%
Mechanical power equipment	7.03%	3.59%	14.37%	7.99%
General purpose machinery	0.70%	0.60%	6.44%	5.75%
Agricultural machinery	0.69%	1.01%	10.74%	9.95%
Machine tools	1.04%	0.94%	3.05%	2.77%

| Table 4 (continued): Effects on Gross Operating Surplus of Simulated 20% "Environmental" Tax				
Input-output sector	Simulated 20% taxes		Simulated taxes + combined environmental taxes	
	2008	Average 2004-2008	2008	Average 2004-2008
Special purpose machinery	0.60%	0.68%	3.64%	4.02%
Weapons and ammunition	0.43%	0.47%	2.21%	2.39%
Domestic appliances nec	0.81%	0.78%	4.63%	4.89%
Office machinery & computers	0.09%	0.09%	1.06%	0.90%
Electric motors and generators etc, Insulated w	0.68%	0.76%	5.56%	6.13%
Electrical equipment nec	0.97%	0.58%	7.05%	4.04%
Electronic components	0.61%	0.60%	1.80%	1.72%
Transmitters for TV, radio and phone	0.89%	0.74%	2.95%	2.69%
Receivers for TV and radio	0.19%	0.31%	0.66%	1.01%
Medical and precision instruments	0.25%	0.25%	1.48%	1.62%
Motor vehicles	2.85%	1.44%	9.44%	5.11%
Shipbuilding and repair	4.75%	3.88%	21.60%	17.29%
Other transport equipment	0.65%	2.15%	6.78%	13.10%
Aircraft and spacecraft	1.18%	0.76%	7.05%	4.60%
Furniture	0.99%	0.99%	5.58%	5.36%
Jewellery & related products	0.61%	0.69%	1.62%	1.80%
Sports goods and toys	0.18%	0.23%	2.23%	2.31%
Miscellaneous manufacturing nec, recycling	2.36%	1.86%	10.53%	8.83%
Electricity production & distribution	0.16%	0.15%	14.14%	11.92%
Gas distribution	0.20%	0.21%	9.68%	9.16%
Water supply	0.57%	0.63%	2.00%	2.24%
Construction	0.64%	0.62%	11.21%	10.46%
Motor vehicle distribution & repair, fuel	0.62%	0.51%	5.86%	4.82%
Wholesale distribution	0.37%	0.38%	7.91%	7.77%
Retail distribution	0.29%	0.28%	3.15%	3.13%
Hotels, catering, pubs etc	1.31%	1.27%	6.11%	5.95%
Railway transport	1.10%	1.19%	10.89%	11.36%
Other land transport	0.37%	0.34%	21.70%	20.81%
Water transport	1.38%	1.05%	29.90%	23.63%
Air Transport	0.47%	0.39%	31.95%	29.92%
Ancillary Transport services	0.70%	0.80%	4.88%	5.55%
Postal and courier services	1.51%	1.55%	9.56%	9.19%
Telecommunications	0.16%	0.16%	2.04%	1.93%
Banking and finance	0.06%	0.07%	0.87%	1.00%
Insurance and pension funds	0.21%	0.22%	3.26%	3.35%
Auxiliary financial services	0.79%	0.75%	2.99%	2.77%
Owning and dealing in real estate	0.01%	0.01%	0.64%	0.54%
Letting of dwellings	0.02%	0.02%	0.71%	0.69%
Estate agent activities	0.22%	0.19%	0.76%	0.64%
Renting of machinery etc	0.41%	0.43%	2.49%	2.48%
Computer services	0.16%	0.18%	1.26%	1.34%
Research and development	1.49%	1.09%	5.83%	4.46%
Legal activities	0.08%	0.08%	0.59%	0.58%
Accountancy services	0.17%	0.15%	0.92%	0.95%
Market research, management consultancy	0.15%	0.11%	2.45%	1.68%
Architectural activities & Tech. Consult	0.20%	0.22%	2.10%	2.28%
Advertising	0.86%	0.69%	2.53%	1.97%
Other business services	0.26%	0.25%	1.58%	1.47%
Public administration & defence	6.34%	6.35%	18.81%	18.88%
Education	2.41%	2.28%	7.77%	7.86%
Health and veterinary services	1.50%	1.48%	3.91%	3.92%
Social work activities	2.27%	2.46%	10.01%	10.24%
Sewage and Sanitary services	28.91%	28.64%	46.04%	45.74%
Recreational services	0.87%	0.82%	2.65%	2.49%
Other service activities	1.67%	1.78%	3.98%	4.22%

6. CONCLUSIONS

In this paper we present the case that in certain circumstances energy taxes mainly or wholly operate by affecting profits to producers and not by changing prevailing market prices. These circumstances are where (a) the relevant environmental taxes are national rather than global (b) the goods and services concerned are internationally traded and (c) the country concerned faces given world prices. It might be thought that such circumstances apply in theory but not in practice so we provide evidence to support the hypothesis that such conditions are credible for much of the UK economy. Although we do not provide evidence to extend this to other countries it is likely that, if such conditions prevail in the UK, they also prevail in a significant number of other countries.

Even though the consequences of facing given world prices means that national taxes do not effectively change prices the resulting change in profits provides the key incentive to reduce the use of environmentally damaging inputs. They provide incentives for user industries to (a) adopt more environmentally favourable production techniques or (b) reduce the use of such inputs by reducing the output of the user industries. We provide an analysis of the UK economy using, firstly, current energy taxes and, secondly, a package of hypothetical new taxes. Our results suggest that the burden of adjustment of, in particular, the hypothetical new taxes would fall on a small range of user industries. For current environmental taxes the burden is more widely spread throughout the economy but again suggests that a minority of user industries are taking the burden of adjustment.

APPENDIX 5a. BASIC ANALYTICAL FRAMEWORK

Figure 1:
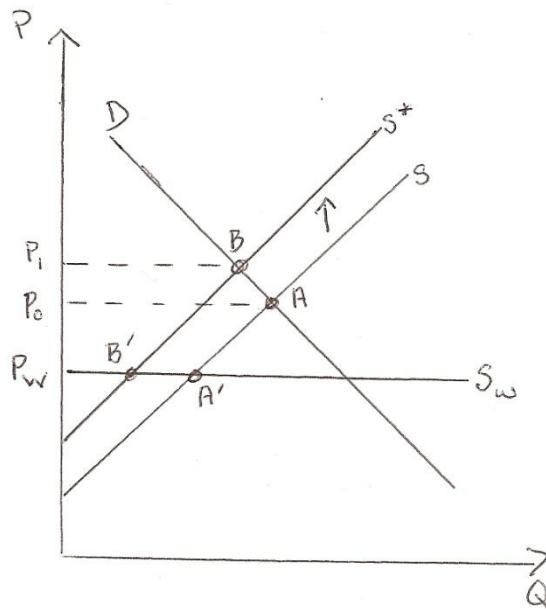
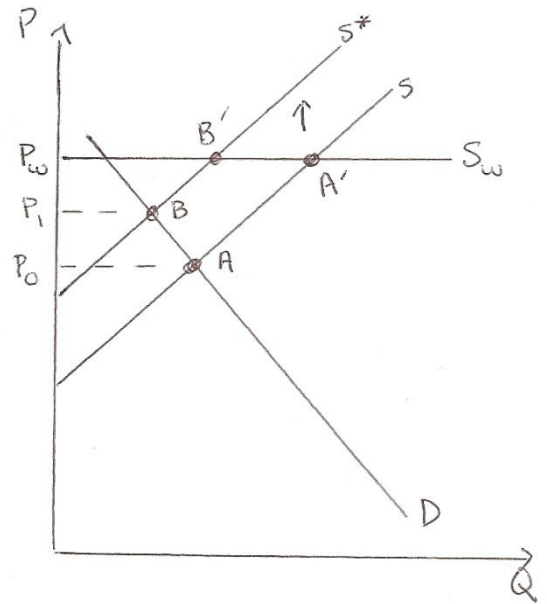**(b) Import competing sector**   **(b) Export sector**

Figure 1 produces a modified version of the diagram produced in Chamberlain

(2009) to illustrate the economic effects of a carbon tax, itself closely based on

standard economic analysis. The figure shows domestic demand (D) and supply

(S) for an import competing sector and an export sector. In Chamberlain's analysis

the tax shifts the supply curve inward to S^*, raises prices from P_0 to P_1 in each

case. Where we differ is that we introduce a world supply curve S_w that is

perfectly elastic. In international economics this is known as the *small country*

assumption – that domestic prices are determined in relation to given world prices.

This description is misleading since the country does not need to be "small" in any

normal sense. It is only necessary that the country faces given world prices for the world supply curve to be horizontal.