Advancing comparative policy evaluation techniques: A case study of British climate change policies

Nia Davies

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Centre for Environmental Policy
Imperial College London
University of London

For John.

Abstract

The notion of 'better regulation' indicates a desire on the part of policy makers to pursue improved policy design. The aim is to minimise the burden on both the regulated and the regulator whilst maximising the positive outcomes. The intensive evaluation of policy instruments forms an essential part of the cycle of improvement of policy design and implementation. However, existing evaluation techniques are often applied in an ad hoc and inconsistent manner. This reduces the opportunities to compare different policy instruments with a view to informing future instrument design.

This research has led to the identification of six critical evaluation criteria which can be applied to policy instruments *ex post* in order to facilitate a robust and systematic comparative analysis of instruments. The purpose of this unique approach is to identify the instrument-specific lessons and the generic lessons regarding instrument design. The outcome of this research will be to improve future climate change policy design and hence to ameliorate the results that these policies deliver.

The evaluation criteria were applied to four case studies that feature in the UK Climate Change Programme: the Pollution Prevention and Control (England and Wales) Regulations 2000; the Climate Change Agreements; United Kingdom Greenhouse Gas Emissions Trading Scheme; and, the European Union Emissions Trading Scheme.

This innovative approach to comparative analysis of case studies led to the identification of several critical recommendations for future design of policies targeted at industrial emissions control. These recommendations include:

- More caution in the setting and measurement against performance baselines due to the inevitable risk of information asymmetries;
- Improving the transparency of the negotiation of targets and performance reporting;
- Greater emphasis and effort on the analysis of the costs and cost effectiveness of policies to Government (and by association, the tax payer);
- Greater awareness among policy makers of the impact of industry lobbying on instrument design and performance targets.

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I dedicate this thesis to you.

Contents

Abstract 3

Acknowledgements 4

Contents 5

List of tables 11

List of figures 13

Acronyms and abbreviations 15

1 Introduction 18

1.1 Rationale of the research 19
1.2 Research overview 20
1.3 Thesis structure 21

2 Research methodology 24

2.1 Introduction 24
2.1.1 Definitions of terms used in this thesis 25
2.2 Research strategy 26
2.3 Research questions 29
2.4 Literature review 30
2.5 Development of the evaluation framework 31
2.6 Application of evaluation criteria 34
2.6.1 Economic efficiency 34
2.6.2 Environmental effectiveness 35
2.6.3 Transparency 35
2.6.4 Innovation 36
2.6.5 Acceptance and equity 36
2.6.6 Flexibility 37
2.7 Selection of case studies 37
2.8 Identification of stakeholders 38
2.9 Questionnaire design 39
2.10 Focus groups 42
2.11 interviews 43
2.12 Interpretation of findings from the survey 44
2.13 Criteria for judging the quality of research design 44
2.13.1 Construction validity 45
2.13.2 Internal validity 46
2.13.3 External validity 46
2.13.4 Reliability 47
2.14 Chapter summary 47

3 Evaluation, application of policy instruments and climate change policy 48

3.1 Introduction 48
3.2 Concepts of policy evaluation 49
3.3 Purpose and application of policy evaluations 51
3.4 Approach to policy evaluation in the United Kingdom 54
3.5 Regulatory Impact Assessment 56

3.6 Cost-benefit analysis 59
3.7 Drivers and barriers to *ex post* policy evaluations 62
3.8 Historical approach to environmental protection in the UK 65
3.9 Regulatory Instruments 67
3.10 Market Based Instruments 69
3.11 Voluntary approaches to environmental policy 71
3.12 International climate policy: the United Nations, IPCC and Kyoto 76
3.13 The flexible mechanisms of the Kyoto Protocol 79
3.14 Post-2012 Kyoto: the Bali Roadmap 82
3.15 Approach to climate policy in the UK 83
3.16 Climate Change Programme 2000 and Climate Change: The UK Programme 2006 84
3.17 Stern Review of the Economics of Climate Change 88
3.18 Energy White Paper 89
3.19 Climate Change Bill 90
3.20 Chapter summary 90

PART 2: ANALYSIS OF CASE STUDIES 92

4 Pollution Prevention and Control (England and Wales) Regulations 2000 93

4.1 Introduction 93
4.2 Description and characterisation of the IPPC Directive and the PPC Regulations: origins of IPPC in British environmental law 93
4.2.1 Rationale of the IPPC Directive 96
4.2.2 Development and consultation of IPPC 97
4.2.3 Best Available Technique within IPPC 98
4.2.4 Reporting at EU level: EPER and E-PRTR 99
4.3 Transposition of IPPC into UK legislation 100
4.3.1 Consultation and RIA of the PPC Regulations 101
4.3.2 Best Available Technique within the PPC Regulations 102
4.4 Implementation of the PPC Regulations in England and Wales 103
4.5 Interaction between IPPC and the European Union Emissions Trading Scheme 104
4.6 Overview of performance to date 107
4.7 Overview of evidence-based analysis 109
4.7.1 Sector associations 109
4.7.2 Emissions/environmental data collection 109
4.8 Economic efficiency 110
4.9 Environmental effectiveness 117
4.9.1 Data limitations 118
4.9.2 Carbon dioxide 121
4.9.3 Nitrous oxides 122
4.9.4 Methane 123
4.9.5 Hydroflurocarbons 124
4.9.6 Perfluorocarbons 125
4.9.7 Sulphur hexafluoride 126
4.9.8 Total emissions of greenhouse gases as carbon 127
4.10 Transparency 128
4.11 Flexibility 131
4.12 Innovation 133
4.13 Acceptance and equity 137
4.14 Other issues 140
4.14.1 Interaction between PPC and other climate change policy instruments 140

4.14.2 Perceptions of strengths and weaknesses of the PPC Regulations ... 142
4.15 Chapter summary ... 144

5 Climate Change Agreements ... 146

5.1 Introduction ... 146
5.2 Description and characterisation of the Climate Change Levy and Climate Change Agreements ... 146
5.2.1 Regulatory Impact Assessment and the consultation process ... 148
5.3 Operation of the Agreements ... 148
5.4 Performance of CCAs to date ... 150
5.5 Operation of CCA participants within the UK ETS ... 151
5.6 Impact of industrial changes within CCA sectors ... 153
5.7 *Ex post* evaluation within Parliament ... 156
5.8 Overview of evidence-based analysis ... 157
5.8.1 Sector associations ... 158
5.9 Economic efficiency ... 158
5.10 Environmental effectiveness ... 162
5.11 Transparency ... 166
5.12 Flexibility ... 167
5.13 Innovation ... 169
5.14 Acceptance and equity ... 170
5.15 Other issues ... 171
5.15.1 Interaction between CCAs and other climate change policies ... 171
5.15.1.1 European Union Emissions Trading Scheme ... 172
5.15.2 Impact of energy prices on energy consumption ... 174
5.15.3 Post-2013 Climate Change Agreements ... 175
5.16 Chapter summary ... 177

6 United Kingdom Greenhouse Gas Emissions Trading Scheme ... 179

6.1 Introduction ... 179
6.2 Operation and characterisation of the UK ETS ... 179
6.3 Consultation and RIA ... 183
6.4 Allowance allocation methodology ... 184
6.5 Baseline calculation, monitoring and reporting requirements ... 185
6.6 Overview of performance 2002-2006 ... 187
6.7 Overview of evidence-based analysis ... 188
6.8 Economic efficiency ... 188
6.9 Environmental effectiveness ... 198
6.10 Transparency ... 203
6.11 Flexibility ... 204
6.12 Innovation ... 206
6.13 Acceptance and equity ... 207
6.14 Other issues ... 209
6.14.1 Interaction between UK ETS and CCAs ... 210
6.14.2 Interaction between UK ETS and EU ETS ... 210
6.15 Chapter summary ... 211

7 European Union Emissions Trading Scheme ... 213

7.1 Introduction ... 213
7.2 Description and characterisation of the EU ETS ... 213
7.3 Implementation of the Directive ... 215
7.4 Consultation process ... 216
7.4.1 Regulatory Impact Assessment ... 216

7.4.2 National Allocation Plans 217
7.4.3 Auctioning and EU harmonisation 224
7.4.4 Exemption of British firms in Phase I: UK ETS and CCAs 225
7.5 Monitoring, reporting and verification 225
7.6 Provisions for new market entrants, exits and changes to installations 226
7.7 Overview of evidence-based analysis 227
7.7.1 Sector associations 228
7.7.2 Emissions/environmental data collection 228
7.8 Economic efficiency 228
7.9 Environmental effectiveness 234
7.10 Transparency 241
7.11 Flexibility 244
7.12 Innovation 245
7.13 Acceptance and equity 248
7.14 Other issues 252
7.14.1 Interaction between the EU ETS and other climate policies 253
7.14.2 Quality of legislation 255
7.14.3 Overall strengths and weaknesses of the EU ETS 256
7.15 Chapter summary 261

PART 3: COMPARATIVE ANALYSIS AND RESEARCH OUTCOMES 262

8 Comparative evaluation of case studies 263

8.1 Introduction 263
8.2 Economic efficiency 263
8.3 Environmental effectiveness 268
8.4 Innovation 272
8.5 Flexibility 273
8.6 Acceptance and equity 274
8.7 Transparency 277
8.8 Instrument cohesion 278
8.9 *Ex ante* appraisal 280
8.10 *Ex post* evaluation 282
8.11 Chapter summary 300

9 Discussion 301

9.1 Introduction 301
9.2 Generalisability of case study outcomes 302
9.2.1 Outcome 1: Caution in the establishment and use of baselines 303
9.2.2 Outcome 2: A need to improve the transparency of policies specifically in relation to performance and negotiation of targets 304
9.2.3 Outcome 3: With the exception of PPC, which is roughly revenue neutral for the Government, there is little analysis/publication of the costs of climate polices to Government 304
9.2.4 Outcome 4: Impact of "*credit for early action*" 305
9.2.5 Outcome 5: Industry will generally perceive targets to be unfair and too challenging despite evidence to the contrary 305
9.2.6 Outcome 6: While voluntary schemes, such as UK ETS and CCAs, have proved to have limited environmental benefits, they compared well against the performance of Phase I of EU ETS and the PPC Regulations 306
9.2.7 Outcome 7: Policies implemented under strict time constraints may experience greater difficulties in achieving environmental objectives 306

9.2.8 Outcome 8: The positive effect of data accumulation and the impact on information asymmetry 307
9.2.9 Recommendation 9: Policy makers need to demonstrate greater awareness of (and willingness to challenge) lobbying by industry 309
9.3 Policy-specific outcomes and recommendations 309
9.3.1 Pollution Prevention and Control Regulations (England and Wales) 2000 311
9.3.2 Climate Change Agreements 315
9.3.3 UK Emissions Trading Scheme 321
9.3.4 EU Emissions Trading Scheme 324
9.4 Response to detailed research questions 328
9.5 What characteristics of policy existing evaluation and appraisal techniques could be employed effectively in the *ex post* evaluative situation? 328
9.5.1 Transparency 328
9.5.2 Innovative behaviour 329
9.5.3 Acceptance and equity 330
9.5.4 Flexibility 330
9.6 Can a systematic approach to policy evaluation enable the comparative evaluation of policy instruments? 331
9.7 What lessons can be drawn from this research regarding the role of policy instruments in environmental policy making, specifically policies relating to climate change mitigation? 333
9.7.1 Specific implications for voluntary policy instruments 334
9.7.2 Preferred approach to climate change mitigation in energy intensive industrial sectors 335
9.8 Further applications of the evaluation framework 338
9.9 Critique of research methodology 339
9.10 Limitations of the research 341
9.11 Chapter summary 342

10 Conclusions 343

10.1 Introduction 343
10.2 Conclusions 343
10.2.1 *Ex post* policy evaluation 343
10.2.2 Utility of comparative analysis 344
10.2.3 Positive policy design lessons in relation to the UK approach to industrial environmental governance 344
10.2.4 Weaknesses of design in UK industrial climate change policy 345
10.3 Originality of research 347
10.4 Further research 348
10.5 Thesis summary 350

References 351

Appendix 1: Example questionnaire 377

Appendix 2: Example interview schedule 391

Appendix 3: Interview Participants 393

Appendix 4: Evaluation of Regulatory Impact Assessments 395

Appendix 5: IPPC activities and PPC activity transposition dates 403

Appendix 6: Climate Change Agreement sectors 409

Appendix 7: UK ETS Direct Participants 412

Appendix 8: EU ETS Activities 414

Appendix 9: Summary of Assessments and Evaluations 416

List of tables

Table 2.1 Conceptual and technical issues in the development of a policy evaluation 25
Table 2.2 Definition of terms used in the thesis 26
Table 2.3 Deductive and inductive research approaches 29
Table 2.4 Factors and methods of a Post-implementation review 32
Table 2.5 Criteria for selecting case studies 38
Table 2.6 Breakdown of surveyed stakeholders 41
Table 2.7 Survey response rates 41
Table 2.8 Categories and number of interview participants 43
Table 2.9 Research validity, methodologies and sources 45
Table 3.1 Evaluation frameworks 53
Table 3.2 Common strengths and weaknesses of CBA 61
Table 3.3 Changes in predicted carbon savings from measures identified in the 2000 and 2006 Climate Change Programmes 86
Table 3.4 Additional measures specified in the 2006 Climate Change Programme 87
Table 4.1 Size of responding organisations 109
Table 4.2 Average one-off costs of the PPC Regulations 111
Table 4.3 Average annual costs of the PPC Regulations 112
Table 4.4 Estimated costs of IPPC to regulatory authorities in the UK 113
Table 4.5 Annual subsistence charges per permit 2001-2005 114
Table 4.6 EPER reporting threshold values 119
Table 4.7 EPER reported GHG emissions from PPC sectors in 2001 and 2004 expressed as $MtCO_2e$ 127
Table 4.8 Rating flexibility of PPC regulations with regard to management of investment decisions 131
Table 4.9 Rating of flexibility with regard to allowing companies to optimise emission reductions via financial assessment of the most practical means to do so 132
Table 4.10 Stated changes within company activities arising directly from the implementation of the PPC Regulations 136
Table 4.11 Level of acceptance of sector association members 138
Table 4.12 Rating of overall fairness of PPC Regulations 138
Table 4.13 Overall experience of members 138
Table 4.14 Rating of the interaction between PPC and other UK climate change polices 140
Table 4.15 Rating of the interaction between PPC and EU environmental polices 140
Table 4.16 Key strengths of the PPC Regulations 142
Table 4.17 Key weaknesses of the PPC Regulations 142
Table 5.1 CCL income and approximate National Insurance Contribution rebate 2001-2006 147
Table 5.2 CCL rates per tonne CO_2 at the 2001-2007 rates 147
Table 5.3 Results of target periods 1-3 150
Table 5.4 Size of responding sector associations (number of companies) 158
Table 5.5 Number of target units within each CCA administered by responding sector associations 158
Table 5.6 Rating of flexibility with regard to management of investment decision making 168
Table 5.7 Rating of flexibility with regard to industry deciding how to reduce emissions/energy consumption in the most cost-effective manner 168
Table 5.8 Degree to which CCAs incentivise technological innovation within energy-intensive industry 169

Table 5.9 Stated changes within activities arising directly from CCAs 169
Table 5.10 Level of acceptance for CCAs according to stakeholder group 170
Table 5.11 Rating of fairness of the CCAs 170
Table 5.12 Rationale for withdrawing CCAs in 2013 176
Table 6.1 Timeline of the UK ETS 182
Table 6.2 Aggregate targets and actual performance during years 2002-2006 of the UK ETS 188
Table 6.3 Performance of Direct Participants 2002-2006 199
Table 6.4 UK GHG reduction targets 202
Table 6.5 Stated changes within Direct Participants arising directly from the UK ETS 207
Table 7.1 Activities participating in the EU ETS (Phase I) 214
Table 7.2 Consultation timeline for Phase II 216
Table 7.3 Size of responding organisations 228
Table 7.4 Rating flexibility of EU ETS with regard to management of investment decisions 245
Table 7.5 Rating of flexibility with regard to allowing industries to optimise emission reductions via assessment of marginal abatement costs 245
Table 7.6 Stated changes arising within sectors as a result of the EU ETS 248
Table 7.7 Rating of fairness of allocation of Phase I allowances from the perspective of sector associations 249
Table 7.8 Rating of fairness of allocation of allowances in Phase I and Phase II from the perspective of sector associations in Phase II 250
Table 7.9 Overall experience of members 250
Table 7.10 Rating of the interaction between EU ETS and other British environmental polices 253
Table 7.11 Rating of the interaction between EU ETS and other EU environmental polices 253
Table 7.12 Strengths identified by all respondents 258
Table 7.13 Weakness identified by all respondents 259
Table 9.1 Policy recommendations, rationales and stakeholder feedback: Pollution Prevention and Control Regulations 312
Table 9.2 Policy recommendations, rationales and stakeholder feedback: Climate Change Agreements 316
Table 9.3 Policy recommendations, rationales and stakeholder feedback: United Kingdom Greenhouse Gas Emissions Trading Scheme 322
Table 9.4 Policy recommendations, rationales and stakeholder feedback: European Union Emissions Trading Scheme 325
Table 9.5 Rationales for positive/negative support for the promotion of voluntary policy measures in British climate policy 335
Table 9.6 Standard deviation for policy preferences 337

List of figures

Figure 2.1 Research procedure 28
Figure 2.2 Case study chain of evidence 46
Figure 3.1 Role of policy appraisal and evaluation in the policy cycle 52
Figure 3.2 Elements to be included in a Regulatory Impact Assessment relating to post-implementation review 57
Figure 3.3 Voluntary approaches to environmental policy and the level of legal 'bindingness' of each approach 72
Figure 3.4 Aims and objectives of IPCC 77
Figure 3.5 Article 2 of Kyoto Protocol to UNFCCC 79
Figure 4.1 Permit application information requirements 100
Figure 4.2 Comparison of costs and benefits incurred by the government and industry 110
Figure 4.3 Mini-case study 116
Figure 4.4 Global warming impact of four sectors in the UK between 1990 and 2005/6 118
Figure 4.5 Change in reported CO_2 emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value (transformed to Log data to facilitate graphical depiction) 121
Figure 4.6 Changes in reported NOx emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value (transformed to Log data to facilitate graphical depiction 122
Figure 4.7 Change in reported CH_4 emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value (transformed to Log data to facilitate graphical depiction 123
Figure 4.8 Change in reported HFC emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value 124
Figure 4.9 Change in reported PFC emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value 125
Figure 4.10 Change in reported SF_6 emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value 126
Figure 4.11 Impact of PPC Regulations on effort to reduce GHG emissions and energy efficiency improvements beyond permit requirements 128
Figure 4.12 Technical knowledge and adaptation to new environmental requirements 134
Figure 5.1 UK ETS allowance price trends (March 2002 - November 2005) 152
Figure 5.2 Annual manufacturing productivity in real terms since 1948 (using 2003 as baseline year = 100 units) 154
Figure 5.3 Annual increase on previous year in manufacturing productivity in real terms since 1949 154
Figure 5.4 Perceptions of costs and benefits incurred by companies participating in CCAs 160
Figure 5.5 Perceptions of costs and benefits incurred by Government though the CCAs 160
Figure 5.6 Preferred policy option in economic terms 161
Figure 5.7 Emission reductions compared to business as usual scenario 163
Figure 5.8 Preferred policy response of respondents who doubt the environmental effectiveness of CCAs 164
Figure 5.9 Interaction between CCL, IPPC, CCA, EU ETS and UK ETS 172
Figure 5.10 Electricity, gas, coal and LPG prices by quarter since 1999 174
Figure 6.1 Total GHG emissions from four Direct Participants 186
Figure 6.2 Economic efficiency of UK ETS 189
Figure 6.3 Shell UK: underperformance and profits 190
Figure 6.4 Calculated costs and benefits relating to the UK ETS 192

Figure 6.5 Baseline, targets and actual performance of four major participants in UK ETS 196
Figure 6.6 Percentage of respondents ranking drivers as 'important' or 'very important' 198
Figure 6.7 % change in GHG emissions from Direct Participants in the UK ETS 200
Figure 6.8 Perception of flexibility offered by UK ETS 205
Figure 6.9 Level of agreement with incentivised participation in the UK ETS ... 209
Figure 7.1 Approved National Allocation Plan caps in Phase I and Phase II 220
Figure 7.2 Difference between allocated allowances and actual emissions across Member States in Phase I 221
Figure 7.3 % difference between total Phase I allocations and total Phase I emissions 222
Figure 7.4 Long and short positions of UK installations in Phase I (with exception of power sector) in Phase I 223
Figure 7.5 Long and short positions of Lithuanian installations in Phase I 223
Figure 7.6 Price of EU ETS allowances (1t CO_2) from 2005 to 2008 224
Figure 7.7 Comparison of perceptions of costs incurred by industry with the overall environmental benefits of the EU ETS 230
Figure 7.8 Comparison of perceptions of costs incurred Government with the overall environmental benefits of the EU ETS 230
Figure 7.9 UK verified emissions and total allocation in 2005 (excluding power sector) 235
Figure 7.10 UK verified emissions and total allocation in 2006 (excluding power sector) 235
Figure 7.11 UK verified emissions and total allocation in 2007 (excluding power sector) 236
Figure 7.12 Phase I allocations and actual emissions from the electricity generation sector 236
Figure 7.13 Preferred allocation method according to stakeholder group 238
Figure 7.14 Level of acceptance exhibited by both stakeholder groups 249
Figure 9.1 Mean ranking of preferred policy response and associated standard deviation within sector association group 336
Figure 9.2 Mean ranking of preferred policy response and associated standard deviation within external stakeholder group 336

Acronyms and Abbreviations

ACEA	European Automobile Manufacturers' Association
Art.	Article
BAT	Best Available Technique
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BAU	business as usual
BEPO	best practicable environmental option
BERR	Department for Business, Enterprise and Regulatory Reform
BPM	Best Practicable Means
BRC	Better Regulation Commission
BRE	Better Regulation Executive
BREF	Best Available Technique Reference document
C	carbon
CAC	command and control
CAPEX	capital expenditure
CBA	cost-benefit analysis
CCA	Climate Change Agreement
CCL	Climate Change Levy
CCP	Climate Change Programme
CCS	carbon capture and storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CH_4	methane
CHP	combined heat and power
CITL	Community Independent Transaction Log
CO_2	carbon dioxide
CO_2e	Carbon dioxide equivalent
COP	Conference of the Parties
CRC	Carbon Reduction Commitment
Defra	Department for Environment, Food and Rural Affairs
DETR	Department of the Environment, Transport and the Regions
DTI	Department of Trade and Industry
EAC	Environmental Audit Committee
EC	European Community
ECA	Enhanced Capital Allowances
EEC	Energy Efficiency Commitment
EMS	Environmental Management System
ENDS	Environmental Data Service
EPA	Environmental Protection Agency
EPA 1990	Environmental Protection Act 1990
EPER	European Pollutant Emission Register
EPP	Environmental Permitting Programme
E-PRTR	European Pollutant Release and Transfer Register
ERU	Emission Reduction Unit
ET	emissions trading
ETG	Emissions Trading Group
ETR	Emissions Trading Registry
EU	European Union
EU ETS	European Union Emissions Trading Scheme
EUA	EU Emission Allowance
EUP	Energy-using products
GAD	Global Atmospheric Division
GHG	Greenhouse gas
GQCHP	good quality combined heat and power

HFC	hydrofluorocarbons
HMIP	Her Majesty's Pollution Inspectorate
IAG	Inter-Departmental Analysts Group
IAIP	Industrial Air Pollution Inspectorate
IPC	Integrated Pollution Control
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention and Control
ITL	International Transaction Log
JAMA	Japanese Automobile Manufactures' Association
JI	Joint Implementation
KAMA	Korean Automobile Manufactures' Association
LA	Local Authority
LAAPC	Local Air Pollution and Control
LCP	Large Combustion Plant Directive
MBI	market based instrument
MRV	monitoring, reporting and verification
Mt	megatonne
MtC	million tonne carbon
$MtCO_2$	million tonne carbon dioxide
$MtCO_2e$	million tonne carbon dioxide equivalent
MW	Megawatt
MW	megawatt
NAO	National Audit Office
NAP	National Allocation Plan
NER	New Entrant Reserve
NGO	Non-governmental organisation
NIC	National Insurance Contributions
NIEA	Northern Ireland Environment Agency
NIEHS	Northern Ireland Environment and Heritage Service
NOx	nitrous oxides
NRA	National Rivers Authority
OECD	Organisation for Economic Co-operation and Development
OFT	Office of Fair Trading
PAC	Public Accounts Committee
PAE	Policy Appraisal of the Environment
PFC	perfluorocarbons
PIR	post-implementation review
PPC	Pollution Prevention and Control
RCEP	Royal Commission on Environmental Pollution
RECLAIM	Regional Clean Air Incentives Market
RIA	Regulatory Impact Assessment
RTFO	Renewable Transport Fuel Obligation
SD	Standard deviation
SEPA	Scottish Environmental Protection Agency
SF_6	sulphur hexafluoride
SME	Small and Medium-sized Enterprise
SO_2	sulphur dioxide
t	tonne
t/d	tonnes per day
t/y	tonnes per year
UK	United Kingdom
UK ETS	United Kingdom Emissions Trading Scheme
UKAS	United Kingdom Accreditation Service
UN	United Nations
UNCED	United Nations Conference on Environment and Development
UNECE	United Nations Economic Commission for Europe

UNFCCC	United Nations Framework Convention on Climate Change
US EPA	United States Environmental Protection Agency
USA	United States of America
VA	Voluntary approach
VEA	Voluntary environmental agreement
VED	Vehicle Excise Duty
WID	Waste Incineration Directive
WMO	World Meteorological Organisation
WWF	World Wildlife Fund

1 Introduction

When this research commenced, interest in climate change was generally reserved for limited sections of the academic community and environmental campaigners. Save for the occasional end of bulletin news item on television, public exposure to climate change issues was limited. By 2008, these circumstances could not have changed more. Public, industrial, commercial, academic and governmental interest in climate change has exploded to the point where it is seen as the most pressing environmental issue facing humanity. Demands for action from civil society are increasing. This has added impetus and much needed political support to calls from academia, selected national governments, non-governmental organisations (NGOs) and supra-national organisations to change our behaviour in order to avert the consequences of dangerous climate change.

It was a personal desire to make a positive and, hopefully, long-lasting contribution to this cause that prompted this research. I wanted to understand how we could possibly challenge the causes of climate change if we do not learn from our mistakes and develop efficient and effective policies and legislation. I wanted to learn how policy instruments could be refined to maximise the positive outcomes and minimise the negative. Moreover, I felt that the United Kingdom (UK), as one of the largest economies in the World, whose economic position was built on the strength of the industrial revolution largely to the detriment of the environment, should be leading the way. At the level of public discourse, the British Government has demonstrated admirable leadership addressing the massive challenges posed by climate change. However, closer inspection of the policies and politics of climate change in the UK reveal areas that warrant immediate attention. The approaches we take and the lessons we learn will have serious ramifications on our level of success in tackling the most pressing environmental issue of our time.

1.1 Rationale of the research

In 2000, the European Union (EU) Lisbon Strategy first identified the role of "better regulation" in creating economic prosperity though sustainable growth and the creation of employment (European Commission, 2008a). The 2000 Strategy was refined and refocused in 2005 following disappointing progress during the first five of its ten-year life. The 2005 *New Start for the Lisbon Strategy* identifies the crucial role "better regulation" plays in advancing the economic and competitive position of European businesses. Whilst the focus of the *New Start* shifted towards employment and growth, the importance of better regulation remained:

> 'Better regulation has a significant positive impact on the framework conditions for economic growth, employment and productivity by improving quality of legislation, thereby creating the right incentives for business, cutting unnecessary costs and removing obstacles to adaptability and innovation.'
>
> (European Commission, 2005a: p.20)

Furthermore, the Commission was keen to stress that the pursuit of better regulation should actively seek to "*remove unnecessary burdens and cut red tape unnecessary for reaching the underlying policy objectives*" (European Commission, 2005a). A natural question arises over the extent to which the drive for better regulation is consistent with or enhances high standards of environmental protection but this matter is beyond the scope of this thesis. This thesis applies a more instrumental and functional approach to the Lisbon Strategy by evaluating climate change policy instruments against the instrumental goals that they set for themselves.

In order to meet the ever-changing vision of 'better regulation' it is paramount that policy makers, of all levels, learn from previous experience. At this point the importance of *ex post* policy evaluation becomes evident. Deficiencies in *ex post* analysis of policies, in the form of reviews of value of money, reporting of unintended impacts and identification of policy lessons to name but a few, were identified almost in parallel with the first Lisbon Strategy by the European Environment Agency (EEA) (EEA, 2001). This report set out to determine if existing practices of legislative analysis and reporting within EU Member States was being carried out effectively. One hundred pieces of domestic legislation implemented to comply with EU requirements were examined. In only 12% of

cases were Member States required to evaluate the effects of the legislation and the effectiveness of the legislation in meeting EU requirements. Furthermore, in instances where requirements were identified, the approaches were deemed to be highly variable, ranging from vague proposals for "*programme reviews*" and "*assessment of impacts*" to more specific requirements to "*quantify effects of measures taken, indicate progress, economics impact and evaluate effectiveness*" (EEA, 2001).

Transferring attention to the performance of the United Kingdom, the National Audit Office (NAO) has identified failings in the application of *ex post* policy evaluations in the form of post implementation reviews across numerous Government departments (NAO, 2007b). Taking this into account, and given the already extensive use of quantitative *ex ante* policy appraisals, a natural progression was to identify the need to apply rigorous, systematic and replicable qualitative techniques to evaluate existing policies.

The second rationale behind the study is the comparative critique of the evaluation outcomes. In applying a rigorous and systematic methodology, the outcomes of the evaluations of individual case studies allow for the comparative assessment of instruments in order to identify the most effective elements of an instrument. With many authors advocating the use of instrument mixes, and the move away from pure regulatory regimes, the benefits of drawing on the positive aspects of instrument experience can thus be maximised.

The final rationale of the research focuses on the application of policy instruments. As stated earlier, there has been a significant shift away from command and control regulation in recent years, but is this for good reason? Are the alternative instruments performing any better?

1.2 Research overview

The overall aim of this research is to explore how evaluation processes (where *evaluation* refers to analysis of the outcomes of an instrument following implementation, *ex post*, in order to compare the *actual* performance with the original policy objectives). The study area was selected as a result of the apparent failure of relevant authorities (such as governmental departments,

regulatory authorities and independent bodies) to undertake *ex post* evaluations in a rigorous manner and systematic.

1.3 Thesis structure

The thesis comprises 10 Chapters.

Chapter 1: Introduction
Rationale of the study
Structure of the thesis

PART 1: METHODOLOGY AND BACKGROUND

Chapter 2: Methodology
Methodological approaches to data collection, literature critique and data analysis

Chapter 3: Literature review
Presentation of comprehensive critique of existing literature relating to ex post policy instrument evaluation and climate change policy

PART 2: ANALYSIS OF CASE STUDIES
Each instrument was subject to a systematic evaluation based on a set of evaluation criteria designed to facilitate the identification of instrument-specific and generalisable policy lessons

Chapter 4: Pollution Prevention and Control Regulations

Chapter 5: Climate Change Agreements

Chapter 6: United Kingdom Greenhouse Gas Emissions Trading Scheme

Chapter 7: European Union Emissions Trading Scheme

PART 3: COMPARATIVE ANALYSIS AND RESEARCH OUTCOMES

Chapter 8: Comparative analysis

Comparative analysis of the case studies with particular reference to the evaluation criteria

Chapter 9: Discussion

Discussion of the key policy lessons from each case study

Critique of the methodological approach

Identification of policy-specific recommendations

Chapter 10: Conclusions

Key conclusions of the study, identification of sources of originality, identification of areas for further work

PART 1: METHODOLOGY AND BACKGROUND

2 Research methodology

2.1 Introduction

The aim of this research is to develop and extend the use of *ex post* policy evaluation in the context of policy instrument design. The research draws on four case studies:

- Climate Change Levy Agreements (CCA)
- EU Emissions Trading Scheme (EU ETS)
- UK Emissions Trading Scheme (UK ETS)
- Pollution Prevention and Control (England and Wales) Regulations 2000 (PPC Regulations)

In doing so, the research required the development of a policy evaluation methodology. This methodology incorporates some selected design features of other commonly used evaluation and assessment techniques. In order to test the methodology, it was applied to the instruments above. These instruments are key components of the UK Climate Change Programme with the aim of reducing greenhouse gas (GHG) emissions from industry.

In this Chapter, sections 2.2 to 2.12 present the methodological approach to identification of stakeholders, development of surveys, interviews, secondary data collection and analysis of findings. This Chapter continues by presenting the rationale for the selection of the evaluation criteria applied to the four case studies. The evaluation methodology applied in the course of this research has drawn on methods from two existing assessment methodologies: Regulatory Impact Assessment (RIA) and Cost-Benefit Analysis (CBA) (as a founding principle of RIA). This led to the selection of evaluation criteria based on quantitative and qualitative methods that take into account the economic costs and environmental outcomes of an instrument in addition to other aspects including equity to stakeholders, the ability of an instrument to promote technological innovation, the level of flexibility of an instrument and the degree of transparency of the policy design and operation process. The primary purpose of the criteria-based approach is to ensure as many facets of a policy and associated instruments as possible are evaluated adequately.

Patton (1987) identified two fundamental issues to be addressed in the process of developing a policy instrument evaluation framework: conceptual issues and technical issues. The elements of each issue that must be addressed prior to commencing a policy evaluation are presented in Table 2.1.

Table 2.1 Conceptual and technical issues in the development of a policy evaluation

Conceptual issues to be identified	Technical issues to be identified
Relevant stakeholders	Methods of enquiry
Purpose of the evaluation	Primary unit of analysis
Approach, model or framework to be used to direct the evaluation	Sampling strategy
Primary evaluation questions/issues	Comparisons (if any) to be made
Any political considerations to be taken into account	Type of data to be collected, from whom, when and how
Standards and criteria against which the evaluation will be judged	Level of accuracy required, how to ensure accuracy and quality of data
Resources available for the evaluation	Address concerns over validity and reliability
	Type of data analysis to conducted
	Type of statements and findings arising from analysis

Source: Adapted from Patton (1987)

The technical issues are addressed in the second part of this Chapter (sections 2.2 to 2.12). The methodological approach to the conceptual issues identified in Table 2.1 is addressed in sections 2.13 of this Chapter.

2.1.1 Definitions of terms used in this thesis

The subject of this thesis and the discipline of policy instrument evaluation are not based on exact science as factors beyond the environmental performance (e.g. exact emission reductions) and the financial costs/benefits to industry or government of an instrument are not easily quantifiable. Stakeholder perceptions of other outcomes (whether intended or unintended) of the instrument, such as the degree of transparency, are subjective. However, this does not mean these factors are any less important. The drive towards holistic environmental protection (as seen with Integrated Pollution Prevention and Control) should be mirrored by holistic instrument assessment and evaluation. This indicates that non-quantifiable outcomes should always be considered.

A host of terms are often used in reference to the same theory, particularly when dealing with policy instruments. In order to prevent confusion the following terms have been defined within the context of this thesis:

Table 2.2 Definition of terms used in the thesis

Term	Definition
Policy evaluation	*Ex post* analysis of a policy based on evidence
Policy assessment	*Ex ante* (pre-implementation) analysis of the predicted impacts of a policy
Voluntary environmental agreement (VEA)	Category consisting of all types of voluntary agreements including negotiated agreements and private agreements (see figure 3.3 for descriptive analysis of types of agreements)

2.2 Research strategy

This study contains three key facets:

- the development a methodology to facilitate the *ex post* evaluation of environmental polices
- the application of the evaluation methodology to four case studies
- the cross-comparison of the case studies to with a particular focus on evaluating the role of different policy instruments within British environmental policy

Figure 2.1 demonstrates the procedure employed to execute this research. A literature review was conducted to include the key areas of the research:

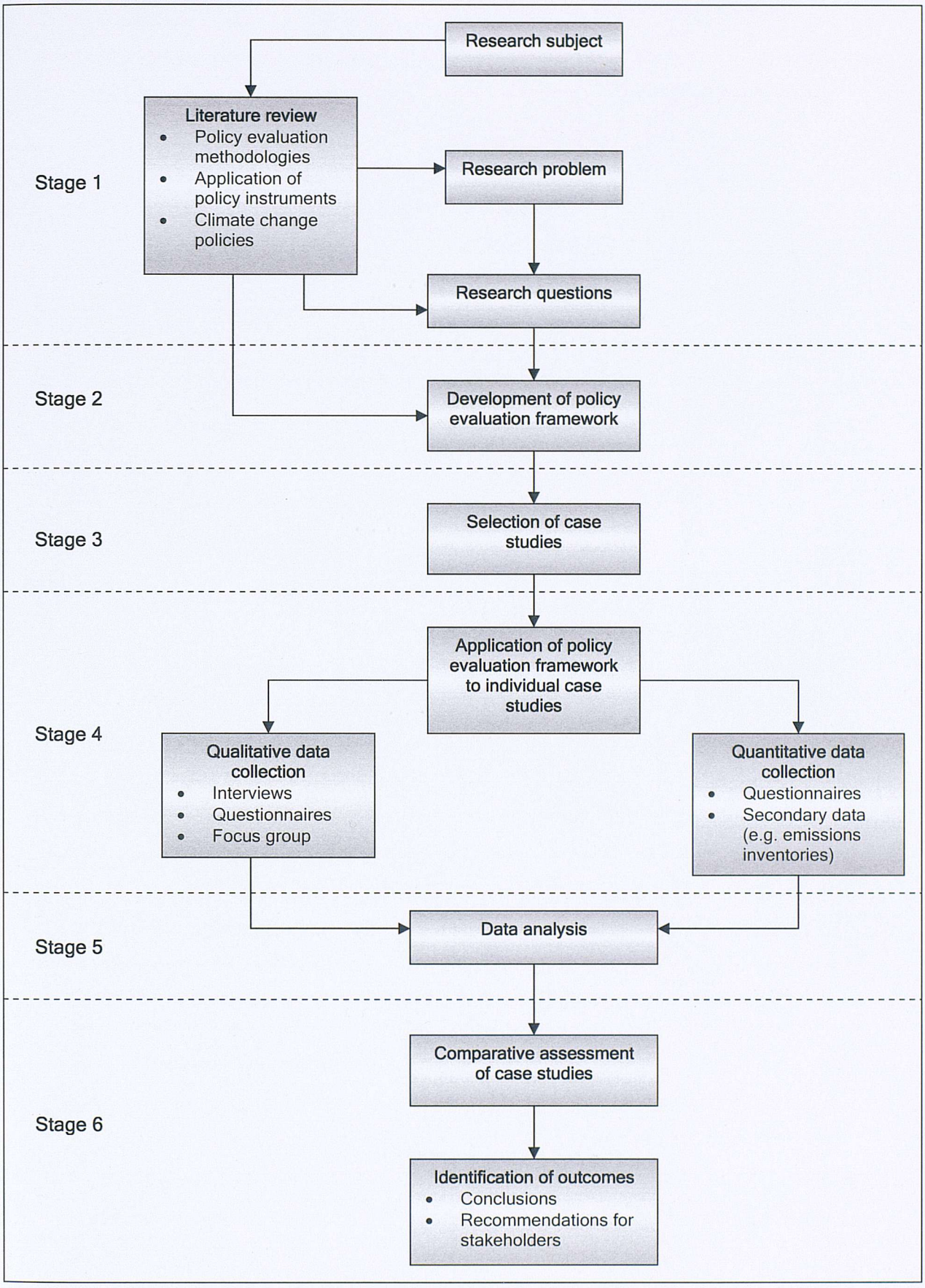
- The application of policy evaluation techniques
- The development and implementation of policy instruments
- The use of evaluation techniques and application of policy instruments to climate change policy

The outcomes of this critical review were used to inform the development of the evaluation framework and its methodologies. The case study policies were selected according to criteria based on the scope of the instrument, industry coverage and its role within the UK Climate Change Programme (Department of the Environment, Transport and the Regions (DETR), 2000a, Defra, 2006d).

The case study instruments were subsequently subjected to the evaluation framework based on multi-method qualitative and quantitative techniques, as specified in sections 2.9 to 2.11. The resulting data, both qualitative and quantitative, was analysed using the techniques identified in section 2.12. The final stage of the research required the comparative assessment of the case studies using the empirical and secondary data sourced from government

emissions inventories, policy progress reports and company sourced information. This process enabled the identification of generalisable policy lessons and instrument-specific policy lessons, with particular focus paid to the often contentious issue of the application of non-mandatory policy instruments in future environmental policy decision making.

Figure 2.1 Research procedure



Source: Adapted from Flick (2002)

In light of the strategy employed for this research it is apparent that a predominately *inductive* research approach has been applied. Table 2.3 identifies the key differences between an inductive approach, predominately employed by social scientists, and a deductive approach to research, a predominately scientific approach.

Table 2.3 Deductive and inductive research approaches

Deductive approach	Inductive approach
Based on scientific principles	Used to gain understanding of what meaning humans attach to specific events
Seeks to explain the casual relationship between variables	Closer understanding of the research context
Quantitative data	Qualitative data
Application of controls to ensure data is valid	Flexible structure to enable changes of focus as the research progresses
Application of concepts to ensure clarity of definition	Researcher is part of the research
The researcher is often independent of what is being researched	Less need to generalise findings
Needs sufficient sample size to enable generalisation of conclusions	

Source: Saunders et al. (2000)

It should be highlighted that even though an inductive approach is the centre pillar for the research strategy, elements of the deductive approach were also applied in this research. The limitations of a purely inductive approach have been discussed by Silverman (2005) and focus on the risk of carrying out simple observations within a field. Inductive approaches can also be '*blind to the need to build cumulative bodies of knowledge*' (Silverman, 2005: p.79). To avoid this risk in this research, elements of quantitative study have been incorporated. The comparative element of the evaluation ensures that the research goes beyond narration of the case studies.

2.3 Research questions

Following the examination of existing literature and policy documentation it became clear that there are some fundamental differences between the approach to policy assessment and policy evaluations. The UK has a strong history of policy assessment. Regulatory Impact Assessments (RIA) are carried out prior to the implementation of all environmental policies as part of the Government's drive for "better regulation". The approach to policy evaluation is considerably less

rigorous. The absence of a systematic approach to evaluating polices led to identification of the following research problem:

> *Ex post* policy evaluation, with a view to improving instrument design, is not adequately addressed in UK policy making

From this research problem the following broad research question was developed:

> *How could policy evaluation practices be improved to ensure maximum policy learning is achieved?*

In order to address this broad research question the following sub-questions were developed:

1. What characteristics of policy existing evaluation and appraisal techniques could be employed effectively in the *ex post* evaluative situation?
2. Can a systematic approach to policy evaluation enable the comparative evaluation of different policy instruments?
3. In light of any comparative evaluation, what conclusions can be drawn regarding the role of different policy instruments in environmental policy making, specifically policies relating to climate change mitigation [1]?

2.4 Literature review

A literature review should enable the development of a solid understanding of the subject area (Saunders et al., 2000). It should also lead to the identification of trends within the subject and highlight gaps in the knowledge. In addition to this, a literature critique should help the researcher decide upon the most suitable methodological approach to the research. A review of existing research should also identify the specific weaknesses and contributions of different research designs in the subject (Hamkin, 1987).

[1] Of the four policies examined in this thesis three are applicable across the United Kingdom: CCA, UK ETS and EU ETS. Pollution Prevention and Control (England and Wales) Regulations 2000 do not apply to Scotland and Northern Ireland. Scotland and Northern Ireland have separated legislation and the Regulations are administered by separate regulatory authorities. For the purpose of this thesis the application of PPC in England and Wales will be the primary focus.

In this respect the review carried out for this research identified the following vacancies in the existing literature in three areas:

- Application of *ex post* evaluation techniques to environmental policies
- Comparative assessment of differing policy instruments
- Academic assessment of key instruments within the UK Climate Change Programme with particular interest in the role of non-mandatory policy instruments

This enabled the identification of the research problem and the fundamental research questions to be addressed in the course of this thesis. The literature review has hence been structured to reflect these vacancies.

The review of literature on *ex post* evaluation techniques required the assessment of previous academic work in this field. An examination of previous scholarship in the field of policy evaluation was followed by a review of the application of *ex ante* appraisal techniques in order to draw together the key elements to define the evaluation framework at the strategic and methodological levels. In particular, policy reviews carried out on behalf of the government by the National Audit Office and consultants were analysed to determine the scope and limitations of how the government reviews its own policies at present. This process was also used to identify theories of best-practice regarding *ex post* evaluations. EU and Organisation for Economic Co-operation and Development (OECD) documentation concerning 'better regulation' and the 'simplification of the regulatory environment' were analysed to determine the influence of international activities on national practices.

2.5 Development of the evaluation framework

This section of the methodology Chapter focuses on one of the key empirical elements of this research: the development and application of an evaluation methodology to be applied *ex post* to environmental policies.

In recent years the British Government has shown a keen interest in improving the regulatory environment. The Better Regulation Executive (BRE) (within the Department for Business, Enterprise and Regulatory Reform (BERR)) is charged with overseeing the government's drive to improve regulation by ensuring that:

regulation is only implemented where necessary; targets are set to ensure the cost of regulation to all parties is reduced; and, that enforcement and inspection arrangements for regulated sectors are rational (Better Regulation Executive, 2007a). Key to the achievement of 'better regulation' is the application of RIA prior to the implementation of a policy. In the UK RIA is primarily used as a means to justify the financial cost of a policy (Radaelli, 2004). This comes as no surprise given that RIA focuses primarily on assessing the impacts prior to both the consultation phase and the implementation of a policy. However, as Radaelli also highlights, RIA should also be used as a means to demonstrate policy maker's commitment to *ex post* evaluation and policy reviews (Radaelli, 2004). Herein lines the basis of the problem formulation of this research. RIA is conducted prior to policy proposals across all Government departments but the quality is "mixed" (NAO, 2008). In its 2007 annual report the NAO found that in previous years "*the establishment of robust evaluation arrangements was often handled poorly in RIAs. Our assessment of RIAs this year identified continuing weaknesses*" (NAO, 2007b: p.22).

The Government has specified that each RIA must include provisions for a *post-implementation review* (PIR) (Better Regulation Executive, 2007b). In undertaking the PIR the factors identified in Table 2.4 should be considered.

Table 2.4 Factors and methods of a Post-implementation review

Factor	Method
RIA used as a starting point for the PIR	Establish baselines and success criteria/success measures
How and when the PIR will take place	Recommended after three years of policy being in place
Basis of review	Whether it is statutory (of legal basis) or political requirement
Modification of policy	Establish criteria to modify or replace then policy if the objectives have not been met
Regulatory simplification and deregulation	The review should include scope to assess even if this triggers a nil return
Determine if there have been any unintended consequences	Stakeholder engagement to obtain information on any unintended consequences of the policy

Source: Better Regulation Executive (2007b)

The basis of PIR is sound. Legal provisions for reviews may be used to ensure the review is carried out. Credit should also be given for ensuring that modifications to policies are considered. The presence of regulatory simplification and effects on deregulation within the checklist are in keeping with the EU drive to

minimise the regulatory burden on government and business (European Commission, 2006a). However, the government has made it clear that the role of PIR is to establish "*whether implemented regulations are having the intended effect and whether they are implementing policy objective efficiently. It is* ***not intended to review the effects of the policy itself*** *or to determine whether the intended policy is still desirable*" (Better Regulation Executive, 2007c).

The comparative evaluation of varying policy instrument types has been identified as a further stumbling block in the assessment of policy instrument efficiency in OECD countries (Börkey et al., 1998). This report stressed the need to drive forward research in this field to improve understanding of the costs associated with different policy instruments.

By way of an overview, policy evaluations are an important stage in the policy development process. Rutman (1984) identified three key reasons for conducting policy instrument evaluations:

- meaningful accountability - to ensure competent authorities are held to account over their policy decision making and implementation
- improved programme delivery - facilitate the improvement of future policy decision making thought policy 'learning'
- contributing to the knowledge of the social sciences - programme and policy evaluations may arise in greater knowledge and understanding of the process of decision making and its consequences

For the above reasons the methodological approach to producing valid and reliable outcomes should be based according to the type of measurement to be applied, the type of research design to be employed and the format of the data analysis (Rutman, 1984).

The development of the evaluation methodology for this research involved an extension of the literature review to establish current practices. The criteria employed in previous academic studies were collated. The criteria used in this research were selected based on two key criteria:

- Prevalence in academic literature and official documentation

- Criteria of importance according to previous studies yet not generally considered in traditional policy evaluation practices

This led to the identification of six key criteria (economic efficiency, environmental effectiveness, transparency, acceptance and equity, impact of innovation, and flexibility) to be applied in each policy evaluation based on the selection criteria above. In order to assess the policies against the criteria three methodologies were used: collection of quantitative data from surveys; collection of qualitative data from surveys and interviews; and, the analysis of existing reports and inventories relating to each policy. The detailed methodology for each criterion is presented in section 2.6.

2.6 Application of evaluation criteria

The section of this methodology Chapter presents the approaches of applying each evaluation criterion to the case studies.

2.6.1 Economic efficiency

In its purest form, this criterion deals with the cost encountered by three key groups in the development, implementation and continued operational costs. The three key groups are:

- The public authority charged with developing, implementing and administering the policy
- The target audience of the policy (e.g. industrial sectors, general public, commerce)
- Other bodies involved in the development, implementation and operation of a policy such as the European Commission, government departments and agencies

Policy reviews undertaken by the NAO and the Carbon Trust have been particularly useful in addressing this criterion (NAO, 2004, Carbon Trust, 2005, NAO, 2007a, Carbon Trust, 2008). Defra has also published limited data concerning the cost of policies to itself and to industry (Defra, 2007g). In addition to the quantitative data collected from these sources this research demanded the collection of qualitative data from government, industry and external stakeholders

on perceptions of the economic efficiency of each policy instrument. Questionnaire respondents were asked to rank the efficiency of the instrument and to compare the economic costs to both government and industry with the environmental outcomes of the policy instrument in question.

2.6.2 Environmental effectiveness

The environmental effectiveness of each policy instrument was assessed in a similar fashion to the economic efficiency, as detailed in section 2.6.1. Secondary sources of information were used to obtain emissions data and performance of each policy instrument against its targets. Sources of secondary data used in the analysis include progress reports published by Defra (Future Energy Solutions, 2004, Future Energy Solutions, 2005, Defra, 2006h, Defra, 2006i, Defra, 2007a, Defra, 2007g, Defra, 2007h). The data obtained from these sources was enhanced with qualitative information obtained though the surveys. Views on the ability of each policy to deliver policy objectives were gathered. Respondents were also asked to rank their preferred policy instrument in terms of maximising environmental outcomes. This provided meaningful insight into the preferred policy option according to stakeholder group.

2.6.3 Transparency

There is general consensus on the importance of transparency within the process of policy instrument development, implementation and administration (Silvo et al., 2002, Santos et al., 2006). Transparency in policy making can help to avoid undesirable side effects of policy and to maintain support for the policy from all stakeholders (Silvo et al., 2002). Transparency also facilitates the setting of credible and rigorous targets (Jimenez, 2007). In particular, previous studies of the case studies show no attempt to discuss or critique the level of transparency within the policy process (NAO, 2004, Future Energy Solutions, 2004, Future Energy Solutions, 2005, Defra, 2007a, Defra, 2007g).

The questionnaires asked all respondent to rate the level of transparency of the instrument from the development through the implementation and subsequent administration. Respondents were subsequently asked to identify measures that could improve the situation if they believed the level of transparency was too low or too high. Further to this, all respondents were asked to rate the level of non-industry stakeholder involvement in the policy process from the decision marking stages through to the implementation and functioning of the policy instrument.

2.6.4 Innovation

Innovation and technological change can be difficult to attribute to a specific policy instrument. For this reason, *ex post* evaluation of policy instruments and their impacts on innovation and learning effects is a reasonably challenging task (OECD, 1997). This task can is made more complex if the instrument itself does not contain explicit provisions for innovation.

Following a critical assessment of policy to identify any provisions directly related to the promotion of innovative behaviour the effect of a policy instrument upon innovative behaviour and learning effects was assessed though the survey of industry practitioners. The views of industry practitioners concerning whether a policy has promoted innovative behaviour amongst firms enabled the assessment of the degree to which a policy instrument has acted as an incentive or deterrent to innovation. Information concerning sharing of technical knowledge and specific technology changes was obtained though the survey to identify the specific innovative behaviour promoted by the instruments.

2.6.5 Acceptance and equity

Acceptance and equity rarely feature in policy assessments and evaluations. This may be a result of the difficulty in assessing an instrument against this criterion. The reliance upon qualitative data could have implications for the neutrality of the assessment as individuals/organisations may have a desire to protect their interests. Perceptions of what is politically, environmentally and socially acceptable may be biased according to the affiliation of survey respondents.

Despite these concerns, the level of acceptance demonstrated for a policy instrument can prove to be invaluable. Acceptance has a direct link to the perceived credibility of an instrument.

Hepburn (2006) identified the political economy as having major implications on the feasibility and acceptance of a policy by industry. Industry will generally show less preference for a policy that directs income away from itself compared with policy that directs income towards industry. This theory has been tested though the circulation of questionnaires to obtain information on preferred policy instrument types to promote energy efficiency and greenhouse gas emission reductions by relating the policies to impacts on income.

2.6.6 Flexibility

The flexibility of a policy instrument is important when dealing with an issue such as climate change that requires a complex response involving technological innovation. It has been previously stated that flexibility within policy instrument design promotes the uptake of existing technologies and the development of new alternative technologies (Dupuy, 1997, Sunnevag, 2000, Wu, 2000). Furthermore, the EU drive to promote 'better regulation' requires a more consensus oriented approach to policy making, the consideration of economic implications of policy and greater flexibility to allow Member States and industry to meet policy objectives as they see fit (Hey et al., 2007).

The level of flexibility of a policy lies not only within the policy documentation but also within the structure and working of the public authority. Flexibility can be determined in two manners: analysis of opinions of stakeholders using specific examples of how flexibility is manifested within a policy; and analysis of the policy text with specific focus on provisions for adapting and reviewing the policy in the face of changing conditions and knowledge.

2.7 Selection of case studies

The approach to the research was a multiple-case study to test the application of the evaluation methodology. The use of a multiple-case study enables the comparative analysis of outcomes (Yin, 2003). Patton (1987) asserted that the use of case studies is "*particularly valuable when the evaluation aims to capture individual differences or unique variations from one program setting to another, or from one program experience to another*". Furthermore, Patton states that regardless of the unit of analysis, a case study "*seeks to describe that unit of analysis in depth, in detail, in context, and holistically*" (Patton, 1987).

Table 2.5 identifies the criteria for selecting the case studies and the rationale behind the application of each criterion.

Table 2.5 Criteria for selecting case studies

Criteria	Definition	Rationale
Location of instrument in wider policy arena	Part of the UK Climate Change Programme (DETR, 2000; Defra, 2006d)	Indicates the British government views the policy as having a key purpose in addressing climate change
Scope of the instrument	Policy targeted at industry, in particular energy intensive industry	To facilitate the comparative assessment due to continuity within the policy target audience
Size of the instrument	To involve number of sectors or individual firms that presents a sufficient sample size	To facilitate the comparative assessment due to similarity in sample sizes

The application of these criteria led to the identification of four policies from the UK Climate Change Programme:

- Climate Change Agreements
- Pollution Prevention and Control (England and Wales) Regulations 2000
- European Union Emissions Trading Scheme
- United Kingdom Greenhouse Gas Emissions Trading Scheme

2.8 Identification of stakeholders

In order to conduct a comprehensive survey that produces meaningful data the relevant stakeholders were identified. Purposive sampling is often used in case study research given the small sample sizes (Saunders et al., 2000). This type of sampling allows a researcher to use their own judgment to identify the stakeholders with sufficient knowledge to contribute to answering the research question. This was considered the optimal approach for this research given the highly complex nature of the instruments involved and the level of technical knowledge required from respondents to the questionnaires and interviews. Three of the four case studies (CCAs, PPC Regulations and EU ETS) are applied to numerous industrial sectors. In order to obtain representative data from as many sectors as possible the sector associations[2] were identified as the primary contacts for the survey. The fourth case study, the UK ETS, was a pilot policy instrument with 34 participating companies from various sectors. Due to the small number of companies involved and the spread of companies across sectors it

[2] A sector association is a trade organisation representing the interests of its members, who are individual companies operating within a specific industrial field. The size, form and function of a sector association varies from sector to sector. In general sector associations provide guidance to their members on issues relating to legislation and technical best practice and provide lobbying services.

was determined the most suitable approach in this instance would be to survey all individual companies directly.

Governmental stakeholders included departments charged with administering the policies (in all instances this was the Department for Environment, Food and Rural Affairs (Defra)), regulatory agencies (the Environment Agency) and government-employed consultants.

NGOs with specific interests in climate change policy were identified from a survey of websites. Policy think-tanks, policy institutes and academics with research interests in the policies were identified via the literature review. This group of stakeholders will henceforth be referred to collectively as 'external stakeholders'.

2.9 Questionnaire design

Questionnaires were sent to all identified stakeholders via email. An example questionnaire is located at Appendix 1. For each case study three types of questionnaire were developed:

- **Industry questionnaire**

This format contained the standardised questions posed to all stakeholders. Further questions were included to obtain information on changes within technical processes, management and operations within each industry.

- **External stakeholder questionnaire**

The external stakeholder format led to questionnaires that were shorter than the industry questionnaire to reflect the level of interaction with the instruments and in order to attract participation.

- **Policy maker/implementer questionnaire**

This questionnaire was based on the external stakeholder questionnaire. Additional space was provided to enable the policy makers/implementer to provide comments on every question. This was a result of request from Defra during the first survey on the UK ETS. This style of questionnaire was not thought to be suitable for other stakeholders as the overall aim was to minimise the length of the questionnaires and reduce the time required to complete the

questionnaires to maximise the response rate. Care was taken to ensure the questionnaire was not so short so as to appear less useful or important (Dillman, 2000).

The policy instruments were dealt with the in following order: UK ETS, CCA, PPC and EU ETS. The rationale for this approach was to deal with the UK ETS before the scheme ended in late 2006. The CCAs were the next policy initiative and the timing coincided with the publication of the National Audit Office report into the effectiveness of the CCAs and the Climate Change Levy (CCL). PPC and the EU ETS were dealt with simultaneously as all EU ETS participants are subject to PPC Regulations, thus enabling both issues to be dealt with in one questionnaire to avoid surveying the same sector association more than necessary. These two instruments were dealt with after the UK ETS and CCAs as full implementation of both instruments did not occur until 2005 for EU ETS and 2007 for the PPC Regulations (although in the case of the latter staggered implementation had been occurring since 2001 (transition dates are located at Appendix 5)). This ensured stakeholders had the maximum allowable experience of the instruments within the time constraints of this research.

After developing the initial questionnaires relating to the UK ETS the questionnaires were sent to a selection of stakeholders as a pilot study. Feedback from the respondents was used to modify the content, style and format of the questionnaires.

Questions were grouped according to the evaluation criteria. The majority of questions were in a multiple choice format, with options presented in a ranking scale. Several questions were open ended. At the end of each questionnaire respondents were invited to provide further comments on the policy instrument and to provide feedback on the questionnaire itself. Responses to open ended questions were used to illustrate the resulting analysis of each case study. Patton (1987) identified the primary strengths of open ended questions over closed questions: it enables the respondent to '*let their thoughts roam freely*', ideas are expressed in their own language and respondents are not restricted to the predefined choice of responses provided with closed questions. However, researchers must be aware that the use of open ended questions often results in the respondent articulating their immediate thoughts and this may not be truly representative of the respondents' sentiments (Patton, 1987).

A full breakdown of the number of organisations within each stakeholder group surveyed is presented in Table 2.6.

Table 2.6 Breakdown of surveyed stakeholders

		PPC	CCA	UK ETS	EU ETS
	Industry	65	50	37	50
	Government (including Environment Agency)	2	4	2	2
External stakeholders	Consultants	1	7	13	6
	Think tanks/policy studies institutes	0	3	2	1
	NGOs	4	4	4	4
	Academics	6	5	7	11
	Other	0	0	3	0
	Total number of surveyed organisations	**78**	**73**	**68**	**74**

All respondents, with the exception of government departments, were given written notice of the confidentiality of responses. In essence, the responses from both the questionnaires and the subsequent interviews would not be viewed by any third party, individuals and organisations would not be named, and no information would be published that would lead to the identification of any participants and their organisations in relation to their comments (Oppenheim, 1992). Government departments were not guaranteed confidentiality in the interest of transparency. The response rates to each survey are presented in Table 2.7.

Table 2.7 Survey response rates

		PPC	CCA	UK ETS	EU ETS
	Industry	17%	36%	35%	14%
	Government (including Environment Agency)	50%	25%	50%	50%
External stakeholders	Consultants	0%	42%	0%	83%
	Think tanks/policy studies institutes	0%	0%	50%	0%
	NGOs	0%	0%	0%	0%
	Academics	0%	60%	14%	45%
	Other	0%	0%	0%	0%
	Total response rate	**15%**	**32%**	**36%**	**21%**

Response rates for this type of business-oriented survey have been previously reported as low as 15-20% (Saunders et al., 2000). Another study of response rates found that surveys of people in senior-managerial roles can be much lower than other groups, with an average response rate of 36.1% (Baruch, 1999).

Response rates between 20% and 36% were deemed to be acceptable based on the evidence from Saunders et al. and Baruch.

2.10 Focus groups

It was initially thought that focus groups may be a more suitable format for follow-up questioning of respondents. A focus group on the UK ETS was conducted in November 2006. The focus group participants were a representative from Defra, a NGO, a UK ETS participating company and an academic with expertise in the field of emissions trading. Krueger (1994) identified six key advantages to conducting focus groups over other interview methods:

- Participants are often more relaxed in a group setting compared with a one-on-one interview. This promotes "*increased candor by respondents*".
- The group format allows the moderator to probe for further information in the event of unanticipated issues being raised
- The "*high face validity*" of focus groups means the method is easily understood and complex statistical analysis of the outcomes is avoided
- Focus groups can be relatively low cost to arrange and operate compared with the use of questionnaires
- Results can be obtained quickly compared with one-on-one interviews and questionnaires
- Focus groups can allow the researcher to increase the sample size in qualitative studies as the number of participants increases without a correlating increase in time and cost to the researcher

Despite these noted advantages of focus group research, following the first focus group it became clear that this approach was not particularly effective in the context of this research. The majority of survey participants held high-ranking positions within their organisations. As a result many ware subject to severe time constraints. It was difficult to arrange a convenient time for participants. It was significantly easier to arrange one-on-one interviews as the interviewee could state their preferred time, date and place without the need to achieve consensus with other participants. Further to this limitation, analysis has shown that focus group participants articulate only 60% to 70% of the ideas they may voice in a one-on-one interview (Morgan, 1996). Experience of focus groups in relation to this research indicates that much of the discussion between participants centres

on conflict avoidance with the outcome of less information than one might expect from an active discussion. Consideration of these factors led to the conclusion that one-on-one interviews would be the most appropriate method to pursue.

2.11 Interviews

All questionnaire respondents were asked if they would participate in a follow-up interview. All consenting respondents were contacted by telephone or email to arrange a follow-up interview. Of the respondents approached concerning a follow-up interview ten were no longer willing to be interviewed. A detailed list of interviewees is located at Appendix 3. A brief breakdown of interview participants is provided in Table 2.8

Table 2.8 Categories and number of interview participants

Stakeholder group	CCA	PPC	EU ETS	UK ETS
Industry	6	6	4	3[3]
Government (including Environment Agency)	1	1	1	1[4]
External stakeholders	3	0	2	3[5]
Total number of interviewed organisations	10	7	7	7

The interviews lasted between 30 and 90 minutes. Approximately half of the interviews were carried out in person. The remaining interviews were conducted by telephone if participants were located outside of the London area. All interviews were recorded and notes were taken during the interviews to facilitate impromptu questioning. The recordings were subsequently transcribed to enable completeness of the analysis.

Interviews were semi-structured. An interview schedule containing questions to be posed to all interviewees was developed. An example interview schedule is located at Appendix 2. The schedule was subsequently tailored to individual respondents based on their questionnaire responses. Where questionnaire respondents had expressed particular dissatisfaction or support for any aspect of the policies further questions were posed during the interview to obtain information on how and why these sentiments were formed.

[3] One of the three respondents from the industry group participated in a focus group
[4] The government respondent participated in a focus group
[5] Two of the respondents from the external stakeholder group participated in a focus group

2.12 Interpretation of findings from the survey

The findings from the survey and interviews were analysed using quantitative techniques were applicable (i.e. for questions with ranked responses). Open ended questions from the questionnaire and interviews were used to enhance the data through the exploration of rationales behind trends.

The policy recommendations arising from the research were circulated to relevant stakeholders (i.e. questionnaire respondents and interview participants) to obtain levels of agreement with the recommendations and supporting rationales. The purpose of this exercise was to obtain stakeholder validation for the outcomes of the research.

2.13 Criteria for judging the quality of research design

The validity of the research design and execution can be assessed against four criteria identified by Yin (2003):

- validity of the research construction/design;
- internal validity arising from analysis of events and data (for example ensuring that the researcher does not simply infer a relationship between two events but presents evidence of the link);
- external validity whereby the analysis can be generalised beyond the case study in question;
- and, reliability of the research methods where reliability means that if one investigator were to employ identical research methods to a previous investigator of a case study the former would arrive at exactly the same conclusions as the latter.

The sources of information for the four criteria are identified in Table 2.9.

Table 2.9 Research validity, methodologies and sources

Tests	Case study methodology	Sources/phases of research providing validity
Construction validity	Use multiple sources of evidence	Data collection
	Establish chain of evidence	Data collection
	Have key informants review draft of case study report	Data collection
Internal validity	Pattern-matching	Data analysis
	Explanation-building	Data analysis
	Address rival explanations	Data analysis
	Use logic models	Data analysis
External validity	Use theory in single-case studies	Research design
	Use replication logic in multiple-case studies	Research design
Reliability	Case study protocol	Data collection
	Develop case study database	Data collection

Source: Yin (2003)

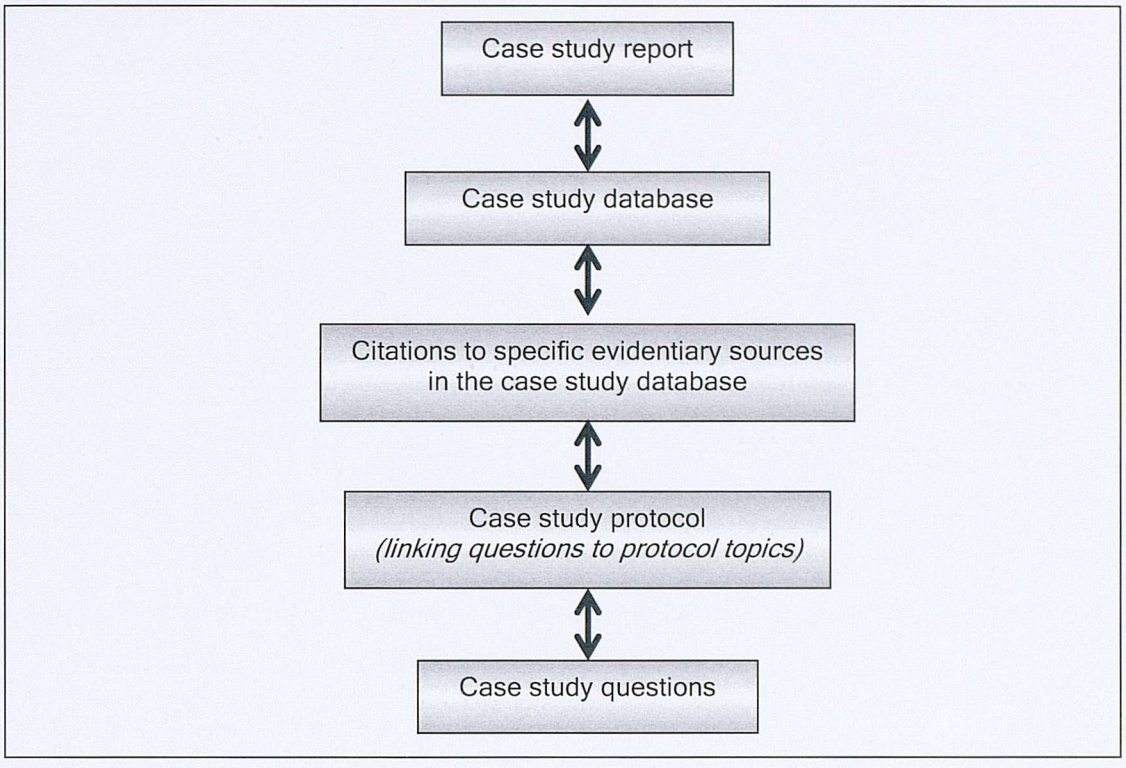
2.13.1 Construction validity

The construction validity of this research has been approached using triangulation[6]. Multiple sources of evidence were used in each case study. Questionnaire and corresponding interview responses from each participant were analysed for evidence of conflicting statements and opinions. Previous analysis, policy documentation and stakeholder feedback on the research outcomes were used to provide further validity of the research.

An evidence chain based on the following format was applied to the research:

[6] Saunders et al. (2000) define triangulation as:
"*The use of different data collection methods within one study in order to ensure that the data are telling you what you think they are telling you.*" (p.99)

Figure 2.2 Case study chain of evidence



Source: Yin (2003)

2.13.2 Internal validity

The internal validity of this research was addressed through the exploration of alternative explanations for results. The interface between one event and another is a key concern in obtaining internal validity. The complex relationship between the four case studies, including areas of policy overlap, was analysed to minimise the risk of incorrectly attributing the outcomes of each case study.

2.13.3 External validity

The external validity of case study research indicates how the outcomes of the study can be applied to other situations; in effect the generalisation of the research. The comparative element of this research inherently verifies the application of the evaluation criteria. Conducting evaluations of the different categories of policy instruments demonstrates the transferability of the methodological approach. However, to a degree generalisability is context specific. Therefore the findings of this research should not be generalised to non-climate change policy areas without considering the different policy features, procedures and circumstances for policy making in other fields.

2.13.4 Reliability

Referring to Table 2.9, the sources of reliability within case study research are found in the use of a case study protocol and the development of a case study database. Flick (2002) describes how "*the quality of recording and documenting data becomes a central basis for assessing their [the previous criteria] reliability and that of succeeding interpretations*" (p.369). The case study chain of evidence provides (Figure 2.2) provides the framework for to ensure the reliability of the research in question.

2.14 Chapter summary

This Chapter has presented the methodological approach to the research project and provided justifications for the choice of approach. Chapter 3 presents a comprehensive critique of existing literature in the fields of policy evaluation, instrument design and climate change policy.

3 Evaluation, application of policy instruments and climate change policy

3.1 Introduction

The purpose of this Chapter is to introduce the themes of the research. It also provides a critique of existing literature on the four key elements of the thesis as follows:

- The theory and application of *ex post* policy evaluation techniques
- The optimal application of policy instruments to address environmental problems
- The development of climate change policy in the UK

The first section analyses existing theoretical and academic arguments on policy evaluation. In order to develop policy valuation techniques identified in the theory, and in the absence of sufficient real-life application of the theory, the second section of this chapter identifies the application of *ex ante* appraisal techniques. This section pays particular attention to how *ex ante* assessment informs and shapes *ex post* evaluations. This critique provides the justification of the chosen approach in developing a new methodological model. The second section gives an overview of the application of policy instruments according to the three main categories: regulatory, economic and voluntary. The purpose of this is to facilitate to the comparative element of the empirical research. The third and final section of this Chapter analyses climate change policy development in the UK to provide the context for the case studies.

Section 1: Policy assessment practices

> 'Economic efficiency is not the only standard by which to judge environmental policies, although it is an important one. Using other criteria, such as equity or environmental justice or the extent of public participation, analysts, policymakers, and citizens often ask which programs have proven to be the most successful and which the least.'
>
> (Kraft, 2007)

3.2 Concepts of policy evaluation

There are two key stages in the policy life cycle that require thorough and rigorous appraisal: *ex ante* (prior to implementation), and *ex post* (some time following implementation when evidence is available to judge how the policy is performing). *Ex post* evaluation has been defined as entailing the use of scientific methods to measure the outcomes of policies in order to aid future decision making (Rutman, 1984).

This first part of the literature review chapter is intended to provide an overview of academic progress with *ex* post evaluation theory and to provide background analysis upon which the rationale of this thesis is based. The *ex post* evaluation of policy instruments has been explored by many theorists since the early 1970s. However, as *ex ante* assessment became increasingly popular with policy makers, policy evaluation remained a largely 'academic' area of investigation.

In recent years several organisations have begun to develop the practical application of instrument evaluations, including the European Environment Agency (1997) and the OECD (1999). The British Government has also been pursing evaluation techniques via its *Green Book*, although the guidance remains limited to cost-benefit analysis and there is little consideration of other approaches to evaluate instruments (i.e. through the evaluation of the transparency of an instrument).

The history of evaluation is rooted in academic theory and early developments in evaluation studies often focused on the rationality of decision making (e.g. Schwartz, 1970). Other early examples sought to evaluate the quality of decisions made by policy makers through comparison of the real life situation with the theoretical situation of alternative instruments (Hartle, 1973). Some years later as policy valuation theory developed, albeit slowly, Nagel (1987) identified six

common areas of that was often a result of an evaluation leaning too much in one direction without showing sufficient consideration of the other:

- Based on out of date material or evidence
- Theoretical or practical
- Multi-disciplinary or embedded in political science
- Quantitative or qualitative/subjective
- Under utilised or over utilised
- Too liberal or too conservative

These difficulties associated with evaluations can often be linked to the evaluator and the risk of bias influencing the methodological approach, the analysis of findings and the development of conclusions and recommendations (Weiss, 1998). These issues can be addressed in various ways, such as the development of a rigorous methodological framework to ensure all evaluations are carried out to an acceptable standard and the involvement of stakeholders in the development of conclusions and recommendations to ensure the evaluator has not misinterpreted the available evidence.

The critical importance of evaluation was identified by Weiss in not only the instrument-specific context but in informing future policy design (Weiss, 1999) Unfortunately, in the real life setting policy makers rarely refer to evaluations of earlier policies to help inform present and future policy design. Weiss attributes this to competing interests, differing ideologies and institutional constraints. It is particularly interesting to note that Weiss asserts that evaluators (and this case the evaluator is typically academic not policy maker) often assume their work should inform future policy design. However, there is fundamental gap in the process that means this rarely happens: policy makers may be reluctant to use evaluations to inform decision and therefore may show reluctance to fund evaluations and utilise available analysis.

More recently, the theory of evaluation has developed to include the benefits of systematic reviews and the need to include both quantitative and qualitative research methods to ensure that criteria defined by the researcher are investigated in sufficient depth (Oliver *et al.*, 2005).

Scholars have also been showing increasing interest in the role of actors and institutions in evaluations. Soederbaum (1994) identified the importance of

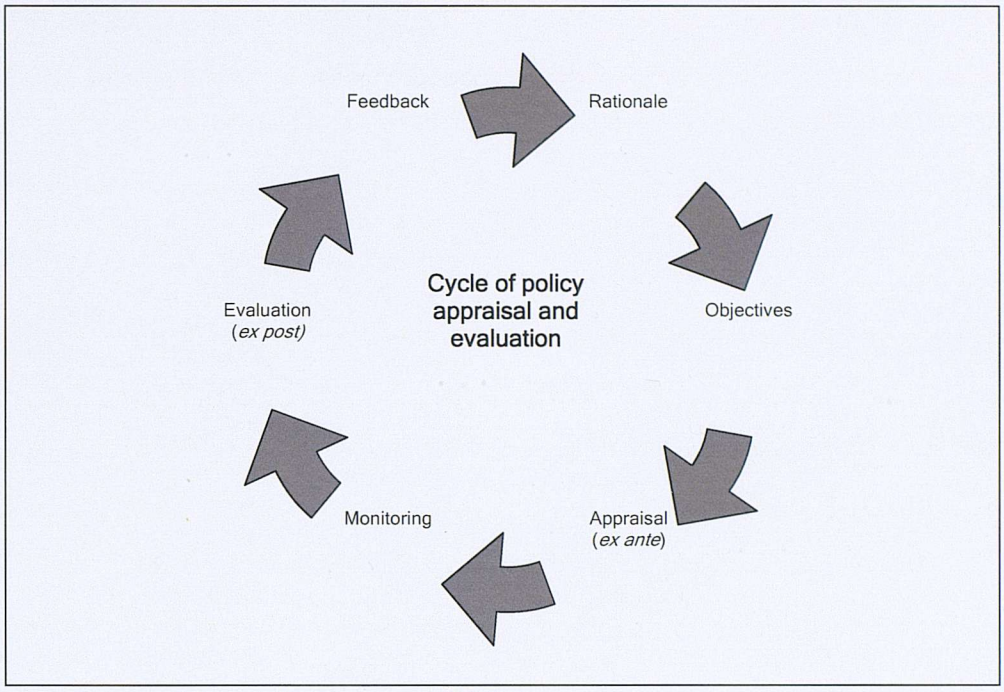
including stakeholders beyond the policy maker, such as businesses and groups representing civil society, in evaluations as policy often starts at the level of the individual, not government. The inclusion of stakeholder is particularly important if an evaluation is intended to determine the extent to which a policy met the objectives and aspirations of stakeholders (Gysen *et al*, 2006). The inclusion of a wider range of stakeholders is of immense value if an evaluator wishes to identify the disproportionate role of certain actors in the policy process (e.g. lobbying by business sectors).

In recent years various organisations and academics have developed assessment criteria to determine the environmental effectiveness of instruments (such as OECD (1999), Carraro and Lévêque (1999). Alberini & Segerson (2002) and Mickwitz, (2003)). Each of these approaches has advanced the use of criteria to evaluate the effectiveness of instruments, but have been limited in their application to only one type of instrument (e.g. Mickwitz only applied the criteria to voluntary agreements). Furthermore, in none of the instances of recent evaluations or evaluations carried out some time ago was evidence of comparative analysis of evaluations located. This could in part be due to the inherent difficulty in comparing different categories of instruments. Arguments that favour one type of instrument over another are often based on assumptions surrounding its superior effectiveness over the alternative (for example Gunningham (1998) makes some interesting assertions on the application of instruments in various settings). By carrying out a thorough comparative analysis of evaluative outcomes meaningful conclusions relating to instrument design are possible.

3.3 Purpose and application of policy evaluations

Policy evaluation should form part of the continuous cycle of policy improvement. The evaluation should be used to provide feedback on the performance of the policy in order to inform amendments to the existing policy or to inform the development of new policies, as depicted in Figure 3.1. Evaluation in turn leads to 'policy learning' and is essential to allow responsive amendments to policy instruments to mitigate or redress the unintended consequences of a policy (Foxon et al., 2005).

Figure 3.1 Role of policy appraisal and evaluation in the policy cycle



Source: Adapted from HM Treasury (2003)

The objective of the evaluation stage of the cycle of policy appraisal can take one of seven routes, as identified by Weiss (1972):

- To decide whether to continue or discontinue a policy
- To improve practices and procedures
- To add or remove techniques and strategies within a policy instrument
- To facilitate the implementation of similar policy instrument elsewhere
- To enable the efficient allocation of resources among competing instruments
- To enable policy makers to accept or reject a specific approach or theory in policy making

Once the purpose of the evaluation has been determined the appropriate framework for analysis must be selected. The frameworks are identified in Table 3.1. Descriptive evaluations are limited to the identification of what happened in a given situation following the implementation of a policy instrument. A casual approach extends the description approach by attempting to identify what influence a policy instrument has had in a specific situation. In reference to this thesis this approach would lead to the identification and determination of the effects of the climate change policies on the greenhouse gas emissions within the

target sectors within the four case studies. However, this research extends the use of the casual framework and takes a normative approach by evaluating, *inter alia,* the effectiveness of the policies in question against pre-established criteria, such as the efficiency of the policies in economic terms and the unintended consequences of the instruments.

Table 3.1 Evaluation frameworks

Framework	Purpose	Questions
Descriptive	Simply observe and measure change	What happened after the measure was put in place?
Causal	Analyse what has occurred in terms of cause and effect Assessment of projected and actual effects of policy enables development of models/scenarios on future trends	To what extent are the observed changes attributable to the measure? Why did *that* measure have *those* particular effects in *those* particular circumstances?
Normative	To provide a judgement on whether the policy outcomes are satisfactory Judgement made against explicit objective or benchmark	Effectiveness: has the policy met its intended objectives in relation to outcomes and/or impacts? Relevance: to what extent does the policy meet the needs of the issue/problem? Efficiency: Have the objectives been met at lowest cost? Utility: Have the intended and unintended effects of the policy resulted/contributed to a net increase in social welfare?

Source: Adapted from European Environment Agency (1999)

Another important question when conducting a policy evaluation, in addition to selecting the most suitable framework for an evaluation, is *who* should conduct the evaluation. Generally there are two options: in-house (e.g. government carries out the evaluation of its own policies) or outside/third party (e.g. independent researchers/think tanks/NGOs/consultants conduct the evaluation) (Weiss, 1972). In-house evaluators may have the benefit of superior knowledge of the mechanics of policy development in any given instance through "inside" knowledge and role in negotiating policy outcomes. They may also be able to save time and resources by having data readily available, such as contact details, performance data and access to previous work undertaken. These positive aspects are balanced by the possibly large risk of a biased evaluation. Policy makers evaluating their own policies may not wish to identify and draw attention

to any failings of their work. This may even lead to the more serious situation of ineffective policy remaining in place because the shortcomings have not been identified.

Evaluations conducted by third parties have the benefit of increased impartiality. The evaluators may be able to provide a more complete picture of the policy as the remit of the evaluation has not been defined by the authorities charged with developing and implementing the policy. But this kind of evaluation can have limitations, namely resource constraints and knowledge uncertainty (Weiss, 1972). Consultants undertaking evaluations may also have conflict of interests if they are employed by both the government to evaluate a policy and private sector firms for other work.

To clarify these issues in relation to this study financial resource constraints have not been an issue due to independent, external funding. Knowledge uncertainty of the researcher has been minimised though the extensive study of both policy documentation and existing literature and though continuous communication and consultation with stakeholders. There is no conflict of interest as the research is funded independently and the researcher has no previous links to any of the organisations involved in any of the four policy instruments. It may be that selected independent academics are best placed to undertake *ex post* evaluations in order to avoid the difficulties associated with other evaluators.

3.4 Approach to policy evaluation in the United Kingdom

There have been limited attempts to pursue systematic and comparative evaluations of greenhouse gas policies across the British government. In 2006 the Inter-departmental Analysts Group (IAG) published a guidance document (Defra, 2006f) to be read in conjunction with the Treasury Green Book and government guidance on RIA (HM Treasury, 2003).

The Treasury Green Book aims to '*promote efficient policy development and resource allocation across government. It does this by informing decision-making, and by improving the alignment of departmental and agency policies, programmes and projects with government priorities and the expectations of the public. The guidance emphasises the need to take account of the wider social costs and benefits of proposals, and the need to ensure the proper use of public*

resource". Further to this aim the Green Book '*describes how the economic, financial, social and environmental assessments of a policy, programme or project should be combined*. However, two points are particularly striking about the Green Book. Firstly, there is an apparent dominance of quantitative techniques within the guidance. Furthermore, the economic valuation of policy is a central pillar of the guidance. Valuation techniques of choice include the transferral of benefits and costs into prices determined by market data. If this is not possible, the techniques of preference (in order of priority) are:

- Willingness to pay
- Revealed preference
- Hedonistic pricing
- Stated preference
- Willingness to accept

Economic valuation rightly has a key role to play in policy evaluation. However, this should not be to the detriment of qualitative techniques as regardless of the problem being investigated it is likely quantitative techniques will not be suitable to address all issues (Quade, 1975). Quade furthers the argument for the use of qualitative techniques alongside quantitative methods as the recommendations arising from the quantitative analysis are not necessarily more robust or useful which is often a result of poor quality inputs and/or analysis The abundance of quantitative evaluative research further supports qualitative approach of this research as a method of academic enquiry (Herrick, 2004, Anger and Oberndorfer, 2008, Brizio and Genon, 2006, Bohringer *et al.*, 2007).

In general, the approach to policy evaluation in the UK has been rather ad hoc. The timing, frequency and depth of evaluations are largely dependent on the Government department in question. An investigation by a Cabinet Office official in 2004 found that commonly used methods included the systematic review of existing evidence, *ex ante* and post hoc evaluations of specific interventions, programmes or policies, strategic audits and performance management mechanisms (Davies, 2004). This report used the term 'evaluation' for all types of policy analysis, *ex ante* and *ex post*. The strengths of the British approach to *ex ante* assessment are clear - the systematic use of RIA being the jewel in the crown. However, the report also identifies the pressing need to implement a rigorous system of *ex post* policy evaluation:

> 'A recent review of the evidence on effective implementation, however, has described the field as 'imperfect and often inconclusive....Successful implementation and successful impacts are clearly closely linked, and both require a combination of experimental/quasi-experimental methods of evaluation methods.'
>
> (Davies, 2004: p.14)

The Government has stressed the need to measure the success of a policy through the comparison of the outcomes with the intended effects (HM Treasury, 2003). These projections, along with provisions for evaluations of the policy, should be incorporated into the RIA. Yet analysis conducted by the NAO and a review of RIAs for this research project found provisions for *ex post* assessment severely lacking (this will be developed further in section 3.5). Herein lies a key problem of existing approaches to evaluation: the reluctance to compare intended impacts with actual impacts with a view to implementing mitigation strategies when the unintended impacts are undesirable.

3.5 Regulatory Impact Assessment

In light of the desired link between RIA and *ex post* evaluation the following sections will provide analysis of RIA practices. The application of some form of pre-implementation appraisal of regulations in the UK commenced in the mid-1980s with the launch of the Deregulation Initiative (Italian, Irish and Dutch Presidencies of the Council of the European Union, 2004). Whilst this early form of RIA attempted to deal with the assessment of compliance costs, it did not seek to address the comparison of predicted costs and benefits. 1996 saw the introduction of "regulatory appraisal", which embedded the use of systematic assessment of the costs and benefits of proposed regulations. By 1998 the practice of RIA was firmly embedded within the policy making cycle (Italian, Irish and Dutch Presidencies of the Council of the European Union, 2004).

In the UK in early 2007, the term Regulatory Impact Assessment was replaced with Impact Assessment (IA) following the publication of new guidance for completing an IA (formerly RIA) (BERR, 2007b). The purpose of the 2007 review was to improve the level of transparency within RIA though the application of Impact Assessments. The review sought to make the RIA process simpler and to ensure policy assessments are carried out earlier in the policy process. Given the short space of time between the launch of the IA guidance and the writing of this

thesis it is difficult to analyse the impact of the revised approach to impact assessment. It is worth noting that the review resulted in the publication of an IA template containing a section dedicated to post-implementation review. The purpose of this section within the IA is to specify the date for evaluation of the policy to enable the identification of the actual costs and benefits. Given the infancy of IA and the lack of interaction between the case studies and IA the remaining analysis will focus on the approach to RIA prior to the guidance revisions and the re-branding of the framework as 'Impact Assessment'.

Figure 3.2 Elements to be included in a Regulatory Impact Assessment relating to post-implementation review

- Once you have implemented a change of policy, it is important to review subsequently how well it is meeting the policy objectives and whether government action is still needed
- Good planning for review during policy development will make clear what will be reviewed and reduce uncertainty for those affected by the policy
- Use the RIA as the starting point for the review. The review should establish a baseline and include the success criteria against which you will assess the effectiveness of the policy in delivering the objective. You should also have success measures included in the implementation and delivery plan
- Describe how and when the review will take place. It is often a good idea to review a policy change after three years but this will depend on the policy. Key issues for review include whether:
    - the policy objective has been met
    - impacts have been as expected, including the costs and benefits
    - there have been any unforeseen unintended consequences
    - government intervention is still required
    - compliance levels indicate that the enforcement regime is effective - perhaps it could now be lighter touch or more risk based
- Say which elements of the policy will be reviewed
- Set out the basis of the review - it could be statutory (forming part of the legislation) or there could be a political commitment to review
- Think about criteria for modifying or replacing the policy if it does not achieve its objectives
- The review should consider the scope for simplification or deregulation and produce a statement for the departmental Simplification Plan. Even if there is nothing to input, the review should trigger a nil return
- During the review you will need to consult stakeholders for their views on the implementation of the policy and whether there have been any unintended consequences. Include any feedback on unintended consequences in the Review
- Where possible you should make a specific person responsible for conducting the review

Source: BERR (2007)

The guidance is clear on the need to ensure sufficient provisions within the RIA for post-implementation review. The focus of the PIR should extend beyond assessing whether the policy met its objectives to the consideration of unintended consequences, compliance levels and whether the policy intervention is still

required. As Chapters 4-7 will demonstrate, there is little evidence of this being carried out in reality.

The UK, along with Denmark and the Netherlands, has been considered to be leading the way in the field of *ex ante* impact assessments (Italian, Irish and Dutch Presidencies of the Council of the European Union, 2004) In 2004, a comparative assessment of RIA application practices across EU Member States found that in the UK RIA is '*compulsory for all regulatory measures with some impact (defined according to general pre-established criteria) and is actually and systematically applied'* (p.5). At a domestic level, the NAO is charged with producing annual reviews of how government is approaching RIA. The reviews commenced in 2003 and are yet to tackle RIAs carried out by Defra. However, the annual reports serve a useful purpose as they have identified a persistent failure within Government to maximise the utility of RIAs. The 2006 review[7] was critical of the approach to RIA across departments:

> 'RIAs are often not used in the right way. The purpose of RIAs is not always understood; there is a lack of clarity in the presentation of the analysis; and persistent weaknesses in the assessments. As a result, RIAs are only occasionally used to challenge the need for regulation and influence policy decisions - although they can still serve a valuable communications role, improving the transparency of departmental decision-making'
>
> (NAO, 2006: p.2)

By the following year, 2007[8], the use of RIA in the decision making process was still found to be lacking in strength. The NAO stated that:

> 'RIAs should be the cornerstone of evidence-based policy making but our results indicate that they were not always being used effectively....RIAs were not an integral part of the policy making process as they were not used to inform and facilitate all stages of policy formation - from initial development through to implementation and review.'
>
> (NAO, 2007b: p.5)

[7] The 2005-06 review of RIAs examined the work of the Department of Trade and Industry, Department for Transport, Home Office, and the Department for Culture, Media and Sport.
[8] The 2006-07 review dealt with the Department of Health and the Department for Communities and Local Government

Beyond these criticisms of British RIA, Persson (2003) found that the quantification of costs of government was, in general, poorly addressed[9]. Furthermore, problems are thought to arise when policy makers experience difficulty in defining the scope of the RIA and executing an RIA that is proportionate to the problem the proposed policy seeks to address (Persson, 2003). Despite these limitations of the approach the UK demonstrates one of the highest levels of support and enthusiasm[10] for RIA in the EU (Radaelli, 2004). This notion is supported by the work of the NAO and the abundance of explicit government guidance on RIA.

At this point it is useful to introduce cost-benefit analysis as a founding principle of RIA (and IA). Particular focus will be given to its application in the UK and the perceived strengths and limitations of the technique, given the central role it plays in RIA.

3.6 Cost-benefit analysis

IA, and its predecessor RIA, are based on the application of CBA to identify the predicted outcomes of a policy instrument, both negative and positive, in monetary terms. The application of CBA, in the context of RIA/IA and in other applications, has been the subject of lively debate in recent years and deserves a brief critique in this thesis.

A succinct history of the development of CBA was presented by Pearce (1998). A detailed analysis of the historical context of CBA is beyond the scope of this thesis. However, a few interesting facts appear in Pearce's work that deserve to be noted by way of providing a brief background on the development and application of the technique. The earliest form of CBA was seen in the mid-1800s. French engineer, Jules Dupuit, developed a method to measure the "marginal analysis" of public spending, indicating that the costs should not exceed the benefits. By 1936 the United States of American (USA) had instigated a policy to

[9] Persson compared 23 British RIAs with 22 Swedish RIAs to analyse the rationality behind environmental decision making in the two countries.

[10] Radaelli (2004) analyses the spread and application of RIA across the EU. The European Commission (DG Enterprise) asked Member States to rate the level of importance of RIA on a scale of 1 to 5 (5 being highest level of importance). The UK was one of only 4 of the pre-2004 EU-15 to rate RIA as 5. Radaelli states that "*accordingly, the enthusiasm for RIA should be quantified*".

ensure that the benefits and costs of projects linked the Flood Control Act were considered. The theory of CBA was all but developed by the 1960s save for some difficulties in dealing with the socio-economic distribution of the costs and benefits. With human health and accidents being the focus of CBA at this time the costs and benefits of projects on the environment were rarely considered. This changed in the 1970s as environmental awareness gained momentum. By the 1980s a CBA had to be performed prior to all US regulations (Pearce, 1998).

The uptake of CBA in the UK was more lethargic than in the USA. The first example of *ex ante* CBA was carried out prior to the construction of the M1 motorway in 1958 (Barrell and Hills, 1972). This first application of CBA has been described as "*experimental*" and even if the outcome was that costs outweighed the benefits the motorway would still have been constructed (Pearce, 2000). These early applications of CBA bear little resemblance to the CBA used today. As discussed earlier, all major policy proposals require an RIA, the basis of which is an analysis of the associated costs and benefits. It is at this point that a discussion of the strengths and limitations of an approach based on CBA is useful. Table 3.2 is provided to give a brief overview of some of the common points of discussion of CBA practices.

Table 3.2 Common strengths and weaknesses of CBA

Strength	Limitations
Test for economic efficiency to allocate scarce resources - identification of policies that might entail 'excessive' costs	CBA can be a time consuming and costly exercise
Helps to identify all the costs and benefits associated with a policy	Difficulty in dealing with cumulative and indirect effects of policies - should certain policies be tackled individually or as part of a portfolio of investments/decisions?
Allows inclusion of social values in decision making based on stated preferences for a policy	Uncertainty surrounding policy outcomes based on scientific uncertainty of the problem
Placing a monetary value on environmental goods may elevate the importance of the environment in decision making	Doubts remain over benefits estimation due to the nature of environmental economics and valuation research
Works best when the goal is economically efficient policy	Transparency issues - especially when costs or benefits are presented as a number without explanation of the process of arriving at that figure
	CBA can be 'cut and dried' with benefits either exceeding or not exceeding costs, but little regard paid to other factors that may be beneficial such as flexibility of a policy
	Other goals, beyond economically efficient policy making, are difficult to account for (such as employment creation, maintaining competitiveness)
	The pace of change within field of valuation techniques means that policy makers undertaking CBAs may have difficulty in maintaining knowledge
	There are huge differences in the quality and 'sophistication' of CBAs - the quality of analysis is severely compromised when previous CBAs are used as the basis for new analyses
	Difficulty in quantifying the monetary value of environmental resources beyond willingness to pay

Source: Adapted from Pearce (1998) and Hanley (2001)

Despite any concerns linked to the use of CBA raised in some literature and the reservations often exhibited by regulatory agencies (Pearce, 1998), the UK Government has favoured the technique since the mid-1980s for new policy/project appraisals (OECD, 2002). In 1991 the Government launched the Policy Appraisal and the Environment document (PAE) in response to its earlier environmental protection document *This Common Inheritance*. Aimed at improving policy assessment across departments the guidance failed to really improve *ex ante* assessment - only 6 proposals during 1995/96 were subject to the methodology described in the guidance and appraisals were found to be

informal and non-quantitative (Hanley, 2001). By 1995 the desire of the Government to reduce the regulatory burden on British businesses led to the publication of the Deregulatory Task Force guidance (Pearce, 1998). This guidance required all government departments to undertake compliance cost assessments prior to the implementation of all new regulations. The focus on compliance costs to business, as a means to support policy proposals, has been identified by the OECD as the primary justification for regulatory analysis in the UK (OECD, 2002). Analysis appears to only seek to support policy proposals based on the cost to business. The costs and benefits to society as a whole may be overlooked. However, it is encouraging that the former Department for Trade and Industry (DTI) was renamed and redefined as the Department for Business, Enterprise and Regulatory Reform (BERR) in July 2007 (BERR, 2007a). This indicates that the government is keener than ever to improve the regulatory environment and gives further purpose and encouragement for the outcomes of this research.

This contrasts with the primary purpose of this task in countries such as Australia, Canada, Scandinavian states, Netherlands and New Zealand - to *inform* decision making (OECD, 2002). Even if appraisal techniques are applied in the correct manner they are often only done so to support a policy proposal, not challenge or change the proposals. Addressing this issue is beyond the scope of this thesis.

3.7 Drivers and barriers to *ex post* policy evaluations

In the Green Book the Treasury made it clear that all policies should be subject to rigorous evaluation post-implementation. It states that:

> 'When any policy, programme, or project is completed or has advanced to a pre-determined degree, it should undergo a comprehensive evaluation. Major or on-going programmes, involving a series of smaller capital projects, must also be subject to *ex post* evaluations.'
>
> (HM Treasury, 2003)

The protocol for conducting an *ex post* evaluation is also described within the document. All evaluations should be based on "*robust analysis*" and should be "*conducted in the same manner as an economic appraisal*". The evaluation should take the shape of a cost benefit analysis based on verified data and evidence rather than predicted outcomes.

Policies relating to greenhouse gas emissions are subject to further discussion in the Defra publication "*Greenhouse Gas Policy Evaluations and Appraisal in Government Departments*" (Defra, 2006f). This guidance was designed to complement the Green Book by providing further specific requirements for GHG policies. The purpose of the guidance is to produce evaluation-based cost benefit analysis and cost effectiveness analysis. The impact of a policy on the following outputs should be included in an evaluation:

- Net costs and benefits
- Total cost
- Cost effectiveness per tonne of carbon
- Sectoral impacts for the Exchequer, firms and households
- Impact of the policy on:
  - public spending
  - security of energy supply
  - air quality
  - energy prices
  - competitiveness
  - fuel poverty

The evaluation guidance is dominated by the use of cost benefit analysis as a methodology. Further to this cost effectiveness analysis is promoted as a means to assess and compare the impacts of policies. Due to the economic nature of these methodologies the common unit of analysis is financial. In the Government publications on policy evaluation there is little reference to the use and application of qualitative evaluation methodologies. These techniques include the collection of information regarding the impacts of a policy instrument on behavioural changes within industry or domestic energy users, impacts of a policy instrument on technological innovation, the involvement of stakeholders in the policy design process and the level of transparency in reporting. Nor do the guidance documents provide scope for the comparative assessment of policy instruments beyond the monetary value of carbon saved. It is intended that the approach taken in this research will provide a framework to complete the picture in terms of policy evaluation by giving sufficient weight to policy outcomes that cannot be transformed into a monetary value.

Although the Defra guidance seeks to provide a clear framework on *ex post* evaluation within government the impact of the guidance and degree of implementation is questionable. In 2007 the NAO concluded that the majority of Government departments are not making sufficient provisions for *ex post* evaluations and when they are carried out it is often to a low standard (NAO, 2007b). This situation is somewhat surprising given the requirement that all *ex ante* RIAs include provisions and timescales for post-implementation reviews. The quality and rigour of the RIAs carried out in relation to the four case studies is highly variable (see individual case study Chapters 4-7) in terms addressing the costs to stakeholders other than business (including Government), provisions for post implementation reviews and considerations of uncertainty. A detailed review of the RIAs undertaken in relation to the four case studies and the CCL (as this RIA has direct ramifications on the CCAs) can be found at Appendix 4.

The PPC RIA deals with the cost to businesses in an adequate manner by specifying approximate costs of payments, compliance costs and one-off costs. Conversely, the RIA for the CCL only specifies the estimated overall income to the Exchequer from the Levy. It is made clear that the Levy is revenue neutral for the Exchequer and it is to be achieved though the recycling of revenue via grants and the reduction in employers' National Insurance Contributions. However, the distribution of the grants is not specified pointing to an equity issue - can any company paying the CCL apply for and receive a grant? Despite these concerns, it is the CCA RIA that causes particular concern. The scope of the RIA is restricted to dealing with the eligibility criteria for entering into an Agreement. This approach led to the exclusion of other important factors for consideration in an RIA, such as the level of fairness of the proposed policy and issues relating to competition. The RIA also fails to specify the policy outcomes in terms of emission reductions or energy savings. It is difficult to understand how these elements were excluded from the analysis given that they are the fundamental aims of the policy instrument. Further to the issues described above, provisions for policy reviews and evaluations were also dealt with in an unsatisfactory manner as these requirements were usually overlooked.

Section 2: Application of policy instruments

3.8 Historical approach to environmental protection in the UK

The use and application of regulatory approaches to managing the environment in the UK can be traced back to 1228 when the use of coal in London became regulated (Tindale and Hewett, 1998). The application of specific environmental and health related legislation arose from the industrial revolution some six hundred years later. The introduction of the Alkali Act 1863 and the resulting Alkali Inspectorate was one of the first examples of the introduction of legislation and the creation of a public body tasked with dealing with a specific environmental and human health issue (Bell and McGillivray, 2000, Bell and McGillivray, 2006). The Act dealt specifically with the control of certain noxious fumes from alkali works in the UK. The Act specified targets for individual installations to reduce their acidic emissions by set percentages. However, as the number of installations increased so did the overall concentration of noxious fumes (Bell and McGillivray, 2006). A decade later saw the introduction of the Public Health Act 1875 and the Rivers Pollution Act 1876. The Rivers Pollution Act prohibited the introduction of all pollution into rivers. However, it proved difficult to enforce for several reasons. The specifics relating to the agencies with the power to bring about enforcement action; the requirement placed on the regulator to consider the needs of industry when granting effluent consents; and, provisions within the Act protecting industry from fines or legal action that may have a detrimental effect upon its activities (Bell and McGillivray, 2006). Nevertheless, these pieces of early legislation proved to be pivotal in the development of health and environmental quality-related legislation. In fact, the Alkali Act was functional, following several amendments, until its repeal in 1996, some 130 years after its introduction (Jordan, 1998).

It was during the 19th century that a key concept underpinning British, and now European Union, legislation was developed: the concept of *best practicable means* (BPM) (Gilpin, 2000). BPM was not specified within the Alkali Act until 1956 and was never interpreted by a higher court (Jordan, 1998). However, the origins of modern-day environmental regulation and the application of Best Available Technique (BAT) can be traced to the use of BPM and subsequent Best Available Technique Not Entailing Excessive Cost (BATNEEC) as a foundation for applying technology standards to industrial activities. BATNEEC guided the

regulation of industrial pollution across the EU from 1984 following the inclusion of the concept in the 1984 Air Framework Directive (Sorrell, 2002). The Air Framework Directive was replaced in 1996 by the Integrated Pollution Prevention and Control (IPPC) Directive (Directive 96/61/EC) and the concept of BATNEEC was subsequently replaced with BAT.

Until the latter part of the twentieth century the development of environmental laws was based on the traditional British system of common law. Environmental problems were often ignored at worst (Hahn, 1993) and at best legislation was developed in an *ad hoc* fashion and was executed in a largely uncoordinated manner (Macrory, 1991). The Royal Commission on Environmental Pollution (RCEP) highlighted the flaws of this approach. The 1976 RECP report concentrated on the performance of the Industrial Air Pollution Inspectorate (IAPI) (Jordan, 1993). Whilst the IAPI was broad in its approach to environmental regulation its remit of dealing with atmospheric pollution was so specific that companies were widely able to shift their pollution and waste from one media to another with regulatory bodies paying little notice and without formal requirements to reduce or render the effluents harmless. The 1976 RCEP report also described the development of British environmental regulation as "discretionary", "collaboratory" and "secretive" (O'Riordan and Wynne, 1987). Furthermore, this regulatory atmosphere left little room for third party involvement in decision making (Jordan, 1993).

The preference for regulatory approaches continued until the mid-1980s when economists started to promote the use of market based instruments (MBIs) as alternatives for or complementary to existing regulatory approaches. This movement was fuelled largely by dissatisfaction with existing models of environmental protection (Bailey and Rupp, 2004) and the desire to bring about greater environmental improvements (Smith, 1995). The American Regan Administration and the British Thatcher government also proved to be key forces behind the drive towards 'deregulation'. However, in the early days of MBIs, policy makers, regulators and environmentalists were not as confident as economists in the potential benefits of MBIs. Many stakeholders continued to favour regulation over MBIs for some time and policy makers were often reluctant to apply economic tools to environmental problems (Helm, 2000). The first large, well-respected organisation to pursue the theory of economic instruments as effective tools for environmental protection and pollution control was the OECD

(OECD, 1989). During the 1980s the organisation began researching the area, prompting governments to take an interest in these "new" policy instruments.

The theory and application of economic instruments has since developed into what has been described as "the hottest growth industry in environmental law" (Orts, 1995). The onset of budgetary constraints within regulatory authorities in the UK was another contributing factor to the increased interest in applying environmental taxes to generate income and reduce administrative costs (Helm, 1993). The 1990 White Paper *This Common Inheritance* also prompted increased interest in MBIs. The White Paper supported the principle of 'the polluter pays' by advocating the use of MBIs such as environmental taxes and tradable permits (Helm, 1998). This stance has been maintained to this day by both Conservative and Labour governments (HM Treasury, 2002). The White Paper proved to be of limited use with the initiative described as "*the shallowest response*" to the improvement of environmental standards (Doyle and McEachern, 1998). Following the publication of the White Paper, the government committed to providing annual updates on progress towards the goals set in the paper. However, this practice ceased in 1996 following criticism that the paper and subsequent annual reports were not being used to influence government policy as planned (Doyle and McEachern, 1998). The final component of the policy 'tool kit', voluntary measures, arrived on the scene with force circa 1988 with the introduction of the Chemical Industry's Responsible Care programme (Givel, 2007). Since the first days of Responsible Care in the USA the programme has developed into a world-wide scheme operating in more than 52 countries and providing coverage of 90% of global chemical production (Responsible Care, 2008). There are currently more than 300 examples of voluntary measures within the EU (Börkey and Lévêque, 2000).

3.9 Regulatory Instruments

Regulatory instruments are often referred to as 'command and control' approaches. They have long played a central role in environmental policy. These instruments can take the form of environmental standards and licences (Abbot, 2006), the application of 'best available technology' and other forms of technology-based requirements (Gunningham and Sinclair, 1998).

The problematic issues of regulatory instruments are well documented and have been discussed frequently in academic circles. Helm (1993) identified the pursuit of self interest on the part of the regulator (rent-seeking) and regulatory capture as two principal concerns that can lead to regulatory failure. Rent-seeking, when regulators attempt to increase their powers and associated budgets or when industry attempts to increase its property rights in the belief that higher emissions now will result in higher property rights in the future, is usually associated with regulatory and economic regimes that are poorly defined (Helm, 1993). If the remit of the regulator is not specified accurately the risk of regulator rent-seeking develops. Regulatory capture - when industry has too much influence over regulators - creates different problems and has implications on the credibility and reliability of regulatory regimes. Rooted in part in information asymmetries, the reliance of regulatory bodies on industry sourced information, often not subject to independent verification (Helm, 1993, Helm, 2006), can fuel doubts over the ability of policy to maximise the social good. The economic inefficiency of many regimes, the lack of flexibility for both the regulator and the regulated, the difficulty in applying regulatory approaches to transboundary pollution and the risk of placing a heavier regulatory burden on new market entrants have all been cited as drawbacks of regulatory approaches (Alm, 1992, Dean and Brown, 1995, Gunningham and Sinclair, 1998, Makuch, 2003, O'Doherty et al., 2003). Regulatory approaches may also struggle to maintain pace with increasingly complex environmental problems (Orts, 1995). Even more complexity and information asymmetry can be found at the EU level, particularly when Member States compete to shape EU policy (Lowe and Ward, 1998).

Despite these documented limitations, regulatory approaches are still the instrument of choice in many jurisdictions due to the level of dependability they provide (Gunningham and Sinclair, 1998). This is particularly noticeable in situations when requirements of the regulated are specified exactly. Providing little room for manoeuvre can offer some degree of assurance of the policy outcomes contributing to a greater overall sense of transparency. Despite claims that regulation may stifle innovation and new market entrants some authors believe that regulation can, in fact, result in the opposite: regulation can inspire firms to obtain 'first mover' advantage (Dean and Brown, 1995). Regulation may even promote innovative behaviour and increase the level of competition within a sector (Sharma, 2001). However, reasons for employing regulatory tools for improving environmental conditions are becoming increasingly overshadowed by

new and emerging techniques. As policy makers, regulators and society are faced with increasingly complex environmental problems the desire to find more "economically efficient" solutions has increased.

3.10 Market Based Instruments

As discussed in section 3.8 MBIs, in the form of environmental taxes, charges, tradable permits and subsidies, had a modest impact in British environmental policy until 1990 (Hahn, 2000). Since the publication of *This Common Inheritance* the academic case in favour of MBIs has grown rapidly. Rajah and Smith (1993) argue in favour of environmental taxes on the basis of efficiency gains[11] and revenue generation. The effectiveness of MBIs in environmental protection is directly related to the ability of the instrument to harness market forces in favour of environmental protection (Galoub, 1998). In terms of the practical implementation level MBIs may be perceived to be a more cost-effective tool for dealing with pollution control. In 1999 United States Environmental Protection Agency (US EPA) estimated that the adoption of MBIs for most pollution control in the USA at federal, state and regional levels would cost only $50 million to the national coffers. This compares with an estimated $200 billion for a regime based purely on command and control regulation (Anderson, 1999).

However, the advantages of employing MBIs over regulatory approaches are balanced by some critical weaknesses. The level of uncertainty surrounding the environmental outcome is higher, especially following the application of a tax, as it is the polluter, not the government or regulator, who decides how much abatement to undertake (Rajah and Smith, 1993). Information asymmetry and the high level of information disclosure (for example, concerning the quality and quantity of effluents) can be problematic for MBIs. Policy makers must subsequently be prepared to refrain from implementing an MBI if the level of information asymmetry is so high as to endanger the ability of the instrument to achieve policy targets. In these situations a regulatory approach may well be

[11] Rajah and Smith (1993) state that the use of environmental taxes increases *static efficiency* where marginal abatement costs of polluting firms vary. A tax on pollution should, in theory, lead to polluters with the lowest abatement costs choosing to abate emissions. These polluters should also abate the most, leaving polluters with higher abatement costs to undertake less abatement. Polluters with abatement costs that are higher per unit than the tax would not find it in their interest to undertake pollution abatement. Environmental taxes may also lead to increases in *dynamic efficiency* as polluters will seek further abatement measures beyond the cost (tax) minimisation level to make further cost savings. This potentially provides an incentive for innovation and research and development.

more appropriate (Gunningham and Sinclair, 1998). The practical implementation of MBIs can be more difficult that the theory allows. The European Commission, for one, has acknowledged that despite a marked increase in the application of MBIs across the EU, these instruments have proven to be more difficult to implement and use than first anticipated in the 5th Environmental Action Programme (European Environment Bureau, 2004, Hare, 2004). Some Member States have successfully implemented environmental taxes aimed at changing behaviour of businesses and the public at low administrative costs. Some have experienced resistance from many sectors of society due to the degree of transparency required by MBIs which can draw undesired attention to polluters.

In addition to environmental taxes, tradable permit schemes are becoming increasingly popular. The success of the US sulphur dioxide trading scheme and the high profile of the EU ETS has led to a rapid growth in the study of tradable permits[12]. The balance of literature appears to be in favour of the application of trading mechanisms compared with environmental taxes. Sterner (2003) believes emissions trading to be the most logical approach to deal with aggregate level of pollution. Furthermore, emissions trading may help policy makers to achieve policy goals with greater speed and with more confidence of the outcome compared to command and control approaches (Ellerman et al., 2003). Yet recent experience of emissions trading has identified two elements that, if not properly addressed, threaten to undermine the economic balance and the environmental outcome of a trading scheme. A tradable permit scheme requires 3 key activities to be undertaken by the regulatory body (Swanson, 1995):

- Decide the total allowable use of a resource/level of pollution/cap setting
- Creation of property rights (i.e. level of pollution or use of resource allowed) via certificates/permits
- Allocation of permits amongst uses/polluters

However, Phase 1 of the EU Emissions Trading Scheme failed to address the cap and allocation of allowances in a way that would prevent over-allocation to participating firms. This eventually led to the collapse of Phase I allowance prices (trading at €0.05 per tonne carbon dioxide (tCO_2) in late 2007) and questions

[12] See Peeters (2003), Hansjürgens (2005), Pring (2006), Soleille (2006), Tietenberg (2006), Hepburn (2007) as some examples for recent studies relating to the performance of the EU ETS and the US SO2 program

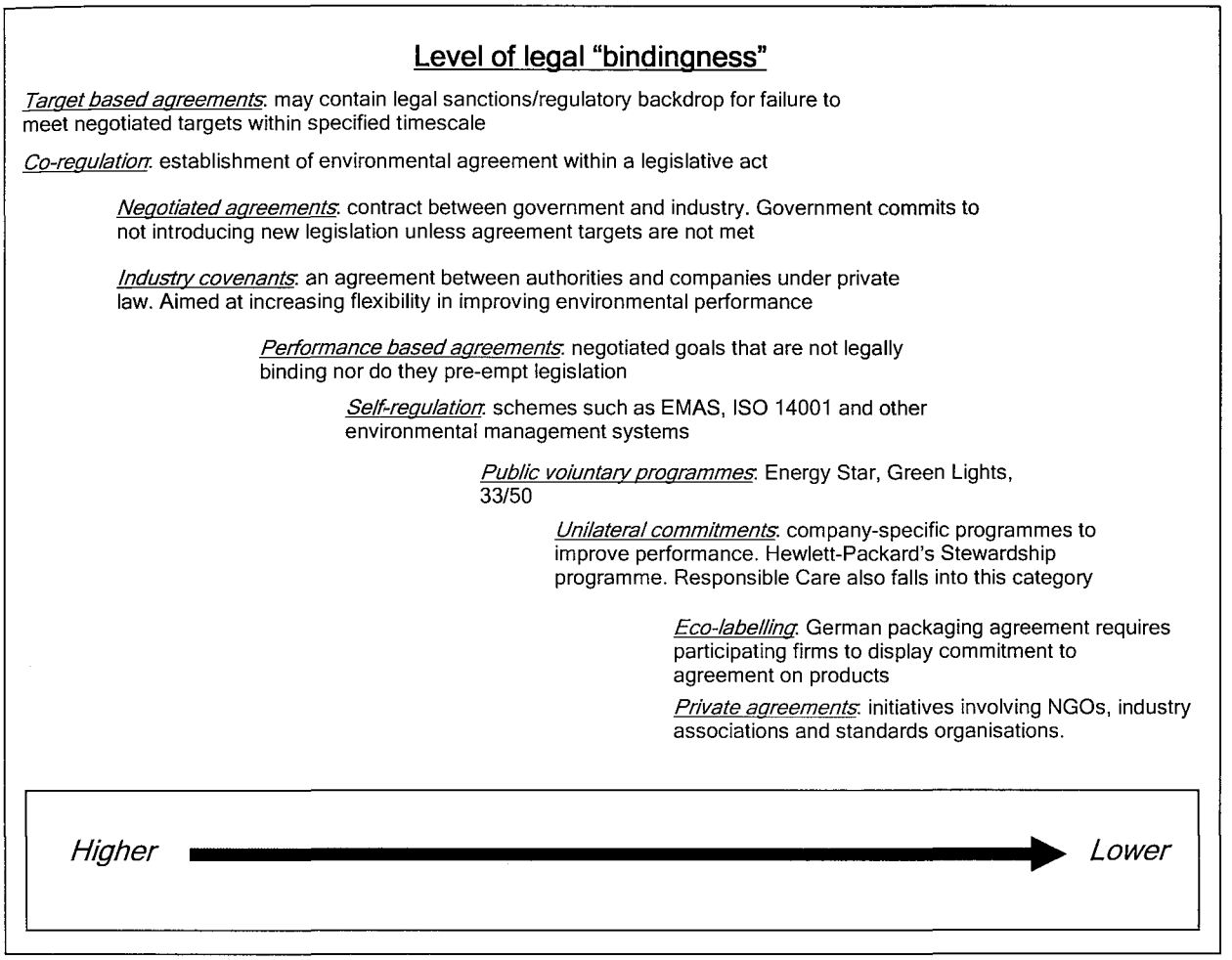
were raised over the environmental benefits. Beyond this illustration, further detailed analysis of the EU ETS is presented in Chapter 7.

3.11 Voluntary approaches to environmental policy

The category of voluntary approaches (hereafter referred to as 'VA') contains numerous instruments including voluntary environmental agreements (VEAs), self-regulation, co-regulation, environmental covenants and environmental management systems (EMS) (Börkey and Lévêque, 2000). The complexity of the field is increased by the variation of terminology, levels of 'voluntarianism' of each instrument and the level of legal 'bindingness' of each instrument, as depicted in Figure 3.3. Within the broad spectrum of voluntary approaches some possess a greater degree of certainty. The more legally binding an instrument is the higher the environmental outcome. Despite this, one crucial weakness in relation to the targets of voluntary approaches has been identified by the OECD. A survey of VAs employed across OECD countries found that whilst the targets were generally met there is evidence that much of the improvements (emission reductions or otherwise) were carried out in the time between target negotiation and the setting of baselines and full implementation of the policy (OECD, 2003).

Voluntary policy instruments divide the academic and policy communities. Numerous studies have been published advocating the use of VAs on the basis of economic efficiency gains (European Commission, 1996, Makuch, 2003, Jimenez, 2007). It has been argued that voluntary approaches can address some environmental problems far quicker than more traditional routes because they require less preparation to implement compared to regulatory instruments (OECD, 2003). However, the environmental effectiveness of such an approach is often dependent on the level of initial preparation (for example in setting baselines) verification of emissions data and preparation of legal documentation (OECD, 2003).

Figure 3.3 Voluntary approaches to environmental policy and the level of legal 'bindingness' of each approach



Source: Adapted from OECD (1997a), OECD (1997b), OECD (1999a), OECD (1999b) and Lehmann (2004)

Resting on the notion of economic savings, it has been argued that VAs may present opportunities to save transaction costs within involved sectors. Glachant (1999) believes that a VA can be more economically efficient compared with command and control or MBIs as the VA can provide the impetus to promote communication amongst firms thus reducing information costs. This is particularly beneficial in instances where knowledge about suitable abatement technologies is limited. However, the transaction costs do not remain at a lower level in sectors where there is localised knowledge of abatement technologies (where some firms have good knowledge and others have inferior knowledge) and in sectors that are less than homogenous in terms of size, turnover and scope of activities (Enevoldsen, 2005). As discussed in section 3.9 regulatory approaches can lack the ability to promote innovation and development of individual solutions to environmental problems. Conversely, VAs may present better atmosphere for

innovative behaviour in allowing firms to develop strategies that meet their individual needs and potentially without compromising the achievement of an environmental goal (Delmas and Terlaak, 2000).

The OECD, the EEA and the European Commission have been principal sources of analysis of voluntary approaches in environmental policy[13] at the supranational level. However, Enevoldsen (2005) argues that these types of analyses often raise more questions than they manage to answer. This is in part due to the difficulty drawing concrete conclusions on the effectiveness of different case studies. Nevertheless, the 1997 EEA report identified some key features that can significantly influence the effectiveness of a VA:

- Clear targets set during negotiations
- Specification of the baseline against which the targets will be measured
- Specific reliable and credible monitoring and reporting mechanisms
- Availability of technical solutions to meet the targets
- Limited compliance costs
- Compliance costs similar across firms
- Involvement of third parties in development and implementation

It can be argued that these seven qualities are required in the development of *all* policies, irrespective of the type of instrument in use. The Aarhus Convention, established via the United Nations Economic Commission for Europe (UNECE) aims to ensure public participation in all environmental decision making, thus meaning that regulatory, economic and voluntary policy approaches should all include adequate third party participation in development and implementation (UNECE, 1998). It is true that VAs may require more third party involvement in order to obtain sufficient support for the measure than other policy instruments, especially as NGOs and other external organisations are often wary of voluntary policy instruments. The presence of credible and stringent legal sanctions should also contribute towards achieving external support for voluntary measures, as advocated by the European Commission (European Commission, 1996). In personal communication relating to the subject matter of this thesis the UK

[13] See European Environment Agency (1997), OECD (1997a), OECD (1998), OECD (1999a), OECD (1999b) European Commission (2002) and OECD (2003) for examples of assessments of voluntary approaches.

branch of Greenpeace highlighted this issue by stating in personal correspondence:

> "We place very little importance on voluntary agreements. We believe they rarely if ever lead to the necessary environmental results and are more often used as a strategy by industry to head off much needed regulation."
>
> (Strutt, 2006).

In addition to the difficulty in recruiting external support for VAs, policy makers wishing to apply this approach to environmental problems must also deal with a problem that in many respects is unique to VAs: the free rider. Free riding is one of the most commonly debated issues relating to VAs (Ten Brink, 2002). This is not without due cause. The presence of free-riders can severely undermine the effectiveness of a VA. There is no better example of free riding than the case of climate change and the Kyoto Protocol - with particular reference to the initial refusal of the USA and Australia to ratify the treaty. Shogren (2004) asserts, in relation to global action on climate change, that:

> 'By free riding, some nations can be better off refusing an agreement. The greater the global net benefits of cooperation, the stronger the incentive to free ride: therefore, self-enforcing agreement is harder to maintain.'
>
> (Shogren, 2004: p.60)

VAs dealing with climate change are particularly susceptible to the negative effects of free riding for multiple reasons (Viguier, 2004):

- Non-participants can not be excluded from enjoying the benefits of action as carbon dioxide (CO_2) accumulation does not have negative local effects - the effects are global irrespective of source location
- Units of emissions reductions are perfectly substitutable (e.g. a reduction of 10 tonnes of CO_2 has the same effect upon the climate irrespective of the location and nature of the polluter)
- Benefits of individual action can be eroded by the inaction of other individuals.
- Number of actors involved
- Difficulty in verification of emission reductions

In light of these issues relating to climate change policy it is an opportune time to commence the critique of climate change policy in the UK, the founding pillar of which is the Kyoto Protocol.

Section 3: Climate Change Policy

> 'An overwhelming body of scientific evidence now clearly indicates that climate change is a serious and urgent issue. The Earth's climate is rapidly changing, mainly as a result of increases in greenhouse gases caused by human activities.'
>
> (Stern, 2006: p.2)

3.12 International climate policy: the United Nations, IPCC and Kyoto

With few exceptions, the global scientific and political communities agree that climate change exists and the causes are primarily anthropogenic (Oreskes, 2004)[14]. In response to increasing concern over global warming, the Intergovernmental Panel on Climate Change (IPCC) was established in 1988 at the 40th Session of World Meteorological Organization (WMO) Executive Council. The United Nations Environment Programme (UNEP) officially endorsed the creation of the IPCC (Intergovernmental Panel on Climate Change, 2004). The aim of the IPCC was to provide independent and scientifically robust information on the emerging issue of global warming and climate change. Further details on the remit and objectives of the IPCC are presented in Figure 3.4. The IPCC formulated the report that was to found the United Nations Framework Convention on Climate Change (UNFCCC), the back-bone of modern climate policy in many countries including the UK.

IPCC relies on the global scientific community to provide expertise on all scientific aspects of climate change, thus allowing the IPCC to present scientifically robust and well-founded assessments of the potential impacts of climate change and the possible steps that can be taken by national, regional and supranational organisations to avert the consequences of climate change. In keeping with the trend of considering socio-economic impacts of policies demonstrated in many jurisdictions over recent years, in 2004 the Chairman of IPCC, Rajendra Pachauri, made calls for greater involvement of social scientists in the debate on climate change, stating:

[14] A survey of 928 peer-reviewed paper published between 1993 and 2003 found that 75% of papers endorsed the theory of climate change, proposed mitigation measures or evaluated the impacts of climate changes. The remaining 25% assessed methods or dealt with paleoclimate science. None of the papers disagreed with the consensus position of climate change and its anthropogenic causes (Oreskes, 2004).

'There is, however, still a greater need for social scientists to get involved in the work related to climate change, so that the biophysical aspects of climate change can be converted and interpreted effectively in socio-economic terms. It is only then that society would fully appreciate the implications of climate change for the human race as well as for other species on this planet.'

(Intergovernmental Panel on Climate Change, 2004: p.1)

Figure 3.4 Aims and objectives of IPCC

Intergovernmental Panel on Climate Change: initial objectives

- Identification of gaps and uncertainties in current knowledge on climate change and its potential impacts
- Identification of information required to evaluate the impacts of policies formulated in response to climate change
- Review current and proposed national policies concerning climate change/greenhouse gas emissions
- Scientific and environmental assessment of all aspects of greenhouse gas emissions issue, this information to be transferred to national governments and intergovernmental organisations

To meet these objectives, the IPCC established three working groups:

I. The Physical Basis of Climate Change
II. Climate Change Impacts, Adaptation and vulnerability
III. Mitigation of Climate Change

Since its inception in Rio in 1992 at the United Nations Conference on Environment and Development (UNCED), UNFCCC has endured repeated assaults on its integrity and ability to drive much needed greenhouse gas emission reductions as detailed in Art. 2 of UNFCCC:

'The ultimate objective of this Convention and any related legal instrument that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse has concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.'

(UNFCCC, 1992: p.4)

In March 1994 the UNFCCC entered into force (UNFCCC, 2004). Yet by the time of the first Conference of the Parties (COP) took place in Berlin in 1995 it was clear that the vague commitments from Annex I[15] parties were insufficient to being about real change. The Second Convention of the Parties (COP-2) took place in 1996, and proved to be a somewhat monumental point in the climate change debate. At this meeting the participating parties officially announced that climate change was a result of human activities. Until this point there was much contention over whether human activities were indeed to blame for climate change or not (Arcas, 2001). COP-3 took place a year later in Kyoto (UNFCCC, 1997). A total of 159 countries were present and consensus was reached on two key issues that were to form the backbone of the Kyoto Protocol: the Protocol would be legally binding; and targets would be more ambitious than previously anticipated requiring Annex I countries to make reductions on their 1990 emissions, not merely stabilise their emissions to 1990 levels (Arcas, 2001). Article 2 of the Protocol identifies the approaches Annex I countries can take in order to meet their commitments, as shown in Figure 3.5.

[15] Annex I countries are all members of the OECD plus countries of the former Soviet Union and Eastern Europe (referred to as economies in transition). There are 40 Annex I countries. The remaining countries, developing and least developed countries are classed as Annex II countries. All countries share a responsibility to address climate change through the implementation of national climate change strategies, technology transfer, research cooperation and education. However, only Annex I formally committed to reduce their greenhouse gas emissions although this commitment is not legally binding (Depledge, 2004).

Figure 3.5 Article 2 of Kyoto Protocol to UNFCCC

Article 2 of the Protocol states that by achieving quantified emissions limitations and reductions in order to promote sustainable development, Parties included in Annex I (shall implement policies and measures such as:

i) Enhancement of energy efficiency in relevant sectors of the national economy;

ii) Protection and enhancement of sinks and reservoirs of greenhouse gases not controlled by the Montreal Protocol, taking into account its commitments under relevant international environmental agreements; promotion of sustainable forest management practices, afforestation and reforestation;

iii) Promotion of sustainable forms of agriculture in light of climate change considerations;

iv) Research on, and promotion, development and increased use of, new and renewable forms of energy, of carbon dioxide sequestration technologies and of advanced and innovative environmentally sound technologies;

v) Progressive reduction or phasing out of market imperfections, fiscal incentives, tax and duty exemptions and subsidies in all greenhouse gas emitting sectors that run counter to the objective of the Convention and application of market instruments;

vi) Encouragement of appropriate reforms in relevant sectors aimed at promoting policies and measures which limit or reduce emissions of greenhouse gases not controlled by the Montreal Protocol;

vii) Measures to limit and/or reduce emissions of greenhouse gases not controlled by the Montreal Protocol in the transport sector;

viii) Limitation and/or reduction of methane emissions through recovery and use in waste management, as well as in the production, transport and distribution of energy.

Source: Adapted from UNFCCC (1997)

3.13 The flexible mechanisms of the Kyoto Protocol

Beyond these measures the Kyoto Protocol contained three key mechanisms that have been subject a significant amount of controversy since their inception (Hepburn, 2007): Joint Implementation (JI), the Clean Development Mechanism (CDM), and emissions trading. The Joint Implementation mechanism, the theory of a Party implementing an emission mitigation scheme or project in another country and then claiming credit against their target emission reduction for doing so, has been criticised by some, predominately by developing countries, on equity grounds (Depledge, 2004). JI projects can be implemented between Annex I countries, but the widely criticised element refers to provisions for Annex I countries to implement projects in Annex II countries (developing countries). It has been argued that allowing industrialised nations to gain credit for action abroad simply allows richer nations to benefit from emission reductions in developing countries, where the reductions are far cheaper than at home (Depledge, 2004). Annex I to Annex I JI is slightly less controversial as the difference in cost of emission reductions across Annex I countries should not be as significant compared with Annex II countries. This reduces the assumption that

Annex I countries are taking advantage of cheaper emission reductions in developing countries. The investments are private but must be of benefit, in emission terms, to the countries involved and all investments must be authorised by both governments and the industries involved (Grubb, 2004).

The Clean Development Mechanism has similar characteristics to JI. However CDM projects must also demonstrate that they are contributing towards sustainable development in the host country (Ellis, 2004). Again, Annex I countries are permitted to undertake projects in developing countries. The resulting certified emissions reductions (CER) may then be credited to the developed country. In the case of EU Member States CERs may be used towards meeting EU ETS requirements in Phase II which coincides with the Kyoto Commitment period (2008-2012). The purpose of the CDM is to provide options for global emissions abatement in the absence of a global trading scheme[16]. This mechanism has resulted in some noteworthy achievements. Ellis et al. (2007) identify increased implementation of climate-friendly projects, increased awareness of climate change and improved institutional capacity to develop climate mitigation projects as some of the key beneficial outcomes of the CDM. Furthermore, reductions from some 325 planned CDM projects across 51 countries are expected to be in the region of 79 million tonnes carbon dioxide equivalent ($MtCO_2e$) during the first Kyoto commitment period from 2008 to 2012 (Ellis et al., 2007).

Markandya and Halsnaes (2004) argue, however, that the involvement of governments in authorising and rejecting projects mean the CDM is far from efficient in achieving emission reductions. The approach to implementing CDM projects has been described as "cumbersome and unrewarding" and "tangled in red tape"[17]. The ability of CDM to promote and advance sustainable development has also been questioned. CDM project do not appear to be facilitating the transition of developing country energy sectors towards renewable energy (Pearson, 2007). The most problematic aspects of CDM thus far are:

[16] Annex II countries cannot participate in emissions trading as they do not have emission reduction commitments under the Kyoto Protocol: "*As they have no target they will never be buyers of emission rights and they cannot be suppliers as they do not have a target against which the supplies can be accounted*" (Markandya and Halsnaes, 2004).
[17] Comments of the Secretary of the Indian Ministry for Non-conventional Energy Sources and the Chief Executive of BP, Lord Browne, respectively. Comments cited by Pearson (2007).

- The geographic concentration of projects and the types of GHG involved (largely in China and India, most projects are related to non-CO2 gases which have higher global warming potential. As a consequence these projects generate huge quantities of CERs) (Hepburn, 2007). While these emissions reductions[18] are valuable, the existing projects are doing little to reduce direct CO_2 emissions from energy generation - the largest source of climate altering gases (Energy Information Administration, 2004).
- Proving the 'additionality' of projects. Donors and host have to demonstrate how the project ahs resulted in emission reductions that would not have necessarily occurred. This is incredibly difficult to assess.
- The link between the EU emissions registry (the Community Independent Transaction Log (CITL)) and the Kyoto credit registry (the International Transaction Log (ITL)) has been fraught with difficulties. By September 2008 the link had still not been established meaning the CERs could not be used by EU ETS participants.

Despite the concerns of CDM and JI, it is the third flexible mechanism that is of most interest to this thesis. Provisions for emissions trading are set out in Art. 17 of the Kyoto Protocol to the UNFCCC stating that:

> 'The Conference of the Parties shall define the relevant principles, modalities, rules and guidelines, in particular for verification, reporting and accountability for emissions trading. The Parties included in Annex B may participate in emissions trading for the purposes of fulfilling their commitments under Article 3. Any such trading shall be supplemental to domestic actions for the purpose of meeting quantified emission limitation and reduction commitments under that Article.'
>
> (UNFCCC, 1997: p.15)

With Art. 17 in mind the EU Emissions Trading Scheme was developed. Further detailed analysis of the EU ETS is presented in Chapter 7. However, this section of the literature review will conclude with a critique of literature on Kyoto's provisions for emissions trading. It was initially predicated that emissions trading between Annex I countries could reduce the marginal costs of meeting Kyoto targets from anywhere between 45% and 72% (Barrett, 2000). However, Barrett

[18] Hepburn (2007) states that the majority of projects deal with HFC-23 from refrigerant manufacturing. Reducing one tonne of HFC-23 equates to 11,700 tonnes CO_2.

stressed that achieving this figure would depend on how emissions trading was developed. In the absence of any modelling it is difficult assess whether marginal costs have been lower than in the absence of emissions trading. Two factors indicate that these predictions may have been over-ambitious: Phase I of the EU ETS has been plagued by difficulties arising from over-allocation of allowances (leading to the collapse of the carbon prices); and the initial refusal of the USA to ratify Kyoto and actively engage in global climate mitigation action.

3.14 Post-2012 Kyoto: the Bali Roadmap

The annual COP meetings following Kyoto in 1997 were plagued by disagreement and conflicting interests. At COP-4 in The Hague in November 2000 it became clear that global agreement on ratification of Kyoto could not be achieved due to the polarised positions of the EU and the USA (Pallemaerts and Williams, 2006). Pallemaerts and Williams describe the refusal of President Bush to put the Kyoto Protocol forward for ratification by the Senate in 2001 and the COP-6 meeting of 2001 as '*a crucial test of a multilateral approach to solving global environmental problems within the framework of the UN* (p.42). As more and more countries ratified the Protocol and following the relative success of COP-7 with the 'Marrakesh Accords'[19], it was emerging that the drive of the EU and its developing country allies could keep the Kyoto Protocol alive.

Subsequent COP meetings passed with minor achievements and set backs, but most attention was focused on COP-13 in Bali. In December 2007 leaders from more than 180 countries assembled in Bali to discuss five issues (Witoelar, 2007):

- a framework for new negotiation proceedings for post-Kyoto/2012;
- the launch of the Adaptation Fund;
- defining the scope for review of Article 9[20] of the Kyoto Protocol;

[19] At COP-7, 172 governments met in Marrakesh to thrash out the finer details of implementing and meeting the objectives of the Kyoto Protocol. The stance of the USA and developed country allies (namely Australia, New Zealand, Ukraine, Russia and Norway) barely changed (Dessai and Schipper, 2003), demanding maximum flexibility in meeting their Kyoto targets. The Marrakesh Accord is a document containing 23 detailed actions to implement the Kyoto Protocol. These actions relate to, *inter alia*, capacity building, technology transfer, principles and provisions for the flexible mechanisms of the Kyoto Protocol, issues relating to land use, land use change and forestry, and 'good practices' within policy making for Annex I countries.

[20] Article 9 to the Kyoto Protocol concerns the review of the Protocol in light of the best available scientific, environmental, economic and social data regarding climate change.

- the definition of a course to reduce GHG emissions from deforestation;
- and, strategies to promote technology transfer.

In this respect the Bali COP was a success. Developed, developing and least developed countries reached consensus on the need to pursue urgent action on climate change (The Economist, 2007). Reaching agreement on post-2012 action will depend greatly on how countries view their "common but differentiated responsibility". Simply reaching agreement on starting negotiations has been hailed as a major success (Witoelar, 2007), although many non-governmental observers of the Bali negotiations left bitterly disappointed by the lack of real progress towards firm commitments for the Copenhagen round of negotiations in November 2009 (COP-15) (The Economist, 2007). The outcome of the 2009 negotiations remain to be seen. One thing is certain: it is going to be a difficult task to reach consensus on who should do how much.

3.15 Approach to climate policy in the UK

Having examined the influence of the UN on global action on climate change one should now consider how this filters down to domestic level activities. In the UK this takes the form of the publication of two national climate change programmes, the *Stern Review on the Economics of Climate Change,* the Energy White Paper (2007) and the draft Climate Change Bill. These actions, on the surface, indicate the UK is leading the way in domestic level responses. But is the action producing real benefits? Or are the reports, reviews and Bill indicating anything more than lip-service? To begin addressing these questions, an overview of the four key Government responses will be discussed in conclusion to this Chapter. The analysis of the four case studies, followed by the comparative assessment, will draw the arguments together to complete the picture.

The initial response of the British government to the Kyoto Protocol is seen in the *Climate Change Programme 2000.* The plan was revised and updated in 2006 in *Climate Change: The UK Programme 2006.* These reports, whilst important in their own right have since been dramatically overshadowed by the *Stern Review* published in 2006 amidst much international furore. Following on from the *Stern Review,* the British Government published its draft Climate Change Bill. At the

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The Protocol should be revised accordingly. However, beyond specifying the first review at COP-2, the text is vague and does not specify when or how often reviews should take place.

time of writing the Climate Change Bill was still on its lengthy journey through Parliament.

3.16 Climate Change Programme 2000 and Climate Change: The UK Programme 2006

The UK's Climate Change Programme (CCP) was published in 2000; six years after the publication of the first attempt by the government to develop a comprehensive strategy for tackling climate change the Government revised its programme (see Table 3.4). Although the British Government was one of the first governments to produce such a plan (Penman, 1996), it believed that the case for tackling the challenge of climate change was clear:

> 'Climate change is one of the most serious threats facing the world's environment, economy and society. But if we all act, the world can avoid its worst effects. The devastating floods, droughts and storms we have seen in the UK and across the world in recent years show all too clearly how vulnerable we are to climate extremes and how devastating they can be. And we have been warned that things will get worse. We have to take practical action to deal with flooding and severe weather. But we also need to tackle climate change by cutting the greenhouse gas emissions that cause it.'
>
> (DETR, 2000a: p.2)

The 2000 Programme contained novel and innovative policy responses. The UK Emissions Trading Scheme, as analysed in Chapter 6, was the first emissions trading scheme in the world open to all sectors of the economy. The inclusion of all six greenhouse gases further added to the novelty of the scheme. However, a comparison of the 2000 Programme with the updated version published in 2006 shows that some of the early predictions for this and other policy instruments were over-ambitious. In particular, the European Union voluntary agreement with car manufacturers[21] was predicted to yield substantial CO_2 emission reductions

[21] The car manufacturers' agreement is a Community-wide voluntary agreement is that aimed to reduce CO_2 emissions from passenger cars. This agreement, referred to as the Commitment in EU documents, requires that manufacturers of passenger cars sold within the EU reduce the CO_2 emissions from vehicles to a fleet average of 140 grams/CO_2 per kilometre by 2008. The Commitment was signed by the European Automobile Manufacturers Association (ACEA) in 1999, with the Korea Automobile Manufacturers Association (KAMA) and the Japan Automobile Manufacturers Association (JAMA) joining the Commitment in April 2000. The Commitment was based on voluntary subscription by

yet led to a hugely disappointing outcome (Environmental Data Service (ENDS), 2007c).

The instruments of interest to this thesis have been highlighted in Table 3.3. The most noticeable difference between the two Programmes is the UK ETS with the 2000 Programme carbon saving figures being much higher than the 2006 Programme.

automobile manufacturers, but should the participants fail to meet target emissions the Commission is likely to adopt formal regulations to reduce the CO_2 emissions from passenger cars (Sustainable Asset Management Group, 2005). Progress against the interim targets was consistently poor (ENDS, 2007a). By late 2007 it was evident that the target would not be achieved by 2008, paving the way for the adoption of formal legislation to reduce CO_2 emissions from passenger vehicles (ENDS, 2007b).

Table 3.3 Changes in predicted carbon savings from measures identified in the 2000 and 2006 Climate Change Programmes

Measure	Inclusion in 2000 CCP	2000 CCP estimated saving in 2010 (MtC)	2006 CCP estimated saving in 2010 ((MtC)
Energy			
Renewables Obligation	✓	2.5	2.5
Business			
Climate Change Levy	✓	2	3.7
UK Emissions Trading Scheme	✓	Minimum 2	0.3
Carbon Trust	✓	0.5	1.1
Building Regulations 2002	✓	1.3 (only one reform noted in 2000)	0.4
Building Regulations 2005	✓		0.2
Climate Change Agreements and IPPC	✓	2.5	-
Climate Change Agreements alone	✓	-	2.9
Transport			
Voluntary Agreements package, including reform of company car taxation and graduated VED	✓	4	2.3
Wider transport measures	✗	-	0.8
Sustainable distribution in Scotland and Wales	✓	0.1	0.1
Fuel duty escalator	✓	1-2.5 (until 1999)	1.9
Domestic			
Energy Efficiency Commitment (EEC) (2002-05)	✓	2.6-3.7 (only one EEC noted in 2000)	0.4
Energy Efficiency Commitment (EEC) (2005-08)	✓		0.6
Energy Efficiency Commitment (EEC) (2008-11)	✓		0.6
Building Regulations 2002	✓	Included in Building Regulations above	0.7
Building Regulations 2006 including 2005 condensing boilers update	✓		0.8
Warm Front and fuel poverty programmes	✗	-	0.4
Market Transformation including appliance standards and labelling	✓	0.2-0.4	0.2
Upgrading district heating systems	✓	0.9	Not included in 2006 CCP
Agriculture			
Woodlands Grants Scheme (England)	✗	-	0.2
Woodland planting since 1990 (Scotland)	✗	-	0.5
Public Sector			
Central Government, NHS, UK universities and English schools including Carbon Trust activities	✓	0.5	0.2
Proposed changes to building regulations, new central estate target and NHS services (Scotland only)	✓	0.1	Not included in 2006 CCP
TOTAL		**21.8 - 24.6**	**20.8**

Source: Adapted from DETR (2000a) and Defra (2006d)

By the time of the publication of the revised Programme in 2006 the degree of scientific certainty of the causes and implications of climate change has improved significantly (Defra, 2006d). The 2006 Programme crucially contained a commitment for the government to publish annual reports on national progress towards the targets within the Programme (see Table 3.4). Provisions for public

reporting of progress against targets was not a feature of the first Climate Change Programme meaning that progress could only be assessed by examining individual policy reviews published by the responsible Government departments. The 2006 Programme also contained additional measures that may result in a further 7 - 12 MtC saving per year by 2010 (Table 3.4). This would raise the total target of the 2006 Programme to 27.8 to 32.8 million tonnes of carbon (MtC) savings per year by 2010, an admirable figure if predictions are realised.

Table 3.4 Additional measures specified in the 2006 Climate Change Programme

Measure	Estimate carbon saving in 2010 (MtC)
Energy supply	
Subsidy for biomass heat	0.1
Second phase of EU emissions trading scheme	3.0-8.0
Business	
Carbon Trust support for investment in energy efficiency in Small and Medium-sized Enterprises (SMEs)	0.1
Measures to encourage or assist SMEs to take up energy saving opportunities	0.1
Transport	
Renewable Transport Fuel Obligation (RTFO)	1.6
Future voluntary agreement with car manufacturers to reduce CO_2 emissions from new cars	0.1
Domestic	
Increased activity in Energy Efficiency Commitment (EEC) (2008-11)	0.5
Provision of advice to stimulate early replacement of inefficient boilers and implementation of the Energy Performance of Buildings Directive	0.2
Package of measures to improve energy efficiency in buildings	0.1
Better billing and metering	0.2
Products Policy: consumer information and standards for lights and other energy-using products (EUPs)	0.2
Agriculture	
Strategy for non-food crops	0.1
Public Sector	
Additional effort by local authorities	0.2
Revolving loan fund for the public sector	0.1
Actions by devolved administrations	0.3
Other measures	0.1
TOTAL	**7.0 - 12.0**

IPPC is a noticeable absence from the 2006 Programme. Whilst the 2006 Programme makes reference to the regulatory regime, any quantitative predictions concerning the impact of the PPC Regulations are omitted in contrast with the 2000 Programme. This absence of quantitative predictions for the PPC Regulations may have arisen for two reasons:

- the difficulty in differentiating between emissions/energy savings from this policy when it is so closely linked to other policies (such as EU ETS and CCL/CCA);

- and, the failure to implement a regulatory regime that properly addresses energy efficiency and reduction in non-CO_2 greenhouse gases.

3.17 Stern Review of the Economics of Climate Change

The Stern Review, published in the same year as the 2006 Climate Change Programme, added further credibility to somewhat political stance of climate change by dismissing any possibility of climate change not being of anthropogenic cause. The Review was published amidst a furore of global publicity not least because it was the only economic study of climate change (based on CBA) that called for immediate and drastic action (Neumayer, 2007). Examining the estimated costs of climate change cited in the Review, it is easy to see why immediate and drastic action was called for. With marginal damage costs of $312 per tonne of carbon emitted today and the total cost of climate change in the order of a permanent loss of 5 - 20% of average global per capita consumption it is impossible to contradict calls for urgent action (Dietz et al., 2007). The body of literature analysing the claims made within the Stern Review is still relatively small, as to be expected with a report of this size published relatively recently. However, the widespread acclaim was coupled with concerns from some corners over the methodologies used within the Review to quantify the impacts and costs of climate change mitigation. Full analysis of this issues is beyond the scope of this thesis. However, it is important to present both sides of the argument concerning the Review. In particular, the discount rate caused a great deal of concern within some academic circles, as demonstrated by Nordhaus (2006). The central argument presented by Nordhaus is that the discounting rate applied of nearly zero magnifies the impact of climate change in the future to justify deep cuts in emissions and consumption now. Furthermore, a higher discounting rate would lead to the present climate policy ramp of modest emissions cuts now and greater cuts in the medium to long term.

Pielke (2007) notes another concerning aspect of the Review: the cost of extreme weather events. Stern states that there has been an annual 2% increase in economic losses due to extreme weather since 1970. However, the source of this information, a conference proceedings published by Muir-Wood et al. (2006) states that when viewed in the context of a longer time-frame (e.g. from 1950 to 2005) there is no apparent trend in losses over time. Furthermore, the

devastating hurricanes experienced in the USA in 2004-05 (including Katrina) account for much of the reported increase in costs.

In the face of any concerns raised over the approach or findings of the Stern Review, it is important to remember that there is no such thing as the 'correct' discount rate (Neumayer, 2007). Furthermore, arguments over the cost of extreme weather and the 'right' level of mitigation will be difficult to resolve. But one thing remains clear, the Stern Review added much needed kudos to the argument for immediate deep cuts in emissions.

3.18 Energy White Paper

The White Paper on Energy was published in May 2007 by the Department of Trade and Industry (DTI) (DTI, 2007a). This White Paper identified the need to ensure the UK has an energy supply system that is both secure and considers the effect of energy generation on climate change. The Paper was controversial for two reasons: the consideration of nuclear and coal energy generation. The White Paper stated that a decision on nuclear power generation had not been finalised and was to be subject to stakeholder consultation. However, this move only came following a High Court[22] ruling on a previous "consultation" on nuclear power. In early 2007 the High Court ruled that the DTI consultation on nuclear power that led the Government to support a new generation of nuclear power stations was "seriously flawed", "misleading" and "procedurally unfair" (The Independent, 2007).

Following a revised consultation process the White Paper on Nuclear Power was published in January 2008 (BERR, 2008c). This White Paper gave the go-ahead to the construction of the first nuclear power stations in the UK for more than 20 years (ENDS, 2008a). The rationale behind the move towards nuclear power included the need to ensure energy security and the benefits of nuclear energy in reducing greenhouse gas emissions. In addition to the controversial promotion of nuclear power, the government also advocated the construction and use of "clean" coal power stations with the potential to apply carbon capture and storage (CCS) technology once the technology reaches maturity. Again, the requirement for a secure energy supply is cited as a driving force behind this move (ENDS, 2008d). However, coal-fired power stations, albeit "clean" coal, seems to be at

[22] The legal challenge was brought about by Greenpeace in 2006 following an announcement that the government would pursue the construction of a new generation of nuclear capacity in the UK.

odds with the Climate Change Bill as the construction of new coal capability will no doubt have serious implications on the ability of the UK to meet the domestic emission targets set out in the Climate Change Bill (ENDS, 2008d).

3.19 Climate Change Bill

Defra claims that the adoption of a legislative tool such as the Climate Change Bill would make the UK the first country to implement a long-term legal framework for addressing the causes of climate change (Defra, 2007l). The Bill is intended to have four central pillars:

- to create a system to implement a "credible" emission reduction pathway to 2050 in order to meet the UK target of 60% GHG reduction;
- to implement a strong institutions framework to manage the transition to a low carbon economy;
- to provide powers to implement addition measures to achieve further emission reductions;
- and, to develop a clear framework of accountability to ensure Government reporting to Parliament (HM Government, 2007).

Following the consultation process the Government announced its intention to include annual, not 5-yearly, emission reduction targets (ENDS, 2008b). The final details of the Bill were unknown at the time of writing.

3.20 Chapter summary

This Chapter sought to address the three pillars of this thesis as follows:

- The theory of policy evaluation
- Approaches in policy evaluation, with particular interest in how *ex ante* assessment can inform *ex post* evaluation
- Application of policy instruments in various settings
- The challenges and approaches to climate change policy in the international and domestic settings

The critique of policy evaluation and analysis of the current governmental approach to evaluation has demonstrated that methods currently employed in the UK need attention. In particular, the qualitative aspects of policy evaluations are often over looked in favour of quantitative methods despite the numerous

advantages of applying *both* methodological techniques. Support for this approach from the IPCC indicates that the nature of research in the spheres of climate change policy evaluation is required and can bring great benefits.
The application of policy instruments and how effective different categories perform are dependent upon numerous factors. Each approach has strengths and limitations that must be considered when developing policy and importantly when evaluating policy instruments *ex post*. Analysis of policy instrument application does not preclude the application of any of the three categories of policy instruments provided prudent design in an appropriate *ex ante*/*ex post* assessment framework

Climate change policy is, without a doubt, one of the most complex issues to face modern society. The approach in the UK, whilst admirable in many respects, requires closer examination to determine what policies are actually performing and which are not. In particular, the sizable conflict between the White Papers on energy and nuclear power and the Climate Change Bill presents a serious and real risk to undermine any progress made in other sectors towards reducing greenhouse gas emissions.

PART 2: ANALYSIS OF CASE STUDIES

4 Pollution Prevention and Control (England and Wales) Regulations 2000

4.1 Introduction

The transposition of the European Union Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (hereafter referred to as "the IPPC Directive" or "IPPC") into domestic law via the Pollution Prevention and Control Regulations was one of the most important events in the development of British environmental law. The IPPC Directive has shaped the way we approach environmental regulation and as such has provided the central pillar of industrial environmental performance across the EU. In the UK, the PPC Regulations have been used to set thresholds for participation in other policies. It is for this reason that the PPC Regulations is the first case study Chapter of this thesis.

This Chapter provides detailed analysis of IPPC as an EU-level Directive. The practical application of the IPPC Directive, via the Pollution Prevention and Control (England and Wales) Regulations 2000 (hereafter referred to as "PPC" or "PPC Regulations") is addressed in more depth to provide a base for the application of the evaluation framework detailed in Chapter 2. The Chapter progresses to present the findings of the evidence-based evaluation following a survey of stakeholders and the analysis of pre-existing evidence (including emissions data, where available).

4.2 Description and characterisation of the IPPC Directive and the PPC Regulations: origins of IPPC in British environmental law

The foundations of the IPPC Directive can be clearly seen in the earlier approach to environmental regulation in the UK. Integrated Pollution Control (IPC) was formed under the Environmental Protection Act 1990 (hereafter referred to as the EPA 1990) has had significant influence upon the development of IPPC (Skea and Smith, 1998). IPC was administered by Her Majesty's Inspectorate of Pollution (HMIP)[23] until 1996 when the Environment Agency was created under

[23] Her Majesty's Inspectorate of Pollution was formed in April 1987 and took over the responsibilities of four previous regulatory agencies (Castle and Harrison, 1996):

- Industrial Air Pollution Inspectorate

the Environment Act 1995[24]. In addition to HMIP, the Environment Agency also took over the responsibilities of the National Rivers Authority (NRA) (Castle and Harrison, 1996).

IPC had two key objectives (Castle and Harrison, 1996):

- To prevent or minimise the release or render harmless certain substances;
- To develop an approach to industrial pollution control that controls the release of all polluting substances into all media whilst viewing the environment in its entirety.

These objectives were to be met by the issuance of authorisations to industrial installations. Under the EPA 1990 operators were obliged to use BATNEEC to prevent the release of prescribed substances. Where this was not possible the operator had to apply BATNEEC to minimise releases of prescribed substances or as a last resort render them harmless. In applying BATNEEC operators were also required to consider the best practicable environmental option (BEPO) when considering the environment as a whole. However, specific details of what were considered "excessive" costs to the environment and industry were not included in the EPA Act. This difficult task was left to the judgement of HMIP (Anderson, 1994).

Despite the novelty and innovation of some elements of the IPC approach, three weaknesses of varying severity have been identified by Murphy and Gouldson (2000). Firstly the resources allocated by central government to implement the regime were insufficient and the number of pollution inspectors was insufficient to allow for effective monitoring of the regime. Secondly, industry was concerned that IPC was expensive to implement. Murphy and Gouldson argue that the required experience of inspectors and permit cost recovery made IPC an expensive regulatory regime.

- Radiochemical Inspectorate
- Hazardous Waste Inspectorate
- Water Pollution Inspectorate

[24] The Environment Act 1995 also led to the creation of the Scottish Environmental Protection Agency (SEPA). With regards to IPPC, the functions of SEPA mirror those of the Environment Agency in England and Wales.

The third criticism, possibly the most serious, concerns the degree of regulatory capture due to the industrial backgrounds of inspectors (Murphy and Gouldson, 2000). Regulatory capture had been a significant problem under the earlier approach of the Alkali Inspectorate in its attempts to implement a regime of "best practicable means" to control emissions. BPM was not based on statutory limits, rather it was left to individual inspectors to reach agreement with operators concerning the degree of pollution control to be employed (Skea and Smith, 1998). However, many inspectors were previous employees of the industries they were intended to regulate. This coupled with the approach of reaching agreement with industry concerning its emissions limits naturally led to an unacceptable degree of regulatory capture. The implementation of IPC was intended to address this issue by taking an "arm's length" approach to industry through the application of centrally set criteria. Industry was to be dealt with at the sector level, no longer taking a site-by-site approach, thus removing the need to base decisions on the judgement of inspectors (Skea and Smith, 1998). However, the lack of a reliable information base for the application of BATNEEC meant that the approach quickly returned to it pre-IPC ways, with HMIP relying largely on industry-supplied information to make decisions. The relationship between inspectors and industry, and the information asymmetries weakened as industry was driving the pace and direction of the environmental improvements arising from IPC (Murphy and Gouldson, 2000).

Despite the many limitations of IPC, some of the lessons learned appear to have influenced the IPPC Directive and the PPC Regulations. For the most polluting processes PPC is administered centrally and the technical requirements of permits are determined at EU level. This significantly reduces the risk of localised industrial influence in the regulatory process. While IPC was primarily concerned with emissions, PPC extends this by seeking to address the wider environmental impacts of industrial activities (Bell and McGillivray, 2006).

Despite the "integrated" approach pursued under IPC, the EPA 1990 in fact created two systems of pollution control: IPC; and Local Authority Air Pollution and Control (LAAPC), for which local authorities assumed responsibility. The rationale behind the two-tiered approach was based on the seriousness of the pollution in question. Under IPC, the EA regulated the most seriously polluting industrial processes, whereas LAAPC was designed to regulate less serious

processes that did not necessarily require control from one central organisation. This format continued with the implementation of the PPC Regulations in 2000.

4.2.1 Rationale of the IPPC Directive

The concept of developing a Community-wide Directive to deal with environmental pollution in an integrated approach was first raised in September 1993 (Faure and Lefevere, 1998). The 1996 IPPC Directive represented a movement within the EU to pursue a holistic approach to environmental protection and the control of industrial environmental impacts. Member States were given three years to transpose IPPC into domestic legislation. As of 1999 all new Annex 1 installations and all significant changes to existing Annex 1 installations were legally obliged to apply for and obtain the relevant domestic licence. All other existing installations that did not undertake significant changes to activities were required to obtain licences sector by sector over an eight year period. The IPPC Directive had to be fully implemented in all Member States by 2007.

IPPC is intended to meet the objectives and principles of the Community environmental policy, as set out in art. 130(r) of the Treaty of Rome[25] in the form of preventing, reducing and, as far as possible, eliminating pollution whilst adhering to the Community principles of 'the polluter pays' and the prevention of pollution (recital 1) (EU Council Directive 96/61/EC). Significantly, the recital 4 of the IPPC Directive states an aim to provide protection of the soil, a media that had previously been neglected in terms of environmental legislation(EU Council Directive 96/61/EC).

Recital 7 further emphasises the need for a holistic approach to environmental regulation as regulating media individually often results in the pollution being shifted to anther media (EU Council Directive 96/61/EC). Furthermore, the

[25] Art. 130(r) of the Treaty Establishing the European Union, signed in Rome on March 25th 1957, sets out the Community principles with regard to the environment. The key, specific principles are:
- preserving, protecting and improving the quality of the environment;
- protecting human health;
- prudent and rational utilization of natural resources;
- promoting measures at international level to deal with regional or worldwide environmental problems

Source: Treaty Establishing the European Union (1957)

Directive aims to take waste management into account, with a view to minimising waste generation and thus providing further protection of the environment.

The IPPC Directive has been amended twice. The first amendment followed the Aarhus Convention[26], and ensured that public participation and access to justice are represented within the Directive. In particular, recital 7 of the IPPC Directive amendments states that the Aarhus convention should ensure that members of the public have a right to participate in decision making concerning all Annex I activities and any other activity deemed to have a significant effect on the environment. Crucially, article 6 of the IPPC Directive was amended to ensure that when a Member State makes a decision should be made public and the permit available to the public. As discussed in section 4.10, the implementation of this requirement in England and Wales is questionable.

The second amendment of the Directive arose from the Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (hereafter referred to as 'the ET Directive').

The IPPC Directive covers six main industrial activities: energy; production and processing of metals; mineral industry; chemical industry; waste management; and other industries (including pulp, timber, textile treatment, tanning, poultry rearing, pig rearing, and various other activities allied to agriculture). Threshold limits, in production or capacity terms, exist within each sector, with the exception of the chemical industry as all chemical plants are included in the Directive regardless of size or output.

4.2.2 Development and consultation of IPPC

During the initial stages in its development, the definition of BAT and its application within the proposed directive met with some criticism, mainly from Germany. The proposed directive followed the British IPC approach, allowing for environmental quality standards to be set at a local level (or in the case of IPPC,

[26] Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC

at a Member State level). It was argued that the absence a mechanism to set environmental quality standards centrally would result in competitive distortions and would fail to harmonise environmental standards across the Community. The final Directive, however, made an effort to compromise. Article 18 reserves the right for the Council to set Community-wide environmental standards to address certain problems should the need arise (Bell and McGillivray, 2006).

4.2.3 Best Available Technique within IPPC

A key element of the Directive is the theory of 'Best Available Technique' (BAT), defined in the Directive as:

> 'The most effective and advanced stage in the development of activities and their methods of operation which indicate the practical suitability of particular techniques for providing in principle the basis for emission limit values designed to prevent and, where that is not practicable, generally to reduce emission and the impact on the environment as a whole.'
>
> (Directive 96/61/EC: Article 2)

The theory of BAT represents a move from the former use of emissions-based and technology-based standards. BAT should enable the competent authority to analyse the available technology to determine the most suitable emission limit for a particular sector. 'Pure' technology standards often fail to achieve the maximum environmental gain as there can be very little focus on emissions, with competent authorities being more concerned with ensuring sectors are installing specified kit. On the other hand, determining emissions standards without considering the technology available to industry can also be problematic as this can lead to the setting of emissions targets that are too high (due to the unavailability of technology or the excessive cost of available technology) or too easy to attain.

However, the Directive does provide for the introduction of environmental quality standards that are stricter than BAT, should the need arise, in art. 10. In order to implement the theory of BAT and in adherence with Article 16 (2) of the IPPC Directive, the Commission, in consultation with Member States and industry, has developed guidance notes for each sector covered by the Directive. These documents, BAT reference documents (or 'BREF' documents), are available to the public and form the basis of IPPC permits across the Community.

4.2.4 Reporting at EU level: EPER and E-PRTR

In 2000 the Commission published a decision relating to implement the European pollutant emission register (EPER) (European Commission, 2000). IPPC Annex 1 activities producing emissions exceeding prescribed thresholds are required to submit data to the EPER every three years from 2001. EPER is a joint initiative bewteen the Commission and the EEA (Dooley, 2004). EPER currently covers 42% of EU CO_2 emissions and 15% of methane (CH_4) emissions (European Pollutant Emission Register, 2007). Data published in late 2006 for the reporting year 2004 covered more than 12,000 industrial installations across the expanded EU (including all new Member States) (European Commission, 2007c). However, these 12,000 installations represent under 25% of the total 52,000 installations covered by IPPC across the EU (European Commission, 2008b).

Whilst EPER represents a useful addition to environmental data sources it suffers from a lack of enforcement capabilities of the EEA. The Council Decision of 17 July 2000 is a minimal document that presents a simplistic approach to EPER. Issues such as enforcement, sanctions and reliability of data are not sufficiently tackled. EPER exists purely as a database to enable citizens to access environmental data from across the EU. However, EPER is soon to be replaced by Regulation (EC) No 166/2006 of the European Parliament and of the Council of 18 January 2006 concerning the establishment of a European Pollutant Release and Transfer Register and amending Council Directive 91/689/EEC and 96/61/EC (hereafter know as 'E-PRTR').

E-PRTR represents a significant step forward in terms of coverage of emissions, penalisation of failure to adhere to the rules of the regime, public participation and data quality assurance (European Parliament and the Council of the European Union, 2006). The following paragraphs present some of the key elements of E-PRTR.

Recital 6 of E-PRTR identifies how "*the Protocol builds on the same principles as EPER, but goes beyond, by including reporting on more pollutants, more activities, releases to land, releases from diffuse sources and off-site transfers*". A comparison of Annex I of E-PRTR and Annexes A1 and A3 of EPER highlights the degree to which the boundaries have been expanded. Under EPER only installations exceeding the threshold have to report their emissions, and these installations only have to report their emissions that exceed a threshold, not all

emissions. Under E-PRTR many categories of installations, for example chemical industries, have to report all emissions irrespective of installation size, quantity of emissions and type of emissions. The implications of this change will be significant. For example, in 2004 only 6 organic chemical installations in the UK reported CO_2 emissions, although one can be reasonably certain that most chemical installations, if not all, produce CO_2 emissions to some degree. Increasing the quantity and quality of data available to all stakeholders represents a clear move towards meeting the requirements of the Aarhus Convention.

4.3 Transposition of IPPC Into UK legislation

The vast number of installations - approximately 52,000 across the EU - covered by the IPPC Directive led to a substantial transition period being granted between 1999 and 2007. Installations in existence prior to 30th October 1999 were to be covered by a permit by the 2007 deadline, but new installations were required to obtain a permit immediately. The Directive requires installations to provide the information in stated in Figure 4.1, to the relevant competent authority.

Figure 4.1 Permit application information requirements

Detailed description of the following must be provided by a permit applicant to the relevant competent authority:

- the installation and its activities
- substances used or generated
- energy used or generated
- emission sources
- conditions on the site
- nature and quantities of foreseeable emissions and the likely environmental impacts of these emissions
- proposed abatement techniques
- waste prevention and/or recovery measures
- planned measures to monitor emissions

Source: O'Malley (1999)

The legal framework for the implementation of IPPC in the UK was established in the Pollution Prevention and Control Act 1999. The Act led to several sets of regulations dealing with specific geographic locations: the Pollution Prevention and Control (England and Wales) Regulations 2000; the Pollution Prevention and Control (Scotland) Regulations 2000; and the Pollution Prevention and Control (Northern Ireland) Regulations 2003 (Environment Agency, 2007, Environment and Heritage Service, 2007, Scottish Environmental Protection Agency, 2007).

The Offshore Combustion Installations (Prevention and Control of Pollution) Regulations 2001 were also introduced to deal specifically with the application of the Directive to offshore installations (i.e. oil rigs, gas rigs). Finally, the Pollution Prevention and Control Ordinance 2001 was introduced to implement the Directive in Gibraltar (Defra, 2003b). The Directive was one of the first pieces of European legislation to be transposed into UK law following devolution.

There are two competent authorities within England and Wales responsible for issuing permits. The Environment Agency claims responsibility for regulating the majority of sites (approximately 85% of installations) (Defra, 2003b). The remaining 15% of installations are regulated by local authorities (LA) (at either London, metropolitan or district council level). The installations regulated by LAs are viewed as presenting a lower pollution potential, and therefore deemed suitable to be monitored and regulated at the LA level.

4.3.1 Consultation and RIA of the PPC Regulations

The proposed PPC Regulations were subject to several rounds of consultation between 1997 and 1999[27]. According to the RIA carried out by the DETR 200 responses were received following each consultation exercise. A final consultation was carried out on the final content of the Regulations in April 2000 (DETR, 2000b).

The DETR also attempted to analyse the impact of the PPC Regulations on small businesses. Unfortunately the consultants employed by the government were unable to quantify the impacts accurately. However, it was thought that the impacts would not be significant. In fact feedback from some small businesses identified the business sense of waste minimisation and energy efficiency as areas to make cost savings if dealt with in a "common sense" manner by the regulator.

The RIA specifically assessed the changes IPPC would make to the existing IPC regime operated in the UK. These changes included the handling of applications, frequency of permit reviews, requirements for site remediation, the inclusion of energy efficiency measures and installations that were previously covered by IPC but were not included in IPPC. However, the 440 installations that do not fall with

[27] Consultations took place in July 1997, January 1998, January 1999 and August 1999.

the IPPC Directive but were covered by IPC were incorporated into the domestic PPC Regulations. This led the prediction that 7000 installations would be covered by PPC. By 2005 1800 PPC permits had been issued across the UK (Defra, 2007f). By the end of October 2007 - the EU deadline for transposition of the Directive - 3974 permits had been issued throughout the UK, with a further 215 permits application requiring processing (Defra, 2008d) (refer to Appendix 5 for a list of activities and implementation dates).

A further crucial element of the RIA was the calculation of application and compliance costs. DETR estimated that costs associated with a PPC application may be in the region of £20,000 to £60,000, depending on how prepared the applicant is. A mid-term review commissioned by Defra and conducted by Atkins consultants found that the mean one-off application costs were in the region of £48,000, including in-house staff costs, consulting costs and other associated costs[28] (Defra, 2007g; Saarinen, 2003), well within the region predicted in the RIA. The lowest stated cost was £500, in contrast to the highest at £317,000.

The RIA did not make specific predictions relating to compliance costs as "*costs of compliance with permit conditions are both potentially the most significant and also the hardest to estimate*" (DETR 2000b: p.6). Compliance with permit conditions could result in actual cost savings, arising from energy efficiency measures and waste reduction for example, or could run to hundreds of thousands of pounds, as stated in the RIA.

4.3.2 Best Available Technique within the PPC Regulations

The basic fundament of BAT is that sources of pollution should adopt the most effective technology in terms of protecting the environment from the polluting effects of an industrial activity.

Paragraph 3 of the Pollution Prevention and Control (England and Wales) Regulations 2000 define each component of BAT as follows:

(a) "available techniques" means those techniques which have been developed on a scale which allows implementation in the relevant industrial sector, under economically and technically viable conditions,

[28] 'Other costs' refers to administration costs, advertising, site surveys and environmental surveys.

taking into consideration the cost and advantages, whether or not the techniques are used or produced inside the United Kingdom, as long as they are reasonably accessible to the operator;

(b) "best" means, in relation to techniques, the most effective in achieving a high general level of protection of the environment as a whole;

(c) "techniques" includes both the technology used and the way in which the installation is designed, built, maintained, operated and decommissioned.

These definitions result in the exclusion of experimental techniques from consideration and techniques that have been proven to work in the specific conditions of other countries but not in the UK (Bell and McGillivray, 2006).

As with much terminology found within environmental policy the definition of BAT within the PPC regulations is sufficiently vague to allow the regulatory authorities a certain degree of discretion when attaching BAT conditions to permits. The discretionary approach to BAT implementation should be considered against the desire of regulatory agencies to improve environmental performance over time. The flexibility of the approach means that the concept of BAT should elicit maximum environmental performance from industry though on-going negotiation of the best available technology to ensure the interpretation of BAT for any given sector is as advanced as possible.

4.4 Implementation of the PPC Regulations in England and Wales

Industrial activities covered by the PPC Regulations are detailed in Schedule 1 to the Regulations. Within Schedule 1 activities are segregated into three sub-categories according to the perceived scale of environmental impact. Part A(1) activities are regulated and administered by the Environment Agency in England and Wales, as specified in paragraph 8(2). In regulating these installations, whether permanent or mobile plants, the Environment Agency is required to ensure that installations achieve "*a high level of protection of the environment taken as a whole by, in particular, preventing or, where that is not practicable, reducing emissions into the air, water and land*" (The Pollution Prevention and Control (England and Wales) Regulations, 2006). Part A(2) activities are controlled by the local authorities according to location. Despite the difference in regulating authority, these activities also produce emissions into air, land and

water regulated by PPC permits. However, these activities are deemed to be less environmentally harmful thus placed under the control of local authorities instead of the centrally administered Environment Agency. The final category of activity referred to in Schedule 1 is Part B installations. These activities have the least damaging environmental impact. As with Part A(2) activities, local authorities are the relevant regulatory authority. However, only emissions into air are subject to PPC permit requirements. These activities were once controlled by via Local Authority Air Pollution Control.

4.5 Interaction between IPPC and the European Union Emissions Trading Scheme

By its very nature, the IPPC Directive tackles all forms of environmental impacts arising from a wide array of industrial activities. This includes greenhouse gas emissions. Oxides of nitrogen are referred to in Annex III but all other GHGs are referred to implicitly. Article 1 provides for the coverage of all emissions into air from the activities covered by the permitting system (Olsen, 2006), although coverage of GHG emissions are restricted if these emissions are covered by the EU ETS or another comparable policy instrument, and these emissions are unlikely to cause any significant local pollution (art.9(3)).

Therefore, emissions of greenhouse gases from installations covered by the ET Directive are not subject to BAT. However, at the time of writing, only CO_2 emissions are included in the EU ETS, with the remaining five GHGs covered by the permitting regime of the IPPC Directive.

Further differences between the IPPC Directive and the ET Directive also deserve discussion at this point. The IPPC Directive does not require the imposition of specific pollutant levels or the installation of specific technology. A fundamental aspect of the Directive is BAT, enabling competent authorities to assess the technology available to individual sectors, and then factor in the geographic and environmental issues when determining the maximum permitted values of each pollutant into each media. Cap-and-trade systems, on the other hand, operate by establishing the maximum allowable emissions across the entire scheme (or within a certain region within the scheme), and then allowing participants to decide whether to reduce emissions below the allocation and bank or sell excess allowances, meet the cap, or exceed the cap and purchase extra

allowances. In this sense, the EU ETS offers a 'guarantee' of the minimum expected emissions reductions (Olsen, 2006). Conversely, BAT may not provide financial incentives to encourage organisations to reduce their emissions below the limit specified within the permit.

The allocation of EU ETS tradable allowances is also dependant upon the granting of a permit. The GHG permit, requirements found in art. 5 of the ET Directive[29], mirrors the requirements for an IPPC permit, is a pre-requisite for installations receiving GHG allowances. As a result, an installation operating within the remit of the EU ETS would have two permits. Article 8 of the ET Directive and art. 9(3) the IPPC Directive make provisions to avoid the risk of duplication by ensuring GHGs covered by an EU ETS permit and subsequent inclusion in the EU ETS are not included in the integrated permitting under the IPPC directive.

Whilst both approaches include a permitting regime, the differences between the two systems have been identified by Olsen (2006) as potentially signalling a change in direction for European environmental law. The IPPC Directive is explicit in allocating responsibility to Member States and competent authorities for assessing and taking into account local conditions and the application of BAT. Conversely, the ET Directive does not leave much to the discretion of Member States and their competent authorities, therefore "*diminishing the regulatory role of the Member States*" (Olsen, 2006: p.159). It is with this in mind that Olsen continues "*this [diminishing role of Member States] is not unusual in an EU context, but it is unusual in the context of environmental law and may be seen as an indication of what could be a change of approach to environmental regulation*" (p. 159).

The allocation of powers to Member States to determine the costs and benefits within their specific geographic and environmental areas will play a significant

[29] An application to the competent authority for a greenhouse gas emissions permit shall include a description of: (a) the installation and its activities including the technology used; (b) the raw and auxiliary materials, the use of which is likely to lead to emissions of gases listed in Annex I; (c) the sources of emissions of gases listed in Annex I from the installation; and (d) the measures planned to monitor and report emissions in accordance with the guidelines adopted pursuant to art. 14 (Guidelines for monitoring and reporting of emissions).

role in this, but the introduction of the BAT Reference[30] document should go some way to combating this situation (O'Malley, 1999).

In addition to the differences highlighted in the preceding paragraphs, the two Directives have contrasting applications of public participation and provisions of information to the public. The IPPC Directive was amended in 2003[31] to account for the provisions of the Aarhus Convention. This resulted in the introduction of art. 15 on access to information and public participation in the permit procedure and the corresponding Annex V. Article 5 prescribes the participatory opportunities Member States must grant the public, specifically when: issuing a permit for a new installation; issuing a permit for any substantial change in the operation of an installation; and the updating of a permit or permit conditions for an installation in accordance with art. 13, paragraph 2, first indent 1[32]. Annex V provides further details of the role of public participation, including possible methods of communication (i.e. publication within local press, bill posting) and the methods for public consultation (i.e. written submissions, public inquiry). Importantly, Annex V also makes provisions to ensure the results of public consultation are taken into account during the decision making process. However, the degree to which public participation can influence the decision making process remains unclear from the Directive itself.

The permitting regime within the ET Directive takes a different approach to the inclusion of public participation. The Directive makes reference to access to information in several articles, although stops short of including an article dedicated to public participation. Article 17 deals with access to information, but contrary to the art. 15(5) of the IPPC Directive specifies that the competent authority will provide information to the public should it be *requested* and in accordance with art. 3(3) and art. 4 of Directive 2003/4/EC[33]. However, despite

[30] BAT Reference document (BREF) is an information exchange mechanism that includes information concerning best practice for all of the activities covered by the IPPC Directive.
[31] Directive 2003/35/EC of the European Parliament and of the Council of 26 May 2003 providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending with regard to public participation and access to justice Council Directives 85/337/EEC and 96/61/EC
[32] Art. 13(2) indent 1 states: pollution caused by the installation is of such significance that the existing emission limit values of the permit need to be revised or new such values need to be included in the permit
[33] Directive 2003/4/EC of the European Parliament and of the Council of 28 January 2003 on public access to environmental information and repealing Council Directive 90/313/EEC. Art. 3(3) relates to the conduct of competent authorities if the request for information is too vague. Article 4 relates to exceptions and permitted refusals to requests for information.

the lack of an article dealing explicitly with public participation and access to information, MacDonald and Makuch (2006) highlight the availability of alternative legal instruments that can enhance public participation and access to information with regards to the EU ETS. Of specific importance here is the link between the IPPC Directive and the ET Directive, which in effect signifies that installations covered by IPPC and requiring a GHG permit are subject to the more rigorous public participation and access to information provisions of the IPPC Directive.

4.6 Overview of performance to date

Article 16(3) of the IPPC Directive places responsibility upon Member States to submit reports on progress with implementation every three years. The United Kingdom submitted reports in 2003 and 2006 (Defra, 2003b; Defra, 2006g). These reports cover areas of generic interest with regards to implementation, *inter alia*, provisions for transposition into domestic law, number of installations covered by the Directive, identification of relevant competent authorities, and provisions within domestic legislation to meet the key objectives of the Directive such as efficient use of energy, monitoring requirements, waste management and limit values for emissions to air and water.

A considerably more detailed review of the implementation of the PPC Regulations was published by Defra in 2007 (Defra, 2007f). This review sought to investigate three issues:

- to calculate the capital and operating costs for industry and the administration costs for the regulators;
- to assess the benefits of the Regulations;
- and, to identify other issues relating to the implementation of the PPC Regulations such as the regulatory burden, the impact on SMEs and the development of environmental industries

The Review identified that the PPC Regulations have been the vehicle for implementing other EU Directives beyond IPPC including the waste incineration Directive (WID) and the large combustion plant Directive (LCP)[34].

[34] Directive 2000/76/EU of the European Parliament and the Council of 4 December 2000 on the incineration of waste, Directive 2001/80/EC of the European Parliament and the Council of 23 October 2001 on the limitation of certain pollutants into the air from large combustion plants

Further to this Review, in April 2008 the Defra and the Environment Agency launched a new permitting regime for industrial installations in England and Wales following a lengthy process of consultation with industry. The Environmental Permitting Programme (EPP) was first developed in 2005 and was intended to reduce the regulatory burden placed on industry by implementing a system requiring one single environmental permit arising from a common approach to application, administration, monitoring and enforcement (Defra, 2007k). EPP was implemented to combine the permitting processes of the PPC Regulations and waste management licensing[35] with the overall aim of streamlining the permitting processes (Defra, 2008f). The Environmental Permitting (England and Wales) Regulations 2007 came into force on 6th April 2008. Defra states the primary objectives of EPP are (Defra, 2008a):

- to protect the environment;
- deliver permitting and compliance effectively and efficiently in a way that provides increased clarity and minimises the administrative burden on both the regulator and the operators of facilities;
- encourage regulators to promote best practice in the operation of regulated facilities;
- and, continue to fully implement European legislation.

It is too early to provide any insights and analysis of the EPP. However, should streamlining the administration of PPC and waste management licensing be achieved there may be significant financial and environmental benefits, as detailed in the RIA published in 2007 (Defra, 2007b).

[35] The precise directives and regulations included in the streamlining process (and the relevant coverage) include:
- Part A installations and Part A mobile plant (the Integrated Pollution Prevention and Control Directive)5 - Schedule 7
- Domestic Part B installations and Part B mobile plant - Schedule 8
- Waste Framework Directive - Schedule 9
- Landfill Directive - Schedule 10
- Waste motor vehicles (the End of Life Vehicles Directive) - Schedule 11
- Waste Electronic Electrical and Electronic Equipment Directive - Schedule 12
- Waste Incineration Directive - Schedule 13
- Solvents Emission Directive - Schedule 14
- Large Combustion Plants Directive - Schedule 15
- Asbestos Directive - Schedule 16
- Titanium Dioxide Directive - Schedule 17
- Petrol Vapour Recovery Directive - Schedule 18

4.7 Overview of evidence-based analysis

The PPC Regulations survey was circulated to 65 sector associations representing all PPC activities in October 2007. A total of 11 responses were received (response rate: 17%). A further 13 questionnaires were sent to external stakeholders. Only one response was received (from the Environment Agency) despite significant effort to increase this response rate through email and telephone contact to stakeholders. 55% (n=6) of sector association respondents stated they would be willing to participate in an interview. All of these respondents were subsequently contacted. Interviews were carried out with 6 questionnaire respondents. One further sector association was interviewed who had not completed the questionnaire but was willing to participate in the research through an interview. The PPC Policy Manager from the Environment Agency was also interviewed.

4.7.1 Sector associations

Each sector association was asked to give a brief overview of their organisation and their members, as detailed in Table 4.1. Two respondents did not provide this information:

Table 4.1 Size of responding organisations

Size	% respondents
1-10 members	44%
11-20 members	22%
21-30 members	22%
31-40 members	0%
41-50 members	0%
More than 51 members	11%

Given the ranges presented above the minimum and maximum numbers of companies represented by the responding sector association are 119 and 191 respectively. 56% of sector associations reported representing companies with installations operating in EU ETS. A total of 53 installations operated in Phase I of the scheme. A further 33% stated that they represented companies operating in Phase II when a further 156 installations will be operating in this Phase.

4.7.2 Emissions/environmental data collection

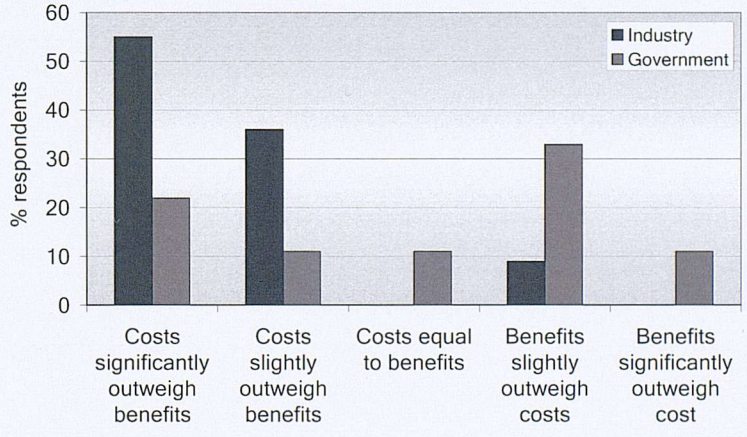
Specific environmental performance data has been sourced from EPER. However this data is limited by the scope and frequency of data submission. At

the time of writing, data had only been submitted for years 2001 and 2004 and the next available data set would be located on E-PRTR. Moreover, only installations exceeding threshold values have to submit data to EPER. Although this accounts for 90% of all emissions from IPPC activities the remaining 10% of emissions are not reported. This shortfall in the data needs to be considered when analysing emissions data obtained from EPER.

4.8 Economic efficiency

Sector associations were asked to identify their perceptions of the costs and benefits of the PPC Regulations to both industry and the Government, where the benefits are identified as energy efficiency improvements and GHG emission reductions. As Figure 4.2 depicts, more than half of sector association respondents believe the costs associated with the PPC Regulations are significantly outweighed by the benefits associated with energy efficiency and GHG emissions. Conversely, the attitude towards the costs incurred by government shows that the climate change related benefits are slightly higher than the costs.

Figure 4.2 Comparison of costs and benefits incurred by the government and industry



The 2007 review conducted by Defra found that the average one-off application cost was approximately £48,000, including own staff time and consultancy services. Some companies reported consultancy costs of £200,000, highlighting the significant variation in applications costs due mainly to variations in the complexity of the installations involved. In addition to the one-off application costs, companies spent an average of £307,000 on capital investment (CAPEX)

to meet PPC requirements, although the expenditure ranged from zero to £5 million (Defra, 2007f). In addition, the average on-going annual compliance costs of management time, monitoring, reporting and other costs are in the region of £43,000. The Defra review analysed various other costs including the difference in cost to companies formerly regulated by IPC and costs incurred due to the BAT element of the application process. Without wishing to replicate all the information, the average cost of every element of the Review has been calculated to give an indication of the potential costs involved for industry. Details of average reported costs are presented in Table 4.2 and Table 4.3.

Table 4.2 Average one-off costs of the PPC Regulations

	Average one-off cost	Average (£)
A	One-off application costs	48,119
B	One-off compliance costs	351,942
C	BAT element of application - own staff	8,577
D	BAT element of application - 3rd party consultants	8,578
E	BAT element of application - other	3,042
F	One-off cost to apply BAT	12,898
G	One-off cost to monitor BAT	6,948
H	One-off cost of reporting BAT	913
I	Cost of reassessment of BAT	1,986
J	TOTAL	**430,105**

The 'one-off application costs' (row A) were categorised in the Review as:

- own staff costs (mean £17,170)
- third party costs including employment of consultancy services (mean £21,429)
- other costs identified by survey respondents including permit application fees charged by the Environment Agency (mean £9,521)

Row B presents the average total one-off compliance costs. This category is broken into five sub-categories: capital investment, management time, monitoring, reporting and 'other' costs. Unfortunately, the Review did not investigate the precise costs charged by the Environment Agency in relating to application fees and on-going permit fees. However, a rough estimate from the figures provided from the 56 respondents who provided 'other' cost data indicates that Environment Agency revenue from these organisations alone may have been in the region of £533,000. Capital investment represents the largest one-off compliance cost with the average expenditure in the region of £300,000. The

inclusion of BAT in the application process adds a further £20,197 to the cost of a PPC permit application (rows C-E). The costs arising from employing consultations and own-staff time are straight forward. Interestingly 'other' costs average £15,204 yet these costs were not specified by any of the respondents to the Review. The absence of any clarification or justification for this figure raises questions over the credibility of the data provided. It is concerning that these data were included in the final Review without further investigation by either Defra or the consultants employed on their behalf to undertake the study.

Table 4.3 Average annual costs of the PPC Regulations

	Average annual cost	Average (£)
A	Annual compliance costs	43432
B	Other annual costs - internal	3455
C	Other annual costs - 3rd part consultants	16945
D	Average annual change in cost of operation to apply BAT	10104
E	Average annual change in cost of monitoring to apply BAT	2388
F	Average annual change in cost of reporting to apply BAT	1306
G	CAPEX to modify design of installation to apply BAT	7086
H	TOTAL	84716

The annual compliance costs (row A of Table 4.3) include management time of staff, monitoring, reporting and again 'other' costs. These costs were placed in two categories: internal costs and third party consultant. Within each sub-category there were various named costs. Internal costs were identified as administration fees, membership fees, responding to schedule, sub-contractors, advertising and training (row B). Third party consultant costs include environmental consultancy services, site surveys, administration, sub-contractors, advertising, training and responding to consultants (row C). The CAPEX figures (row G) relate to the spending required to upgrade or acquire physical assets in order to meet BAT requirements.

Whilst it is difficult to define an 'average' installation subject to the PPC Regulations, it is clear that the average figures provided by industry for compliance costs are considerable. However, it should be borne in mind that not all installations will incur every cost identified above. For example, an installation may already be operating BAT, thus avoiding this as a directly incurred cost of the PPC Regulations. Furthermore, industry provided data should be viewed with some caution, not least because of the failure of organisations to provide verifiable details of 'other' costs in some instances.

Crucially, the Review also included estimated costs to regulators. This information is presented in Table 4.4. The costs to regulators have continually increased as more activities passed through the transition to IPPC regulation. Whilst the PPC Regulations have saved the government over £18 million compared with IPC and waste management licensing costs, the cost of administering PPC applications and the subsistence costs of administering PPC on a day-to-day basis are significantly higher and cancel out any savings in this respect.

Table 4.4 Estimated costs of IPPC to regulatory authorities in the UK

	Income/ expenditure	2001	2002	2003	2004	2005	Total (2001-2005)
A	Income from IPPC application charges	£4.3m	£3.6m	£9.8m	£11.7m	£10.9m	£40.4m
B	Annual IPPC subsistence costs (annual charges)	£266,000	£1.5m	£3.1m	£6.0m	£13.5m	£24.3m
C	A2 local authority income from permit application charges	£0	£0	£524,961	£572,531	n/a	£1.1m
D	Total income from application and subsistence charges	**£4.6m**	**£5.1m**	**£13.5m**	**£18.3m**	**£24.4m**	**£65.9m**
E	Avoided income from IPC/waste management licence charges	£0	£605,000	£2.1m	£5.5m	£10.5m	£18.8m
F	**Net total regulatory income**	**£4.6**	**£4.5m**	**£11.3m**	**£12.8m**	**£13.9m**	**£47.1m**

Source: Defra (2007g)

The data presented in Table 4.4 represents the income for all UK regulators: the Environment Agency in England and Wales, the Scottish Environmental Protection Agency (SEPA) and the Northern Ireland Environment and Heritage Service (NIEHS). The Review published by Defra contains a further breakdown of charges for the three authorities.

According to the Review, approximately 1800 permits had been issued in the UK between 2001 and 2005. Using the data provided in row A of Table 4.4, this translates to £22,444 in Environment Agency charges per application. Assuming

each application costs on average £22,444 the annual subsistence cost per permit has been calculated (Table 4.5).

Table 4.5 Annual subsistence charges per permit 2001-2005

Year	Total number of permits	Average permit subsistence charges
2001	191	£1388
2002	351	£4268
2003	788	£3933
2004	1309	£4582
2005	1794	£7520

It stands to reason that some permits will be subject to subsistence charges much lower and much higher than the mean figures in Table 4.5. The cost to the installation operator is directly proportional to the level of complexity of the operation, the complexity of the permit, the environmental risk posed by the activity and compliance rating of the operator (Environment Agency, 2006).

The fact that the costs to the tax payer have been calculated is significant. This is rarely done in such a seemingly rigorous manner. As the remaining three case studies will show calculations of this nature are not commonplace in policy evaluation in the UK. The Review undertaken by Defra has a further benefit in addition to assisting the evaluation of the economic efficiency of the Regulations - an increased level of transparency and accountability to the tax payer.

One sector association representing more than 200 firms of both Part A(1) and Part A(2) stated that:

> "Whenever the [Environment] Agency gets involved to start with, they have to recover their costs. For A2 processes with Local Authorities, some of the costs that are involved [are] in submission of an application then the annual cost every year. I just think the cost is too high."

This statement, from a sector with a large number of small companies, reflects the sentiments made by several other sector associations (see Table 4.17) who feel that the Regulations are not always applied in a proportionate manner with many small organisations incurring disproportionately large costs (i.e. application and subsistence fees) compared with larger organisations.

However, the funding for all Environment Agency PPC-related activities comes directly and solely from charging application and subsistence fees to permit

holders. The Environment Agency claims this method allows them to carry out all the activities it needs to in order to effectively implement, monitor and enforce the Regulations:

> "The PPC is a funded public regime. There is no money that comes directly from Government. It all comes out of charges. The amount we recover from charges is enough to cover what we want to do. So, we're not restricted by the charges not being high enough. They're not too high either [for industry], but they do provide resources we need to do the work that we feel is worth doing. It doesn't mean that there couldn't be more available money."

It stands to reason that the regulated parties should be responsible for funding the administration of the regime given that the only other source of funding would be provided directly from public taxation income. This is properly in keeping with the notion of the polluter-pays.

Despite the concerns raised by some sector associations relating to the proportionality of the charging system, one sector association identified how the clarity and certainty of the approach mean that companies can factor in long term costs into decision making:

> "It's an approach that we're all used to now, I know our members think that we know what we've got in place now, we know the cost of it, we know the cost going forward, we can plan with that and that gives us some sort of comfort. A leap into another system that will take another ten years to get used to, that just causes unrest and discomfort."

Only one sector association, representing 10 companies (assuming maximum permit application charges of £224,440 based on figures discussed in section 4.8) identified the cost effectiveness of permit charges for government, stating that:

> "PPC regulation is based on a charging regime designed to recover admin costs which should make it quite cost effective for Government"

Furthermore, one respondent representing 9 large firms stated that, in consideration of non-GHG emissions, the PPC Regulations are an efficient means of pollution control:

"The costs are for control of these non-GHG pollutants. Such pollutants need a degree of site-specific control. PPC is economically efficient."

Further to this evidence, in mid-2007 one sector association circulated a questionnaire to its members to obtain detailed information relating to members experiences of the implementation of the PPC Regulations. The implementation of the Regulations for this sector occurred in 2002. The information arises from 5 years experience of dealing with PPC from seven companies regulated under Part A (1) or Part A(2), thus providing a snap-shot of the impact at the sector level. A summary of the financial implications of PPC for this sector are provided in Figure 4.3.

Figure 4.3 Mini-case study

Sector A

One sector association sent a questionnaire to all its members who are Part A(1) and (2) regulated. The questionnaire was designed to elicit information relating to precise costs to date of the PPC Regulations in terms of capital investment, management costs and Of 200 association members, 38 are Part A(1) regulated and a further 2 Part A (2) regulated. Responses were received from seven companies.

Company	Installation of equipment to meet BAT (total)	Cost to date of 3rd party consultants	Internal costs to date	Total cost per company
A	£9,360	£30,000	£10,000 + > 5,000 hours management time	£42,340
B	£1211,238	£67,562	£205,933	£1,484,793
C	£0	£26,025	£2,000	£28,025
D	£4,000	£15,000	£20,000	£39,000
E	£200,000	£0	£5,000 + 1 full time staff	£205,000
F	£45,000	£15,000	/	£60,000
G	£968,500	£10,000	£12,000	£980,510
Total cost	£2,438,098	£163,587	£254,933	£2,839,668
Mean	**£348,300**	**£23,370**	**£36,426**	**£405,666**

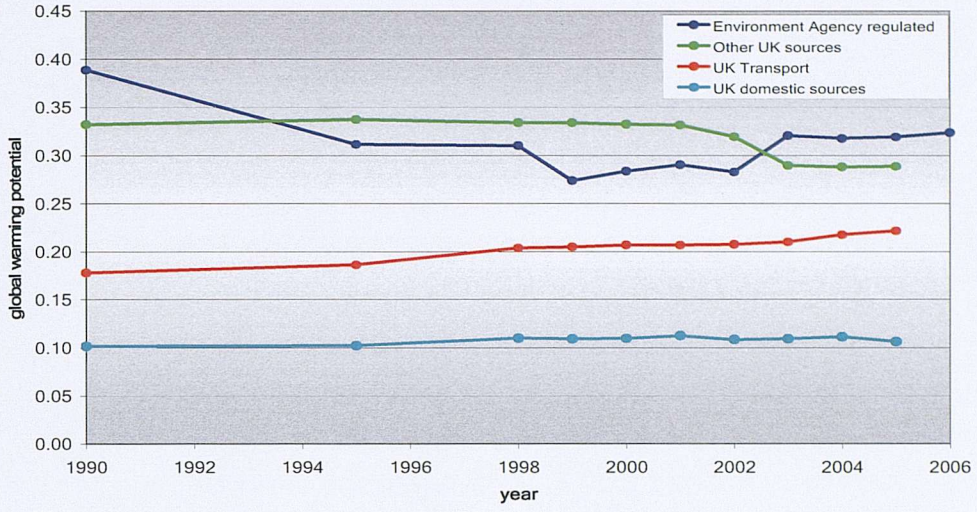
This sector was integrated into the PPC regulatory regime in 2002. In addition to the costs identified above the companies were subject to the Environment Agency application fee (mean across all sectors £22444). Further to the costs identified above the annual fees to the Environment Agency from 2002 until 2005 may have been in the region of £20303 (based on the calculations in Table 4.5).

Compared to the other three case study instruments, the availability of financial data for the PPC Regulations is significantly superior. The evaluation carried out by Atkins on behalf of Defra has proved to be an extremely valuable source of information. This report was limited to the economic costs and benefits of PPC for industry and the Government, and lacked in depth analysis of any qualitative elements of the Regulations. Inclusion of environmental data for example as a means to compare the costs incurred with the social benefits arising from emissions abatement would have led to possibly the most detailed and comprehensive report of its kind. Furthermore, the scope and size of the IPPC Directive in shaping domestic environmental policies mean that the Commission is keen to undertake reviews and obtain data concerning progress with implementation. The PPC Regulations are the oldest of the four case studies perhaps explaining the quality of Government-led reviews. One only hopes that other pivotal policies, such as EU ETS, are subject to such rigorous financial assessment in due course. However, as section 4.9 will show, the collation of environmental data relating to PPC is problematic.

4.9 Environmental effectiveness

As a brief introduction, Figure 4.4 presents the global warming impact of various sectors in the UK between 1990 and 2006. 'Global warming impact' refers to the contribution of each sector towards total United Kingdom GHG emissions as a proportion of the total (where the total = 1). The group 'Environment Agency regulated' comprises all installations and industries that are subject to regulations administered by the Environment Agency. As further categorisation is not provided by the Environment Agency it would be correct to assume that some of the emissions in this group come from industries or installations that are not subject to the PPC Regulations. However, this data is useful to present an overview of the trends in the contribution of industrial sectors to GHG emissions since 1990.

Figure 4.4 Global warming impact of four sectors in the UK between 1990 and 2005/6



Source: Adapted from Environment Agency (2008b)

It is interesting to note that the global warming impact of Environment Agency regulated sectors decreased between 2001 and 2002 by approximately 3%. This coincides with the decrease in output from the steel sector and the implementation of the CCAs. As section 5.6 shows the steel sector is a key emitter of GHG emissions. The knock-on effect of decreased output was noticeable within the CCA programme and it is likely to have contributed to the decrease shown in this figure.

4.9.1 Data limitations

Two factors make the evaluation of the environmental performance difficult: the brevity of the RIA and the absence of detailed emissions data. The RIA did not contain detailed analysis of the predicted environmental outcomes, including GHG emissions or energy efficiency improvements. In this respect one cannot determine whether the PPC Regulations have met their initial objectives in the UK. Even if the RIA had included environmental quality targets it would be almost impossible to assess progress against them as detailed data sorted according to PPC (or IPPC) activity does not exist. The most useful data is to be found on EPER, despite the severe limitations relating to the timeframe and coverage of reporting.

The database only contains emissions data from installations that have exceeded the relevant threshold values. Therefore the database is not a comprehensive emissions inventory. It is claimed that the threshold values are set at a level that results in approximately 90% of EU emissions being reported (Environment Agency, 2008c). Table 4.6 presents the threshold values for emissions of the six greenhouse gasesr.

Table 4.6 EPER reporting threshold values

Pollutant	Threshold value
Carbon dioxide (CO_2)	10,000 tonnes/year
Methane (CH_4)	100 tonnes/year
Nitrous oxide (NOx (as NO_2))	100 tonnes/year
Hydroflurocarbons (HFC)	0.1 tonnes/year
Perfluorocarbons (PFC)	0.1 tonnes/year
Sulphur hexafluoride (SF_6)	0.05 tonnes/year

Source: European Commission (2000)

At a domestic level, the National Environmental Technology Centre compiles annual greenhouse gas emissions data reports on behalf of Defra. This data is available on-line via the UK National Atmospheric Emissions Inventory (UK National Atmospheric Emissions Inventory, 2008). The Environment Agency also maintains a web based database of pollution from businesses (Environment Agency, 2008d). However, the format of these data is not compatible with IPPC. Data is not categorised according to IPPC sector and takes the form of "energy generation" or "chemicals" without differentiation of sub-sectors (e.g. organic and inorganic chemicals). These factors led to the conclusion that EPER is the only source of emissions data that would meet the requirements of this research. The activity codes used by EPER vary slightly to the codes used within the PPC Regulations (attached at Appendix 5).

The Environment Agency, in collaboration with SEPA and the NIEHS, published a range of guidance documents to facilitate the implementation of the PPC Regulations. One such document is the Horizontal Guidance Note IPPC H2 on energy efficiency (Environment Agency, 2002). This guidance note provided information to installations regarding energy efficiency requirement of the PPC Regulations. It also states that installations participating in a Climate Change Agreement or Direct Participants in the UK Emissions Trading Scheme do not have to undertake energy efficiency measures as part of their PPC permit compliance as energy efficiency is already covered by these instruments.

However, installations not participating in either CCAs or UK ETS must adhere to additional energy efficiency requirements specified within the PPC permit. Installations participating in the EU ETS are also exempt from most of the energy efficiency requirements of the PPC Regulations (ENDS, 2008c). However, full exemption from PPC requirements would need action at the EU level to amend the IPPC Directive.

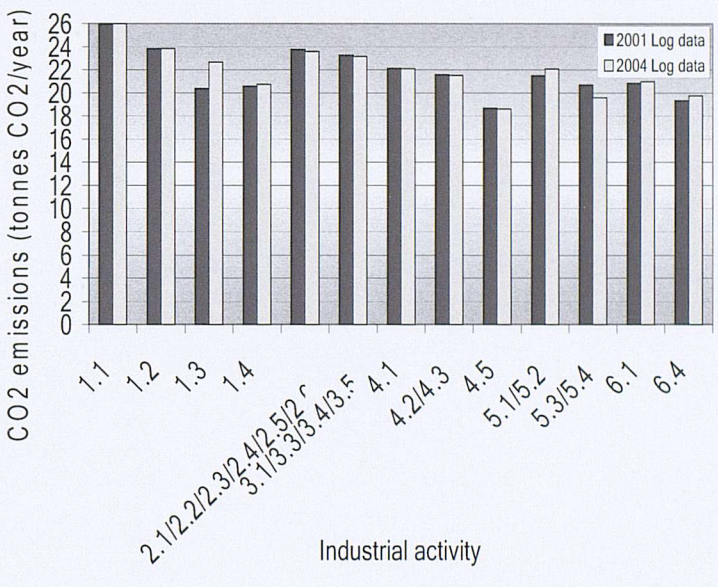
The following subsections of Chapter 4 analyse the emissions of the basket of six GHGs from UK installations in 2001 and 2004.

4.9.2 Carbon dioxide

Figure 4.5 depicts the carbon dioxide emissions from all IPPC sectors exceeding the threshold limits in 2001 and 2004. There was little change between the two reporting years in combustion installations and refineries. Coke ovens (1.3) on the other hand increased CO_2 emissions by 89% during this time. Installations dealing with hazardous and municipal waste (5.1/5.2) by 45%. Several other sectors witnessed increased CO_2 emissions, but several also reported reduced emissions, notably installations for the disposal of non hazardous waste to landfill (-192%) (5.3/5.4).

Figure 4.5 Change in reported CO_2 emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value (transformed to Log data to facilitate graphical depiction)

Activity	% change 2001-2004
1.1	3.0
1.2	-0.3
1.3	89.8
1.4	14.4
2.1/2.2/2.3/2.4/2.5/2.6	-18.7
3.1/3.3/3.4/3.5	-8.4
4.1	-2.6
4.2/4.3	-5.6
4.5	-7.4
5.1/5.2	45.2
5.3/5.4	-192.0
6.1	12.9
6.4	34.5
Total change	**+3.4**



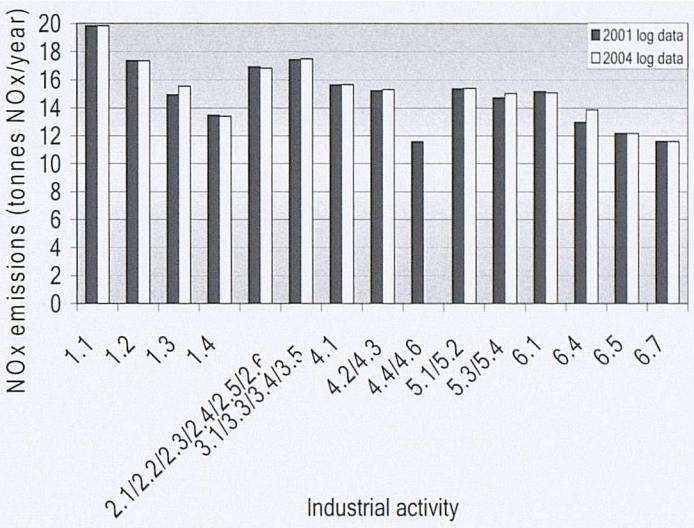
Source: European Pollutant Emissions Register

4.9.3 Nitrous oxides

Emissions of NOx did not vary greatly between 2001 and 2004, although emissions from coke ovens and slaughterhouses were significantly higher in 2004 than in 2001.

Figure 4.6 Changes in reported NOx emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value (transformed to Log data to facilitate graphical depiction

Activity	% change 2001-2004
1.1	0.2
1.2	-1.6
1.3	46.8
1.4	-6.1
2.1/2.2/2.3/2.4/2.5/2.6	-10.0
3.1/3.3/3.4/3.5	5.6
4.1	2.3
4.2/4.3	8.1
4.4/4.6	no reported emissions 2004
5.1/5.2	3.3
5.3/5.4	27.7
6.1	-9.6
6.4	59.0
6.5	0.0
6.7	0.0
Total change	+0.88



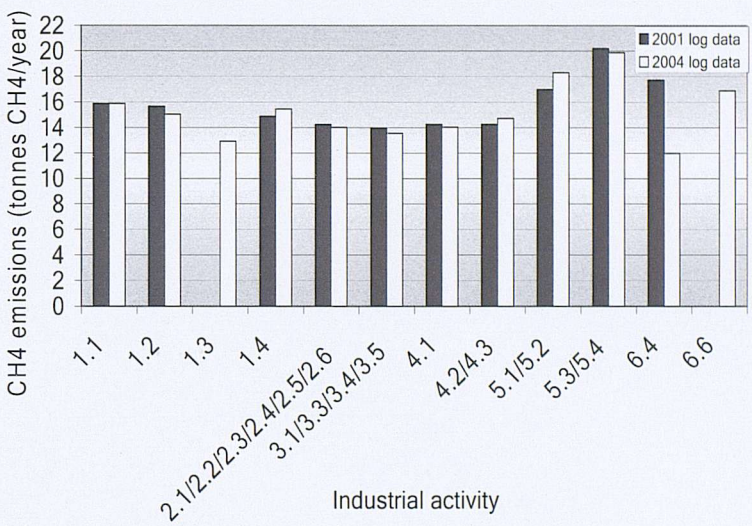
Source: European Pollutant Emissions Register

4.9.4 Methane

Landfill, slaughterhouses, milk production and other animal by product processing are the primary sources of methane in the UK. However, reported emissions of CH_4 were significantly lower in 2004 than in 2001 from slaughterhouses, milk production and other animal materials showing a reduction of more than 31,000%. Landfill CH_4 emissions also decreased by a less dramatic 39%, a side effect of the landfill tax.

Figure 4.7 Change in reported CH_4 emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value (transformed to Log data to facilitate graphical depiction

Activity	% change 2001-2004
1.1	0.1
1.2	-87.1
1.3	100.0
1.4	44.6
2.1/2.2/2.3/2.4/2.5/2.6	-23.9
3.1/3.3/3.4/3.5	-53.1
4.1	-26.3
4.2/4.3	36.8
5.1/5.2	73.8
5.3/5.4	-39.5
6.4	-31175.6
6.6	no reported emissions 2001
Total change	**-23.3**



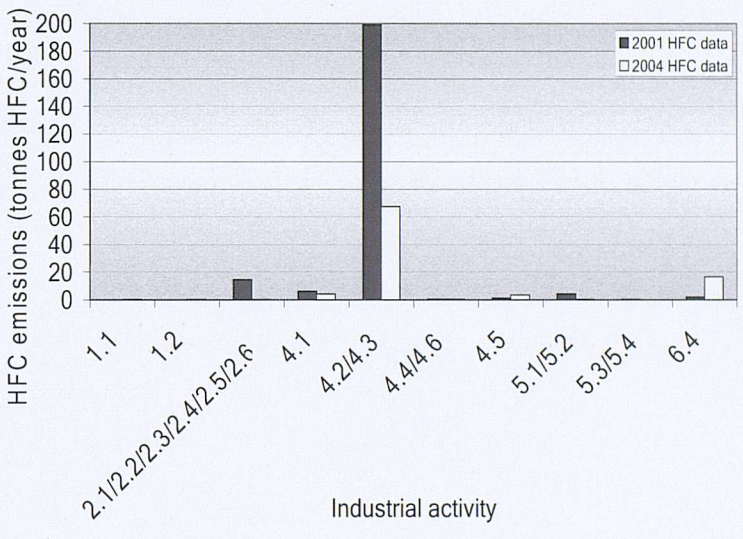
Source: European Pollutant Emissions Register

4.9.5 Hydroflurocarbons

The key source of HFCs reported in both 2001 and 2004 was the production of basic inorganic chemicals and fertilisers. Emissions from these sectors reduced significantly by nearly 200%. However, this was not the most notable source of emission reductions. Between 2001 and 2004 the emissions of HFC from metal production and processing sectors fell by more than 6000%. Furthermore, emissions from waste incineration plants decreased by 3500%. These emission reductions coincide with the implementation of the waste incineration directive in 2002/03.

Figure 4.8 Change in reported HFC emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value

Activity	% change 2001-2004
1.1	no report 2001
1.2	no report 2001
2.1/2.2/ 2.3/2.4/ 2.5/2.6	-6124.6
4.1	-43.6
4.2/4.3	-196.1
4.4/4.6	-4.0
4.5	69.9
5.1/5.2	-3540.7
5.3/5.4	no reported emissions 2004
6.4	86.7
Total change	-146



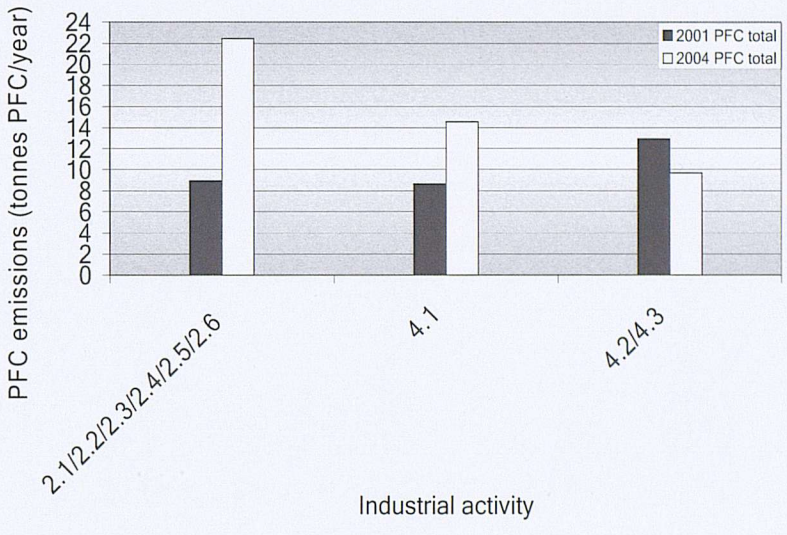
Source: European Pollutant Emissions Register

4.9.6 Perfluorocarbons

The key sources of PFC emissions in the UK are the production and processing of metals, production of basic organic chemicals and the production of basic inorganic chemicals and fertilisers. Reported emissions increased by more than 34% between 2001 and 2004, largely a result of emission increases in the metals and organic chemicals sectors.

Figure 4.9 Change in reported PFC emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value

Activity	% change 2001-2004
2.1/2.2/2.3/2.4/2.5/2.6	60.3
4.1	40.4
4.2/4.3	-33.7
Total change	+34.6



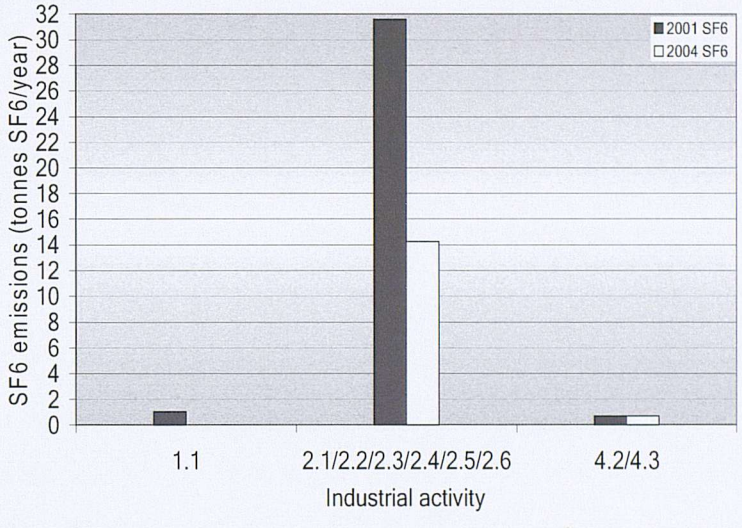
Source: European Pollutant Emissions Register

4.9.7 Sulphur hexafluoride

In 2004 combustion installations reported no emissions of SF_6. The contribution of this sector to the overall reported emissions in 2001 was small indicating that the each installation had managed to reduce its SF_6 emissions below the reporting threshold. Reported emissions from metal production and processing industries fell by more than 120% leading to an overall decrease in the reported emissions between 2001 and 2004.

Figure 4.10 Change in reported SF_6 emissions and emissions from PPC regulated sectors in 2001 and 2004 above the threshold value

SF_6	% change 2001-2004
1.1	no reported emissions 2004
2.1/2.2/2.3/2.4/2.5/2.6	-121.6
4.2/4.3	2.1
Total change	**-122.8**



Source: European Pollutant Emissions Register

4.9.8 Total emissions of greenhouse gases as carbon

Table 4.7 presents emissions of each GHG, as reported on EPER, in million tonnes/CO_2 equivalent to enable comparison with the outcomes of the other case studies.

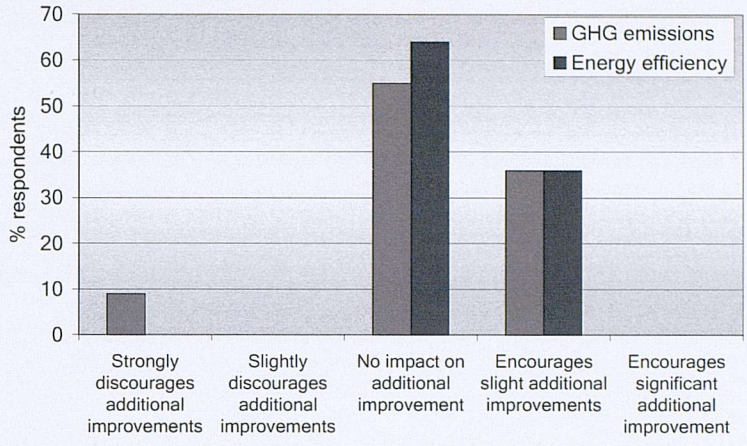
Table 4.7 EPER reported GHG emissions from PPC sectors in 2001 and 2004 expressed as $MtCO_2e$

	2001 (Mt)	Quantity as $MtCO_2e$	2004 (Mt)	Quantity as $MtCO_2e$
CO_2	256528	256528	265625	265625
N_2O	535.2	165901	539.9	167377.3
CH_4	687.5	4436,4	557.2	1702.3
HFC	0.000227	0.002663	0.000092	0.001078
PFC	0.0000304	0.000198	0.000047	0.000303
SF_6	0.0000333	0.000797	0.000014	0.000357
Total (CO_2e)		426870		43470.6
% change between 2001-2004				**+2.9%**

Source: EPER (2008)

Reported CO_2e emissions from PPC activities increased by nearly 3% between 2001 and 2004. Comparison of the costs to date of IPPC with the environmental outcomes in terms of GHG emissions reveals some areas of serious concern. The PPC Regulations began staggered transposition in 2001. By the end of 2004, 17 of 29 industrial activities were covered by the Regulations. It would be fair to expect that the implementation of BAT based requirements are be reflected in decreasing emissions. However, reported emissions of CO_2, NOx and PFCs increased between 2001 and 2004. Furthermore, evidence collected through the survey of sector associations shows that the PPC Regulations do not provide any incentive to reduce GHG emissions and improve energy efficiency beyond permit requirements (see Figure 4.11). Although the Regulations are not primarily intended to reduce GHG emissions, the integrated nature of the IPPC Directive means that greenhouse gases that are not covered by alternative policy instruments should be dealt with by the PPC regulations. At present only emissions of carbon dioxide are covered by alternative policy instruments indicating that the PPC regulations should be working to reduce emissions of any remaining greenhouse gas emissions.

Figure 4.11 Impact of PPC Regulations on effort to reduce GHG emissions and energy efficiency improvements beyond permit requirements



The aggregate cost to industry of the PPC Regulations is high due to the vast number of installations covered by the regime and the scope of coverage. Yet the environmental returns, in terms of GHG emissions and energy efficiency, have been disappointing. In light of the data presented within this section, it is reasonable to assert that the UK is not taking full advantage of the opportunities presented by IPPC, as a form of technology based standards, in the use of BAT to encourage industry improve industrial performance beyond permit requirement. Even in the presence of other polices that target GHG emissions and energy efficiency one must query the benefit of shifting the responsibility away from the 'holistic' IPPC approach to other polices (such as EU ETS, CCL and CCAs).

4.10 Transparency

The survey found that 64% of sector association respondents ranked the overall level of transparency of the PPC Regulations as 'slightly transparent'. The remaining 36% of respondents ranked the level of transparency as 'completely transparent'. This compares favourably with the other three case studies. The majority of industry stakeholders ranked the CCAs as having a greater degree of confidentiality, owing largely to the publication of sector-level compliance results without detailing installation-level results.

When asked to rate the level of transparency of the PPC Regulations the overwhelming majority (91%) stated it was acceptable. This is comparable with the other case studies, which returned between 83% and 94%. It is regrettable that external stakeholders were unable to provide further insights on this issue as the results from this stakeholder group in relation to the CCAs and EU ETS are

particularly revealing (for example 50% of CCA respondents and 67% of EU ETS respondents stated that they found the existing level of transparency of those instruments to be unacceptable). Given that provisions for transparency within CCAs and EU ETS are seemingly higher than the PPC Regulations it is possible that external stakeholders may have similar concerns relating the PPC Regulations. Only one sector association questionnaire respondent stated they believed the transparency of the PPC Regulations has areas that need improvement. This was echoed during an interview with a sector association representative, who did not provide a questionnaire response, when asked about the transparency of the permitting process:

> "It isn't. It's one of the bugbears of all industries. Most of the companies don't see anything wrong with environmental legislation. The bureaucracy it entails is mind-boggling. We were one of the first industries. The [Environment] Agency had two different ways of permitting at that point. You either had it though as local officer, but then halfway through the process, they set up a central permitting unit. And the two different approaches gave two entirely different results as to what your permit was going to be."

However, the Environment Agency introduced centralised permitting in an attempt to maximise quality control and minimise regional disparities based on the performance of individual members of staff.

From a legal perspective, provisions for transparency are made in Part V, Articles 28 to 31 of the PPC Regulations. Article 28 deals specifically with requests from the Secretary of State or regulatory authorities for information from an operator. Time restrictions are not specified allowing the regulatory authorities to determine an exact time frame on a case-by-case basis. Provisions for *public* access to information pertaining to PPC permits made in Art. 29. Paragraph 6 states that it is the duty of the regulator, either the Environment Agency or Local Authority, to maintain public records on every PPC permit, specifically:

- to secure that the registers maintained by them under this regulation are available, at all reasonable times, for inspection by the public free of charge;
- and, to afford to members of the public facilities for obtaining copies of entries, on payment of reasonable charges.

This is supported by an Environment Agency representative who stated that:

> "Permits go on the public register, they [the public] can go and inspect them, not only the permits but also the decision document, which is a text document that explains why we've issued the permit the way we have. Any follow-up legal documents associated with that, inspection reports and enforcement action, and so forth. That might be associated with that side will be recorded in that public register."

However, information concerning enforcement action in the case of breaches of permit conditions is not communicated actively to the public as a matter of course beyond inclusion on the public register in the relevant Environment Agency office:

> "It tends to get into by the media, but, in general, we don't make a point of communicating actively enforcement action, which contains everything from routes of prosecution, but it's all recorded on the public register and the public can access that if they want. Of course, the next time they apply for either a new permit or a variation of their existing permit, all that information is drawn out again and re-examined, so that's another opportunity for it to come back in to the public domain as well."

There is no question that the public participation requirements of the PPC Regulations meet the minimum requirements of Art.15 of the IPPC Directive. PPC meets the need to ensure "*the public concerned are given early and effective opportunities to participate in the procedure*" (IPPC Art. 15, para.1) and making available "*the content of the decision, including a copy of the permit and of any conditions and any subsequent updates*" (IPPC Art.15, para. 5(b)). However, upon comparison with another Member State it becomes clear that access to PPC permitting information in England and Wales is lacking in some areas, notably the ease of access to information. Public registers and permit information are located in various Environment Agency offices according to geographic region. This makes access the country-wide information difficult without visiting numerous regional offices. In contrast, the Republic of Ireland operates an internet based system for access to all permit applications, granted permits and any associated documentation, making access to environmental information significantly easier than the system employed in England and Wales (Environmental Protection Agency, 2007).

As a further illustration to this point during the course of this research the Environment Agency was contacted in an attempt to obtain copies of every PPC permit relating to non-hazardous waste incineration plants in England and Wales. There are 18 such facilities. The Environment Agency was unable to provide copies of all permits directly, instead advising that regional public registers would have to be visited in order to obtain the documents. There are eight regional offices throughout England and Wales. The inability of the Agency to provide information electronically and without a personal visit by members of the public to regional offices is a cause for concern and is in direct contradiction with the centralised approach to issuing permits. Whilst the public registers meet Aarhus standards for access to environmental information, it is not unreasonable to expect that regulatory authorities across the EU should be actively pursuing *better* practices relating to communication with the public and information accessibility. If an entirely on-line based system works effectively in the Republic of Ireland, the regulatory authorities in the UK should be making efforts to follow suit.

As discussed earlier in this Chapter, work undertaken by Defra regarding the costs of implementation and long-term costs of administering the Regulations greatly enhances the level of transparency. Despite the difficulties in obtaining information on permit applications and site-specific information, the provision of detailed financial costs of the Regulations improve the transparency of the PPC process to a degree.

4.11 Flexibility

The perceived level of flexibility appears to mirror the differences in opinions on the key strengths of the Regulations (see section 4.14.2). Whilst many respondents believe the PPC Regulations give industry a moderate amount of flexibility in how it chooses to manage investment decisions and optimisation of emission reduction, a sizeable minority are of an opposing view (Table 4.8 and Table 4.9).

Table 4.8 Rating flexibility of PPC regulations with regard to management of investment decisions

No flexibility	Very little flexibility	Moderate flexibility	High flexibility
0%	36%	55%	0%

Table 4.9 Rating of flexibility with regard to allowing companies to optimise emission reductions via financial assessment of the most practical means to do so

No flexibility	Very little flexibility	Moderate flexibility	High flexibility
9%	45%	36%	9%

The application of site-specific BAT should lead to a greater degree of flexibility compared with other regulatory approaches in terms of accounting for site-specific conditions. Outcome based emissions standards, whilst allowing companies to implement any technology they wish in order to meet the requirements, may not consider such local conditions. These conditions may include variations in the process input (e.g. the type of clay used in the manufacture of ceramic products has an impact upon the emissions from the process as certain clays require higher kiln temperatures). The nature of BAT leads to these conditions being taken into account.

However, technology-based standards remove the ability of firms to decide what technology to employ and at what cost. This restriction is reflected in Table 4.8 as 56% of respondents stated that the PPC Regulations offer little or no flexibility in terms of technology decision-making. For this criterion the CCAs and UK ETS were both ranked as moderately flexible (38% and 43% respectively although 25% of CCA respondents ranked the policy as offering very little flexibility). Conversely, the EU ETS was the strongest instrument in this sense with 50% of respondents ranking the flexibility as high and the remaining 50% as moderate. These findings do not offer any surprises given the widely-held belief that MBIs, in particular emissions trading, offer a greater level of flexibility to industry in allowing the market to decide where emissions abatement occurs based on rational assessment of marginal abatement costs.

A considerable advantage of the technology-based approach of PPC is that it should, in theory, lead to a level playing field across industries as all firms are required to meet the same technological standards. This could be particularly beneficial when dealing with standards across many countries, as seen with the IPPC Directive. The advantage of reducing the flexibility given to firms to create equal minimum standards is challenged by the removal of incentives to innovate. A lack of flexibility in the selection of technology does not provide the conditions

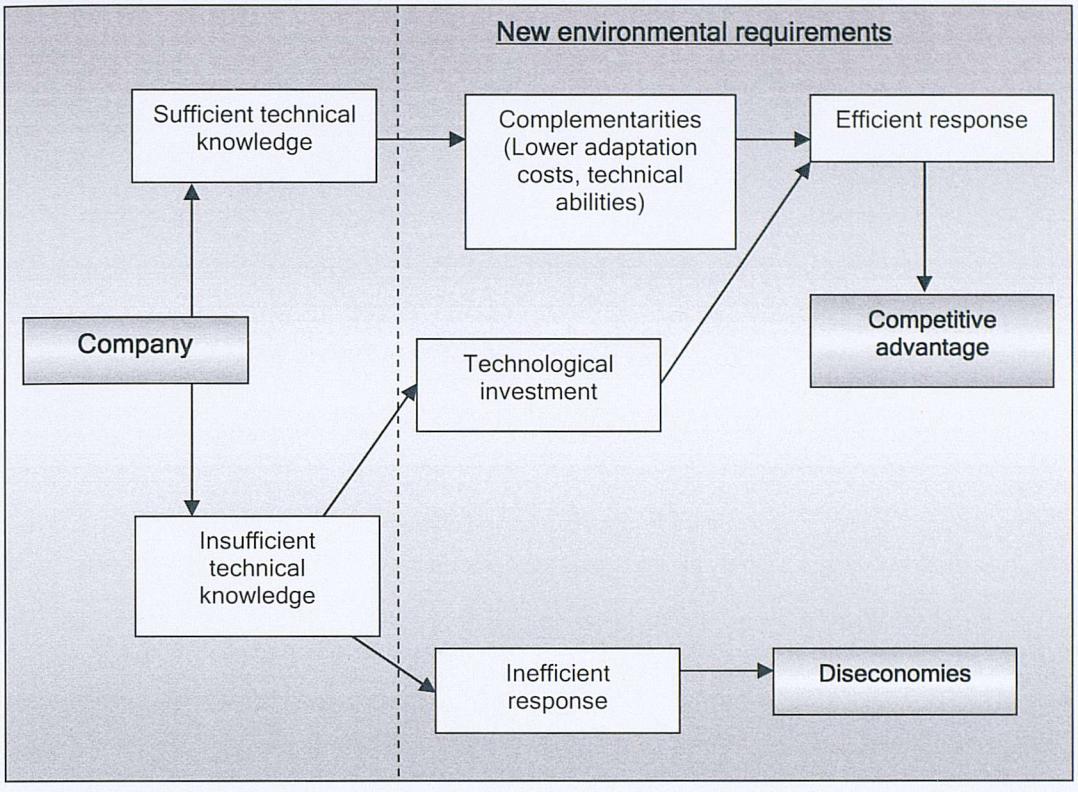
under which firms will investigate new technologies as provided a firm meets the standards set out within the permit penalties are not incurred by operators.

4.12 Innovation

The importance of technological innovation in improving industrial energy efficiency has been highlighted by Smith and Sorrell (2001) In this paper the authors identify two types of energy efficiency improvements. The first group of improvements relate directly to energy efficiency including the collection of 'low hanging fruits' (general housekeeping issues, low-cost engineering/operation improvements) through to high cost solutions involving investment in new equipment and fundamental changes to basic technology. The second category of improvements arises as by-products of investment in processes that are not directly intended to lead to energy efficiency improvements. Determining the prevalence of activities in the first category is relatively straightforward and relied on sector associations stating what behavioural and activity changes have occurred within each sector. It is considerably more difficult to determine what activities, if any, which have resulted in energy efficiency improvements as a by-product.

Research undertaken by Cañón-de-Franca et al. (Cañón-De-Francia *et al.*, 2007) indicates that innovative firms may benefit not only from a competitive advantages over rivals but innovative firms are also quicker to adapt to the demands of new environmental legislation. Figure 4.12 depicts the routes that can be taken by firms in response to environmental regulations. Firms need to have sufficient technical knowledge and the ability to respond efficiently to new requirements in order to maintain a competitive position in the market place. Failure to do so leads to a loss of competitive advantage.

Figure 4.12 Technical knowledge and adaptation to new environmental requirements



Source: Cañón-De-Francia et al. (2007)

(Note: in the context of this diagram "diseconomies" refers to loss of competitive advantage of a firm over market rivals)

None of the sector association respondents ranked the PPC Regulations as discouraging technological innovation. However, further information provided by one respondent indicated that across one sector the PPC Regulations have in some cases discouraged innovation as new technology is often required to be implemented consequently across the sector with negative financial implications for some less innovative companies:

> "The 'no impact' answer represents a split between those who see some encouragement but the majority who see discouragement, the latter because innovation soon becomes promoted as BAT, rigorously applied despite being inappropriate for some sites."

The vast majority (64%) of PPC sector association believe the regulations do not actively promote innovation. 27% believe PPC encourages a small degree of

technological innovation while only one respondent stated the regulations encourage a significant amount of innovation. Furthermore, most sector associations believe that the PPC Regulations do not provide any incentive to reduce GHG emissions and energy consumption beyond the permit requirements (55% and 64% respectively). This indicates that the PPC Regulations are performing in the manner commonly associated with output-based standards as little regard paid to innovative behaviour, a crucial factor in the application of technology-based standards. Without innovative behaviour and the incentive to reduce emissions beyond permit requirements the commonly accepted level of BAT will not improve at the maximum possible rate.

The apparent failure of PPC to promote additional abatement and incentivise innovation contrasts with the positive response to the remaining three case studies in this regard. The CCAs, UK ETS and EU ETS all received positive feedback in relation to the impact of the policy on innovation with 63%, 57% and 40%, respectively, stating the policy had a slightly positive impact on innovation. A further 40% of EU ETS respondents believe the policy has a very strong impact on innovative strategies within firms. The market mechanisms of these three policies (including the trading provisions within CCAs) greatly increase the propensity of firms to seek new abatement opportunities as the benefits of doing so directly translates into financial rewards.

Referring once again to PPC, comments made regarding the impact of the PPC Regulations on innovative behaviour indicate that despite being a regulatory regime based on the implementation of best available technology the prescriptive nature of the BREF documents does not provide incentives to implement technology beyond the recognised "best" option. Furthermore, three respondents identified that other instruments exist to drive forward improvements in energy efficiency and GHG emission reductions:

> "This is an interesting question. The BREF document identifies best technology but unlike the EU ETS or CCAs does not reward additional actions and may actually stifle adoption of unproven (i.e. not in BREF) technology. Additionally, companies covered under CCAs are deemed to have satisfied PPC energy efficiency improvement obligations, so the regulations do not operate independently."

"Companies must demonstrate a willingness to improve performance but as levels are achieved they may not be amended to drive improvement. This will come from CCA or EU ETS."

"The aim of PPC is to provide holistic protection of the environment at a cost society is willing to bear. Other instruments are available to "encourage innovation" or to combat climate change."

Whilst it is true that the CCL, CCAs and the EU ETS exist with the sole purpose of tackling GHG emissions, key objectives of the IPPC Directive include achieving efficient processes (Annex IV (9)), efficient use of resources (in particular energy) (Art. 3(d)) and the minimisation of atmospheric emissions (Art. 3 (a)). It therefore stands to reason that the PPC Regulations should be a driving force in industrial resource efficiency and reductions of *all* atmospheric emissions.

Despite the inability of the PPC Regulations in their current state to sufficiently promote technological innovation within industry, nearly three quarters of sector associations stated that environmental reporting within their sector had improved as a direct consequence of the PPC Regulations (Table 4.10).

Table 4.10 Stated changes within company activities arising directly from the implementation of the PPC Regulations

Change directly related to PPC Regulations	% respondents
Introduction of BAT specified within PPC permit	73
Improved environmental reporting	73
Process changes	36
Increased awareness of GHG reduction opportunities within senior management	27
Increased awareness of energy saving opportunities within senior management	18
Introduction of equipment of higher efficiency rating/lower emissions rating than specified within PPC permit	18
Inclusion of cost of carbon in new project appraisals	18
Improved supply chain management	9

Three quarters of sector associations reported that their members had to install new equipment in order to meet the BAT requirements of their permits. This evidence supports the notion that the PPC Regulations do not promote innovation and industrial changes beyond the requirements of individual permits. Only one third reported process changes to improve efficiency. Moreover, only 18% of sector associations reported that their members had installed equipment of a

higher efficiency rating or lower emissions rating than the BAT specified within permits.

There is hope that the revision of the BREF documents in 2008 will result in improvements in bringing technological change dealt with:

> "At present there is little encouragement, but the revision of our sector BREF is expected to introduce more energy savings requirements."

> "The BAT documents are being updated (for the first time) with the aim to better identify and promote the best performance."

The Environment Agency also acknowledged that the PPC Regulations do not promote as much innovation as possible. However, the current situation was attributed to the need to get all industrial activities, and all companies operating within each industry, to a common baseline:

> "They [the PPC Regulations] allow it [innovation] very freely. What they don't do, currently, as well as they should, or as well as, perhaps, they could, is encourage it, and, in a sense, the reason for that is, mainly, because the vast thrust of PPC, over the last six years, has been about getting to a baseline, getting to a point where everybody's starting from the same place. As we now move forward, they can be, now, used to encourage innovation and drive, but that hasn't really happened because we were trying to bring everybody up to the same baseline standard. Therefore, we couldn't actually put the effort into "how can we stretch this further?" Now we can, and that's what we [the Environment Agency] propose to do."

In addition to the BREF revisions the implementation of the Environmental Permitting Programme (EPP) could provide the much needed encouragement for innovation However, the lengthy process of BREF revisions (and subsequent transition into national-level guidance documents) and the novelty of the EPP mean it will be some time before the level of success can be assessed.

4.13 Acceptance and equity

An analysis of the level of acceptance for the PPC Regulations should ideally have input from external stakeholders to balance the debate. However, the

absence of external stakeholder responses to the survey means this criterion can only present the views of industry.

Nevertheless, the opinions of industry have proven to be very insightful. Table 4.11, Table 4.12 and Table 4.13 summarise the ranking provided by sector associations regarding equity and acceptance of the PPC Regulations.

Table 4.11 Level of acceptance of sector association members

Full rejection	Qualified rejection	Indifference	Qualified acceptance	Full acceptance
9%	9%	18%	55%	18%

Table 4.12 Rating of overall fairness of PPC Regulations[36]

Very unfair	Unfair	Fair	Very fair
0%	56%	33%	11%

Table 4.13 Overall experience of members

Completely negative	More negative than positive	More positive than negative	Completely positive
9%	36%	55%	0%

It should be pleasing for the Environment Agency to note that the majority of installations regulated generally rate their experience as positive. However, the remaining 45% who do not cause some concern especially in light of 56% of respondents rating the PPC Regulations as 'unfair'. Many of the respondents who were critical of the fairness and equity of the Regulations cite a lack of proportionality in the application of the Regulations (i.e. the cost implications for small firms or the inclusion of emissions that are perceived to have little environmental impact). One sector association highlighted the cost implications for firms that are at the borderline of the scope of the regulations as a major factor in the perception of equity and fairness. The perception of fairness of the PPC Regulations is on a par with the EU ETS, for which 40% of respondents ranked Phase I as unfair, with this figure increasing to 60% in Phase II. Conversely, the CCAs and the UK ETS are generally perceived to be fair to industry (69% and 64% respectively), largely due to the provision of financial benefits for

[36] In reference to the "overall fairness" of the PPC Regulations, sector associations were asked to consider four factors prior to stating their opinion:
- Costs incurred by industry
- Administrative requirements for the regulatory authorities and the government
- Changes in environmental quality arising from the Regulations
- Overall distribution of costs and benefits

participation in what are essentially voluntary policy instruments. Furthermore, the voluntary nature of these two instruments gives industry a choice regarding participation.

Concerns were raised over the ability of local authorities to deal with the complexity of the PPC Regulations, particularly in areas where there are few installations. It may not make economic sense for the local authority to spend scarce resources on training of staff and ensuring the correct controls are in place. In light of this, it would appear that the existing system is not the most effective, a view supported by the Environment Agency:

> "[It's] an incredible waste of resources - the amount of time and effort that's spent arguing about whether activities are A1 or A2, whether they should be local authority or Environment Agency. ..... I don't think it makes a difference to the environmental outcome, as to whether you have one group or two groups. It's just been a lot of extra regulatory effort, which, effectively, ends up as cost to operators in one way or another."

Approximately 400 installations are currently Part A(2) regulated. It would make sense in terms of equity - by reducing regional disparities in the interpretation and application of the Regulations - if the Regulations were to be administered centrally for all A(1) and A(2) installations. Given the reduced environment risk of Part B installations there may be a case for keeping these installations under the control of local authorities, not least because these installations are only regulated according to their atmospheric emissions.

Interestingly one sector association, whose members are all Part A(2) or Part B regulated, stated that local authorities have been the stakeholders who have lost out in the equity stakes adding further weight to the argument against the existing two-tiered administrative approach.

> "I think the local authorities would say they've had it quite rough over the last few years. They've struggled."

The Environment Agency operates a system of charging that attempts to take into account the differences in environmental impacts of processes and local conditions. The charging system also considers the risk of breaching permit

requirements and previous performance when calculating the administrative and subsistence charges. This system, in the eyes of some industry stakeholders, may be flawed but it is difficult to suggest an alternative method of charging that could be more equitable. Furthermore, the failure of external stakeholders (beyond the Environment Agency) to participate in the research makes it difficult to assess how the Regulations are perceived by civil society representatives.

4.14 Other issues

The final section of analysis contains other key issues identified in the questionnaire responses and interviews

4.14.1 Interaction between PPC and other climate change policy instruments

The interaction between PPC and other instruments was identified as an area that needs attention at both the domestic and EU level. At the UK level, more than half of respondents stated that there is room for improvement with regards to the interaction between PPC and other UK environmental policies. Respondents were asked to cite the policies of concern. However, none of the respondents cited specific UK policies that caused a regulatory burden for their members enabling the dismissal of this as a significant issue.

Table 4.14 Rating of the interaction between PPC and other UK climate change polices

Interaction between PPC and other policies creates a significant regulatory burden	Room for improvement. Some problems with cohesion between PPC and some policies - slight regulatory burden	Minor problems with interaction between PPC and other policies but nothing too serious	PPC and other polices operate in a complementary manners - excellent level of cohesion
22%	56%	22%	0%

Interestingly, the fewer respondents stated there is a regulatory burden caused by the interaction of PPC and other EU-level policies, yet most respondents identified policies of concern.

Table 4.15 Rating of the interaction between PPC and EU environmental polices

Interaction between PPC and other policies creates a significant regulatory burden	Room for improvement. Some problems with cohesion between PPC and some policies - slight regulatory burden	Minor problems with interaction between PPC and other policies but nothing too serious	PPC and other polices operate in a complementary manners - excellent level of cohesion
22%	33%	44%	0%

In particular, the following EU-level issues were identified as creating a some degree of additional regulatory burden, through duplication of administrative requirements, direct administrative costs and conflicts of regulatory interest, for UK companies:

- Large Combustion Plant Directive 2001/80/EC
- Water Framework Directive 2000/60/EC
- Air Quality Framework Directive 96/62/EC
- European Union Emissions Trading Scheme (established through Directive 2003/87/EC)
- Landfill Directive 1999/31/EC
- Asymmetric transposition of IPPC Directive across Member States meaning sectors in one Member State were regulated from an earlier date than counter parts in other Member States
- Perception of more stringent interpretation of EU Directives in the UK compared with other Member States

One comment made by a sector association during the interviews also identified issues with waste and the PPC Regulations:

> "[PPC] interacts oddly with the EU ETS. In terms of waste incineration there has been a problem with the application of those particular regulations. We do have some problems in respect of the definitions of waste."

The issue of waste was supported by another sector association respondent who stated there is a conflict between waste treatment and energy usage. This is a particular issue for sectors carrying out process related to animals and animal products due to the interpretation of what constitutes waste or products suitable for human consumption. Treating waste to render it harmless often requires energy intensive processes. The only other option is to landfill the waste but this leads to a conflict with the Landfill Directive and the overall aim in the UK of reducing the amount of waste sent to landfill. Furthermore the Environment Agency identified the performance-based approach of the Landfill Directive and the technology-based approach of PPC as a source of conflict:

"Under PPC, the requirements are to deliver the available techniques. But, under Landfill, the requirement is to deliver fixed emissions, pre-set outcomes, and those two are relatively incompatible. Unfortunately, governments have never sat down and worked out how to bring those two things together. We spend a lot of time arguing in court with people about what those things mean, where do they apply and where don't they apply. It's, really, an unclear and unhappy mix between those two, and we spend a lot of resources arguing that very point. We, obviously, know what we feel it means, but other people try to give a different argument."

4.14.2 Perceptions of strengths and weaknesses of the PPC Regulations

As a means to determine the overall attitude towards the PPC Regulations respondents were asked to identify the key strengths and weaknesses of the Regulations. Table 4.16 and Table 4.17 identify the responses.

Table 4.16 Key strengths of the PPC Regulations

Strength	% respondents
Administrative flexibility/site-specific approach	40%
Sector level focus	10%
Integrated approach facilitates communication	10%
An attempt to reduce pollution	10%
On-going improvement though BAT	10%

Table 4.17 Key weaknesses of the PPC Regulations

Weakness	% respondents
Lack of proportionality (including inclusion of low risk activities and too much emphasis on areas of low risk according to activity)	40%
Differences in application of IPPC across EU	20%
Cohesion with other policies	10%
Pressure to increase monitoring requirements to account for 'flexibility'	10%
Lack of incentive/encouragement for additional abatement effort	10%
Less efficient environmental improvement compared with MBIs	10%
Do not achieve aim	10%
Confidentiality concerns	10%
High resource requirements	10%
Over-prescriptive/not risk-based	10%

The flexibility of the PPC Regulations is by far the most commonly perceived strength though this is at directly contradicts the responses received in relation to the flexibility of PPC to allow industry to determine how permit conditions are met. However, comments in support of the flexible approach are based on the sector-

level focus of technology standards, the site-level approach to agreeing permit conditions (including the consideration of local environmental conditions) and the flexibility of administration. Whilst other strengths were identified there was little consistency among the responses indicating that the opinions of stakeholders are highly dependent upon individual circumstances and personal experiences of the Regulations.

The predominant identified weakness is in direct contrast, if not a direct contradiction, to the key strength. The lack of proportionality (which may inherently lead to greater flexibility) centres on three key concerns:

- Too much focus on low-risk factors for some sectors (e.g. aquatic pollution from industries with low risk of polluting waterways)
- Questions surrounding the inclusion of activities/installations with generally low environmental impact
- Lack of proportionality in the interpretation of the Regulations by the Environment Agency

The two-tiered administrative approach may add to the sentiments of disproportionality. If all PPC regulated activities were administered by the Environment Agency there would be reduced differentiation between the environmental impacts of activities in administrative terms.

The second most common concern referred to the differences in the application of the IPPC Directive across the EU. The 2007 Defra Review of IPPC implementation found that most companies believe the PPC Regulations have a largely negative effect upon the ability of companies to compete at both the EU and wider international levels. One sector representative stated that:

> "There's a European report on how an IPPC was implemented, across the EU. Basically, it shows that we and Germany were doing everything that we were supposed to do, efficiently. And basically, the rest of the EU had done absolutely nothing."

The "*rest of the EU had done absolutely nothing*" is over-stating the problem, but this point is indeed supported by implementation progress reports. The 2005 Commission report on implementation found that the majority of Member States

had shortcomings in their implementation of the Directive (European Commission, 2005c), with the exception of the UK and Germany as rightly asserted by this industry stakeholder.

However, perceptions from other industries are very different. Two sector associations indicated that even in the presence of different implementation approaches, the *real* effects are unlikely to be as severe as some industry stakeholders claim:

> "Implementation across the EU - it's a different rate of application and therefore you have competitive distortions. I couldn't actually say that it has caused specific damage. But obviously there are occasional concerns if you find yourself governed by a stricter regime than another country in the EU."

Further to this point, the long transposition period obviously led to some countries implementing the Directive prior to others for some activities. Since the 2007 all activities have to be regulated by IPPC, thus reducing any of the competitive issues during the transposition phase.

4.15 Chapter summary

This Chapter has approached the following key issues relating to the application of the IPPC Directive in the UK:

- An analysis of the development of the IPPC Directive at EU-level
- The transposition of IPPC into the British legislative system
- The implementation of the PPC Regulations in England and Wales
- Evidence-based analysis of the performance of the PPC Regulations to date based on evidence gathered during a survey of industrial sector associations and interviews with stakeholders including the Environment Agency

Evidence gathered during the survey of sector associations indicates that the PPC Regulations provide little or no impetus to consume energy efficiently and reduce GHG emissions beyond permit requirements for these installations. This is particularly concerning given the central place of energy efficiency within the IPPC Directive. A key feature of the IPPC Directive, and the subsequent PPC Regulations, is the improvement of energy efficiency. Installations participating in

CCAs or the EU ETS are required to improve energy efficiency as part of these programmes. However, as Chapters 5-7 will demonstrate, the shortcomings of these policies mean that these crucial issues for addressing climate change may not be addressed adequately. Furthermore, installations outside of these policies have to meet energy efficiency requirements as part of the PPC permit requirement yet PPC does not provide a suitable means to reduce GHG emissions and manage energy efficiently.

Further outcomes of the analysis in this Chapter indicate that the perception of industry is generally negative towards the BAT-based approach. However, PPC has only been in operation for 7 years. By implementing a technology-based, holistic permit-based approach to environmental protection the European Commission was clearly adopting a long-term strategy to deal with emissions into air, water and soil. The benefits of such an approach may not be immediately apparent to the regulated. It is unfortunate that external stakeholder participation in this element of the research was not forthcoming as this group of respondents would certainly have provided some invaluable insights, particularly given the intention to compare this regulatory approach with the voluntary CCAs and UK ETS.

5 Climate Change Agreements

5.1 Introduction

In the 1999 Budget the Chancellor of the Exchequer announced the introduction of an energy tax for non-domestic consumers - the Climate Change Levy. The CCL was subsequently codified in law through the Finance Act 2000 (c.17). To 'soften' the financial blow of the CCL, industrial sectors were presented with the opportunity to enter into voluntary agreements with the Government (HM Treasury, 1999). This was supplemented with a £150 million fund to support energy efficiency improvements within firms in 2000/01. In return for adhering to the rules of the CCAs, by reducing energy consumption and carbon emissions, companies receive an 80% rebate on the CCL.

The Government initially claimed that the CCL would generate 2 MtC savings per year by 2010. The Government subsequently revised the impact of the CCL upwards to 3.5 MtC per year by 2010. However, a review undertaken by the NAO in 2007 found that the impact of the CCL on industry had been significantly watered down in the presence of rapidly increasing energy prices due to other causes (e.g. EU ETS cost pass through from the power sector and rocketing oil and gas prices). At the time of CCA negotiation, it was believed the CCAs would deliver savings of 2.5 MtC per year in 2010 (NAO, 2007a). This figure has since decreased to 1.9 MtC per year in 2010. With five years remaining until the current Agreements expire in 2013, the Government has decided to extend the CCA programme until 2017.

5.2 Description and characterisation of the Climate Change Levy and Climate Change Agreements

The CCL came into force in April 2001 (Defra, 2001) and is applied to the consumption of gas, coal, electricity, petrol and hydrocarbon in liquid states, lignite, coke, semi-coke of coal/lignite and petroleum coke by non-domestic users[37](HM Customs and Excise, 2002). Commodities not taxed under the Levy include oil, road fuel gas, heat, steam, low value solid fuel (e.g. coal tailings with

[37]Non-domestic users includes: industry, commerce, agriculture, public administration and other services.

a market value of less than £15) and wastes defined in the Statute. The Levy is applied once in the supply chain directly to the end user.

Early expectations of the government were that the "revenue neutral" CCL would amount to approximately £1 billion revenue per year. This £1 billion would then be recycled by means of reducing employer National Insurance Contributions (NIC) by 0.3% and through the establishment of the Enhanced Capital Allowances (ECA)[38] with a £50 million fund to promote energy efficiency in businesses (Carbon Trust, 2002). By 2006 the CCL had not managed to meet the income expectations. Income peaked in 2003/04 at £832 million (UK Trade Info, 2004) (see Table 5.1). Conversely, the NIC rebate has gradually increased over the life of the Levy.

Table 5.1 CCL income and approximate National Insurance Contribution rebate 2001-2006

Financial year	CCL income (£ million)	Approx. NIC rebate (£ million)
2001/02	555	1,035
2002/03	829	1,125
2003/04	832	1,185
2004/05	764	1,215
2005/06	744	1,275

Source: NAO (2007a)

In order to qualify for the reduced CCL rate (table 5.2) businesses would have to enter into a voluntary CCA with the Secretary of State for the Environment, Transport and the Regions (now Secretary of State for the Environment, Food and Rural Affairs, henceforth both terms are interchangeable and will be referred to as the 'Secretary of State').

Table 5.2 CCL rates per tonne CO_2 at the 2001-2007 rates

	CCL equivalent price per tonne of CO_2 (£/tCO_2)	CCL discounted price per tonne CO_2 (£/tCO_2)
Levy on electricity (0.43p /kWh)	£10.30	£2.06
Levy on natural gas (0.15 p/kWh)	£8.05	£1.61
Levy on coal (0.15 p/kWh)	£5	£1

[38] ECA reward businesses that invest in energy saving equipment. These businesses also pay less tax on profits arising from energy saving equipment.

5.2.1 Regulatory Impact Assessment and the consultation process

A full RIA of the CCAs has never been carried out. As detailed Appendix 4, a partial RIA of the rules relating to energy use at CCA sites was carried out in 2001(Defra, 2001a). According to this partial RIA some stakeholder consultation activities were carried out in 2000-01. The list of consulted organisations does not extend beyond sector associations with the notable absence of external stakeholders (in the form of NGOs, academic experts, consultants etc.).

New regulations were introduced in 2006 to account for the extension of the eligibility criteria on an energy intensity basis (The Climate Change Agreements (Eligible Facilities) Regulations, 2006). In this instance not even a partial RIA was carried out. The explanatory note to the Regulations states:

> 'A full regulatory impact assessment has not been prepared for this instrument as it has no impact on business, charities or voluntary bodies.'

Given that the CCAs apply to industry there is clearly an impact on business. Furthermore, the voluntary nature of the Agreements means, as stated earlier in this thesis, external consultation is important in ensuring a voluntary instrument achieves widespread support.

5.3 Operation of the Agreements

The Secretary of State originally negotiated Agreements with 44 sector associations, representing more than 5000 companies and 12,000 target units[39] (ENDS, 2005b). The number of Agreements and the target units they represent has changed continuously since their introduction in 2001. Energy usage targets were negotiated using four possible units: relative energy; relative carbon; absolute energy; and absolute carbon. 'Relative' targets terms refer to the energy use or carbon emissions produced per tonne of unit of output. 'Absolute' targets refer to the total quantity of carbon emissions or energy used, irrespective of produced output. The majority of CCAs were negotiated using relative energy use. Only four sectors negotiated absolute energy targets and a further two negotiated relative carbon targets (a list of all sectors, type of target, baseline years and performance to date is located at Appendix 6). Sectors were able to choose their preferred target type and the sector target was based on the sum of

[39] A target unit refers to an individual site or parts of a site that is included in an Agreement

the targets within underlying Agreements - the second tier of Agreements signed by operators of target units and the Secretary of State (NAO, 2007a).

Eligibility to enter into an Agreement was initially based on IPPC coverage. However, the thresholds for inclusion in PPC Regulations are disregarded and all IPPC activities (as implemented through the PPC Regulations) irrespective of size are eligible to enter into a CCA (Defra, 2001b). In 2006, an extension of the eligibility criteria resulted in 12 new sectors signing umbrella agreements. These sectors are all relatively small in terms of the number of target units and energy use compared with the original CCA participating sectors. The Treasury estimated that these sectors will make carbon emissions savings of approximately 0.3 MtC/year by 2010 (Defra, 2006c). These participating target units are also eligible to receive the 80% discount on CCL payments provided the terms and conditions of the CCA are met. Companies that meet the IPPC criteria for participation must do so under the IPPC arrangements. Units are not permitted to enter an agreement under the extended Energy Intensive criteria unless they fail to meet the IPPC eligibility criteria. However, in cases where a single site comprises separate facilities that are eligible under both criteria the site can share a single target (Defra, 2006c), thus reducing the administrative burden on the operator, the sector association and Defra.

Performance of target units and sectors is measured bi-annually at interim target periods (2004, 2006, 2008 and 2010). At each interim target point, individual target units have to present data concerning energy use and production levels to the sector association. Defra subsequently checks the data to determine whether both the sector and the target units are eligible for recertification and the resulting 80% CCL discount during the next 2-year interim target period (de Muizon and Glachant, 2004). During the original negotiation of CCAs, provisions were installed to allow the review of the final three interim targets (2006, 2008 and 2010) in 2004 to ensure that the targets for each sector still represent the best option in terms of cost-effective energy savings. This review process was also used as a means to assess whether targets set in the original Agreements were too stringent or too lenient (Future Energy Solutions, 2005).

5.4 Performance of CCAs to date

In absolute terms (i.e. total energy consumption or CO_2 emissions reductions) the CCAs have overachieved in each target period by nearly double the initial targets within the umbrella agreements when translated in to absolute carbon savings. Table 5.3 presents the performance of CCAs in the first three target periods. It is important to note that this 'overachievement' is largely attributed to a significant downturn in steel production (see Table 5.3, rows I-K). The steel sector accounts for approximately a quarter of the energy consumption within all CCA sectors. This issue is analysed in more detail in section 5.6. The number of target units that were not re-certified following the interim target period assessment has decreased from 12% after the first target period to 10% in the third target period (see Table 5.3, row H).

Table 5.3 Results of target periods 1-3

		Target period 1 (2002)	Target period 2 (2004)	Target period 3 (2006)
A	Total number of umbrella agreements	44	42	49
B	Number of sectors meeting targets	24	21	32 (41)[40]
C	Total number of target units	5742	4675	4885
D	Target units re-certified (either meeting individual target or whole sector target)	5042	4420	4401
E	Target units withdrawing from an agreement	164	228	345
F	Target units not re-certified (i.e. failing to meet underlying agreement target if sector as whole fails to meet umbrella target)	219	23	23
G	Target units not submitting data at end of target period[41]	319	4	116
H	% of Target units re-certified	88%	95%	90%
I	Absolute annual carbon saving (MtC)	4.5	3.9	4.5
J	Absolute annual carbon saving (excluding steel sector) (MtC)	1.9 (steel = 2.6)	1.9 (steel = 2)	2.5 (steel = 2)
K	Proportion of annual savings arising directly from CCAs (MtC)	1.9	1.9	2.5

Source: Future Energy Solutions (2004), Future Energy Solutions (2005), NAO (2007a), Defra (2007a)

The 2007 NAO assessment of CCAs highlighted several fundamental issues with the calculation of performance and difficulties in modelling the impacts of the Agreements during the negotiation period. Prior to the negotiations, the Global

[40] Defra uses both of these figures in Results of the Third Target Period Assessment stating "overall 32 out of the 49 sectors have met their targets after taking the emissions trading by operators into account. However one of these sectors, whilst meeting their CCA target, did not meet their European Union Emissions Trading Scheme corrected target, and a single target unit within the sector was decertified. In effect, however, 41 of the 49 sectors met their targets as all target units have been re-certified".

[41] Failure to submit data at the end of a target period results in termination of the agreement with the individual target unit.

and Atmospheric Division (GAD) of Defra modelled the potential carbon savings from 14 of the CCA sectors. Extrapolated to the original 44 sectors the modelling suggested that the CCAs could save 4.5 MtC per year below business as usual (BAU) projections by 2010 (ETSU - AEA Environment, 2001). In the event, Defra negotiated agreements that should have produced carbon savings of 2.5 MtC in 2010 despite the evidence of the GAD modelling (NAO, 2007a). Furthermore, even the 2.5 MtC saving negotiated with the original 44 sectors is unlikely to occur. The current prediction for carbon savings below the BAU scenario is 1.9 MtC in 2010 (NAO, 2007a).

Econometric modelling by Ekins and Etheridge (2006) led to some critical observations of the approach taken to negotiate and apply targets within some of the participating sectors. In some sectors, such as minerals and chemical production, the decrease in energy consumption would have occurred in the absence of the CCAs. Ekins and Etheridge attribute this to the impact of information asymmetries between industry and government, and the often "compelling arguments" of industry that any proposed measure will cost more to industry than the reality.

Contrary to the industry positioning on the CCL, further analysis undertaken by Ekins and Etheridge led to the conclusion that the CCL is, in fact, beneficial to the economy due to the NIC rebates and resulting small increases in GDP and employment levels. Furthermore, in terms of economic efficiency it is posited that a uniform environmental tax applied across sectors can result in cheaper emission reductions compared to the situation we find with the addition of CCA-type instruments where some companies receive a reduced tax rate as companies not in receipt of a discount are often subject to a higher tax rate.

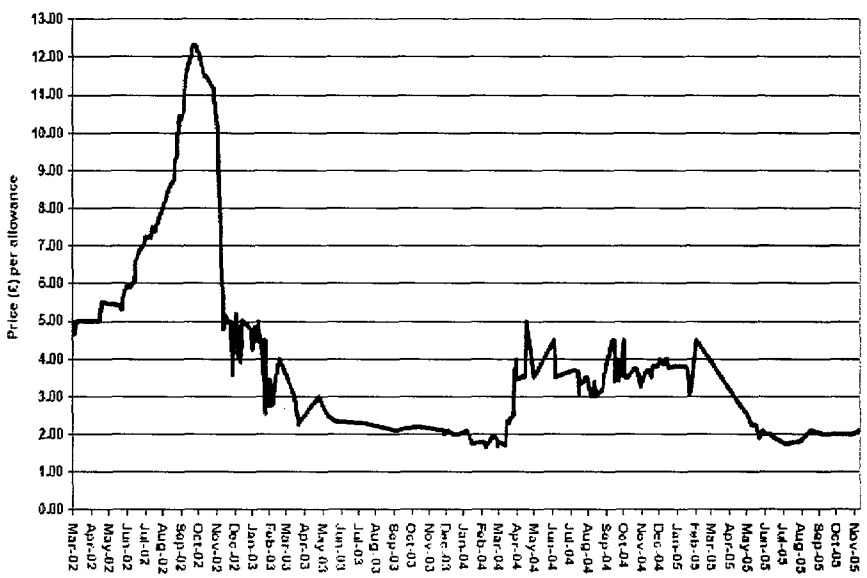
5.5 Operation of CCA participants within the UK ETS

Operators of target units are permitted to purchase allowances from the UK ETS emissions trading registry (ETR)[42] in the event of a target unit not meeting the targets specified in the underlying agreement. The impact of CCA operators on the trading price of UK ETS allowances has been significant. Allowance prices peaked in autumn 2002 at around £12.50 per tonne of carbon dioxide equivalent (CO_2e). This peak is linked to the rush from CCA signatories to purchase

[42] The ETR was established as the trading registry for the UK ETS.

allowances prior to the end of the 1st target period in order to meet their targets (NAO, 2007a). Since then the allowance price has decreased dramatically with the occasional elevation to around £5. In July 2007 Natsource Transaction Services were trading allowances for CCA participants below £2 per tonne of CO_2e (Natsource, 2007).

Figure 5.1 UK ETS allowance price trends (March 2002 - November 2005)



Source: Natsource (2007)

Target unit operators and sectors are also permitted to 'ring-fence' emission reductions. This means the operator/sector may preserve any overachievement for use against future interim targets (Defra, 2002d). This provision is commonly referred to as 'banking' in the context of emissions trading. Studies show that banking can prevent price volatility within trading schemes and subsequently increases certainty within the market (Ellerman, 2005, Cason and Gandagharan, 2006, Schleich et al., 2006, Tietenberg, 2006). Furthermore Schleich et al. (2006) argue that banking can reduce overall compliance costs as cost savings can be traded over time.

A brief comparison of two trading schemes in the United States: the sulphur dioxide (SO_2) trading scheme and the Regional Clean Air Incentives Market (RECLAIM) demonstrates the potential impact of banking. The RECLAIM programme is particularly rigid in terms of banking (specifically inter-temporal banking where inter-temporal banking refers to the banking of emissions allowances for use in future commitment/compliance periods). As a result, the

price fluctuations have been particularly severe (Ellerman, 2005). On the other hand, the more lenient approach to banking within the SO_2 programme has led to a significantly higher degree of price stability (Ellerman, 2005). In the case of CCAs, over-achievement that is ring-fenced may be used in the instance of an operator or sector not meeting their interim targets. At the end of the third target period the majority of sectors, 41 out of 49, were able to ring-fence allowances for future use (Defra, 2007a). Ring-fenced allowances are available for subsequent sale via the UK ETS or use during the emissions/energy accounting prior to the subsequent interim target reconciliation.

Evidence from the USA suggests that banking may have had a negative impact on the outcome of the CCAs. Scarcity of allowances would have led to higher allowance prices and a more fluid market. However, the perceived overachievement against unambitious targets led to high volumes of allowances entering the market and few being purchased. Problems associated with banking are neatly summarised by Carson and Gandagharan (2006) who state that:

> 'Price stability comes at a cost, however, since noncompliance and emissions are significantly greater when banking is allowed'
>
> (Carson & Gandagharan, 2006: p.199)

This issue was of particular concern during the period 2002-2006, when several key Direct Participants[43] in the UK ETS over-performed, generating an additional surplus of 3.5 million allowances (Smith and Swierzbinski, 2007).

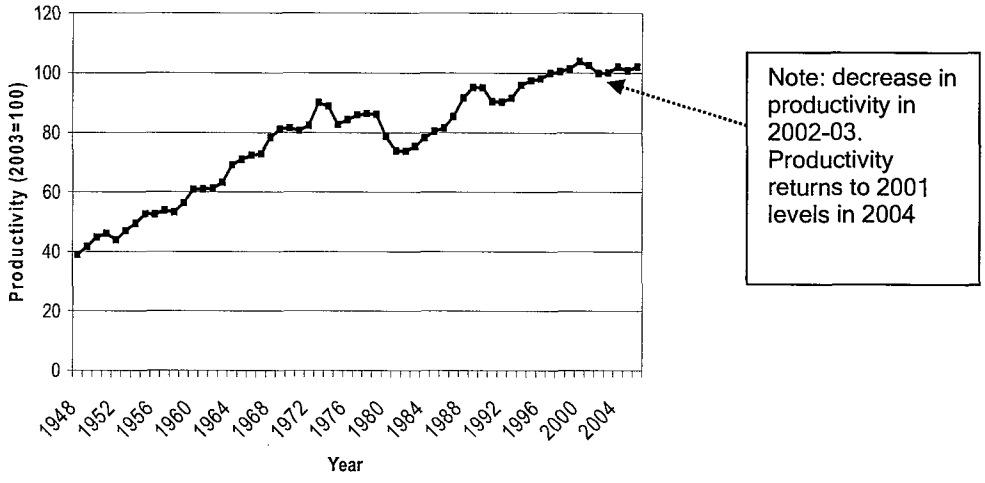
5.6 Impact of industrial changes within CCA sectors

British industry has experienced a period of rapid and dramatic change during the last 60 years. Production in real terms (using 2003 as the benchmark of 100 units) has increased steadily since the late 1940s (Figure 5.2). This development has been characterised by periodic, dramatic decreases in productivity in the late 1970s, mid-1980s and early 1990s (Office of National Statistics, 2007). Of particular interest to this thesis is the decrease in productivity experienced in

[43] There were 32 Direct Participants in the UK Emissions Trading Scheme. These companies voluntarily agreed to reduce their GHG emissions below a baseline (1998-2000) in return for a share of £215 million incentive fund supplied by HM Treasury. The UK ETS operated for Direct Participants from 2002 until the end of 2006. After the end of 2006, the ETS remained open to allow trading by CCA participants.

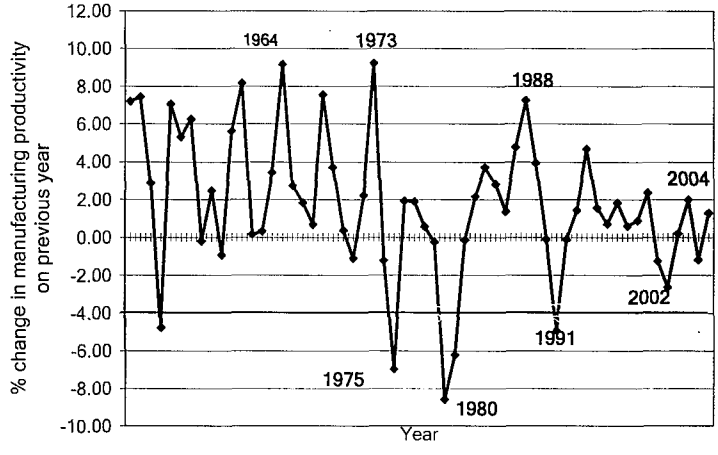
2002 (Figure 5.3). This mirrors the reduction in output from the steel sector, which happens to be one of the largest and most energy intensive sectors within the CCAs.

Figure 5.2 Annual manufacturing productivity in real terms since 1948 (using 2003 as baseline year = 100 units)



Source: Adapted from Office of National Statistics (2007)

Figure 5.3 Annual increase on previous year in manufacturing productivity in real terms since 1949



Source: Adapted from Office of National Statistics (2007)

The initial overachievement in the first two target periods has mainly been attributed to these dramatic changes within the steel sector. Output from the steel industry in 2002 was 13.3% below 2001 levels (Iron and Steel Statistics Bureau,

2006). This was followed by an increase in output of 15% between 2002 and 2004, whilst energy use increased by 10%, indicating that the steel industry is making some significant improvements in its energy efficiency (Stern, 2006).

It should be noted that the steel industry is not the sole cause for the over-achievement in the first two target periods. The calculation of the baselines for some of the CCAs may have had a negative impact on overall performance. Several sector targets were calculated according to 1990 energy use baselines. Defra justified the use of such historical baselines on the basis of allowing "credit for early action", especially in industries where significant improvements were made in the early 1990s with little prospect of new technologies or advancements in energy efficiency during the life of the CCAs. This methodology has similarities to the calculation of baselines in the UK ETS which has also been subjected to criticism (NAO, 2004). The use of early baselines, while giving credit for early action, may mean that the targets set against these baselines are not sufficiently challenging despite the 'early action'. Difficulties in defining early action and the impact on performance targets undermined the effectiveness of both the CCAs and the UK ETS to varying degrees.

A third explanation for the ease with which the first three target period targets have been met centres on the theory presented by Ekins and Etheridge (2006) of businesses knowledge and influence in the negotiations. Helm (2006) identified factors that influence the degree or this type of regulatory capture: staff turnover and source of staff, salaries and "overwhelmingly, strategic information revelation". In interview Defra acknowledged that continuity of staff within its CCA team and the loss of corporate knowledge may be of concern to some CCA participants. However, there are procedures and policies in place in an attempt to ensure that new staff are adequately trained and knowledgeable through the use of checklists, databases and protocols.

The revision of interim targets in 2004 leads to questions over the ability of Defra to negotiate challenging targets even in the presence of reliable data is questionable. Following the release of performance data in 2004 it became apparent that the CCA sectors had overachieved against targets by an aggregate of 5%. Defra had the right to tighten targets that were perceived to be too lenient. Despite the availability of initial compliance data indicating a 5% aggregate tightening was required (NAO, 2007a), Defra negotiated an aggregate tightening

of 3.2% of 2006 targets, 2.7% for 2008 targets and 3.0% for 2010 targets. In interview, Defra stated that it did not believe it was in a position to force tougher targets on sectors, despite the availability of evidence to the contrary, indicating the presence of regulatory capture. Furthermore, the timescale of the release of verified performance data from Defra's consultants was uncoordinated with the negotiations as the verified data was released following the negotiation stage (NAO, 2007a).

It is interesting to note that a recent study on voluntary agreements in Chile found that even in the presence of some degree of regulatory capture, significant environmental improvements can be made (Jimenez, 2007). This study suggests that regulatory capture may not be so severe as to negate any possibility of improvement in the environmental performance of companies. Thus, the impact of regulatory capture on the environmental outcomes of policy instruments is a matter of degree. In this regard, it should be noted that capture of this nature is not restricted to voluntary measures, but all forms of environmental governance. This will continue to be the case while governments and regulatory bodies rely upon industry for information.

This teaches us a valuable lesson. Industry may have a better understanding of what it can achieve but the need remains to push industry to achieve more, despite its protestations about the negative impacts of environmental policy. Where there is information asymmetry the justification for increased spot monitoring and tougher compliance systems also increase.

5.7 *Ex post* evaluation within Parliament

Following the publication of the NAO review of the CCL and CCAs in 2007, the House of Commons Environmental Audit Committee (EAC) commenced an investigation into the role of the CCL and CCAs in reducing greenhouse gas emissions from UK businesses. The EAC called upon numerous stakeholders to provide evidence including representatives from the Carbon Trust, government advisors and sector association representatives. The Committee released its findings in March 2008 (Environmental Audit Committee, 2008). In this report the EAC acknowledged that the CCL has not had the effect first predicted by the Government upon business energy consumption. Furthermore, the report

identified the issues relating to baseline selection and the implications for assessing the overall effectiveness of the Agreements:

> 'It appears to us that isolating and enumerating the impacts of the Climate Change Agreements is even more complex and uncertain than accounting for the impacts of the Climate Change Levy. It is remarkable that the performance of most sectors is measured from a variety of different starting points that predate the start of the Agreements; in three cases stretching back to 1990. While measuring the impact of Agreements by reference to business as usual projections avoids some of these problems, it also creates new ones of its own: as we have argued in previous reports, BAU projections intrinsically lack certainty, and depend very much on the quality of the assumptions and data used to generate them. For these reasons we recommend that, when reporting figures for the impacts of the Agreements, the Government gives a range of uncertainty attaching to them.'
>
> (Environmental Audit Committee, 2008: p.18)

The EAC also criticised the Government for failing to tighten the interim targets, especially given the vast over-performance of many sectors in the first three target periods. In light of the strength of these criticisms coupled with the administrative complexity of the CCAs, it is surprising the EAC indicated support for the continued use of CCAs beyond the existing life-span provided the Agreements are adapted to better account for other policies (including the Carbon Reduction Commitment and the EU ETS (Environmental Audit committee, 2008). As a result, Defra has surprisingly decided to extend the Agreements by five years.

5.8 Overview of evidence-based analysis

To populate the evidence-based analysis questionnaires were sent to the 49 sector associations party to a CCA. Questionnaires altered to account for 'external' stakeholders (i.e. non-sector association actors) were sent to a further 25 individuals or representatives of organisations. The 25 non-sector association stakeholders included non-governmental organisations, academics, consultants and government departments. The response rate from both groups was reasonable: 36% of sector associations responded and 32% of external stakeholders responded. The overall response rate was 32%.

The majority of respondents from both the sector associations and external stakeholder groups (69% and 85% respectively) were willing to be interviewed. Ten interviews were conducted in 2007. The interviewees were categorised as follows: sector associations (6 interviews); consultants (3 interviews); and government (1 interview).

5.8.1 Sector associations

The responding sector associations varied in size according to the number of companies they represent. The majority of associations represented more than 21 companies (see Table 5.4). In terms of the number of target units participating within the CCA administered by a sector association, the most common frequency is between 11 and 31 target units (see Table 5.5).

Table 5.4 Size of responding sector associations (number of companies)

Size	% respondents
1-5	12.5%
6-10	12.5%
11-15	12.5%
16-20	6.3%
21+	50%

Table 5.5 Number of target units within each CCA administered by responding sector associations

Number of target units	% respondents
1-10	25%
11-30	31%
31-50	6%
51-70	13%
71-90	0%
91+	25%

On the basis of the ranges presented above the minimum number of companies represented by the responding sector associations is 236 companies. The maximum number is at least 268. The minimum number of target units within the Agreements administered by the responding sector associations is 556. The maximum number of target units is at least 744.

5.9 Economic efficiency

When approached in the context of the policy mix of CCL and CCA, the majority of both stakeholder groups stated that the CCAs operate in an economically

efficient manner although a sizeable minority (25%) of all respondents ranked the efficiency as 'very inefficient' or 'quite inefficient'. Approximately 20% of respondents rated the efficiency as 'average', with the remaining 55% rating the economic efficiency of CCAs as either 'quite efficient' or 'very efficient'. More than 79% of respondents also believe that voluntary programmes such as CCAs result in cost savings to industry compared with traditional regulation-based approaches to environmental protection. However, only 42% of all respondents believe the same to be true for the Government. Defra, on the other hand, stated that the CCAs *are* cheaper for the Government to administer:

> "A regulatory approach would cost more because additional civil servants would be needed to administer the scheme, police it and enforce it. Also there would be penalties for breaching the rules in the form of prosecutions which cost a lot in time, fees to lawyers (inc. barristers) and court costs."

The perception of costs and benefits of the CCAs are much more positive compared with EU ETS and UK ETS. The benefits are perceived by industry to slightly outweigh the costs for both industry and government (50% and 38% respectively). It is surprising that the perception in favour of industry is not higher. However, during the interview process all sector associations were asked whether they believe companies could have made financial savings on energy expenditure in the presence of the full rate of the CCL via energy efficiency measures alone. All interview participants agreed that this could have occurred. Hence, industry may have been able to reduce energy costs via efficiency measures alone without the CCL rebate. Consequently, CCAs may represent an additional administrative burden that is not entirely necessary. Perceptions relating to the balance of total costs and benefits of the CCAs are provided in Figure 5.4 and Figure 5.5.

Figure 5.4 Perceptions of costs and benefits incurred by companies participating in CCAs

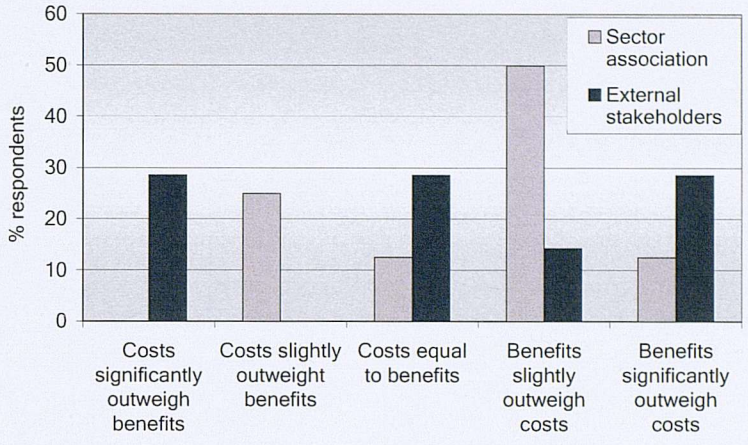
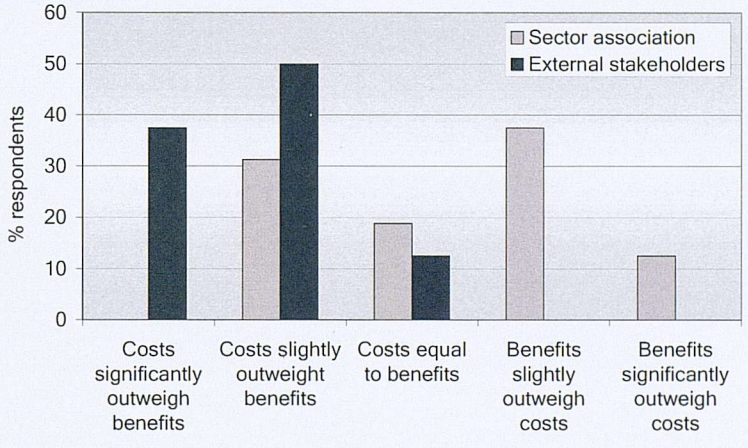


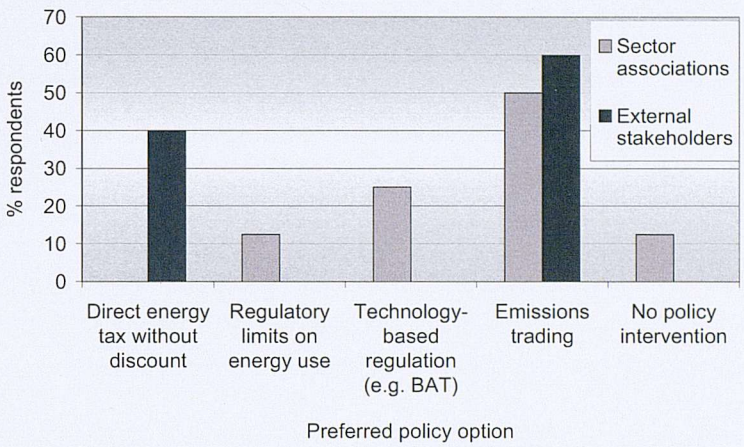
Figure 5.5 Perceptions of costs and benefits incurred by Government though the CCAs



All survey respondents were asked whether they believe the CCL/CCA policy package represents the best policy option in terms of overall economic efficiency and environmental outcomes. External stakeholders are least likely to perceive CCAs as the best policy option in both senses as less than 40% believe CCAs to be the best policy option. The majority of sector associations on the other hand believe the CCAs are the most economically efficient manner in which to achieve energy use reductions. Conversely, most sector associations do not believe CCAs are the best option in terms of environmental outcomes. This contradiction is relatively simple to explain. CCAs, by their voluntary nature, work in favour of participating firms as they may be cheaper to administer than other forms of regulation (Karamanos, 2002). The CCL discount makes the CCAs particularly

cost-effective for firms. The majority of all respondents (58%) believe a stand-alone emissions trading scheme would be a more cost-effective policy to reduce energy consumption in CCA sectors (Figure 5.6). During the course of the interviews it became apparent that the primary reason for this preference for emissions trading was linked to the complexity of the CCL/CCA package in a stand alone sense and also the complexity of the interaction between CCAs and EU ETS.

Figure 5.6 Preferred policy option in economic terms



Interview respondents frequently discussed emissions trading, with most sector associations expressing support for a shift from the non-mandatory CCAs to mandatory emissions trading for energy intensive sectors currently falling outside of remit of the EU ETS. Sentiments included:

> "[Emissions trading] is a valid control instrument and likely to give better results than CCAs."

> "Emissions trading is having to happen anyway. CCAs are just a bureaucratic gateway you have to pass to get to emissions trading."

However, some concerns raised over the use of emissions trading were also noted. The ability of emissions trading to stimulate good energy management and efficient use of energy can cause concern as organisation may become "*pre-occupied with ensuring they have enough credits to do what they want to do instead of asking whether they actually need to do what they want to do*". Furthermore, it is possible that energy price rises occurring as a result of the EU ETS do not provide a sufficient driver alone to make real progress in improving the energy efficiency of industrial energy consumers. A mechanism such as

CCAs on the other hand was noted by all interview respondents for providing the impetus to businesses to place energy management at the top of the corporate agenda.

The survey also led to the identification of fundamental differences in the cultural attitude of sectors with regard to environmental protection. One respondent stated that:

> "The CCL discount is the key driver [for participating in a CCA]; all other [drivers] are equally insignificant."

Another respondent stated in response to a question concerning whether CCAs have resulted in companies including the cost of GHG emissions into their business activities that:

> "Outside of work, I am sure they [people working within manufacturing] are concerned about the environment. Inside of their work they are struggling to survive and so what is important is getting the next order."

Conversely, four sector associations clearly took more favourable stances to environmental protection. One respondent cited a key driver as:

> "The collective will to meet targets and therefore demonstrate environmental credentials."

The other three sector associations stated that participation was in keeping with the environmental policy of the organisation.

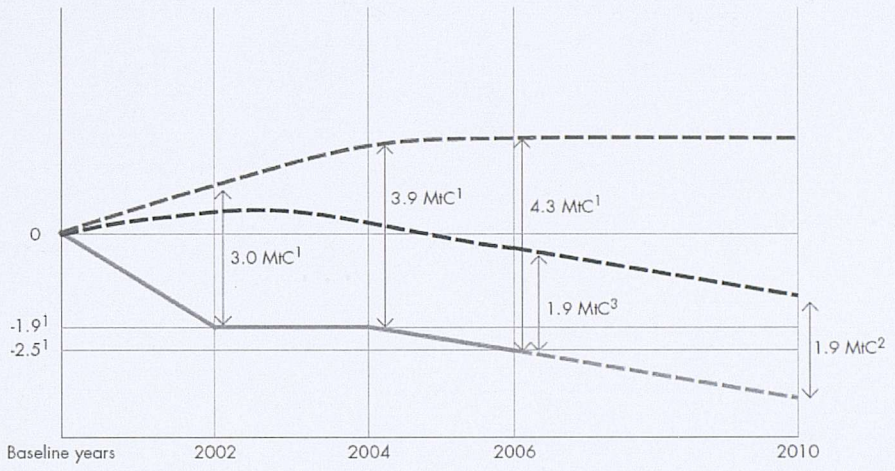
5.10 Environmental effectiveness

The reliance of industry-sourced data upon which to base performance targets in all but 14 sectors (the 14 sectors included in the GAD assessment) suggests that a certain degree of regulatory capture took place during the negotiation of the initial CCA targets. Where GAD modelling was not available Defra relied on industry to provide baseline energy consumption data and carbon dioxide emissions (NAO, 2007a). A consultant stated in defence of Defra that:

"Industry representatives were adamant that the targets Defra agreed at the time were going to cripple them and evidence shows that they haven't. But I don't think Defra were in a defendable position to do anything more than that."

The position taken by Defra led to significant revisions in the actual contribution of CCAs to annual BAU carbon emissions (Figure 5.7).

Figure 5.7 Emission reductions compared to business as usual scenario



BAU(1): Projected emissions reflecting business as usual assuming that production increases but no efficiency improvements are made

BAU(2): Projected emissions reflecting business as usual assuming that production increases and efficiency improvements are made (but only those that would have occurred in the absence of the Agreements, such as those driven by rising energy prices)

Projected emissions reflecting BAU(2) plus efficiency improvements brought about by the Agreements

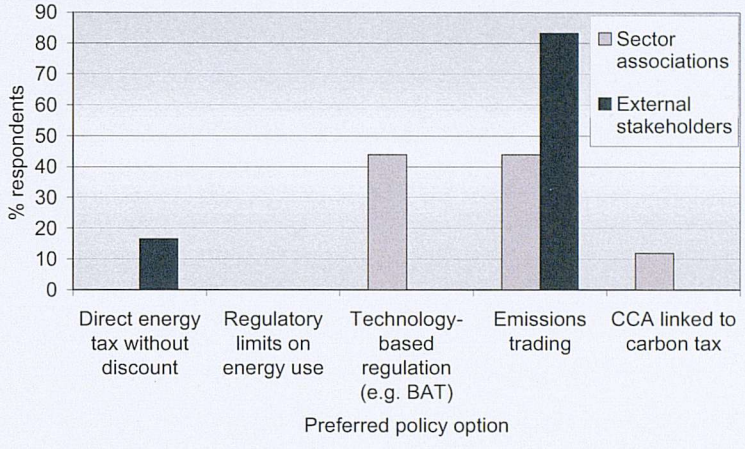
Actual emissions reflecting reported savings

Source: NAO (2007a)

All questionnaire respondents were asked to identify whether they believe the CCAs represent the best policy option for their industrial activities in terms of reducing GHG emissions via energy efficiency improvements. 44% of sector associations believe the CCAs are the best policy option. Interestingly, 19% of sectors are unsure and a significant minority (38%) believe CCAs are not the best policy option. The vast majority of external stakeholders (63%) do not believe CCAs are the best policy option in environmental terms. The remaining 37% disagree. However, it should be noted that within the external stakeholder group there are responses from Defra and consultants employed on their behalf to undertake monitoring and reporting duties.

Respondents who expressed concern about the environmental effectiveness of CCAs were asked to specify the policy instrument they believe would be the most environmentally effective means to reduce GHG emissions from CCA sectors. The breakdown of these responses are presented in Figure 5.8

Figure 5.8 Preferred policy response of respondents who doubt the environmental effectiveness of CCAs



There is a preference for emissions trading from an environmental perspective within both stakeholder groups. In order to minimise the administrative burden of companies participating in CCAs and EU ETS one respondent stated that the CCAs should be withdrawn in favour of the EU ETS due to the high-profile nature of the Scheme:

> "I think the way forward is the EU ETS. On the wider climate change policy front emissions trading is now seen as the most important policy measure. The EU ETS is looked upon as one of the leaders in the field globally. In order to avoid double regulation I think we should not extend CCAs beyond the present life."

Furthermore, environmental benefits of allowing installations to increase absolute emissions yet still comply of the relative CCA target are unlikely. Johnstone (2003) asserts the use of relative targets in negotiated environmental agreements and emissions trading programmes is of questionable environmental benefit. This is largely due to the environmental uncertainty surrounding the outcome of the programme as emission abatement is hinged on production levels. This concept was supported by one consultant:

> "I think it is a much better option and I think the EU ETS is a great way to go. I would want the companies currently covered by a CCA to be incorporated into the EU ETS. EU ETS is a very good mechanism. It is a market mechanism that can't be fudged. You can't create emissions credits. With CCAs you manage to create an emissions credit, a public good, by increasing output. Your emissions go up but you emit less per unit so you create this emissions credit out of nowhere. That is not fair. Telling people they have an absolute emissions limit and people can do what the hell they like to achieve that - you can close a factory, put in more efficient kit, change your product mix. It incentivises people to move manufacturing into the most energy efficient and emissions efficient type of plant which is what we are trying to achieve ultimately."

These sentiments were echoed by a sector association respondent:

> "From an environmental point of view it is possible to increase energy efficiency but at the same time increase emissions. Whereas emissions trading when you have an absolute cap, from an environmental point of view, might appear to be the most attractive. Whereas relative targets such as CCAs do allow companies to increase production and overall emissions."

One sector association respondent, whose sentiments were generally negative regarding policy intervention in environmental issues (specifically energy management), surprisingly stated that they would rather see their sector included in EU ETS that see the continuation of the CCAs:

> "I don't think the CCAs have worked. Meeting Kyoto targets has been primarily down to the dash for gas - and that can only be done once. If they start to use nuclear - 20-30 years away - then where else is there to go? As much as we have fought to remain outside of EU ETS - we are certainly out of Phase II - I still think it is a valid control instrument and likely to give better results than CCAs."

Despite the concerns and availability of data questioning the environmental effectiveness of the CCAs, one sector association was adamant that it would support the continuation of the CCAs beyond 2013 for one reason: to avoid admitting their previous promotion of CCAs may have been misguided:

> "There are major differences between CCAs and EU ETS but we tend to stick with CCAs as it was our idea. If we move away from it people might even say we were even wrong and we should have gone this other way [towards emissions trading]."

This is alarming and does not contribute positively to arguments in favour of continuing the Agreements. If anything, comments such as this only serve to discredit any 'pro-post-2013' CCA arguments.

5.11 Transparency

Many authors have previously highlighted the fundamental role of a reliable and credible legal backdrop in VEAs in order to ensure environmental goals are achieved (Helby, 2002, Makuch, 2003, Ekins and Etheridge, 2006). Ekins and Etheridge (2006) assert that CCAs do indeed offer such credible sanctions in the form of the removal of the 80% CCL discount from target units failing to meet their interim targets. The empirical data collected for this thesis supports this notion, as 57% of external stakeholders and 69% of sector associations believe that the loss of the 80% CCL discount is a sufficient penalty to deter non-compliance. A further 19% of sector associations believe that the penalty is too severe and should be replaced with the issuance of a formal warning and public disclosure of target units failing to meet their targets. However, this type of penalty is unlikely to be acceptable to external stakeholders as voluntary agreements rely on "credible" sanction. A non-financial warning is unlikely to deter sub-optimal behaviour.

The involvement of stakeholders external to industry is an area of the policy the two groups of participants exhibited clear differences. 31% of sector association believe that external stakeholders had too much influence in the development of CCAs with the remaining 69% stating external stakeholder participation was acceptable. Of the external stakeholder group 50% believe that external stakeholders were not involved sufficiently during the development of CCAs. This is particularly significant as the link between public/external participation in policy decision making and the level of transparency of policies has been widely acknowledged and most notably within the Aarhus Convention (UNECE, 2000). A further 38% of external stakeholders stated that the level of transparency of the CCAs either has some areas in need of improvement or the level of transparency is wholly unacceptable. External stakeholders identified one particularly problematic area as the reliance on industry to provide reliable and accurate data

to inform the setting of baselines. Two external stakeholders also stated that the absence of performance data on individual target units reduces the level of transparency of the Agreements. A practice of 'naming and shaming' target units that fail to meet the underlying agreement targets and "*comprehensive reporting in the public domain*" would significantly improve the perception of transparency of the agreements. However, Defra justified the current level of reporting and administrative transparency by stating:

> "This isn't a mandatory scheme. These are voluntary agreements and they already have the penalty that if they forget to report or if they fail to report their performance against their targets for our reconciliation, their Climate Change Agreement is terminated straightaway. So, they stop getting their discount from April 1st after that.....Our overarching policy aim is to have as much energy covered by Climate Change Agreements as possible because that way we have the challenging energy efficiency or emission reduction targets and we've got some improvement in energy efficiency on all of that energy. We don't really want to fight the people out of the scheme."

In essence, Defra did not (and plans not to in the future) increase the level of public reporting as it is fearful that in doing so target units, or even entire sectors, would leave the CCAs. Yet looking at positions of both groups - Defra as government negotiator, industry as the target audience - it is difficult to understand the stance taken by Defra. In offering a significant reduction on CCL payments Defra is in an incredibly strong negotiating position. Given the financial value of participation to industry (and bearing in mind that even if an individual target unit fails to meet its target it will still receive the discount if the whole sector meets the target), it is hard to believe that increased public reporting and the use of "naming and shaming" would deter participation.

5.12 Flexibility

The voluntary nature of the CCAs give companies the power to improve the management of their investment decisions, as demonstrated by the responses in Table 5.6. The use of relative targets, in particular, was raised in the interviews as having a positive effect upon the flexibility of the Agreements. Further to this point, the CCAs were introduced for an initial period of 13 years. The certainty that accompanies such a long-term policy approach is reflected in the confidence

industry has in investment decision making linked to the CCAs. Uncertainty about the future of policies has been previously shown to have detrimental effects upon industry confidence in future investment decision making (European Commission, 2006b).

Table 5.6 Rating of flexibility with regard to management of investment decision making

Respondent group	No flexibility	Very little flexibility	Moderate flexibility	High flexibility
Sector associations	0%	0%	88%	12%
External stakeholders	0%	0%	50%	50%

Table 5.7 Rating of flexibility with regard to industry deciding how to reduce emissions/energy consumption in the most cost-effective manner

Respondent group	No flexibility	Very little flexibility	Moderate flexibility	High flexibility
Sector associations	0%	25%	56%	19%
External stakeholders	0%	25%	37.5%	37.5%

The most interesting results relating to flexibility concern the degree to which CCAs allow industry to optimise emission reduction/energy efficiency improvements according to the marginal abatement costs of individual firms (Table 5.7). A quarter of both groups of stakeholder believe the CCAs offer very little flexibility in this respect. These statistics are surprising since CCAs have a trading provision that should help to identify where marginal abatement cost are lowest. The combination of a voluntary agreement with the ability to buy or sell excess allowances should make the CCAs a highly flexible option for the industries concerned. The low trading price of allowances, a characteristic of the UK ETS for all but a few months in 2002, should have made the purchase of allowances an attractive option for companies. In fact, more than 56% of sector associations reported that between 11% and 50% of their members had purchased allowances from the UK ETS. Without this facility in place, these installations may have failed to surrender sufficient allowances at the end of each interim target period.

5.13 Innovation

The majority of all stakeholders believe that CCAs incentivise a degree of technological innovation within participating firms (Table 5.8). However, a sizeable minority (25% of sector associations and 37.5% of external stakeholders) believe they have no impact either way. The element of emissions trading via the UK ETS should provide an additional economic incentive for firms to innovate via opportunities to sell excess allowances generated through the introduction of more energy efficient technology. However, the vast over-allocation of allowances to UK ETS Direct Participants and the leniency of some CCA targets have diminished the financial appeal of making additional energy efficiency savings in order to sell surplus allowances.

Table 5.8 Degree to which CCAs incentivise technological innovation within energy-intensive industry

Respondent group	Strong disincentive	Slight disincentive	No impact	Slight incentive	Strong incentive
Sector associations	0%	0%	25%	63%	12%
External stakeholders	0%	0%	37.5%	37.5%	25%

Sector associations were asked to identify the changes within their sectors that are directly attributable to the presence of CCAs (Table 5.9). The level of awareness within senior management of climate change was identified as the primary change. It is reassuring to note that 88% of sector associations reported that their members had also installed new equipment with higher efficiency ratings that previous equipment in order to meet CCA targets.

Table 5.9 Stated changes within activities arising directly from CCAs

Change directly related to CCAs	% respondents
Increased awareness of climate change within senior management	94
Introduction of equipment/machinery with higher energy efficiency rating than previous equipment/machinery	88
Improved environmental reporting	69
Inclusion of the cost of carbon in new project appraisals	56
Process changes	44
Improved monitoring and reporting of peripheral systems	12
Improved auditing/comparisons of performance within sector	12
Improved supply chain management	0

5.14 Acceptance and equity

Industry stakeholders have a strong sense of acceptance for the CCAs with 88% of sector association stating they had either qualified or full acceptance (Table 5.10). It is surprising that 60% of external stakeholders also mirrored these sentiments. Voluntary policy instruments often suffer from negative press and receive little support from circles beyond government and industry, exemplified by the European car manufacturer's agreement (ACEA, JAMA and KAMA agreements).

Table 5.10 Level of acceptance for CCAs according to stakeholder group

Stakeholder group	Full rejection	Qualified rejection	Indifference	Qualified acceptance	Full acceptance
Sector associations	0%	6%	6%	44%	44%
External stakeholders	0%	20%	20%	20%	40%

Respondents were asked to rank the level of fairness of the CCAs taking certain issues into account. These issues included: the economic costs of CCAs incurred by industry and government; social benefits arising from the CCAs; changes in environmental quality; and the distribution of costs and benefits of the CCAs. A breakdown of the responses is provided in Table 5.11.

Table 5.11 Rating of fairness of the CCAs

Stakeholder group	Very unfair	Slightly unfair	Fair	Very fair
Sector associations	0%	25%	69%	6%
External stakeholders	0%	0%	88%	12%

It is surprising that all external stakeholders rate the CCAs as either fair or very fair. This contradicts assumption made by the Aldersgate Group[44] that non-industry actors do not fully support voluntary environmental policy instruments (Aldersgate Group, 2006). The responses from sector associations provide further useful insights. One quarter of sector associations believe the CCAs to be, overall, unfair particularly given evidence collected during the interviews indicating that some sectors believe CCAs in conjunction with the CCL is not a

[44] The Aldersgate Group is a coalition of NGOs, academics, industry representatives and think tanks "*who believe that high environmental standards will be a major part of future economic growth and international competitiveness*" (www.aldersgategroup.org.uk/home).

suitable policy approach and leaves industry vulnerable to international competition. However, the views of industry on this are largely based on anecdotal evidence and there is little evidence available to support the notion of UK firms closing or relocating abroad as a direct consequence of the CCL and CCAs.

The strong sense of acceptance of the CCAs within industry coupled with Defra's position of its ability to offer challenging targets indicate that lobbying by sector associations was a key feature in the development of the Agreements. Many of the sector associations interviewed for this research talked about the role of their organisations in the negotiation of the Agreements. They frequently drew attention to their success in weakening the targets proposed by Defra only for these targets to be met with considerable ease by companies. Individual companies may not be in a position to lobby governments to such an extent but many sector associations are in place with the primary objective of ensuring the interests of their members are protected. This highlights the importance of having parties with conflicting interests, such as NGOs with an environmental agenda, at involved not only in the development of instrument but during the negotiation of performance targets.

5.15 Other issues

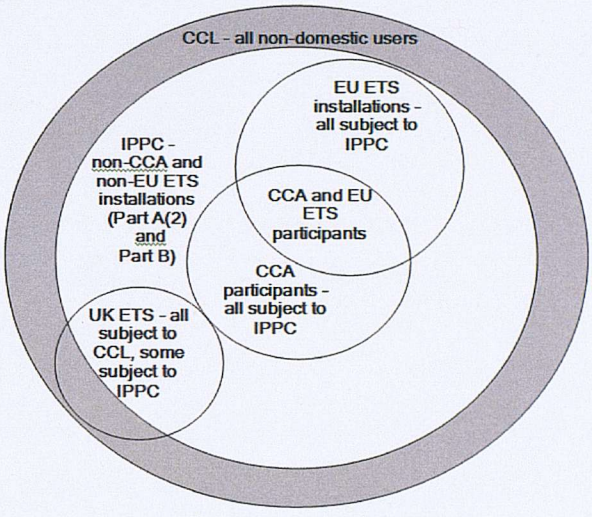
Several other pertinent issues were raised in both the questionnaire responses and interviews. The key area of concern relates to the interaction between CCAs and other climate change policies. The cohesion with the EU ETS is particularly concerning due to the complex methodology used to adjust targets for installations operating within both systems. This section will detail the operation of the CCAs within the EU ETS and UK ETS in further detail. Another important issue raised repeatedly was the impact of escalating energy costs and the implications for the effectiveness of the CCAs.

5.15.1 Interaction between CCAs and other climate change policies

Any assessment of the Climate Change Agreements would not be complete without dealing with the often intricate and complex relationship between the Agreements and other environmental policies. The role of the IPPC Directive in defining the eligibility of an installation to participate in the CCAs and the impact of the CCAs on the UK ETS has already been analysed. One further instrument

has a significant impact on the CCAs: the EU ETS. The interaction between IPPC, CCAs, CCL and other key policies such as EU ETS and UK ETS is demonstrated in Figure 5.9 IPPC forms the basis of qualification for both CCAs and EU ETS. Until 2007 installations covered by a CCA and EU ETS were permitted to opt-out of Phase I. This exemption was withdrawn for Phase II. All installations covered by IPPC are subject to the CCL.

Figure 5.9 Interaction between CCL, IPPC, CCA, EU ETS and UK ETS



5.15.1.1 European Union Emissions Trading Scheme

The interaction between the EU ETS and CCAs is complex. The most pressing of issues is double counting of emissions that are potentially covered by both the EU ETS and CCAs. Installations covered by both policies were given the opportunity to opt-out of the EU ETS until the end of Phase I. Of the 500 target units eligible for EU ETS participation, 330 chose to opt out (Defra, 2007a). In order to avoid target units operating within both schemes receiving twice the benefit or twice the penalty for changes in emissions, Defra introduced a methodology to correct the CCA target to account for emissions included in the EU ETS. In the majority of cases the emissions associated with electricity consumption remained within the CCA. Direct emissions from processes fell within the EU ETS. In some situations combustion emissions were covered by the EU ETS. These emissions may also have been covered by a CCA. However some other process emissions could be included in the CCA but not in the EU ETS. Therefore, Defra adjusted CCA targets to remove EU ETS-covered emissions. Defra subsequently compared the CCA performance of the target unit

against the revised CCA target (Defra, 2006b). Defra guidance on double counting specifies that:

> 'If an operator reduces emissions, then they may have a surplus of allowances for sale on EU ETS or banking for future use. The same reduction in emissions may also mean that the operator over-performs against their CCA target, which can be converted into allowances for sale on UK ETS. In other words, the operator gains allowances on both trading schemes for the same reduction in emissions. Conversely, if emissions increase, operators may find themselves forced to obtain allowances on both EU ETS and UK ETS to meet the requirements of different targets.'
>
> (Department for Environment Food and Rural Affairs, 2006b: p.1)

The NAO reported that many sector associations and operators were concerned about the interaction between the two policies. These concerns focused primarily on:

- Data from different compliance periods being compared (e.g. 2006 CCA data compared with 2005 EU ETS data, 2008 CCA data compared with 2007 EU ETS data).
- Difficulties in determining where the overlap between the two policies occurs on a given site, due in part to the coverage of EU ETS for entire installations and CCA coverage of only energy intensive activities in some instances.
- Operators experiencing difficulties during the accounting periods for both policies, which has on occasion resulted in an installation failing to meet adjusted targets for both the CCA and EU ETS despite having initially complied with both policies.

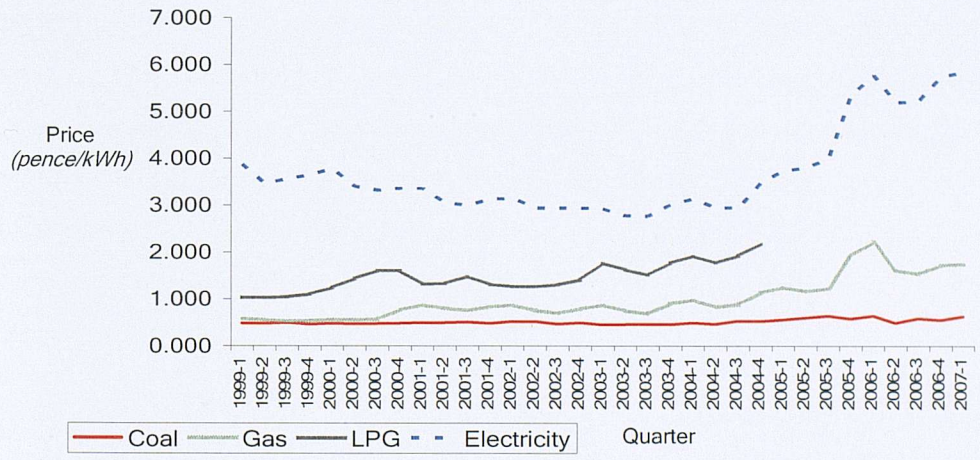
Interviews for this research found that several sector associations interviewees were concerned about the interaction between the EU ETS and CCAs due to the complex nature of double counting. There have been few investigations into the effects of double counting. Defra and Defra-appointed consultants remain the major sources of information with little in-depth analysis of the issues. This comes despite the Better Regulation Commission (BRC) recently highlighting the importance of Government ensuring that the appropriate level of intervention is applied within climate change policy (Better Regulation Commission, 2007).

Furthermore the BRC stated that the Government should also ensure that "double-banking" is avoided.

5.15.2 Impact of energy prices on energy consumption

In addition to the impacts of other policies and dramatic changes to the industrial landscape in the UK in recent years, energy prices have possibly had the most severe impact British industry. Energy costs were comparatively low during the 1990s. With the turn of the 21st century came not only the CCL, but rapidly increasing energy prices. It is, therefore, difficult to separate the influence of these two factors. As Figure 5.10 demonstrates, the rate of increase in energy prices, in particular electricity and gas, has been rapid and severe. Between 2001 and 2006 gas prices increased by 121%, roughly equal to 94% in real terms. Electricity prices also increased during this time by 76% (54% in real terms) (DTI, 2007b). Coal prices also increased but by a less dramatic 17.6% (4.2% in real terms).

Figure 5.10 Electricity, gas, coal and LPG prices by quarter since 1999



Source: Author's own calculations based on data from BERR (2008)

The CCA/CCL policy package was designed to enable companies willing to commit to energy consumption reduction targets to reduce the rising cost of energy following the introduction of the CCL. Whilst the sector associations generally give credit to the CCAs for increasing the importance of energy efficiency at the board level, most also believe that energy prices have had a greater impact in reducing energy consumption compared to CCAs, as stated by one sector association:

> "In comparison to the energy price rises we have seen in the last 2 years the CCL is a relatively small proportion of the energy bill."

This indicates that CCL is not applied at a high enough rate in order to achieve the maximum energy consumption reductions, which is highlighted by the dwarfing of the CCL by the rate of growth in energy prices. Another respondent stated that:

> "When CCAs started, energy was probably the third highest cost in the industry - the two higher being raw materials and labour. But with the increased cost of energy it has now risen to second place ahead of labour as labour was cut severely during the financially hard times."

However, not all respondents expressed such negative views. One sector association pointed out that rising energy prices merely highlighted the need to ensure the sector participated in a CCA as "*the [CCL] discount is invaluable to us*".

5.15.3 Post-2013 Climate Change Agreements

Possibly the most startling revelation of the CCA investigation is that all respondents were in agreement that participating companies could still have reduced their energy costs in the presence of the CCL and in the absence of the 80% discount though the implementation of energy efficiency measures alone. This suggests that the targets, including the revised targets (the majority of which were tightened in 2004), were set so low as to not require much additional effort beyond business as usual behaviour.

Despite this, 62% of sector respondents believe that CCAs should continue beyond the current life span. A quarter of sector associations and 63% of external stakeholders do not support the continuation of CCAs beyond 2013. Reasons for this are presented in Table 5.12.

Table 5.12 Rationale for withdrawing CCAs in 2013

	Sector associations	External stakeholders
Alternative policy instrument will result in better environmental outcome	40%	12%
More economically efficient means available	20%	38%
CCAs are too complex	20%	25%
CCAs should continue but compulsory withdrawal of EU ETS installations	20%	0%
Too soon to tell	0%	0%
Relative targets are too lenient	0%	25%

Nevertheless, in addition to saving approximately 1.9 MtC per year by 2010, the CCAs have successfully elevated the strategic importance of energy and in decision making within many sectors. In some instances, CCAs have inspired the implementation of new technologies and procedural changes towards efficient energy consumption. The CCAs have also led to the 'cost of carbon' being included in the appraisals of new projects within industry.

From a policy and regulatory learning perspective, the reliance upon industry-sourced information in the absence of independently derived data (a condition precedent to sound law and policy making) has proved to be problematic. This state of affairs would appear to have contributed towards the establishment of unambitious targets. At the time of the CCA negotiations Defra were in a difficult position for a number of reasons. The GAD assessment made certain predictions yet could not be applied to all sectors. Therefore Defra had to reply upon information provided by the sector associations. By their own admission, some sectors provided recommended targets based on energy audits that were particularly unambitious. Had the proposed targets been approved by Defra, the CCAs would have resulted in energy use reductions little beyond business as usual. One would assume that industry knowledge on its performance potential would be high. This case highlights two pitfalls of reliance upon industry-source information: the previous ambivalence towards energy use within industry and the potential for industry to attempt to negotiate targets that could be met with considerable ease.

A final point in relation to the CCAs focused on the use of relative targets. The majority of sectors chose relative energy consumption targets. The reasons for this are clear: relative targets allow companies to grow and increase production without having to reduce their total energy consumption - the amount of energy used per unit of output must however decrease. Absolute targets may be more

difficult to meet especially if production increases and the target does not reflect this. However, it can be argued that absolute targets are fundamental to achieving the ultimate objective of deep cuts in GHG emissions. Relative targets will allow total GHG emissions to continue on the current increasing trajectory as long as industrial productivity continues to increase. In addition to allowing energy consumption to increase under certain production conditions, the relative nature of CCA targets is contrary to the absolute nature of EU ETS targets and those targets which exist within the EU and international climate change policy frameworks. This could not have been prevented as the negotiation of CCAs took place five years prior to the introduction of the EU ETS, though the backdrop of the EU and international frameworks may well serve as a warning against future use of relative targets.

5.16 Chapter summary

This Chapter has presented a comprehensive analysis of the CCAs. A number of key issues that have influenced the degree of success of the CCAs were repeatedly raised by respondents to both the questionnaire and interviews. These have been identified as:

- Difficulties in the interaction between the CCAs and other policies, notably the EU ETS
- Changes in productivity within CCA sectors
- The impact on rapid energy price rises on industrial energy consumption reducing the impact of CCAs
- Issues relating to transparency and public reporting
- Potential for GHG emissions to increase due to relative energy consumption targets

The current projected carbon savings from the CCAs are significantly lower than initial estimates. Evidence concerning the overachievement of the CCL suggests that there is a possibility that the application of the CCL alone may have yielded similar, if not greater, carbon reductions than CCAs (Ekins and Etheridge, 2006). The cumulative effect of these issues is a disappointing environmental outcome of the Climate Change Agreements. The Agreements underperformed against initial expectations. The Agreements subsequently underperformed against

revised expectations. Detailed policy recommendations on the CCAs and the other three case studies are presented in Chapter 9.

6 United Kingdom Greenhouse Gas Emissions Trading Scheme

6.1 Introduction

The third case study Chapter presents the analysis of the UK Greenhouse Gas Emissions Trading Scheme. Whilst this trading scheme was voluntary in nature and of limited coverage, it thoroughly deserves the detailed analysis presented in this Chapter for the following reasons. Firstly, the UK ETS incorporated three key policy instrument techniques: voluntary participation, allowance trading, and subsidies. Secondly, the Government was keen in publicising the UK ETS in the first few years of its operation. It was a key component of the 2000 Climate Change Programme. Yet by the time of the revised 2006 Climate Change Programme the Government was less than keen to draw attention to the instrument as its lack of achievement became more apparent. This Chapter analyses the limited elements of the policy that were particularly successful and the key elements that led to the underperformance of the Scheme.

6.2 Operation and characterisation of the UK ETS

In 1999, shortly following the Government's announcement to introduce the Climate Change Levy, the Confederation of British Industry (CBI) published a proposal for the introduction for a greenhouse gas emissions trading scheme within the UK (ENDS, 1999). At the time, many Government Ministers and industry insiders were sceptical that the launch of such a scheme within such a short timescale would be possible. Furthermore, the Government appeared to be showing less interest in trading schemes, pursuing instead the CCL and the negotiated CCAs. However, the CBI remained confident that with enough support from the Government a trading scheme could be introduced by April 2001 (ENDS, 1999). Trading proposals were developed by 24 leading companies, many of which were power generators or petrochemical industries[45], all stating their interest in pursing a greenhouse gas trading scheme. The significance of the industrial activities of those advocating emissions trading should not be underestimated. Power generators in particular were in a strong position to make

[45] The 24 companies identified by ENDS can be categories by sector as follows: Power generation (8 companies), petrochemicals (5), cement (2), metals (2), food/beverages (2), motor vehicles (2), and aviation (1). (ENDS Report 297, 1999)

significant emission reductions with little effort and with minimal risk to competitive positions due to fuel (coal to gas) switching. The Government subsequently congratulated the CBI on "addressing the key issues" of climate change policy and for helping the UK to move along the road towards implementing the world's first fully fledged greenhouse gas trading scheme (ENDS, 1999). Further developments, notably the publication of the UK Climate Change Programme in 2000, began to explicitly set out the desire of the British Government to pursue emissions trading.

The UK Emissions Trading Group (ETG) was established in 1999 with the purpose of representing industry and further developing the initial UK ETS proposals. In March 2000 the ETG published its full UK emissions trading scheme proposals, 9 months prior to the publication of the 2000 Climate Change Programme. With some haste, the Government agreed to implement the Scheme and included it within the 2000 Climate Change Programme. The UK ETS consultation was published in May 2001. In August 2001, the then Minister of State for Environment, Michael Meacher, signed the Regulatory and Environmental Impact Assessment conducted by Defra, declaring that the benefits of the proposed emissions trading system would outweigh the financial costs, thus giving the official go-ahead for the Scheme (Defra, 2001c). By March 2002 the UK ETS was launched and trading commenced on 1st April.

The UK ETS had four key objectives:

1. To reduce greenhouse gas emissions at reasonable cost to Government and industry.
2. To give British industry 'first mover' advantage in anticipation of the launch of the EU ETS.
3. To establish the City of London as a global centre of expertise in emissions trading and allied services (i.e. verification, auditing, brokerage).
4. To influence the EU by demonstrating that emissions trading is a practical and viable means to meet Kyoto Protocol targets.

As this Chapter will demonstrate, only one of the four objectives was met with any certainty. The City of London is now operating as a major hub for carbon trading, with a wealth of expertise in verification, brokerage and off-setting services.

However, the cost of the UK ETS, the low participation numbers and the significant overlap between the UK ETS and the EU ETS, *inter alia*, had serious ramifications on the achievement of the remaining objectives.

The UK ETS had two principal groups of participants: Direct Participants and Climate Change Agreement Participants. Other parties were permitted to participate as traders without compliance commitments (Radov and Klevnäs, 2004). Direct Participants were subject to absolute targets, based on a system of baseline and cap-and-trade. Table 6.1 presents the key events during the lifetime of the UK ETS from 2000 until the end of 2006.

Table 6.1 Timeline of the UK ETS

Date	Event
January 1998-December 2000	Baseline period
November 2000	Launch of UK Climate Change Programme
April 2001	Climate Change Levy introduced
August 2001	Publication of draft Framework of the Scheme
August 2001	Publication of the Regulatory and Environmental Impact Assessment
August 2001 - December 2001	Pre-registration period of organisations considering direct participation in the Scheme
December 2001	Publication of draft rules of the Scheme
1st January 2002	Commencement of the first compliance period
January 2002	Registration period and auction bids from organisations wishing to participate in the Scheme
January 2002	Publication of auction format
February 2002	Publication of final Scheme rules
1st April 2002	Successful Direct Participants enter the Scheme; allocation of first allowances - trading begins
31st December 2002	End of first compliance period
1st January 2003 - 31st March 2003	First reconciliation period [46]
April 2003	First incentive payments made to compliant Direct Participants
May 2003	The Government hails the first year of the UK ETS as a success following 900 companies trading emissions allowances amounting to more than 7MtCO_2e. However, critics remain sceptical of the potential effectiveness as the price of carbon remains low, potentially reducing the incentive for companies to continue emissions reductions beyond targets
31st December 2003	End of second compliance period
1st January 2004-31st March 2004	Second reconciliation period
31st December 2004	End of third compliance period
1st January 2005-31st March 2005	Third reconciliation period
November 2005	The Carbon trust publishes the report "*The UK Climate Programme: Potential evolution for business and the public sector*". The report details proposals for a refined emissions trading system within the UK following the closure of the UK ETS.
31st December 2005	End of fourth compliance period
1st January 2006-31st March 2006	Fourth reconciliation period
December 2006	End of fifth compliance period **UK ETS closed to Direct Participants** (Emissions Trading Registry remains open for CCA participants)

Source: Adapted from DETR (2000a), ENDS (2003) Radov & Klevnäs (2004) and Person (2004)

[46] During the reconciliation period Direct Participants must have their total emissions for the preceding compliance period verified by accredited verifiers. The emissions are subsequently reported to the Emissions Trading Authority (ETA). Direct Participants must conduct any final trading to ensure they are in receipt of sufficient emissions allowances to cover their verified emissions for the compliance period. Allocation of incentive payments is based on successfully meeting these criteria.

Of particular importance to the UK ETS is the inclusion of six greenhouse gases within the trading scheme. Previous experience of trading schemes, such as the US SO_2 program and the 1997 volatile organic compounds (VOC) trading scheme implemented in Illinois had been restricted to one pollutant (Pring, 2006). The approach of including six GHG, followed by conversion of emissions into units of CO_2 equivalent (CO_2e), was novel and even beyond the initial remit of the EU ETS.

6.3 Consultation and RIA

In November 2000 the Government issued a consultation document on the proposed scheme. The Government received 89 responses from various stakeholder groups, including: sector association representatives and companies participating in Climate Change Agreement; other sector association representatives and companies; consultants (environmental and business); business associations; NGOs; academics; and, traders and brokers (DETR, 2001). Every response to the consultation document was generally supportive of the proposed scheme. However, several concerns were raised including the need for simplicity and flexibility, the need for periodic reviews of the scheme, and the constraining effect of other Government policies upon the development and operation of the scheme. In hindsight, most of these issues were not addressed adequately in the framework of the Scheme.

Initially 34 companies committed to take part in the Scheme (a list of Direct Participants and the incentive payments received by each company is located at Appendix 7). This is a staggeringly low figure compared with initial expectations that between 400 and 3000 companies may have benefited from participation, and given that Defra invited more than 6000 companies to participate (House of Commons Committee of Public Accounts, 2004).

The entire process, from first Government proposals to implementation, took slightly more than two years. In response to concerns over the number of Direct Participants, Defra has since stated it decided to press ahead with the Scheme with only 34 participants as it believed that this was a sufficient number to have an operational trading market (House of Commons Committee of Public Accounts, 2004). Defra also stated that time constraints explains the failure to attract more participants as the Scheme needed to be launched and running for

several years prior to the introduction of the EU ETS if the objective of gaining first-mover advantage for both industry and the City of London was to be met. Had more time been available to Defra to develop the Scheme and to attract participants greater emission reduction at lower cost, increasing overall value for money, may have been achieved. Furthermore, with more participants the market might have been significantly more active resulting in higher trading prices of allowances and true realisation of 'first mover' advantage in terms of companies obtaining experience in trading.

6.4 Allowance allocation methodology

The level of incentive payment per tonne of CO_2 abated was calculated using a complicated "descending clock" methodology. To enable Direct Participants to experience the auction format, Defra issued briefing notes on how to bid and held a mock auction shortly before the auction-proper to allow Direct Participants to practice using the auction software (Flynn and Lee, 2002). In contrast to the format of traditional auctions the UK ETS auction started by setting the highest bid. Direct Participants then placed a bid of quantified emissions reductions to receive the current sum of money in incentive payments for reducing their emissions below their baseline emissions. Another round followed, in which the Government reduced the incentive price. This continued until all emission reductions bid by Direct Participants multiplied by the lowest auction price totalled the incentive fund (Defra, 2002b).

The Secretary of State opened the auction with a price £100/tCO_2e. By introducing a high starting price, the Government hoped to encourage participation in the auction (Flynn and Lee, 2002). Following nine further rounds of bidding, the auction closed with a final price of £53.37 per tCO_2e reduction in 2006 (Radov and Klevnäs, 2004). During the initial auction, the 34 Direct Participants committed to reducing 4.03 $MtCO_2e$ in 2006. This equated to 12.1 $MtCO_2e$ during the entire operating time of the UK ETS (Radov and Klevnäs, 2004). However, following the withdrawal of 3 Direct Participants this figure decreased to 11.88 $MtCO_2e$ (NAO, 2004). Two of these participants withdrew at the end of 2002 and a further one in 2003. Little information is available publicly regarding the reasons behind these withdrawals. However, a conversation with a representative from one of the companies established that the withdrawal was

'suggested' by Defra on the grounds of under-performance of the company in question.

Further complexity, beyond the descending clock auction, was added to the Scheme as Direct Participants were required to make progressively larger emissions reductions year on year. As a result, the required emissions reductions for 2006 represented one third of all required emissions reductions during the entire life of the Scheme (2002-2006). Subsequently, the final auction price of £53.37/tCO_2e corresponds to an actual per unit reduction payment over the life of the Scheme of £17.79/tCO_2e when taking cumulative emissions reductions into account (Radov and Klevnäs, 2004). The target emissions reduction for the final year of the Scheme stood at an aggregate reduction of 13% on all verified baseline emissions.

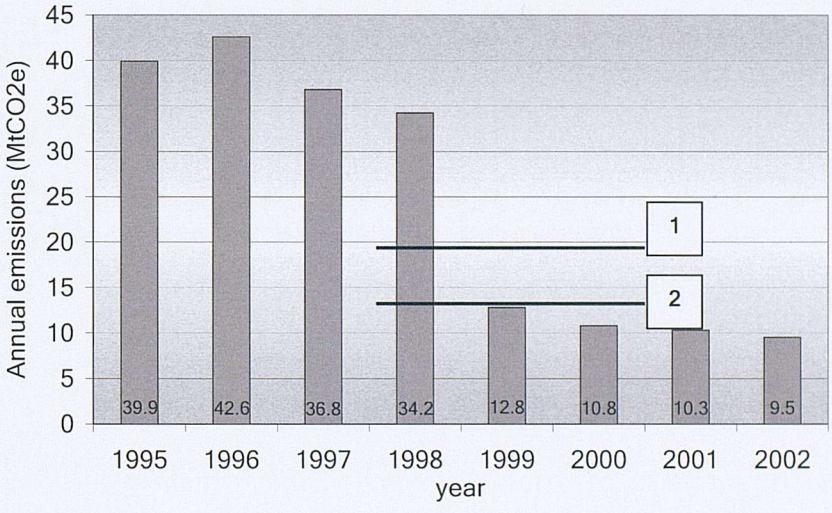
6.5 Baseline calculation, monitoring and reporting requirements

Prior to the launch of the Scheme in 2002 Direct Participants had to submit baseline data against which performance during the UK ETS would be assessed (NAO, 2004). The baseline for each Direct Participant was calculated according to the average GHG emissions during the years 1998-2000. The NAO reported that some participants wanted a shorter baseline period, but Defra maintained that a three year period was required to ensure companies were challenged to make real progress against their business as usual performance. Despite attempts by Defra to ensure forthcoming legislation that may affect the baseline data was accounted for in the final baseline[47] several Direct Participant's emissions were lower at the start of the Scheme than the baseline calculation. This had a severe impact on both the credibility and the environmental impact of the Scheme. Some companies were able to receive significant sums of money in incentive payments for little or no effort to reduce emissions beyond BAU or by installation equipment at significantly lower cost than the value of incentive payments. For example, ENDS (ENDS, 2004d) identified that Rhodia Organique Fine invested £1.25 million in its incinerator to reduce HFC emissions. This investment was required to meet legislative IPC requirements yet the company still received £23 million in incentive payments from the UK ETS because of the impact on the company's GHG emissions.

[47] For instance, IPC requirements implemented between 2000 and the start of the Scheme in 2002 led to a significant reduction in emissions from several companies

Four companies in particular caused severe problems for the Scheme: BP, Invista UK, Ineos Fluor and Rhodia Organique Fine. These four companies were the largest emitters operating within the Scheme. Figure 6.1 presents the total GHG emissions (converted to million tonnes CO_2e from these Direct Participants) between 1995 and 2002. The line labelled 1 indicates the calculated baseline before adjustments to account for new regulatory requirements (19.4 $MtCO_2e$). The line labelled 2 indicates the adjusted total baseline for all four companies (13.3 $MtCO_2e$). Even after the adjustments for regulatory requirements the baseline is still higher than the emissions during two of the baseline period years. The emissions from these four companies were even lower in the first year of the UK ETS thus undermining the economic and environmental performance of the Scheme before it even commenced. During the first year the total abated emissions exceeded the project savings for the life of the Scheme, and this was largely due to the 'over-performance' of these four companies.

Figure 6.1 Total GHG emissions from four Direct Participants



The inadequate baseline calculation had a serious effect upon the total volume of allowances entering the Registry. By 2005 ENDS were reporting of a "carbon mountain" for sale due to the vast over-allocation of allowances compared to the BAU scenario (ENDS, 2004f). In order to rectify the situation Defra first announced it would drain the surplus allowances from the market (ENDS, 2004a). However, under the threat of forced action, six of the largest emitters within the UK ETS (the four companies identified above plus Lafarge Cement and British Airways) "voluntarily" agreed to make further emission reductions. Unfortunately

confidentiality agreements prevented the Government from releasing specific details of the commitments made by each company (ENDS, 2004a).

The Emissions Trading Registry (ETR) monitored and maintained the UK ETS. The ETR was established by the Secretary of State for Environment prior to the launch of the UK ETS with the function of holding trading accounts and records relating to allocation, holding, transfer, cancellation and retirement of emissions allowances (Defra, 2002d).

Requirements for monitoring and reporting were published by Defra in 2003 (Defra, 2003a). The guidelines are based on five key principles of: faithful representation of events and transactions; completeness of information; consistency in methodologies, calculations and data; reliability of baselines and annual emissions; and transparency of data via third party audit.

There is little to doubt about the rigour with which monitoring and reporting was been undertaken. The NAO stated that the "*Participants' reported results have been carefully checked*" (NAO, 2004). The Government issued a list of approved independent and accredited verifiers. These verifiers were charged with ensuring that the reported emissions are correct and that reported results meet the requirements of the Scheme. Annual verified results were published by Defra and made available to the public on-line. The performance of each Direct Participant was detailed annually including the baseline emissions for the year in questions, the target performance, actual emissions and the value of incentive payments.

6.6 Overview of performance 2002-2006

Direct Participants agreed to an aggregate GHG emission reduction of 13% below BAU over the lifetime of the Scheme (Defra, 2006a). However, there was vast over-performance against targets in all years of the Scheme (Table 6.2).

Table 6.2 Aggregate targets and actual performance during years 2002-2006 of the UK ETS

Year	Target reduction below baseline ($MtCO_2$ e)	Actual performance below baseline ($MtCO_2$ e)	Over-performance (%)
2002	0.79	3.85	487%
2003	1.5	3.7	246%
2004	5.8	6.0	103%
2005	5.9	7.1	121%
2006	5.9	7.2	122%
Total	**19.89**	**27.85**	**140%**

Source: Adapted from ENDS (2004e), ENDS (2005c), Defra (2006a) and Defra (2007i)

The environmental performance of the UK ETS is analysed in further detail in section 6.9.

6.7 Overview of evidence-based analysis

The survey of Direct Participants and external stakeholders was undertaken in the first half of 2006. A questionnaire exploring issues relating to the evaluation criteria was sent to 34 Direct Participants, of which three companies were no longer participating. The response rate for this group of stakeholders was 35%. A further 38 questionnaires were sent to external stakeholders, including NGOs, consultants, verifiers, brokers and academics. The response rate from this group was 37%.

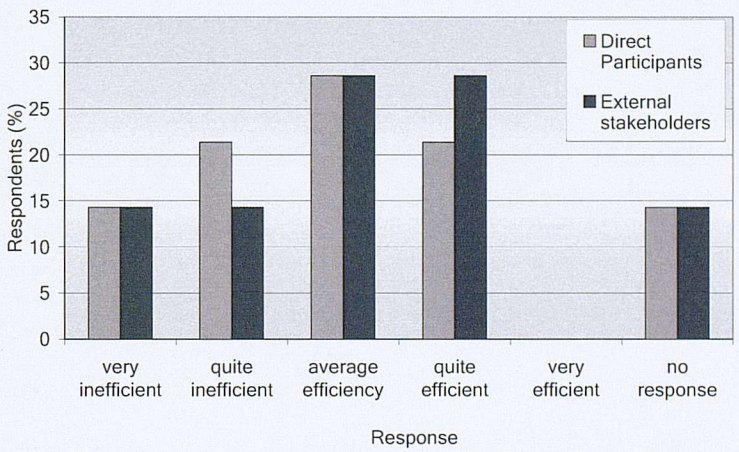
Four stakeholders (one academic, one NGO representative, a Defra representative and one Direct Participant company representative) participated in a focus group. As discussed in Chapter 2, the outcomes of this focus group led to a change in approach and no further focus groups were undertaken. Three one-to-one interviews were carried out with Direct Participant representatives.

6.8 Economic efficiency

Survey analysis shows that Direct Participants have generally positive feedback on most aspects of the UK ETS. Due to the voluntary nature of UK ETS results from the survey were expected to show an overall positive reaction to the Scheme. The Scheme was a policy experiment and did not impose mandatory participation. Therefore UK ETS posed minimal risk of coercion from regulators and a higher likelihood that companies were *willing* to improve their environmental performance.

Upon its closure in late-2006 it was clear that the UK ETS had met some of its initial objectives. Results from the survey indicate that the majority (78.6%) of Direct Participants feel that costs incurred as a result the monitoring and reporting requirements are outweighed by the environmental benefits directly arising from the Scheme. It is reasonable to conclude that the significant incentive payments also contributed to this outcome as monitoring, reporting and verification costs would undoubtedly have been covered by the incentive payments. The three interview respondents from Direct Participant companies indicated that the costs incurred by Direct Participants during monitoring, reporting and verification stages were significantly lower than company income from incentive payments. One respondent stated that the company received £50,000 per year in incentive payments. Verification cost the company £5000 annually. The incentive payment is recycled within the company in energy efficiency measures, saving the company approximately £250,000 per year. As Figure 6.2 shows most stakeholders believe the UK ETS operated in a relatively efficient manner.

Figure 6.2 Economic efficiency of UK ETS



However, the provision of substantial incentive payments for many of the Direct Participant led to questions concerning the value for money of incentivised participation and emissions reductions provided in return. The NAO report of 2004 was particularly concerned that greater emissions reductions could have been achieved at lower cost. Furthermore, a brief case-study of Shell (Figure 6.3) highlights the availability of such large incentive payments and the potential over-spend of the Government on unambitious emissions reductions targets, or more worryingly the provision of large incentive payments to companies who persistently fail to meet the reduction targets yet remain in profit due to the low cost of buying allowances.

Direct Participants largely hold the view that UK ETS is economically efficient because it is efficient in *their* favour - Direct Participants received large incentive payments that are, generally, disproportionate to the costs incurred in meeting emissions reduction targets or the cost incurred in purchasing allowances and the costs of monitoring, reporting and verification (see Figure 5.1 for allowance price trends). The price of an allowance peaked in September 2002 at £12.50. This was largely due to an influx of transactions as CCA participants approached the end of the first accounting period. Since then the price has rarely exceeded £5, with it hovering around £2 from 2005 until trading closed for Direct Participants in December 2006.

Figure 6.3 Shell UK: underperformance and profits

Shell UK Ltd committed to emissions reductions of 409,087 tonnes CO2e over the life of the UK ETS. The company failed to meet its annual targets during every year of the Scheme by approximately 2,760,000 tonnes. In order to comply with the rules of the Scheme the company bought allowances to surrender at the end of each compliance period. Let's assume the market had managed to maintain the peak price of £12.50/tCO2. The company would have to spend approximately £3.5 million on purchasing allowances to meet the deficit. However, this peak price was limited to two months in 2002. Since then the price has not risen above £5 per tonne. Purchasing allowances at this price would have cost the company £1.4 million. These two figures are the maximum amounts the company would have spent on purchasing allowances during the life of the Scheme given the one-time price peak at £12.50 and the more frequent price high of £5, with figure more likely to be in the region of £1.1 million. ENDS stated that "Only one major player, Shell, has consistently fallen short of its emission targets. Even so, the company's annual incentive payments of £4.7 million have greatly outweighed the cost of buying allowances to make up the shortfall. UK allowances traded at £3.5-4/tCO_2 for most of 2004" (ENDS, 2004a)

The cost Shell of purchasing allowances is dwarfed by the incentive payments of approximately £23.5 million received by Shell, despite the company failing to meet its annual emissions reduction targets. The company made a profit of at least £20 million from merely participating in the UK ETS.

Three quarters of Direct Participant respondents stated that the UK ETS represents cost savings to industry compared with traditional approaches to emissions control (i.e. regulation through command and control legislation). This finding further supports the case for market based instruments as a more efficient and cost-effective means to achieving environmental goals.

Defra acknowledged in the focus group that the incentive fund was a *"significant amount"*, although the benefits of the Scheme also need to be *"fully acknowledged"*. These benefits are identified as 'significant emissions reductions', the provision of 'learning by doing', and 'first mover advantage' ahead

of the launch of the EU ETS. Whilst these benefits are indeed worthy, as discussed in some detail within this section, the value of money achieved is questionable. Were these three benefits (first mover advantage; learning by doing; and 'significant emissions reductions', despite several Direct Participants having already achieved their targets prior to the launch of the Scheme) worth £215 million?

The UK ETS successfully helped to establish the City of London as a major centre of international emissions trading expertise. In this sense the 'first mover' advantage had a wide-reaching effect via the establishment of verification, brokerage and trading services The accomplishment of giving industry first mover advantage over EU rivals in anticipation of the EU ETS was supported by Direct Participant respondents. 71% believe the UK ETS met this aim. However, one must question the value of the 'first mover' experience of Direct Participant firms. As stated earlier, Direct Participants come from a variety of sectors. Only 14 Direct Participants had installations that were eligible to participate in Phase I of the EU ETS. 11 of these companies chose to opt-out of Phase I until January 2007 with the remaining 3 having installations operating within both schemes. Of the remaining 17 companies it is unclear how many will be required to operate within the proposed Carbon Reduction Commitment (CRC)[48] as this mechanism is still in the early stages of development and the exact participation requirements are still in consultation. Although the majority of respondents believe the UK ETS did in fact meet its first mover goal (which at the time referred only to the EU ETS), the reality is that less than half of the participants could benefit directly .at a cost of £215 million. Whether the value of the experience was accurately reflected in the cost is difficult to determine but logic reasons that this many not have been the best use of resources.

Furthermore, the cost of the Scheme was slightly higher due to the administrative cost to Defra. In an attempt to quantify the costs and benefits of the Scheme Defra published the calculations in Figure 6.4 in 2002 (Defra, 2002c).

[48] The Carbon Reduction Commitment is the newest proposal from Defra targeted at commercial energy use and carbon emissions. At the time of writing the final scope and coverage of the scheme were being developed. However, it is envisaged that the CRC will be trading scheme for all large, non-energy intensive commercial energy users. Participation will be mandatory and will involve sectors such as local authorities (including school), universities, hospital, Government departments, retail, hotels and large offices. It is anticipates that approximately 10,000 companies will be included in the scheme (http://www.defra.gov.uk/environment/climatechange/uk/business/crc/)

Figure 6.4 Calculated costs and benefits relating to the UK ETS

Net Benefits = Social Benefits + Private Benefits - Exchequer Costs - Administration Costs - Private Costs	
£-66m to £467m =	(£117m to £469m) + (£127m to £181m) - (£127m - £181m) - £1.815m - ≤ (£127m to £181m)
Social benefits =	avoided emissions, using the cost of carbon as a guide
Private benefits =	incentive money paid to Direct Participants, in 2006 prices discounted to 2002 value. The lower of the two figures refers to the amount of incentive money paid if all Direct Participants are subject to the highest level of corporation tax
Exchequer costs =	incentive payments (at discounted rate)
Administration costs =	consultancy and Government staffing costs
Private costs =	assumed to be less than or equal too incentive money received by Direct Participants

Source: Defra (2002c)

Calculation of the benefits of a policy in terms of the monetary value of carbon emissions abated is a highly contentious issue. For its calculations Defra turned to the estimates provided by European Commission placing the value of abated carbon at £70/tC in 2000 (Defra, 2002c). By 2006 this cost had increased to £76/tC. In a selection of report Defra has produced several estimates for the cost of carbon and places the cost in the region of £35/tC to £140/tC[49], with the Government supporting the 'mean' cost of £70/tC. Whilst the accuracy of such measurements is difficult to determine (Mendelsohn, 2003), these figures allow us to perform an interesting comparison with the cost of carbon within UK ETS. Allowance trading peaked at £12.50/tCO_2e. This equates to £3.37 per tonne carbon[50], a staggering 22 times lower than calculated cost per tonne of carbon employed by the European Commission. The incentive payments equated to £4.80/tC. Possibly the most alarming aspect of the calculations in Figure 6.4 is the enormous range of the value of the net benefits. Based on these figures the minimum and maximum benefits stand a staggering £533 million apart. With a range this large one must question the accuracy of the data upon which Defra based these calculations. Furthermore, one must question whether the calculations add any value to analysis of the Scheme given the vast range and the failure of Defra to publish revised or updated values based on more accurate

[49] Variations in the cost of carbon arise from differences in calculations and reports.
[50] 1 tonne carbon is equivalent to 3.67 tCO_2e. (Department of Trade and Industry, 2006)

data (this data was published the year the Scheme commenced and was never updated to reflect the real life operation of the Scheme). The cost of carbon ignites furious academic debates which should in part resolve once schemes such as the EU ETS establish stable price for allowances. It has been argued that this may not occur until all available abatement opportunities have been realised (Personal communication, 2008). Only when companies have to buy allowances out of necessity as all available abatement opportunities have been utilised will we see the true price of carbon established via market forces.

The 2004 NAO Report highlighted that greater emission reductions could have been achieved had more companies participated. Had Defra extended the preparation period[51] prior to the launch of the Scheme more firms may have taken part, resulting in more emissions reductions being achieved at less cost. The NAO also reinforced the position that several companies had reduced their emissions below their baselines prior to the launch of the Scheme. This meant that several companies did not have to change their operations and were not required to make further reductions in order to receive their incentive payments. However, following the publication of the report six Direct Participants announced they would 'voluntarily' make further emissions reductions which went some way to rescuing the Scheme (ENDS, 2005c).

Interestingly, the publication of the 2004 NAO review led to ENDS questioning the impartiality of the organisation. ENDS published claims that the report on UK ETS was 'watered' down following comments from Defra and other stakeholders (ENDS, 2005a). ENDS applied to see the final draft of the report under the Freedom of Information Act. Comparison of the published report and the final draft sent to Defra and other directly related parties, to ensure factual accuracy, showed several key criticisms of the Scheme had either been removed or reduced in severity. Three key 'changes' to the report were:

- The draft report stated "the scheme's cost-effectiveness in reducing emissions is doubtful". Following consultation with Defra and other directly related organisations this was changed to "the scheme has achieved some emission reductions".

[51] Defra adopted a tight time scale from inception to launch of the Scheme in order to ensure maximum experience was gained from the Scheme (National Audit Office (2004) *The UK Emissions Trading Scheme: A New Way to Combat Climate Change.*.

- The draft report stated that in the cases of four key participants - Ineos Fluor, BP, Invista and Rhodia - only 58% of emissions reductions were attributable to UK ETS. The remaining 42% would have occurred in the business as usual scenario[52]. However, the published report stated that approximately 66% of emissions reductions from these four companies were as a result of UK ETS. The NAO did not respond to ENDS when questioned about the changes in the data.
- In the draft report the auction was described as 'disappointing' because fewer than expected companies took part. However, the published report changed the slant on this statement to the success of Defra in ensuring there were enough participants to ensure a viable auction.

These criticisms of the NAO draws attention to the difficulty in sourcing independent and rigorous analysis of not only the UK ETS but other environmental policies which are subject to analysis from organisations beyond Whitehall. Hence, the propensity for self criticism and objective analysis may be low.

In terms of costs incurred by industry, 92.9% of responding Direct Participants calculated the financial costs and benefits of entering the Scheme prior to joining. Many respondents were unable or unwilling to provide further details due to the sensitivity surrounding such financial issues. However, several respondents did elaborate on how and why costs and benefits of participation were calculated. Only one respondent stated that costs outweigh the benefits of participation, by approximately 40%. Further details on this response were gathered during a telephone conversation with the respondent. This particular company received approximately £50,000 revenue for the company per year from incentive payments. Verification costs are approximately £6000 per year, plus additional consultant fees of several thousand pounds per year. Clearly the participation costs were outweighed by the incentive payments drawing attention to the need to rigorously investigate industry claims regarding the cost of policy instruments.

Another compelling response came from a representative of a manufacturing firm. The UK ETS is worth approximately £250,000 per year to the firm. Data verification costs £5000 annually. The company receives approximately £50,000

[52] The NAO employed consultants to assess the impact of UKETS upon the emissions reductions of the four companies.

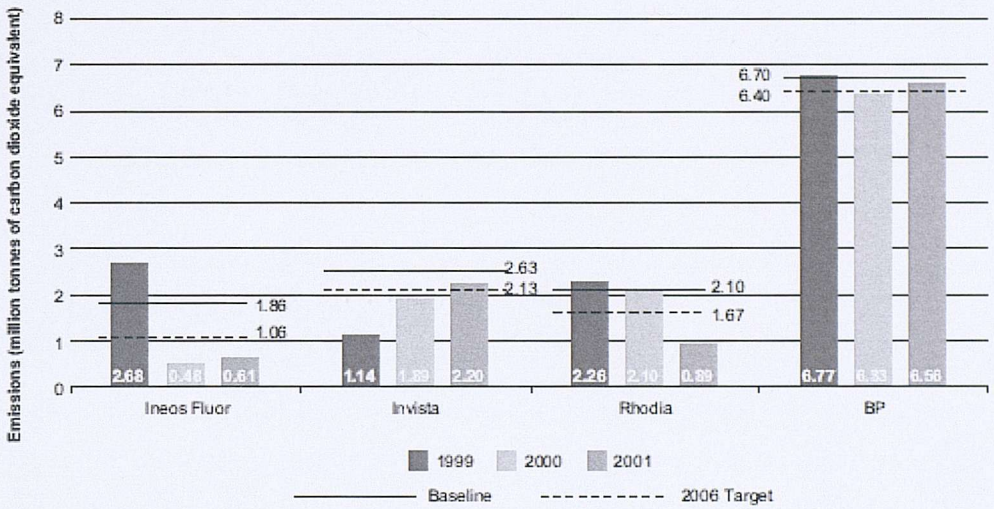
per year incentive payments, all of which is invested in energy efficiency measures within the company (in the production process or within other areas of the business). This annual investment has been calculated to save the company around £250,000 per year. This case shows that companies meeting or exceeding their targets can not only reap the financial rewards of incentive payments, but can make even greater financial savings by redistributing income from incentive payments into schemes that can further improve their energy efficiency. This example highlights the lack of conditions attached to the use of incentive monies in the design of the UK ETS ('earmarking'). There were no legal requirements for companies in receipt of incentive payments to use this income for energy saving or emission reduction schemes or environmental projects, nor to return the payments in the event of failure to meet modest emissions reduction targets. If these provisions had been outlined within the Scheme rules, greater emissions reductions may have been achieved in return for incentive fund.

Following the NAO report, the House of Commons Committee of Public Accounts (PAC) published its own report, based upon the NAO's findings and oral and written evidence (House of Commons Committee of Public Accounts, 2004). In May 2004, Sir Brian Bender, the then Permanent Secretary of Defra, and Henry Derwent, Director of Climate at Defra, were called before the Committee in order to respond to questions arising from the publication of the NAO report. Questions focused on the number of participants, the quantity of incentive payments, and the calculation of the baselines. As Figure 6.5 shows, the baselines calculated for four big players in the Scheme were above company emissions in both 2000 and 2001. This proved to be an area of concern for the PAC as these four companies were collectively in receipt of more than £111 million (House of Commons Committee of Public Accounts, 2004).

However, representatives from the NAO defended Defra's position by highlighting that in Figure 6.5 the dotted line represents emissions reduction commitments made by each company prior to the launch of the Scheme. In each case, the figure is below the actual baseline, as one would expect. However, in two cases actual emissions were below the committed reductions one year prior to the launch of the Scheme. Whilst this does not represent any particular failing on the part of the companies involved - after all they required to provide verified data and were merely operating within a policy experiment - it does indicate a failing on Defra's part in allowing such an occurrence. Defra justifies its failure to rectify

such baseline and target emissions on the basis of giving credit for 'early action'. Unfortunately, from the perspective of equity to stakeholders, including the tax payers who funded the programme, this may not be a sufficient excuse. By not wishing to penalise companies who allegedly acted early, Defra discriminated against the stakeholders to whom they are accountable by jeopardising the value for money of the Scheme and failing to secure real emission reductions.

Figure 6.5 Baseline, targets and actual performance of four major participants in UK ETS



Source: NAO (2004)

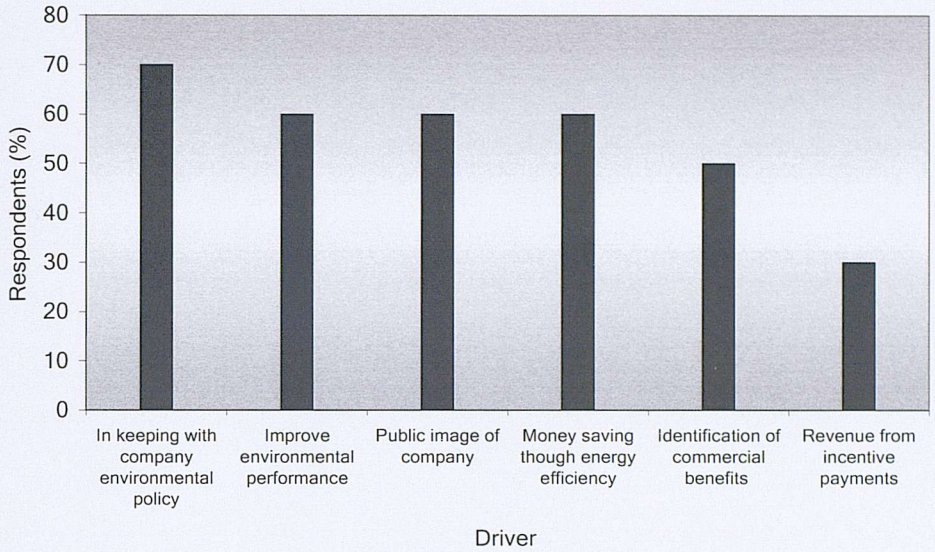
Defra also acknowledged that the absence of precise data concerning the past and projected emissions from companies led it to set baseline limits according to regulatory limits. Another problem of this method is the 'headroom' allowed between regulatory limits and the expected level of emissions from each company (House of Commons Committee of Public Accounts, 2004).

The nature of the auction prior to the launch of the Scheme, the so-called descending clock auction, has also been under scrutiny. The closing price was £53 per tonne CO_2e reductions following nine rounds of bidding. Defra did have the option to close the auction or reduce the amount of money available at the end of the first round of bidding. However, Defra decided to continue the auction and to maintain the maximum incentive fund as the opening reduction bids were higher than the benchmark set in the rules of the scheme. Defra adopted a defensive position towards the auction, the quantity of incentive payments and the quantity of emissions reductions in the focus group undertaken for this research despite several reputable sources, including the NAO, the PAC and

NERA (an economic consulting firm) criticising the auction methodology, the quantity of reductions secured and the price paid for reductions (House of Commons Committee of Public Accounts, 2004, NAO, 2004, Radov and Klevnäs, 2004). It is now widely accepted that had the auction followed a different methodology, such as a process of sealed bids, Defra would have secured greater emission reduction commitments from Direct Participants. Interestingly, prior to the launch of the Scheme, Defra had to secure approval from the European Commission for the provision of incentive payments as state aid. The Commission ruled that financially incentivising the Scheme did not represent unfair state aid to participants (NAO, 2004). This ruling was also a factor in Defra's decision not to impose further emissions reductions on the four companies that had already met their targets prior to the launch of the Scheme as this could have been viewed as unfair state aid to the remaining participants.

The survey showed that drivers for participation appear to be uniform across companies. Figure 6.6 presents the breakdown of the data. However, interviews with three representatives from Direct Participant companies each acknowledged that financial gain was one of the most important drivers to participation. This seems to contradict the results of the survey, which found that improving environmental performance, adhering to company environmental policy, and improving the public image of the company were cited as the most important drivers for participation. It is likely that these drivers were initially due to the uncertainties surrounding the format of the Scheme. When companies joined the UK ETS the auction had not been carried out, nor was the exact number of participants clear. On this basis, companies would not have had accurate information relating to the financial value of participation, not least because the high financial value was caused by design faults that most stakeholders, including Defra, were unaware of at the time.

Figure 6.6 Percentage of respondents ranking drivers as 'important' or 'very important'



A frequent fundamental driver in research of policy instruments is the desire to develop policy instruments and policy tools that are less costly to stakeholders yet successfully deliver environmental targets. 75% of Direct Participant respondents and 86% of external stakeholders believe that UK ETS represented cost savings to industry compared with more traditional approaches (such as binding emissions targets implemented though legislation). This was highlighted by Defra in their response to this question:

> "One of the central benefits of a cap and trade scheme is that carbon savings can be made in the most cost effective areas, whilst still ensuring an overall reduction in emissions."

In this sense, UK ETS was more than successful. However, it is difficult to assess whether UK ETS would have represented cost savings to industry had smaller financial rewards been made available. Using common theory of trading systems, even without incentive payments, the UK ETS should have still been a cheaper method of meeting emissions reductions targets compared with regulatory approaches (Helm, 1993).

6.9 Environmental effectiveness

The performance of Direct Participants against annual emission baselines is presented in Table 6.3. Between 2002 and 2006 total emissions were reduced by

nearly 10%. The baseline emissions account for the emission reductions committed to by each Direct Participant, hence the reducing in the baseline over the five year period. The noted decrease in over-performance against baseline data in 2004 is a result of additional emission reduction commitments made by the six Direct Participants arising from NAO criticism of the baseline calculations for these companies, as discussed earlier in section 6.7 of this Chapter.

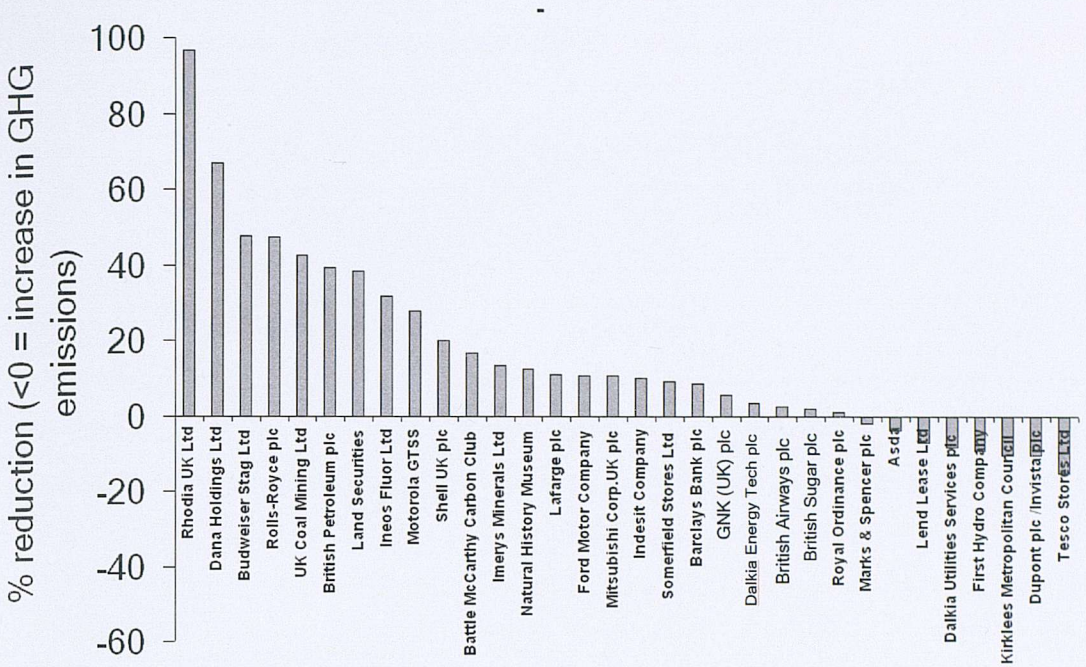
Table 6.3 Performance of Direct Participants 2002-2006

Year	Baseline emissions ($MtCO_2$ e)	Actual emissions ($MtCO_2$ e)	$MtCO_2$ e saving	% difference
2002	29.74	25.92	3.82	-14.8
2003	26.28	22.61	3.66	-16.2
2004	20.73	20.44	0.28	-1.4
2005	20.49	19.05	1.43	-7.5
2006	18.88	17.57	1.30	-7.4
Total	11.61	10.56	10.52	-10.0

Source: Adapted from Defra (2003c), Defra (2004a), Defra (2005c), Defra (2006h) and Defra (2007i)

The vast overachievement in the first two years of the UK ETS is largely attributable to the performance of three chemical companies: Rhodia Organique Fine (as states previously), Invista (formerly DuPont) and Ineos Fluor. In the late 1990s the latter of these companies were required to install equipment to comply with their IPC requirements. Flaws of the baseline calculation methodology leading to insufficient consideration of these events meant that both companies had met and exceeded their targets before the Scheme even started (ENDS, 2004a). As Figure 6.5 (NAO chart in section above) demonstrates, Defra failed to adequately account for changes in the regulatory environment when establishing baselines. In the interest of equity to Direct Participants all companies were subject to the same baseline calculation methodology. However, the impact on the overall performance of the Scheme was profound. Figure 6.7 shows that the vast majority of Direct Participants achieved significant emission reductions over the life of the UK ETS with the exception of 8 companies.

Figure 6.7 % change in GHG emissions from Direct Participants in the UK ETS



During the House of Commons Committee of Public Accounts hearing in May 2004, Sir Brian Bender stated that "*We have learned....about the importance of incorporating future emissions projections into baseline setting*" (House of Commons Committee of Public Accounts, 2004: p.Ev3).

Criticisms of the leniency of the targets do appear to have been heeded by Defra, with a representative stating that:

> "Defra do recognise that perhaps they [the targets] could have been set a little more stringently but it was difficult to do that in 2000/2001, especially as Defra wanted to give credit for early action."

However, comments from Direct Participant issue a stark warning for future approaches using baselines as this methodology may have even served to attract companies who knew in advance that they would be reducing their GHG emissions thus providing an opportunity to receive incentive payments for little additional effort:

> "The way the baseline is calculated obviously attracts companies who are planning to reduce their emissions by whatever means or have opportunities to reduce them."

Comments such as these only reinforce the negative reception policies based on voluntary action often receive from NGOs, as stressed by comments from a representative from one such organisation in the focus group:

> "Environmental groups do not have an ideological opposition against voluntary agreements at all, but the reality is that there is no evidence whatsoever that they are going to work."

Börkey and Lévêque (2000) confirm this perception stating that one of the biggest political threats voluntary environmental agreements must overcome is the negative perceptions of civil society and environmental NGOs, who often perceive these approaches to be second best. There is an underlying assumption within these stakeholder groups that industry *and* governments promote these approaches as a means to avoid "*more substantive environmental improvements*" (p.52-53).

In relation to this point about NGO participation, Friends of the Earth provided a statement that organisational policy means they are unable to respond to individual requests to participate in surveys. A follow-up phone conversation also revealed that the NGO in question did not have any input at any stage of UK ETS and has not actively researched the Scheme as the organisation does not consider voluntary approaches, or indeed any instruments apart from mandatory regulation, as acceptable approaches to environmental protection. Another NGO (Greenpeace) explicitly stated that the organisation was opposed to voluntary approaches to environmental protection and therefore saw no benefit in participating in a survey on a voluntary initiative. This suspicion is countered by an increasing body of literature on new policy instruments lends support to the case of alternatives to command and control regulation as methods for addressing environmental standards at lower costs (Börkey and Lévêque, 2000). The administrative costs of voluntary environmental agreements may not present savings over alternative policy instruments. They can often represent increased administrative costs from the regulator to industry and can prove to be economically efficient if industry operates more efficiently than the regulator. However, Börkey and Lévêque also stress that the lack of empirical data on this aspect, and the difficulty in collecting such data, means this is a purely analytical proposition.

In light of this analysis what conclusions can be drawn in relation to the impact of the UK ETS on GHG emissions from the UK? In 1997, the British Government announced a self-imposed target of reducing GHG emissions to 20% below 1990 levels by 2010. Table 6.4 below presents some figures relating to this target.

Table 6.4 UK GHG reduction targets

1990 GHG emissions =	765 $MtCO_2e$
20% 1990 GHG emissions (target reduction) =	152.8 $MtCO_2e$
2010 GHG target =	611.2 $MtCO_2e$
UK ETS total GHG emissions reduction =	10.5 $MtCO_2e$
UK ETS represented as % of target reduction =	6.9%
UK ETS GHG reductions accounting for the 'Big Four'(66% of emission reduction attributable to UK ETS) =	8.3 $MtCO_2e$
UK ETS represented at % of target reduction accounting for the 'Big Four' =	5.4%

Based on these figures, the UK ETS should have made a credible contribution towards the UK 2010 target of 20% reduction below 1990 levels. However, when one considers issues discussed in the previous section on economic efficiency, it becomes difficult to assess the *real* contribution of the UK ETS. As reported by the NAO, the 'big four' (Ineos Fluor, BP, Invista and Rhodia - the four companies that had met their targets prior to the launch of the Scheme) could only attribute 66% of their emissions reductions to the UK ETS. Therefore, the 6.9% figure above is questionable. Hence, the figures have been adjusted to account for the UK ETS leading to 66% of emission reduction from these four companies in 2002/03. Of the 6.3 MtC02e reductions below baselines achieved by these four companies during the first two years of the Scheme, only 4.2 MtC02e can be directly attributed to the UK ETS. By adjusting the contribution of the UK ETS to overall national progress towards GHG reductions by 2010, we can see that the impact of the UK ETS is lower than initially envisaged.

In terms of the contribution of the UK ETS meeting its 2012 Kyoto commitment, the UK ETS fared relatively well compared to the other case studies. 29% of participating firms believe the policy would make a very positive contribution, compared to no PPC respondents (although 64% ranked the contribution as slightly positive) and 19% of CCA sector associations. However, the EU ETS received the highest rankings for this aspect, with 60% stating the impact would be significant and 40% believing it to be slightly positive. External stakeholders

appear to have higher expectations of the UK ETS with 43% believing the impact would be significant and a further 43% stating it would be slightly positive. The data in Table 6.4 does not contradict these findings, as a contribution of more than 5% to the overall UK target is not insignificant. Furthermore, survey results are particularly interesting as the high result for external stakeholders is unexpected as one would imagine this group would be more critical of this voluntary, incentive-based Scheme. However, many NGOs, who traditionally voice the greatest concern over non-regulatory measures for environmental protection, declined to participate in the survey due to resource constraints. Therefore the views of the external stakeholder group were limited to academics, governmental/regulatory bodies, consultants and verifiers.

6.10 Transparency

Annual performance results, containing details of individual Direct Participant performance against targets, quantity of incentive monies received and targets for the following compliance period are made available to the public via the Defra website. This level of detailed reporting is in keeping with the monitoring and reporting requirements of the Scheme.

More than two-thirds of external stakeholders rated the Scheme as slightly transparent, and Defra is in agreement with this, stating:

> "We have endeavoured to keep he scheme as transparent as possible....In terms of the voluntary agreements we reached with the six participants last year, these have been less transparent due to confidentiality agreements with the six companies concerned."

The majority of Direct Participants also believe the Scheme is slightly transparent (43%), with a further 36% finding it completely transparent. Of the six Direct Participants to 'volunteer' further emissions reductions four completed and returned questionnaires. Two of these respondents claimed the Scheme is completely transparent, and the remaining two stating it is slightly transparent. In light of Defra's response to this question, one might expect these participants to rate the Scheme as slightly transparent as they secured additionally confidentiality agreements with Defra following their additional emissions reduction targets. As a result, it was unclear whether these six companies had committed to make additional emission reductions or reduce the size of their

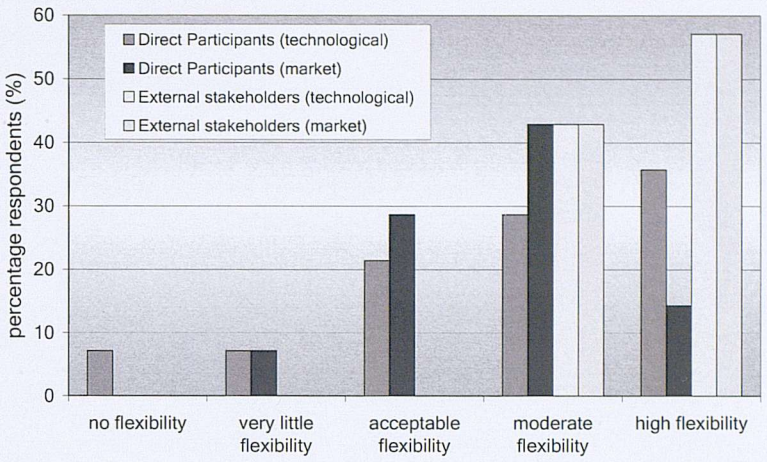
'banked' allowances (ENDS, 2005c). It is difficult to envisage the benefits to the public of shrouding these negotiations and the outcomes in secrecy. The UK ETS was, after all, a policy experiment funding by a significant quantity of public money. In keeping the details of the agreements confidential Defra merely served to protect the interests of business, perhaps overlooking the best interests of civil society.

6.11 Flexibility

Economic instruments, and in particular trading systems, should allow flexibility in two senses. Firstly, the instrument should allow industry/group of organisations to determine where the greatest emissions reductions take place - organisations with lowest marginal abatement costs should make greater reductions, potentially selling excess allowances to organisations with higher abatement costs. Flexibility can also refer to the ability of an instrument to give organisations the independence to better manage investment in technological innovation.

Figure 6.8 depicts the different stakeholder groups and how they view the levels of flexibility offered by the Scheme. Only two respondents from the Direct Participant group felt that the Scheme offered an inadequate amount of flexibility. During an informal conversation with one of these respondents and analysis of the questionnaire responses, it became clear that this respondent was dissatisfied with most aspects of UK ETS. One reason for this was the refusal of Defra to increase the company's baseline following an expansion of activities. However, the respondent stated that this eventually did not pose a specific problem as other areas of business activities covered by CCAs had generous baselines. This meant that overall company emissions were always in compliance with the UK ETS target.

Figure 6.8 Perception of flexibility offered by UK ETS



The majority of respondents stated that UK ETS is at least moderately flexible, in terms of both technological innovation and market forces. Approximately 50% of Direct Participants ranked the flexibility of the Scheme in terms of permitting flexibility in investment decision making as moderate. 36% ranked this aspect of flexibility as high, which compares favourably with the EU ETS (33%), CCAs (13%) and PPC (0%). This is largely due to the provision of incentive payments, which has proved to be valuable source of income for many Direct Participants as the example of Rhodia illustrates. If we look beyond the startling equity and environmental issues relating to such a huge incentive payment for abatement that would have occurred regardless of the UK ETS, one can see how the income from the UK ETS offsets any financial burden relating to capital investment pertaining to other policy instruments.

In terms of the ability of UK ETS to offer technological flexibility, Defra stated that:

> "The UK emissions trading scheme is highly flexible. The incentive payments help participants to make investment decisions on energy efficiency/CO_2 abatement that would otherwise not have been feasible. Emissions trading is all about meeting targets in the most cost effective manner."

The outcome of the survey leads to the conclusion that UK ETS is a flexible policy instrument that has allowed participants to manage their emissions in the manner they see fit. Incentive payments have made the process easier by providing extra funds for energy efficiency projects and GHG abatement technologies, should they so desire.

Additionally, UK ETS allowed the regulating body (i.e. Defra) a level of flexibility when dealing with non-compliance with the rules of the Scheme. For example, should a company fail to meet its emissions target and fail to buy surplus credits to cover the 'excess', then the Secretary of State has the power to impose a range of penalties. These penalties vary, depending upon the severity of the breach of the rules, but may include the following (House of Commons Committee of Public Accounts, 2004):

- Declaration of invalidity of the emissions statement submitted by a Direct Participant
- Non-payment of incentive monies for the year of the breach
- Reduction in allowances the following year
- Refusal to allocate allowances the following year
- In the case of a Direct Participant withdrawing from the Scheme prior to the official end of the Scheme in 2006, the participant will have to repay all received incentive monies

Defra and the Secretary of State for Environment have never employed any of the penalties for non-compliance with the Scheme rules as all Direct Participants consistently complied, either by reducing emissions below baseline targets, or by purchasing allowances to accommodate for emissions above the baseline target. The absence of non-compliance is a significant achievement and one of the key successes of the Scheme.

6.12 Innovation

Over three-quarters of Direct Participant respondents found that UK ETS provides some level incentive for technological innovation. Examples of innovation ranged from the introduction of energy and environmental improvement programmes, process changes, improved data management, greater awareness of buildings energy efficiency, and the inclusion of the cost of carbon within new projects. The most advanced and ambitious example provided was the vision of the company (a non-energy intensive organisation) becoming carbon neural by 2020. This type of forward thinking and ambitious self-setting of targets is admirable. Furthermore, these examples support the widely-held belief that market based instruments are effective means of promoting innovative

behaviour within firms. Examples of the changes resulting directly from the UK ETS, as specified by respondents, are provided in Table 6.5.

Table 6.5 Stated changes within Direct Participants arising directly from the UK ETS

Type of change	% respondents
Increased awareness of energy management opportunities	29%
Inclusion of the cost of carbon in new projects	14%
No changes	14%
Process changes	7%
Improved data management	7%

The importance of cross-industry (either within sectors or across sectors) cooperation in promoting innovation was highlighted by a focus group participant who stated that:

> "Cooperation is desirable perhaps in areas where you are trying to promote innovation, for example."

This notion was supported by 43% of Direct Participants who stated that the UK ETS has had a directly positive effect upon communication (in the sense of exchange of information regarding any aspect of the business) between firms in their sectors. However, only 29% of respondents believe communication regarding best environmental practice has improved as a result of the UK ETS. Whilst this appears to be a small figure, it is important to remember that spread of UK ETS Direct Participants across sectors (supermarkets, local authorities, petrochemicals to name but a few) means that within each sector a maximum of two or three firms participated. The fact that the UK ETS managed to improve best practice communication despite the majority of sector members not participating should, therefore, not be under-valued.

6.13 Acceptance and equity

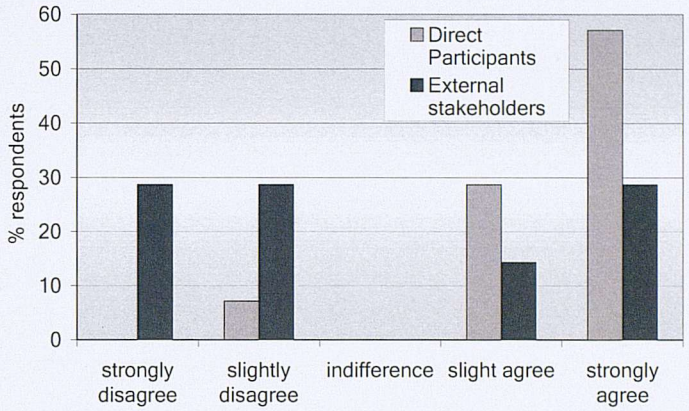
Overall, both Direct Participants and external stakeholders find the rules of the UK ETS to be a fair (64% of Direct Participants and 57% of external stakeholders). The sense of equity and fairness for this Scheme is far higher than the PPC Regulations, which was ranked as unfair by 56% of sector association respondents. Furthermore, the EU ETS received negative responses in this respect with 40% of sectors association ranking Phase I as unfair and even more

(60%) believing the same to be true of Phase II. CCAs on the other hand are generally perceived by industry to be fair with 69% of respondents stating so. There is a clear difference between the two policy instrument groups receiving positive feedback: the two voluntary instruments are well received by industry. The two mandatory instruments (PPC and EU ETS) presented fewer opportunities for industry to be involved in the policy development and subsequently received more negative feedback. Furthermore, both the CCAs and the UK ETS are policies that provide a significant financial benefit for participating companies - the UK ETS via its incentive mechanism and the CCAs via a reduced CCL rate. Alternatively, meeting PPC requirements remains the financial responsibility of companies and there is no financial reward for meeting requirements. The EU ETS is a slightly different case. Whilst allowances are allocated free of charge, thus providing opportunities to make financial gains thorough selling allowances, a company must first undertake emissions abatement in order to be in a position to have excess allowances. During Phase I allocations were arguably lenient, thus only 40% of respondents perceiving the Scheme to be unfair. However, this figure increased dramatically in reference to Phase II when it is envisaged companies will receive more stringent allocations. As the EU ETS progressed towards an auction-based allocation the perception of fairness will, beyond doubt, decrease further as a reflection of the envisaged negative financial upon industry.

There is a relatively strong sense of organisational acceptance of UK ETS with 64% of Direct Participant respondents and surprisingly 42% of external stakeholders rating their organisations' acceptance of the Scheme as a strong level of acceptance. It is entirely reasonable that some external stakeholders, in particular those with few ties to Government and regulators, have acknowledged that the instrument operates in a manner that is fair to stakeholders despite its environmental failings. For example, the level of fairness felt by external stakeholders may be linked to the reporting requirements, the lack of non-compliance by Direct Participants and the provision of sufficient powers to Defra to deal with non-compliance should it arise are quite note-worthy outcomes of the Scheme. However, external stakeholders do not agree with the allocation of incentive payments, with 57.2% of respondents in either strong or slight disagreement - a somewhat counterintuitive stance given the earlier data revealing external perceptions on fairness. Conversely, more than 85% of Direct Participants agree with the allocation of incentive payments, with the obvious

financial benefits at the root of this (Figure 6.9). Defra's response on incentive payments focused on the need to attract sufficient participants to ensure a viable trading market. In order to distribute incentive monies sourced from the Government, Defra had to obtain State Aids clearance from the European Commission. One condition of this clearance is that participants should fulfil their obligations to the Scheme in order to receive incentive monies.

Figure 6.9 Level of agreement with incentivised participation in the UK ETS



The external stakeholder group were also asked to assess the level of influence of external stakeholders during the development of the Scheme. Nearly 30% believe there was too little influence from external stakeholders. A further 43% felt this stakeholder group had the right level of influence. It is important to relate the involvement of external stakeholders (or lack of, as viewed by 30% of external stakeholders) to the original proposals for a domestic emissions trading scheme. As noted at the beginning of this chapter the UK ETS was originally proposed by the CBI, a sophisticated lobbying organisation. The development of these proposals to a scheme that allowed 34 companies to make substantial profits for very little improvement beyond business as usual emissions demonstrates the power with which such organisations operate and the level of influence they have in the policy process.

6.14 Other issues

This section of Chapter 6 will analyse other issues relating to the UK ETS that may have impeded its performance. Several issues were identified and have already been covered to varying degrees in previous Chapters (e.g. the interaction with CCAs).

6.14.1 Interaction between UK ETS and CCAs

This point relates specifically to the impact of the first CCA reconciliation period on UK ETS allowance prices. Uncertainty within CCA participants surrounding their ability to meet the first interim target forced the price of UK ETS allowances to an all-time high of £12.55 in September 2002. However, vast overachievement by both UK ETS Direct Participants and CCA participants against lenient targets led to the subsequent near-collapse of the price of allowances.

6.14.2 Interaction between UK ETS and EU ETS

Installations operating within UK ETS but eligible for participation within EU ETS were provided with temporary exclusions from Phase I until the end of 2006 (Defra, 2004b). In total, 63 installations operated by 11 of the 34 Direct Participants were excluded from the EU ETS until the end of 2006. In January 2007, following the closure of the UK ETS, these installations were required to join the EU ETS[53].

Installations that opted out of the EU ETS were required to monitor, report and verify their emissions as per the requirements of the EU ETS. These emissions had to be reported to Defra annually (Defra, 2004b). In allowing installations to opt-out of the EU ETS until 2007 the Government was attempting to reduce the administrative burden on companies. Furthermore, participation in the UK ETS may have been beneficial for companies required to participate in the EU ETS as the financial incentives of the UK scheme coupled with three additional years experience may have put these installations on a firmer footing regarding emissions trading. The respondents to the questionnaire certainly believe so, with 71% of respondents stating they believe the UK ETS fulfilled its aim to give British industry early experience of emissions trading in order obtain a competitive advantage over rivals. However, as stated earlier in this Chapter, the limited number of participants in the UK ETS is a cause for concern here. At its peak, only 34 companies were participating in the Scheme. This is a small fraction of the number of companies invited to participate. The benefits of operating a scheme that cost £215 million plus administrative costs for the Government to provide early experience of emissions trading for just 34 companies seem to be

[53] Installations within the following companies were eligible for EU ETS participation: Royal Ordinance, British Airways, Battle McCarthy, BP, Imerys Minerals, British Sugar Plc, UK Coal, Ford Motor Company, Shell UK Ltd, Dalkia Utilities Services and Lafarge.

questionable, especially given that around 700 installations UK-based installations operated within EU ETS in Phase I (Defra. 2008b). Furthermore, it is difficult to believe that any company beyond the 34 Direct Participants would have benefited from the Scheme with regards early learning of emissions trading. Beyond these queries, there is a further possibility that the first-mover advantage that was one of the rationales behind the Scheme was not realised. The late launch of the UK ETS (it was scheduled for 2001 but did not occur until April 2002) meant that the Scheme overlapped with the start of the EU ETS in January 2005 with an overlap between the final two years of the UK ETS and the first two years of the EU ETS. Companies that opted-out of the EU ETS until 2007 and then joined the Scheme had only 2 additional years of experience over their rivals within the EU ETS. Companies within other Member States appear to have operated within the confines of the EU ETS without much cause for concern (particularly in the EU-15 where compliance is generally high). Furthermore, Phase I of the EU ETS was designed specifically to be an introductory phase lasting only 3 years, the purpose of which was to give the Commission, Member States and companies an opportunity to get to grips with emission trading on this scale. This puts the notion of first mover advantage over rivals in serious doubt as the 'rivals' were also given an introductory phase within which to learn.

6.15 Chapter summary

This Chapter has comprehensively analysed the UK Greenhouse Gas Emissions Trading Scheme. Areas such as the impact of the UK ETS on innovation, stakeholder perceptions of equity and the interaction between the UK ETS and other polices have led to several key conclusions that are developed further in Chapter 9.

The UK ETS was a novel policy instrument. The elements of emissions trading, availability to all sectors of the economy, the provision of incentive payments and the voluntary nature of participation make for a fascinating case study. In this Chapter it has been demonstrated that the UK ETS has received higher praise from stakeholder compared to similar policy responses. In particular the perception of fairness by industry stakeholders is significantly higher within Direct Participants than within PPC and EU ETS sectors. Whilst such data may appear to support the UK ETS, analysis within this Chapter has shown that the sense of fairness does not reflect overall acceptance of a policy instrument. Furthermore,

the perception of fairness arising from the UK ETS is largely attributable to the vast incentive payments and the absence of any negative financial implications for participating companies.

Defra successfully argued the case in favour for incentivised participation at the European Commission, thus providing significant political support. However, the level of value for money achieved from this approach is difficult to promote. Whilst the overall emission reductions arising from the Scheme were far higher than anticipated, an unknown quantity (of which least 44% of emissions from the four largest emitters in the first two years have been quantified) can not be directly attributed to the UK ETS. The gross miscalculation of baselines and the insufficient consideration of other influences (such as regulatory requirements) upon the performance of companies seriously undermined any real progress in reducing GHG emissions via the UK ETS. Furthermore, the benefit of the so-called first mover advantage is questionable given the limited number of participants and the significant overlap between the UK ETS and the EU ETS. These factors combined bring into question the real value of this policy experiment.

7 European Union Emissions Trading Scheme

7.1 Introduction

In this fourth and final case study Chapter the analysis turns to one of the most influential and widely debated policy instruments of recent years: the European Union Emissions Trading Scheme. Unlike the UK ETS, the EU ETS requires mandatory participation. Furthermore, it is intended to operate in a purer sense of emissions trading, without incentivised participation. Implemented in 2005, it is curious to note that only six years previously some academics were still battling the corner of MBIs as many stakeholders were only beginning to relinquish their belief in regulatory instruments, as observed by Ellerman (1999):

> 'Whether one applauds or deplores this trend [of MBIs], it might reasonably be asked, after electricity utilities are restructured, what new domain exists for experimenting with freer markets? The increasingly obvious candidate is the environment. At first blush, this suggestion seems outlandish.'
>
> (Ellerman, 1999: p.141)

Ellerman continues by questioning whether we will ever reach a point when regulation is viewed as "*sustaining higher levels of pollution than would be obtained if freer play were given to markets?*" (p.142). The implementation of the EU ETS, the first trading scheme to include a vast numbers of installations from a large number of countries, heralded a new era in the approach to environmental protection. However, the first Phase (and potentially the second) of the Scheme has been plagued by difficulties that require urgent attention in order to maximise the environmental outcome.

7.2 Description and characterisation of the EU ETS

The EU ETS was established via Directive 2003/87/EC of the European parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC (hereafter referred to as the ET Directive). The overall aim of the EU ETS is to "*promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner*" (Article 1). Installations

participating in the Scheme must obtain a permit to release GHG emissions into the atmosphere from the relevant competent authority in accordance with Articles 5 and 6. In England and Wales the competent authority is the Environment Agency, SEPA in Scotland and the Northern Ireland Environment Agency (NIEA) in Northern Ireland (formerly the Northern Ireland Environment and Heritage Service).

Annex I of the ET Directive specifies the activities included in the Scheme which is based on IPPC activities although different performance thresholds apply. The IPPC Directive sets a threshold for combustion installations of 50 MW. This threshold is reduced to 20 MW for the ET Directive, essentially capturing many installations that do not fall within the activity categories but do have on-site combustion facilities. Further details of the installations participating in the EU ETS are presented in Table 7.1. These installations account for approximately 45% of all CO_2 emissions from within the EU (Klepper and Peterson, 2006). The number of UK installations within each activity category is located at Appendix 8.

Table 7.1 Activities participating in the EU ETS (Phase I)

Activity	Threshold values
Energy activities	Combustion installations with rated thermal input exceeding 20 MW (except hazardous or municipal waste installations)
	Mineral oil refineries
	Coke ovens
Production and processing of ferrous metals	Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
	Metal ore (including sulphide ore) roasting or sintering installations
Mineral industry	Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day
	Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
	Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m3 and with a setting density per kiln exceeding 300 kg/m3
Other activities	Industrial plants for the production of pulp from timber or other fibrous materials
	Industrial plants for the production paper and board with a production capacity exceeding 20 tonnes per day carbon dioxide

The EU ETS commenced in January 2005 with the launch of the pilot Phase I. An estimated €38 billion worth of property rights (in the form of allowances) per year were created based on 1.88 billion tonnes of CO_2 allowances per year (assuming a trading price of €20/tonne CO_2) (Åhman et al., 2007). At the time of launch 9000 installations from 25 Member States were participating in the Scheme (Haar and Haar, 2006).

All installations participating in an activity identified in Annex 1 of the ET Directive must possess a sufficient number of allowances (known as EU Emission Allowance (EUA) whereby 1 EUA = 1 tonne CO_2) at the end of each reporting period (e.g. Phase I = 2005 to 2007, Phase II = 2008-2012, Phase III = 2012-2020). In Phase I and Phase II, the majority of EUAs were distributed free of charge according to the quantities defined in National Allocation Plans (NAP) approved by the Commission. Phase I NAPs had to be submitted to the Commission by the end of March 2004. There followed a process of debate and amendments as the Commission evaluated each Member State's NAP against criteria outlined in Annex 3 of the ET Directive. Further analysis of the NAP process is provided in section 7.4.2 below.

In addition to intra-EU trading, the EU ETS contains provisions for links with the flexible mechanisms of the Kyoto Protocol. Under the rules of Joint Implementation, EU ETS participant firms are permitted to undertake emission reduction projects in other countries identified in Annex 1 of the Kyoto Protocol. Firms may also undertake Clean Development Mechanism projects in non-Annex 1 countries (Klepper and Peterson, 2006). CERs arising from CDM projects are expected to be tradable via the EU ETS from late 2008 following the resolution of issues in linking the Community Independent Transaction Log (CITL) with the UN-based International Transaction Log (ITL) (where CERs are initially stored and traded).

7.3 Implementation of the Directive

The EU ETS was formally launched on 1st January 2005. Phase I and ran until the end of 2007. This three year introductory Phase has been followed by Phase II, which will run from 1st January 2008 until the end of 2012. At the time of writing few details surrounding the scope and operation of Phase III (2013-2018) were available. In early 2008 the European Commission launched a review of the EU ETS Directive with a view to amending the Directive for Phase III, the outcomes

of which are predicted to be transposed in to UK domestic law in 2010 (Defra, 2008c).

7.4 Consultation process

The British consultation process relating to Phase I of the Scheme began in August 2003 when the Government undertook a consultation on the proposed allocation methodologies for the development of the Phase I NAP. Two further consultations on the draft NAP were carried out in 2004. In May 2004 the Government released its working paper on energy and emissions projections. Comments received from NGOs, industry and electricity generators were considered prior to the publication of the final document later that year. The revised NAP was developed based on comments pertaining to the total national cap in late 2004 and industry was given the opportunity to comment on individual installation-level and sector level allocations in early 2005 (Defra, 2005b).

The consultations for Phase II commenced at the same time of the closure of the Phase I consultations in 2005. Key events are identified in Table 7.2

Table 7.2 Consultation timeline for Phase II.

Date	Event
March 2005	Publication of informal communication paper on general approach to Phase II
July 2005	Preliminary formal consultation published with details of approach to Phase II - Government sough views on auctioning, NER and expansion options
February 2006	DTI launched consultation on emissions projections - process included stakeholder workshops to increase transparency
March 2006	DTI consultation on review of NER benchmarks for Phase II
March 2006	Publication of Draft UK Phase II NAP for formal consultation - supplemented by stakeholder events
July 2006	Launch of consultation on treatment of small emitters
August 2006	Launch of consultation to allow operators to identify errors in data and information used to calculate installation-level allocations
Continuous	Industry informed via the ETG. Government meets "regularly" with NGOs and other interested parties

Source: Adapted from Defra (2007e)

7.4.1 Regulatory Impact Assessment

A full RIA for Phase I was published in May 2005, five months after the official launch of the Scheme in January 2005. This RIA made a significant effort to include the fundamental components of an RIA. It quantified the predicted costs

to industry, the costs to consumers (though the passing on of the cost of carbon), the benefits of the Scheme and the impacts of the Scheme on the competitiveness of British firms within European and global markets. One area the RIA failed to address was the cost of administering the EU ETS to Government and the relevant regulatory authorities. Furthermore, Defra stated it was unable to specify predicted environmental outcomes of the Scheme as this was largely dependent on not only the cap applied at the UK-level (through the NAP), but this was also affected by the caps set on all other Member States.

In 2007 Defra undertook several detailed RIAs relating to various aspects of the Phase II. A general RIA was also published detailing the proposed 4 options for the national cap:

- *Option 1*: no cap
- *Option 2*: Allocation of 252 $MtCO_2$ /year - 3.8 MtC below BAU projections
- *Option 3*: Allocation of 245 $MtCO_2$ /year - 5.8 MtC below BAU projections
- *Option 4*: Allocation of 237 $MtCO_2$ /year - 8 MtC below BAU projections

Legal issues relating to the implementation of the ET Directive lead to the automatic dismissal of option 1 as all Member States are required to set national-level caps (article 9). Following consultation the Government decided to support option 4 - the most ambitious and challenging cap set out within the RIA (Defra, 2007c). Defra selected this option on the basis of the impact of Phase II on the costs and benefits associated with, *inter alia*, electricity prices, security of energy supplies and the impact of this option on domestic emissions.

7.4.2 National Allocation Plans

The rules governing NAPs are found in Annex 3 of the ET Directive. The criteria against which National Allocation Plans are judged by the Commission include:

- Total quantity of allowances allocated by Member States should be consistent with obligations under Decision 2002/358/EC[54] (concerning approval of the Kyoto Protocol and UNFCCC)

[54] Council Decision of 25 April 2002 concerning the approval, on behalf of the European Community, of the Kyoto Protocol to the United Nations Framework Convention on Climate Change and the joint fulfilment thereunder.

- Total quantity of allowances should be consistent with the requirements of each Member State in Decision 93/389/EC (on monitoring GHG emissions in the EU)
- NAPs should take account of unavoidable emission increases arising from other Community legislation
- Allocated allowances should be consistent with the potential for a sector to reduce its emissions
- NAPs should not discriminate between sectors or activities in accordance with Articles 87 and 88 of the EC Treaty regarding competition
- NAPs may account for early action using information obtained from IPPC BREF documents
- The NAP should include information on clean technologies and energy efficiency measures that have been employed
- The NAP should include provisions for public consultation
- Each installation covered by the Directive should be listed along with the quantities of allowances to be allocated to each installation
- The NAP may include information on how non-EU competition will be dealt with

Each Member State must submit their NAP to the Commission for scrutiny against the criteria identified above. By the 1st January 2005 21 NAPs had been approved by the Commission (Grubb et al., 2005). Specifically, the Commission had issued threats of legal action to Greece and Italy for failing to submit NAPs on time (ENDS, 2004b). Other issues involved Germany referring the Commission assessment of their NAP to the European Court of Justice following severe criticism of initial provision for *ex post* adjustments to allocations. In this case, Germany argued that it should be permitted to adjust allocations during Phase I to account for inaccuracies in initial emission projections provided by industry and to account for new and closing installations (ENDS, 2004c). Although the proposed *ex post* adjustments were only to be made in a downward manner (i.e. reduced allocations), the Commission found that:

> 'Ex-post adjustments would create uncertainty for operators, and be detrimental to investment decisions and the trading market. Ex-post adjustments substitute more efficient solutions found in the marketplace by administrative processes that would be cumbersome to implement. Also downward ex-post revisions, that might be argued have a beneficial environmental effect, are detrimental to the certainty that businesses need in order to make investments that lead to reductions of emissions.'
>
> (Judgment of the Court of First Instance, 2007)

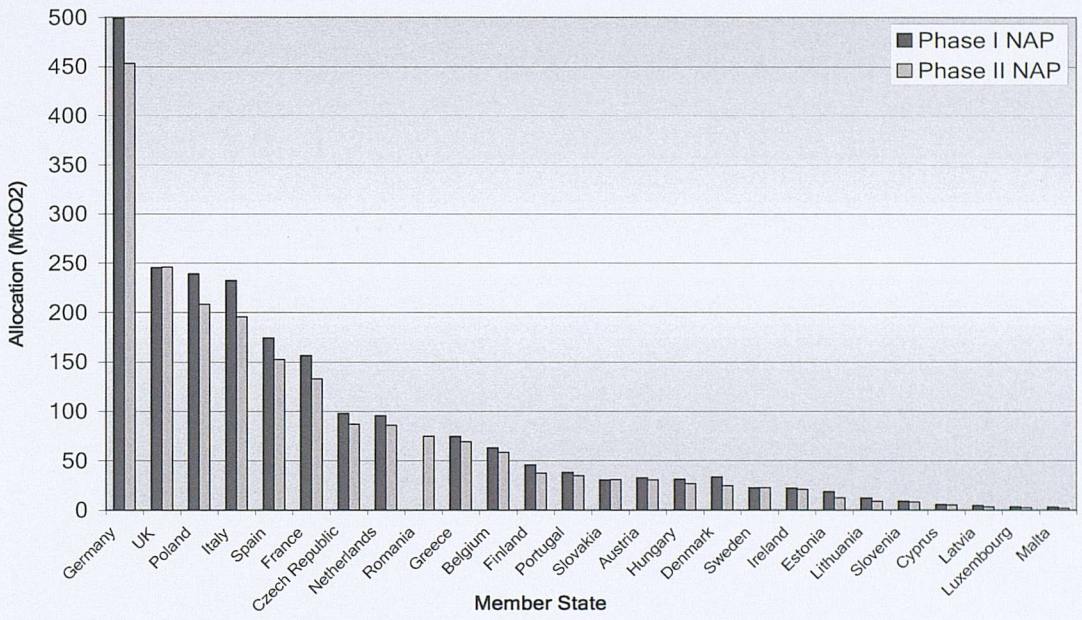
In late 2007 a Judgement of the Court of First Instance found in favour of Germany and ordered the Commission to revoke its demands for the removal of *ex post* adjustment provisions from the German Phase I NAP.

By the time Phase I commenced, the UK was also still awaiting approval for its NAP . In November 2004, four months following the Commission's approval of the UK's draft NAP, the Government informed the Commission that it wished to increase the national cap by 20 $MtCO_2$ in light of revised emission projections following revisions of the DTI Updated Energy Projections (UEP) and intense lobbying from industry (ENDS, 2005d). The Commission initially rejected the UK's amendments to the NAP in a bid to clamp down on generous national allocations. The UK subsequently took the Commission to the Court of First instance to appeal against the decision. In late 2005 the Court found that the Commission should not be allowed to dismiss final amendments to emission projections, or indeed to the entire NAP, following final consultation within Member States as this would make the consultation process "*purely academic*" (ENDS, 2005d). The Court ordered the Commission to overturn its decision and allow the increase in the UK allocation. However, Commission would not let the issue end in a situation that could have undermined its future authority regarding NAP approval. By February 2006 the Commission had again rejected the increased allocation on the basis that the UK did not submit its amendment to the NAP in time for the 30 September 2004 deadline for taking final decisions on NAPs (ENDS, 2006b).

After 18 months of legal wrangling, during which time the UK had held the EU Presidency and during a period in which the UK was trying to show leadership in climate policy and mere months away from the deadline for Phase II NAP submission, the UK finally laid the issue to rest, its reputation somewhat tarnished and the Commission in a stronger position to challenge Phase II NAPs.

National Allocation Plans from the Czech Republic, Greece, Italy and Poland were also being contested Member State government by the time the Scheme launched. The final total caps per Member State are shown in Figure 7.1. The agreed caps for Phase II are also shown in this figure. The annual EU-wide cap for Phase I was 2190.0 $MtCO_2$. This has decreased to 2036.7 $MtCO_2$ per year during Phase II - a reduction of 7% on Phase I. The UK's Phase II allocation is broadly the same as Phase I reflecting the comparative under-allocation in Phase I compared to many EU counterparts, as seen in Figure 7.1.

Figure 7.1 Approved National Allocation Plan caps in Phase I and Phase II



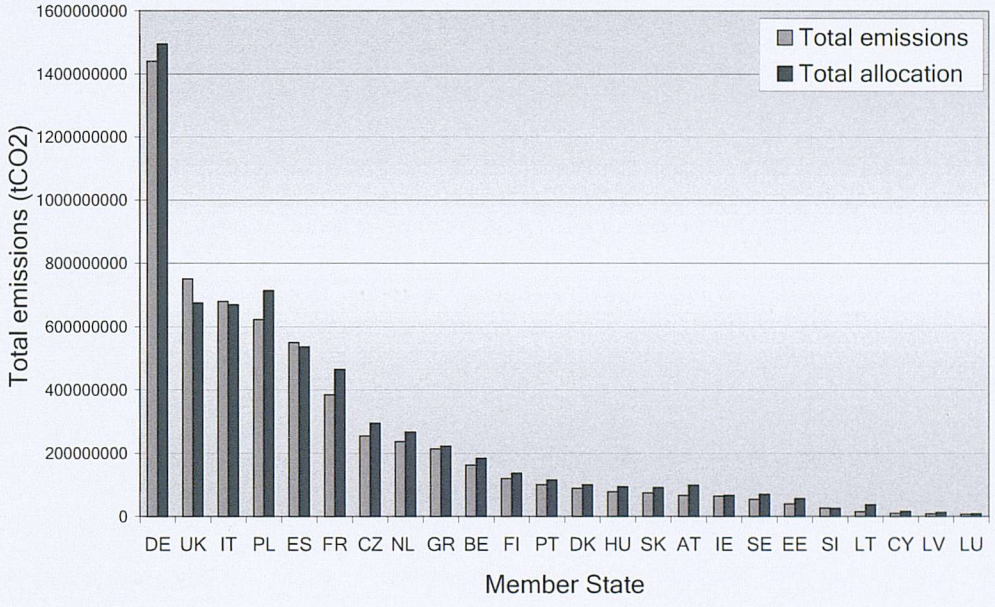
Source: Adapted from individual Commission Decisions relating to Phase II NAPs (available at http://ec.europa.eu/environment/climate/2nd_phase_ep.htm)

The UK is one of the few Member States to have set cap that was exceeded by verified emissions in Phase I (Figure 7.2). For Phase I the baseline emissions for installations were calculated by taking the average of the five years with the highest emissions during the period 1998-2003 (Defra, 2005b). The power generation sector was the only sector to receive Phase 1 allowances below the predicted BAU baseline, with the assumption that all other sectors would receive allocations that mirror BAU performance. However, in early 2008 ENDS reported that 63% of British installations in fact received significantly more allowances than they needed in 2006 (ENDS, 2008e). At the sector level, power generators exceed their allocation by 45%, the only sector to do so. Every other sector had

surplus allowances, with only one third of all installations within sectors having to buy allowances from the market.

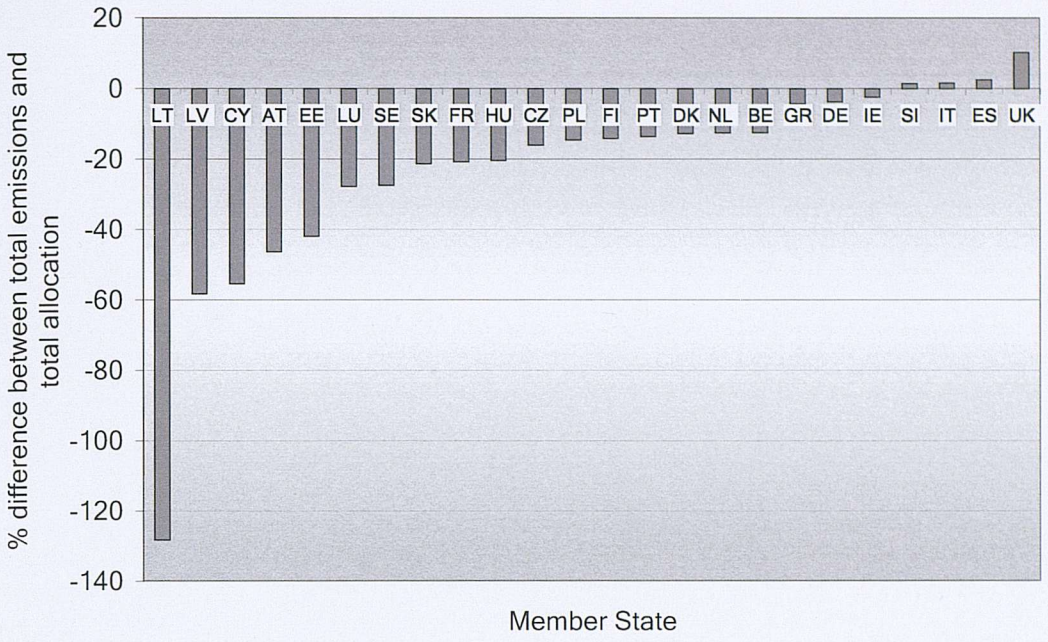
The majority of EU Member States vastly over-allocated in Phase I, as Figure 7.2 shows. Lithuania, Latvia and Estonia saw the greatest differences between allocated allowances and actual emissions. Lithuania in particular has been identified by Anger and Oberndorfer (2008) as the principal Member State having a 'long' position, i.e. over-allocation compared to verified emissions. The UK was one of only four Member States with an aggregate short position (higher verified emissions than allocations). The source of the short position is largely the power sector.

Figure 7.2 Difference between allocated allowances and actual emissions across Member States in Phase I



Source: CITL

Figure 7.3 % difference between total Phase I allocations and total Phase I emissions

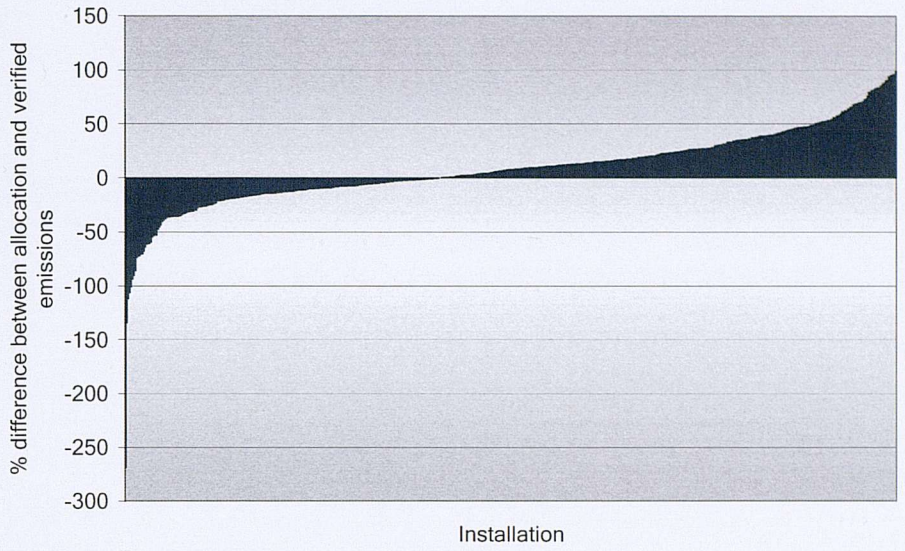


Source: CITL

The disparity in allocations across the EU is further highlighted in Figure 7.4 and Figure 7.5. The long and short positions of all installations in Lithuania (the Member State with the greatest difference between allocations and verified emissions) demonstrates that aggregated across Phase I only three installations were in receipt of allocations below actual emissions (a short position). However, when all UK Phase I data is analysed to show the difference between allocations and verified emissions at the installation level one can clearly see that a significant number of installations were in a net short position, despite all sectors (with the exception of the power sector) producing aggregate emissions lower than the aggregate sector allocation.

In reference to Figure 7.4 and Figure 7.5, all installations below the x-axis are in a short position (net buyers of allowances during the Phase) and all installations above the x-axis are in a long position (net sellers of allowances during the Phase).

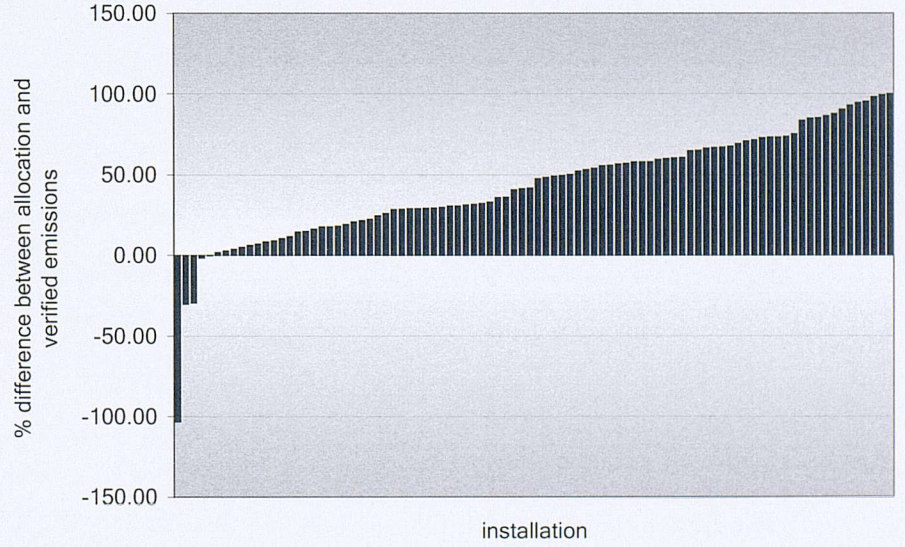
Figure 7.4 Long and short positions of UK installations in Phase I (with exception of power sector) in Phase I



Source: CITL

Note: Figure 7.4 excludes data from the power sector in order to facilitate the presentation of the data form other sectors.

Figure 7.5 Long and short positions of Lithuanian installations in Phase I



Source: CITL

Note: Figure 7.5 includes data from all Lithuanian installations

Regardless of the comparatively accurate allocation of the UK in Phase I, the impact of widespread over-allocation by Member States led to the collapse of the allowance trading price Figure 7.6. By the end of 2007 EUA were being traded for less than €0.05 compared to the peak price of €30 in 2006. The initial decrease in the carbon price in 2006 was a result of the publication of 2005 verified emissions data demonstrated that Phase I was likely to be vastly over-allocated (ENDS 2007). A consequence of the excessive allocations and the subsequent collapse of the trading price severely undermined the credibility of the EU ETS in Phase I.

Figure 7.6 Price of EU ETS allowances (1t CO_2) from 2005 to 2008



Source: (Carbon Trust, 2007)

7.4.3 Auctioning and EU harmonisation

In Phase I 95% of UK allowances were allocated free of charge. This figure reduced to 90% in Phase II. The remaining allowances generally form part of a new entrant reserve (NER). This reserve can be accessed by either completely new entrants or by operators wishing to expand existing installations (Environment Agency, 2008a).

In Phase II the quantity of allowances available for auction can increase according to the conditions of the ET Directive. Member States are able to set the maximum quantity of allowances for auction provided this quantity does not exceed 10% of the total national cap. This unharmonised approach means that Member States have implemented difference levels of auctioning in Phase II. The

UK has established the highest quantity at 7% of the national cap, one of the highest across the EU.

7.4.4 Exemption of British firms in Phase I: UK ETS and CCAs

The ET Directive contains provisions for the temporary exclusion of installations in the instance of the installation being subject to a national policy to limit GHG emissions via taxation (recital 24). It is upon this basis that UK CCA and UK ETS participating installations were given the opportunity to opt-out of Phase I of the Scheme. As discussed in Chapter 5, approximately 330 firms opted out of Phase I on the basis of CCA involvement (Defra, 2008b). A further 59 opted out on the basis of UK ETS involvement. All eligible CCA participants are required to participate in Phase II and the 59 UK ETS installations were required to participate from January 2007 following the closure of the UK scheme in late 2006.

7.5 Monitoring, reporting and verification

Provisions for monitoring and reporting are made in Art. 14 of the ET Directive. This article does no more than state that the Commission will provide guidelines to Member States regarding monitoring and reporting. Commission Decision 2004/156/EC, and the subsequent revision in 2007, form the basis of the monitoring and reporting requirements of installations participating in the EU ETS (European Commission, 2004, European Commission, 2007). The ET Directive provides a wide-ranging and detailed framework for monitoring and reporting (Peeters, 2006). Annex I of the 2007 guidelines identifies the key principles of the monitoring and reporting of the EU ETS. These include, *inter alia*, transparency of monitoring and recording of data, cost-effectiveness in selecting monitoring and reporting methodologies, and consistency in the approach to enable the comparison over time of performance. The guidelines include Annexes dealing with each EU ETS sector on an individual basis. The responsibility for ensuring installations adhere to the monitoring and reporting guidelines rests with Member States (Peeters, 2006).

Verification is accounted for in Art. 15 of the ET Directive. Reported emissions must be verified annually by 31st March. In the instance of an installation not having reported its verified emissions for the preceding year by this date, the Member State must ensure the installation is prevented from further trading until

a verified emissions report has been received (Peeters, 2006). In the instance of failure to surrender sufficient allowances to cover verified emissions in any given year an installation operator's trading account is frozen. A €40/tonne fine is applied to each unaccounted tonne of CO_2. The operator must also purchase sufficient allowances from the market to cover the unaccounted emissions. This double-requirement is indented to prevent installation opting to pay a fine instead of purchasing allowances if the allowance price is higher than the fine. Thus far, compliance with the EU ETS has been high with 100% compliance in the UK in 2006 and 2007 (Defra, 2007g; Defra, 2008e). Member States are permitted to decide whether verifiers are state-appointed operators or third-party organisations. In the UK, third-party operators provide verifications services with Defra issuing a list of Government-approved verifiers for operators to employ. These verifiers must be authorised by the UK Accreditation Service (UKAS) as verifiers of GHG emissions data (UKAS, 2007).

7.6 Provisions for new market entrants, exits and changes to installations

Under Art. 11 (3) of the ET Directive, Member States must have provisions in place for new market entrants. Member States are required to reserve a proportion of the total national allocation for new entrants. The approach to this is determined individually by Member States. During Phase I, the UK's NER contained 46.8 million allowances (representing 6.3% of the total national allocation) (BERR, 2008d). A further 13.9 million allowances were set aside for good quality combined heat and power (GQCHP) plants. The NER increased significantly in Phase II to 51.7 million allowances for new entrants and 27.5 million allowances for GQCHP (BERR, 2008b). Analysis conducted by the World Wildlife Fund (WWF) in late 2007 indicated that providing generous allocations to existing installations and less than generous provisions for new market entrants could have a negative effect on innovation. Without sufficient provisions for new entrants existing operators may be inclined to extent the life of their existing plant as the development of new cleaner technologies may not be rewarded sufficiently with allowances (World Wildlife Fund, 2005).

Prior to Phase II Defra consulted with industry and other stakeholder regarding the provisions for new entrants, closures and GQCHP. An RIA dealing specifically with this issue was published in 2007 and details the options considered by the Government (Defra, 2007b). The Government took the decision to have a NER

fund which would reserve 95% of the allowances for non-large electricity producers and CHP producers, with surplus allowances within the NER being auctioned or sold. One proposal that was rejected by the Government was the cancellation of surplus NER allowances. Defra acknowledged that this would be the most environmentally beneficial option which would be reliant upon the number of surplus allowances to be cancelled. However, the revenue for Government from the sale of surplus allowances and the benefits to industry in terms of facilitating emission increases appear to have carried more weight. The Government also decided to maintain the closure regime from Phase I whereby operators have to surrender their ETS permit. Any allowances allocated for the year in which the closure occurs may be retained by the operator but allocations for subsequent years will be cancelled (Defra, 2005a). This could be beneficial for multi-site organisations that close specific installations at the start of a reporting year as the emissions for the remainder that year will be avoided but the allowances retained. These may then be used in other business areas or sold via the registry.

However, this approach to the NER is also the source of its key weakness. By withdrawing allowances from sites that close, operators may be reluctant to close older, more polluting activities. Furthermore, providing free allocations to new installations effectively rewards more polluting activities as installations with higher projected emissions receive more allowances than installations with lower projected emissions. This also removes the need to factor the cost of carbon in to investment decisions as more polluting operations in Phases I and II receive higher allocations than installations with low-carbon technology on-site. If all new installations had to buy allowances there would be a far greater financial incentive for operators to invest in low carbon technologies.

7.7 Overview of evidence-based analysis

The collection of evidence to populate the evaluation of the EU ETS was again based on stakeholder surveys and interviews, and third party literature and analysis. Emissions data from Phase I was collected from the European Commission and Defra. Questionnaire responses were received from 9 external stakeholders, including academics, consultants and the Environment Agency. Defra did not provide a written response to the questionnaire but a representative

from the EU ETS team was interviewed. 7 responses were received from sector associations as industry representatives.

7.7.1 Sector associations

Responding sector associations generally represented between one and ten companies. The number of companies represented by respondents is presented below in Table 7.3

Table 7.3 Size of responding organisations

Size	% respondents
1-10 members	58%
11-20 members	14%
21-30 members	0%
31-40 members	0%
41-50 members	14%
More than 51 members	14%

Sector associations responded on behalf of a minimum of 107 companies and a maximum of 161 companies. Of all the companies represented by responding sector associations, 48 installations participated in Phase I representing 7% of the 703 installations in the UK participating by the end of 2006 (Defra, 2008b). A further 81 installations are participating in Phase II taking the total number of participating firms 115. This figure represents approximately 12.5% of the UK 923 installations participating in Phase II (Defra, 2007e).

7.7.2 Emissions/environmental data collection

Data relating to allowance prices, CO_2 emissions and allocations is freely available via Defra and the CITL[55]. There were no issues relating to quality and availability of data largely due to the application of Community-wide guidelines on monitoring, reporting and verification of emissions and surrendered allowances.

7.8 Economic efficiency

In Phase I the economic efficiency of the EU ETS was dictated by the quantity of allowances allocated across all Member States. The majority of Member States

[55] Refer to the Defra website for compliance and results http://www.defra.gov.uk/environment/climatechange/trading/eu/operators/compliance.htm and the Commission for details of Member State verified allowances and surrendered allowances http://ec.europa.eu/environment/climat/emission/citl_en.htm .

over-allocated allowances. The UK allocation appeared to be comparatively more stringent as the UK was one of only four Member States to have higher verified emissions than allocations. However, the UK allocation was, in fact, only stringent for the power generation sector. All other sectors received a higher allocation than their actual emissions (see Figure 7.7, Figure 7.8 and Figure 7.9).

The Government attempted to quantify the cost of EU ETS participation to firms in 2005 via the RIA (detailed analysis is attached at Appendix 4). However, a detailed reassessment of the actual costs incurred to either the Government or industry have not been undertaken in light of actual experience of the ETS. The Carbon Trust has been the most prominent organisation in terms of evaluating the economic cost of the EU ETS, although the focus of much of this work has focused on the identification of sectors vulnerable to international competition and the quantification of the risk posed by the EU ETS (Carbon Trust, 2004, Carbon Trust, 2006, Carbon Trust, 2008).

There is a clear difference between the views of external stakeholders and industry with regards to the balance of the costs incurred and the environmental benefits of the EU ETS (Figure 7.7 and Figure 7.8). External stakeholders generally believe that the costs incurred by industry are far outweighed by the environmental benefits. Even though the environmental benefits of Phase I appear to be limited (see section 7.9), free allocation of allowances mean that the economically the EU ETS works in favour of industry especially given the generous allocations witnessed during Phase I. Industry, on the other hand, is distinctly more negative about the balance of costs and benefits. As will be discussed later in this Chapter, many industry respondents also felt the Phase I allocations were unfair despite all sectors receiving higher aggregate allocations compared to actual emissions, thus making the negative perceptions of costs and benefits of Phase I difficult to justify.

With regard to the costs incurred by Government and the balance with environmental outcomes the situation changes noticeably. The majority of sector associations believe that the costs incurred by Government are outweighed by environmental benefits, yet external stakeholders appear to be more reserved about the benefits of the approach when compared with administration costs. If allocations were not issued free of charge, thus providing a source of revenue for the Government and potentially minimising or eliminating the administration

costs, as seen with the PPC charging system, the responses of this stakeholder group are likely to shift to a more positive stance.

Figure 7.7 Comparison of perceptions of costs incurred by industry with the overall environmental benefits of the EU ETS

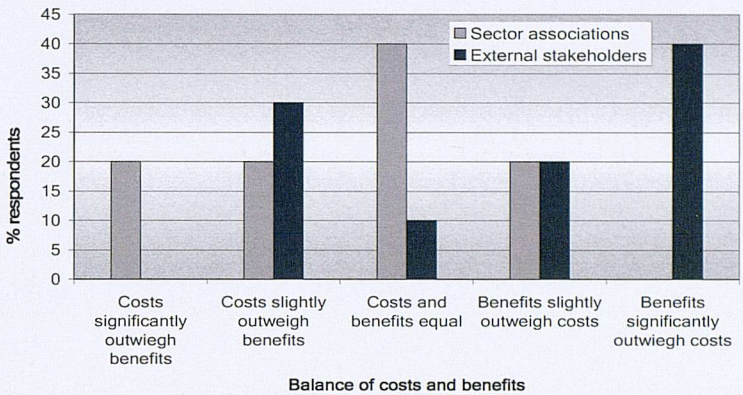
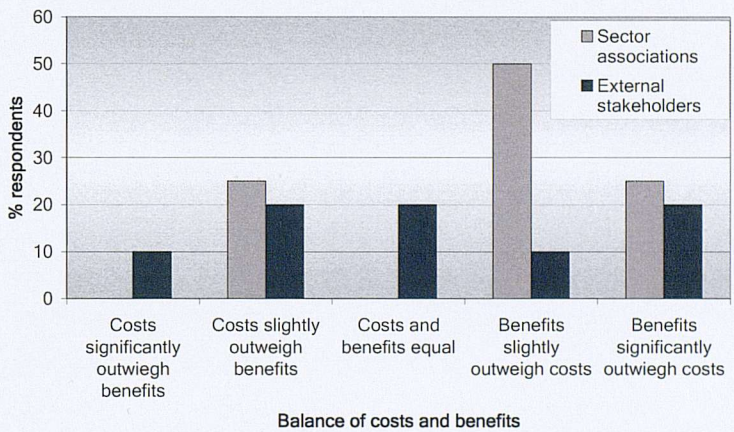


Figure 7.8 Comparison of perceptions of costs incurred Government with the overall environmental benefits of the EU ETS



The absence of accurate data provided by the Government concerning the total cost of administering the EU ETS to the UK tax payer is disappointing. As one sector association noted, the number of Government departments (including Defra, BERR (formerly DTI) and the Environment Agency) and quantity of personnel involved indicate that the costs are likely to be significant insignificant:

> "On the Government side, they seem to have a very large team working on EU ETS in Defra, BERR, Treasury, Department for Transport and the Environment Agency and a large budget for consultancy backup. This, too, needs to be added to the real cost of EU ETS."

RIAs carried out prior to both Phase I and Phase II focus solely on the costs of the Scheme for industry supporting OECD analysis that RIA in the UK is used only as a means to justify a policy in terms of the costs incurred by industry (OECD, 2006b). Even the new IA guidance does make requirements for analysis of the costs likely to be incurred by the Government. The costs incurred by the taxpayer seem to be of little importance in either the *ex ante* or the *ex post* situation as these issues are not dealt with in any detail in any analysis of the EU ETS from a UK perspective.

Despite concerns relating to the administrative costs, another sector association respondent highlighted that these costs are balanced by the EU ETS being the most efficient means to achieve emission reductions:

> "Whilst the cost of administering the EU ETS is significant, this is by far the most flexible way of encouraging emission reduction without simply driving investment (and emissions) abroad to countries without carbon policies."

Furthermore, one external stakeholder identified that the determination of some stakeholders to apply pure economic theory, distracting from the need to focus on delivering emission reductions, to the EU ETS as one of the main problems with the Scheme:

> "Economic dogmatists [who] simplify the economic text book model and focus on flexibility instead of shaping the scheme so as to deliver the desired emission reductions."

This appears to be a logical and rational argument. Although the economic theory behind an emissions trading scheme is in place to facilitate the achievement of a policy objective, one must question the value of striving to achieve a system reflecting the purest form of emissions trading if the environmental outcomes are unsatisfactory. If the environmental objectives of a policy can be achieved under imperfect conditions, this should be viewed as a satisfactory outcome.

The inclusion of smaller installations was noted on several occasions as a factor affecting the economic efficiency, and to a certain extent the equity, of the EU ETS. One interview respondent, a representative from a small participating firm, stated that the primary problem in Phase I for small organisations were the de minimis rules.

> "They [the regulatory authorities] have relaxed the tier level because we are such a de minimis and minor emitter. We can use supply records and national inventories and data sets so we are not so reliant upon our own monitoring and testing. It will reduce our costs and work input. And rightly so. I think it is now more in line with how it should be. I can appreciate if you are a big emitter that you do need robust monitoring and reporting procedures. I just felt it was over the top for the amount of carbon we were emitting under Phase I."

The de minimis rules in Phase I refer to an installation with several small combustion activities that amount to a total thermal capacity of 20 MW (for example an installation with small back-up generators and other units with a thermal output less than 3 MW that aggregate to 20 MW). This led to concerns from some sectors, in particular the ceramics sector that the administrative burden to these installations was not believed to be proportionate to their CO_2 emissions. For Phase II the Government introduced new de minimis rules allowing operators to voluntarily exempt any combustion installation with a thermal output of less than 3MW. If the aggregate output from an installation is more than 20 MW all elements must be included (Defra, 2007d). The impact of the changes to the de minimis rules remain to be seen. However, given that installations may only withdraw from the Scheme if the aggregate output is less than 20 MW it is unlikely that significant changes will be seen. Installations comprising numerous small combustion units will still be required to participate if the total output is more than 20 MW.

This approach was supported by two further sector associations. One believes larger installations should only be subject to EU ETS and smaller installations should be subject to CCAs. There should be no overlap between the two policies, thus reducing the administrative burden for companies and reducing the problems relating to double counting between the two polices. Furthermore, the administrative costs incurred by Defra and the Environment Agency in relation of double-counting calculations and amendments would be reduced. The second sector association made this statement in relation to the administrative burden created by the monitoring, reporting and verification (MRV) requirements on small businesses:

> "The sector is fully engaged in the need for a climate change policy, and recognises that all industry must reduce emissions. However, inevitably as the first major trading scheme there have been issues with the permitting, allocation and MRV process that have greatly increased the administrative burden on members. Even in the long term it remains true that despite proposals covering special treatment for small emitter, generally the cost of regulation for smaller industry is many times more than the major emitters per tonne of carbon emitted."

It was observed that none of the survey participants (external stakeholder or sector associations) identified the economic impact of passing through the cost of EU ETS to consumers. It is widely acknowledged that electricity generators operated in the manner in Phase I by raising electricity prices (Carbon Trust, 2006). Energy generators were the only installations in the UK to receive Phase I and Phase II allocations below BAU projections, made on the basis that electricity generation is not subject to the same risks of international competition as other EU ETS sectors. Furthermore, electricity generators are in a unique position in terms of passing on opportunity costs to consumers due to the immobility of electricity and the degree of immunity they enjoy from international competition. The impact of this on other businesses, particularly energy-intensive industries, particularly CCA participants, was analysed in detail in Chapter 5. Analysis by the Carbon Trust in 2006 led to the conclusion that in 2005 alone the UK power sector made €1 billion windfall profits from the EU ETS (Carbon Trust, 2006). This was largely caused by power generators using more gas to generate electricity when allowance prices were high reducing the quantity of allowances required to cover emissions. As gas prices increased and EU ETS allowance prices dropped more coal was used as the marginal cost of coal generation plus the allowance price was less than the wholesale gas price. The windfall profits were increased further by power companies incorporating the cost of EU ETS allowances in to every megawatt hour (MWh) of electricity they sold including electricity that was already covered by free allowances.

At this point, there is one final note on the economic efficiency of the EU ETS. Grubb and Neuhoff (2006) identify two key factors that influence the performance of an emissions trading scheme:

> 'Like any market the key to prices is scarcity, and the price depends on both the absolute quantity of allowances available and expectations about the future.'
>
> (Grubb & Neuhoff, 2006: p.8)

To this end, and considering the immense windfall profits of the British power generators in Phase I, the economic efficiency of the EU ETS has, thus far, been at best disappointing. At worst it is a reflection of poor judgement of national governments in assuming individual Member State over-allocation in a bit to protect domestic industries would not impact upon the efficacy of the Scheme. It is too early to determine if Phase II will replicate the Phase I situation or if the Commission has done enough to tighten the national allocations. The Commission does appear to be taking a more assertive stance. In October 2006 the Commission received 17 NAPs that had collectively set Phase II caps 15% higher than 2005 verified emissions (ENDS, 2006a). The Commission responded by reducing the national caps of nine countries by an aggregate of 7%[56]. The UK was one of the few Member States to have its first draft Phase II NAP accepted by the Commission with the requirement for revisions indicating that the UK, in its bid to show leadership, is moving in the right direction.

7.9 Environmental effectiveness

As discussed earlier in this Chapter, in Phase I only the power generation sector was allocated allowances below BAU projections. The rational behind this approach was justified by Defra on the basis that:

> '[The] sector faces limited international competition and has relatively low cost abatement opportunities, such as fuel switching.'
>
> (Defra, 2006e: p.9)

This approach has been repeated in Phase II, as only large electricity producers have received allocations below their projected BAU emissions. Furthermore, the quantity of allowances available for Phase II auction in the UK was taken from the overall allocation for the electricity generation sector. Consequently, the emissions from all sectors with the exception of the energy sector were far lower than the sector-level allocations throughout Phase I, as demonstrated in Figures

[56] The nine countries are: Germany, Greece, Ireland, Latvia, Lithuania, Luxembourg, Malta, Slovakia and Sweden. Germany received a cut of 6%, while Latvia and Lithuania revived national cap cuts of 57% and 47% respectively (END Report 383, 2006).

7.7, 7.8 and 7.9, largely attributable to conservative BAU projections. This over-allocation is indicative of the key problem of Phase I - over allocation leading to low CO_2 allowance prices and a negative effect on the environmental gains of the Scheme. Data for the power sector are not included in Figures 7.9, 7.10 and 7.11 for visual reasons, and are instead presents in Figure 7.12 (Defra, 2007j, Defra, 2008e).

Figure 7.9 UK verified emissions and total allocation in 2005 (excluding power sector)

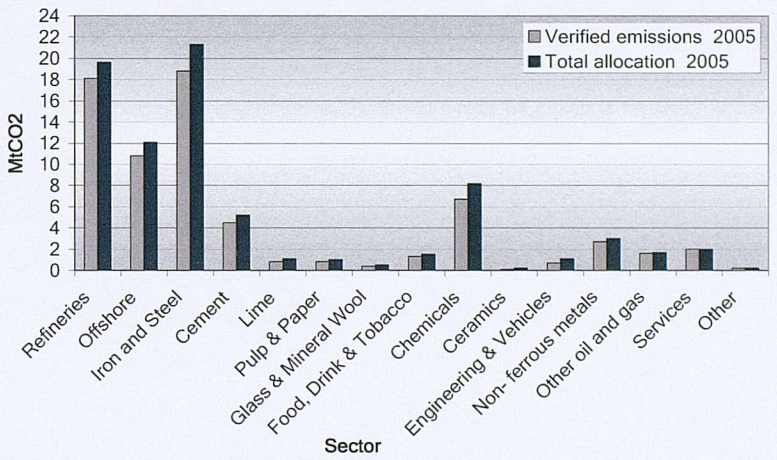


Figure 7.10 UK verified emissions and total allocation in 2006 (excluding power sector)

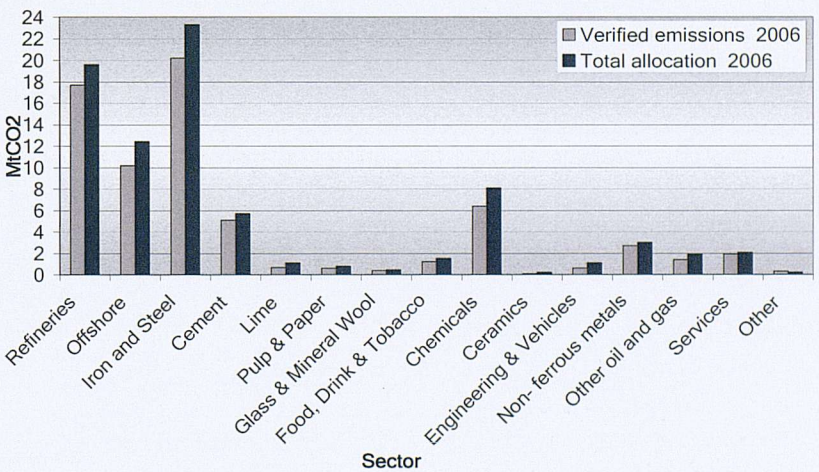


Figure 7.11 UK verified emissions and total allocation in 2007 (excluding power sector)

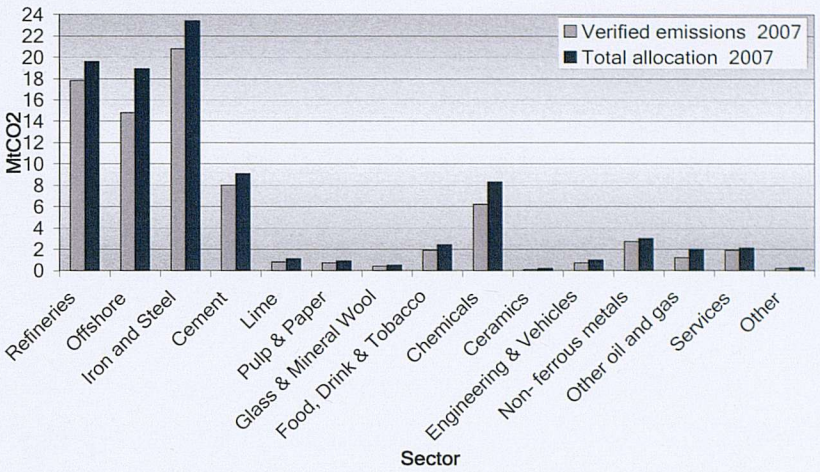
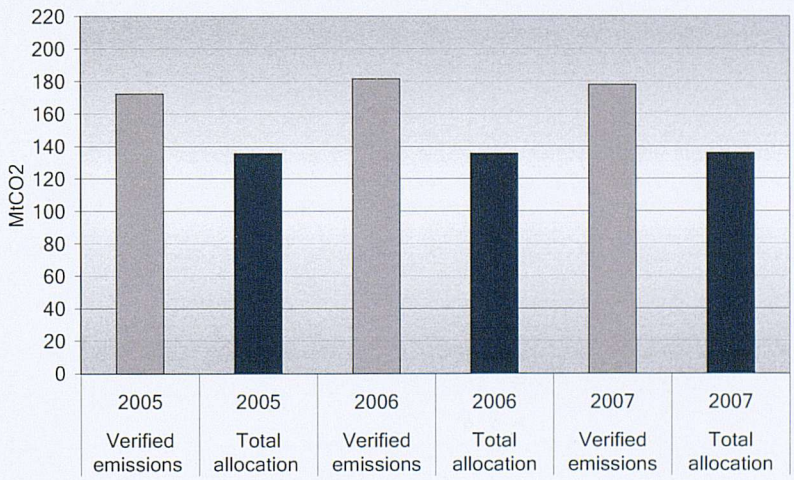


Figure 7.12 presents the data for the power sector. The power sector is the greatest emitter of CO_2 in the UK and receives the largest quantity of allowances yet was in a net short position in terms of allocations. Nevertheless, in 2005 the total emissions from UK installations were 27.1 $MtCO_2$ above the total allocation (242.3MtC02) and in 2006 emissions were 33.3 $MtCO_2$ above total allocations (217.7MtC02) (Defra, 2006e; Defra, 2008b). Verified emissions increased by 5% in 2006 compared to 2005 emissions. This rise in emissions, and the impact this had on the perception of the UK NAP, is behind the perceived stringency of UK allocations.

Figure 7.12 Phase I allocations and actual emissions from the electricity generation sector



Analysis of stakeholder perceptions of the environmental effectiveness of the EU ETS shows a clear difference between those with a practical, day-today relationship with the EU ETS, and those who examine the EU ETS from a further distance (i.e. academics and consultants not working directly with EU ETS). Only 33% of sector associations believe the EU ETS encourages a small degree of CO_2 abatement below allocations from firms, with even fewer (17%) believing the EU ETS does the same at the sector-level. This is in stark contrast with external stakeholders, of whom 67% believe the EU ETS should encourage CO_2 emission reductions below allocations from individual firms and 77% stating the same for at the sector-level. Only 11% of external stakeholders believe the EU ETS has no impact on CO_2 emissions at the firm-level and none believe the same at the sector-level. In this situation, evidence in the form of emissions data supports the stance of the sector associations. As Figures 7.9, 7.10 and 7.11 demonstrate, all sectors performed well against their allocations leading to a long position of being in a position to sell surplus allowances. However, the sentiments of the sector associations confirm that the allocations were too generous and did not provide any incentives to improve performance.

One cannot analyse the performance of an emissions trading scheme without examining the method of allocation. This is one of the most contentious features of the scheme. Tietenberg (2003) identifies four possible approaches to allocation;

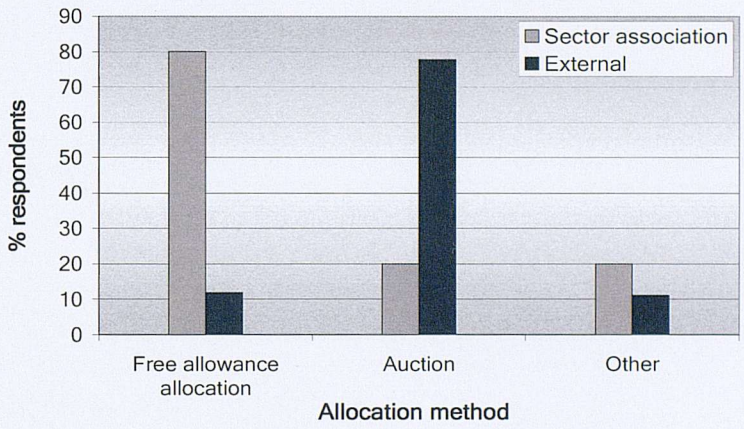
- Random access (lotteries)
- First come, first served
- Administrative rules based on eligibility criteria (such as grandfathering, BAU-based allocations or benchmarking)
- Auction

Clearly the first two approaches are not suitable for an emissions trading scheme of this size and scope. These approaches are usually applied in the allocation of permits resource use (e.g. water). The third and fourth options are the only two available to GHG emissions trading. However, within these two categories there exist numerous variations of the methodology. For example, an auction may be based on the descending clock approach used in the UK ETS, or if may be based on closed or open bids. Auctions, however, often receive criticism from industry due to the additional operational costs incurred through the purchase of

allowances. Conversely, administrative rules for allocating allowances often require the application of complex methodologies such as 'grandfathering' whereby installations are allocated allowances based on historical emissions trends and benchmarking whereby allowances are allocated according to best technological practice. Phases I and II of the EU ETS have relied on BAU projections, but as performance data from Phase I suggests, this approach is also fraught with difficulties, not least due to underestimating the ability of industry to undertake emissions abatement and information asymmetries between Government and industry.

In light of the importance of the allocation issues, all research participants were asked to identify their preferred method of allowances allocation. The distribution of responses is provided in Figure 7.13.

Figure 7.13 Preferred allocation method according to stakeholder group



These results support the findings of the 2005 study undertaken by Ecofys and McKinsey on behalf of the Commission (European Commission, 2006b). The 2005 study found that the vast majority of companies and sector associations (80% and 88% respectively) were not in favour of auctioning 5% of the total allocation in Phase I and 10% in Phase II. This is in direct contrast with the majority of Government bodies, NGOs and market intermediaries who believe that Member States should either be able to choose to have greater auctioning (52%, 30% and 41% respectively) or that more auctioning should be mandatory across the EU (21%, 55% and 35% respectively) (European Commission, 2006b).

There was a clear preference among external stakeholders surveyed for this research for 100% auctioning of allowances. One external stakeholder who

selected "other" in fact supported auctioning but selected 'other' on the basis that the method of allocation is not hugely important:

> "Talking about maximisation of the reduction, the method of allocation is not the most important thing but the readiness of the legislator to implement it in a meaningful way. Nevertheless, I am in favour of auction, but the political will is low."

The issue raised by this respondent is very important. An emissions trading scheme based on free allocations should theoretically work well in terms of achieving an environmental objective in a cost-effective manner. Therefore, with perfect knowledge of the ability of industry to abate and the presence of reliable data, a system based on baselines could produce the desired results. Policy makers are often in a weakened position due to information asymmetries. Regardless of the desire of a government to implement the policy in a "meaningful" manner, informational difficulties may negatively affect its ability to do so (Ekins and Etheridge, 2006).

Only one external stakeholder suggested the continued use of free allowance allocation on the basis that both methods should in theory lead to the same environmental outcome:

> "The effects of auctioning and free distribution of allowances on the level of abatement should be the same (except for possible emissions consequences of the different incentives for new entry and exit). The method of distribution affects the profits of firms, but not the value of permits, which will be defined by marginal abatement cost."

However, Joskow and Schmalensee (1998) argue that the highly politicised approach to establishing the allocation methodology often leads to "*interest group politics*" and rent seeking behaviour by firms. Furthermore, the impact of distribution costs and barriers to trading also have implications on the efficiency of a trading scheme. In instances of regulators relying on industry-provided information the impact of rent seeking should not be over-looked, particularly in situation such as the EU ETS when powerful industry lobbying was a feature of the entire process of developing, implementing and allowance allocation of the EU ETS (Markussen and Svendsen, 2005).

In addition to the negative perception of many external stakeholders towards free allocations, there may indeed be legal ramifications of such an approach. Johnston (2006) draws attention to the possibility that free allocations could be deemed to be a form of State aid and may contravene the provisions surrounding State aid in the EC Treaty. This argument is based on the pass-through of costs from energy generators to consumers. Crucially, the lack of State aid assessment of NAPs led the author to the conclusion that several Member State NAPs involved an element of State aid which had not been notified to, and cleared by, the Commission. Johnston argues that this fact leads to a degree of legal uncertainty of the EU ETS which must be taken into account in future phases of the Scheme. Further, the over-allocation by some Member States reflects an additional inequity of some states granting higher levels of 'State aid' than others. However, the absence of legal challenges on the grounds of State aid since the implementation EU ETS indicates that this may not be a significant issue within the operation of the Scheme.

However, the issue of State aid does serve to strengthen the argument in favour of a centralised allocation structure with the removal of NAPs and the Commission taking charge for distributing allowances or preferably full auctioning of allowances. Whilst the latter allocation mechanism might not necessarily prevent the pass through of costs to consumers, it would eliminate the double dividend received by some industries via trading of allowances coupled with increasing product prices.

If all allowances are auctioned, emissions trading begins to have similar characteristics and effects as taxation. This is especially true if governments (or the EU) intervene in the price-setting by establishing a floor-price to ensure a minimum value of a tonne of CO_2. One must also question whether 100% sale will be politically feasible, despite current claims of if being so, given the insurmountable difficulties experienced by the EU in the 1990s in its attempt to introduce a Community-wide energy tax (Makuch, 2000).

The Commission in its 2008 climate change energy package has suggested an approach that may reduce allocation distortions across the EU. One key proposal of the package is the replacement of national allocations with either central allocation based on standardised methodologies or replaced by full auctioning of

allowances (European Commission, 2008d). In response to this Defra articulated the Government's support for such an approach:

> "We welcome much greater predictability in the cap-setting process with a long-term trajectory cap. This will provide business with the certainty to invest in a low-carbon economy."

Despite the obvious flaws of Phase I allocations, the limited environmental benefits and the inequity caused by some national allocation plans, one sector association summed up what has been learned over the previous 3 years of large-scale emissions trading:

> "More has been achieved than many commentators acknowledge, and the prospects are for higher carbon prices in Phase II as a result of better baseline data emerging from Phase I."

This is an important point. The improvement in baseline data should in theory result in increased accuracy in allocations. Improved baselines should improve the prospects for a stable carbon price over the course of Phase II.

As discussed earlier in Chapter 5 (Climate Change Agreements) the issue of baseline data has a crucial impact on the success or failure of a policy. In the case of the EU ETS, Phase I has proved to be of immense benefit to establishing accurate and reliable baseline data for future phases.

7.10 Transparency

As stated earlier, transparency is one of the fundamental principles of the monitoring and reporting requirements. Annex I of the 2007 guidelines states:

> 'Monitoring data, including assumptions, references, activity data, emission factors, oxidation factors and conversion factors shall be obtained, recorded, compiled, analysed and documented in a manner that enables the reproduction of the determination of emissions by the verifier and the competent authority.'
>
> (European Commission, 2007a)

The Environment Agency has responsibility for monitoring and reporting requirements. Defra, being the competent authority in the UK, is responsible for

publishing performance data in the public domain. These performance reports can be found on the Defra website and generally contain an overview of the UK's performance followed by sector-level performance details relating to allocated allowances and actual performance (Defra, 2006e, Defra, 2008b).

The perception of transparency within the EU ETS was assessed during the survey. All stakeholders were asked to rank the level of transparency of the Scheme and subsequently rate how they perceived about this aspect of the Scheme. Sector associations generally find the EU ETS operates in a somewhat transparent manner (67%). The remaining 33% stated the EU ETS is completely transparent. This compares with 90% of external stakeholders ranking the transparency as 'slightly' transparent' and 10% ranking it as 'confidential subject to commercial secrets'. Only 17% of the sector associations believe there is room for improvement with regards to the level of transparency. The remaining 83% believe the level is acceptable and not in need of improvement. The perception of external stakeholders is very different. 70% of external stakeholders believe the transparency of the EU ETS needs to be improved, with only 30% believing the situation is acceptable. In their analysis of the EU ETS and its compliance with the Aarhus Convention, MacDonald and Makuch (2006) conclude that inquiry into the Scheme from a academic and professional stance may be enhanced if the transparency were to be improved. Furthermore, the authors assert that "*a public information campaign should be developed in order to stimulate stakeholder involvement in what is otherwise a technical and inaccessible field*" (p.148). Comments received from external stakeholders support the view that the transparency of the Scheme would be improved if communication and public engagement were increased:

> "More information to stakeholders in terms of functioning and rules of the system."

Furthermore, the process of developing and reviewing NAPs is also an area of concern with criticisms being levied towards the way in which NAPs are assessed by the Commission, public disclosure of the rationale behind decision making and difficulty in understanding the allocation methodology:

> "There is poor transparency and accountability in the basis for allocating allowances. Over-generous allocations made by individual member

> states damage the interests of the system as a whole, and need to be justified more publicly and transparently."

The difficulty in assessing whether a country has made overly-generous allocations, however, lies in the timescale. During Phase I the vast over-allocation within most Member States did not become apparent until the latter part of the Phase. This is likely to be repeated in Phase II, when sufficient data relating to actual emissions and the impact of the allocations on trading prices becomes available.

Another area of concern relates to the complexity of the NAP methodology. It goes without saying that given the size and scope of the EU ETS and the complexity of the activities operating within the Scheme any methodology relating to baseline calculations, cap setting and allowance allocation is going reflect this complexity. However, one external stakeholder points to the failing of Member States to simplify these methodologies when they are included in documentation to improve public understanding:

> "The main problem relates, in my opinion, to the complexity of NAPs regarding methodologies for setting caps and allocating allowances, which prevent any non-expert from understanding what's going on. Improvement most probably requires more harmonisation at EU level and a different approach to allocation, either through general benchmarks or auctioning."

The final point of the comment above relating to the use of benchmarking or auctioning to increase public understanding is very useful. Not only would alternative allocation methodologies, such as auctioning, increase the sense of equity, it may also improve public understanding of the Scheme as it would remove many of the complexities of the existing BAU-projection based system. However, the establishment of an EU-wide cap under which auctioning would take place is not without data issues. In order to set a challenging cap a significant quantity of data needs to be collected from participating industries. However, the method is made much simpler by not assigning specific quantities of allowances to individual firms, as stated by an external stakeholder:

> "The measure would be to replace the present system with an auction. As long as the administration of free allocation will be upheld, the transparency will be less than desired."

Moving beyond the allocation methodology to the monitoring, reporting and verification requirements, one sector association interview respondent highlighted how the MRV requirements have proved to be particularly successful. As previously stated in this thesis, efficient monitoring, reporting and verification procedures are fundamental to achieving transparency within policy:

> "I think that the monitoring and verification systems have proved pretty robust. The compliance rate is very high."

This comment, from a sector association, accurately reflects the situation during Phase I. In 2005, 99.7% of UK installations surrendered sufficient allowances prior to the compliance deadline (Defra, 2006e). Only four installations were subject to civil penalties amounting to approximately £758,000 for failure to surrender sufficient allowances by the compliance deadline. In 2006, the performance of UK installations improved with all installations submitting sufficient allowances by deadline on 30 April 2007 (Defra, 2008b).

The CITL operates in a manner that allows any stakeholder to access information relating to the transactions of all installations operating within the Scheme (European Commission, 2008a). It also provides contact information for persons responsible for various activities within the Environment Agency and Defra. A transaction log of this type is vital for stakeholders to obtain detailed information.

7.11 Flexibility

An emission trading scheme, by its very nature, should offer a high level of flexibility to participating companies, as documented in numerous studies (OECD, 1989; Joskow, and Schmalensee, 1998; Stavins, 2003; Tietenberg, 2006). Questionnaire respondents supported this notion. All sector association respondents rated the flexibility of the EU ETS in terms of allowing investment management and abatement options as either moderately flexible or highly flexible. External stakeholders mirrored this with the exception of one respondent who believes the EU ETS offers very little flexibility in terms of abatement decision making (Table 7.4 and Table 7.5).

Table 7.4 Rating flexibility of EU ETS with regard to management of investment decisions

Respondent group	No flexibility	Very little flexibility	Moderate flexibility	High flexibility
Sector associations	0%	0%	67%	33%
External stakeholders	0%	0%	30%	70%

Table 7.5 Rating of flexibility with regard to allowing industries to optimise emission reductions via assessment of marginal abatement costs

Respondent group	No flexibility	Very little flexibility	Moderate flexibility	High flexibility
Sector associations	0%	0%	50%	50%
External stakeholders	0%	10%	30%	60%

Based on this evidence, it seems appropriate to assert that the EU ETS provides a sufficiently flexible mechanism within which companies can undertake emissions abatement.

7.12 Innovation

A significant proportion of the respondents (80% of sector associations and 77% of external stakeholders) stated they believe the EU ETS fosters a small amount of technological innovation within industry. This is in-line with the general economic rationale behind market based instruments. The potential to generate revenue following investment in 'good' behaviour should inspire a firm to pursue activities that reduce emissions if it is financially viable to do so. Firms subsequently benefit financially though sale of surplus allowances. This is balanced by firms whose marginal abatement costs are higher than the allowance cost. Therefore, there is less incentive for these firms to abate emissions.

However, only one sector association linked the ability of the EU ETS to promote innovative behaviour and the method of allowance allocation, stating that:

> "It does not matter whether the initial allocation is free or auctioned; all companies see a price of carbon. Expectations of long term carbon prices are factored into investment decisions."

This appears to add support to calls for 100% auctioning of allowances as innovative behaviour can have a positive impact on environmental performance. The more a firm innovates the more its environmental impact will decrease. Therefore, sale of allowances should be the preferred route for allowance allocation.

One external stakeholder was keen to stress that even with full auctioning a carbon tax could have been a more effective and efficient means to promote development and investment in low carbon technologies:

> "I think it was absolutely essential to get the Scheme in place. I would have preferred a carbon tax but that was inconceivable. It would give some sense of surety about the price of carbon because the price of carbon is the carbon tax. Investors in low carbon technology know exactly where they are. With the EU ETS they have absolutely no idea what the price of carbon is going to be. It would be worth putting in a carbon tax now because it would establish a floor for the EU ETS - the price of carbon would never fall below the price of the tax."

However, it is important to note that some key difficulties lie within the establishment of a 'green' tax. These include setting the tax at the correct rate in order to elicit the desired response (Stavins, 2003); minimising the distributional outcomes of the tax (i.e. ensuring the polluter-pays and other stakeholders are not unfairly burdened) (Sadler, 2001; OECD, 2006a); and, the impact of taxation on the competitiveness of businesses (Rosenstock, 2006).

Numerous authors have documented the detrimental impact of price instability on long-term investment (e.g. Green, 2001, Blyth et al., 2007, Fischer, 2008). The fluctuating carbon price of Phase I coupled with uncertainty surrounding the long-term future of the EU ETS post-Phase II is likely to lead to industry exhibiting reluctance to invest. This is supported by 60% of sector associations who stated long-term uncertainty has a negative impact on investment decision making of industry. Furthermore, the low carbon price does not reflect the real cost of carbon and as a consequence fails to give the required price signals to invest in low carbon technologies.

However, analysis by the Carbon Trust has stressed that *ex post* government interference the market (e.g. draining 'surplus' allowances) to increase allowance

prices could have detrimental effects upon the ability of the EU ETS to incentivise investment in technological research and development as the government action may be seen by industry as penalising 'good' behaviour (e.g. abatement) (Carbon Trust, 2006). This was echoed by an interview respondent:

> "Price discovery allows projects to be valued including the revenue stream from carbon abated. Therefore whilst under Phase I abatement primarily involved generator fuel switching, true technological innovation will become increasingly common going forward."

The data collected as part of this study indicates that sector associations believe the EU ETS has a greater impact on innovation than individual firms. A survey conducted by McKinsey and Company and Ecofys on behalf of the Commission in 2005 found that 53% of companies (of 134 survey respondents from across the EU) believe the EU ETS has a strong or medium impact of decisions to develop innovative technologies (European Commission, 2006b). This survey was conducted in 2005 - the first year of the EU ETS - which may offer an explanation as to why the impact on innovation was lower than found in this study. The full impacts of the Scheme are unlikely to have been felt within companies until further into Phase I.

In order to populate the concept of innovation within EU ETS participants sector associations identified the types of innovative behaviour that had been exhibited within their sector arising directly from participation in the EU ETS (

Table 7.6). A significant majority stated that the EU ETS led to an increase in awareness of senior management of GHG emission reduction and energy efficiency opportunities, but only 50% reported changes to process and equipment indicating the scale of the challenge faced by the EU ETS in Phase II if significant emissions abatement is to occur.

Table 7.6 Stated changes arising within sectors as a result of the EU ETS

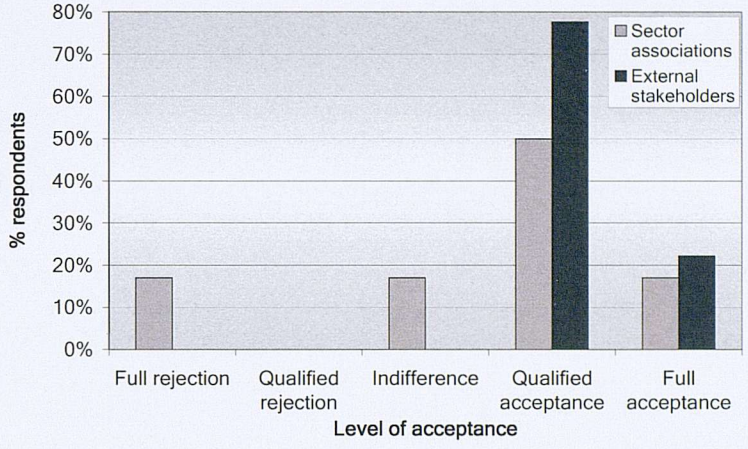
Change	% respondents
Increased awareness of GHG reduction opportunities within senior management	83
Increased awareness of energy saving opportunities within senior management	67
Process changes	50
Introduction of equipment of higher efficiency rating/lower emissions rating than previous equipment	50
Inclusion of cost of carbon in new project appraisals	50
Improved environmental reporting	33
Improved supply chain management	17
Development of strategies to manage carbon as a resource	17

The establishment of a stable carbon price will inevitably lead to greater industrial confidence towards making financial investments in new technology. However, low carbon prices in Phase I and high gas prices led 'negative' fuel switching by many power generators - from gas to coal (ENDS, 2008e), which should be avoided as the market gains strength.

7.13 Acceptance and equity

The perceptions of equity and the acceptance exhibited by different stakeholders were evaluated (Figure 7.14). External stakeholders have a stronger sense of acceptance for the EU ETS with all respondents professing either qualified or full acceptance of the Scheme. Whilst more than half of sector associations exhibit a sense of acceptance of the EUETS, slightly fewer than 20% completely reject the approach. It is useful to note that the level of strong acceptance within the external stakeholder group is approximately 50% lower than the UK ETS and CCA external stakeholder groups. It became clear over the course of the interviews and questionnaire analysis that this stakeholder group is largely supportive of MBIs but has concerns over the design and operation of the EU ETS.

Figure 7.14 Level of acceptance exhibited by both stakeholder groups



A second element of the evaluation of fairness, equity and acceptance is industry's perception of allowance allocation in Phases I and II. None of the responding sectors stated that their sectoral allocation was excessive for either Phase I or Phase II. With 60% of respondents stating that their sectoral allocation in Phase I was either unfair or very unfair, one must investigate the validity of such claims (Table 7.7).

Table 7.7 Rating of fairness of allocation of Phase I allowances from the perspective of sector associations

Allowance allocation excessive	Fair allocation compared with EU counterparts	Slightly unfair allocation but no significant detrimental effects on members	Very unfair allocation leading to competitive disadvantage compared with EU counterparts
0%	40%	40%	20%

Evidence disputes the ranking of three of the respondents who stated that their sectoral allocation as unfair or very unfair. In 2005 the actual emissions from these sectors ranged from 20% to 30% below the 2005 allocation. 2006 allocations for these sectors were between 15% and 40% higher than actual emissions. This clearly disputes the notion that the allocations were in any way

unfair. It is interesting to note that two sectors who stated their allocation was fair had significantly lower over-allocations compared to the remaining respondents (between 5% and 15% in 2005, 10% and 18% in 2006). It is difficult to provide a valid explanation of the 20% of sector associations who ranked the Phase I as 'very unfair' beyond a general perception of negativity towards the Scheme. The allocations for Phase II are perceived to be more unfair than Phase I (Table 7.8). However, at the time of writing there was no emissions data available to support or dispute these claims.

Table 7.8 Rating of fairness of allocation of allowances in Phase I and Phase II from the perspective of sector associations in Phase II

Allowance allocation excessive	Fair allocation compared with EU counterparts	Slightly unfair allocation but no significant detrimental effects on members	Very unfair allocation leading to competitive disadvantage compared with EU counterparts
0%	20%	60%	20%

Responding sector associations were asked to describe the overall experience of their members during Phase I of the Scheme. Overwhelmingly, industry appears to have negative feedback (Table 7.9).

Table 7.9 Overall experience of members

Completely negative	More negative than positive	More positive than negative	Completely positive
20%	60%	20%	0%

In order to obtain further insight as to the perception of industry responses were analysed for reasons behind the negative or positive feedback, of which two sector associations chose to expand on their answer. One was largely dissatisfied with the bureaucratic requirements of the Scheme. The other was dissatisfied with the level of consultation prior to the development of the NAP. However, as section 7.4.2 of this Chapter demonstrates, Defra went to significant effort to consult with industry prior to the development of the NAPs for both Phases I and II. Given that no other respondents raised the issue of bureaucracy and administrative requirement, and bearing in mind the need to ensure accuracy of emissions inventories, it is unlikely that there is a real issue behind these comments.

External stakeholders were asked to rank the level of influence they believe non-industry stakeholders had in the development of the EU ETS. The majority (66%) believe there was too little influence of non-industry stakeholders. One third believed the amount of influence was about right. None of the respondents believe non-industry stakeholders had too much influence in the development of the EU ETS. In the UK the Government went to great lengths to consult on most aspects of Phases I and II. The Government is currently undertaking a consultation on the Commission's proposals to revise the ET Directive for Phase III. There have certainly been adequate opportunities for all stakeholders to engage in the policy process.

Looking at the broader concept of equity, one must question an allocation methodology based on the creation of property rights which are then distributed free of charge. The commonly help belief of industry is that only free allocations can protect industry from negative competition from non-EU industry, in particular competitors who are not subject to equivalent levels of environmental control (Hepburn et al., 2006). However, these arguments are discredited by Hepburn et al. (2006) who draw particular attention to sectors that are largely immune to foreign competition, namely power generation. The assumption that auctioning of allowances would hinder the competitiveness of European industry is misguided on the basis that free allocations provide short-term subsidies to firms and protect profits, yet do not offer any long-term protection against foreign competition and do not protect a company's market share.

Possibly the most crucial element of the evaluation of equity and acceptance for the EU ETS is the concept of responsibility. Van Asselt and Biermann (2007) comprehensively analyse a host of measures proposed by industry, academics, politicians and lobbyists deigned to protect the competitiveness of European industry, to secure economic growth and to maintain employment rates. These measures include, *inter alia*, relaxing allocations, the provision of subsidies for energy climate -friendly industrial activities, the restriction of competitive imports into the EU (via border tax adjustments, imposition of quotas, or imposition of technical standards), and raising of consumer awareness across the EU with regards to goods produced in accordance with the ET Directive. From an environmental and economic standpoint, in the sense of establishing a price-stable, functioning market, the relaxation of allowance allocation is incomprehensible. Any of the other measures proposed must also meet with strict

WTO trade guidelines. However, there is one criteria noted by van Asselt and Biermann (2007) that is fundamental to the discussion of equity and the EU ETS: the adherence to the fundamental principle of UNFCCC of common but differentiated responsibility. Based on ability to abate, the economic situation of EU Member States and the historical (and continued) contribution global GHG emissions, EU industry has a significant responsibility to undertake emissions abatement regardless of the efforts (or lack of) within non-EU countries. This is not to presume that the competitiveness of EU industry should be severely compromised in order to achieve GHG emission reduction. However, on the basis of data presented in this thesis it is reasonable to assert that the protestations of industry should not be given undeserved weight in future developments of the Scheme. This is particularly pertinent given the largely negative perception of British industry towards Phase I despite generous allocations.

None of the previous three case studies have demonstrated lobbying to the extent of the EU ETS. During its development, implementation and subsequent revisions industry groups have been persistent. A unique aspect of lobbying in the EU ETS context is the lengths government from Member States have gone to maximise the level of protection for their industries. The case of Germany and other eastern Member States threatening legal action following the Commission's revisions to their NAPs highlights the seriousness with which some Member States view the impact of the EU ETS on their industries.

The creation of property rights, which are distributed without charge, also leads to a situation whereby industry will fiercely lobby to ensure the maximum quantity of this tradable commodity is allocated. In the case of the UK, the total allocation in Phase I and II were identified before the allocations to individual sectors and installations were determined. This naturally leads to intense lobbying from companies and sector associations. However, desire and purpose of such lobbying (under the assumption that successful lobbying can lead to favourable allocations) would decrease through increasing the use of auctioning (Hepburn *et al.*, 2006).

7.14 Other issues

The concluding analysis section of this Chapter will present additional issues identified through the survey and interview process, namely:

- the interaction between the EU ETS and other environmental policies;
- overall weaknesses and failures of the EU ETS in Phase I and projections for Phase II.

7.14.1 Interaction between the EU ETS and other climate policies

The interaction between the EU ETS and other environmental polices at both the EU and UK-levels appear to be of little concern to industry. Only 40% of sector association believe the EU ETS and other British environmental policies create a significant or slight regulatory burden for their members (Table 7.10 and Table 7.11).

Table 7.10 Rating of the interaction between EU ETS and other British environmental polices

Interaction between EU ETS and other policies creates a significant regulatory burden	Room for improvement. Some problems with cohesion between EU ETS and some policies - slight regulatory burden	Minor problems with interaction between EU ETS and other policies but nothing too serious	EU ETS and other polices operate in a complementary manners - excellent level of cohesion
20%	20%	60%	0%

Table 7.11 Rating of the interaction between EU ETS and other EU environmental polices

Interaction between EU ETS and other policies creates a significant regulatory burden	Room for improvement. Some problems with cohesion between EU ETS and some policies - slight regulatory burden	Minor problems with interaction between EU ETS and other policies but nothing too serious	EU ETS and other polices operate in a complementary manners - excellent level of cohesion
20%	0%	80%	0%

The rationale behind these patterns can be explained by both the Climate Change Agreements and the PPC Regulations, as identified by one sector association:

> "The UK has CCA, EU ETS and is now introducing the Carbon Reduction Commitment. Although PPC is not in direct conflict there are serious issues here on the interaction of this regulation. In some areas the PPC forces sites to increase energy use e.g. manual handling regulations and

dust control measures, which is in direct opposition to energy and emission reduction."

However, this was contradicted by another respondent who believes that difficulties in meeting health and safety requirements are given sufficient consideration within the context of the EU ETS:

> "Other policies sometimes require more energy to be used, e.g. to remove sulphur from oil products or operations. The EU ETS allows a reasonable interaction between these policies."

Recital 29 of the IPPC Directive states that the Directive should be implemented without prejudice to Community provisions for health and safety at the workplace. The site-by-site nature of the PPC permitting process should, technically, take into account health and safety requirements if these lead to increases in specific emissions. Recital 21 of the EU ETS Directive (2003/87/EC), on the other hand, only makes provisions for the interaction between this Directive and the IPPC Directive insofar as prohibiting Member States from applying GHG emission limits to installations operating within the EU ETS. Furthermore, energy efficiency requirements may not be imposed via the IPPC permit if an installation operates within the EU ETS. Beyond these specific requirements, no further requirements are made in relation to the IPPC Directive nor in relation to any health and safety related EU legislation.

In 2001, Smith and Sorrell published detailed analysis of the potential interaction between the IPPC Directive and a potential emissions trading scheme (at that point the EU ETS was yet to be developed) (Smith and Sorrell, 2001). Under various scenarios, the authors identify the possible outcomes following the implementation of both Directives. Given the date of this analysis, it is interesting to compare the possible scenarios within this paper with the real outcomes. Of particular importance is 'Scenario 3'[57], which is the closest to the existing

[57] Smith and Sorrell identify three possible scenarios for the interaction between the IPPC and EU ETS Directives:
Scenario 1: '*Strict interpretation*' whereby quantitative limits on energy use and CO_2 emissions are specified within IPPC on a site-by-site basis
Scenario 2: '*Minimalist interpretation*' whereby energy efficiency and CO_2 emissions are not subject to any quantitative limits and are treated as secondary considerations to IPPC
Scenario 3: '*Trading based interpretation*' whereby energy efficiency and CO_2 emission requirements of IPPC are met through emissions trading. Allocations may be based on either a site-specific assessment of BAT for energy efficiency/CO_2 emissions or on a

situation. It was proposed that removing energy efficiency and GHG emissions from the remit of IPPC would, in fact, be beneficial in terms of reducing emissions on the basis that the IPPC BAT for energy efficiency could be used as a means to benchmark installations. These benchmarks could be the basis of allocations. Unfortunately, the real-life situation did not mirror the scenario proposed by Smith and Sorrell. An opportunity may have not been maximised in terms of allocating allowances based on accepted best practice. Instead, allocations based on historical emissions and projected BAU showed little regard for the notion of best available technique, meaning that installations operating within IPPC and the ET ETS are not subject to any form of BAT-based requirements for energy efficiency and GHG emissions.

7.14.2 Quality of legislation

The case study of the EU ETS raises some interesting issues about the root causes of the problems associated with policy instruments. Certainly in the case of the EU ETS there are Articles in Directive 2003/83 EC that have undoubtedly led to some of the failings of Phase I and risk undermining Phase I. Two Articles of the Directive have played a particular role in reducing the effectiveness of the Scheme:

- *Article 9 National Allocation Plans*

The use of domestic-level NAPs led to an unharmonised approach to allocating allowances. Many Member States, particularly in Eastern Europe, provided allowances beyond need to the vast majority of installations. Such an approach led to not only the collapse of the Phase I allowance price, but possibly competitive distortions within the Community as industries in some countries were treated more favourably than in others.

- *Article 10: Method of Allocation*

The restrictions imposed limiting the maximum quantity of allowances without stipulating the *minimum* quantity led to only four Member states choosing to auction in Phase I. In Phase II only the UK and Germany plan to auction significant quantities of allowances (7% and 8% respectively). The UK

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generic approach in which generic energy efficiency/CO_2 emissions BAT are used as a basis to determine allocations

Environmental Audit Committee has also previously identified is disappointment at the Government' decision not to auction the full allowable quota in Phase II (Environmental Audit Committee, 2007). If the Directive specified a minimum quantity of allowances that each Member State should auction there would be multiple benefits including:

- Industry would obtain more experience of auctioning;
- Reducing the creation of property rights that are distributed free of charge may increase the sense of equity within sectors beyond those participating in the Scheme; and,
- Generation of revenues for Member States governments.

Beyond specific Articles, there are other aspects of the Directive that may have contributed to the disappointing performance of Phase I. For example, the Directive was passed in October 2003 and Member States had less than three months within which to implements the Directive fully in to domestic legislation. In addition to the imposition of a strict time constraint for domestic transposition the Directive only provided Member States with one year to collect and validate the data upon which allocation of allowances was to be based.

These factors combined highlight the impact of primary legislation on effective implementation. It is of course impossible to determine what the outcome of Phase I would have been had the allocation methodology and the time constraints been more robust. This serves a useful learning purpose for Phase III of the EU ETS and for the development in future EU-level environmental legislation.

7.14.3 Overall strengths and weaknesses of the EU ETS

To conclude the questionnaire all respondents were asked to identify the key strengths and weaknesses of the EU ETS (see Table 7.12 and Table 7.13). The most prominent strength of the EU ETS was identified as the political support it has succeeded in generating. The success of the EU in developing a Community-wide emissions trading scheme that was politically acceptable to 15 independent countries (the EU ETS was initially developed pre-expansion in 2004) deserves praise and should not be underestimated. Furthermore, the Scheme was developed and implemented in less than three years. One external stakeholder neatly summarised the significant benefits arising from Phase I despite the

presence of factors that seriously undermined the environmental effectiveness of the Scheme:

> "EU ETS is an extraordinary policy phenomenon. When you think about how long it usually takes the EU to introduce even bog-standard regulations the fact that it came up with an absolutely ground-breaking scheme that had not been done anywhere in the world and put that in place unanimously is really quite remarkable. The sheer policy innovation must not be underestimated. I think that it is not at all surprising that it hasn't worked perfectly. I recommended that permits should be auctioned but equally business would not have allowed it. It's as simple as that. So the grandfathering of allowances was a necessary part of getting it [EU ETS] introduced. Now even businesses realises that the permits need to be auctioned."

These sentiments were echoed by another interviewee, a consultant:

> "The EU ETS is a fascinating institutional development. Because at one level, the mere achievement of a European-wide carbon cap and trade market, created from almost nothing in the space of three years, is actually staggering when you think that the European Union spent about 50 years trying to negotiate a common energy market, and mostly dismally failed. Then it spent ten years bashing its head over the European carbon tax, and that ended in dismal failure. So, the mere fact of achieving a common carbon price across Europe with a freely traded market is no small thing."

Across both groups of stakeholders the development of the EU ETS and the political ramifications of establishing such a Scheme were identified as the key strengths (Table 7.12). The innate flexibility of emissions trading and the potential for the Scheme to promote cost-effective emissions abatement were also identified as key strengths of the Scheme. However, the experience of Phase I, in terms of problematic allocations and minimal environmental outcomes, indicates that these respondents may be providing this response based on future benefits of the scheme should the problems encountered in Phase I be adequately addressed in Phase II.

Although some respondents identified the creation of a carbon price and the cost-effectiveness of emissions trading as key strengths of the EU ETS analysis of

performance data of Phase I indicates that these sentiments do not reflect the actual impact of the Scheme. Emissions abatement was limited and although a carbon price was created it was so low in Phase I that it is unlikely to have had a serious impact on long-term investment decisions.

Table 7.12 Strengths identified by all respondents

Identified strength	% respondents
Political support	38%
Flexibility	25%
Most cost-effective emissions reductions	25%
Long-term visibility of carbon price	19%
First mover/EU at forefront of global policy	12%
Industry support	12%
Link with CDM	12%
Innovative approach to environmental policy	12%
Equal impact on all industry across EU	6%
Ability to link EU ETS to other markets	6%

Representatives from Defra were also asked to identify the key strengths of Phase I. These were identified as:

- The EU ETS is a long term policy that was established in a short time frame
- Phase I provided many lessons that can be used to improve the EU ETS in the future
- The monitoring, reporting and verification systems worked well and have improved the quality of emissions data. This should help ensure future emission targets deliver "*real emission reductions*"
- Phase I established a thriving carbon market.
- The establishment of the City of London as a centre of carbon trading expertise

Despite these strengths, respondents provided a varied and extensive list of weaknesses of the EU ETS (Table 7.13). Unsurprisingly, free allocation of allowances, the leniency of NAPs, and the lack of stringency in the overall EU cap were identified by 38% of respondents are a key weakness. As discussed earlier in this Chapter, the EU and Member State governments have acknowledged the problems relating to the NAPs and allocations in Phase I. It is hoped that the

Phase II allocations will be more challenging. However, a trading scheme based on free allocations may never be as equitable or environmentally beneficial as an auction-based system as the creation of free property rights insinuates that industry has a 'right' to emit. There is a further issue relating to equity and fairness to stakeholders in the presence of free allocations. This method opposes the polluter-pays principal as polluters are given property rights which can be used to generate income. If free allocations are both stringent and accurate this is less of an issue. But the problems relating to methodologies to calculate caps and information asymmetries mean that the only rational and equitable approach to take is to ensure all polluters have to buy allowances.

The case for stringent targets is supported by research undertaken by the Carbon Trust. This research indicates that beyond two sectors at risk (cement and steel) there is little evidence to show that European industry will suffer as a result of the EU ETS. In fact, the Carbon Trust predicts that during Phase II most companies should benefit financially, provided the total cap is challenging and a sufficiently high price of carbon is established (Carbon Trust, 2006).

Table 7.13 Weakness identified by all respondents

Identified weakness	% respondents
Allocations/NAPs/cap setting	38%
Overly bureaucratic/complexity	25%
Lack of proportionality (i.e. dealing with small emitters, onus on industry to prove competitiveness effects, Phase I allocations)	25%
Policy constraints/lack of political support	19%
Lack of additional policies to meet GHG reduction goal	12%
Lack of linking of EU ETS with other markets/schemes	6%
Competitive disadvantage for industry if other countries do not follow suit	6%
Absence of mechanism to value carbon	6%
Lack of support for renewable	6%
Insufficient action to meet post 2012 needs in developing countries (via CDM)	6%
Too focused on flexibility not designing a scheme to meet policy goals	6%
Illiquid market	6%
Insufficient compliance mechanisms	6%

The complexity of the Scheme and the lack of proportionality are both common criticisms of the EU ETS. Dealing with complexity first, a certain level of bureaucracy is unsurprising given the scope, coverage and size of the EU ETS. It is an international, cross-industry emissions trading scheme that must fulfil the EU requirements for subsidiarity. In allowing Member States to determine their national cap using a bottom up approach the Commission is given the burden of

responsibility for challenging and approving NAPs. The informational requirements for a NAP are significant. Information asymmetries may have a negative effect upon the overall performance of the Scheme as demonstrated by the changes in the UK Phase I NAP (following the changes in the DTI energy model). Therefore Member States and the Commission require a significant amount of information to aid the decision making process.

Defra were again asked to identify what they believe to be the key weaknesses of Phase I. These were noted as:

- Over-allocation due to the majority of Member States over-calculating emission figures
- Over-allocation creating a surplus of allowances in the market leading to low trading price, thus removing financial incentives to invest in low-carbon technologies and other abatement opportunities
- Harmonisation issues in relation to:
    - Definition of combustion activities
    - Monitoring, reporting and verification
    - Difficulty in creating a level playing field due to over-allocation by some Member States

These concerns mirror many of the concerns raised by other stakeholders. However, one of the main weaknesses identified by external stakeholders relating to the transparency of the Scheme was not identified by Defra as being an area of concern. Specifically, during an interview a Defra representative stated that the Scheme is "*very transparent and it is undertaken with stakeholder consultation*". "*Stakeholder consultation*" was further clarified as specifically being taken to the Emissions Trading Group (ETG)[58], an industry lobbying organisation. This does not, as Defra may believe, represent public involvement in the policy process. As previously discussed in this Chapter, information relating to the EU ETS should be continually improved and specifically, translation of technical issues (such as NAPs) into formats that are easier to digest would greatly improve the transparency and public involvement in the policy process. The concerns of

[58] The Emissions Trading Group (ETG) represents businesses accounting for 95% of the UK emissions captured by the EU ETS. The ETG asserts that: "*The business-led ETG offers a forum for discussion and resolution of all aspects of emissions trading and enables communication to take place between commerce and industry, and the UK Government. In so doing, we contribute to Government thinking at a formative stage of policy development.*" (http://www.uketg.com/)

stakeholders about the complexity of documentation and NAP methodologies should be considered.

It appears that the majority of the weaknesses from Phase I will be remedied though the introduction of central allocation or sale of all allowances in Phase III. This should remove any competitive distortions and level the 'playing field' for firms would be level across the Union. Furthermore, full auctioning of allowances may reduce the administrative complexity for both firms and national governments as this would remove the need to collate and verify baseline data followed by the application of technical knowledge required to apply challenging sector-level caps.

7.15 Chapter summary

This Chapter has analysed the EU ETS from the perspective of industry (in the form of sector association representatives) and external stakeholders. In general, both stakeholder groups have positive feedback on the Scheme, although there are clear differences between the groups regarding issues of concern.

It is clear from the analysis in this Chapter that emissions trading is, in theory and in practice to a limited degree, a more efficient means to reduce actively emissions form industry compared with regulatory approaches. However, as the CCA, UK ETS and EU ETS case studies show, failures in market design and weak negotiation of caps undermine any efficiency gains over regulatory approaches. Furthermore, sub-optimal policy design in Phase I has led to low trading prices within the UK ETS and the EU ETS with the added effect of reducing the incentive to undertake emissions abatement, preventing innovation and leading to disappointing environmental outcomes and the failure of the instrument to date in meeting its original environmental aims.

PART 3: COMPARATIVE ANALYSIS AND RESEARCH OUTCOMES

8 Comparative evaluation of case studies

8.1 Introduction

In this Chapter the comparative analysis of the case-studies will be completed, the focus of which is Table 8.1. The data presented in this table is largely based on the analysis of primary data collected for this research. Other sources of information feed into the table where appropriate in order to enhance the analysis. Sections 8.2 to 8.10 will draw together the notable outcomes in relation to each evaluation criterion, as specified in Chapter 2 (methodology).

8.2 Economic efficiency

The comparative analysis commences with the economic efficiency of the case studies. The economic efficiency analysis undertaken within this thesis indicates that contrary to offering cost savings, some market based approaches may in fact be more costly to some stakeholders, usually government/regulators. The PPC Regulations are broadly revenue neutral for the Government as the Environment Agency recoups costs through application and subsistence charges. These charges provide the Environment Agency, on their own admission, with sufficient resources to undertake all necessary PPC-related activities. The costs to industry of such an approach are evident, but this is firmly in-keeping with the 'polluter-pays' principle. After all, why should the tax payer shoulder the financial burden of regulating industry? However, the tiered charging system, based on gravity of environmental impact and historical compliance, attempts to redress any potential issues of inequity towards smaller polluters. Conversely, the CCL has transpired to be a policy of net cost to the Government as the income of CCL was substantially below the cost of reducing employers National Insurance contributions (see Table 5.1). The incentivised participation in the UK ETS also contradicts the notion of MBIs offering cost savings. The outcome of this Scheme was a perverse situation whereby many companies made significant profits in return for little abatement effort at significant cost to the Government and by the nature of government funding, the tax payer too[59].

[59] The costs to tax payers are likely to be higher than for any other stakeholder group within the policy process. Firstly, government funding is sourced from taxation revenue. Secondly, the costs incurred by industry are often passed on to consumers. The cost of regulation, for example, is only a cost for industry when it negatively affects the profit margin of a product and impacts upon the competitive position of a company within the

The reporting requirements for industry and Government vary greatly within the case studies. For Government the most onerous are the PPC Regulations, due to the number of installations involved and the frequency of emissions reporting for industry. The situation is mirrored by EU ETS. EU ETS requirements for industry involve the submission of annually verified data to Defra and compliance with trading and banking requirements. The approach within the CCAs is one of 'light touch', a phrase often employed by Defra during current consultations on the proposed Carbon Reduction Commitment. Not all energy consumption data has to be verified, significantly reducing the cost and administrative requirements for industry compared with the EU ETS and UK ETS, which both have formal requirement for all emissions data to be independently verified. Sector associations act as intermediary organisations between the Government and target units reducing the burden of data collection for Defra. Sector associations are responsible for providing data with a degree of verification to Defra, whereby the "*sector association would identify a number of sites that wish to have their emissions verified for trading purposes*" (Defra, 2002a). The negative impact of this approach could be viewed as significantly outweighing the positive impact. Defra acknowledged in an interview that only about 5% of energy consumption data is verified following the bi-annual reconciliation period.

Such a low verification rate is concerning in terms of the environmental (in)effectiveness as the guarantee of reliable data is reduced, transparency (in terms of industry-Government transparency and Government-public transparency as the data does not have the safety net of independent validation), and equity (absence of verified data may reduce accountability of industry, a particularly pertinent issue when the outcome may be financially beneficial).

The comparison of perceptions of costs and benefits incurred by industry and Government reveals some key observations. For both trading schemes, external stakeholders are split across all options on the financial and environmental benefits of the approach for Government. Both schemes are viewed by external stakeholders as being financially beneficial for industry, yet the benefits for Government in administering an emissions trading scheme are less clear. The incentivised participation is the likely cause of the responses in relation to the UK ETS. However, the EU ETS is a far more complex issue. The provision of free

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international market. The impact on competition is significantly lower in terms of domestic competition as, generally, all companies within a sector will be subject to the same regulation.

emission allowances can be compared to a financial incentive for participation as firms undertaking emissions abatement benefit financially from the sale of surplus allowances. As asserted by Johnston (2006) free allocations, which remain unchallenged and uninvestigated by the Commission, possess many similarities with State aid as defined within the EC Treaty. 100% auctioning may increase the perception of cost-effectiveness for governments as auction revenue may be used to cover administration costs, as seen in Member States planning to auction small quantities of allowances in Phase II of the EU ETS, such as Ireland (0.5% of total allowances) and Poland (0.9% of total allowances) (Pelchen, 2006).

Unfortunately, analysis of previous *ex post* evaluations proves that the Government has not adopted a coherent and systematic approach towards calculating the costs[60] to itself and to industry. The most detailed evaluation of costs to both stakeholder groups was undertaken in relation to the PPC Regulations (Defra, 2007f). The remaining three case studies have not been subject to comparable levels of economic evaluation by the Government. With regards to the EU ETS, it is likely that this is caused by the relative infancy of the Scheme and the principle of Phase I acting as an introductory/pilot phase. Nevertheless, early analysis undertaken by the Carbon Trust draws attention to the significant profits made by British energy generators in the first three years of the Scheme (Carbon Trust, 2008). It is rational to assume that the financial impact of Phase I should also be calculated for other sectors and the Government yet there is no evidence of such analysis.

Defra attempted to quantify the costs and benefits of the UK ETS, yet arrived at a figure between a net cost to the tax payer of £66 million and a net benefit of £467 million (Defra, 2002c). The huge range of this calculation diminishes its value in terms of allowing a comparison with alternative policies. Finally, the CCAs have not been subject to any form of economic impact analysis in terms of the costs to Government. The cost savings, as reduced CCL rates, for industry are readily available but the lack of any quantitative evaluation of the costs incurred to industry and the administrative costs for Government (for both Defra and HM Customs and Excise as the department charged with CCL collection) has a negative impact on the inclusion of this policy in the comparative analysis. Furthermore, it begs the question of the quality of policy decision making if the

[60] 'Costs' refers to the administrative, environmental and profit related financial impacts of the policy.

Government can commit to extending the CCAs by five years despite the absence of accurate evidence in support of the economic impacts of the instrument.

Hanh (2000) analysed projected *ex ante* and actual *ex post* cost savings of implementing an MBI[61] over a regulatory approach in various situations in the USA. In many instances projected cost savings were not confirmed through the analysis of *ex post* data as evaluations were not undertaken. However, the Offset Policy[62] is believed to have generated cost savings in the region of $960 million-$13 billion and the sulphur dioxide trading program is believed to have saved $600 million (in the region of 35% less than a command and control approach). However, the robustness of these projections is questionable as further reliable evidence relating to other programmes designed to offer cost savings to industry and regulators have not been subject to *ex post* analysis to determine the accuracy of initial projections.

Analysis undertaken by Harrington et al. (2004) relating to the static efficiency and informational requirements of regulatory and market-based instruments approaches to pollution control may be contradicted by the case studies used in

[61] Hahn (2000) analysed the estimated and actual cost savings from five emissions trading programmes operating in the USA:

- Emissions Trading Program (arising from the Offset Policy)
- Lead Credit Trading
- Ozone Depleting Chemicals Allowance Trading
- Sulphur Dioxide Allowance Trading
- RECLAIM

[62] The Offset Policy was established in 1976 in response to concerns that many regions in the USA would fail to meet air quality standards within the timeframes set out within the 1970 Clean Air Act. The US EPA was faced with the task of prohibiting new industrial market entrants on the basis of the contribution to atmospheric emissions. Therefore, a new policy was implemented that allowed new market entrants on the condition that their emissions would not exceed regulatory limits and the quantity of emissions they produced would be 'offset' through investment in abatement at existing installations to ensure regional emissions met standards set out in the Clean Air Act. The Offset Policy was eventually combined with three other trading-based mechanisms (bubble, banking and netting) to form the Emissions Trading Program. The 'bubble' policy refers to the approach towards whole site emissions: instead of regulating emissions from specific processes or sub-sections of sites only the total emissions from a site are quantified (the site effectively becomes a 'bubble'). Expansion within the site would not be subject to additional regulatory requirements provided emissions are abated elsewhere and the total emissions from the site do not increase (Oates, 1999). Similarly, the 'netting' of emissions allowed for sites to expand provided the overall ('net') emissions did not increase significantly. The banking approach was added to the Emissions Trading Program in 1979. This element of the program enabled sites to reserve emissions credit for future use against regulatory targets. This element of the program had initially been rejected by the EPA over concerns that it would be counter-productive in achieving regional emissions standards. However, revisions to the Clean Air Act in 1977, including new deadlines, reduced the conflict between the regulatory and banking approaches (Oates, 1999).

this research. The authors assert that on the basis of informational requirements, MBIs lead to more cost-effective emission reductions due to significantly lower information requirements compared with command and control approaches. However, as three of the case studies demonstrate (CCAs, UK ETS and EU ETS), in order to achieve the desired environmental outcomes a significant quantity of information is required, sourced largely from industry, in order to establish emission caps, to set baselines and to negotiate targets. Although an economic instrument approach may initially be perceived to have cost-saving advantages for administrators over command and control mechanisms without a significant quantity of reliable information from industry the cost-effectiveness and hence the environmental effectiveness of an instrument, is at risk of being compromised.

Glachant (1999) asserts that in evaluating the effectiveness of a voluntary policy approach one should view it within the context of existing regulatory and market-based mechanisms. Theoretical analysis has concluded that under very specific conditions voluntary environmental approaches may, in fact, be more efficient than regulatory or market-based approaches. In particular, some companies may over-comply with a VEA in order to reap the price benefits of improved environmental credentials (Arora and Cason, 1995). Further conclusions drawn from Segerson and Miceli (1998) indicate that a VEA may offer a higher degree of equilibrium than other policy responses. In this case, companies face cost-savings due to higher flexibility in meeting the negotiated target and reduced transaction costs. However, this is based on one crucial assumption: that the regulator aims to maximise welfare via negotiated emissions reductions that reflect equal marginal social costs and marginal social benefits. In the absence of these factors, the VEA is likely to operate in an inefficient manner. It is also important to remember that the level of 'success' of a VEA (i.e. meeting the target performance) is often a result of the enforcement provisions and threat of regulation used as a backdrop to the VEA, not necessarily the VEA itself.

On the basis of these conditions, how well do the UK ETS and the CCAs perform in efficiency terms? The most notable area for examination is that of how well the UK ETS regulator (Defra) performed in terms of maximising the welfare gains of the financial outlay of the UK ETS on behalf of society. The provision of significant subsidies for participation contradicts the notion of equal social costs and benefits. Furthermore, a subsidy and a trading mechanism provided many

companies with possible double-dividend for participation whilst the outcome in terms of the social good (i.e. emissions abatement) was highly questionable due to uncertainty of the precise cause of abatement (i.e. existing regulations, pre-determined plans to close sites, or, in fact, the UK ETS). In this regard, the CCAs are even more complex. Provisions for tightening of targets and the sector-by-sector approach to target negotiation indicate the Defra was in a stronger position to balance the marginal social costs and the marginal social benefits. However, this theoretical proposition does not necessarily translate when in practice. In the presence of modelling and a strong negotiating position due to the financial incentive for CCA participation, Defra negotiated comparatively weak targets and failed to adequately address this issue when given the opportunity to do so with the revision of targets in 2004. This highlights the immense importance of information asymmetry within the policy negotiation process and the political willingness to negotiate policies with the highest environmental standards.

8.3 Environmental effectiveness

With the exception of the PPC Regulations, the use of baselines is a common feature of the case studies. This has revealed some serious issues relating to the environmental efficacy of the instruments for a number of reasons. These include, *inter alia*, the choice of baseline year (CCA), the use of only one baseline year (CCA), insufficient consideration of legislative requirements (UK ETS) and difficulty in predicting BAU emissions in relation to the baseline (EU ETS). The EU ETS made a step towards improving baseline calculations compared to the approach of CCAs and UK ETS in requiring 5 years' worth of data and excluding the year with the lowest emissions. However, this proved to be insufficient to establish realistic and challenging allocations in Phase I despite the aim of this Phase being the allocation of allowances broadly in line with BAU projections. The extended use of a baseline against which to calculate BAU projections in Phase II may also prove to hinder the environmental outcomes of the Scheme until 2012.

Sources have stressed the importance of investment in new technology as a response to rising GHG emissions (Carbon Trust, 2006). In this respect, the requirement for industry to implement recognised 'best' technologies, as required by the PPC Regulations, has a significant advantage over market based mechanisms, particularly when MBIs fail to work in the desired manner. An MBI

that works in its optimal capacity provides the correct level of financial incentives for firms to abate emissions and invest in new technologies. However, critical factors have been identified as having detrimental effects upon investment in abatement technologies (Rajah and Smith, 1993):

- Informational failures (e.g. firms being unaware of advances in technology and the potential cost savings of implementing such technology).
- Difficulties in acquiring capital or knowledge.
- Imperfections within the relationship between the market and capital income.

The EU ETS, in particular, has suffered as a result of at least two of these influencing factors, with the market failing to offer sufficient financial incentives and secure returns for investments, and possible informational failures arising from uncertainty surrounding the future direction of the Scheme post-2012.

The environmental effectiveness of voluntary policy instruments, such as negotiated agreements, remains highly debateable. Research undertaken by the OECD in 2003 based on case studies from Denmark, Canada, Japan and the USA led to the conclusion that the environmental effectiveness of voluntary approaches is unclear and that in some instances this could be a result of a "*significant degree of "regulatory capture"*" (OECD, 2003: p.14). Furthermore, whilst the environmental targets of most voluntary approaches were met, it is likely that the same outcome would have been achieved in the absence of the policy. The data obtained from this research, specifically the comparison of emission reductions arising from the four case studies, does not contradict the conclusions of the OECD. It is indeed possible that the policy package of CCL and CCAs would not have influenced energy consumption behaviour had energy prices not risen so dramatically in recent years.

The cases of the CCAs and the UK ETS add further weight to the argument, put forward by the OECD, in relation to the apparent over-performance of companies operating within voluntary agreements. The case of Intel's Project XL[63] indicates

[63] Project XL was established by the US EPA in 1995 as a means to provide participants with 'regulatory relief' in return for voluntary emission reductions. Intel Corporation was one of the first companies to participate in the scheme. In return for atmospheric emissions abatement of volatile organic compounds, NOx, carbon monoxide and SO2,

that the company was probably aware of its projected emissions five years in advance. Thus, following the establishment of a baseline and the subsequent vast over-performance against the target emission reductions the OECD concluded that is was likely the company would have know in advance of the scheme what its emissions trends would be (OECD, 2003). Such knowledge on the part of a company represents an acceptable situation provided the same information is available to the regulator and that the regulator uses the information to negotiate challenging environmental targets. Industry knowledge of future energy or emissions trends should only be problematic in the policy development cycle if the regulator is unaware of the projections. Therefore, regulators must operate in a creative manner in order to obtain the required information. The vast over-performance of many UK ETS Direct Participants also indicates that many of these companies were aware of impending emissions abatement, either as a result of regulatory requirements or through changes to existing plants (i.e. closure of particularly polluting plants). This notion was supported by one industry stakeholder who identified the link between firms volunteering to participate and existing knowledge of short-term emissions abatement.

Of particular importance to the sectoral approach of the Climate Change Agreements, Enevoldsen (2005) concludes that *some* sector-level voluntary agreement may be more cost-effective than regulatory or MBI approaches. The sector level agreement provides stimulus for the companies within the sector to cooperate and collaborate in the search for pollution abatement technologies specifically when compliance is based on the entire sector meeting the target, regardless of individual firm performance. However, this approach is only more economically efficient if the sector is homogenous and there is widespread uncertainty surrounding the pollution abatement technology as the level of burden-sharing reduces transaction costs and technological innovation may be inspired through the application of the VEA. Therefore, within CCA sectors that had undergone significant energy consumption improvements in the early 1990s (the sectors that selected early baseline years) the Agreements present an opportunity to reduce transaction costs and improve prospects for innovative solutions to energy efficiency across the sector. However, Glachant (1999) asserts that within sectors that do not face the same uncertainty regarding

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the EPA reduced demands for new permit applications in relation to process changes (OECD, 2003).

pollution abatement since voluntary agreements lead to burden sharing of information, thus increasing the cost-effectiveness of the approach compared to command and control and economic policy. This is the situation within the CCAs as the majority of sectors selected baseline years that were relatively close to the start of the Agreements, indicating that the majority of energy saving opportunities had not yet been realised which should not outweigh the additional communication costs of the collaborative approach. This is because the required technologies were likely to already exist; they merely required implementation by firms. Removal of the need to invest in R&D significantly reduces costs. Crucially, Glachant argues that although in instances of waste minimisation and recycling, VEAs can be the most efficient means to reach a policy goal the ability of VEAs to result in CO_2 abatement is less certain:

> 'Concerning C02 reduction agreements in high energy consuming industries, we can be more suspicious about the cost efficiency of voluntary approaches. As a matter of fact, in these sectors, given the weight of energy cost in total production costs, firms have paid much attention to energy saving activities for a long time. It can be assumed that the nature and the cost of energy saving techniques are well known by each firm and the informational context is asymmetrical'
>
> (Glachant, 1999: p.88)

To conclude this section on environmental effectiveness, questions remain regarding the benefit of applying a VEA over other policy instruments. The environmental outcomes of the four case studies are, at present, somewhat disappointing. However, it is clear that when the carbon savings and length of policy are balanced, the CCAs have resulted in the most carbon savings although it is difficult to distinguish between the impact of the CCL alone and the CCAs. The UK ETS, in fact, resulted in higher carbon savings over the life of the policy, but the difficulty in attributing abatement to the Scheme and the impact of other policies upon the behaviour of firms it difficult to attribute these emission reductions to the UK ETS. The PPC Regulations have made very little impact on energy consumptions and GHG emissions and show little prospect of doing so. There are two key reasons for this. Firstly, other instruments exist for some installations that are designed to specifically deal with energy efficiency and GHG emissions. Secondly, the Regulations and the associated BREF documents pay little attention to the issues of energy efficiency and GHG emissions, placing minimal requirements on installations falling outside of the remit of other policies

in these areas. It is, however, the EU ETS that shows the greatest prospects for GHG emission reductions. In Phase I the environmental outcomes were very poor. However, long-term expectations for the Scheme are high provided problematic areas such as allocations, auctioning, new entrants and maintaining a stable and high carbon price are resolved.

8.4 Innovation

Both MBIs and regulatory approaches have been found to incentivise innovation (Harrington et al., 2004). However, various case studies also indicate that MBIs provide a much greater incentive to reduce emissions further below a specified standard by providing a clear financial incentive to do so. These case studies include examples from the United States (phasing-out of leaded gasoline and SO_2 trading), Sweden (NOx taxation/charging) and the Netherlands (industrial water pollution control via charges). The analysis undertaken for this research shows a clear difference between the impact of a regulatory approach on innovation and the impact of a market based approach. The PPC Regulations do not appear to provide any incentive for companies to invest in or investigate new technologies. The prescriptive, technology focus of the Regulations (and, of course, the IPPC Directive) reduce any financial incentive to innovate as once a company meets the required technology standard no further action is required until the BAT Reference documents are amended to account for changes in technology. The impetus for individual companies to innovate is thus removed. In their study of 'ecological modernisation'[64], Murphy and Gouldson (Murphy and Gouldson, 2000) found that the common operating practice within industry leans towards control measures (such as end-of-pipe technologies), with restricted organisational change and focus on operational issues. Therefore, unless specifically designed to do so, regulatory approaches may not provide an incentive for industry to innovate beyond minimum required operational practices.

An approach incorporating emissions trading should provide a clear financial incentive for companies to pursue new, more efficient/less polluting technologies and practices. The EU ETS provides the strongest incentive for innovation despite economic shortcomings of Phase I. Although there is uncertainty surrounding the post-2012 form of the Scheme, there is probably more certainty

[64] Where ecological modernisation refers to "*a way of addressing some of the environmental problems associated with industrialism whilst at the same time improving economic competitiveness*" p.43.

within this policy than the CCAs. Companies participating within EU ETS know the Scheme will be continuing post-2012, but the details (particularly the method of allocation) are yet to be decided[65]. The short lifespan of the UK ETS and the only recent extension of the CCAs will lead to greater uncertainty within industry.

Previous analysis of the impact of VEAs on innovative behaviour within firms suggests that unambitious targets, that require little additional effort beyond BAU, are unlikely to lead to advances in technology as the incentive to do so (through the threats in place for non-compliance) does not exist (Carraro and Lévêque, 1999). Conversely, challenging targets may require investment in new technologies to achieve compliance. In the case of the CCAs, the impact on innovation was deemed to be minimal with most sector associations reporting an increased awareness of energy management issues are the primary change within companies. Coupled with the lower than expected carbon savings, this indicates that the CCAs are not sufficiently challenging to provide an incentive to innovate.

8.5 Flexibility

Market based instruments, by their inherent design features, are assumed to offer the maximum level of flexibility to firms, particularly when compared to regulatory approaches (Prakash and Kollmann, 2004). This is largely due to the creation of financial incentives to abate and disincentives to pollute, based on the theory of the equalisation of abatement costs across industry (Baumol and Oates, 1988). However, Prakash and Kollmann (2004) stress that despite the advantages for firms, in terms of flexibility, equalisation of abatement across industry and financial incentives MBIs may offer less security regarding levels of pollution in instances where information asymmetry between firms and regulators is present. Furthermore, in the instances of taxation without an absolute emissions cap equity issues arise as pollution abatement is dictated by firms' responses to the

[65] In January 2008 the Commission launched a review of EU ETS Directive for Phase III. At the time of writing the UK Government had recently closed its consultation on the Commission's proposals and its own response to these proposals. Key areas of difference between the two bodies include: the inclusion of aluminium sector (Commission stance, UK against); the creation of an EU carbon bank to be responsible for future caps, allowance distribution and mechanics of the carbon market (UK stance, Commission makes no reference); harmonised auctioning (Commission stance) vs. minimum auction levels, allowing Member States to increase quantity (UK stance); and, auction revenues should be earmarked for environmental use (Commission stance, UK very opposed) (European Commission, 2008f; Department for Environment Food and Rural Affairs, 2008g)

tax, which can lead to an increase in emissions if firms choose to pay rather than abate. This highlights the fundamental requirement of setting taxation at a level high enough to make abatement the most financially attractive option. All sector associations agree that rising energy prices had a far greater impact on consumption than the CCL or CCA discount. This indicates that the rate of the CCL was not set at a high enough level to significantly change energy consumption behaviour.

The data collected for this research shows that the PPC Regulations are regarded as offering the least flexibility of the four case studies. Although the site-by-site approach of issuing permits takes site-specific conditions into account, installations are still required to meet minimum technology and not exceed maximum emission threshold values. Such an approach should lead to the achievement of minimum technology standards across an industry thus ensuring a level playing field across the EU for companies. However, it is widely acknowledged that the most efficient policies allow companies with the lowest marginal abatement costs to reduce emissions, leaving companies with higher abatement costs to continue operating in such a manner and compensating the market for doing so (via purchase of allowances from an emissions trading scheme or by paying more tax). The remaining three case studies (EU ETS, CCAs and UK ETS) were found to offer comparable levels of flexibility in terms of allowing companies to manage investment decision making and allowing industry to decide where emissions abatement takes place according to marginal abatement costs largely a result of the trading mechanisms. This outcome is to be expected when dealing with a regulatory approach and three policies containing significant economic elements.

8.6 Acceptance and equity

Rajah and Smith (1993) draw attention to the feasibility, or lack of, in the implementation of direct taxation to reduce pollution. The authors assert that a direct taxation is often the 'first-best' policy response[66] yet may not prove to be the most feasible option due to the requirement of support from political, administrative and industrial circles. This may not be forthcoming.

[66] Whereby 'first-best' refers to the "*maximisation of o government objective function in which aggregate economic welfare (including appropriate valuation of environmental effects) is the sole argument, and in which no account is taken of the costs of administering and enforcing taxes and other policy instruments*" p.50

The use of subsidies is also addressed in Rajah and Smith's analysis. At the time of publication there are few real-life examples of subsidies in practice. Even now, there exist few instances of such an approach in environmental protection, particularly in relation to climate policy. The UK ETS is one exception, although the approach taken by Defra does not meet the operational requirements set out by Smith and Rajah. A policy based on provision of subsides should, in fact, work in one of two manners. Firms may either be paid to reduce emissions with the value of the payment varying in accordance with the level of abatement undertaken. The second approach may involve issuing a subsidy to help firms meet emissions abatement requirements set out in other policies (such as regulatory requirements). However, in neither case would one expect firms to receive subsidy payments in the absence of abatement efforts. The UK ETS contravened this notion directly by providing a subsidy for participation (in a bid to attract involvement and also to negate any financial risk undertaken by firms), yet failed to implement safeguards against firms who do not actively undertake emissions abatement (see Figure 6.3 for the example of Shell plc). Whilst this was not direct profiteering on the part of participating firms, as Defra were charged with developing the rules of the Scheme, it does represent a lack of political will to minimise the ability of private actors to manipulate a policy to reap financial rewards to the detriment of the tax payer, as seen with the massive windfall profits made by the UK power sector in Phase I.

It is common for certain stakeholder groups to believe they are unfairly treated with the implementation of environmental policies (Harrington et al., 2004). In instances such as increases in taxation the severest effects are often felt by poorer members of society. However, industry stakeholders are also subject to inequalities within such policy development. Comparative analysis undertaken by Loh and Morgenstern (2004), Millock and Sterner (2004), Harrington (2004), and Hammar and Löfgren (2004) found that small businesses have been identified as being at risk of suffering inequitable effects of policy instruments.

The PPC Regulations, in particular, were been identified as having the greatest impact on small businesses. The Government attempted to deal with the impacts on small businesses within the RIA. However, economic analysis undertaken by Atkins and Defra (Defra, 2007f) identified high average costs associated with the PPC Regulations. Furthermore, the feedback from industry from the survey

indicates that many sectors perceive the Regulations to be unfair, indicating that inequalities relating to the economic cost of the regulations have not been adequately addressed. The EU ETS also received negative feedback in relation to equity and fairness. However, as discussed in Chapter 7, data relating to allocations serves to discredit this stance of industry.

The voluntary nature of the CCAs and the UK ETS also present an opportunity for interesting analysis of the perception of such instruments. Previous scholarship has identified the importance of including adequate sanctions for non-compliance and penalties for failure to meet the requirements of the agreements as a means to obtain the support of external stakeholders (Makuch, 2003, Ekins and Etheridge, 2006). There is a general sense of acceptance for these policy instruments and it is notable that external stakeholders exhibit a relatively strong level of acceptance. This indicates that the provisions for non-compliance are sufficient to warrant support from non-industry actors.

However, despite the majority of external stakeholders lending a degree of support to the two voluntary and the EU ETS policy instruments, the perceptions of stakeholder involvement within the policy development process indicate that insufficient consideration has been given to the involvement of external stakeholders. 66% of EU ETS external stakeholders and 57% of CCA external stakeholders rated the level of external involvement as insufficient. There is limited other evidence, relating to the impact of external, third-party participation in the development of VEAs. However, a recent study undertaken in Costa Rica found that in instances where the target sector, the regulators and NGOs (representing civil society) all fully participate in the policy development process the outcome of the policy was highly satisfactory (Miranda et al., 2007). Although the case studies presented by Miranda et al. focus on watershed management, some valuable conclusions were drawn from that paper that may be particularly insightful in this research. In most of the examples from Costa Rica, the VEA was negotiated between companies and an NGO with governmental departments having a limited role within the negotiation of the agreement. Furthermore, the participation of NGOs within the process is thought to have provided a mediatory role within the process that may not have been possible within negotiations between companies and the state. The use of this illustrative example is not intended to advocate the use of VEAs between NGOs and industry in the UK. It does, however, reinforce the importance of involving stakeholders beyond

industry and government within the policy development process. This is particularly important when performance targets are to be negotiated (as seen with CCAs and UK ETS) as the presence of NGOs may provide a tougher stance than government within the negotiations resulting in an overall increase in the stringency of targets.

8.7 Transparency

The two case studies originating from EU Directives (IPPC and EU ETS) contain explicit provisions to meet requirements of the Aarhus Convention relating to public reporting and provision of information. All case studies are generally perceived to be slightly transparent to stakeholders, although the EU ETS received the highest ranking. However, these outcomes appear to be counterintuitive following analysis of access to data in relation to each case study. As detailed in Chapter 4, PPC performance data and permit-related documentation is comparatively difficult to obtain with the onus being on the stakeholder (e.g. member of the public) to contact and visit the relevant Environment Agency regional office. General performance data, such as total emissions from all PPC sectors is available on-line, yet more detailed installation-level information is significantly more difficult to obtain.

The CCAs and the UK ETS both retained a certain level of secrecy. Despite bi-annual reporting within CCAs performance data relating to individual target units is not released into the public domain. Furthermore, performance data relating to individual companies within UK ETS was publically available but the revised targets of six Direct Participants remain protected by a confidentiality agreement between companies and Defra. In addition, of all the existing analyses of policies, undertaken by Government, Government-appointed consultants or third parties (such as the Carbon trust) examined as part of this research none address the issue of transparency and availability of data to external stakeholders. This is a disappointing situation as evidence from this research indicates that the transparency of the four case studies needs to be addressed in order to continually improve transparency standards, instead of simply meeting minimum requirements (e.g. requirements set out in the Aarhus Convention).

8.8 Instrument cohesion

In instances where multiple policy objectives are in place a mix of policy instruments may be more effective than implementing one single policy (Böhringer et al., 2008). However, if the policy objectives overlap there is a risk that efficiency will decrease. The achievement of the objectives may become more costly and may even prove to be counterproductive in environmental terms (Johnstone, 2003). In the case of the four policies examined within this thesis there are instances of policy overlaps and corresponding evidence highlights the resulting efficiency losses. In implementing the UK Climate Change Programme the Government appeared to focus most of its efforts on GHG emissions and energy consumption from industrial and business sectors, with few policies targeted at other major sources of emissions such as domestic consumers and transport (Darkin, 2006). The vast number of policies targeted at industry (see Tables 3.4 and 3.5) reflects the seriousness with which the Government is attempting to tackle GHG from these sectors but the absence of any stringent and challenging policies targeted at domestic and transport consumers is cause for concern.

The infancy of climate policy, compared to other forms of environmental protection policy (such as water effluent control, atmospheric emissions of non-GHGs such as sulphur dioxide) means that the most recent decade has been one of trial-and-error for the Government in terms of developing and testing policies. Consequently, the mixture of policies, which have been developed in an ad hoc manner, creates problems for industry, regulators and society as maximum efficiency[67] is difficult to achieve.

The CCAs and EU ETS pose a particular challenge to policy makers as a substantial number of installations are presently eligible to participate in both schemes. When questioned about the efficacy of this approach Defra stated that it believes the two policies can co-exist as CCAs focus on energy efficiency and EU ETS on direct CO_2 emissions. However, it is arguable that the desired outcome - CO_2 emissions abatement - is the same for both policies thus meeting the "same policy objective" criteria identified by Johnstone (2003). Furthermore, the specific eligibility requirements for both schemes are closely linked with both targeting energy intensive industrial installations that are regulated under the

[67] In this sense, maximum efficiency refers to the efficiency of a policy to deliver maximum emissions abatement at an acceptable cost to industry, government and society.

PPC Regulations. Therefore, if the target industries and the overall policy objectives are mirrored within the policies it is unlikely that optimal policy efficiency, in economic and environmental terms, can be achieved.

In light of the voluntary nature of both the UK ETS and the CCAs the use of such approaches, within the context of a policy mix, should be addressed. The EU and the UK Government have both exhibited a keen desire to pursue "better regulation" (European Commission, 2005a, Better Regulation Executive, 2007a). In June 2007 the UK Government renamed and rebranded the former Department for Trade and Industry as the Department for Business, Enterprise and Regulatory Reform (with the Better Regulation Executive operating as a sub-division within this department) (BERR, 2008a). This gave a clear indication of the vigour with which "better regulation" is to be pursued in the UK. The notion of developing policy based on numerous policy responses (including co-regulation, self-regulation and other instruments) and employing a more consensus- and participatory-based format is often believed to result in "better regulation" that is more efficient and effective than more traditional approaches[68] (Hey et al., 2007). However, Hey et al. (2007) also assert that most 'new' forms of environmental governance are hybrid combinations of traditional regulatory approaches and new policy instruments. Examination of the impact of these approaches, from the perspective of the individual policy outcomes and the performance of the instrument within the context of an overall policy framework (e.g. the operation and performance of the UK ETS within the context of the policy package of the UK Climate Change Programme), have rarely been undertaken. Hence, the usefulness of such approaches remains unclear.

In a case study of the EU REACH (Registration, Evaluation Authorisation and Restriction of Chemicals)[69] regulation, Hey et al. analyse the use of 'hybrid' policy

[68] Traditional approaches are largely regulatory policy responses such as performance standards, technology standards and banning of certain substances/processes.

[69] The principal aim of Regulation EC 1907/2006 REACH is to improve protection of human health and the environment via earlier identification of the intrinsic properties of chemicals. This is undertaken through the employment of various approaches centred around a regulatory framework that makes formal requirements on companies to provide data relating to substances with the possibility of substance restrictions/bans through the use of cooperative dialogue between industry and regulators. The other approaches used within the framework are identified by Hey et al. as:

- Public risk communication so markets, consumers and the public can react to substances of concern
- Chemical producers are obliged to undertake a self-regulatory role to implement an appropriate risk management strategy

responses (whereby a variety of policy instrument features are employed to achieve one policy objective). In the case of REACH, they hybrid system is based on safety management information and the phasing out of some substances (European Commission, 2008c). The cooperative approach within REACH was found to be beneficial in both conflict management and in making the decision and implementation process robust. Specifically, the cooperative approach and the pursuit of consensus-oriented decision making ensured that the concerns of environmental groups were not overshadowed by the concerns of industrial lobbyists. The purpose of drawing this case into the policy cohesion debate is to draw parallels with various elements of the approach to climate policy in the UK. The CCAs, for example, could also be categorised as a hybrid instrument due to the key influencing factors such as the incentivised participation, the negotiation of targets (which are supposedly reached through debate and consensus between industry and Government) the informational requirements placed on industry and the linking in of the scheme with other instrument (UK ETS).

8.9 *Ex ante* appraisal

The United Kingdom is regarded as a "*forerunner*" of EU countries regarding best practice of Regulatory Impact Assessment (Italian, Irish and Dutch Presidencies of the Council of the European Union, 2004). This arose from RIA being a compulsory stage in the policy process for all proposals what are predicted to have some impact on stakeholders and is applied in a systematic manner. The European Council report also states that the United Kingdom and the Netherlands are the only Member States in the EU that assess multiple policy options "*before the regulatory option is chosen and make this analysis transparent to the public*" (p.14). However, the four cases studies within this thesis contradict this finding. The EU ETS and the PPC Regulations were not subject to such analysis as both of these policies stem from EU Directive. The UK has a legal obligation to transpose these Directives into domestic law. Ironically, the remaining two policies, the CCAs and UK ETS, were not subject to such an analysis either for one crucial reason: t UK ETS and the CCAs (and CCL) were seemingly implemented without consideration of alternative policy options.

- A cooperative approach as the Regulation only provides a framework for basic rules and procedures

Russel and Jordan (2007) present a comprehensive analysis of policy appraisal trends in the UK between the last 1980s and 2004. The outcomes of which indicate that Defra is providing leadership to other Government department in the field of RIA. The use of environmental policy appraisal (EPA)[70], a category of policy analysis within which RIA (and the EU approach of Impact Assessment) belongs, across Government departments is found to have rarely been influenced by the political persuasion of the administration of that time. Furthermore, despite Government guidelines specifying that EPA should be incorporated into all areas of policy development and appraisal, Defra (and its predecessors) was the leading department in terms of quantity of EPAs undertaken between 1997 and 2004 (48 out of 62 across all Government departments). Furthermore, Defra undertook the highest number of RIAs across all departments between 1999 and 2004 (228 out of 631). The analysis undertaken by Russel and Jordan led to the conclusion that RIAs are generally undertaken in a uniform fashion across Government departments (with approximately 90% of all department complying with requirements to undertake RIAs), yet EPAs are hugely under-represented within *ex ante* policy analysis compared to RIAs.

In the case of the CCAs, the RIA was partially included in the CCL RIA and partially dealt with in a separate analysis (see Appendix 4). However, neither of these documents, as stand alone analyses or combined, provided a complete RIA prior to the implantation of the Agreements. The UK ETS RIA was a very limited document with no reference to any potential negative outcomes of the Scheme. One must question whether in real-life situations a policy instrument has no negative effects. Defra was either aware of these but unwilling to share the information with the public or had made no attempt to consider any negative side effects. The PPC Regulations, which were subject to an RIA in 2000, was dealt with in a slightly more rigorous manner. This RIA analysed the projected impacts of the Regulations on small businesses and the economic costs to industry of implementation. It also attempted to make provisions for *ex post* evaluations and considered other options in relation to the implementation of the Regulations. Considered within the context of a comparative analysis, this RIA was undertaken to a surprisingly high standard given the timing and the early stage of RIA

[70] Russel and Jordan describe the approach to EPA as "*[the] UK Central government sought to produce ex ante assessment of the potential environmental impacts of different policy options*". Therefore, the use of EPA was not limited to strictly *environmental* policies. The purpose of EPA was to transcend policy arenas to ensure environmental impacts of all policies were considered, regardless of the sector, scope or objectives of policy.

development in the UK in 2000. The EU ETS RIA of 2004 was a comparatively robust document with most key areas (such as competition assessment) dealt with in a satisfactory manner. However, the document focused on justifying the implementation of the Scheme in terms of the costs to industry, a conclusion previously drawn by the OECD (OECD, 2002). Regrettably, Defra did not undertake any analysis of the costs to Government or consumers (through energy price rises).

8.10 *Ex post* evaluation

For the purposes of clarity and comparison, the approach to *ex post* evaluation attached at Appendix 9 has been segregated into two categories. The first, '*Government-led/commissioned* evaluations, deals with evaluations undertaken by Government departments, consultants commissioned to undertake evaluations on behalf of Government and evaluations undertaken by the EU (either the Commission or the relevant Directorate). The second category, 'other *ex post* evaluation', indicates *ex post* evaluation undertaken by organisations that are not directly accountably to the Government. NAO evaluations are presented within this category as this organisation reports to Parliament, not Government, and is intended to operate in an objective manner.

As discussed in section 8.2, the only case study to undergo a substantial *ex post* assessment of the financial costs to industry and Government is the PPC Regulations. In 2006 prior to the end of the UK ETS, Defra published an evaluation of years 1-4 of the Scheme. The timing of this report coincided with the start of consultations in relation to the proposed Carbon Reduction Commitments. However, it is unfortunate that the evaluation was not undertaken to incorporate the final year of the Scheme to provide a comprehensive account of emission reductions and allowances prices over the life of the Scheme.

The situation of *ex post* evaluation of the EU ETS and the CCAs is more concerning. Currently, the only Government/EU-led evaluation of the EU ETS was undertaken in 2005 before a full reporting cycle of the Scheme had been completed. Although this evaluation provides a useful base for future *ex post* evaluations (specifically from a comparative stand-point), the value of the analysis is undermined by the dramatic changes within the Scheme following the publication of this report. As Figure 7.6 shows, at the time of this evaluation EU

ETS allowances were trading between the relatively healthy figures of €10 and €30 per tonne of CO_2. Less than six months into 2006 the price decreased to around €10 again, before a brief period of recovery followed by the start of a downward spiral in the autumn 2006. By early 2007, allowances were trading at less than €5 per tonne. It stands to reason that the performance of the market, arising from over-allocations, would have an impact on the recommendations and conclusions arising from any *ex post* evaluation. Although the 2005 review provides an interesting snapshot of the first year of trading, it does not reflect the reality of Phase I.

The final point in reference to *government ex post* evaluation relates to the Climate Change Agreements. In late 2007 the Government announced the extension of CCAs to 2017. However, in depth *ex post* evaluation by the Government is limited. It seems likely that the decision to extend the Agreement was based on the 2007 NAO review of the CCAs and CCL and the 2007 EAC inquiry. The NAO is not in a position to endorse the continuation or withdrawal of a policy, however, the NAO analysis led to some serious criticisms of the CCAs. The resulting EAC inquiry led to a lukewarm response to the outcomes of the Agreements. This makes the decision to continue the instrument all the more surprising. In summary, the NAO concluded that the CCAs have resulted in significantly lower emission savings than initially projected, the majority of targets are too lenient (despite subsequent revisions) and industry is divided on the impact of the policy. One of the few positive outcomes is the success that CCAs have had in raising the importance of energy management within business operations. On the basis of these conclusions, it is puzzling that the Defra decision to continue CCAs beyond 2013 is viewed as the most appropriate course of action.

The approach to *ex post* evaluation undertaken by organisations external to Government varies greatly across the four cases studies. The EU ETS has been the subject of most interest, with the Carbon Trust being the principal source of analysis. Since the Scheme was launched in 2005 the Carbon Trust has undertaken several detailed analyses of various aspects of the Scheme including, based on data from Climate Strategies, an EU-wide academic network, which are summarised in Appendix 9.

The inclusion of stakeholder participation within the Carbon Trust analysis is limited to Climate Strategies and academic participation. Conversely, the NAO reports on CCAs and the UK ETS have a strong stakeholder-engagement focus, with industry, Government departments and academic consultation being at the core of the analysis.

Finally, the PPC Regulations have been subject to very little *ex post* analysis beyond the Defra mid-term review. The size, scope and coverage of the Regulations no doubt presents a major challenge to any evaluator. Undertaking an evaluation of two aspects of the Regulations - the impact on energy efficiency and GHG emissions - proved to be a major undertaking for this research. Extending this to incorporate all elements of the Regulations (i.e. all emissions into all media) would require significant resources that are probably beyond the reach of independent researchers.

Table 8.1 Comparative summary of case studies based on various evaluative criterion

Each criterion within the table commences with a colour-coded ranking of the performance of each instrument in relation to that criterion. This is followed by a brief rationale for the ranking. The purpose of this is to facilitate comparison between case studies for the reader.

	Best
	Average
	Weak

Criterion	Sub-criterion	Pollution Prevention and Control Regulations	Climate Change Agreements	UK Emissions Trading Scheme	EU Emissions Trading Scheme (Phase I)
Economic efficiency	Overall performance				
	Reason	Although roughly revenue neutral to the Government the benefits of the Regulations in terms of GHG emissions and energy efficiency are low.	The revenue from the CCL has been lower than anticipated resulting in a significant shortfall.	The high subsidies and low allowance price lead to a rather inefficient trading scheme.	Phase I operated sub-optimally, but future Phases should operate in a more efficient manner.
	Approximate cost/income to Government to date	£47.1 million income (2005)	Intended to contribute to making CCL revenue neutral for Exchequer however the net cost of meeting NIC rebate against total CCL income cost the Exchequer £2.1 billion between 2001 and 2006.	Within range of £66 million net cost to £467 net value of benefits (accounting for value of carbon saved).	No accurate data.
	Approximate cost/income per year of operation	£9.42 million income	No data available	Between £13.2 million net cost to £93.4 net benefit per year	No data available
	Approximate annual cost to	£84,716	Per tonne carbon the	No data available.	No accurate data available.

	industry		following CCL payments (including CCA discount) are applicable: Electricity: £0.56 Natural gas: £0.43 Coal: £0.27	However evidence suggests that in many instances incentive payments negate costs associated with emissions monitoring and verification.	However, in Phase I the UK power sector made £1 billion profit. All other sectors received over-allocations thus providing sectors with aggregate surplus allowances to sell.
	Approximate one-off costs to industry	£430,105	n/a	n/a	Permit: £1230-5490 Access to NER: £1030
	Time from proposals (e.g. EU Directive adoption) to full implementation in UK	11 years (Directive adopted in 1996 - full implementation across EU by 2007)	3 years (1999-2001)	3 years (1999-2002)	2 years (Directive adopted in 2003 - full implementation of Phase 1 2005)
	Reporting cycles	Annual	Bi-annual	Annual	Annual
	Reporting requirements for government	Implementation review submitted to EU every three years (2003 and 2006 so far).	Bi-annual reports published by AEA Technology (government consultants) detailing sector-level performance including total energy consumption per sector, quantity of UK ETS allowances ring-fenced/purchased/sold, and number of target units failing to meet targets leading to suspension of CCA and CCL discount.	Publication of annual commitments from each Direct Participant against actual performance.	Publication of annual performance data.
	Reporting requirements for industry	On-site inspections carried out by Environment Agency inspectors to check performance of installations against permit conditions/requirements. Installations generating emissions exceeding thresholds must report emissions to EPER.	Sector associations submit verified data on bi-annual basis in order to receive re-certification for the following compliance period.	Submission of verified annual performance data to Defra. Emissions must be verified by an approved verifier.	Competent authority issues emissions trading permit to installations it believes can sufficiently monitor emissions. Emissions reports from operators must be verified by an accredited verifier - failure to do leads to suspension of trading rights.

	Use of consultants by government	n/a	Frequent: AEA technology employed by Defra from inception of CCAs to date. Involved in negotiating initial and subsequent targets, analysis of reported data.	During development phase to establish a suitable auction methodology.	DTI economists to calculate Updated Energy Projections.
	Use of consultants by industry	Application process Annual assistance	Occasional: sector associations provide significant administrative and technical advice to members.	Verification services	Verification services
	Industry evaluation of the balance between environmental benefits and financial costs incurred by:				
	Industry	Costs significantly outweigh benefits (55%)	Benefits slightly outweigh costs (50%)	Benefits significantly outweigh costs (36%)	Costs and benefits equal (40%)
	Mean ranking (1= poor, 5= best)	2.8	3.5	3.6	2.5
	Standard deviation	0.94	1.03	1.44	1.29
	Government	Benefits slightly outweigh costs (33%)	Benefits slightly outweigh costs (38%)	n/a	Benefits slightly outweigh costs (50%)
	Mean ranking (1= poor, 5= best)	1.7	3.31	n/a	1.6
	Standard deviation	1.45	1.07	n/a	1.25
	External stakeholder evaluation of the balance between environmental benefits and financial costs incurred by:				
	Industry	n/a	Split: Costs significantly outweigh benefits (29%) Equal costs and benefits (29%) Benefits significantly outweigh costs (29%)	Benefits significantly outweigh costs (43%)	Benefits significantly outweigh costs (40%)
	Mean ranking (1= poor, 5= best)	n/a	3.1	4	3.7
	Standard deviation	n/a	1.67	1.46	1.32
	Government	n/a	Benefits significantly outweigh costs (50%)	Split: Costs significantly outweigh benefits (29%)	Split: Costs slightly outweigh benefits (25%)

				Benefits slightly outweigh costs (29%) Benefits significantly outweigh costs (29%)	Costs and benefits equal (25%) Benefits significantly outweigh costs (25%)
	Mean ranking (1= poor, 5= best)	n/a	3.3	3.1	3.1
	Standard deviation	n/a	1.76	1.7	1.45
Environmental effectiveness	Overall performance				
	Reason	Difficulties in obtaining a complete data set from EPER relating to carbon emissions and energy efficiency mean it is difficult to accurately determine the impact of the PPC Regulations on performance.	Despite the negotiation of weak targets and underperformance of the Agreements in relation to the predicted carbon savings the CCAs performed have performed comparatively well against the other three case studies. A caveat of this performance is the difficulty in separating the impact of the CCL and the CCAs. The CCL alone may have led to similar emission reductions.	Although the carbon savings arising from the UK ETS are higher than the other three case studies, there is evidence to suggest that a significant proportion of the carbon savings would have been undertaken regardless of the UK ETS due to other regulatory requirements.	Total UK carbon emissions for Phase I actually increased compared to BAU projections. However, many stakeholders involved in this research stressed that the environmental performance of the Scheme should dramatically improve once the allocation methodology is improved and once a stable carbon price is established. Therefore, the overall performance is deemed to be average based on the potential impact of the Scheme.
	Use of baseline years	None	Yes	Yes	Yes
	Baseline calculation	n/a	Variable: between 1990 and 2001 Based on energy consumption and perceived ability to reduce	Average of emissions from 1998-2000	1998-2003 (average excluding year with lowest emissions)
	Key environmental objectives	To achieve integrated prevention and control of pollution arising from the activities listed in Annex I.	To contribute towards making the Climate Change Levy revenue-neutral for the Government.	To reduce GHG emissions from Direct Participants below baseline calculations.	To contribute to fulfilling the commitments of the European Community and its Member States more

		To prevent or, where that is not practicable, to reduce emissions in the air, water and land from the abovementioned activities, including measures concerning waste, in order to achieve a high level of protection of the environment taken as a whole.	To provide an incentive for energy efficiency improvements in return for 80% discount on CCL.	To give industry early experience of emissions trading prior to the launch of the mandatory EU Emissions Trading Scheme. To influence the development of the EU Emissions Trading Scheme. To establish the City of London as an international centre of expertise in emissions trading.	effectively, through an efficient European market in greenhouse gas emission allowances, with the least possible diminution of economic development and employment.
	Predicted UK carbon savings pre-implementation	2.5 MtC combined total with CCAs following full implementation.	4.5MtC per year by 2010 based on GAD modelling (total over life of the policy = max. 40.5MtC). Actual value of negotiated targets: 2.5MtC per year by 2010 (total over life of the policy = Max. 22.5 MtC)	3.36MtC over life of Scheme.	Between 3MtC and 8MtC per year by 2010.
	Revised carbon savings	n/a	1.9 MtC per year by 2010 (NAO calculation)	Figures revised following withdrawal of three Direct Participants: 3.2MtC of the life of the Scheme. Targets tightened for 6 Direct Participants following NAO report: 5.4MtC over the life of the Scheme.	Significant room of alteration within current predictions.
	Carbon savings to date	None reported directly from PPC regulations. Change between EPER 2001 and 2004 reported emissions (total basket of GHGs) = 2141MtC increase.	5.7MtC	7.5MtC (this total volume of carbon reduction cannot be attributed entirely to the UK ETS. However it is difficult to differentiate between emission reductions arising	UK installations (excluding power sector) emitted 2.6MtC below projected BAU emissions/allocations in 2005 and 3.5MtC below projected BAU

				from UK ETS and emission reductions arising from other influences).	emissions/allocation in 2006. The power sector emitted 10.13MtC above the 2005 allocation and 12.75 MtC above the 2006 allocation. This equates to an aggregate increase in emissions beyond BAU (2005-2006) of 16.78 MtC from all UK installations.
	% change between predicted and actual carbon savings	n/a	Assuming reductions of 2.5MtC per year by 2010 (15 MtC by 2006) emissions to 2006 were 263% above target.	Total policy emissions were 223% higher than predicted savings (note points raised above).	Assuming 3MtC per year 2005 emissions were 250% above target 2006 emissions were 308% above target.
	Value of carbon reductions to date against baseline assuming a carbon value of £70/tonne (sensitivity analysis £35/tonne - £140/tonne). Add £1 per year since 2000. [71]	n/a	£984.2million benefit (to date assuming carbon value of £70/tonne plus £1 annual increment). Sensitivity analysis (taking £1/year increment into account): £518.4m - £1.91 billion.	£565.8million benefit (to 2006 assuming carbon value of £70/tonne plus £1 annual increment). Sensitivity analysis (taking £1/year increment into account): £299.4m - £1.09 billion.	£564.7 million cost (2005) £703 million cost (2006) Total = £1.2 billion cost Sensitivity analysis: 2005 = £301.2 m - £1.1 billion 2006 = £379.2 m - £1.3 billion Total = £680m - £2.4 billion
	Impact on UK meeting 2012 Kyoto target				
	Overall	Slightly positive impact (77%)	Slightly positive impact (75%) Very positive impact (18%)	Slightly positive impact (42.9%)	Very positive impact (50%)
	Mean ranking (1=low impact, 5= high impact)	3.7	4.06	3.8	4.5

[71] Defra (2006) *Greenhouse Gas Policy Evaluations and Appraisal in Government Departments.*

	Standard deviation	0.67	0.68	1.16	0.54
	Perceptions of environmental effectiveness in terms of reducing GHG emissions				
	Industry stakeholders	Slightly positive impact (64%)	Slightly positive impact (75%)	Slightly positive impact (43%)	Split: No impact (33%) Slightly positive impact (33%) Very positive impact (33%)
	Mean ranking (1= low effectiveness, 5=high effectiveness)	3.2	4.06	3.85	4
	Standard deviation	0.92	0.68	1.09	0.89
	External stakeholders	n/a	Split: No impact (38%) Very positive impact (38%)	Split: Slightly positive impact (43%) Very positive impact (43%)	Slightly positive impact (78%)
	Mean ranking (1= low effectiveness, 5=high effectiveness)	n/a	4	4.2	4.2
	Standard deviation	n/a	0.92	0.72	0.44
Innovation	Overall performance				
	Reason	Stakeholder feedback indicates that despite assumption that a BAT system should inspire technological innovation the reality is the opposite with the majority of industry stakeholders finding that the Regulations have no impact on innovation.	The linking of the CCAs with the UK ETS means that firms have clear price signals to incentivise over-performance against a target as surplus allowances may be sold. However, the lenient CCA targets and over allocation within the UK ETS led to very low trading prices thus reducing the level of financial incentive.	As detailed in the previous CCA box, the over allocation (due largely to several firms reducing emissions prior to the start of the Scheme) led to the collapse of the trading price of allowances. This situation reduces the financial incentive to invest in new technologies and to undertake R&D as it may be financially cheaper to purchase allowances rather than undertake abatement.	The EU ETS experienced a price collapse similar to that of the UK ETS. Vast over-allocation by some EU Member States led to prices falling to less than €5 per tonne in 2007. However, the longevity of the Scheme (it is expected to continue for at least 3 phases until after 2012) led to many industry representatives stating the Scheme presents a strong incentive to innovate as once issues relating to allocations and carbon

					prices are resolved there should be clear price signals to incentivise innovation.
	Provisions for innovation within policy documentation	BAT should take into account "technological advances and changes in scientific knowledge and understanding".	No explicit provisions. Trading mechanism designed to provide further financial incentives to reduce energy consumption.	No explicit provisions. Trading mechanism designed to provide financial incentive to reduce GHG reductions and promote innovative behaviour[72].	No explicit provisions.
	Perceptions of effect of policy on innovative behaviour				
	Industry stakeholders	No impact (64%)	Slight incentive (63%)	Slight incentive (57%)	Split: Slight incentive (40%) Strong incentive (40%)
	Mean ranking (1= low effectiveness, 5=high effectiveness)	3.4	3.8	4	4.3
	Standard deviation	0.69	0.61	0.67	1.00
	External stakeholders	n/a	Split: No impact (38%) Strong incentive (38%)	Split: No incentive (29%) Strong incentive (29%)	Slight incentive (55%)
	Mean ranking (1= low effectiveness, 5=high effectiveness)	n/a	4	3.5	3.8
	Standard deviation	n/a	0.92	1.44	0.92
	Most frequent change within industry arising from policy	Introduction of equipment to meet BAT (73%) Improved environmental reporting (73%)	Increased awareness of GHG/energy efficiency improvements within senior management (94%)	Increased awareness of energy management/GHG reduction opportunities (29%)	Increased awareness of CO_2 reduction opportunities within senior management (83%)
	Incentivised emission reductions beyond requirements	No	No - CCAs focus on energy	Yes - via trading mechanism	Yes - via trading mechanisms

[72] Defra (2001) *Framework for the UK Emissions Trading Scheme*

	Incentivised energy efficiency improvements beyond requirements	No	Yes - CCL discount and ability to sell excess allowances via UK ETS	Yes - where energy consumption relates directly to GHG emissions (i.e. facilities with on-site power generators)	Yes - where energy consumption translates directly into CO_2 emissions (i.e. on-site electricity generation)
Flexibility	Overall performance				
	Reason	The site-by-site approach leads to a good level of flexibility within the permit process. However, the very nature of a technology-based regulatory regime does not allow for cost-effective emissions abatement across an industry.	The arrangement of Agreements (umbrella agreements and individual agreements) bestow a good level of flexibility as not all target units have to meet targets provided the sector meets its target set out in the umbrella agreement. Further flexibility is found in the provisions for UK ETS trading.	The inherent design features of a cap and trade emissions trading scheme allow companies to manage investment decision making on the basis of carbon price signals. Furthermore, it allows companies to decide whether to undertake abatement or not on the basis of marginal abatement costs.	In addition to the factors noted in the previous UK ETS box, the EU ETS provides added flexibility by containing provisions for new markets entrants and market exits. Furthermore, Member States are currently charged with developing NAPs, allowing a degree of national flexibility relating to the methodology used, the distribution of allowances and the quantity of allowances for sale.
	Flexible mechanisms within policy structure	Site-by-site approach, consideration of local conditions.	Sector targets arising from individual target unit agreements. Provisions to allow CCA participants to operate within the UK ETS to buy sell and bank allowances. Ability of participants to terminate agreements.	Descending clock auction allowed companies to decide the quantity of emission they would be willing to abate.	Member States develop individual National Allocation Plans in consultation with industry. New Entrant Reserve used to provide allowances to new market entrants.
	Perception of flexibility: investment decision making				
	Industry stakeholders	Moderate (55%)	Moderate (88%)	Moderate (50%)	Moderate (67%)
	Mean ranking (1= low flexibility, 4=high	2.5	3.6	3.7	3.3

	flexibility)				
	Standard deviation	0.44	0.71	1.25	0.51
	External stakeholders	n/a	Split: Moderate (50%) High (50%)	High (57%)	High (70%)
	Mean ranking (1= low flexibility, 4=high flexibility)	n/a	4.5	3.5	4
	Standard deviation	n/a	0.53	0.51	0.50
	Perception of flexibility: cost-effective abatement across industry				
	Industry stakeholders	Very little flexibility (45%)	Moderate (38%)	Moderate (43%)	Split: Moderate (50%) High (50%)
	Mean ranking (1= low flexibility, 4=high flexibility)	2.6	3.5	3.6	3.5
	Standard deviation	0.80	1.09	0.85	0.54
	External stakeholders	n/a	Split: Moderate (38%) High (38%)	High (57%)	High (60%)
	Mean ranking (1= low flexibility, 4=high flexibility)	n/a	3.9	3.5	3.5
	Standard deviation	n/a	1.24	0.51	0.70
Equity and acceptance	Overall performance				
	Reason	Industry has a reasonable level of acceptance for the Regulations but exhibits a high perception of unfairness. This coupled with the absence of external stakeholder participation in the survey leads to a borderline assessment of the overall performance as external stakeholder	As the CCAs are based on voluntary participation only firms willing to participate have to do so. Therefore industry is supportive of the Agreements. The presence of sanctions (i.e. removal of CCL discount for sectors/target units failing to meet targets) lead to a high level of external stakeholder	Similar to the CCAs, UK ETS Direct Participants exhibit a high level of acceptance. External stakeholders also display good levels of acceptance - a surprising outcome given the heavy subsidisation. However, the high level of external stakeholder participation in the survey	Industry perceives the EU ETS to be unfair, particularly in relation to allowance allocations. However, allocations in Phase I were far in excess of actual emissions indicating the industry is feeling 'hard done by', particularly in comparison to EU counterparts that

		perceptions are not included in the analysis.	acceptance. Coupled with the general perception of fairness (in relation to targets, sanctions, administration requirements), the CCAs perform well in this category.	led to the conclusion that the UK ETS performed well in this category.	received higher allocations. Surprisingly, external stakeholders had a lower level of acceptance for the EU ETS compared with the CCAs and UK ETS, although this was largely due to the over allocation of Phase I.
	Stated level of acceptance for the policy				
	Industry	Qualified acceptance (55%)	Split: Qualified acceptance (44%) Strong acceptance (44%)	Strong acceptance (64%)	Qualified acceptance (50%)
	Mean ranking (1= low acceptance, 5=high acceptance)	3.4	4.25	4.5	3.5
	Standard deviation	1.07	0.85	0.873	1.37
	External stakeholders	n/a	Strong acceptance (40%)	Split: Qualified acceptance (43%) Strong acceptance (43%)	Qualified acceptance (78%)
	Mean ranking (1= low acceptance, 5=high acceptance)	n/a	3.8	4.2	4.2
	Standard deviation	n/a	1.30	0.72	0.44
	Perception of fairness				
	Industry	Unfair (56%)	Fair (69%)	Fair (64%)	Phase 1: Split Fair (40%) Slightly unfair (40%) Phase II: Slightly unfair (60%)
	Mean ranking (1= low fairness, 4=high fairness)	2.5	3.37	3.76	Phase I: 3 Phase II: 3
	Standard deviation	0.7	0.95	1.09	Phase I: 0.89 Phase II: 0.63

	External stakeholders	n/a	Fair (88%)	Fair (43%)	Fair (89%)
	Mean ranking (1= low fairness, 4=high fairness)	n/a	3.5	3.7	2.8
	Standard deviation	n/a	0.75	1.20	0.30
	Stated preferred policy response to achieve greater GHG reductions				
	Industry	1. Voluntary agreement 2. Emissions trading 3. BAT or binding emissions requirements	1. Voluntary agreement (CCA) 2. BAT 3. Emissions trading	n/a	1. Emissions trading 2. Voluntary agreement 3. Binding emissions requirements
	External stakeholders	n/a	1. Emissions trading 2. Policy mix: regulation & MBI 3. Policy mix: regulation &/or MBI & voluntary agreement	n/a	1. Emissions trading 2. Taxation 3. Binding emissions requirements
	Stated preferred policy response to achieve greater energy efficiency				
	Industry	1. Emissions trading 2. Voluntary agreement 3. Binding emissions requirements	n/a	n/a	n/a
	External stakeholders	n/a	n/a	n/a	n/a
Transparency	Overall performance				
	Reason	Difficulties relating to public access to permit information and the performance of EPER reduce the transparency of the PPC Regulations.	The lack of target unit-level performance data has a negative effect upon the transparency of the CCAs. The involvement of eternal stakeholders within the development of CCAs also reduce the transparency of the Agreements.	Generally a good level of transparency. However, details of the additional targets negotiated between Defra and six companies in 2004 were not publicised due to a confidentially agreement between Defra and the companies.	External stakeholders have concerns relating to the methodologies used to develop NAPs, the publication of negotiations of NAPs at the Commission-level and the communication of highly technical EU ETS information with the public.
	Provisions for transparency within policy documents	Article 15 of IPPC Directive dealing with access to	Bi-annual reports published by Defra detailing sector-	Annual publication of company-level	Article 14 of EU ETS Directive and Commission

		information and public participation in permit process introduced following Aarhus Convention. Deals with public access to permit applications, regulatory authorities making emissions data available to the public, and involving the public in permit decision making. Part V of PPC Regulations: Public access to registers at Environment Agency offices (with exception of information that may compromise national security and certain other confidential information). Advertisement of high-profile applications in at least one local paper and London Gazette.	level results including the targets, actual performance, quantity of UK ETS allowances bought, sold or ring fenced, and the number of target units failing to meet individual targets from Underlying Agreements. No provisions for publication of target unit-level data publication.	performance. Publication of transaction log.	Decision 2004/156/EC detail requirements relating to monitoring and reporting. Decision 2004/156/EC specifies that data provided by operators should be documented in a manner that allows the competent authorities and verifiers to replicate the outcomes. Data possessed by competent authorities should be made public in compliance with the requirements of Directive 2003/4/EC relating to public access to information.
	Description of transparency				
	Industry	Slightly transparent (64%)	Confidential subject to commercial secrets (57%)	Slightly transparent (43%)	Slightly transparent (67%)
	Mean ranking (1= low transparency, 4=high transparency)	3.4	2.3	3.1	3.3
	Standard deviation	0.51	0.84	0.77	0.51
	External stakeholders	n/a	Slightly transparent (50%)	Slightly transparent (71%)	Slightly transparent (90%)
	Mean ranking (1= low transparency, 4=high transparency)	n/a	2.6	2.8	2.9

	Standard deviation	n/a	0.91	0.36	0.31
	Overall perception of transparency				
	Industry	Acceptable (91%)	Acceptable (94%)	n/a	Acceptable (83%)
	Mean ranking (1=unacceptable, 4=acceptable)	2.8	2.9	n/a	2.8
	Standard deviation	0.42	0.25	n/a	0.40
	External stakeholders	n/a	Acceptable (63%)	n/a	Areas in need of improvement (70%)
	Mean ranking (1=unacceptable, 4=acceptable)	n/a	2.5	n/a	2.3
	Standard deviation	n/a	0.75	n/a	0.48
	Involvement of non-industry stakeholders in policy process	n/a	Split: Not enough (50%) Acceptable (50%)	n/a	Unacceptable (67%)
Policy cohesion	Overall performance				
	Reason	Provides a route for implementation of various other policies (such as WID) but problems remained leading to the revision of the PPC Regulations and other environmental regulations under the Environmental Permitting Programme.	Very complex interaction between CCAs and EU ETS entailed complicated methodologies to alter targets. Lenient CCA targets also had negative effect upon the UK ETS allowance price.	Difficulties towards the end of the Scheme relating to EU ETS participants. However, these issues were resolved with the closure of the UK ETS to Direct Participants in late 2006.	See details in CCA box relating to policy cohesion.
	Problematic areas	Health and safety regulations EU Emissions Trading Scheme Waste Incineration Directive	EU Emissions Trading Scheme UK ETS	EU Emissions Trading Scheme Climate Change Agreements	Climate Change Agreements UK ETS IPPC
	Issues relating to problematic policy cohesion	PPC Regulations replaced by Environmental Permitting Programme in early April	EU ETS: double counting	EU ETS: companies participating in both Scheme leading to	Refer to previous issues noted in this row.

		2008.		administrative burden from double counting measures or requirement opt-out status.	
			UK ETS: impact of lenient CCA targets on fluidity and price stability within UK ETS	CCA: impact of CCA participants on allowance price (rush from CCA participants in September 2002 led to peak prices)	
Ex ante appraisal/ Regulatory Impact Assessment	Overall performance				
	Reason	Identification and quantification of approximate costs to industry Consideration of impacts on small businesses Identifies the level of uncertainty surrounding the quantification of costs to industry Provisions for post-implementation review after five years No quantified costs to public sector/Government, no consideration of non-compliance	Focus of RIA solely on eligibility criteria CCL RIA deals fleetingly with CCAs CCA RIA does not meet requirements to consider impacts on competition, non-compliance, monitoring, and no quantification of costs to industry or Government beyond the cost of sub-metering for certain sites No consideration of uncertainty	RIA limited to positive outcomes of the Scheme.	Extensive RIA but focus on justifying the costs to industry. No consideration of the costs to Government.

8.11 Chapter summary

This Chapter has presented the key outcomes of the four case studies in a tabular format to facilitate the comparison of the policy-specific outcomes. Chapter 9 will draw the outcomes together to lead to a discussion of generalisable policy recommendations and case study-specific recommendations.

9 Discussion

9.1 Introduction

The primary purpose of this research was to develop a methodological approach to evaluate contrasting policy instruments. Further to this purpose, the research aimed to undertake a comparative analysis of the evaluation outcomes in order to advance policy learning through the identification of specific elements of instrument design that lead to the best policy outcome. Finally, this research has critiqued four important instruments within UK climate change policy in a manner that goes far beyond traditional examination of financial costs and environmental benefits. This approach has led to vital conclusions concerning the applicability of policy instruments under certain conditions.

An examination of existing policy evaluations undertaken in the environmental field in the UK led to the conclusion that evaluations in the UK do not adequately deal with aspects of instrument design beyond economic efficiency and environmental effectiveness (Appendix 9). Further to this point, Minogue (2005) identified four problems currently associated with comparative analyses of policy, ranging from the influence of law and political science within traditional economic scholarship, difficulties in differentiating between regulation and normal state intervention, and problematic comparisons of cross-sectoral or cross-national evaluations which display familiar weaknesses. Crucially, Minogue also asserts that problems also lie in the measurement of evaluations. Quantitative analyses are often based on weak data and qualitative analyses are rarely undertaken (Minogue, 2005).

Therefore, in this thesis the following research problem has been addressed:

> *Ex post* policy evaluation, with a view to improving instrument design, is not adequately undertaken in UK policy making

In order to tackle this problem an overarching research question was established, as detailed in Chapter 2:

> *How can policy evaluation practices be improved to ensure the maximum amount of policy learning is achieved?*

The overarching research question has been addressed by answering three detailed sub-questions:

1. What characteristics of policy assessment techniques could be employed effectively in the *ex post* evaluative situation?

2. Can a systematic approach to policy evaluation enable the comparative evaluation of different policy instruments?

3. In light of the comparative evaluation, what conclusions can be drawn regarding the role of different policy instruments in environmental policy making, specifically policies relating to climate change mitigation? Which elements of policy instruments work best under a given set of conditions?

Before approaching the discussion in relation to each research question, the policy recommendations arising from the case study evaluations will be presented and discussed. The recommendations have been segregated into two categories:

- Generalisable recommendations (which are largely a result of the comparative analysis following the identification of trends across the case studies).
- Case study-specific recommendations (arising from individual analyses).

9.2 Generalisability of case study outcomes

As Yin (2003) asserts, case study research must take account of outcomes that are generalisable (the outcomes and recommendations can be applied in other situations) and those that are non-generalisable (the outcomes and recommendations relate specifically to the case study in question due to the unique features of the case study). Table 8.1 presents a comprehensive breakdown of the key elements of analysis in this thesis. There are certain features and lessons from each policy that have a limited level of generalisability in other policy contexts. However, each policy evaluation has led to the identification of lessons, recommendations and features that can be transferred to other instances of policy development, implementation, review and improvement.

9.2.1 Outcome 1: Caution in the establishment and use of baselines

Three of the case studies (CCAs, UK ETS and EU ETS) relied heavily on the use of baselines against which sectoral or individual performance was to be measured. There are several notable difficulties in establishing baselines and subsequent difficulties in measuring performance against these baselines.

The negotiation of targets at both sector and target unit levels within the Climate Change Agreements was based upon one baseline year. This alone presents an obstacle in setting a reliable baseline as the year in question may not present an accurate picture of performance over a longer time frame. Furthermore, sectors were permitted to select a baseline year of their choosing but the value of such an approach is limited as industry will inevitably select a year that is advantageous in the context of the policy (i.e. when energy use was particularly high). Using the notion of "credit for early action" as the rationale behind this approach, Defra permitted some sectors to select baseline years as early as 1990. The resulting commitments to reduce energy consumption were, with few exceptions, lenient and easily met.

The UK ETS baseline methodology also proved to undermine the efficiency and environmental outcome of the Scheme. Even early analysis undertaken by the NAO, less than two years into the five year scheme, identified that the approach to baseline setting had been flawed, resulting in some of the major Direct Participants meeting their 5-year targets prior to the start of the Scheme (NAO, 2004).

The approach taken in the development of the EU ETS was an improvement on the practices of the CCAs and UK ETS as the baseline was determined using the average of 5 years' data (1998-2003) excluding the year with the lowest CO_2 emissions. However, this was not without problems as demonstrated by the over-performance of all but four Member States (the UK, Italy, Spain and Slovenia) during Phase I. Future Phases of the EU ETS are likely to minimise any further complications as years with verified data (such as 2005 - the first year of the Scheme) will be used as baseline years.

9.2.2 Outcome 2: A need to improve the transparency of policies specifically in relation to performance and negotiation of targets

The need to ensure transparency within the policy process is well documented (UNECE, 1998, Silvo et al., 2002, Graafland and Eijffinger, 2004, BERR, 2007b). The benefits of operating a policy based on clear and transparent processes such as public disclosure of information, stakeholder engagement and transparency are numerous. Within the development and negotiation of targets transparency leads to a situation of increased accountability, providing greater incentives to the 'regulated' to maximise performance, and helps to ensure that policy makers are being effective and are seeking to maximise the public good.

9.2.3 Outcome 3: With the exception of PPC, which is roughly revenue neutral for the Government, there is little analysis/publication of the costs of climate polices to Government

The Government is to be applauded for undertaking a comprehensive analysis of the costs of implementing the PPC Regulations to both industry and Government. However, this level of examination remains the exception rather than the norm. Although the UK ETS incentive fund provides some indication of the costs to the public and the government attempted to calculate the administrative costs of the scheme (Defra, 2002c), the range of the total costs and benefits was so large that the outcomes are rendered virtually meaningless. Of greater concern is the complete absence of implementation and administration cost data relating to the CCAs and EU ETS.

This problem concerning lack of publication of costs incurred by Government is likely to stem from the approach taken to RIA in the UK. In general, British RIAs focus on the costs likely to be incurred by industry as a means to justify the implementation of a particular policy (OECD, 2002). Therefore if an *ex post* evaluation is undertaken, the basis of which is often the RIA, and it overlooks the importance of assessing the cost to tax payers via Government administration costs. This means there is very little evidence relating to the cost effectiveness of climate polices from the perspective of costs incurred by society.

9.2.4 Outcome 4: Impact of "*credit for early action*"

This phrase appeared frequently in relation to CCAs and UK ETS, specifically as justification for the approach to setting baselines. The Government's desire to give industry "credit for early action" meant that some CCAs sectors used baseline years as far back as 1990, on the premise that most energy saving activities were undertaken sometime after, with little hope of significant energy consumption reductions in later years (this was specified within an interview with a Defra representative). UK ETS Direct Participants were also given such credit. The impact of this approach on baselines is profound. CCAs targets and UK ETS commitments were far from challenging for many participants and the desire to give industry additional credit for action only served to further undermine the environmental effectiveness of the policies as subsequent abatement is not easily attributable to the policies. In the interest of equity and also to preserve the value of policy instruments it would be highly recommended to avoid the inclusion of credit for early action in future policy design, with exceptions made in exceptional circumstances such as niche areas of industry that are already operating in the most efficient manner.

9.2.5 Outcome 5: Industry will generally perceive targets to be unfair and too challenging despite evidence to the contrary

The majority of EU ETS sectors stated they found the allocation in Phase I to be unfair. However, every one of these sectors received aggregate installation allocations that were in excess of verified emissions for the entire period. This contradiction not only serves to strengthen the bargaining position of Government, it serves as a warning on the reliance on industry-supplied data when determining allocations and targets. Many of the CCA sectors associations interviewed also stated that at the time of CCA target negotiation they were of the belief that the targets were too stringent. Following the first reconciliation period all CCA sector targets were tightened in light of evidence proving the initial targets were, in fact, too lenient. The Government should ensure that any future negotiations relating to targets should not give too much weight to the protestations of industry that targets are too stringent in the absence of verified data and evidence of the impact of more stringent targets on the competitiveness and profitability of British companies. This outcome also indicates that data collection should not be sacrificed for time and finances. Delaying the implementation of a policy in order to collect data may lead to better

environmental outcomes in the long run, potentially offsetting the downside of delaying implementation.

9.2.6 Outcome 6: While voluntary schemes, such as UK ETS and CCAs, have proved to have limited environmental benefits, they compared well against the performance of Phase I of EU ETS and the PPC Regulations

The CCAs have under-performed against initial expectations of the Government. The UK ETS appeared to over-perform against emission reduction commitments yet a significant quantity of the reductions cannot be directly attributed to the Scheme. However, compared to Phase I of the EU ETS these two instruments actually performed relatively well in environmental terms. This is partly due to the vast over-allocation of EU ETS allowances reducing the environmental outcome of Phase I and partly due to the overall increase in CO_2 emissions from UK industry during the period 2000-2006. On the basis of this evidence, there may be a case for the continued use of voluntary schemes provided a strict set of conditions are met, including:

- The availability of verified and reliable data upon which to base targets
- Adequate provisions to ensure value for money is achieved if any form of financial incentive is available
- Credible penalties in cases of non-compliance (e.g. significantly higher fine than under regulatory schemes to reflect the cost savings of the voluntary policy)
- Rigorous *ex post* evaluations to ensure the policy is performing and if not, to ensure the policy is either refined or withdrawn
- Extensive public reporting to maximise the incentives for companies to perform and to maintain a sense of accountability.

9.2.7 Outcome 7: Policies implemented under strict time constraints may experience greater difficulties in achieving environmental objectives

The implementation of the PPC Regulations was a lengthy process, commencing with the adoption of the EU IPPC Directive in 1996 (EU Council Directive 96/61/EC). Member States were required to fully transpose the Directive into domestic legislation by 2007. By the time this deadline arrived the majority of UK installations were in possession of a PPC permit. The staggered implementation meant that the Environment Agency could implement the Regulations in a sector-

by-sector approach giving the added benefit of developing industrial knowledge of staff at the same time.

Conversely, Defra acknowledged that time constraints prior to the launch of the UK ETS was a contributing factor in the low participation rate (NAO, 2004). This in turn contributed to the low liquidity of the market and the resulting value for money of the provision of the incentive fund. The EU ETS was also implemented under significant time constraints, which is particularly apparent when one considers the number of countries and installations involved. MBIs and voluntary environmental agreements may offer superiority over regulatory approaches due to the comparable speed with which they can be implemented. However, as these two case studies show, under pressing time constraints the environmental outcomes of an instrument may be compromised. It is therefore recommended that the complexity of an issue and the policy response should be reflected in the time allocated to policy instrument development.

9.2.8 Outcome 8: The positive effect of data accumulation and the impact on information asymmetry

Since the turn of the 21st century the quantity of regulations, economic instruments and other more novel approaches to environmental protection, such as voluntary agreements, has increased to such a level that a significant quantity of data now exists in relation to industrial environmental performance. For example, the establishment of EPER represents a crucial development in data collection, despite its limitations. The replacement of EPER with E-PRTR should serve to reduce the limitations of the existing approach, through requirements that all chemical installations report all emissions to the Register (European Parliament and the Council of the European Union, 2006), thus greatly increasing the volume of data available for analysis.

With respect to the Climate Change Agreement sectors, Defra, its appointed consultants (AEA Technology) and individual sector associations are in possession of bi-annual performance data from every target unit participating within the Agreements. Defra stated in an interview that due to resource constraints not all data is verified, with approximately 5% of target units being subject to spot audits. This diminishes the value of the data as external verification is critical to achieving a transparent, robust and meaningful system of

assessment of performance against targets. However, the data will nevertheless prove to be of significant value in determining the form of any post-2013 instruments targeted at these sectors.

The situation in relation to the EU ETS is a significant improvement on the CCAs and PPC Regulations as all installations must submit verified data on an annual basis. As the Scheme progresses further into Phase II the long-term performance trends of installations become clearer as the bank of emissions data will increase providing a more reliable and robust platform for future cap setting (a necessity even if 100% auctioning is achieved as an overall cap must still be established). Even if allocations continue to be based on grandfathering, a situation that is likely to be unacceptable to most stakeholders beyond industry, the availability of data will should provide the Commission with much needed evidence to set a challenging emissions cap. However, whether the Commission utilises its position effectively is a political issue and likely to be subject to intense lobbying from industry and Member States as they seek to protect their competitive positions by obtaining a lenient cap.

On a more general note, the historic problems of information asymmetry between the regulator and the regulated has been studied to a limited degree, with examples such as Šauer et al (2003) and Dassler et al. (2006). Crucially, Dassler et al. assert that regulation is also subject to information asymmetries that can lead to allocation distortions. They conclude that benchmarking, by way of comparing a regulated firms' costs with those of a firm operating efficiently within the sector, provides an adequate solution to many of the difficulties encountered when a regulator has to rely upon company-provided information. In these situations, additional resources, in the form of regulatory personnel, are likely to improve the negative impacts of regulatory capture and the absence of data. However, one must also be mindful of the often strict resource constraints that regulatory bodies are operating under.

Whether the UK Government intends to pursue climate change policy responses based on grandfathering, the foundation of which is invariability a baseline, or whether the it intends to adopt a more aggressive policy approach (such as auction-based emissions trading), the implementation of the CCAs, PPC Regulations and the EU ETS all serve to reduce any informational asymmetries that currently work in the favour of industry.

9.2.9 Recommendation 9: Policy makers need to demonstrate greater awareness of (and willingness to challenge) lobbying by industry

Lobbying by business groups and other stakeholders is a key feature of all policy development, regardless of the subject in question. However, in three of the case studies examined in this thesis, industry lobbing has undoubtedly led to the weakening of environmental targets. The willingness of sector associations to discuss their roles within the policy development process and the apparent susceptibility of Government departments of such practices has led indirectly to the disappointing performance of each case study instrument when compared with the initial policy objectives. There are many other factors that influence the performance of an instrument, such as the application of rigorous monitoring and reporting, the use of sufficient penalties, and the data upon which targets are set and monitored. Industry lobbying is active in all areas and as such precise impact of this compared with other areas of the policy design can not easily be disentangled. However, this highlights the need for policy makers to increase their awareness of industry tactics with a view to strengthening their negotiating position.

Lobbying is not, of course, limited to industry groups. As the recent EU-level negotiations (in late 2008(on the Commission's proposals for a revised EU ETS Directive demonstrate, governments are also culpable of intense lobbying with dramatic consequences. For example, the Commission sought to implement 100% auctioning for the power sector from 2013. Following weeks of intense negotiations this was amended to allow eastern Member State to phase in auctioning until 2020 for this sector on the grounds of their dependency on coal. It is for this reason that auctioning is required and auctioning would provide the right financial incentive for governments and power sector companies to invest in cleaner technologies. The perceived need of some governments to protect industry clearly outweighed the need to implement an ambitious and effective approach to the power sector.

9.3 Policy-specific outcomes and recommendations

This section of Chapter 9 presents the policy-specific recommendations arising from the case study evaluations undertaken in this study. Provisional lists of recommendations, grouped according to policy instrument, were circulated to relevant stakeholders. These stakeholders were identified as the industry and external stakeholders who participated in the surveys and interviews. The recommendations were not circulated to the total set of stakeholders to whom the

original surveys were sent to on the basis that the recommendations were developed in light of the responses from the surveys. The purpose of this exercise was two-fold:

- to obtain a ranking of the level of agreement from stakeholders towards each recommendation and the associated rationale;
- to obtain further comments from stakeholders on how they perceive the recommendations and rationales.

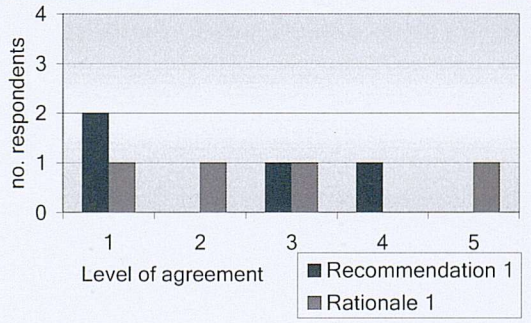
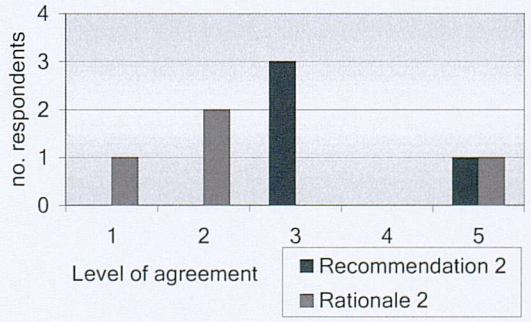
Tables 9.1 to 9.4 present the instrument-specific recommendations with the associated rationale. Each table also includes the aggregate level of agreement for each recommendation and rationale. Furthermore, the tables include comments received in relation to the policy recommendations in order to explain the patterns of agreement.

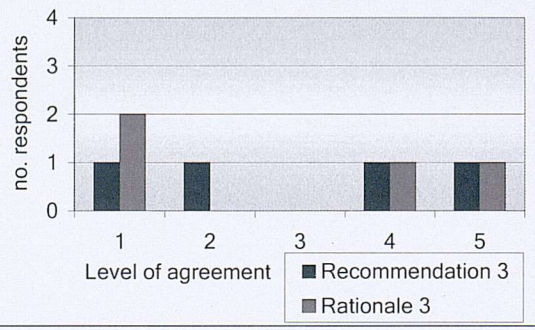
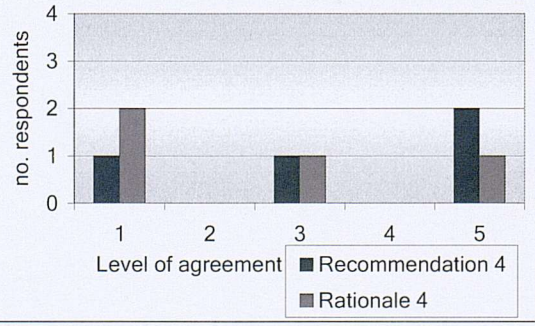
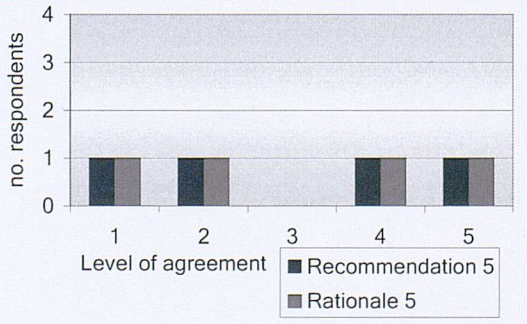
9.3.1 Pollution Prevention and Control Regulations (England and Wales) 2000

Before commencing the discussion of PPC-specific lessons and recommendations one must first consider the key limitation of the PPC Regulations. If the truest interpretation of BAT was successfully implemented and maintained (e.g. via a cycle of continuous monitoring of technological advances and transposition of any advances into IPPC permits) would there be a requirement for other policies relating to any of the emissions and media specified within the Directive (in effect, the EU ETS and potentially the CCAs)? The definition of BAT (see section 4.2.3) within the Directive indicates technology standards and emission limits should be based on "*the most effective and advanced stage in the development of activities*". Furthermore, this definition of BAT also specifies that the aim of the IPPC Directive is to eliminate emissions where possible and reduce emissions when elimination is not practicable. In an *ex ante* study of the IPPC Directive on efficiency within the dairy industries in the UK, Finland and Sweden, Honkasalo et al. (2005) found that the efficiency requirements within the BREF document for this industry was lacking in ambition despite the focus being on *processes* not *emissions*. This unique study also found that the implementation of energy efficiency requirements via permits was a problematic area for regulators in the three countries. No other studies have been carried out to investigate the impact of the IPPC Directive on energy management nor have any other studies been published relating to the interaction between the IPPC Directive and greenhouse gas emissions. Only one other study made a limited attempt to analyse the implementation of IPPC with a brief reference to energy efficiency (Silvo et al., 2002).

As the figures in the third row of Table 9.1 show, the level of agreement exhibited by stakeholders for the policy recommendations and rationales was mixed, with most recommendations receiving a spread of responses across all levels of agreement (1=strongly disagree to 5 = strongly agree). A selection of comments is presented alongside the figures, displaying the stated level of agreement in brackets in order to illustrate the reasons behind the agreement figures. It should be noted that not all respondents provided comments relating to each recommendation.

Table 9.1 Policy recommendations, rationales and stakeholder feedback: Pollution Prevention and Control Regulations

Recommendation	Rationale	Stakeholder feedback	Stakeholder comments
1 - Greater inclusion of energy efficiency in permits and within BAT guidance notes	Evidence from the survey suggests that the majority stakeholders (64%) do not believe that the PPC Regulations incentivise energy efficiency improvements. Whilst installations operating within EU ETS and CCAs are required to meet energy/emissions requirements of those schemes, installations operating outside of these schemes may not have sufficient policy-driven incentives to consume energy more efficiently.		"*Energy efficiency may conflict with other environmental objectives, especially where companies are under pressure to process their own waste and discouraged from using communal facilities*" (4) "*I agree that we need better guidance on the viability of energy efficiency measures. The BREF has finally been completed - years too late*" (3) "*PPC requires energy to be used efficiently, and operators outside the EU ETS and CCA must still pay the rising cost of the energy they use, and in the future join the CRC scheme under development. Changing the IPPC regime will cause double regulation but not achieve any benefit*" (1)
2 - Access to permit and performance information should be Improved using a web-based system	Sectors outside industry (e.g. members of the public, NGOs, academics) would be better served if information relating to permit applications, changes to permits, enforcement action and the permits themselves were available electronically on the internet. The existing system of accessing permits and any related information at Environment Agency regional offices and the process of requesting specific documents via the Environment Agency website presents significant barrier to the public accessing this information.		"*Much of the information is likely to he highly technical and there are issues of confidentiality and whether the information is likely to be used responsibility*" (3) "*The costs/burdens associated with making everything available electronically (which are ultimately passed on to the consumer) are extremely high relative to the return for the environment*" (3) "*We have no problem with better access*" (3)

3 - Activity-level environmental performance reporting and analysis needs to be improved with a web-based compliance system	Reporting at the EU-level should improve with the replacement of EPER with E-PRTR. The current format makes it difficult to access information that correlates with the activity codes of the PPC Regulations.		"*All reporting systems need to improved and standardised*" (4) "*Not sure, but we have no problem with better info, the concern is how it is used and the danger of false comparisons*" (2) "*I would suggest concentrating on EPER*" (1)
4 - Consideration of removing the two-tiered approach to administration - referring responsibility for LAAPC to regional Environment Agency offices	The Environment Agency acknowledges that the existing approach to regulation (with the majority of installations falling within the remit of the Environment Agency but approximately 400 installations being regulated by Local Authorities) causes an administrative burden. Industry and regulators (the Environment Agency and local authorities) would benefit from a more centralised regulatory system.		"*Would be a significant improvement*" (5) "*No real experience to bring to this*" (3) "*The current arrangement appears to work satisfactorily in our sector*" (1)
5 - The technology-based standards do not promote technological innovation and investment in new technologies. Provisions need to be implemented to incentivise firms to investigate new technologies to continually change BAT. These	65% of sector associations do not believe the PPC Regulations provide any incentive for firms to innovate. Investment in research and development has been identified as a key requirement in progressing towards a low carbon economy.		"*I would support incentivisation to investigate and develop new technologies but would question whether BAT should be changed frequently because to be BAT I would expect technologies to be tested and validated as practical, appropriate and financially viable - all of which takes time*" (4) "*Difficult to see what policy measures would improve technological development. No real evidence that current policies do not drive innovation or that other policies would do better*" (2)

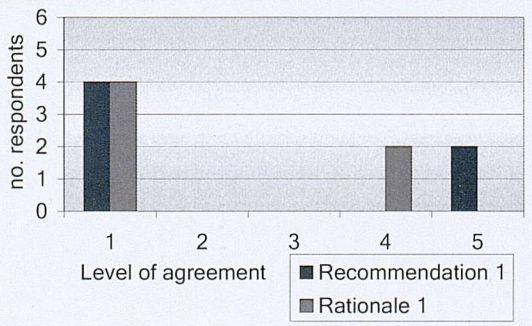
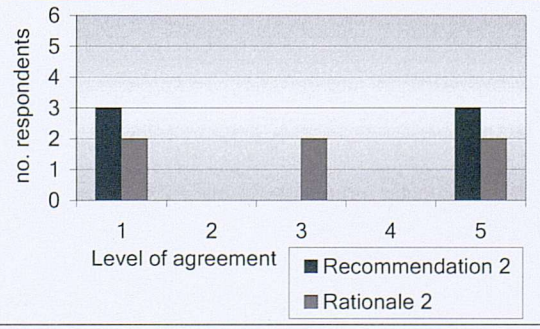
provisions could involve the IPPC BAT Bureau codifying innovation within permit requirements.			*"The purpose of the PPC Regs is a high standards of environmental protection. That is ambitious enough! Incentives for the low carbon economy are in high energy prices, climate policies such as EU ETS, and advice from organisations such as the Carbon Trust"* (1)

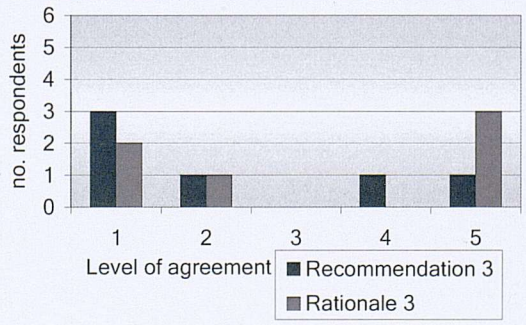
9.3.2 Climate Change Agreements

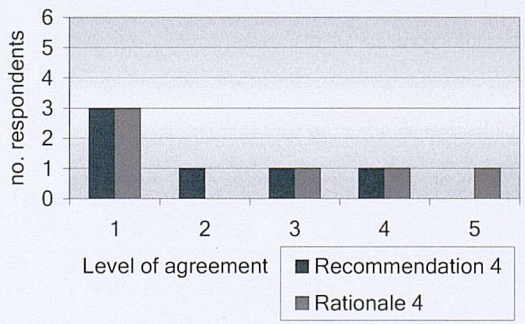
The Climate Change Agreements were implemented to provide industry with a financial incentive to consume energy more efficiently. However, on the basis of the evaluation undertaken in this study a number of factors must be taken into account in the development of post-2013 CCAs. Uncertainty surrounding the shape and form of EU ETS post-2012 will have a major impact on the coverage of CCAs if the Government is to avoid the double-regulation that has plagued climate policies since 2002. Indeed, if the scope of the EU ETS is extended to include most target units currently within CCAs then the continuation of the agreements would be futile as the overlap between the two instruments is already problematic. However, in addition to the key benefit of the CCAs cited by the National Audit Office - the elevation of energy to senior industrial management level - CCAs have also provided an opportunity to gather a vast amount of energy consumption data which will prove to be invaluable in informing future policy making. The fact that the majority of this data is unavailable in the public domain is a cause for concern, but there are significant environmental benefits to be reaped from this data in establishing accurate baselines for future legislation and policies.

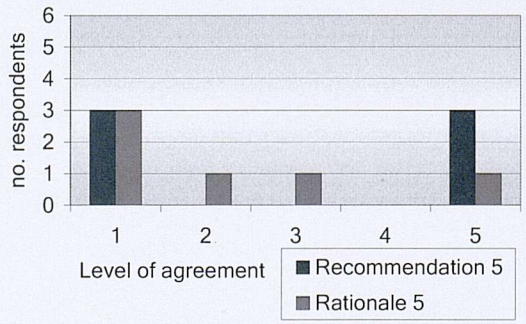
The responses in relation to the policy recommendations in Table 9.2 are polarised with Defra and some sector associations strongly disagreeing with most recommendations, and the remaining sector associations and external stakeholders exhibiting strong agreement with the recommendations. It is plausible that Defra and the opposing sector associations are unwilling to support changes to the existing CCA format as this would indicate a level of failure of the Agreements and may make the process more rigorous in the future. One area that consensus was reached is in relation to the interaction between the CCAs and the EU ETS (recommendation 6).

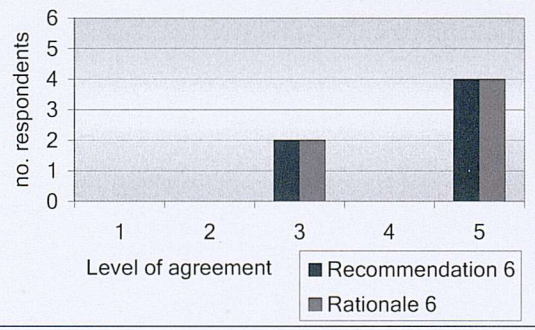
Table 9.2 Policy recommendations, rationales and stakeholder feedback: Climate Change Agreements

Recommendation	Rationale	Stakeholder feedback	Stakeholder comments
1 - A certain degree of regulatory capture (industry had disproportionate influence in the policy maker process) occurred during the negotiation of CCA targets. Therefore greater resources (i.e. staff and implementation time) should be allocated to future policy developments of this nature.	Despite modelling evidence (provided by the Global Atmospheric Division of Defra) indicating possible carbon savings, the final negotiated targets were significantly lower (2.5MtC compared to 4.5MtC in 2010). The combination of the financial incentives for CCA participation means that Defra was in a very strong negotiating position that may not have been maximised. Many of the sector association respondents to this survey acknowledge that their original target demands were too lenient. In future negotiations Defra should capitalise on the financial incentives of participation to obtain energy consumption/emission targets that are significantly more stringent.		"*Agreed, though would accept that Defra were trying to do something not done before in the UK and therefore, in practice, optimisation was not likely to happen from the start. The real weakness was in the first review stage when much tougher targets could have been pushed*" (5) "*Many sectors offered soft initial targets to Defra, who could not really challenge them as energy was not a major priority for most companies in 2000 and many did not have accurate data*" (5) "*Global Atmosphere Division achieved the best targets possible in the given circumstances*" (1) "*Not in our sector - the targets were regarded as challenging at the time*" (1)
2 - By the end of the current Agreements (2013), the possession of 13 years of energy and emissions data from more than 10,000 energy-intensive installations will provide Defra with an excellent opportunity to implement	Whether its through the extension of CCAs, the establishment of a new policy, or the integration of CCA target units into another policy (e.g. EU ETS), the data accumulated during the life of the CCAs places Defra in an good position relating to any future policies due to the significant reducing in information asymmetry which often has a negative effect on policy development. This is particularly important if the use of baselines is to be continued. It seems unfortunate that the scope of the CCAs was not widened to increase the number of target units, and hence the amount of data relating to		"*Difficult to disagree with this - but the interpretation of the data will be crucial*" (5) "*Problem has been the difficulty of relating relative data/targets to anything tangible - reflecting only the awful complexity of the initial agreements*" (5) "*Should CCAs continue beyond 2013 Defra will need to rebaseline. Care will be required as facilities which have*

challenging future targets for these installations based on the deep cuts in emissions proposed by the IPCC (30% reduction below 1990 levels by 2020, 50% below 1990 levels by 2050)	energy consumption and carbon emissions.		*been in CCAs since 2000 cannot be expected to have the same potential energy savings as those just entering an agreement in 2013*" (5) "*I strongly disagree with the recommendation because the targets are already challenging and the 2008 review will push to get even more challenging targets for the sectors and target units*" (1)
3 - The use of relative targets should not continue beyond the current Agreements	The general industry viewpoint regarding relative targets is one of necessity. Relative targets are promoted as the best manner to protect growth as overall energy consumption can increase provided energy consumption per unit of output does not. Greenhouse gas emissions in the UK have increased in recent years. The most suitable means of reducing total emissions from energy intensive industry is to implement absolute targets. Absolute targets also provide a guarantee of emission reductions.		"*Absolutely! As long as the traded sector is broad enough and deep enough (e.g. EU-wide, not just UK - wide) the arguments for relative targets are easily disposed of*" (5) "*There should be a grater degree of compatibility between the various instruments i.e. CCAs, EU ETS and CRC*" (4) "*In a sector that is forecast to continue global growth of 3% to %% per annum, and in which the UK and northern Europe has a competitive advantage, it is not welcome to tax the sector into contraction*" (1) "*This is a matter for decision after the full public consultation*" (1)

4 - The level of publicly available information should be increased by providing target-unit level performance data	Existing reporting requirements within CCAs provides performance analysis at a sector level. However, the provision of more detailed performance information, for example at target unit level (e.g. through identification of target units failing to surrender performance information) would greatly increase the transparency of the scheme and may incentivise better performance.		"*Yes - but reflects on the crazy complexity of the whole scheme. Not sure you want to introduce a marginal change into CCAs - just stick the target units in an emissions trading scheme and public emissions data/surrender patterns*" (5) "*People are becoming disillusioned by the league table mentality of the present government. Failing companies are already penalised by having to seek compliance through the purchase of allowances.*" (2) "*Sector information is good - target unit information is commercially sensitive*" (1) "*Defra is limited by the Data Protection Act and the terms of the CCAs, which state what can and cannot be made public. Remember that information can be used by competitors in the UK and abroad to the detriment of the company/target unit concerned. Defra has to be careful*" (1)

5 - High energy prices were identified as having a greater impact on energy management than CCAs bringing into question the usefulness of the Agreement. Therefore, future policy development should carefully take account of the impact of external factors on the usefulness of a policy.	All sector associations interviewed as part of this research identified rising energy prices as having a greater impact on energy consumption compared to the Climate Change Agreements. Furthermore, all sector associations agreed that companies could have reduced their energy bills in the presence of the full rate of the CCL through the implementation of energy efficiency measures alone. An alternative approach post-2013, such as emissions trading, may provide a greater financial incentive for companies to reduce energy consumption through the explicit opportunities to benefit via sale of allowances.		"*The CCL is just a further marginal cost on a key cost in our sector - it is the base cost of energy that drives decision making - a tax on the energy does not significantly alter decisions*" (5) "*Agreed - a central problem of mine has been how to believe Government statements about how effective CCAs/CCL package has been at reducing emissions compared with my experience of working with companies affected and hearing how little difference CCAs have made to decision making*" (5) "*Emissions trading (both UK ETS and EU ETS), to date, has had very little impact and will not have until allowances are more realistically priced*" (5) "*I understand that the idea of (legitimately) stopping the Exchequer getting some tax had an important effect - it brought the CCAs to Finance Directors' notice and CCAs became a board level issue*" (1)

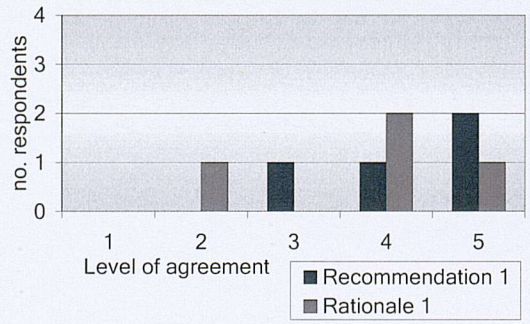
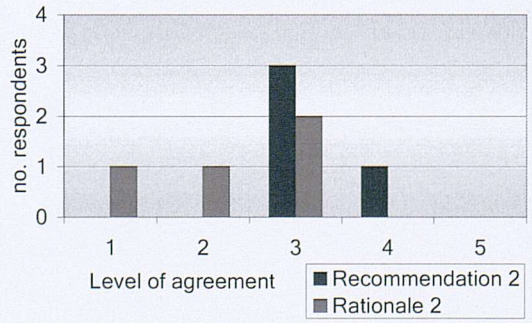
6 - The interaction between CCAs and the EU ETS should be central in the post-2013 design of CCAs through harmonisation of reporting cycles, targets and simplification of adjustment methodologies	Approximately 500 installations are currently included in both the CCAs and EU ETS. The administrative burden of this, including double reporting requirements, conflicts between relative CCA targets and absolute EU ETS allocations, and conflicting reporting cycles, indicate that any installation eligible for EU ETS participation should be withdrawn from CCAs. The presence of both policies for some installations is in direct contradiction with the Government's agenda of pursuing 'better regulation'.		"*It is a nightmare to have two different schemes*" (5) "*Absolutely - expand EU ETS where possible, and if not put CCA target units into UK CRC; get rid of complex nonsense that is the CCA/CCL package*" (5)

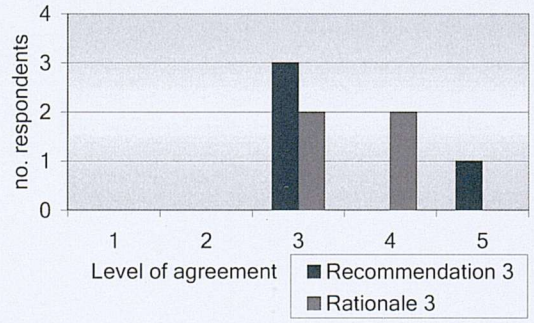
9.3.3 UK Emissions Trading Scheme

The UK ETS presented an opportunity to examine a unique instrument which drew on several different instrument types to develop a scheme based upon trading, of a voluntary nature with incentivised participation through the provision of a subsidy. The analysis within this thesis reflects the concept that the UK ETS was a policy experiment that was not intended to be a long-term response. The limited scope of the policy in terms of number of participants and the short five-year time scale are reflected within the quantity of policy recommendations.

As with the other sets of policy recommendations, the UK ETS document was circulated to all participating stakeholders including the representative from Defra from the department responsible for its development and implementation (this department closed in early 2007 following the closure of the Scheme to Direct Participants). However, this civil servant refused to comment on the recommendations citing the following: "*In my area of Defra it is the policy not to contribute to recommendations on an area where you have been directly involved*". However, Defra provided responses in relation to the CCAs and the EU ETS. These departments, including the former UK ETS department, form part of the larger Climate and Energy: Business and Transport (CEBT) division of Defra. This anomaly is curious. Whether the civil servant in question was unwilling to contribute for other reasons or whether there is, in fact, a departmental policy that was ignored by fellow Defra colleagues, remains a mystery. The lack of continuity does not bode well for the desire of Defra to engage in research and facilitate dialogue with stakeholders. The majority of other responses are broadly supportive of the policy recommendations with particular support being exhibited for the need to consider existing regulatory requirements when implementing new policies.

Table 9.3 Policy recommendations, rationales and stakeholder feedback: United Kingdom Greenhouse Gas Emissions Trading Scheme

Recommendation	Rationale	Stakeholder feedback	Stakeholder comments
1 - Existing or imminent regulatory requirements should be given greater consideration when determining baselines	In the cases of several Direct Participants imminent regulatory requirements were accounted for to some degree by Defra when establishing baselines. However, these companies had already reduced emissions below the baseline before the Scheme started. This indicates that insufficient consideration was given to the impact of regulatory requirements. In future, policies requiring the use of baselines should pay much greater attention to the impacts of other polices on baseline emissions.		"*I think this is a very important recommendation - BERR proposed to introduce a trading scheme for oil in produced water discharges from offshore installations. However, plans to do this effectively collapsed due to the fact that a change was made in the analytical technique used to measure oil in produced water between the baseline year and now and it appears not possible to make a reliable correlation between the results of old and new methods*" (5) "*The implementation of the CRC pays little attention to those installation that have reduced core emissions prior to setting up the baseline*" (5) "*Many policies now do take this into account*" (3)
2 - The value of 'experiments' involving such small numbers of participants needs to be evaluated in detail and perhaps rejected following negative outcomes	One of the key aims of the UK ETS was to provide UK businesses with early experience of emissions trading in anticipation of the EU ETS. The value of this experience is yet to be evaluated by the Government. However, analysis carried out for this research raises questions over the value of early experience for only 34 companies, many of whom are not eligible for EU ETS participation.		"*There were many companies in CCAs that participated and gained experience. However, the £215m spent on incentivising the Direct Participants could possibly have been better spent given that some had already met their targets. For us, we found it valuable to gain some experience in advance of EU ETS*" (3) "*The scheme was open to all businesses but only 34 voluntarily joined in. They should be praised not questioned as the lessons learned were used to help create the EU*

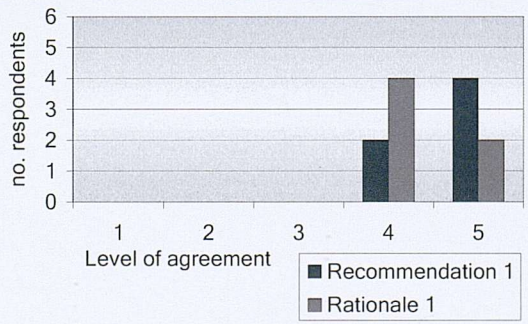
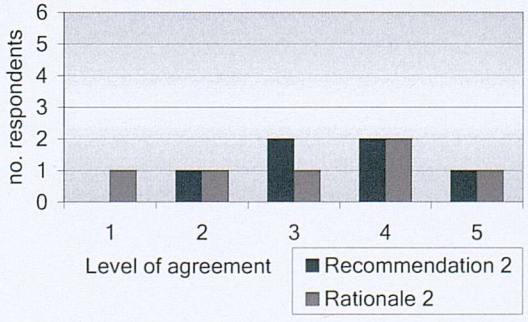
			ETS" (3)
3 - Future schemes involving subsidised participation need closer pre-implementation scrutiny and post-implementation accountability to more accurately determine the value for money for tax payers. This could be undertaken through the use of a multi-stakeholder group to assess the value for money of a proposal.	The UK ETS was not subject to a Regulatory Impact Assessment. Without clear calculations relating to the predicted value for money the task of assessing the actual performance of the Scheme was more challenging. Furthermore, beyond the 2004 National Audit Office assessment, there has been no analysis of the value for money of the Scheme to taxpayers in reference to the emission reductions achieved in return for the £215 million incentive payments.		"*Agree with proposal re: pre-implementation scrutiny. Less convinced about post-implementation accountability. Defra did amend the rules of the scheme in response to findings from NAO report, e.g. tightening up rules re: partial closures. I also question whether it is realistic to expect that value for money for taxpayers could be calculated. This would mean that companies would have to be able to calculate how much reduction in emissions was attributable to UK ETS. If the Government had designed the scheme such that it forced participants to release more information, would as many companies have signed up to it?*" (3) "*The UK ETS was a learning by doing scheme and so the determination of value would be difficult if only considered in money terms*" (3)

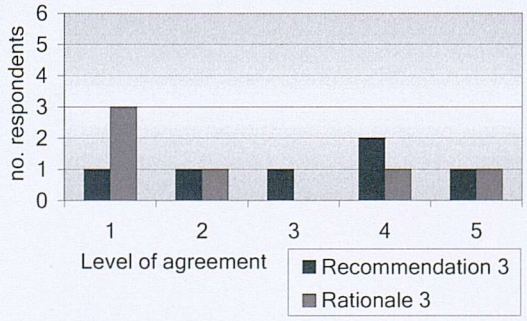
9.3.4 EU Emissions Trading Scheme

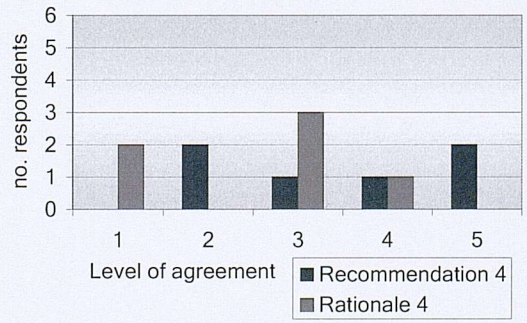
The analysis of the EU ETS led to some critical observations of the design and operation of Phase I. Of the four case studies, the EU ETS evaluation had the smallest quantity of emissions data upon which to base the evaluation. This was due to the relative infancy of the Scheme. However, the political and economic importance of the EU ETS led to the accumulation of a significant quantity of analysis of both historical performance of the EU ETS and analysis of the future of the EU ETS. Any disadvantages associated with availability of performance data were significantly reduced by the quantity, and indeed the quality, of pre-existing EU ETS analysis.

Again, most responses from stakeholders in relation to the policy recommendations are spread across the spectrum of agreement. However, there is a higher level of support for the recommendations compared to the other case studies. In particular, transparency issues and the allocation methodology received substantially higher levels of support than responses disagreeing with the recommendations.

Table 9.4 Policy recommendations, rationales and stakeholder feedback: European Union Emissions Trading Scheme

Recommendation	Rationale	Stakeholder feedback	Stakeholder comments
1 - The EU ETS represents a significant achievement in policy development. The methods used to development of the Scheme and to achieve of consensus among Member States should be replicated where possible in future policy design.	Despite any shortcomings of Phase I, and indeed Phase II, the EU ETS amounts to a phenomenal achievement of the European Union in establishing a Union-wide trading mechanism within less than 5 years. The EU ETS has succeeded in areas the EU and the UK have previously failed. The EU attempted to implement a Community-wide carbon tax in the 1990s. Political and industrial obstacles prevented the tax from reaching an implementable stage. In the UK, the process of developing and implementing the UK ETS was delayed, for reasons of low participation numbers and industry requirement more time to prepare, yet the EU scheme was rolled out on-time regardless of the preparedness of industry, not least because Phase I was deemed to be the pilot phase in which industry was to learn.		"*The interaction with CCAs is unfortunate. They should dovetail more, for ease of administration and future development*" (4)
2 - Free allocations are fraught with both technical difficulties and equity issues that must be minimised in order to maximise the social and environmental outcomes of the Scheme. Therefore future programmes of trading should consider avoiding free allocations.	The use of baselines to predict allowance need in the future led to significant over-allocation in Phase I in all Member States. In the United Kingdom only one sector (power generation) received a lower-than business as usual allocation. Despite this, the power sector in the UK made an estimated £1 billion profit from Phase I. Furthermore, the total emissions of UK installations in 2005 and 2006 were 16.8 MtC above the total national allocation.		"*The UK and a few other MS did not overallocate in Phase I. Our NAP set out that the power sector would be the only sector not to receive an allocation based on BAU projections. Although the UK was over it's cap - we purchased allowances, this is the point behind emissions trading and should not be viewed as meaning that the UK performed worse than other Memebr States*" (4) "*Industries that are particularly sensitive to energy costs need special provision, and time in the consultation process to understand their position. The sector basis was crude, and failed to address the complexity of UK industry*" (3)

			"*It is important to realise that any other allocation mechanism, whether benchmarks or auctioning, are also fraught with enormous technical difficulties and equity issues. Hence, the argument should be extended to allocation methods in general, and otherwise the policy recommendation should be nuanced*" (3) "*The allocation system IS fraught with difficulties, but this is too simplistic. It should be no surprise if most industries have delivered emissions lower than the verified baseline used in UK - this is a success. Power is unique in not being exposed to import substitution, for most other industries the realities of international competition constrain the ability to compete for investment with non-EU locations*" (2)
3 - Future phases of the EU ETS must avoid this method of allocation if the optimal environmental effectiveness and economic efficiency of the ETS is to be realised	Many organisations, including the Carbon Trust, have analysed the impact of the continuation of free allocations on the effectiveness (in both environmental and economic terms) of the EU ETS. In particular, the continued use of free allocations will continue to reap large profits for the power sector. 80% of industrial organisations surveyed for this research support the continued use of free allocations. However, an equal number of external stakeholders would prefer an auction-based approach. It is difficult to justify on economic and environmental terms the long-term continuation of free allocations.		"*The European Commissions' proposals on allocation, moving towards full auctioning by 2020, and full auctioning for the power sector from 2013, are broadly sound*" (5) "*Important that decision on deciding the levels of auctioning for sectors are evidence-based*" (4) "*Bit too strong. Transitions needed for some?*" (4) "*The basis of the recommendation is the extensive real life experience with free allocation. However, there is no such a experience with benchmarks or allowances. Real implementation of both will show that also they lead to problems of efficiency and equity*" (3) "*Consideration of carbon leakages and*

			competitiveness must happen" (2) "*The power industry should speak for itself but I don't think this statement is true - EUROELECTRIC[73] accept full auctioning. The key issue is exposure to international competition*" (1)
4 - The transparency of the existing approach to NAP development should be reviewed and improved. For example, consultation meetings between government and industry relating to sector level allocations could be monitored by other stakeholders (e.g. NGOs).	External stakeholders have concerns about the transparency of the Scheme, in particular the complexity of National Allocation Plans (specifically public disclosure of negotiations between Member State governments and industry the, ad between governments and the Commission relating to the content of NAPS). 70% of external stakeholders believe the transparency of the EU ETS is in need of improvement. The most frequently cited cause for this is the level of disclosure relating to the negotiation of national and sector-level allocations. Another cause relates to the complexity of the methodologies used within National Allocation Plans. Therefore, a review of the existing approach may be required in order to determine how public disclosure of information could be improved.		"*Consultation for Phase II was non-existent - the supposed consultation breached department guidelines, and the outcome was decided before the consultation process had started*" (5) "*If the proposal of the Commission to amend the EU ETS is adopted as it stands now, NAPs will be history*" (4) "*Moves to auctioning will eventually remove the need for a NAP*" (3) "*As the body of historic verified emission data increases, so this problem becomes smaller*" (2) "*Phase II caps are based on a transparent formula set out by the Commission*" (2)

[73] EUROELECTRIC is the "*professional association which represents the common interests of the electricity industry at pan-European level*" (http://www2.eurelectric.org/Content/Default.asp?)

9.4 Response to detailed research questions

This section of Chapter 9 will focus on exploring how this thesis has addressed the detailed research questions outlined in section 9.1.

9.5 What characteristics of policy existing evaluation and appraisal techniques could be employed effectively in the *ex post* evaluative situation?

The most commonly used approaches to *ex ante* policy assessments, in the form of cost benefit analysis and Regulatory impact Assessment (the basis of which is CBA) were presented in Chapter 3 in detail. The UK has a relatively strong history of both CBA and RIA in anticipation of new environmental policies. However, analysis also shows that the approach to *ex post* evaluation is limited and undertaken, at best undertaken in an ad hoc manner. This situation means that the continuous cycle of policy improvement (see Figure 3.1) is not, in fact, maintained in many environmental policy instances in the United Kingdom.

9.5.1 Transparency

Following the extensive examination of academic evaluative techniques and *ex ante* policy assessment practices employed in the United Kingdom in Chapter 3 'economic efficiency' and 'environmental effectiveness' were found to be two criterion that are present in every form of environmental instrument analysis. The remaining criteria were selected according to the arguments presented in previous studies referring to the importance of the criterion within policy analysis. Transparency was highlighted by Silvo et al. (2002) and Santos et al. (2006) as being a fundamental part of the policy process. However, examination of existing UK Government policy assessments of the four case studies found that this criterion was overlooked in every instance (NAO, 2004, Future Energy Solutions, 2004, Future Energy Solutions, 2005, Defra, 2007a, Defra, 2007g). Beyond these sources of validation of the inclusion of transparency within the evaluation criteria, the Aarhus Convention provides possibly the strongest support for the inclusion. A founding principle of the Convention states that the Parties recognise that:

> 'In the field of the environment, improved access to information and public participation in decision-making enhance the quality and the implementation of decisions, contribute to public awareness of environmental issues, give the public the opportunity to express its concerns and enable public authorities to take due account of such concern.'
>
> (UNECE, 1998: p.2).

It is the notion of "*improved*" access to information upon which this criterion was evaluated. Whilst the importance of a policy operating in a transparent manner is beyond doubt, the situation should be one of continuous improvement. Policy makers and regulators should be actively seeking to *improve* the level of transparency and the public participation within the policy process. The level of transparency should not be stationary. For this reason 'transparency' held a deserving place within the set of evaluation criteria, not least because the evaluations found that the level of transparency is in need of improvement across the board.

9.5.2 Innovative behaviour

The impact of a policy on innovative behaviour was determined according to the testimony of industry representatives. In 2006 the Stern Review (Stern, 2006) was explicit in need for technological innovation as a response to climate change. Furthermore, Stern highlighted that technological innovation was reliant not only on carbon pricing but on increasing incentives for R&D and the provision of support for "*early stage commercialisation investments in some sectors*" (p.347). A concerning outcome of the Stern Review is the identification of the rate of private investment in R&D over the last 30 years. The rate of investment has fallen dramatically and is clearly in need of reversal if the required changes in technology are to be achieved. The evidence collected for this study indicates that beyond the carbon price established within the EU ETS and the UK ETS; the existing policy approaches in the UK do not contain specific incentives for investment in innovation. Furthermore, the most notable outcome in terms of innovation and behaviour changes within all responding sectors relate to an increase in awareness of the need to manage energy and minimise GHG emissions. Unfortunately, this has not translated into investment in new technologies as a significantly smaller proportion of respondents reported

changes to operations and equipment as a direct consequence of the policy (with the exception of the PPC Regulations with most sector associations reporting the implementation of new equipment to meet PPC permit requirements).

Resting on the point of the PPC Regulations and innovation, analysis undertaken by OECD found that the incentives for technology development within a permit-based framework are usually weak and rarely are they strengthened through the addition of a voluntary policy instrument (OECD, 2003).

9.5.3 Acceptance and equity

The level of acceptance for each policy instrument resulted in some insightful statistics, particularly relating to the two policies based on voluntary participation (UK ETS and CCA). External stakeholders appeared to show higher than expected levels of acceptance for the policies. Previous research in this area has indentified the need for external sources of validity in the policy process (Hepburn et al., 2006), especially if a voluntary approach is to be taken (Makuch, 2003, Ekins and Etheridge, 2006). This element of the evaluations ties in with the transparency, as defined by the Aarhus Convention, for enabling the public and other stakeholders to express concerns or otherwise in relation to a policy.

At this point in the discussion, it is valuable to note that the positive perceptions of industry towards all of the case studies were generally lower than that of the external stakeholder group. The EU ETS and the CCAs received negative feedback, specifically in relation to targets and allocations, despite the majority of sectors meeting performance targets with ease. This indicates a limit to the value of the industry standpoint. Furthermore it is surprising that, in general, external stakeholders exhibited more positive perceptions of the voluntary polices compared to the industry stakeholder group. This may add weight to the argument that industry displays a feeling of being 'hard done by' in the presence of some environmental protection policies.

9.5.4 Flexibility

The final specific evaluation criterion was flexibility. This criterion was found to have strong links with the level of innovation arising from a policy. The PPC Regulations were deemed to have the lowest impact on innovation and a correspondingly low level of flexibility for companies in terms of pollution

abatement and investment decision making. This contradicts the fundamental notion of BAT and the cycle of improvement it is meant to inspire. Moreover, as stated earlier in this Chapter, if BAT and the IPPC Directive were operating in the most efficient manner it would negate the need for supplementary measures to reduce energy consumption and drive down GHG emissions.

The importance of flexibility within policy design and operation has been identified by many influential sources (Dupuy, 1997, Sunnevag, 2000, Wu, 2000, Carbon Trust, 2006, Stern, 2006). The pursuit of a low carbon economy requires numerous drivers and incentives, ranging from a clear price signal for carbon, the promotion (via government schemes or through the price of carbon) of investment in low carbon technologies, research and development in new technologies and the use of market mechanisms to enable industry to undertake cost-effective emissions abatement. All of these factors require a high degree of flexibility within policy design in order to meet changing demands and to account for changes in knowledge. The case studies show that greater flexibility is to be found within emissions trading schemes but only when the carbon price is stable and high enough to make investment in abatement more financially attractive than simply purchasing allowances.

9.6 Can a systematic approach to policy evaluation enable the comparative evaluation of policy instruments?

This research question can be answered in part through the assessment of the research design (see section 2.13). Yin (2003) refers to various sources of research validity, including construction validity, internal validity, external validity, and reliability. The suitability of undertaking a comparative analysis of the policy instruments should therefore be subject to these sources of research validity. By its nature, comparative analysis leads to a degree of internal validity through the comparison of case study outcomes and the examination of overlapping outcomes within the case studies. The detailed approach taken to policy cohesion and policy interaction within the wider climate change policy framework further enhances the level of internal validity of the comparative approach.

In order to validate the construction and methodology of the approach, various techniques were employed. Yin advises the use of multiple sources of evidence, the establishment of a chain of evidence and the review of case study reports by

stakeholders. In order to meet these requirements the individual evaluations and the larger comparative analysis involved the collection and analysis of primary data and secondary data (i.e. emissions data), the analysis and inclusion of other policy reviews (i.e. Carbon Trust analysis of the EU ETS), and the use of stakeholder feedback in relation to the arising policy recommendations. Furthermore, as detailed in section 2.13.1, questionnaire responses and interview transcripts were examined in detail on an individual basis and viewed as a whole sample in order to identify any areas of conflicting evidence. These areas were subsequently incorporated in to the policy evaluations in Chapters 4-7.

The external validity of the each evaluation was attained through the use of extensive stakeholder engagement within the process through questionnaire circulation and interviews which provided an opportunity to obtain detailed information to enhance the analysis. Every effort was used to involve external stakeholders in the process, although in some instances this proved to be a challenging task. Finally, following the accumulation and analysis of all available evidence (including the survey data, interview data, Government documentation, academic research and any other available policy analysis documentation), the assembled policy recommendations (as associated rationales) were circulated to all stakeholders who participated in the research. This provided an opportunity for stakeholders to comment on the recommendations based on their contributions to the research. Furthermore, it provides a valuable source of stakeholder validation of the methodology used in this research and the associated outcomes.

To further enhance the external validity of the research design, the policy recommendations were categorised into generalisable and non-generalisable recommendations. This exercise served to justify the comparative element of the methodology, as the generalisable recommendations support the notion of comparative analysis through the identification of common themes and trends within the four case studies.

The reliability of the analysis was tested through the use of the case study protocol (see Figure 2.2). In order to meet the requirements of the protocol a database of questionnaire responses, policy documentation and academic literature was developed. Table 8.1 presents a succinct version of this database. During the process of developing the database and during the comparative analysis of the case studies it was imperative to remain mindful of possible

challenges in comparing policy instruments which, in some aspects, operate in contrasting manners.

In addition to the methodological approach of this study and the provisions in place to ensure the analysis was undertaken in a rigorous manner, the generalisable policy outcomes serve to support the use of comparative analysis within the methodological framework.

9.7 What lessons can be drawn from this research regarding the role of policy instruments in environmental policy making, specifically policies relating to climate change mitigation?

In order to address this research question it is imperative to view the case studies in this research in the context of the policy mix within which they operate. The OECD has long been a supporter of the concept of policy mixes to address environmental protection (OECD, 2003). Michaelowa (2004) highlights the limitations of assuming emissions trading presents a one-stop solution to GHG emissions on the basis of high monitoring and transaction costs. Several authors, however, have identified shortcomings of approaches to policy mixes (Johnstone, 2003, Sorrell and Sijm, 2003, Oikonomou and Jepma, 2008). For example, the lack of empirical research, both *ex ante* and *ex post*, is believed to have an impact on the issue of optimal policy mixes. Yet more fundamental problems have been identified in the limited literature available. Analysis by Johnstone (2003) concludes that when dealing with policy mixes, and specifically when dealing with GHG-related policy mixes, the mix must meet certain criteria to justify the inclusion of policies additional to an emissions trading scheme. The criteria are based on the additional policies:

- legitimately meeting a policy goal that cannot be met via the emissions trading scheme;
- being the optimal policy response to the problem in hand;
- can be administered in a cost effective manner;
- and, provide a "*reasonable*" complement to the emissions trading scheme.

These criteria coupled with the assertion that in many instances policy mixes may be at best redundant and at worst counter-productive (Johnstone, 2003) leads to some critical observations regarding the use of policy instruments within the UK.

At the time of implementation of the CCL, CCAs and UK ETS the European scheme was yet to be developed. Therefore, one cannot levy too much criticism towards the UK Government for implementing policies that had problematic interactions with the EU ETS. However, some additional points are worth considering. Firstly, the UK ETS was intended to influence the development of the EU ETS and provide first mover advantage to participating companies. Both of these benefits were severely diminished by the postponed start of the UK scheme and the very small number of participants that would eventually be included in the EU scheme. Secondly, the time frame of the CCL and CCAs is curious. The CCL has been implemented indefinitely and covers all installations operating within the EU ETS. The CCAs have been extended to 2017, yet EU ETS eligible installations were only given temporary exclusion from the EU ETS until the end of 2007. One must question the value of operating the policy mix in such a manner as it has been frequently acknowledged in academic research that such policy over-laps only serve to increase bureaucracy, decreasing the economic efficiency of the trading scheme and is of limited environmental benefit (Sorrell and Sijm, 2003, Michaelowa, 2004, Darkin, 2006, Böhringer et al., 2008). Furthermore, in a Danish case study with similarities to the VEA/tax mix of the CCL and CCAs, Johannsen (2002) concludes that on the basis of low efficiency, information asymmetry and high administration costs this policy mix is far from the optimal policy response. This highlights the need for more joined-up thinking in the policy process and perhaps greater consideration of the timing of instrument implementation.

9.7.1 Specific implications for voluntary policy instruments

The utility and efficacy of voluntary policy instruments such as negotiated agreements, as either stand alone policies or within the context of policy mixes has been debated to a limited degree over the last decade. Furthermore, there has been even less comparative analysis to inform policy makers of the optimal policy response under certain conditions. This research has provided an opportunity to address this vacancy in knowledge.

This sub-section of the thesis will address a key line of enquiry of this research: in light of experience to date of the Climate Change Agreements what role, if any, should these forms of voluntary policies have in the future of British climate policy making?

This was a question posed to all interview participants to establish any consensus or underlying trends relating to the application of such policy instruments. 40% of participants believe that VEAs should be promoted and do have a place in the policy "tool kit". The rationales behind each response are summarised in Table 9.5.

Table 9.5 Rationales for positive/negative support for the promotion of voluntary policy measures in British climate policy

Positive	Negative
Improves communication within industry	Climate change is such an important issue it requires mandatory action
Already have a place within EU framework for policies	People find a way of not acting - free riding
Voluntary action is more cost-effective than mandatory	Voluntary does not always mean 'voluntary' e.g. companies had no choice but to participate in CCAs if they wanted CCL discount
Participants have the option to leave if the approach is not right for them	Lack of longevity of voluntary policies
	Lack of industrial support e.g. during Carbon Reduction Commitment consultation there was little support for the voluntary option
	Industry will only improve performance if there is a direct benefit - voluntary measures risk allowing industry to do nothing

The remaining 60% opposed this view and exhibited a clear preference for mandatory approaches, which is developed further in section 9.5.6.2.

9.7.2 Preferred approach to climate change mitigation in energy intensive industrial sectors

All questionnaire respondents were asked to rank their preferred policy response to deal with GHG emissions from energy intensive industries. The preferred policy response from sector associations is economic-based, in the form of emissions trading and taxation, in order to financially incentivise emission reductions (Figure 9.1). External stakeholders expressed a preference for a policy mix approach utilising regulatory emissions limits and MBIs to incentivise further emission reductions (Figure 9.2).

Figure 9.1 Mean ranking of preferred policy response and associated standard deviation within sector association group

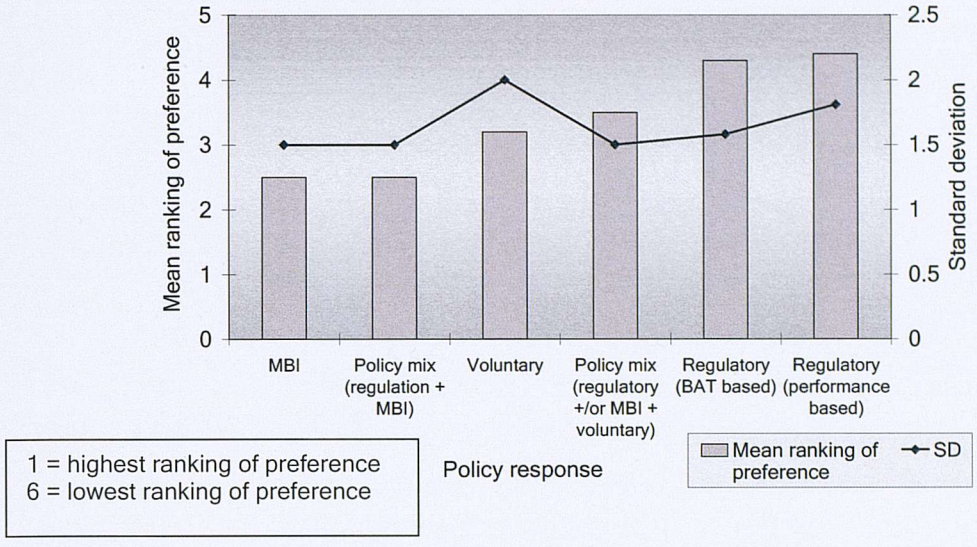
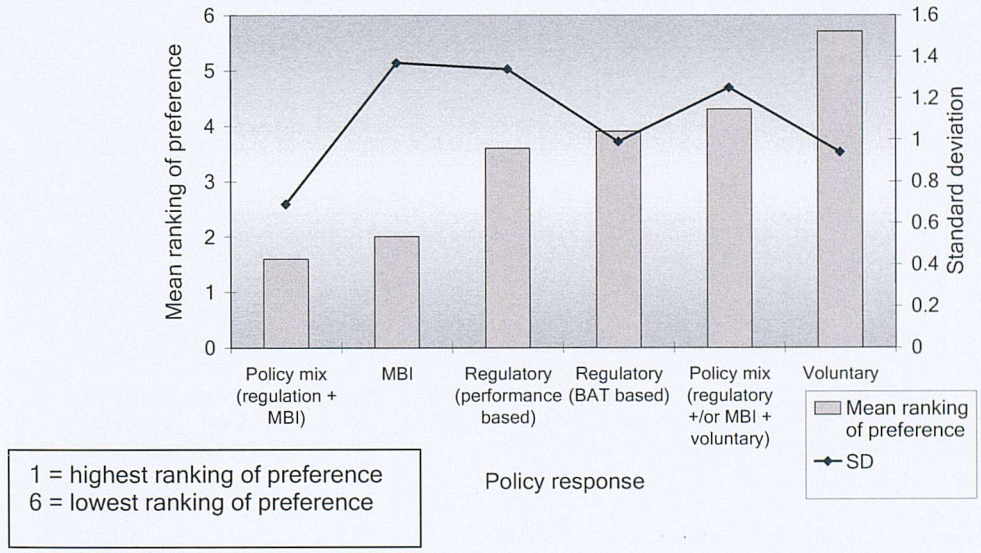


Figure 9.2 Mean ranking of preferred policy response and associated standard deviation within external stakeholder group



The standard deviations (SD) from the sector association group are generally higher than that for the external stakeholders group as demonstrated in Figure 9.1, Figure 9.2 and Table 9.6.

Table 9.6 Standard deviation for policy preferences

Policy option	Sector associations (rank)	External stakeholders (rank)
Market based instrument approach	1.50 (1)	1.37 (2)
Policy mix of regulation and MBIs	1.51 (2)	0.69 (1)
Voluntary approaches	2.00 (3)	0.94 (6)
Policy mix of regulation and/or MBIs AND voluntary approaches	1.50 (4)	1.25 (5)
Regulatory (BAT based)	1.58 (5)	0.99 (4)
Regulatory (performance based)	1.81(6)	1.34 (3)

The differences in the standards deviations indicate that there is greater consensus within the external stakeholder group regarding the preferred policy response. In particular, the highest ranked option for this stakeholder group (policy mix: regulation and MBIs) demonstrated the lowest standard deviation of any option, indicating the highest level of consensus of all options.

This demonstrates real-life policy does not always reflect the preferred policy responses of stakeholder groups. The use of voluntary agreements, in the form of CCAs, does not mirror the opinion of external stakeholders who ranked this approach as the least preferable. This approach is far more appealing to industry representatives. However, the high standard deviation indicates that its position as third within the ranking is not a true reflection of the degree of variation within the opinions. Unsurprisingly, sector associations exhibited a strong distaste for regulatory approaches either based on technology or emissions standards. However, both stakeholder groups showed a preference for an approach based on regulatory standards and MBIs. Taking the analysis of this thesis into account, it is clear that the existing policy approach to climate change is not meeting the preferred requirements of either stakeholder group.

A personal conclusion in relation to the application of policy instruments, based on the analysis of this study, is one of hesitant use of voluntary measures. The CCAs have enjoyed limited success in reducing energy consumption, yet the design of the Agreements requires substantial refinement. Furthermore, the operation of the Agreements within the policy mix is problematic. Voluntary measures may be better suited in situations requiring a less urgent response and in sectors that have a lower environmental impact than energy intensive industry. Emissions trading based on cap and trade should provide far greater

environmental certainty yet the allocation of free allowances significantly reduces the perception of equity. Regulatory approaches also offer greater certainty compared with voluntary approaches, but lack the desired impact on innovation and behavioural changes. Therefore a policy mix drawing on the positive elements of each instrument category is undoubtedly the best route.

9.8 Further applications of the evaluation framework

The focus of this thesis has been the application of the evaluation framework in the *ex post* context. However there is scope for the framework to provide guidance in the *ex ante* appraisal, policy development and implementation settings. Regulatory impact assessments are often used as the informant to *ex post* evaluations (when they take place) regardless of the scope and quality of the RIA. Therefore the application of a more robust and detailed evaluation framework could be facilitate the development of more rigorous *ex ante* appraisals.

The data and informational requirements of the evaluation framework may also serve to notify policy makers at an earlier stage of the data required in order to assess fully the level of success of an instrument. *Ex post* evaluations are challenging when the information required to complete a rigorous and meaningful evaluation is not available. This study found this was a particular issue relating to environmental performance (e.g the reporting of emissions data relating to PPC sites does not facilitate *ex post* evaluation due to the thresholds applied in EPER) and the availability of data relating to the cost of implementation for public bodies. Regulated parties may be unwilling to disclose data relating to the cost of a policy. However, policy implementation (and subsequent policy evaluations) would benefit greatly from earlier consideration of the costs incurred by government bodies and regulatory agencies.

Moving beyond the application of the evaluation framework in the *ex ante* context, the outcome of evaluations carried out in line with the framework would facilitate the design, development and implementation of future policy instruments. By drawing on the outcome of previous evaluations policy makers would be in a position to identify potentially problematic areas of their policy design prior to implementation. This would allow policy markers to explore and implement

suitable safeguards against these risks (e.g. baseline data difficulties could be addressed through the application of more stringent verification procedures).

9.9 Critique of research methodology

In order to undertake this research numerous methodologies were employed. To obtain stakeholder perceptions of the case study policy instruments a comprehensive survey, based on questionnaires and interviews was undertaken. Other evidence sources were analysed to enhance the case studies. Finally, emissions data was obtained in order to provide quantitative evidence of instrument outcomes.

One area that proved to be challenging was the inclusion of external stakeholders in the surveys. The response rate from the PPC external stakeholder groups was very low. Only one response was received from the Environment Agency. Whilst this proved to be very useful input in terms of giving detailed insights into the practical aspects of PPC from a regulator's perspective it was insufficient to give balanced, reliable and meaningful representation for this stakeholder group. Substantial efforts were made increase the response rate by all recipients of the questionnaire by either telephone or email to promote responses to the questionnaire. Despite best efforts no further responses were received. Nevertheless, the intimate relationship between the four case studies meant the many of the other respondents, in particular interviewees, made a significant number of references to the IPPC Directive and the PPC Regulations, thus providing further information.

The evaluations were carried out in the following order:

- UK Emissions Trading Scheme (January 2006 - May 2006)
- Climate Change Agreements (January 2007 - May 2007)
- Pollution Prevention and Control Regulations (May 2007 - December September 2007)
- EU Emissions Trading Scheme (May 2007 - December 2007)

The purpose of this timetable was to account for the duration of the policy, the length of time the policy has been in place and the availability of other sources of information such as emissions inventories and compliance period reports. It was deemed appropriate to commence the evaluation process with the UK ETS as

this Scheme was approaching its end date and to ensure sufficient contact with the relevant staff at Defra and Direct Participant companies. Given that this was the first of the four evaluations it was used as an opportunity to test approaches to the questionnaire and interviews. As discussed in Chapter 2, focus groups were deemed to be unsuitable for this project based on the experience of the UK ETS focus group. The responses to the questionnaire also led to minor changes prior to the development of the surveys for the remaining three instruments, including shortening of question length and reducing the total number of questions (particularly for external stakeholders).

A total of 29 interviews were carried out over the duration of this research. The number of interviews was limited by one key factor: the number of questionnaire respondents willing to participate. All questionnaire respondents who expressed an interest in further participation in the research were contacted to arrange interviews. However, a number of respondents who had expressed initial interest subsequently declined to participate further. This was disappointing and efforts were made to increase the number of interview participants by contacting questionnaire recipients who had declined to participate in the written element of the survey. A total of six interviews were conducted on this basis.

The use of stakeholder feedback in relation to the policy recommendations proved to be a highly beneficial approach in terms of validating the key outcomes of the research.

Analysis of policy documentation, including RIAs, EU Directives and British Government sources, was carried out in a rigorous and systematic manner based on the evaluation criteria identified in Chapter 2. This facilitated the cross-comparison of the case studies and ensured that all relevant sources on information had been examined to the depth required for a study of this nature.

Previous non-official (i.e. not produced by or on behalf of Government) reports examining relevant aspects of the case studies were used, where they existed, to validate the findings of this research. In some instances the findings of this research corroborated previous work (e.g. NAO conclusions relating to the impact on corporate behaviour arising from CCAs). In others, the research contradicted previous studies to varying degrees. It is important to stress that this approach

was not possible in many instances as this research was specifically designed to fill a vacancy in existing research relating to the four case studies.

9.10 Limitations of the research

As with any form of research, there are limitations in terms of the practical undertaking of the research and limitations of the analysis. These limitations as they apply to this research will be discussed in this section.

The use of case studies as a research approach is not without limitations. Harrington et al. (2004) identify several limitations of their comparative analysis of policy instrument choice which also apply to this research. Firstly, case study research naturally involves a limited number of examples from which to draw conclusions. Secondly, examples or case studies are rarely selected at random, which may also limit the observations arising from the evaluation. In order to minimise the impact of these two issues the following approach was taken. In light of these limitations the methodological approach of Yin (2003) was employed in order to minimise the potential difficulties in undertaking both case study research and comparative research.

A further limitation of the case study approach relates to one specific case study examined in this thesis: the PPC Regulations. The Regulations are intended to reflect a holistic approach to environmental protection. The Regulations (and the EU Directive) specifically mention the need to ensure energy is used efficiently. However, greenhouse gas emissions are not explicitly stated as key pollutants covered by the Regulations. Whilst this certainly does not mean that the PPC Regulations do not have a responsibility to help deliver GHG emission reductions one should be mindful when comparing this instrument with others that are specially designed to do so.

Following the completion of the four evaluations it became clear that in addition to the original six criteria a further two were required to ensure the evaluations were holistic: policy instrument cohesion and the impact of lobbying on the policy process. The ability of the instruments to work together while minimising the burden on industry and regulators was an issue that was repeatedly raised by stakeholders. Consequently, the criterion of policy cohesion was added to the evaluations retrospectively.

The issue of lobbying on the policy process is another key area that emerged from the analysis. Lobbying was only raised as an issue by some external stakeholders. However, during the construction of the four evaluations and the comparative analysis it became evident that lobbying has had an effect on each of the instruments to varying degrees. Therefore the impact of lobbying is another criterion that should be included in future evaluations based on the methodology identified in this thesis.

9.11 Chapter summary

This Chapter has discussed the key outcomes of the individual case study evaluations, presented a series of generalisable policy recommendations, explored the stakeholder feedback in relation to policy-specific outcomes, and identified the impact of this research in relation to the continually expanding field of climate change policy.

10 Conclusions

10.1 Introduction

The final Chapter of this thesis presents the key conclusions arising from this extensive study of *ex post* policy evaluation within the environmental policy sphere and its application to the climate change-related case studies.

Ex post policy evaluation was identified as a process that is of immense importance in the policy cycle. As this thesis has demonstrated, when undertaken in a systematic and rigorous manner it can lead to the identification of positive and negative elements in policy design with outcomes ultimately informing future policy making.

10.2 Conclusions

This research has led to the identification of key conclusions in four specific areas:

- The methodological approach to *ex post* policy evaluation
- The utility of comparative analysis
- The positive design elements of industrial climate policy in the UK
- The negative design elements of industrial climate policy in the UK

10.2.1 *Ex post* policy evaluation

Firstly, the approach to *ex post* policy evaluation has historically been overlooked in many instances of environmental policy. Where *ex post* policies have been undertaken they largely focus on the costs to industry as this appears to be the driving force behind *ex ante* assessment. This study has demonstrated that *ex post* policy evaluation of environmental policies in the United Kingdom is limited. Evaluation of climate change policies is limited further, with the Carbon Trust being the dominant source of evaluation (and even then, this is limited to the EU Emissions Trading Scheme). The National Audit Office has undertaken some valuable work in relation to the environmental outcomes of the UK Emissions Trading Scheme and the Climate Change Agreements, but the analysis of the

latter stops short of making specific policy recommendations in order to improve the operation and performance of the policies.

The analysis presented in Chapters 4 to 7 demonstrates how detailed *ex post* evaluations can be successfully undertaken by giving equal weight to quantitative data (such as emissions inventories and financial data) and qualitative data (including stakeholder perceptions of performance). The analyses that form the central pillar of this thesis go beyond a narrative of the case studies or an exploration of the causal relationships between the case studies and external influences (see Table 3.1). The analysis took a normative approach, which was important in developing the policy recommendations as one must be able to measure performance critically either against a benchmark or through the comparison with other similar case studies. This brings us neatly to a few concluding observations about the comparative analysis element of the research.

10.2.2 Utility of comparative analysis

One must be cautious when comparing the outcomes of different policy instruments, as highlighted by Minogue (2005). However, under certain conditions the limitations of comparative analysis of different policy instruments are minimised. In order to maximise the meaningfulness of the outcome of the comparative analysis a systematic approach was adopted to data collection.

In addition to supporting the normative approach of the research, the comparative analysis also provides one of the key elements of originality. This point will be developed further in section 10.3.

10.2.3 Positive policy design lessons in relation to the UK approach to industrial environmental governance

Both the individual analyses and the comparative evaluation identified several lessons that bode well for climate change policies in the UK. Through implementing the PPC Regulations the UK met the transposition requirements of the IPPC Directive (with the exception of a few remaining installations that had not received permits by the October 2007 deadline). The implementation of the Climate Change Levy, the Climate Change Agreements and the UK Emissions Trading Scheme represented a novel approaches to instrument design on the part of the Government. Particularly, the CCL and CCAs were an advanced,

almost brave, response to climate change mitigation given the remaining level of uncertainty of the science in the late 1990s. The UK ETS was an innovative policy in terms of its industrial coverage and the inclusion of numerous pollutants, neither of which had been witnessed previously in emissions trading. Despite the limitations clearly outweighing the benefits of the Scheme, for a time it did further enhance the environmental credentials of both the Government and participating companies. It also served to enforce the stance of the Government in relation to climate change mitigation and demonstrates an admirable desire to show leadership in tackling the causes of climate change.

Comparatively speaking, the UK outperformed all but one EU counterpart in Phase I of the EU ETS. Only the UK, Spain, Italy and Slovenia issued fewer *total* allowances compared to actual performance between 2005 and 2007. The Government has been very keen to publicise this fact. However, the picture painted is not as positive as one might hope, the reasons for which follow in section 10.2.4.

10.2.4 Weaknesses of design in UK Industrial climate change policy

The previous absence of rigorous and systematic *ex post* evaluation of the case studies served to enforce the hypothesis of this thesis: that *ex post* evaluation with a view to improving instrument design is undertaken in an inadequate manner in the United Kingdom. The value of implementing innovative policy instruments is hugely diminished if no attempt to learn lessons is made. For without evaluation how can the existing instruments be improved? How can future policy making be informed? This research has also identified the difficulty developing policy instruments based on performance baselines. Policy makers must remain cautious of the over-reliance on industry sourced data, particularly given the tendency of some industrial organisations to make claims of inequity and financial hardship that are not always based on sound evidence. This is probably best evidenced through the negotiation of CCA targets. The initial targets were weak and yet the opportunity to significantly tighten the targets in 2004 following the first milestone period was not maximised by Defra with an across the board tightening of 3.2 % despite evidence that the over-performance was in fact nearer to 5%.

The PPC Regulations form the central pillar of environmental protection for industry in the UK. Energy efficiency and emissions into *all* media (including GHG emissions in to air) are intended to be regulated as part of PPC. Despite many companies having their energy efficiency and GHG emissions controlled via the CCAs and EU ETS, the absence of clear guidelines and stringent enforcement of energy efficiency and GHG control via the permitting process means that some companies do not have to address these issues. This is a worrying situation and hints at a failure within the UK to adequately consider the conditions of the IPPC Directive.

It is unfortunate that at the time of writing no performance data relating to the first year of Phase II of the EU ETS has been released. However, drawing conclusions from Phase I one can see that the despite the apparent 'good' performance of the UK in relation to EU counterparts, the data presented in Chapter 7 indicates that the Government has failed to adequately communicate the true nature of UK allocations in Phase I. It is only the massive, comparative under-allocation to one sector (the power sector) that has led to the impression that the UK total allocation was stringent. Every other sector received an allocation far higher than its actual emissions in every year of Phase I. Coupled with a host of other issues the EU ETS has thus far failed to meet its objectives in setting a realistic carbon price with the intention of driving down emissions and facilitating the transition to a low carbon economy. Time will tell if the lessons from Phase I have been adequately considered in the execution of Phase II.

This research has shown that the case study climate policies have had *some* impact on GHG emissions, but have thus far failed to maximise their potential. In the case of the CCAs (and the UK ETS to a certain degree) the numerous flaws in the policy design indicate that a radical overhaul is required to improve the environmental outcomes. In such an instance, one must bear in mind comments made by the Better Regulation Commission:

> 'A good policy outcome depends on the quality of the regulatory framework crafted to implement it. The issue is too important to get it wrong; it deserves the most sophisticated response possible. We must not let climate change become a victim of 'quick fix' legislation. Failing to live up to expectations and consequently losing public support is a real possibility, and one that must be avoided at all costs.'
>
> (Better Regulation Commission, 2007)

Therefore, it may be time for Defra explore other options to deal with the GHG emissions from non-EU ETS energy intensive industry.

10.3 Originality of research

The comparative and criteria-based aspects of this study are an original and innovative approach to policy evaluation. Following the examination of existing approaches to evaluation, which remain limited, a framework for analysis was developed drawing on experience with *ex ante* techniques such as RIA and CBA. This framework, based on a set of key criteria to assess the performance of a policy instrument, presented a significant deviation away from the existing approach to *ex post* evaluation, which is as best ad hoc and does not currently take a systematic approach. This study has demonstrated that evaluations can be undertaken in a systematic manner, akin to the existing approach to RIA, through the application of identical methodological and analytical techniques. This study has also demonstrated that comparative analysis of differing policy instruments is not only possible, but that it also provides an excellent basis for the identification of trends within the policy process.

Previous studies in relation to the case studies were limited in terms of the scope and type of analysis. In the 2000 Climate Change Programme the PPC Regulations and the UK ETS were cited as two of the key climate change mitigation policies targeted at industry. However, by the time the Programme was revised in 2006 there was little mention of either policy. Furthermore, beyond a limited review of the UK ETS in late 2006 (that did not account for the results of the final year of the operation and was strictly limited to the impact on GHG emissions) (Defra, 2006a) neither instrument has been examined in comparable detail in order to determine the true extent of the impact on GHG emissions from British industry and at what cost. The EU ETS is an exception within the four case studies. The size and political implications of the Scheme mean it has been subject to a significant quantity of analysis in its relatively short life. However, much of the analysis was found to focus on refining the economic performance of the Scheme in the future. Furthermore, much of the remaining analysis focuses on how the Scheme *should* promote innovation, investment and equitable carbon emissions *in theory*. This study, however, has addressed the *reality* of what has happened in Phase I implementation.

Finally, stakeholder involvement was a fundamental component of the methodological framework. This involvement was extended beyond questionnaires and interviews for the purpose of obtaining information to populate the evaluation to the involvement of stakeholders in the development of the policy recommendations. This provided a level of validation beyond the norm of the policy evaluation process (consider, for example, that the extension of CCAs was granted on the basis of the NAO report and the Environmental Audit Committee proposals with the public consultations due to take place *following* the decision to extend the agreements being taken).

10.4 Further research

This study has laid the foundations for further research in several areas. There are potential areas for further research in within both the methodological field and in relation to the case studies.

Future research on the nature and extent of regulatory capture and the more detailed impacts of information asymmetries on the policy process would greatly advance the subject area. Evidence from the CCAs, UK ETS and EU ETS indicates that industry's influence in the setting of performance targets was too high. But in the absence of robust data upon which policy makers can mount challenges to industry it is difficult to envisage rapid change in this area. However, greater knowledge about how to minimise the disparity in knowledge and how to improve the quality of the data used in instrument design would better prepare policy makers and enable them to maximise the benefits of industrial 'regulation' to society.

This study was limited to four case studies, all of which are key elements of the UK Climate Change Programme. A recommended extension of this study would be an evaluation of additional policies within the Programme to determine the impact on the target audience (e.g. business, agriculture, domestic consumers). Furthermore, many of the stakeholders interviewed for this study drew attention to the disparity between the quantity of instruments aimed at commercial energy users/GHG emitters and domestic consumers. A comparative analysis of the approach to these different stakeholder groups would be highly recommended.

This study has highlighted the limited availability of literature relating to the IPPC Directive. Although the IPPC Directive is in the process of being revised, the ground-breaking nature of the Directive (in terms of its size scope, size, coverage and timescale) means that there are a significant number of areas that require additional investigation. The relationship between IPPC (PPC Regulations as it is transposed in the UK) and energy efficiency and GHG emissions has been largely ignored in any pre-existing analysis. It therefore stands to reason that there are other areas within the Directive that warrant the same attention. In particular, the relationship between IPPC and non-climate change policies may require further examination.

In light of the interaction between the Government and industry in relation to the establishment of environmental performance targets it would be beneficial for the role of institutions (e.g. sector associations, different governmental departments and civil society represented by governments and NGOs) within the policy development process to be investigated further. Further scrutiny of the Government-industry relationship is required in order to determine the extent of influence of industry in the policy process and the significance of this influence on the overall environmental outcomes of policy. This would be particularly beneficial if carried out at the EU-level as the case of the revisions to the EU ETS Directive demonstrate. When industry effectively lobbies governments, governments are then in the position to effectively lobby the Commission, and as this case shows this leads to significant watering down of environmental objectives. Furthermore, the ability of sectors to work at an intra-EU level (e.g. via EU-level sector associations) adds further weight to their powers and further weight to the need to ensure the relationships between these organisations, governments and the Commission are examined in more depth.

A final recommendation for future development of the themes explored in this thesis regards the impact of the quality of primary legislation on the outcome of environmental policies. The case of the EU ETS demonstrated the need to consider impacts beyond domestic transposition of Community legislation to account for the imposition of restrictions or time constraints that may negatively influence success levels of policy instruments.

10.5 Thesis summary

This research has demonstrated the importance of rigorous *ex post* evaluation in the policy process. The evaluation framework was tested using four case studies that are central to the UK's climate change mitigation strategy. The analysis in Chapter 8 highlights the value of undertaking comparative assessments (either *ex post* or *ex ante*) in policy development. It has been demonstrated that comparative analysis of policy instruments can be undertaken effectively under certain conditions. The current approach to *ex post* evaluation in the UK is in need of attention as advances in RIA have not been mirrored in the *ex post* context. The framework applied in this thesis is a platform from which to develop a system within Government for undertaking effective evaluations of policy instruments, which would lead to untold benefits for policy making in the future.

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Appendix 1: Example questionnaire

Imperial College
London

Environmental policy instruments in the UK: Integrated Pollution Prevention and Control and the European Union Emissions Trading Scheme

The Centre for Environmental Policy at Imperial College London is undertaking a research project examining the effectiveness of various environmental policy instruments with particular focus on policies targeted at greenhouse gas (GHG) emissions and energy efficiency.

We are in the process of assessing the impact of the Pollution Prevention and Control Regulations (PPC) and the EU Emissions Trading Scheme (EU ETS) upon British industry. As the two policies are closely linked - with PPC setting the criteria for inclusion in the EU ETS - we have decided to combine the two policies within one questionnaire.

To obtain a complete picture of the impacts of these policies we are surveying all sector and trade associations representing sectors included in the PPC Regulations. We believe you will be able to provide clear, accurate and immensely useful information from the view-point of your members. This will enable us to analyse the impacts of these policies upon the target industry based on comprehensive and reliable data. This will facilitate the development of recommendations to present to policy makers within the Government to refine and improve the policies.

This questionnaire comprises 3 sections:
Part 1: Pollution Prevention and Control Regulations
Part 2: EU Emissions Trading Scheme
Part 3: Climate change policy and concluding remarks

We ask that **all participants** complete **Part 1 (PPC)** and **Part 3** (part 3 only contains 1 question and space to make any comments you have on the issues raised in this questionnaire). If you represent a sector association with members participating in Phase 1 and/or Phase 2 of the **EUETS** please also complete **Part 2**.

We have designed the questionnaire to take as little time as possible. The majority of questions are multiple-choice and there are opportunities to elaborate on your answers if you wish.

Of particular interest to the research project are your opinions on the strengths and weaknesses of the policies, the performance of policies with regards to improving or promoting energy efficiency within your area of business, and the usefulness of the policies in reducing greenhouse gas emissions.

The research is independently funded by the Economic and Social Research Council (ESRC) and there are no links to organisations external to Imperial College London. This ensures that the research is conducted in a rigorous, objective and confidential manner. **Your response will be treated as confidential and will not be viewed by any third parties.**

Thank you in advance for taking the time to complete this questionnaire. I would be grateful if you would return the questionnaire to nia.davies@imperial.ac.uk or to the postal address/fax number below by **Friday 16 November.**

If you have any queries or questions regarding the content of this questionnaire or the research project in general please do not hesitate to contact me.

Yours sincerely,

Nia Davies

Your details

Name (optional - please state if you wish to participate further in the research): _____

Occupation: _____

Organisation: _____

Are you willing to participate in a one-to-one interview based on the issues covered in this questionnaire? Yes ☐ No ☐

How many companies do you represent?

☐ 1-10 ☐ 11-20 ☐ 21-30 ☐ 31-40 ☐ 41-50

☐ 51+

Do any of your members have installations operating in Phase 1 of the EU ETS?

Yes☐ No☐

If yes, please specify approximately how many:

In addition to the members operating in Phase 1, do any of your members have installations participating in Phase 2 of the EU ETS (i.e. inclusion in EU ETS for the first time)?

Yes☐ No☐

If yes, please specify approximately how many:

All participants please complete **Part 1 AND Part 3 (page 13).** If any of your members are participating in Phase 1 and/or Phase 2 of the EU ETS please complete **Part 1, Part 2 AND Part 3.**

PART 1: Pollution Prevention and Control Regulations

Environmental effectiveness

1. To what extent do you think the PPC Regulations encourage energy efficiency and greenhouse gas emission reductions beyond the requirements of the permit in both the *technical activities* (e.g. production processes) AND the *non-technical activities* (e.g. office energy use) of your members? Please make one selection per row.

		Strongly discourages additional improvements beyond permit requirements	**Slightly discourages** improvements beyond permit requirements	**Neither encourages or discourages** improvements beyond permit requirements	**Encourages some** improvements beyond permit requirements	**Encourages significant** improvements beyond permit requirements
Technical activities	Greenhouse gas emissions	☐	☐	☐	☐	☐
	Energy efficiency	☐	☐	☐	☐	☐
Non-technical activities	Greenhouse gas emissions	☐	☐	☐	☐	☐
	Energy efficiency	☐	☐	☐	☐	☐

2. Alternatives to regulation in environmental policy making are becoming increasingly popular at the UK, EU and international levels.

   With regards to *energy efficiency* and *greenhouse gas emissions* which of the following policy instruments do you think would result in the highest energy efficiency improvements and GHG emission reductions from your members if applied as a stand-alone policy? Please select your 3 preferred policies (1= most preferred policy option)

	Energy efficiency	Greenhouse gas emissions
Existing BAT-based permit system	-	-
Binding emissions-based requirements	-	-
Emissions trading	-	-
Energy tax (e.g. Climate Change Levy at a rate of 0.44p/kWh electricity)	-	-
Voluntary agreement (e.g. Climate Change Levy Agreements)	-	-
Other (please specify)	-	-

3. Under the Kyoto Protocol the United Kingdom has committed to reducing its greenhouse gas emissions by 12.5% by 2012. What contribution do you think the PPC Regulations will have in terms of the UK meeting this target?

Very negative impact - PPC will significantly increase GHG emissions (1)	**Slightly negative** impact - PPC will slightly increase emissions (2)	**No impact** either way (3)	**Slightly positive** impact - PPC will slightly reduce emissions (4)	**Very positive** impact - PPC will significantly reduce GHG emissions (5)
☐	☐	☐	☐	☐

Transparency

4. Please consider the following points:
   - Public access to PPC permit information
   - Involvement of stakeholders external to industry and government in the permitting process
   - Availability of environmental performance data to stakeholders external to government and industry
   - Industrial access to information and involvement in decision making

   Taking these factors into account, how would you describe the level of transparency of the PPC permitting process?

Completely confidential (1)	**Confidential subject** to commercial secrets (2)	**Slightly transparent** (3)	**Completely transparent** (4)
☐	☐	☐	☐

5. How would you rate the overall level of transparency of the PPC process?

Unacceptable (1)	Some areas **in need improvement** (2)	**Acceptable** (3)
☐	☐	☐

Please use the box below to indicate what measures should be introduced to improve the level of transparency or confidentiality if you feel the current level is too high or too low?

Innovation

6. Noting that technological innovation is a key response to climate change, to what extent do you think PPC Regulations foster technological innovation?

Strongly discourages technological innovation (1)	**Slightly discourages** technological innovation (2)	**No impact** on innovation either way (3)	**Encourages some** technological innovation (4)	**Encourages significant** technological innovation (5)
☐	☐	☐	☐	☐

Further to your answer to question 6, in the box below briefly identify elements of PPC permitting that either encourage or discourage innovation

7. Have the PPC Regulations resulted directly in any of the following changes within the activities of your members in relation to greenhouse gas emissions and energy efficiency? Please select all that apply.

- ☐ Increased awareness of energy saving opportunities within senior management
- ☐ Increased awareness of greenhouse gas emission saving opportunities within senior management
- ☐ Introduction of equipment/BAT specified within the PPC permit
- ☐ Introduction of equipment of higher efficiency rating/lower emissions rating than specified within PPC permits
- ☐ Improved supply chain management
- ☐ Process changes
- ☐ Inclusion of the cost of carbon in new project appraisals
- ☐ Improved environmental reporting
- ☐ Other (please specify)

Acceptance and equity

8. In general, what level of acceptance do your members have for the PPC permitting process?

Full rejection (1)	Qualified rejection (2)	Indifference (3)	Qualified acceptance (4)	Full acceptance (5)
☐	☐	☐	☐	☐

9. Please consider the following factors:
   - economic costs of the PPC Regulations incurred by industry;
   - administrative requirement of the Environment Agency and government;
   - changes in environmental quality arising from the PPC Regulations;
   - distribution of costs and benefits arising from the PPC Regulations.

   How do you rate the overall fairness of the PPC Regulations?

Very unfair (1)	Unfair (2)	Fair (3)	Very fair (4)
☐	☐	☐	☐

10. How would you describe your member's overall experience of PPC?

Completely negative (1)	More negative than positive (2)	More positive than negative (3)	Overwhelmingly positive (4)
☐	☐	☐	☐

Please use the space below to identify the aspects of the PPC that influenced your answer to question 10.

Economic efficiency

11. How would you rate the overall economic efficiency of the PPC permitting process?

Very economically inefficient (1)	Slightly economically inefficient (2)	Slightly economically efficient (3)	Very economically efficient (4)
☐	☐	☐	☐

12. How would you compare the costs incurred by *your members* and *government* through the PPC Regulations with the environmental benefits in terms of *energy efficiency* and *GHG emission* reductions? Please make **one** selection per row.

	Costs **significantly outweigh** benefits	Costs **slightly outweigh** benefits	Costs **equal** to benefits	Benefits **slightly outweigh** costs	Benefits **significantly outweigh** costs
Members	☐	☐	☐	☐	☐
Government	☐	☐	☐	☐	☐

If you answered '*costs significantly outweigh benefits*' or '*costs slightly outweigh benefits*' to question 12 please use the space below to identify the aspects of the PPC Regulations that you believe contribute towards the costs outweighing the environmental benefits arising from the scheme

Flexibility

13. Some experts believe that in order for a policy to be successful industry must be allowed flexibility to choose the most cost-effective means to meet their targets. In this sense, flexibility can have two meanings:

    - Flexibility to manage investment in technological innovation towards achieving greenhouse gas emission reductions and improving energy efficiency
    - Flexibility can also refer to the ability of businesses to optimise their emissions reductions via financial assessment of the most practical means to do so (e.g. companies with lowest abatement costs make the most emission reductions)

    What level of flexibility do you think the PPC Regulations allow flexibility in terms of the two statements above? Please make **one** selection per row.

	No flexibility	Very little flexibility	Moderate flexibility	High flexibility
Investment management	☐	☐	☐	☐
Financial assessment of cheapest way to abate emissions	☐	☐	☐	☐

14. How do you rate the interaction between the PPC Regulations and other *environmental* policies applied at both the EU and UK level from the perspective of industry? Please make **one** selection per row.

	The interaction between PPC and other policies creates **significant regulatory burden**	There are some problems with cohesion between PPC and some policies - there is **slight regulatory burden** on industry and **room for improvement**	There are minor problems with the interaction between PPC and other policies but **generally it is ok**	PPC and other policies operate in a complementary manner - **excellent level of cohesion**
UK	☐	☐	☐	☐
EU	☐	☐	☐	☐

Please use this space to identify any specify policies that led to your selection to question 14.

Overall strengths and weaknesses of PPC

15. Please use the space below to identify the key strengths of the PPC Regulations

16. Please use the space below to identify the key weaknesses of the PPC Regulations

PART 2: European Union Emissions Trading Scheme

Environmental effectiveness

17. To what extent do you think the EU ETS encourages carbon dioxide (CO_2) emission reductions beyond the allocated allowances from *individual companies* within your sector and from the *entire sector*? Please make **one** selection per row.

	Strongly discourages additional reductions beyond allocation	**Slightly discourages** reductions beyond permit allocation	**Neither encourages or discourages** reductions beyond allocation	**Encourages some** reductions beyond allocation	**Encourages significant** reductions beyond allocation
Emission reductions from **individual firms**	☐	☐	☐	☐	☐
Emission reductions across the **sector**	☐	☐	☐	☐	☐

18. Which of the following policy instruments do you think would result in the highest CO_2 emission reductions within the sectors included in the EU ETS if implemented as a stand-alone policy?

    Please select the three instruments you believe would achieve the highest emission reductions using numbers 1 to 3 to indicate your preferences (1= most preferred).

    - Technology-based permit system
    - Binding emissions-based standards
    - Emissions trading
    - Energy tax (i.e. Climate Change Levy at a rate of 0.44p/kWh)
    - Voluntary agreement (i.e. Climate Change Levy Agreements)
    - Other (please specify)

19. There are two ways in which allowances can be allocated within an emissions trading scheme:
    - Company-level cap applied and allowances allocated free of charge
    - Allowances sold via auction/the market, economy-wide cap may be applied but individual firms decide how many allowances they wish to buy

    Which of the three allowance allocation methods do you would maximise the reduction of CO_2 emissions via the EU ETS? Please select one.

    ☐ Free allocations

    ☐ Auction

    ☐ Other (please specify)

20. Under the Kyoto Protocol the United Kingdom has committed to reducing its greenhouse gas emissions by 12.5% by 2012. What contribution do you think the EU ETS will have in terms of the UK meeting this target?

Very negative impact - EU ETS will significantly increase GHG emissions (1)	**Slightly negative** impact - EU ETS will slightly increase emissions (2)	**No impact** either way (3)	**Slightly positive** impact - EU ETS will slightly reduce emissions (4)	**Very positive** impact - EU ETS will significantly reduce GHG emissions (5)
☐	☐	☐	☐	☐

Transparency

21. Please consider the following points:
    - Public access to EU ETS information
    - Involvement of stakeholders external to industry and government (e.g. public involvement)
    - Availability of environmental performance data to stakeholders external to government and industry
    - Industrial access to information and involvement in decision making

    Taking these factors into account, how would you describe the level of transparency of the EU ETS?

Completely confidential (1)	**Confidential subject to commercial secrets** (2)	**Slightly transparent** (3)	**Completely transparent** (4)
☐	☐	☐	☐

22. How would you rate the overall level of transparency of the EU ETS?

Unacceptable (1)	**Some areas in need improvement** (2)	**Acceptable** (3)
☐	☐	☐

If you rated the level of transparency as 'in need of improvement' or 'unacceptable' please use the box below to indicate what measures should be introduced to improve the level of transparency or confidentiality?

Innovation

23. Noting that technological innovation is a key response to climate change, to what extent do you think the EU ETS fosters technological innovation within industry?

Strongly discourages technological innovation (1)	**Slightly discourages** technological innovation (2)	**Neither encourages or discourages** technological innovation (3)	**Encourages** some technological innovation (4)	**Encourages** significant technological innovation (5)
☐	☐	☐	☐	☐

Further to your answer to question 23, in the box below briefly identify elements of the EU ETS that either encourage or discourage innovation

24. Has the EU ETS resulted directly in any of the following changes within the activities of your members in relation to CO_2 emission reductions? Please select **all** that apply.

- ☐ Increased awareness of energy saving opportunities within senior management
- ☐ Increased awareness of CO_2 reduction opportunities within senior management
- ☐ Introduction of equipment of higher efficiency rating/lower emissions rating than previous equipment
- ☐ Improved supply chain management
- ☐ Process changes
- ☐ Inclusion of the cost of carbon in new project appraisals
- ☐ Improved environmental reporting
- ☐ Other (please specify)

Acceptance and equity

25. How do you think your members have been treated in terms of allowance allocations during Phases I and II of the EU ETS compared to their EU counterparts? Please make one selection per row.

	Allowance allocation very much **in favour** of our members	**Fair allocation** compared with counterparts	**Slightly unfair** allocation, but no significant detrimental effects on our members	Allocation **very unfair** leading to competitive disadvantage compared to EU counterparts	Not applicable
Phase I	☐	☐	☐	☐	☐
Phase II	☐	☐	☐	☐	☐

26. In general, what level of acceptance do your members have for the EU ETS?

Full rejection (1)	**Qualified rejection** (2)	**Indifference** (3)	**Qualified acceptance** (4)	**Full acceptance** (5)
☐	☐	☐	☐	☐

27. How would you describe your member's overall experience of the EU ETS?

Completely negative (1)	**More negative than positive** (2)	**More positive than negative** (3)	**Overwhelmingly positive** (4)
☐	☐	☐	☐

Please use the space below to identify the aspects of the EU ETS that influenced your answer to question 27

Economic efficiency

28. How would you rate the overall economic efficiency of the EU ETS?

Very economically inefficient (1)	Slightly economically inefficient (2)	Slightly economically efficient (3)	Very economically efficient (4)
☐	☐	☐	☐

29. How would you compare the costs incurred by *your members* and the *government* arising from the EU ETS with the *environmental benefits* in terms of CO_2 emission reductions arising directly from the EU ETS? Please select one box in each row.

	Costs **significantly outweigh** benefits	Costs **slightly outweigh** benefits	Costs **equal** to benefits	Benefits **slightly outweigh** costs	Benefits **significantly outweigh** costs
Members	☐	☐	☐	☐	☐
Government	☐	☐	☐	☐	☐

If you answered 'costs significantly outweigh benefits' or 'costs slightly outweigh benefits' to question 29 please use the space below to identify the aspects of the EU ETS that you believe contribute towards the costs outweighing the environmental benefits arising from the scheme

Flexibility

30. What level of flexibility do you think the EU ETS offers in terms of:
    - Allowing companies to manage investment in technological innovation to achieve CO_2 emission reductions?
    - Allowing companies to optimise their emissions reductions via financial assessment of the most practical means to do so (e.g. companies with lowest abatement cost make greatest emission reductions)

    Please make **one** selection per row.

	No flexibility	Very little flexibility	Moderate flexibility	High flexibility
Investment management	☐	☐	☐	☐
Financial assessment of cheapest abate emission	☐	☐	☐	☐

31. How do you rate the interaction between the EU ETS and other environmental policies applied at both the EU and UK level from the perspective of industry? Please make **one** selection per row.

	The interaction between EU ETS and other policies creates **significant regulatory burden**	There are some problems with cohesion between EU ETS and some policies - there is **slight regulatory burden** on industry and **room for improvement**	There are minor problems with the interaction between EU ETS and other policies but **generally it is ok**	EU ETS and other policies operate in a complementary manner - **excellent level of cohesion**
UK	☐	☐	☐	☐
EU	☐	☐	☐	☐

Please use this space to identify any specify policies that led to your answer to question 31

32. Do you think uncertainty surrounding the post-2012 (post-Phase II) future of the EU ETS have an impact upon the investment decisions of your members?

☐Yes ☐No ☐ Unsure

Overall strengths and weaknesses of EU ETS

33. Please use this space to identify your thoughts on the allocation of allowances during Phases 1 and 2 of the EU ETS considering the following factors:
    - Impacts of allocation on UK-based industry
    - Harmony across the EU
    - Pursuit of environmental aims
    - Equity to all stakeholders

34. What do you think are particular strengths of the EU ETS?

35. What do you think are particular weaknesses of the EU ETS?

Please continue to page 13 to complete Part 3.

PART 3 Climate change policy options and concluding remarks

36. In terms of an overarching climate change policy for energy-intensive industry please rank in order of effectiveness (1= most effective, 6= least effective using each number once) the type of policy regime you think would achieve the best results in terms of reducing greenhouse gas emissions and improving energy efficiency?

    1Regulatory - performance based (e.g. prescribed emissions limits/energy efficiency targets)

    1Regulatory - technology based (e.g. BAT-based permitting system)

    1Market based (e.g. emissions trading, energy taxes, emission taxes)

    1Non-mandatory (e.g. voluntary agreements, eco-labelling, voluntary bench marking)

    1Policy mix of regulation and market based instruments

    1Policy mix of regulation and/or market based instrument and non-mandatory approaches

    Please use the space below to identify any reasons that you feel are important for your selection or if you think an alternative to the policy regimes above would be more suitable

37. Please use the space below to make further brief comments/suggestions on the adequacy of PPC as a policy instrument

38. Please use the space below to make further brief comments/suggestions on the adequacy of the EU ETS as a policy instrument

Thank you for taking the time to complete this questionnaire

Appendix 2: Example interview schedule

Review of interviewee's role in CCAs.
Would the CCA/CCL policy package represent cost savings to industry in the absence of the 80% CCL discount? Could energy savings alone result in a policy instrument more cost effective than, for example, regulatory energy use limitations?
What are your overall impressions of the targets?
With regards to your members, what influence have CCAs had on the inclusion of energy and carbon management in new projects?
What impact do you think the CCA/CCL policy package is having upon capital investment within your sector?
Optional. You stated that [e.g. emissions trading] represents a better policy option in terms of environmental effectiveness. Can you give your reasons?
How do you think the CCA/CCL policy package fits into the overarching approach to climate change in the UK?
What are the key strengths of the CCA/CCL policy package?
What are the key weaknesses of the CCA/CCL policy package?

In hindsight, would you recommend the inclusion of [*sector*] in CCAs?
Considering the overall content of the UK Climate Change Programme are its: • strengths • weaknesses?
What role, if any, do you think non-mandatory policy instruments should have within the overall context of UK climate change policy?
What would be your ideal means to tackle climate change from the perspective of energy-intense industry?
What type of policy instrument do you believe provides the optimal conditions to foster technological innovation with regards to climate change?
What are your thoughts, if any, on the existing situation and practices regarding post-implementation environmental policy assessment in the UK?

Appendix 3: Interview Participants

Date	Subject	Name	Position / Organisation	Phone/person
3rd March 2006	UK ETS	Richard Hemmings	Head of Engineering, Somerfield	phone
28th March 2006	UK ETS	Toby Campbell-Colquhoun	Trader, Shell Trading	person
30th March 2006	UK ETS	Chris McGlen	UK Coal Mining limited	phone
27th November 2006	UK ETS	Liz Hoskins	Emisisons Trading Coordinator, Shell UK	phone (focus group)
27th November 2006	UK ETS	Deborah Park	UK Emissions Trading Team, Defra	person (focus group)
27th November 2006	UK ETS	Germana Canzi	Senior Climate Change Campaigner, Friends of the Earth	person (focus group)
27th November 2006	UK ETS	Peter Pearson	Director of the Imperial College Centre for Energy Policy & Technology, Imperial College London	person (focus group)
11th May 2007	CCA	Chris Stubbs	Divisional Managing Director, WSP Energy	person
17th May 2007	CCA	Bryan Bateman	CEO The Bryman Partnership Ltd. Administration of CCA for Confederation of Paper Industries	phone
23rd May 2007	CCA	John Huddlestone	Principal Consultant, AEA Energy & Environment	person
23rd May 2007	CCA	Adam Mansell	British Apparel and Textile Confederation	person
8th June 2007	CCA	Colin West	Executive Director Maltsters' Association of Great Britain	phone
11th June 2007	CCA	David Beardsworth	Technical Director British Ceramic Confederation	person
4th July 2007	CCA	Roy Wootton	General Manager, Target 2010 (Castings Technology International)	phone
4th July 2007	CCA	Chris Leigh	Director (Cities and Regions) The	person

			Climate Group - seconded from Defra	
23rd July 2007	CCA	Peter Clark	Spirits Energy Efficiency Co	phone
23rd November 2007	IPPC	Paul Pearson	UK Leather Federation	person
29th November 2007	EU ETS	Ian Froggatt	Environment Manager Energy Power Resources Limited	phone
4th December 2007	IPPC	Adam Mansell	British Apparel and Textile Confederation	person
5th December 2007	IPPC	John Donohue and Roy Wootton	Environment Manager, Castings Technology International	phone
7th December 2007	IPPC	Tim James	PPC Policy Manager, Environment Agency	phone
7th December 2007	IPPC/EU ETS	Ian McPherson	Director Environment, Health and Safety UK Petroleum Industry Association Ltd	phone
13th December 2007	IPPC/ EU ETS	David Beardsworth	Technical Director British Ceramic Confederation	person
13th December 2007	EU ETS	Javier de Cendra de Larragán	Researcher Metro, University of Maastricht	phone
17th December 2007	IPPC/ EUETS	Bryan Bateman	CEO The Bryman Partnership Ltd. Administration of CCA for Confederation of Paper Industries	phone
18th December 2007	CCA	Nina Hassall	CCA Team Climate Energy: Business and Transport Division Defra	person
19th December 2007	CCA/ EU ETS	Michael Grubb	Chief Economist, The Carbon Trust	person
20th December 2007	EU ETS	Ormonde Joel	EU Emissions Trading Manager, Environment Agency	person
19th March 2008	CCA/EU ETS	Paul Ekins	Head, Environment Group Policy Studies Institute	person

Appendix 4: Evaluation of Regulatory Impact Assessments

	Pollution Prevention and Control Regulations	Climate Change Agreements	Climate Change Levy	UK Emissions Trading Scheme	EU Emissions Trading Scheme
Year of RIA	2000	2001	2000	2001	2005
Responsible department	Department for Environment, Transport and the Regions	Department for Environment, Food and Rural Affairs	HM Customs & Excise	Department for Environment, Food and Rural Affairs	Department for Environment, Food and Rural Affairs
Purpose of the policy instrument	Regulations to supersede current domestic pollution controls in Part I of Environmental Protection Act 1990 (namely Integrated Pollution Control (IPC) and Local Air Pollution Control (LAPC)) to control pollution to air, land and water from industrial processes	To provide 80% discount on CCL for energy-intensive facilities participating in a CCA with the Secretary of State	To specifically encourage energy efficiency in business, agriculture and the public sector. To reduce greenhouse gas emissions from these sectors	To provide a framework for CCA and other companies taking voluntary caps on their emissions to buy and sell emissions allowances.	To reduce greenhouse gas emissions from the installations covered by the Scheme
Risk assessment	No	No	Yes	Yes	Yes
Use of quantitative data	Yes	No	Yes	No	Yes
Type of data (Primary, Secondary or Estimated)	Primary - based on evidence from IPC regime	Estimated	Estimated carbon savings	Estimated	Estimated carbon savings
Consideration of alternative policies What alternatives considered by: Instrument type Coverage Design Scope Reasons for dismissal	Limited options to consider - not implementing regulations not an option as required by EU	No reference to alternative policy approaches - CCAs identified in CCL policy documentation	No - based on Lord Marshall's report recommendations of a tax for businesses	No reference to alternative policy approaches to the approach stated within the RIA	Not for the overall policy (i.e. emissions trading approach) as implementation is mandatory across the EU

of alternatives					
Consideration of alternative arrangements within proposed policy	Public consultation only in respect to changes with negative consequences for environment Allow flexibility of permit reviews where risks involved suggest it is appropriate - replace existing requirement to review every 4 years Standardised permit forms, procedures and conditions replacing ad hoc site-by-site system Introduce provisions for site remediation Extension of regime to include 440 sites in IPC but outside scope of IPPC or exclusion altogether from regime Charges for permits - likely to be in line with existing IPC charges	Whole sites entered into CCA without sub-metering. Dismissed as this would lead to small energy intensive activities being introduced into non-energy intensive sites to obtain the 80% CCL discount	None stated	None stated - document offers justification of the UK ETS framework with no consideration of alternatives	Consideration of options, inter alia, for overall national allocation, baseline period, allocation methodology and new market entrants
Equity/fairness issues - business/industry	Whether it is fair to treat 440 installations within IPC but outside scope of IPPC	None stated	Business energy use accounts for 40% of total energy use and must be addressed	None stated	"*EU ETS is central to the UK's efforts to move towards a low carbon economy*"
Equity/fairness issues - other sectors	None stated	None stated	No plan to introduce similar energy tax for domestic users based on social policy reasons	None stated	None stated - focus on equity/fairness towards industry

			No tax for road transport fuels as sector already covered by fiscal strategy		
Impact on innovation	None stated	None stated	No direct reference but states that "Business has a special role to play as the principal source in the economic of technological innovation"	None stated	Direct references of how the Directive is designed to encourage the transition to a low carbon economy
Competition Assessment including OFT filter test	None stated	None stated	None stated	None stated	None stated
Presentation of competition assessment	None stated	None stated	None stated	None stated	Yes - competitiveness impacts of each option is presented
Consultation with OFT regarding impact on competition	None stated	None stated	None stated	None stated	None stated
Possible non-compliance factored into the RIA	None stated	None stated	None stated	None stated	Yes
Consideration of enforcement costs	None stated	None stated	None stated	None stated	Costs to installations in instance of operator failing to meet the requirements of the Scheme
Consideration of ways to increase compliance	None stated	None stated	None stated	None stated	Sanctions noted above
Procedures for monitoring the policy	Monitored on ongoing basis Phasing in of existing installations until 2007 provide opportunity to fine tune the regulations in light of early experience	None stated	None stated	None stated	Post-implementation review and evaluation of Phase I to be incorporated into development and consultation on Phase II
Time scale for post	Formal review of the	No - monitoring and	No - subject to ministerial	None stated	None stated

implementation evaluation	regulations after 5 years	review to be undertaken as part of any CCL review	review		
Contains procedures for implementing and evaluating the policy	Review to reappraise options and associated costs and benefits Assessment of costs and benefits against stated aims and objectives	None stated	None stated	None stated	None stated
Consideration of impacts on small businesses	Yes - difficult to quantify but felt to be not significant. Energy efficiency and waste minimisation would make good business sense if applied with common sense Site restoration major area for concern due to potential high costs associated but preparation of site reports would be useful when selling and buying sites	Yes - impact of sub-metering on small bakeries	Yes - consultation and concerns over access to ECA to be considered when designing the final energy efficiency grants package	Yes - administrative costs for small businesses my be sufficiently high to deter participation due to the minimum costs for verification but the Scheme could potentially mitigate against this by allowing companies to enter as a collective (to enable pooling of costs and exploitation of economies of scale)	Yes - consultation with small businesses with focus on higher costs and options to reduce these costs
Benefits	Decision time reduced from 4 to 3 months Reduced frequency of permit reviews for low risk activities will reduce cost to industry, regulator manpower and improve stability in operating conditions Increase frequency of permit reviews for high risk activities will bring higher	Scope of CCAs limited to less than 10% energy use in non-energy intensive activities beneficial as other sites with more than 10% energy in non-energy intensive uses will be encouraged to reduce energy consumption by application of full rate of CCL Allowing up to 10% non-energy intensive activities	CCL will "help to achieve these targets [Kyoto target] for greenhouse gas emission reductions" Employers' NIC reduced by 0.3% £150 support fund for energy efficiency measures (Enhance Capital Allowances) 80% CCL discount for CCA	Providing companies with opportunity to perchance allowances from companies able to deliver emission reductions at lower cost and vice versa Facilitating emission reductions from companies outside CCAs Establishment of the UK as a centre for GHG trading activity bringing benefits to	Setting a tight cap will encourage a high carbon price and a liquid scheme If UK is able to reduce overall emissions it will become a net seller of allowances and the associated economic benefits of selling allowances Higher profits of non-fossil fuel power generators

	level of environmental protection Standardised applications to reduce effort required for applications, lower costs and lower charges Environmental benefits of additional requirement to ensure sites are left in satisfactory state - polluter pays Reduced emissions from industries new to pollution control Requirement to address energy efficiency will have long term benefits to industries and will help reduce greenhouse gas emissions	to be incorporated in a CCA will reduce cost burden of sub-metering At sites where less than 90% of energy used in energy intensive activities the use of sub-metering will assist is improving the management and control of energy sued in energy intensive activities	participants Lower CCL rate for LPG 50% discount for horticultural firms for 5 years to protect competitiveness of sector 5 year exemption for natural gas in N Ireland to support new gas market Expected to be revenue neutral for private sector	the Government, business and the City of London	Encouragement of fuel diversity Verification and baselines will ensure integrity of the Scheme New Entrant Reserve for Good Quality Combined Heat and Power Advantages for traders, brokers and verifiers
Quantified carbon savings	None stated	None stated	Total policy package of 5 MtC per year by 2010 Of which at least 1MtC per year by 2010 is attributable to the price effect of the CCL Remaining 4 MtC per year by 2010 attributable to exemption for CHP & renewables, CCA, ECA	None stated	Overall predicted carbon savings not specified
Secondary benefits	None stated	None stated	The resulting NIC reduction "could generate	None stated	As above: brokers, traders and verifiers

			additional employment opportunities" Schemes to promote energy efficiency and renewable energy "will directly stimulate investment" in low carbon technologies		
Revenue	None stated	None stated	£1 billion	None stated	Dependent on quantity of allowances auctioned and performance of the market
Identified costs to government	None stated	None stated	Recycling of revenue via 0.3% reduction in employers' NIC - revenue neutral for government	£43 million per year in incentive payments plus administrative costs: £50k to accredit verifiers £150-250k to design and build trading registry £25k to run auction	Non stated
Identified financial cost to target industries	Application process Permit charges On-going costs associated with compliance with BAT - energy efficiency measures could result in pay-back	Sub-metering for sites with more than 10% energy use in non-energy intensive activities: £1000-£5000 per meter	Initial start-up costs: • Changes to administration and computing systems • Staff training • Printing and stationary costs Continuous compliance costs: • Record maintenance • Completion of 4 CCL returns per years • Site visits by customs officers	Verification and other administration costs, purchase of allowances by companies unable to reduce emissions	Increased electricity prices Permit application Monitoring and reporting costs Verification costs (of baselines and annual reported emissions) New Entrant permit cost
Quantified cost to industry	Permit application: £20,000 to £60,000 Permit charges: £6000 to	None stated	Energy industry changes to billing systems: £24-£40 million	None stated	Permit application: £1230 - £5490 Changes to permits: £240,

	£9000 Permit compliance costs: unclear at time of RIA, dependent upon BREF notes Manpower involved in permit application: based on IPC evidence of 22 person-weeks		Cost of Levy payments: £405 million		£240 and £620 Increase in wholesale cost of energy: €8-11/MWh Access to New Entrant Reserve: £1030
Other costs (identify)	None stated	None stated	Service sector: £450 million Public sector: £150 million All costs to industry/public sector/businesses to be balanced by recycling of £1 billion revenue to result in at least no net impact on CCL sectors. Service and public sector to benefit from positive net impact.	None stated	Cost to consumers in relation to increased energy prices (see above)
Identification of distributional effects	None stated	None stated	No - not possible	None stated	None stated
Consultation	5 consultations: • July 1997 • Jan 1998 • Jan 1999 • Aug 1999 • April 2000 (brief consultation on final content of regulations)	During negotiation of agreements in 1999-2000	3 separate consultations: • 1998 - prior to publication of Lord Marshall report • 1999 - regarding compliance costs to business • 1999/2000 - draft legislation	None stated in RIA	Phase I consultations: • August 2003 • 2 consultations in 2004 regarding draft Phase I NAP
Identified consultees	Industrial sector representatives	Sector associations	Energy suppliers, customers	None stated	Businesses, NGOs, devolved administrations

Consideration of uncertainty	Yes - costs and impacts on businesses	None stated	Yes	None stated	Yes
Overall balance of costs and benefits	Consideration of costs and benefits and support from consultees in favour of options outlined in the RIA lead to recommendation that the proposals are implemented	Secretary of State satisfied that "the balance between cost and benefit is the right one in the circumstances"	Additional costs incurred by businesses arising from CCL significantly outweighed by economic, environmental, social and health benefits	Secretary of State satisfied that the benefits justify the costs	Uncertainties associated with the development of a new market mean that it is not possible to quantify the actual costs and benefits of the Scheme. It is clear that the cost of inaction on climate change potentially has much greater costs than those associated with the implementation and running of the EU ETS.
Comments	Brief RIA but does attempt to deal with significant issues such as small businesses	RIA only deals with the scope of the eligibility of facilities - no general RIA for CCAs	RIA includes elements for consideration regarding CCAs	Very brief RIA that does not quantify any benefits of the Scheme	Generally a thorough RIA. Well laid out in terms of options and scenarios.

Appendix 5: IPPC activities and PPC activity transposition dates

Annex I Categories of industrial installations referred to in Article 1 of Directive 96/61/EC Integrated Pollution Prevention and Control

1. Energy industries
1.1. Combustion installations with a rated thermal input exceeding 50 MW
1.2. Mineral oil and gas refineries
1.3. Coke ovens
1.4. Coal gasification and liquefaction plants
2. Production and processing of metals
2.1. Metal ore (including sulphide ore) roasting or sintering installations
2.2. Installations for the production of pig iron or steel (primary or secondary fusion) including continuous casting, with a capacity exceeding 2,5 tonnes per hour
2.3. Installations for the processing of ferrous metals:
(a) hot-rolling mills with a capacity exceeding 20 tonnes of crude steel per hour
(b) smitheries with hammers the energy of which exceeds 50 kilojoules per hammer, where the calorific power used exceeds 20 MW
(c) application of protective fused metal coats with an input exceeding 2 tonnes of crude steel per hour
2.4. Ferrous metal foundries with a production capacity exceeding 20 tonnes per day
2.5. Installations
(a) for the production of non-ferrous crude metals from ore, concentrates or secondary raw materials by metallurgical, chemical or electrolytic processes
(b) for the smelting, including the alloyage, of non-ferrous metals, including recovered products, (refining, foundry casting, etc.) with a melting capacity exceeding 4 tonnes per day for lead and cadmium or 20 tonnes per day for all other metals
2.6. Installations for surface treatment of metals and plastic materials using an electrolytic or chemical process where the volume of the treatment vats exceeds 30 m^3
3. Mineral industry
3.1. Installations for the production of cement clinker in rotary kilns with a production capacity exceeding 500 tonnes per day or lime in rotary kilns with a

production capacity exceeding 50 tonnes per day or in other furnaces with a production capacity exceeding 50 tonnes per day
3.2. Installations for the production of asbestos and the manufacture of asbestos-based products
3.3. Installations for the manufacture of glass including glass fibre with a melting capacity exceeding 20 tonnes per day
3.4. Installations for melting mineral substances including the production of mineral fibres with a melting capacity exceeding 20 tonnes per day
3.5. Installations for the manufacture of ceramic products by firing, in particular roofing tiles, bricks, refractory bricks, tiles, stoneware or porcelain, with a production capacity exceeding 75 tonnes per day, and/or with a kiln capacity exceeding 4 m^3 and with a setting density per kiln exceeding 300 kg/m^3

4. Chemical industry

Production within the meaning of the categories of activities contained in this section means the production on an industrial scale by chemical processing of substances or groups of substances listed in Sections 4.1 to 4.6
4.1. Chemical installations for the production of basic organic chemicals, such as:
(a) simple hydrocarbons (linear or cyclic, saturated or unsaturated, aliphatic or aromatic)
(b) oxygen-containing hydrocarbons such as alcohols, aldehydes, ketones, carboxylic acids, esters, acetates, ethers, peroxides, epoxy resins
(c) sulphurous hydrocarbons
(d) nitrogenous hydrocarbons such as amines, amides, nitrous compounds, nitro compounds or nitrate compounds, nitriles, cyanates, isocyanates
(e) phosphorus-containing hydrocarbons
(f) halogenic hydrocarbons
(g) organometallic compounds
(h) basic plastic materials (polymers synthetic fibers and cellulose-based fibers)
(i) synthetic rubbers
(j) dyes and pigments
(k) surface-active agents and surfactants
4.2. Chemical installations for the production of basic inorganic chemicals, such as:
(a) gases, such as ammonia, chlorine or hydrogen chloride, fluorine or hydrogen fluoride, carbon oxides, sulphur compounds, nitrogen oxides, hydrogen, sulphur dioxide, carbonyl chloride
(b) acids, such as chromic acid, hydrofluoric acid, phosphoric acid, nitric acid, hydrochloric acid, sulphuric acid, oleum, sulphurous acids
(c) bases, such as ammonium hydroxide, potassium hydroxide, sodium

hydroxide
(d) salts, such as ammonium chloride, potassium chlorate, potassium carbonate, sodium carbonate, perborate, silver nitrate
(e) non-metals, metal oxides or other inorganic compounds such as calcium carbide, silicon, silicon carbide
4.3. Chemical installations for the production of phosphorous-, nitrogen- or potassium-based fertilizers (simple or compound fertilizers)
4.4. Chemical installations for the production of basic plant health products and of biocides
4.5. Installations using a chemical or biological process for the production of basic pharmaceutical products
4.6. Chemical installations for the production of explosives

5. Waste management

Without prejudice of Article 11 of Directive 75/442/EEC or Article 3 of Council Directive 91/689/EEC of 12 December 1991 on hazardous waste (2):
5.1. Installations for the disposal or recovery of hazardous waste as defined in the list referred to in Article 1 (4) of Directive 91/689/EEC, as defined in Annexes II A and II B (operations R1, R5, R6, R8 and R9) to Directive 75/442/EEC and in Council Directive 75/439/EEC of 16 June 1975 on the disposal of waste oils (3), with a capacity exceeding 10 tonnes per day
5.2. Installations for the incineration of municipal waste as defined in Council Directive 89/369/EEC of 8 June 1989 on the prevention of air pollution from new municipal waste incineration plants (4) and Council Directive 89/429/EEC of 21 June 1989 on the reduction of air pollution from existing municipal waste-incineration plants (5) with a capacity exceeding 3 tonnes per hour
5.3. Installations for the disposal of non-hazardous waste as defined in Annex II A to Directive 75/442/EEC under headings D8 and D9, with a capacity exceeding 50 tonnes per day
5.4. Landfills receiving more than 10 tonnes per day or with a total capacity exceeding 25 000 tonnes, excluding landfills of inert waste

6. Other activities

6.1. Industrial plants for the production of:
(a) pulp from timber or other fibrous materials
(b) paper and board with a production capacity exceeding 20 tonnes per day
6.2. Plants for the pre-treatment (operations such as washing, bleaching, mercerization) or dyeing of fibres or textiles where the treatment capacity exceeds 10 tonnes per day
6.3. Plants for the tanning of hides and skins where the treatment capacity exceeds 12 tonnes of finished products per day
6.4. (a) Slaughterhouses with a carcass production capacity greater than 50 tonnes per day
(b) Treatment and processing intended for the production of food

products from:
- animal raw materials (other than milk) with a finished product production capacity greater than 75 tonnes per day
- vegetable raw materials with a finished product production capacity greater than 300 tonnes per day (average value on a quarterly basis)
(c) Treatment and processing of milk, the quantity of milk received being greater than 200 tonnes per day (average value on an annual basis)
6.5. Installations for the disposal or recycling of animal carcasses and animal waste with a treatment capacity exceeding 10 tonnes per day
6.6. Installations for the intensive rearing of poultry or pigs with more than:
(a) 40 000 places for poultry
(b) 2 000 places for production pigs (over 30 kg), or
(c) 750 places for sows
6.7. Installations for the surface treatment of substances, objects or products using organic solvents, in particular for dressing, printing, coating, degreasing, waterproofing, sizing, painting, cleaning or impregnating, with a consumption capacity of more than 150 kg per hour or more than 200 tonnes per year
6.8. Installations for the production of carbon (hard-burnt coal) or electrographite by means of incineration or graphitization

PPC Regulations: Activity categories and implementation dates

PPC ref	Activity	Transition deadline
6.1	Paper, pulp and board	February 2001
2.1	Ferrous metals	August 2001
3.1	Cement and lime	August 2001
2.2	Non-ferrous metals	December 2001
6.3	Tar and bitumen (depending on sub-group)	December 2001 March 2004
3.3	Glass and glass fibre	July 2002
3.4	Other mineral fibres	July 2002
6.4	Coating, printing and textile treatment	July 2002
6.8	Treatment of animal and vegetable matter and food industries (depending on sub-group)	July 2002 August 2004 March 2005
4.1	Organic chemicals (depending on sub-group)	March 2003 August 2003 March 2006 August 2006
3.6	Ceramics	March 2004
5.3	Disposal of waste other than by incineration or landfill (depending on sub-group)	March 2004 August 2004 August 2005
5.5	Production of fuel from waste	March 2004
6.2	Carbon activities	March 2004
2.3	Surface treating metals and plastic materials	July 2004
4.2	Inorganic chemicals (depending on sub-group)	December 2004 August 2005
4.7	Manufacturing involving carbon disulphate or ammonia	December 2004
5.4	Recovery of waste	March 2005
4.3	Chemical fertiliser	August 2005
5.1	Waste incineration	August 2005
1.1	Combustion	March 2006
4.4	Plant health products and biocides	March 2006
4.5	Pharmaceuticals	March 2006
4.6	Explosives	March 2006
1.2	Gasification, liquefaction and refining	August 2006
3.2	Asbestos	August 2006
6.6	Timber	August 2006
6.9	Intensive farming	January 2007
5.2	Landfill	March 2007

IPPC reference codes used by EPER

1	**Energy industries**
1.1	Combustion installations > 50 MW
1.2	Mineral oil and gas refineries
1.3	Coke ovens
1.4	Coal gasification and liquefaction plants
2	**Production and processing of metals**
2.1/2.2/2.3/2.4/2.5/2.6	Metal industry and metal ore roasting or sintering installations, Installations for the production of ferrous and non-ferrous metals
3	**Mineral Industry**
3.1/3.3/3.4/3.5	Installations for the production of cement klinker (>500t/d), lime (>50t/d), glass (>20t/d), mineral substances (>20t/d) or ceramic products (>75t/d)
3.2	Installations for the production of asbestos or asbestos-based products
4	**Chemical industry and chemical installations for the production of:**
4.1	Basic organic chemicals
4.2/4.3	Basic inorganic chemicals or fertilisers
4.4/4.6	Biocides and explosives
4.5	Pharmaceutical products
5	**Waste management**
5.1/5.2	Installations for the disposal or recovery of hazardous waste (>10t/d) or municipal waste (>3t/h)
5.3/5.4	Installations for the disposal of non-hazardous waste (>50t/d) and landfills (>10t/d)
6	**Other Annex I activities**
6.1	Industrial plants for pulp from timber or other fibrous materials and paper or board production (>20t/d)
6.2	Plants for the pre-treatment of fibres or textiles (>10t/d)
6.3	Plants for tanning of hides and skins (>12t/d)
6.4	Slaughterhouses (>50t/d), plants for the production of milk (>200t/d), other animal raw materials (>75t/d) or vegetable raw materials (>300t/d)
6.5	Installations for the disposal or recycling of animal carcasses and animal waste (>10t/d)
6.6	Installations for poultry (>40000), pigs (>2000) or sows (>750)
6.7	Installations for surface treatment or products using organic solvents (>200t/y)
6.8	Installations for the production of carbon or graphite

Source: European Environment Agency (2008)

Appendix 6: Climate Change Agreement sectors

				Adjustment made in 2004 on subsequent targets (% increase/decrease)			
Sector	Type of Agreement	Baseline year	2010 target in 1st target period	2006	2008	2010	Installations in EU ETS
Aerospace	*Absolute energy*	2001	8.5%	1	1	1	4
Agricultural Supply	Relative energy	1999	7.1%	3	3.5	4	0
Aluminium	*Relative carbon*	1990	32.2%	5.6	4.6	5.7	1
Brewing Industry	Relative energy	1999	11.6%	2	2	3.5	1
Cathode Ray Tubes	Relative energy	2000	21%	Sector withdrew from agreement			
Cement	Relative energy	1990	25.6%	0	0	1.5	4
Cementitous Slag	Relative energy	1999	10%	6.1	5	4.3	0
Ceramics - non fletton	Relative energy	2000	12.4%	0.5	0.5	1.1	12
Ceramics - fletton	Relative energy	2000	8.1%	-11.5	-11.5	-11.5	0
Ceramics - refactories	Relative energy	2000	10.33%	0.5	0.5	1.1	1
Ceramics - white wares	Relative energy	2000	10.22%	6.7	6.7	6.9	0
Ceramics - materials	Relative energy	2000	10.1%	12.3	12.5	12.7	0
Chemical Industries	Relative energy	1998	18.3%	3.6	3.5	4	49
Craft Bakeries	Relative energy	1999	9%	18	20	22.1	0

Dairy	Relative energy	1999	9.2%	2.25	3.5	4.5	7
Egg Products (NFU)	Relative energy	1995-2000	11.5%	32	34.2	36.6	0
Egg Products (BEPA)	Relative energy	1999	9.3%	11.7	16.1	17.2	0
Food and Drink	Relative energy	1999	8.1%	2	2.5	3	15
Foundries	Relative energy	1999	11%	0	0	0	0
Glass	Relative energy	2000	9.2%	1	2	3.5	4
Gypsum Products	Relative energy	1999	7.2%	0	0	1	0
Leather	Relative energy	2000	9.8%	0	0	10	0
Lime	Relative energy	1999	7.9%	0	-0.48	1.0	3
Maltings	Relative energy	1998	7.8%	0.2	0.6	1.1	3
Metal Packaging	*Relative carbon*	1999	9%	1	1	2	0
Metal forming	Relative energy	1999	7%	16	17.3	20	0
Mineral Wool	Relative energy	2000	14.9%	0	0	1	2
Motor Manufacturers and Traders	Relative energy	1999	15.3%	3	3	4	12
Non Ferrous	Relative energy	1995	14.7%	7.67	6.88	6.15	1
Paper	Relative energy	1998	24%	2.78	2.21	2.6	2
Pig Rearing	Relative energy	1997	16%	11.3	10.6	11.0	0
Poultry Meat Processing	Relative energy	1995-2000	12.5%	1.5	2.5	3.9	2

Poultry Rearing (BPC)	Relative energy	1999	13.7%	1.6	4.3	6.4	0
Poultry Rearing (NFU)	Relative energy	1999	13.7%	22.7	22.7	22.7	0
Printing	Relative energy	2000	12%	3	3	4	0
Red Meat	Relative energy	1999	10.8%	0	0	0	0
Rendering	Relative energy	1999	9%	2.5	2.5	2.5	0
Rubber Tyre Manufactures	Relative energy	1999	10.3%	12.6	12.6	12.6	0
Semiconductors	Relative energy	2000	59%	0	0	0	1
Spirits	Relative energy	1999	4.5%	1	1	2	2
Steel	*Absolute energy*	1997	11.5%	3.25	1.28	0.22	4
Supermarkets	*Absolute energy*	1999	4.5%	4	4	6	0
Surface Engineering	Relative energy	1999	10.3%	10.8	10.7	10.8	0
Textiles	Relative energy	1999	9%	3	3	3	3
Vehicle Builders and Repairers	Relative energy	2000	10%	**Sector withdrew from agreement**			
Wallcoverings	*Absolute energy*	1999	9%	1.48	1.68	1.88	0
Wood Panel	Relative energy	1999	7.3%	1.87	3.92	6.02	4

Appendix 7: UK ETS Direct Participants

United Kingdom Greenhouse Gas Emissions Trading Scheme Direct Participants

Company name	Total value of incentive payments
Asda Stores Ltd	£4269000.00
Barclays Bank plc	£460903.32
Battle McCarthy	£537169.05
Britoil plc	£13589229.51
British Airways plc	£6365973.60
British Sugar plc	£5337000.00
Budweiser Stag Brewing Company Ltd	£229736.50
Dalkia Energy & Technical Services Ltd	£490790.52
Dalkia Utility Services Ltd	£1195488.00
Dana Spicer Europe Ltd	£267703.92
First Hydro Company	£14602032.00
Ford Motor Company Ltd	£637824.87
Fortum O&M (UK) Ltd	£354270.06
GKN (United Kingdom) Ltd	£485400.15
Imerys Minerals Ltd	£1498469.49
The Indesit Company	£234774.63
Ineos Fluor Ltd	£42996739.95
Invista Textiles (UK) Ltd	£26200987.47
Kirklees Metropolitan Council	£53049.78
Lafarge Cement UK	£12708731.25
Land Securities	£51021.72
Lend Lease Real Estate IS Ltd	£52035.75
Marks & Spencer plc	£106206.30
Mitsubishi Corporation (UK) plc	£13342.50
Motorola	£266850.00
Natural History Museum Trading Co	£48248.48
Rhodia UK Ltd	£22860292.32
Rolls Royce	£1020381.03
Royal Ordnance plc	£293535.00

Shell UK Ltd	£21844180.89
Somerfield Stores Ltd	£264715.20
Tesco Stores Ltd	£3949380.00
UK Coal Mining Ltd	£14848921.62

Appendix 8: EU ETS Activities

European Union Emissions Trading Scheme Phase I: Participating sectors and number of installations in the United Kingdom

Sector	Number of installations (at end of 2007)
Cement	15
Ceramics	18
Chemicals	67
Engineering and Vehicles	35
Food, Drink and Tobacco	59
Glass and Mineral Wool	10
Iron and Steel	12
Lime	4
Non-ferrous Metals	2
Offshore	111
Other	9
Other Oil and Gas	35
Power stations	125
Pulp and Paper	6
Refineries	12
Services	230
Total	**753**

European Union Emissions Trading Scheme Phase II: Participating sectors and number of installations in the United Kingdom

Sector	Number of installations (at end of 2007)
Aluminium	1
Cement	15
Ceramics	77
Chemicals	97
Downstream Gas	34
Food and Drink	123
Glass	26
Iron and Steel	14
Large Electricity Producers	62
Lime	9
Offshore	108
Other Electricity Producers	66
Others A (Gypsum, Mineral Wool including Rock Wool)	14
Others B (Aerospace, Vehicles, Semi-Conductors, Woodboard)	44
Others C (Munitions, Textiles, Tobacco, other non-metallic minerals)	16
Pulp and Paper	64
Refineries	13
Services	138
Total	**922**

Appendix 9: Summary of Assessments and Evaluations

	Sub-criteria	Pollution Prevention and Control Regulations	Climate Change Agreements	UK Emissions Trading Scheme	EU Emissions Trading Scheme (Phase I)
Government-led/commissioned ex post evaluation	Date published	(A) 2005-2007 and (B) 2007	n/a	(A) 2004 and (B) 2006	2005
	Conducted by (internal/external)	A: Internal (European Commission and Member State governments B: External (Atkins consultants)	n/a	External A: NERA consultants (2004) B: Enviros consultants (2006)	External (Ecofys and McKinsey & Company) and internal (European Commission DG Environment)
	Scope	A: Proposals to recast 7 existing EU Directives into one 'coherent' Directive To integrate the following Directives: IPPC, Large Combustion Plants, Waste Incineration Directive, Solvents Emissions Directive, 3 Directives relating to titanium dioxide B: To quantify the costs and benefits of IPPC (as implemented through the PPC Regulations) to industry and government in the UK	n/a	A: To review the performance of the Scheme during the first two years To review market activity To evaluate how the Scheme has achieved it 3 primary goals (deliver emission reductions, first mover advantage, establish City of London at international centre of emissions trading expertise) B: To establish which features could be carried over to a new scheme and highlight where improvements could be made	To summarise the responses from a survey undertaken by McKinsey

		To identify the regulatory burden of the Regulations and the impact on small businesses		To explore any differences or similarities between the environment in which the UK ETS was developed and current circumstances	
	Consultees	A: Member States - analysis of IPPC implementation progress reports B: Individual firms	n/a	A: Direct Participants, brokers and verifiers B: Direct Participants, brokers, verifiers, NGOs, consultants, Carbon Trust	Companies, government bodies, industry associations, market intermediaries and NGOs
	Key conclusions and recommendations	A: Analysis and results of consultation and review awaiting publication B: Considerable uncertainty remains over the costs and benefits of IPPC Little evidence of the impact of IPPC on competition IPPC has lead to greater resource efficiency Most companies believe IPPC is more burdensome that the previous IPC regime Smaller companies feel most disadvantaged by IPPC with larger firms benefiting from IPPC when trying to access new markets	n/a	A: UK ETS provided good experience of verification of GHG emissions The Registry is transparent and easy to use Difficult to differentiate between emission reductions arising directly from the Scheme and reductions that would have happened anyway CCA participation made the market highly cyclical (ebbs and flows in trading) The auction did not work well (demonstrated by the difference between incentive price and market price) In presence of low allowance prices companies still preferred to abate	Most stakeholders rank long-term topics as the most important topics (although market intermediaries rank short-term topics as most important) Long-term development of rules has a short-term impact and uncertainty is seen as one of the biggest obstacles to liquidity in the market Survey responses do not provide enough evidence to suggest that an alternative allocation methodology to grandfathering, such as benchmarking or auctioning, would be any less controversial However, there is a clear divide between industry, who prefer benchmarking,

				emissions rather than purchase allowances (reasons for which are unclear) B: UK ETS provided valuable experience in emissions trading to Direct Participants Wide range of Direct Participants reported investments arising from UK ETS Monitoring, reporting and verification costs are generally believed to be balanced The time-scale allowed for participants to gain an adequate understanding of the operation of how the Scheme worked	and governments/NGOs/ market intermediaries who would prefer auctioning Companies found their feedback to governments on NAPs was unsatisfactorily reflected into revised Plans. Conversely, governments found feedback from companies difficult to incorporate in revised Plans. This indicates a clear need for trade-offs between the two groups
	Provisions for further review of evaluation	No	n/a	No	No
	Evidence/documentation relating to implementation of recommendations	None	n/a	None	None
Other ex post evaluation (e.g. NAO, Carbon Trust)	Conducted by (internal/external)	n/a	National Audit Office	National Audit Office	Carbon Trust EU Commission & DG Environment
	Purpose of review	n/a	To review the impact of the Climate Change Levy and the Climate Change Agreements	To review the performance of the UK ETS during the first two years of operation	Carbon Trust (3 ex post reviews): A: To review the competitiveness impact of

					the EU ETS and to analyse options for Phase II B: To review the implications of the existing allocation methodology on the creation of a carbon price and the incentives for investment in low carbon technology C: To review the impacts of EU ETS on profitability and trade of EU ETS sectors
	Date	n/a	August 2007	April 2004	A: June 2006 B: May 2007 C: January 2008
	Scope	n/a	Analysis of the impact of CCL and CCAs on energy consumption with a view to providing guidance on the role of the policies in future climate policy	To analyse the performance to date and provide recommendations regarding improvement f the Scheme in the last 2.5 years of operation	A: To focus on three areas that are of fundamental importance to UK and EU industry: Phase II allocations; profits, costs and competitiveness of industry; and the design of the Scheme post-2012 B: To analyse the impact of Phase II allocations on the ability of EU ETS to deliver its key objectives: a stable carbon price, incentives investment in low carbon technology and deliver emission reductions C: To deepen previous knowledge of the impacts of the EU ETS on

					manufacturing, with particular emphasis on the impact of carbon prices, and the inclusion of all on-site emissions (from processes and other activities) on the competitiveness and profitability of EU ETS sectors
	Consultees	n/a	Industry, sector associations, Government departments	Direct Participants, Defra, sector associations, expert advisory panel, verifiers, brokers, Corporation of London, US Environmental Protection Agency, Chicago Climate Exchange, Enviros, Ecosecurities, and DG Environment	**A:** Verified data from 2005 and studies undertaken by Climate Strategies **B:** Data analysis from Phase I emissions/prices and Phase II allocations **C:** Data from Climate Strategies
	Key conclusions	n/a	CCAs will result in significantly fewer emissions savings compared to initial projections Many targets are too lenient and subsequent efforts by Defra to tighten targets are disappointing A key beneficial outcome of CCAs is an improvement within managerial knowledge and understanding of the importance of managing energy efficiently	UK ETS is a novel instrument Wider benefits for UK may be less than hoped for In some cases Direct Participant emissions were already below the baseline prior to the start of the Scheme An alternative approach to the auction may have been more effective Only 66% of emission reductions from four large	**A:** Identification of 7 key challenges for Phase II: • In the presence of price instability companies delay investment, particularly in low-carbon technologies • Governments should not interfere with the trading scheme ex post in terms of changing rules - this increases instability, undermines any incentive to abate emissions and could be subject to legal challenges • Withdrawing

			Industry is divided on the overall impact and implications of the policy	Direct Participants can be attributed to the UK ETS	allowances from site closures created perverse incentive for firms to keep old, inefficient installations open. This may be prevented by giving free allocations to new, cleaner installations • Free allocations may lead companies to believe high emissions will be rewarded in the next phase • The power sector made excessive profits in Phase I • Allocating based on BAU projections can lead to lobbying on emission projections and provides no incentive for other sectors (beyond power) to abate emissions) • High levels of CDM and JI projects (and subsequent high level of credit generation) could undermine EU ETS prices B: • Phase I of the EU ETS was fraught with difficulties relating to allocations, carbon price and an

					insufficient time frame to revise Phase II NAPs in light of Phase I verified data • Prices may be heavily influenced in Phase II by CDM/JI credits • The Commission has brought NAPs closer to Member State Kyoto targets - the Commission made a significant achievement in reducing the 'light touch' Plans from Germany and several other Member States • The rules of the Scheme, particularly regarding closures, entrants, perverse incentives and allocations to the power sector, threaten to undermine the ability of EU ETS to provide consistent financial incentives to invest in low carbon technology • Free allocations have led, and will probably continue, to provide vast financial gains for the power sector which could be reduced with greater use of auctioning • While many NAPs

					have improved in terms of transparency and through increasing use of benchmarking and auctioning, many still reflect Phase I NAPs hinting at a degree of inertia • Lack of long-term certainty reduces incentives for investment in low carbon technology • There is a degree of regulatory capture as industry has successfully negotiated BAU allocations for Phase II - this could be reduced through auctioning C: • Identification of 20 activities out of 159 that face more than 4% increase in input costs if required to pay full cost of carbon allowances at €20/tCO2 • Two sectors are particularly vulnerable: cement and steel • If the cement sector was required to pay full allowance cost this

					would easily surpass the existing transportation cost barrier to imports • As a major exporter steel would be most exposed if the cost of allowances/carbon was passed on to the price of export although this sector is already feeling the effects of relocation of production as transport costs decrease and carbon costs increase • The overall effect may be one of leakage to countries with less stringent carbon policies • However, both industries claim that manufacturers would pass on very little carbon cost as a means to maintain production in UK, reducing the possibility of leakage
	Key recommendations	n/a	No explicit recommendations made	Future scheme require greater technical advice and consultation to prevent some participants unduly benefiting Participants should be given enough time to prepare for	A: Recommendations for Phase II allocations: • Allocate below BAU projections, considering sector exposure to competition • Benchmarking were

				future emissions trading schemes The size of pilot programmes should be carefully considered - a smaller auction may have been sufficient to learn lessons as lower cost Requiring participants to provide information on their costs could help future policy development Risk management procedures accounting for conflicts between policies need to be strengthened	possible for incumbent installations but not for new entrants • Use auctions to stabilise carbon price and promote transition to low carbon economy B: • There needs to be an independent authority (e.g. the Commission) to judge allocations, a position much strengthened following the victory over some Member States (e.g. Germany) in the wake of overly-generous NAPs • The introduction of aviation will prove to be beneficial to the scheme • Allocations based on 'need' only serves to provide short term protection to industry when it should be adjusting to operating in a low carbon economy C: No policy recommendations as such - the report focuses on analysing the impacts of auctioned allocation on

					competitiveness as guidance for policy makers without providing specific policy recommendations
	Further review of evaluation	n/a	Government (through Defra) currently establishing the form of post-2013 CCAS	Final review of the Scheme was undertaken in 2006 by Enviros This final review did not evaluate whether the recommendations of the NAO report had been adopted	All three reports form part of a continuing series of EU ETS analysis undertaken by Carbon Trust
	Evidence/documentation relating to implementation of recommendations	n/a	n/a	Defra negotiated further emission reduction commitments from 6 large players within the UK ETS in 2004 following NAO criticism	n/a