



Department
of Energy &
Climate Change

Evidence Review of the Impact of Central and Public Disclosure Methods for Reporting Energy Use and Energy Efficiency

Eunomia Research & Consulting Ltd

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Any enquiries regarding this publication should be sent to us at Philip.Collins@decc.gsi.gov.uk

Executive summary

Eunomia is pleased to present this 'Evidence Review on the Impact of Central and Public Disclosure Methods for Reporting Energy Use and Energy Efficiency', undertaken on behalf of the Department of Energy and Climate Change (DECC).

Article 8 of the European Union (EU) Energy Efficiency Directive (2012/27/EU) requires Member States to establish an energy audits regime under which all large (non-SME) enterprises conduct an audit by December 2015 and, thereafter, once every four years.¹ The 'Energy Savings Opportunity Scheme' (ESOS) is the Government's proposed approach to implementing the requirements of Article 8. Under the scheme, approved assessors will carry out Article 8 compliant ESOS assessments (audits) to identify energy saving recommendations. The Government consultation of the proposed approach included a range of potential reporting options for non-SMEs to register compliance with the scheme.²

The core objectives of this piece of research are to:

- Identify any organisational incentives, attitudes, and behaviours that are likely to arise according to different ESOS reporting requirements; and
- Inform DECC with regard to which of the reporting options proposed in its Impact Assessment (IA) would be most effective at delivering the objectives of ESOS, the goals of which can be summarised as being:³
 - To enable the UK to meet the requirements of Article 8 within the EU Energy Efficiency Directive; and
 - To drive energy efficiency and energy reduction among non-SMEs in the UK.
- Highlight whether sufficient evidence exists to clearly demonstrate that there are different quantified impacts which result from different types of scheme.

¹ The Directive defines a SME as an enterprise with less than 250 employees and either an annual turnover of less than €50m or an annual balance sheet less than €43m (or both). This includes private and non-profit sector enterprises, but not the public sector

² Department of Energy and Climate Change (2013) *Energy Savings Opportunity Scheme (ESOS): Consultation on Implementation of Article 8 of the European Union Energy Efficiency Directive ('Energy Audits')*, July 2013, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211977/20130708_-_ESOS_Consultation_Document_FINAL.pdf

³ Department of Energy and Climate Change (2013) *Energy Savings Opportunity Scheme: Impact Assessment*, May 2013, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211471/130521_Energy_Audits_IA_v28_clean.pdf

Two issues affected the quality and relevance of available evidence, namely:

1. Evidence from other research ‘themes’ cannot easily be transferred to energy efficiency

The scope of the research went beyond energy efficiency reporting to include several additional research ‘themes’. The four additional themes are Greenhouse Gases (GHG), Non-Energy Environmental (NEE), ‘Financial’ and ‘Social’.

Financial reporting and disclosure has relevance to energy efficiency due to the focus on costs. Investor behaviour has been increasingly shown to be influenced by ‘non-financial’ performance data, such as consumption and environmental impact. For some businesses, however, energy consumption is a minor part of the total cost base, and therefore less relevant to investment analysts and boards, aside from companies within the most energy intensive industries. Financial reporting and disclosure is very mature and already occupies *the* central position within the boardroom, where non-compliance incurs immediate financial penalty. This is in stark contrast to reporting of energy efficiency performance.

Much of the evidence under the Social theme is drawn from research relating to corporate sustainability reporting (CSR). The focus of enquiry of the vast majority of this research is upon how companies’ financial (rather than environmental) performance is impacted by CSR reporting. Whilst the transferability of this evidence has limited application to the goals of this research, some relevant analysis has been undertaken with regard to the impacts of ‘self-selection’ of information for voluntary public disclosure.

The above discussion demonstrates that whilst we have provided analysis of the evidence base, caution should be exercised when considering it in the context of ESOS.

2. The existing evidence base provides a limited reference point for informing certain aspects of ESOS design

- a. There is limited evidence which specifically considers the theme of Energy Efficiency (EE) in relation to on-going company operation and growth, which ESOS is primarily concerned with.

The majority of evidence relates to EE and buildings, in the specific context of property value and the buying and selling of property. Most reporting schemes within the EE theme are relatively immature, such that there is a lack of historical empirical data which might be used to help demonstrate causality.

- b. As set out in detail above, the transferability of information from other themes comes with significant caveats
- c. Some aspects of scheme design could be regarded as transferrable

In our analysis of perceived impacts of different schemes (irrespective of analysis of causality), we have split the information on all schemes according to their key features, into six scheme ‘types’. There are many different ‘hybrids’ within each scheme type (for example, some schemes may require selective reporting of information, which renders the scheme neither a central reporting scheme nor a public disclosure scheme), along with other external variables, incentive and enforcement regimes which differ across schemes. Whilst certain aspects of schemes, such as whether the information is centrally or publicly reported, are not addressed specifically in the literature, other aspects, such whether the

scheme is voluntary or mandatory, are attributed as drivers to the effectiveness of the scheme.

- d. There is limited relevant evidence which effectively demonstrates direct causality between a reporting scheme and environmentally beneficial behaviour change.

Many authors have studied the impacts of schemes simply by observing whether there is a direct relationship between the introduction of a scheme and environmentally beneficial change. There are fewer studies that have attempted to isolate the specific drivers of behavioural change and therefore quantify to what extent this can be attributed to the scheme itself and not to the influence of other drivers.

Based on the results presented in many studies listed throughout this report, an important question to answer is whether there has been appropriate consideration of the *counter-factual* argument in all cases. Hence, a study that can separate out the energy (or environmental or carbon-related) factor from the rest is the one that will actually be able to tell us which of the market forces companies are reacting towards.

The only evidence relevant to ESOS that delivers evidence based on a reliable counter-factual is found in a study of the electricity market in the US. In this study electricity comes in one form – and the effect of changing the fuel mix will not affect the kW that customers receive as a ‘product’. Furthermore, the researchers ‘controlled’ for a series of other variables. Consequently, a large proportion of the change seen as a result of companies disclosing fuel mix information could be attributed to the companies’ assumptions about the market’s valuation of a fuel mix which is (potentially) lower in fossil fuels.

This study, however, was relatively unique in the commercial energy sector, and related to just one scheme. Other suggestions of causal links within the literature are almost exclusively based upon ‘expert opinion’ and survey results, without any accompanying quantitative demonstration of behavioural change. Whilst such approaches do add strength to specific pieces of evidence (particularly in instances whereby a number of credible experts are cited), without quantitative evidence, direct causality cannot be fully demonstrated.

Within the context previously provided, the key findings from this study are summarised as follows:

1. Mandatory reporting appears to deliver greater and wider benefits than voluntary reporting

Although there is limited evidence of causality, the available evidence base suggests that the more comprehensive reporting requirements which are driven by mandatory reporting of information leads to greater benefits due to the more informed decisions made by various stakeholders.

The literature demonstrates several ways in which public disclosure can have broader benefits in this context. These benefits include: the potential for growth in (non-energy) consumption and employment by increasing the need for both energy auditors and the installation of new efficient equipment; better investment decisions as a result of improved information; greater public pressure which motivates positive behavioural change among organisations; and greater credibility for the regulator from increased compliance with the relevant environmental

standards, which can also have the positive effect of lowering enforcement costs allowing the regulator to concentrate its enforcement efforts on more serious polluters.

In the context of mandatory central reporting (i.e. without public disclosure of information), there is also reason in the literature (largely based on theoretical logic, rather than primary evidence) to suggest that more comprehensive reporting requirements will lead to more informed decision-making by Government. This is due to the ability for centrally stored data to help with the development of new policies and policy priorities. Having a good reporting system with relevant information coming to authorities in a usable format allows for analysis and policy development that targets areas which require the most intervention.

2. Public disclosure alone is not likely to drive significant behavioural change on energy use

As mentioned above, for companies, in contrast to evidence presented under the GHG and NEE themes, the literature suggests that the reputational driver for energy efficiency is generally relatively weak. Consequently, issues relating to energy efficiency specifically are rarely considered by senior decision-makers, although external reporting may serve to promote energy efficiency as a board level issue.

Furthermore, the evidence suggests that voluntary public disclosure alone will have less of an impact on behavioural change than other reporting options. This is because the lower reputational driver in the EE sector limits the effects of 'outing' those companies which do not choose to publicly disclose information.

It should be noted, however, that there is evidence which suggests that public disclosure required as part of a wider scheme which might, for example, also inform a company about opportunities for energy savings, is likely to encourage behaviour change.

3. Mandatory board-level sign-off could help drive investment in energy efficiency

Whilst the evidence is not substantial, a number of studies show that board interest is a key driver in increasing energy efficiency. The lack of reputational driver (and limited financial driver relative to wider cost issues for most businesses) for energy efficiency performance is such that public disclosure does not appear to guarantee board level interest.

The link between reporting to boards and take-up of energy efficiency improvements was only explored by one survey-based study. Within this survey, it was found that a significant majority of those who had found lack of board interest to be a barrier to energy efficiency improvements no longer experienced this barrier following participation in a scheme which mandated board approval of a public report on energy efficiency. This suggests, therefore, that mandating board sign-off would help drive investments in energy efficiency.

4. Requiring structured reporting formats could help to improve the quality of information in voluntary public disclosure regimes

A potential disbenefit of voluntary reporting schemes is that they can be subject to 'Green-wash'. Both empirical and theoretical studies have suggested that, in general, firms will only voluntarily disclose information when it is in their economic interests to do so. The effect of 'Green-washing' can lead to numerous negative impacts for voluntary reporting schemes, for example: rendering voluntary disclosure as a symbolic gesture; eliciting a false confidence from the public and investors in firms' environmental performance; and possibly delaying the implementation of effective mandatory regulation.

At the same time, where voluntary disclosure is not regarded as 'green-wash', it can result, in the longer term, in an improvement in a company's stock market value. Consequently, structured reporting formats, such as that adopted under the Australian Energy Efficiency Opportunities (EEO), can reduce the chance of real or perceived green-wash. As discussed, below, 'benchmarking' is also important in this context.

It should be noted, however, that such structures may need to be carefully designed to avoid placing significant cost burdens on companies which might already have effective reporting mechanisms in place.

5. Greatest benefit is likely to be derived from ensuring public disclosure schemes are low volume, high quality and in a comparable format

The literature suggests that the disclosure of a smaller amount of quality information can have a stronger effect upon company reputation than disclosure of a larger amount of lower quality information. Similarly, there is good evidence to suggest that disclosure presented in a form accessible to the general public is more likely to lead to improved performance than simple dissemination of large quantities of raw data. Furthermore, high quality, low volume data (whether publicly disclosed or not) is more likely to be of more use to members of the reporting organisation.

The available evidence also suggests that comparability is important; dissemination of data sets relating to individual companies do not provide accessibility or context in the same way as information by which companies can be compared. There is evidence to suggest that, albeit less in the EE theme than in others, perceived poor performance has an adverse effect on 'reputation' and equity value, which then encourages companies to improve performance.

6. There is limited evidence to suggest that central reporting alone is effective in delivering improved outcomes

There is some evidence to suggest that centrally managed schemes produce positive outcomes for companies, including improved internal data management and more employee engagement in environmental matters. The marginal benefits of reporting to a central body, however, to be distinguished from reporting externally in general, are difficult to evaluate. Indeed, there is very little evidence of reporting schemes in the themes chosen that would not involve some partial dissemination of the information to a wider audience, which further constrains offering any definitive view on this issue.

7. Central reporting without any voluntary element must be well-enforced to deliver behavioural change

A substantial number of studies have analysed the factors that motivate firms to participate in voluntary schemes. These studies generally assume that firms are acting in an economically rational manner; that is, their decision to participate is based on the expectation of net-benefits for their firm. The literature suggests that the main determining factors of whether companies will participate in voluntary disclosure schemes are perceived enhanced reputation, stakeholder pressure, competitive pressures and benchmarking, regulatory pressure (which might occur through non-voluntary participation), past environmental performance, company size and perceived technical feasibility of delivering improvements.

In this context, a potential flaw in central mandatory reporting is highlighted by a limited number of studies in that it engages none of the drivers listed above for voluntary schemes, such as public reputation. Consequently, in situations whereby there is no perceived reputational

consequence or penalty due to non-compliance, the resulting data quality and actual participation may suffer.

8. Higher costs will be incurred where schemes are complex and diverge from Business As Usual (BAU) reporting practices. Reputational risk is likely to increase costs.

Evidence in relation to the question of costs is limited to reported figures gathered from surveys of companies currently taking part in a number of schemes as well as modelling of proposals for new schemes. In general, costs associated with measurement and reporting of environmental impacts are not often split according to the business activity to which they relate. Even in the cases where this is attempted, the range of values and the large differences between the schemes they represent can often be relatively large, such that they only provide a vague indication of the costs associated with participation in various reporting or disclosure schemes.

What can be seen from the evidence, however, is that there are various aspects of programme design that will likely affect the costs involved in compliance. First of all, it is likely that the more complicated, extensive and prescriptive a scheme's reporting methods are, the longer it will take for companies to complete and therefore the more it will cost. Furthermore, it is also expected that requiring board level approval will result in companies incurring additional cost, though it should be noted that it is unclear what proportion of companies would do this anyway, in other words, the additional costs associated with this requirement is unclear. Furthermore, the little data there is on such costs, is somewhat inconsistent.

Related to the above, it is thought that there may be a slight increase in costs associated with schemes requiring public disclosure, either due to the extra care taken in presenting a report that may directly influence a company's reputation or due to the higher likelihood of such a report requiring board level approval, albeit the evidence to back this up is very limited. As the evidence shows that reputation is a smaller driver for energy efficiency than for greenhouse gas or environmental reporting, it is likely that the effect of public disclosure on costs will be less for schemes relating to energy efficiency than to other themes.

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Table G 1: Glossary of Terms

Term	Description
BASEL 2	International banking supervision accord (Capital Requirements Directive)
BAU	Business as Usual
Boomerang effect	Where disclosure of energy consumption information compels users to consume more energy if they see that they are relatively low users compared with, for example, their neighbours.
CBA	Cost benefit analysis
CCA	Climate Change Agreement
CCR	consumer confidence reports (CCRs)
CDP	Carbon Disclosure Project
Central Reporting	The provision of information to a central body or organisation which is not generally disclosed to the public (except potentially in anonymised formats, such as for benchmarking, or which may be available as part of a ‘freedom of information’ (FOI) request). This may include programmes where information is disclosed to a select group of people, which might be a governmental body, a company’s shareholders, customers or investors. Within each scheme, if any of these groups are intended to access such information it is usually as an integral part of the scheme, rather than on an ad-hoc post-implementation basis.
COD	Chemical oxygen demand
CPI	Confederation of Paper Industries
CRC	Carbon Reduction Commitment
CSR	Corporate Social Responsibility
DEC	Display Energy Certificate
Disclosure	Any information which is in the public domain, i.e. accessible to any member of the public. It does not necessarily have to be promoted or otherwise be advertised to be considered to be in the public domain.
DUKES	Digest of UK Energy Statistics
EE	Energy Efficiency theme
EEO	Energy Efficiency Opportunities Program (Australia)
EMAS	EU’s Eco-Management and Audit Scheme
EMS	Environmental Management System
EPC	Energy Performance Certificate
EPER	EU’s Pollutant Emissions Register
ESOS	Energy Savings Opportunity Scheme
ETS	Emissions Trading Scheme
FTSE100	Top 100 companies listed on the stock exchange
Greenwash	Misleading or unreasonably bold claims of environmental performance made public by organisations

GHG	Greenhouse Gases
GRI	Global Reporting Initiative
GRP	India's Green Rating Project
HVAC	Heating, Ventilation and Air-Conditioning
IEA	International Energy Agency
IEMA	Institute of Environmental and Management Assessment
IFRS	International Financial Reporting Standards
IPPC	Integrated Pollution Prevention Control law
ISO14001	International Standards Organisation - Environment Management Standard
LEED	Leadership in Energy and Environmental Design
MWh	Megawatt-hour
MOE	British Columbia's Ministry of Environment
MPA	Mineral Product Association
MVRM	Multivariate regression modelling
NEE	Non Energy Environmental theme
NGER	National Greenhouse and Energy Reporting
NGO	Non-Government Organisation
NPI	Australia's National Pollutant Inventory
NPI	Australia's National Pollutant Inventory
NPRI	Canada's National Pollutant Release Inventory
OECD	Organisation for Economic Cooperation and Development
PERP	Performance evaluation and ratings program
PERP	performance evaluation and ratings programs (developing countries)
PJ	Petajoule
PLC	Public Limited Company
PROFEPA	Procuraduría Federal de Protección al Ambiente (Mexico)
PROPER	Program for Pollution Control Evaluation and Rating in Indonesia
PRTR	Pollutant Release and Transfer Register
REA	Rapid Evidence Assessment
SDWA	U.S. Safe Drinking Water Act
Solvency II	EU Directive - insurance solvency risk controls
TRI	US Toxics Release Inventory
TSS	Total suspended solids
U.S. 33/50 Program	US chemical reduction programme targeting the release and transfer of 17 toxic chemicals.
UK GAAP	UK Generally Accepted Accounting Practice
US EPA	US Environmental Protection Agency

1.0 Research Methodology

1.1 Research Objectives

The core goal of this study is to help DECC understand whether different approaches to reporting to ESOS are likely to prompt behaviour change and higher take-up of energy efficiency measures that support the attainment of their policy objectives (that would not happen otherwise).

The study also aims to identify any organisational incentives, attitudes, and behaviours that are likely to arise according to different reporting requirements. Such issues are highlighted in a recent report undertaken on behalf of DECC assessing the factors influencing energy behaviours in the non-domestic sector.⁴ The report considered companies' attitudes to energy management, pointing to a number of factors that helped or hindered investment in energy efficiency, such as perceived investment risk, lack of senior profile, and specific issues concerning the size and sector of the respective organisations. It did, however find that accounting for energy performance could be a significant accelerator for improvements within organisations. This study seeks to explore these issues within the specific context of different reporting methods.

1.2 Overview of Research Method

The approach to this study can broadly be defined as a 'Rapid Evidence Assessment' (REA). An REA can be described as a systematic and documented process of searching for evidence, setting exclusion and inclusion criteria and data extraction from the materials found. Information might be sourced from peer reviewed or 'grey' literature, along with being drawn from primary sources by way of research interviews.

The REA for this study was built around answering a series of detailed research questions formulated by DECC, which are listed in full in Appendix A.1.0. The questions related to:

- Public disclosure schemes;
- Central Reporting schemes; and
- Costs of schemes.

There were nine key steps to the research methodology, which can be summarised as follows:

1. Step 1 (Part 1) – Agree Research Themes

⁴ Centre for Sustainable Energy, and Environmental Change Institute, University of Oxford (2012) *What are the Factors Influencing Energy Behaviours and Decision-Making in the Non-Domestic Sector? A Rapid Evidence Assessment*, Report for Department of Energy and Climate Change, November 2012, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65601/6925-what-are-the-factors-influencing-energy-behaviours.pdf

At project outset, it was agreed that there may be too limited an evidence base to be derived from solely the energy efficiency sector. Consequently, a wider set of research 'themes' was agreed with DECC, the rationale for which is described in more detail in Section 1.3 Each theme was then allocated a researcher and tranche of time within the project resource schedule, during which relevant information was identified and analysis of that information undertaken.

2. Step 2 (Part 1) – Development of Coding Strategy and Online Search Database Template

Within REAs, coding of information sources is a critical element of project design. Our approach to data coding is set out in Appendix A.2.0. This formed the basis of the design of an Excel-based database ('Online Search Database') in which each source was codified and fully referenced. This was designed for a rapid high level systematic review of the content and evidential value of each source (Step 3 below), allowing for a large dataset to be examined in a relatively short space of time.

3. Step 3 (Part 1) – Literature Review and Data Collection

In addition to the internet, Eunomia ran searches using OpenAthens, Wiley, Sage, Science Direct and GoogleScholar to access a range of electronic journals⁵ including, for example, Energy Policy, the Journal of Environmental Economics, Management, Environmental and Resource Economics, the Accounting Review, and Global Environmental Politics. The scope of such journals includes the scientific, technical, social scientific, energy policy, business and economics literature.

The research was based upon a range of initial search terms and 'strings' which developed iteratively, giving flexibility to the research team to follow particular 'live' lines of enquiry as and when they arose.

When reviewing these sources, reference lists and bibliographies were used to track down further evidence. Furthermore, as a matter of principle, we sought to review the primary sources, as some forms of evidence tend to poorly reference secondary data in support of their particular case.

Progress on lines of enquiry was reviewed on a daily basis. Lines of enquiry that were 'drying up' were closed promptly, new search avenues opened up, and tasks reassigned across the team as appropriate.

4. Step 4 (Part 1) – Initial Evaluation and Data Synthesis

The focus of this task was to complete a 'Research Question Matrix', which was based on the initial research questions drawn up by DECC as provided in Appendix A.1.0. The matrix, which has not been included in this report, provided DECC with a summary of the strength of evidence found in response to each of the research questions.

⁵ See www.openathens.net and <http://scholar.google.co.uk/>

The Matrix was submitted to DECC, followed by a Project Meeting to discuss the initial findings. At this meeting, it was agreed that there was sufficient relevant evidence available to warrant progressing to Part 2 of the study (which had been subject to a contract break point).

5. Step 5 (Part 2) - Further Data Gathering and Additional Analysis

As described above in respect of Step 4, the focus of this exercise was upon strengthening the evidence base by undertaking further research and analysis of both new information and that already identified. This was undertaken, however, in relation to a refined set of research questions, as agreed with DECC. These questions are essentially represented by the headings within Sections 0 and 0 of this report.

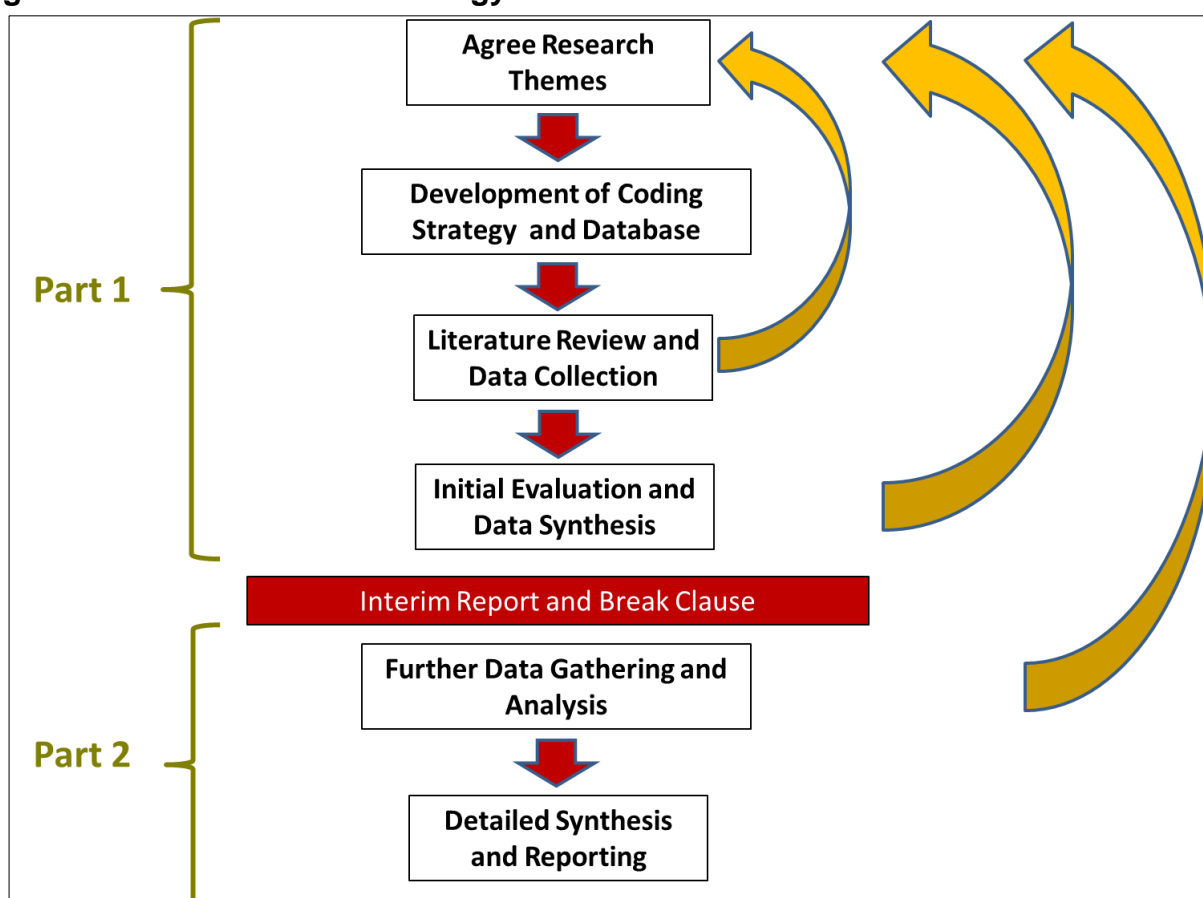
6. Step 6 (Part 2) - Detailed Synthesis and Reporting

The synthesis undertaken for this final phase of the analysis brought together research from all five research themes, albeit transferability to the research questions played a key part in how this evidence was evaluated, as discussed in Section 0. The outcomes of this analysis were submitted to DECC in the form of this report.

An overview of the above methodology is summarised in

Figure 1.

Figure 1: Overview of Methodology



1.3 Rationale for Selection of Research Themes

At project inception, to determine whether they should be included within the REA process, potential research ‘themes’ were assessed according to the following criteria:

- Perceived volume of evidence on data reporting schemes, whether public disclosure, central or hybrid approaches;
- Nature of the reporting entities; with businesses (ideally non-SMEs) rather than other types of organisations, (for example schools, hospitals or individual consumers) being most relevant to ESOS;
- Outcomes of change driven by schemes - improved environmental performance being most relevant; and
- Level of priority in the boardroom – ‘social’ or environmental issues have similar profiles, whilst the likes of finance, and sometime health and safety can attract far greater attention.

This resulted in the following five themes being selected:

1. Energy efficiency reporting;
2. Greenhouse gas emissions reporting;
3. ‘Non-energy’ environmental reporting;
4. Financial reporting; and
5. ‘Social’ reporting.

Further definition of these five themes is provided in Appendix A.3.0. Furthermore, during the course of the REA, it became apparent that the evidence gathered under some of these themes was less *transferable* to the research questions than had been hoped. As a consequence, only limited evidence has been drawn from some themes, as discussed in detail in Section 0 with regard to each specific theme.

1.4 Approach to the Definition of Strength of Evidence

When undertaking an REA it is necessary to set a framework by which evidence can be assessed towards determining whether it merits inclusion within the study. Whilst there will always be an element of subjectivity to this approach, we do not feel it is sensible to attempt to ‘score’ each piece of evidence, but rather use the criteria set out in this section as a framework to guide decision-making by the research team. In many cases, the decision is not about whether to ‘include or exclude’ a particular data source or report, but rather the level of importance to accord it within the drafting of the report. The criteria used to guide decision-making in this regard are set out in Appendix A.4.0.

1.4.1 Transferability of Scheme Design

It should be highlighted that the different schemes we have reviewed vary significantly in nature and design, and thus in their transferability to the research questions. The outcomes from these schemes are likely to be influenced by their design, which must be taken into consideration when determining whether related information represents a strong (or less strong) piece of evidence.

1.4.2 Transferability of Themes

The systematic monitoring, reporting and regulating of business energy consumption is a relatively new policy measure. As a result, the research into its effectiveness is constrained to using data gathered within the last two decades. We therefore looked to other performance data that is reported by companies where more established schemes are in place, and a more substantial number of critical studies are available.

As discussed above, we measured the strength of evidence of individual research pieces on certain key criteria, including the age of the report and whether it used a robust methodology. Once this assessment was completed we could then try to understand whether this research gave us any insight into how energy efficiency reporting might perform with similar scheme characteristics that were addressed in the studies.

1. Energy Efficiency

Although studies investigating corporate energy efficiency are directly relevant to this report, it is worth noting that there are other aspects to energy efficiency that ‘transfer’ in somewhat different ways.

Within the energy efficiency theme, we have investigated a number of building labelling policies, as this represents a more well-established area of research than generic corporate energy efficiency. Although buildings are labelled according to their energy consumption and thus affected by the same drivers above, there are notable differences.

A study on mandatory building labelling policies considers three specific informational problems that cause a lack of action on buildings’ energy usage levels:⁶

- ‘Principal-Agent’: those making investments into energy efficiency are not always the same people who would benefit from them, i.e. a building owner who leases a building to tenants who then pay their own utility bills has no obvious financial incentive to increase the energy efficiency of the building;
- ‘Asymmetric information’: this is a result of those providing the information not being the same people as those using it. It therefore implies that a certain level of trust

⁶ Stavins, R.N., Schatzki, T., and Borck, J. (2013) *An Economic Perspective on Building Labeling Policies*, Report for Greater Boston Real Estate Board, March 2013, http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/Stavins_Schatzki_Building_Labels_Research_March2013.pdf

between information-provider and information-user is necessary, otherwise the user may not believe the information provided and may not act on it appropriately; and

- ‘Public good’ aspect: once information has been created, it can be difficult to limit wide dissemination and free access to it. This means that there is little incentive for information of a general nature (for example in relation to energy efficiency) to be created.

Of these three barriers, the principal-agent problem in particular is specific to buildings. As building labelling policies have specifically been designed to overcome this particular barrier, by providing the landlord with a financial incentive (the lure of possible higher rental income) to increase the energy efficiency of the building, we consider that they are very relevant to the general theme of energy efficiency.

Although the imposition of a reporting scheme may be perceived as a way to mitigate or eliminate ‘barriers’ to energy efficiency, the impacts of new information being disseminated are potentially unpredictable, due to the complex nature of those barriers that may already exist within organisations. These types of barriers have been analysed in detail in other studies.⁷ The basic types include:

- Economic – cost, access to capital;
- Informational – imperfect information, split incentives, adverse selection of goods, lack of control of agent’s energy management;
- Behavioural – limited rationality, credibility of information, inertia, value systems; and
- Organisational – prioritising energy management in organisations, environmental culture.

It is important to note that increased energy reporting cannot be assumed to be always beneficial. As shown in this study, there are cases where information disclosure, such as ‘league table’ reporting, can have adverse effects.

2. Greenhouse Gases

Drivers for action on greenhouse gases (GHGs) are very similar to those for energy efficiency, for example, efforts to reduce GHG emissions will usually, at the same time, mean a reduction in energy usage, and vice versa.

The key difference between the themes, however, is that the reputational driver carries more weight for the GHG theme. This is partially because of the direct link between greenhouse gas emissions and climate change and partially because reducing GHGs does not always result in cost savings, for example when it results from fuel switching rather than reductions in fuel usage. Furthermore, a reduction in greenhouse gases can also be linked to an improvement in local air quality and health which further boosts the reputational driver – particularly as both those aspects are more tangible than ‘tackling climate change’. Indeed, it appears that some companies may deliberately avoid pushing the climate change agenda to reduce the risk of alienating customers who see it as less of a priority.

3. Non-Energy Environmental

⁷ Sorrell, S, Mallett, A, and Nye, S (2011) *Barriers to Industrial Energy Efficiency: A Literature Review*, Report for UNIDO, 2011

Non-energy environmental schemes can increase organisations' awareness of issues such as air and water pollution, potentially leading to long term behaviour change.

The motivations for companies to improve their environmental performance are specific to the construction of each particular scheme. In comparison to energy efficiency schemes we found that 'input market pressures' and judicial and community pressures have a larger impact on firms' behaviour. This highlights the fact that investors, as well as the public, are most concerned about environmental issues with obvious and direct impacts, such as air and water pollution. Furthermore, air and water pollution is particularly relevant at a local level, and so tends to engage citizens and environmental groups more, whereas the environmental impacts of energy consumption and GHG emissions are more geographically dispersed. Conversely, the decrease in environmental impacts resulting from an improvement in energy efficiency is less immediately apparent, particularly to the public who may not be immediately aware of the relevance of energy efficiency to well-known environmental issues such as climate change. We suggest that this is why the energy efficiency of a firm seems to have less effect on reputation compared to non-energy environmental, or even GHG emissions.

In terms of financial drivers for behaviour change, the relationship of these to improved environmental performance is less strong for the non-energy environmental theme. Whilst a decrease in energy consumption may have clear financial benefits for firms, this may not be the case when considering, for example, a decrease in the emissions of specific toxic chemicals. A decrease in raw material or other costs, whilst considered by a limited number of studies, is not considered to be one of the major factors that motivate behaviour change under this theme.

This analysis demonstrates that reputational aspects and the need to communicate to investors are the main drivers of behaviour change when considering schemes relating to this theme. This may explain why no governmental schemes, mandatory or voluntary, were found which did not include a public disclosure as well as a central reporting element. Therefore, when considering this theme in relation to energy efficiency we note a potential bias within the literature, in that the public disclosure element may play a greater role in motivating behaviour change than would be expected for a similar scheme aimed at improving energy efficiency.

4. Financial

Financial reporting is by far the most well-established theme – both in practice and in the substantial pool of research available that has analysed the impacts of financial disclosure. There are some limited lessons to be learnt from public disclosure in the financial sector, particularly as energy efficiency has major financial benefits as well as environmental ones, so it can be seen in a similar light to increasing productivity or reducing overheads. The following points summarise both the perceived benefits and drivers associated with financial reporting and disclosure schemes and how they can be related to energy efficiency.

- Improved financial performance

There is evidence to show that an organisation will strive to improve on the financial results it reports. Reporting can expose weak spots in the organisation, focussing management time on these underperforming areas. It is not unreasonable to conclude that excessive energy use would be given more priority if reported externally.

- Reduced investor risk

The interests of private investors have widened in recent years, so that only a minority of the data they analyse is generated from annual accounts. Therefore one could argue that investors may be swayed by the energy performance of the company, as a demonstration of good cost control and management (and to a lesser extent environmental management, for 'green' investors).

- More efficient market:

The wider 'policy' outcomes of financial disclosure can be defined as the maintenance of a healthy market system based on transparency and risk minimisation, through good availability of corporate information. The wider impacts of energy reporting are not so market focussed. Instead they relate to government policies on energy security, consumer protection, and the environment. The two arenas are so distinct it would be difficult to justify any parallels between the two.

- Senior management commitment to improving financial performance:

The senior management structure in most organisations is already set up to treat finance as a core issue, and any shift to this state would have happened many decades ago when statutory financial reporting was first developed. As a result, there is therefore little evidence of a marginal impact due to the introduction of public disclosure schemes. In contrast, the energy efficiency sector is far less mature, and therefore such schemes may have a marginal impact on senior management commitment.

- Action taken to improve on the performance results being reported:

Several economic theories explore the effect of financial disclosure as a motivator to make management and staff more productive and effective; concluding that reputational drivers affect the individual as well as the organisation. Understanding how one compares with the competition is also a factor. To some extent, energy performance could be subject to these motives although the financial evidence has the benefit of hindsight – using a range of indicators to measure performance before and after reporting schemes are put in place, which suggests action has been taken within the organisation either through better decision-making or simply working harder each day. There is evidence already to show action does take place as a result of energy reporting, and although motivations may be slightly different, they both involve personal reputation, competitiveness (with certain schemes), and the potential to enhance the commercial performance of the company (by reducing energy costs).

- Create more focus on aspects of the company that might affect its reputation:

The dynamics between disclosure and financial reputation are complex and involve a range of reporting techniques used by companies to filter and distribute information in a way that maximises its reputation. This includes marketing, tactical press releases, specific lines of communication with investors, and a usually heavily controlled release of accounting information to the public. In contrast, energy performance, although it has cost implications, can be regarded more as a reputational issue affecting the company's relationship with customers or with wider public.

In summary, we believe there is limited, but important evidence that is transferable to the energy efficiency sector. We have therefore drawn upon a small number of relevant pieces of research as part of the wider evidence base for this study, as presented in Sections 0 and 0.

5. Social

Accounting journals have generated a large percentage of the literature on CSR, with the focus of enquiry being on how companies' financial performance is affected by their CSR reporting. Evidence sources include a mixture of analysis of company accounts, interviews, and literature reviews; however, much of the CSR reporting literature is highly theoretical, and it is not an area to have benefited from much empirical research.

The potential for transferability of CSR-related research is limited. CSR reporting usually lacks a distinct form and the nature of the reporting usually varies in structure, content and format. Perhaps the only relevant point concerns the limitations of voluntary reporting. The opinion expressed by several academics in the field (chief amongst them Gray) who reach a major (and intuitive) conclusion is that there is no reason to expect companies to modify their behaviour when they are free to 'self-select' those aspects of their behaviour on which they are reporting.⁸ As such, in Sections 0 and 0, we rarely draw upon information found under this theme.

2.0 Summary of Characterised Schemes

The following section sets out the findings from assessing individual reporting methods adopted in the UK, US, Australia, and other countries where the data was potentially useful. The research into disclosure and reporting schemes across the five themes resulted in a dataset containing a wide range of configurations.

Table 3 in Appendix A.5.0 provides a snapshot of the types of schemes encountered in the research, showing a range of approaches to optimising the benefits, relating to governing structure, rules on mandatory reporting and how the scheme is incentivised.

2.1 Scheme Types

From this basis we have characterised six scheme types which we believe are relevant to this research study, categorised in terms of whether the scheme involves public disclosure, central reporting, and whether participation is mandatory or voluntary.⁹ The six types are defined as follows:

- **Scheme Type 1: Mandatory Central Reporting with Mandatory Disclosure.** This typically involves government-controlled reporting systems, where company data is systematically disclosed into the public domain, to further governmental policy strategic aims on environmental and other issues.

⁸ Gray, R. (2006) Does Sustainability Reporting Improve Corporate Behaviour?: Wrong Question? Right Time?, *Accounting and Business Research*, Vol.36, No.sup1, pp.65–88

⁹ The definitions for what constitutes central reporting and public disclosure can be found in the Glossary Table G 1

- **Scheme Type 2: Mandatory Central Reporting with Voluntary Public Disclosure.** Scheme type 2 covers programmes that include mandatory reporting to a central body. There is no mandatory public disclosure element, but there are options for companies voluntarily to disclose information publicly. Depending on the particulars of the scheme, this may either be through the central body or by the company itself, for example through an annual report. As mentioned in Section 0, this may include mandatory disclosure of some information to a select audience. What unites all schemes under this type is that there is no mandatory full public disclosure element.
- **Scheme Type 3: Voluntary Central Reporting with Automatic Public Disclosure.** This scheme type is similar to scheme Type 1 in that firms report centrally and then this information is disclosed by the central body, however, in this case participation is voluntary rather than mandatory.
- **Scheme Type 4: Voluntary Central Reporting with Voluntary Public Disclosure.** Many organisations have implemented environmental management systems (EMSs) as a tool to manage their environmental strategy. Organisations frequently seek certification of their EMS under recognised standards such as ISO 14001 and the EU's Eco-Management and Audit Scheme (EMAS).¹⁰ ¹¹These schemes mandate regular third-party audits of participating firms. Certification is then given based on an assessment of an organisations EMS against a number of performance indicators. Essentially, such schemes consist of voluntary central reporting by organisations to the scheme regulator, followed by voluntary public disclosure by the company of their ability to meet the standards of the scheme in question.
- **Scheme Type 5: Mandatory Public Disclosure Directly to the Public** Governments have implemented rules on disclosure of performance data, for example companies required to report to their customers certain key information in order to force suppliers to improve performance or risk losing its reputation with its customers.
- **Scheme Type 6: Voluntary Public Disclosure Directly to the Public.** This category is relatively unstructured and contains a wide range of voluntary schemes and *ad hoc* communication methods used by organisations, which is heavily bent towards commercial interests rather than wider policy objectives that governments may have.

2.2 Scheme Type Analysis

For each scheme type, the analysis is structured as follows:

¹⁰ In 2012, it was reported that around 250,000 organisations had implemented ISO 14001 across 155 countries. See <http://www.businessgreen.com/bg/news/2187008/iso14001-environmental-standard-continues-global-march>

¹¹ UNESCO estimated that in 2009, around 40% of companies in Europe were ISO 14001 certified. See http://www.unesco.org/new/fileadmin/MULTIMEDIA/HQ/SC/temp/wwap_pdf/Table_Trends_in_ISO_14001_certification.pdf

- **Prevalence of scheme types and related examples** - in this analysis we discuss the schemes found during our research, and elaborate on their specific requirements, rules, time period, and participation rate;
- **Outcomes from the scheme** - in this analysis we aim to present a general overview of any observed correlation (or lack thereof) between implementation of a scheme or reporting mechanism and improved environmental performance.

With regard to the second part of the approach highlighted above ('outcomes from the scheme'), it is important to note that we do not explore the question of attribution; that is, whether observed improvements in environmental behaviour can be directly attributed to the effects of the scheme rather than to the influence of other factors (other policies, market conditions etc.).

The difficulties of correctly ascertaining a causal relationship are well known. This is demonstrated here by the relatively small number of studies which attempt to identify the factors which contribute to behaviour change, compared to a much larger body of literature looking at the altogether more straightforward aspect of correlation. As demonstrated in Table 3, the many different 'hybrids' or 'flavours' of scheme, along with other external variables, are such that even within our classification of six different scheme 'types', it is not possible to address causality in this way. For example, most central reporting schemes also include an element of public disclosure, even if this is not widely promoted to either the public or other stakeholders.

As it is important to be able to compare studies which do address this issue against one another, however, we have discussed these in relation to all scheme types together in Section 0.

To be clear, it should also be noted that where no change in environmental behaviour is observed it is reasonable to conclude that the scheme in question had little impact. As there is no need to address causality, studies which come to this conclusion are included in the analysis of scheme outcomes within the following analysis of scheme types.

2.3 Summary of Scheme Prevalence and Outcomes

Table 1 outlines the main findings from the schemes found under each type. A more detailed exploration of the performance of the schemes in question and of the type of scheme as a whole, is provided in Appendix A.6.0.

Table 1: High-level Analysis of Scheme Prevalence and Outcomes

Scheme Type	Theme	Prevalence	Outcomes
Scheme Type 1: Mandatory Central Reporting with Mandatory Disclosure	Energy Efficiency	Relatively widely adopted in the UK, US and Australia. Mostly buildings focused, rather than relating to energy use in operational processes. The Australian EEO scheme is a particularly well studied example.	Australian scheme appears to have delivered significant savings. Very little hard evidence of positive impact of other schemes
	Greenhouse Gas	Most schemes part of emissions trading systems such as ETS and the UK's CRC.	ETS has reported emissions reductions over last 8 years, but this may be due to wider factors, such as economic recession.

			Other schemes are too new to have been reviewed.
	Non-energy environmental	Common type of scheme aimed at pollution reduction. The US TRI scheme is the most studied example. 20 other countries have similar in operation.	The TRI type of scheme has had mixed results in different countries, with Canada achieving benefits, while Australia's emissions increased.
	Finance	Ubiquitous method for statutory accounts reporting internationally	Lack of transparency in reporting widely blamed for economic downturn. No clear evidence of positive impact of mandatory reporting.
Scheme Type 2: Mandatory Central Reporting with Voluntary Public Disclosure	Energy Efficiency	Not prevalent – although 'benchmarking' systems, anonymising public disclosure, such the CRC Energy Efficiency Scheme in the UK, have been used.	Studies have found either no impact or relatively small energy reductions.
	Greenhouse Gas	No evidence found	No evidence found
	Non-energy environmental	No evidence found	No evidence found
	Finance	No evidence found	No evidence found
Scheme Type 3: Voluntary Central Reporting with Automatic Public Disclosure	Energy Efficiency	Examples found limited to labelling systems, such as Energy Star and LEED in the US. These initiatives provide a recognised standard for the construction industry to assess the environmental sustainability of building designs.	No evidence found
	Greenhouse Gas	Several registers set up to allow voluntary input without any consistent structure	The '1605' scheme – A Department of Energy (US) registry in which companies can record their reductions of greenhouse gas (GHG) emissions - actually showed an increase in emissions
	Non-energy environmental	'33/50' chemical reduction scheme in the US most well studied. This type of scheme well used in developing countries.	Two schemes studied in detail saw a significant environmental improvement in terms of reductions in chemical use and water pollutants
	Finance	No evidence found	No evidence found
Scheme Type 4: Voluntary Central Reporting with Voluntary Public	Energy Efficiency	Other building benchmarking schemes fall under this category such as Portfolio Manager in the US	For Portfolio Manager the evidence is positive, with changes in operational behaviours, and energy savings reported.

Disclosure	Greenhouse Gas	No evidence found	No evidence found
	Non-energy environmental	The EMS certification schemes (ISO14004, EMAS) are adopted by thousands of companies worldwide. The PROFEPA scheme in Mexico is also well established.	Good body of evidence to show a positive impact such as pollution reduction, and a fall in imposed penalties in the Mexican scheme.
	Finance	No evidence found	No evidence found
Scheme Type 5: Mandatory Public Disclosure Directly to the Public	Energy Efficiency	No evidence found	No evidence found
	Greenhouse Gas	Countries have considered this approach but only example found was the Companies Act amendment to report GHG.	Only estimated benefits available.
	Non-energy environmental	A few strong examples of government led schemes in the US and Sweden, although these are perceived as pioneering.	Strong quantifiable evidence of benefits of US SDWA scheme. Qualitative evidence found to show Swedish scheme elicits more 'commitment' from members.
	Finance	No evidence found	No evidence found
Scheme Type 6: Voluntary Public Disclosure Directly to the Public	Energy Efficiency	No evidence found	No evidence found
	Greenhouse Gas	No evidence found	No evidence found
	Non-energy environmental	No 'schemes' as such, found, only examples are where companies include environmental performance in their own publications, eg in Annual Reports.	One major US study concentrating on economic theory linked voluntary disclosure with improved environmental performance. However many studies showed contradictory results.
	CSR Reporting	As above	The majority of the literature cites a positive impact from direct voluntary disclosure.
	Finance	Similarly, financial information, in addition to statutory reporting, is publicised via a range of media, but in the interests of the company's commercial position.	A large body of evidence to show that additional voluntary disclosure is beneficial to the company financially.

3.0 Analysis of Key Scheme Variables

In this section we consider the many aspects of the schemes identified and their relationship with stakeholder behaviours and what beneficial or non-beneficial outcomes can be identified. These aspects can come under the definition of public or central disclosure, mandatory or voluntary compliance, but there a number of nuances in scheme design that are highlighted within the following sections which are significant. These include the content and structure of reporting, senior authorisation, and the use of standards and certification.

Many authors have studied the impacts of central reporting and public disclosure schemes simply by observing whether there is a direct relationship between the introduction of a scheme and environmentally beneficial change (for example, a reduction in toxic releases). Far fewer studies have attempted to isolate the specific drivers of behavioural change and therefore quantify to what extent this can be attributed to the scheme itself and not to the influence of other drivers. Based on the results presented in many studies listed throughout this report, an important question to answer is whether in all cases there has been appropriate consideration of the counter-factual argument (for example, the variation in energy performance achieved by an organisation that might have taken place during the period of the reporting scheme has been place, if that scheme had not been implemented).

When looking at the effects of reporting or disclosure, what we are essentially seeking is an indication of the company's understanding of how it can further its own commercial interests, as that is ultimately what drives company behaviour. The problem is that commercial interests are complicated and respond to a multitude of given factors at any point in time, including indications of quality, reliability, sustainability, price and many others. The difficulty for this study is therefore not only to separate out which of these factors companies value more highly and in what way, but also to assess how companies consider reporting or disclosure to affect these factors. Hence, a study that can separate out the energy (or environmental or carbon-related) factor from the rest is the one that will actually be able to

tell us which of the market forces companies are reacting towards. The electricity market is a particularly interesting area in which to study the effects of disclosure, as many factors can be eliminated.^{12 13}

There is evidence to suggest that one cannot assume there will be heterogeneity across all companies in terms of behavioural drivers, benefits and disbenefits that are attributed to disclosure.¹⁴ Companies will react differently to the same external stimulus. For example, companies with a higher profile will be more susceptible to reporting schemes that impact on their reputation. Similarly, energy management investment may have different outcomes for companies depending on their existing operational configuration.

3.1 Schemes as Drivers of Behavioural Change

Key insights from this section can be summarised as:

- The culture of the organisation has a strong bearing on which drivers succeed;
- Commercial interest is the strongest driver, although social and environmental objectives are also important;
- Disclosure to several stakeholder groups can each influence corporate behaviour.

A prominent study (albeit from 1998) listed seven hypothetical ‘channels’ through which public disclosure may lead to environmentally beneficial outcomes.¹⁵ A further study grouped these channels into four main categories, and added two more categories based on a review of more recent studies.¹⁶ These were categorised as output market pressures, input market pressures, judicial pressures, regulatory pressures, community pressures and managerial information.

Different drivers have also been shown to have different impacts on companies, depending on their current engagement with, or commitment, to sustainability objectives. In a survey of senior management executives in Australia’s EEO Program, it was found that of those that saw investing in energy efficiency as extremely important over the next 12 months, 35% were likely to pay attention to their customers when making decisions about their business’ energy efficiency performance. Of those who saw investing in energy efficiency as less important,

¹² Delmas, M., Montes-Sancho, M.J., and Shimshack, J.P. (2010) Information Disclosure Policies: Evidence from the Electricity Industry, *Economic Inquiry*, Vol.48, No.2, pp.483–498.

¹³ Electricity comes in one form – and the effect of changing the fuel mix will not affect the kW that customers receive as a ‘product’. Consequently, a large proportion of the change seen as a result of companies disclosing fuel mix information can be largely attributed to the market’s valuation of a fuel mix which is (potentially) lower in fossil fuels.

¹⁴ Gillingham, K. & Palmer, K. (2014). *Bridging the Energy Efficiency Gap: Insights for Policy from Economic Theory and Empirical Analysis: Resources for the Future*, Review of Environmental Economics and Policy, January 2014

¹⁵ Tietenberg, T. (1998) Disclosure Strategies for Pollution Control, *Environmental and Resource Economics*, Vol.11, No.3-4, pp.587–602

¹⁶ Powers, N., Blackman, A., Lyon, T., and Narain, U. (2011) Does Disclosure Reduce Pollution? Evidence from India’s Green Rating Project, *Environmental and Resource Economics*, Vol.50, No.1, pp.131–155

only 5% paid attention to their customers when making energy efficiency decisions, deferring instead to sustainability and operations managers.¹⁷

In the same survey, participants were also asked about drivers towards energy efficiency. 'Financial/cost management' was the main driver, with 68% stating that it played a very important role. In second place, 61% agreed that 'Board interest' also played a very important role. 'The policy agenda of government and regulators' was third with 53%, 'Brand reputation' received agreement from 51% of respondents and 'public reporting requirements' was at 41%. This supports what has been suggested elsewhere in this report, namely that financial considerations are very important in decision-making over energy efficiency investments. Likewise, government plays an important role, suggesting that companies are keen to stay on top of, indeed if not ahead of, legislative requirements. It should also be noted that variations were seen in companies with over 1,500 employees. For those, government and brand reputation had a higher than average level of importance, with 64% agreeing that both of those played an important role. For large companies, board interest also played a smaller role, with only 51% agreeing it was very important.

The results from the above survey of the EEO were echoed in a similar survey of practitioners participating in the EEO for the end of cycle review. It was found that energy price increases and overall cost reduction strategy were considered by 99% and 97% of respondents respectively as either a major or a minor influence in the 'search for energy efficiency'. A business improvement programme and a corporate commitment to reduce emissions or improve energy efficiency were third and fourth with 93% and 87% finding these influential.¹⁸

Summarising the literature on this specific question, we find that the following categories, are of the most use in understanding the potential drivers of behaviour change:

- The financial imperatives of a company;
- Commitment to the environment and energy efficiency;
- 'Output' market pressures –disclosure can impact on demand for firms' goods;
- 'Input' market pressures – disclosure may affect investor confidence and impact on a company's market value;
- Judicial and community pressures – disclosure may lead to increased pressure from individual members of the public, community groups and NGOs, with the potential threat of judicial action;
- Regulatory pressures – disclosure may increase support for stricter future legislation which provides for improved enforcement of existing legislation; and

¹⁷ OgilvyEarth (2010) *Quantitative Research of CEOs/Senior Level Executives Participating in the Energy Efficiency Opportunities Program*, July 2010, http://www.ret.gov.au/energy/Documents/energyefficiencyopps/events-training-consultation/111005_SeniorManagementResearch.pdf

¹⁸ ACIL Tasman (2013) *Energy Efficiency Opportunities Program Review*, Report for Department of Resources Energy and Tourism, April 2013, <http://eeo.govspace.gov.au/files/2013/05/EEO-Program-Review-Final-Report.pdf>

- Information availability – reporting/disclosure may increase the information available to managers about their plants’ environmental performance and abatement options.

It should also be noted that when considering central reporting schemes in which no public disclosure takes place, the only driver likely to have an effect is the power a scheme administrator has to enforce legislative requirements or to influence further policy changes.

3.2 Specific Impacts of Public Disclosure

3.2.1 Benefits and Disbenefits of Public Disclosure

In this section we outline the main benefits and disbenefits related to public disclosure, (whether mandatory or voluntary), for companies. This analysis focuses on public disclosure, as far as these can be separated from the influences of central reporting and other mechanisms. The main benefits and disbenefits can be summarised as follows:

- A positive effect on reputation and brand;
- A useful tool for investors, provided the data is not misleading;
- Benefits and disbenefits regarding the effect disclosure has on the cost of capital;
- The potential to improve internal reporting systems, resulting in efficiencies and reducing the cost information gathering by external parties; and
- An increase in public awareness, leading to more public pressure on companies.

These benefits and disbenefits are not equally relevant for all types of companies or organisations. Some companies, such as those that are ‘public-facing’, are more susceptible, for example, to impacts on external reputation. Many of the benefits and disbenefits are difficult to quantify or even measure. Most of the research that touches on this topic is therefore based on ‘expert opinion’, responses to practitioners’ surveys and some ‘logical’ conclusions. For example, on the topic of greenhouse gas emissions a Defra publication states that:

‘There is little evidence to show that emissions reporting is a direct driver of emissions reductions, however companies are reporting on a voluntary basis and therefore must see benefit in doing so. Very few reporting companies surveyed are not reporting externally, suggesting that there are additional benefits to external reporting over and above the benefits associated with measuring emissions.’¹⁹

Although this question concerns benefits only, the concept of benefits should also be measured as a net effect when combined with costs. Financial costs of the administration of reporting schemes have been quantified in a number of reports and modelled against positive indicators such as company value, but overall disclosure is usually seen as a net benefit, albeit a diminishing one after a certain amount of information is disclosed. Even those reports which argue strongly against mandatory schemes do not go as far to say that the costs of disclosure exceed the benefits, rather that it would be cheaper to adopt a

¹⁹ DEFRA (2010) *The Contribution that Reporting of Greenhouse Gas Emissions Makes to the UK Meeting its Climate Change Objectives: a Review of the Current Evidence*, November 2010, <http://archive.defra.gov.uk/environment/business/reporting/pdf/corporate-reporting101130.pdf>

voluntary principle. Further analysis of costs versus benefits in this context can be found in Section 0.

Overall, there is a strong consensus across all themes analysed for this study that public disclosure has, on the whole, been beneficial to organisations. The sheer number of advantages identified is revealing; enhanced external reputation, the impetus to promote environmental issues to board level; for larger companies reduced insurance costs, increased market value, and reduced cost of capital are cited, and in the case of voluntary disclosure, a reduced risk of mandatory and/or compliance schemes being imposed.

Effect on External Reputation and Market Value

An improved brand and reputation is one of the main benefits listed in theoretical studies and reports on the impact of public disclosure. This mainly includes literature on greenhouse gas reporting, but also some on energy efficiency, though the evidence is weaker for this theme.

^{20 21} For example, in a survey of participants in the Australian Energy Efficiency Opportunities (EEO Program, only 37% found it 'true' or 'somewhat true' that public disclosure under EEO was successful in raising the energy savings profile of the corporation. Somewhat contradictorily, however, 54% felt it was 'true' or 'somewhat true' that such disclosure was an effective means of publically communicating a commitment to energy efficiency. Despite the uncertainty about public disclosure's role in communicating and raising the profile of the company, 51% of participants surveyed still listed brand reputation as a driver in action on energy efficiency. For large companies with more than 1,500 employees, this proportion rose to 65%.²²

In relation to market value, Eichholtz et al investigated transactions for 'green' labelled buildings in the USA (either Energy Star labelled or LEED, both of which are publicly available certifications), comparing them to unlabelled buildings in the surrounding area, whilst controlling for other variables.²³ The study found that a 'green' labelled building commanded an increase in rental price of 3%, an 'effective rental price' (rent adjusted for building occupancy levels) increase of 7% and an increase in sales prices of 16%. Above these premiums, they also found that a 10% increase in energy savings for the building corresponded to a 1% increase in value.

Provision of Environmental Information to Investors

Many studies point out that being able to provide information to investors is a positive aspect of public reporting. For example, there are benefits to providing more information to investors on companies' energy usage, with studies quoting that it increases the ability of investors to

²⁰ Adelphi (2011) *The Costs and Benefits of Mandatory Greenhouse Gas Reporting: An Independent Analysis of the Defra Impact Assessment*, Report for The Aldersgate Group, July 2011, www.aldersgategroup.org.uk/asset/download/380/1107%20Costs%20and%20Benefits%20of%20Mandatory%20CO2%20Reporting.pdf

²¹ Institute of Environmental Management and Assessment (2010) *Special Report: GHG Management & Reporting*, October 2010, http://www.iema.net/system/files/iema20ghg20report204.10.10_0.pdf

²² OgilvyEarth (2010) *Quantitative Research of CEOs/Senior Level Executives Participating in the Energy Efficiency Opportunities Program*, July 2010, http://www.ret.gov.au/energy/Documents/energyefficiencyopps/events-training-consultation/111005_SeniorManagementResearch.pdf

²³ Eichholtz, P., Kok, N., and Quigley, J.M. (2010) Doing Well by Doing Good? Green Office Buildings, *The American Economic Review*, Vol.100, No.5, pp.2492–2509

estimate risk associated with particular investments.²⁴ This is backed-up by research conducted with investors involved with the Carbon Disclosure Project (CDP), of which 77% stated that climate change information was a factor in investment decisions.²⁵ Furthermore, the same study found that half of participants in a survey on greenhouse gas reporting stated that investor pressure was very important in driving disclosure.

It was also noted in a workshop with investors in the US that more information on energy-related characteristics of homes could help attract mortgage lending.²⁶ This was supported by a survey of 70,000 homes in the US which found that those for 'energy efficient homes' were 32% less likely to default than those on less efficient homes.

Potential disbenefits to using information provided through public disclosure have also been shown. In particular, both information on energy efficiency and environmental credentials has been expressed as potentially problematic as it provides investors (or other stakeholders) with only a snapshot of the company, which can give a false impression (either negative or positive).^{27 28} This, however, is not a feature unique to public disclosure. Any time a company provides information about itself, whether it is to a central body or to the public, it risks being taken out of context.

Access to Capital Costs

A number of studies have tested for an association between environmental disclosures and cost of capital. We found two studies with clear evidence to support the hypothesis that there is an inverse association between CSR and/or disclosure of environment-related information and the cost of capital.^{29 30} In other words, increased environmental disclosure may be financially disadvantageous for companies. However, other studies came to the opposite conclusion. Findings presented by a study of CSR disclosures demonstrate a significant positive association between these and the cost of capital.^{31 32}

²⁴ PricewaterhouseCoopers, and Carbon Disclosure Project (2010) *Review of the Contribution of Reporting to GHG Emissions Reductions and Associated Costs and Benefits*, Report for DEFRA, August 2010, <http://pwc.blogs.com/files/pwc-emissions-reporting-1110.pdf>

²⁵ PricewaterhouseCoopers, and Carbon Disclosure Project (2010) *Review of the Contribution of Reporting to GHG Emissions Reductions and Associated Costs and Benefits*, Report for DEFRA, August 2010, <http://pwc.blogs.com/files/pwc-emissions-reporting-1110.pdf>

²⁶ CERES (2013) *Power Factor: Institutional Investors' Policy Priorities Can Bring Energy Efficiency to Scale*, May 2013, <http://www.ceres.org/resources/reports/power-factor-institutional-investors2019-policy-priorities-can-bring-energy-efficiency-to-scale>

²⁷ Department of Resources Energy and Tourism (2010) *Energy Efficiency Opportunities Program: Mid-Cycle Review*, December 2010, <http://eeo.govspace.gov.au/files/2013/01/EEO-Mid-Cycle-Review-Report.pdf>

²⁸ Nyquist, S. (2003) The Legislation of Environmental Disclosures in Three Nordic Countries: A Comparison, *Business Strategy and the Environment*, Vol.12, No.1, pp.12–25

²⁹ Dhaliwal, D.S., Zhen Li, O., Tsang, A., and Yang, Y.G. (2011) Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting, *The Accounting Review*, Vol.86, No.1, pp.59–100

³⁰ Plumlee, M., Brown, D., Hayes, R.M., and Marshall, S. (2010) *Voluntary Environmental Disclosure Quality and Firm Value: Further Evidence. Working Paper*, December 2010

³¹ Clarkson, P.M., Fang, X., Li, Y., and Richardson, G. (2013) The Relevance of Environmental Disclosures: Are Such Disclosures Incrementally Informative?, *Journal of Accounting and Public Policy*, Vol.32, No.5, pp.410–431

³² Richardson, A.J., and Welker, M. (2001) Social Disclosure, Financial Disclosure and the Cost of Equity Capital, *Accounting, Organizations and Society*, Vol.26, No.7–8, pp.597–616

In addition to the above, a study has also suggested that financial analysts are better able to create an accurate financial forecast (which might influence the cost of capital) when in receipt of publicly disclosed environmental information. For companies in environmentally sensitive industries, however, the effect is not as significant.³³

In summary, it does not seem possible to draw strong conclusions from the literature as to whether increased disclosure can reduce the cost of capital for organisations.

Improved Operational Management

The ability of public disclosure to improve firms' operational management is well documented and is explored in Section 0. One of the key pathways by which disclosure schemes can motivate behaviour change is through an improvement in managerial awareness of environmental issues. In Section 0 we discuss the potential for disclosure to motivate participants to adopt a more comprehensive EMS. Not only can this lead to improved environmental performance but some studies also suggest that firms adopting a credible environmental management standard such as ISO 14001 can benefit from improved competitive advantage.³⁴

A few studies, including a research report by PricewaterhouseCoopers³⁵, have found that the act of preparing a report to be externally published can lead to a better strategy and action on climate change.

3.2.2 Wider Benefits and Disbenefits of Public Disclosure

In this section we explore the policy benefits and disbenefits to wider cohorts, rather than to individual stakeholders such as the regulator or the shareholder. Examples of policy benefits include market performance at a macro-economic level, energy security, equal opportunities, employment, and social empowerment (i.e. the general population being better informed about corporate performance and therefore making better socially conscious decisions). At high-level, the following all represent wider benefits and disbenefits to public:

- Possible knock-on employment benefits ('green jobs');
- Mandatory public disclosure encourages further voluntary disclosure;
- A reduction in information costs for the public and for investors;
- Raising of public awareness of related issues;
- Boosting of regulators' credibility; and
- Unstructured voluntary disclosure can provide a 'perverse incentive' for poor-performing organisations to report misleading information.

³³ Aerts, W., Cormier, D., and Magnan, M. (2008) Corporate Environmental Disclosure, Financial Markets and the Media: An International Perspective, *Ecological Economics*, Vol.64, No.3, pp.643–659

³⁴ Delmas, M. (2001) Stakeholders and Competitive Advantage: The Case of ISO 14001, *Production and Operations Management*, Vol.10, No.3, pp.343–358

³⁵ PricewaterhouseCoopers, and Carbon Disclosure Project (2010) *Review of the Contribution of Reporting to GHG Emissions Reductions and Associated Costs and Benefits*, Report for DEFRA, August 2010, <http://pwc.blogs.com/files/pwc-emissions-reporting-1110.pdf>

Effects on Employment

Many of the Energy Efficiency and GHG studies referenced in Section 0, point to positive benefits of public disclosure to employment and markets, partially as a knock on effect of reducing energy or emission impacts; for example, by increasing the need for both energy or carbon auditors and the installation of new efficient equipment.

Encouraging Further Information Disclosure

There is a small body of evidence to suggest that mandatory public disclosure can encourage companies to increase their voluntary public disclosure of environmental performance. Using data from Australian companies from 1998 to 2000, one study performed an analysis of environmental disclosure in companies' annual reports. The evidence from this study indicates that companies do respond to increased demand for environmental disclosure by providing more environmental-related information in their annual report.³⁶ A study of the effects of information disclosure under the U.S. Toxics Release Inventory (TRI) broadly concurs with these conclusions.³⁷ This analysis examined the change in environmental disclosure within financial reports for a sample of 122 US corporations included on the 1988 Toxics Release Inventory of the top 500 releasing firms. The study found that environmental disclosure for the sample firms significantly increased between 1990 and 1995 (public disclosure under the TRI began in 1989). Furthermore, the study documents that firm-specific increases in disclosure were significantly related to the levels of toxic releases reported, and that this was still the case after controlling for the potential impacts of media exposure on disclosure levels. These results provide evidence that corporations appear to use disclosure as a legitimating tool to reduce public and regulatory pressures. In this scenario, it appears that the increased pressures imposed by mandatory disclosure under the TRI encouraged corporations to voluntarily disclose further environmental performance data in order to mitigate public policy pressures.

Reducing Information Costs

It has also been suggested that sustainability reporting can reduce information costs for the public and for investors. The provision of environmental information to investors is widely acknowledged, and is implicit in much of our discussion in Section 0 and 0. A recent report on sustainability reporting in the EU found that reporting schemes are an important source of data for specialised analysts (like Bloomberg, Thomson Reuters, RiskMetrics) to make data accessible to investors.³⁸

Raising Public Awareness

In a press release, the Canadian Chemicals Producers' Association stated that pollutant release and transfer registers (PRTRs), or emission inventories, are important tools to raise

³⁶ Gozali, N., O., How, J., C., and Verhoeven, P. (2002) *The Economic Consequences of Voluntary Environmental Information Disclosure*, Report for Proceedings of the 1st Biennial Meeting of the iEMS, 2002

³⁷ Patten, D.M. (2002) Media Exposure, Public Policy Pressure, and Environmental Disclosure: An Examination of the Impact of Tri Data Availability, *Accounting Forum*, Vol.26, No.2, pp.152–171

³⁸ CREM, and Adelphi (2011) *The State of Play in Sustainability Reporting in the European Union*, Report for European Commission, 2011, http://www.odpowiedzialnybiznes.pl/public/files/State_of_play_in_Sustainability_Reporting_EU_2011.pdf

public awareness about potential chemical risks.³⁹ Other studies have looked in detail at the pathways through which disclosure can motivate behaviour change amongst participating companies. In these specific cases it is implicit that public disclosure has raised the public's awareness of environmental issues.⁴⁰

Increased Credibility for the Regulator

The regulator itself may benefit from public disclosure. If companies demonstrate more compliance with relevant environmental standards it can boost the regulator's credibility with industry, NGOs and the public.⁴¹ Public disclosure can also make the enforcement task of the regulator easier and more efficient.⁴² Within a disclosure scheme, firms with a good environmental record are motivated to identify themselves. This is likely to make the task of the regulatory agency more efficient, as it can concentrate its enforcement efforts on more serious polluters.

Perverse Incentives from Voluntary Schemes

Within the disclosure of literature, a number of authors, such as (Mitchell et al, 2006) and (Darnall et al, 2005) have examined the potential for 'perverse incentives' from voluntary disclosure schemes. Most importantly, there is some evidence to suggest that voluntary environmental reporting results largely in 'green-wash', as described below. In this capacity, voluntary disclosure can act as a symbolic gesture, eliciting a false confidence from the public and investors in firms' environmental performance, and possibly delaying the implementation of effective mandatory regulation.

We have discussed the positive association between high quality disclosures (for example, this measure is quantified in some studies by indexing against GRI reporting guidelines) and poor environmental performance elsewhere in this report (Section 0). To summarise, the reviewed studies all suggest that voluntary environmental disclosure appears to mitigate the effect of poor environmental performance on firms' reputation.

To look at this in more detail, we refer to a study of Australian firms, which analysed the precise content of disclosed information in the annual reports of Australian listed companies.⁴³ Specifically, this study aimed to investigate the relationship between 'poor' environmental performance and voluntary environmental disclosures, where 'poor' environmental performers are defined as any company that was subject to a successful EPA prosecution at any time between 1994 and 1998. Their results demonstrate that these firms' annual reports are generally limited to copious amounts of positive environmental disclosures of a general nature, with virtually no disclosure about the actual EPA violations. The study concludes therefore that it is unlikely that voluntary environmental reporting creates a situation of adequate and appropriate disclosure for poor environmental performers. Rather,

³⁹ Lloyd, G. (2010) *Chemical Industry Sees Benefits in Reporting Pollutant Emissions*, <http://www.cec.org/Page.asp?PageID=122&ContentID=2444&SiteNodeID=463>

⁴⁰ Lee, E. (2010) Information disclosure and environmental regulation: Green lights and gray areas, *Regulation & Governance*, Vol.4, No.3, pp.303–328

⁴¹ Wheeler, D. (1999) *Greening Industry: New Roles for Communities, Markets and Governments*, Report for World Bank, October 1999

⁴² Kathuria, V. (2006) *Public Disclosures - Using Information to Reduce Pollution*, Report for Madras School of Economics, July 2006

⁴³ Mitchell, J., Percy, M., and McKinlay, B. (2006) Voluntary Environmental Reporting Practices: A Further Study of 'Poor' Environmental Performers, *Australian Journal of Corporate Law*, Vol.19, No.2, pp.182–215

companies may use environmental disclosure to project a positive image and in doing so hide their poor environmental behaviour.

Other studies have investigated green-washing that can occur under reporting schemes under which firms are permitted to self-report environmental information. This feature is common to most government and industry-led voluntary programs, with the main exception being EMS certification schemes such as ISO 14001, which require a third-party auditing process.⁴⁴ A study of 61 voluntary environmental programs in the U.S. demonstrated that participants in voluntary schemes which rely on self-reporting are more likely to falsely report that they are achieving environmental goals compared to non-participants. This is not necessarily a unique feature of voluntary schemes; that is, there is the potential that firms reporting to mandatory programs could also report deliberately misleading information. Mandatory schemes, however, often specify a standardised methodology and structure for self-reporting, and therefore the data reported to such schemes can generally be viewed as more credible.⁴⁵

A study into the effects of public disclosure of fuel mixes by electricity companies showed that those performing worse at the start of the study (in this case meaning companies with a higher proportion of fossil fuels in their mix) had a significantly smaller level of improvement in their fuel mix than those who already had a 'cleaner' portfolio.⁴⁶ The study concludes that there may be a risk of inducing 'inefficient abatement allocations' through mandatory public disclosure, meaning that efforts on pollution abatement end up being made by those who need it least. There are potential for 'easy wins' i.e. larger improvements from companies starting from a lower baseline, which are missed by applying the same weighting to companies with different performance levels.

Another example is the study of participants in a voluntary greenhouse gas emissions disclosure programme in the US '1605(b)'. As participants in this programme, companies were encouraged to disclose information on achieved reductions in their emissions, either on a project basis or on the basis of a whole company footprint. As explained in Appendix A.6.3.1, companies taking part in this scheme actually performed worse than a control set of companies, despite having disclosed emissions reduction as part of their involvement in 1605(b). From this study, the recommendation is made that voluntary disclosure should be more restricted to avoid self-selection of data to this degree.⁴⁷

3.3 Specific Impacts of Central Reporting

Central reporting is defined in this study as information passed to a central body, which retains this information without making it, or otherwise requiring it to be made, publicly available. In some cases, central reporting requirements may also mean that a limited group

⁴⁴ Darnall, N., and Carmin, J. (2005) Greener and Cleaner? The Signaling Accuracy of US Voluntary Environmental Programs, *Policy Sciences*, Vol.38, No.2-3, pp.71–90

⁴⁵ Vidovic, M., and Khanna, N. (2012) Is Voluntary Pollution Abatement in the Absence of a Carrot or Stick Effective? Evidence from Facility Participation in the EPA's 33/50 Program, *Environmental and Resource Economics*, Vol.52, No.3, pp.369–393

⁴⁶ Delmas, M., Montes-Sancho, M.J., and Shimshack, J.P. (2010) Information Disclosure Policies: Evidence from the Electricity Industry, *Economic Inquiry*, Vol.48, No.2, pp.483–498

⁴⁷ Kim, E.-H., and Lyon, T.P. (2011) Strategic Environmental Disclosure: Evidence from the DOE's Voluntary Greenhouse Gas Registry, *Journal of Environmental Economics and Management*, Vol.61, No.3, pp.311–326

of people outside the central body are given access to the information. This includes access given to tenants of new buildings, investors and shareholders.

The main benefits (to the company and to wider stakeholders) of central reporting schemes can be summarised as follows:

- Some evidence that asset value is increased through reporting energy performance;
- Encourages more efficient internal management systems;
- Provides useful data for public bodies to aid policy development;
- Greater levels of employee engagement in energy or environmental issues;
- Improved revenues resulting from higher prices (in the property sector).

More detail on these benefits is provided in Sections 0 and 0. It is important to note that no disbenefits were identified within the scope of the approach adopted for this study.

3.3.1 Benefits of Central Reporting

Central reporting can carry a number of benefits for companies. Some of these are elucidated from survey responses to companies taking part in various schemes. For example, in the review of the EEO Program, survey respondents commented on the use of reporting to government: 42% found that it was 'true' or 'somewhat true' that 'government reporting promotes energy use and energy saving accountability' whereas 52% found it 'true' or 'somewhat true' that 'government reporting helps maintain focus on assessment finalisation and implementation'.⁴⁸

As with comments made in relation to public disclosure in Section 0, the evidence for central reporting also suggests that there is no straight-forward link between a particular reporting requirement and a decrease in energy usage, as the EEO review states:⁴⁹

'Survey respondents are fairly evenly divided on whether any benefits flow to corporations from the public or government reporting that they are obligated to do as part of their compliance with the EEO Program.'

Increased Market Value

In the same way that publicly available information about a 'green' building can raise its market value, several other studies on energy certification or labelling for buildings have also found that buildings with a higher energy efficiency score (which is not publicly disclosed) tend to receive higher rental rates and sales prices. This was shown both in a study of European office buildings, where energy efficient buildings were compared to similar non-energy efficient ones, as well as in a study of residential buildings, where it was found that across Europe almost every area saw a correlation between an increase in the energy

⁴⁸ ACIL Tasman (2013) *Energy Efficiency Opportunities Program Review*, Report for Department of Resources Energy and Tourism, April 2013, <http://eeo.govspace.gov.au/files/2013/05/EEO-Program-Review-Final-Report.pdf>

⁴⁹ ACIL Tasman (2013) *Energy Efficiency Opportunities Program Review*, Report for Department of Resources Energy and Tourism, April 2013, <http://eeo.govspace.gov.au/files/2013/05/EEO-Program-Review-Final-Report.pdf>

efficiency rating and rental or purchase price, with purchase prices increasing more than the rental price.^{50 51} Although not explicit within these studies, it has been assumed that the labelling of these buildings was not made publicly available and instead just reported to prospective tenants or buyers at some point before the transaction took place.

Improved Internal Management

As discussed in Section 0, with regard to public disclosure, central reporting has also been shown to have potential for improving internal management procedures. This is logical, considering assessing and reporting on environmental credentials, whether they are energy, pollution or greenhouse gas related, would incentivise the set-up of better environmental management procedures.

3.3.2 Wider Benefits of Central Reporting

As defined in Section 0, *wider* benefits in the context of this study means those which do not directly affect the company. Instead these are benefits for government and other stakeholders.

Improved Data for Policy Development

One of the key benefits of central reporting for greenhouse gas emissions and energy efficiency, is the ability for centrally stored data to help with the development of new policies and policy priorities. Having a good reporting system with relevant information coming to authorities in a usable format allows for analysis and policy development that targets areas which require the most intervention. This may in turn lead to greater emissions or energy reductions and more efficient delivery of programmes.^{52 53} Such a database of information on greenhouse gases also lends itself to analysis in order to decide on any other mitigation measures.⁵⁴

Greater Employee Engagement and Outside Activities

In a report supporting the mandatory reporting of greenhouse gas emissions in the UK, two further benefits are identified.⁵⁵ First of all, it is quoted that surveys suggest that increasing environmental management practices can lead to a better and more motivated workforce.

⁵⁰ Kok, N., and Jennen, M. (2011) *The Value of Energy Labels in the European Office Market*, May 2011, http://nilskok.typepad.com/KJ/KJ_NL_220511.pdf

⁵¹ Bio Intelligence Service, Ronan Lyons, and Institute for European Environmental Policy (2013) *Energy Performance Certificates in Buildings and their Impact on Transaction Prices and Rents in Selected EU Countries*, Report for European Commission (DG Energy), April 2013, http://ec.europa.eu/energy/efficiency/buildings/doc/20130619-energy_performance_certificates_in_buildings.pdf

⁵² International Energy Agency (2007) *Energy Use in the New Millennium: Trends in IEA Countries*, September 2007, <http://www.iea.org/publications/freepublications/publication/millennium.pdf>

⁵³ International Energy Agency (2007) *Tracking Industrial Energy Efficiency and CO2 Emissions*, June 2007, http://www.iea.org/publications/freepublications/publication/tracking_emissions.pdf

⁵⁴ EPA Victoria (2006) *Greenhouse Gas Emissions Reporting and Disclosure Pilot: Summary of Final Position Paper*, June 2006, <http://www.epa.vic.gov.au/~media/Publications/1047.pdf>

⁵⁵ Adelphi (2011) *The Costs and Benefits of Mandatory Greenhouse Gas Reporting: An Independent Analysis of the Defra Impact Assessment*, Report for The Aldersgate Group, July 2011, www.aldersgategroup.org.uk/asset/download/380/1107%20Costs%20and%20Benefits%20of%20Mandatory%20CO2%20Reporting.pdf

Secondly, an assumption is made that the act of the company taking an active role in environmental management and reporting is likely to have a knock-on effect on its employees, giving them an incentive to consider also investigating and managing their own footprint.

Increased Revenues from Higher Prices

As mentioned in Section 0, when building labelling outcomes are reported to prospective tenants or buyers, building prices tend to go up. Additionally, reporting this information is considered by several papers to be integral to forcing a market consideration of energy efficiency, by allowing prices for properties also to depend on energy requirements, the way other characteristics of buildings are typically taken into account during a transaction.^{56 57 58} This means that, as awareness around the effect of building labelling rises, market forces pushing up building energy efficiencies start to appear and encourage investment in energy efficiency in order to increase ratings.

Also of interest in this discussion are the different perceptions that companies have about the audience to which they are disclosing information. For example, in relation to requirements for electricity companies to disclose fuel mix information to customers, it was found that a greater improvement (environmentally speaking) in this parameter was found for companies that sold a greater proportion of electricity to residential customers when compared to non-residential.⁵⁹

3.4 Effectiveness of Voluntary Schemes (Public and Central)

The key findings in respect of the effectiveness of voluntary schemes can be summarised as follows:

- Voluntary environmental disclosure appears to mediate the effect of poor environmental performance on firms' reputation;
- Poor performers may be less likely to participate in voluntary schemes;
- A range of pressures contribute to the participation in voluntary schemes (reputation, stakeholder, competition, regulatory, past performance), as well factors like the size of company and technical feasibility to improve performance;

⁵⁶ Stavins, R.N., Schatzki, T., and Borck, J. (2013) *An Economic Perspective on Building Labeling Policies*, Report for Greater Boston Real Estate Board, March 2013, http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/Stavins_Schatzki_Building_Labels_Research_March2013.pdf

⁵⁷ Institute for Market Transformation (2011) *Building Energy Transparency: A Framework for Implementing U.S. Commercial Energy Rating and Disclosure Policy*, July 2011, http://www.buildingrating.org/sites/default/files/documents/IMT-Building_Energy_Transparency_Report.pdf

⁵⁸ Dunskey Energy Consulting (2009) *Valuing Building Energy Efficiency Through Disclosure and Upgrade Policies: A Roadmap for the Northeast US*, Report for Northeast Energy Efficiency Partnerships, November 2009, http://www.neep.org/Assets/uploads/files/public-policy/building-energy-rating/NEEP_BER_Report_12.14.09.pdf

⁵⁹ Delmas, M., Montes-Sancho, M.J., and Shimshack, J.P. (2010) Information Disclosure Policies: Evidence from the Electricity Industry, *Economic Inquiry*, Vol.48, No.2, pp.483–498

- Overall there is strong evidence for positive impact of EMS schemes although it is less clear that non-EMS schemes are beneficial; and
- There exists strong evidence to suggest that voluntary disclosure is used to enhance the commercial position of firms.

Many of the studies discussed above (Section 0) somewhat assume a link between public disclosure and external reputation. A further study of the TRI scheme, however, found that firms with significant negative media attention concerning their emission levels did not reduce their emissions to a greater than average (after controlling for company size) level.⁶⁰

Studies of voluntary schemes have reached somewhat different conclusions. The tenets of disclosure theory, as discussed by (Watts et al, 1986) would assume that firms are motivated to voluntarily disclose out of rational economic self-interest.⁶¹ Therefore, it is unlikely that we would see a fall in company reputation following voluntary disclosure. One such study looked at a cross-sectional sample of 92 US firms from environmentally sensitive industries and found that their environmental performance was inversely related to their reputation.⁶² The authors argue this is due to the more extensive disclosure levels of firms that are worse performers and the finding of a significant *positive relationship* between environmental disclosure and firm reputation. Another paper drew similar conclusions from an analysis of patterns in the quality of voluntary environmental disclosures made by a sample of around 450 large UK companies drawn from a diverse range of industrial sectors.⁶³ This paper also found an association between high quality disclosures and poor environmental performance but does not suggest any underlying causal relationship between these variables.

Overall, these results suggest that voluntary environmental disclosure appears to mediate the effect of poor environmental performance on firms' reputation. This is discussed further in the context of green-washing in Section 3.2.2. Although not a new concept, recent studies have found that companies may be deterred from voluntarily disclosing due to the threat of being considered to be green-washing.⁶⁴ This is particularly the case for companies which might be discovered not to be as virtuously green as they claim, whereas companies that do not make such claims, though they may have similar environmental records, are not targeted in the same way.

3.4.1 Effect on a Company's Market Value

As hypothesised from disclosure theory, a growing body of literature is finding that voluntary environmental disclosures enhance a company's value in the long term. In a study of the voluntary US chemical reduction 33/50 program, the authors suggest (based on Excess Value per Unit Sales) that, although an initial drop in firms return on investment is observed

⁶⁰ Cohen, M.A., and Konar, S. (2000) *Why Do Firms Pollute (and Reduce) Toxic Emissions?*, March 2000, http://papers.ssrn.com/sol3/papers.cfm?abstract_id=922491

⁶¹ Watts, R., L., and Zimmerman, J.L.(1986) *Positive Accounting Theory*, Prentice Hall Inc.

⁶² Hasseldine, J., Salama, A.I., and Toms, J.S. (2005) Quantity Versus Quality: The Impact of Environmental Disclosures on the Reputations of UK Plcs, *The British Accounting Review*, Vol.37, No.2, pp.231–248

⁶³ Brammer, S., and Pavelin, S. (2008) Factors Influencing the Quality of Corporate Environmental Disclosure, *Business Strategy and the Environment*, Vol.17, No.2, pp.120–136

⁶⁴ Lyon, T.P., and Maxwell, J.W. (2011) Greenwash: Corporate Environmental Disclosure Under Threat of Audit, *Journal of Economics & Management Strategy*, Vol.20, No.1, pp.3–41

following disclosure, the future profitability is likely to improve for participating firms.⁶⁵ Similar results are found by a number of other studies. For example, a study of five high polluting industries in the U.S. used a self-constructed index to measure voluntary environmental disclosure quality between 2003 and 2006. In this case, the voluntary disclosure was directly to the public either through annual sustainability reports or via the internet. The authors found that these disclosures were incrementally more informative than similar disclosure through the mandatory TRI. Furthermore, the study demonstrates that voluntary disclosure also has incremental explanatory power for future profitability. It seems, therefore, that voluntary disclosure is performed strategically by firms in order to maximize future profits. These results are congruent with the theory (discussed in Section0) that voluntarily disclosure is motivated primarily by rational economic self-interest.

3.4.2 Drivers for Participation in Voluntary Schemes

A substantial number of studies have analysed the factors that motivate firms to participate in voluntary schemes (such as the 33/50 program). These studies generally assume that firms are acting in an economically rational manner; that is, their decision to participate is based on the expectation of net-benefits for their firm. The costs and benefits from participation in a voluntary scheme are likely to vary across firms depending on unique characteristics, such as their size and sector, and therefore it is rational that only certain firms will decide to participate in voluntary schemes. We have grouped the main determining factors of participation in voluntary disclosure schemes discussed within the literature into the following categories:⁶⁶

Reputation

Of the companies that disclosed a Danish 'green account' in 1998, there was a higher rate of external promotion of the accounts by the companies who disclosed it voluntarily than those who did so in response to a mandatory requirement. This suggests that those companies specifically chose to provide an account, amongst other reasons, in order to gain public recognition and the benefits associated with that.⁶⁷

Stakeholder and interest group pressure

The theory behind this driver is that firms participating in voluntary schemes will benefit from public recognition and increased sales (green consumerism). A variety of empirical studies address this hypothesis. Analyses of firm participation in the US 33/50 program have concluded that the following types of firms were more likely to participate in the scheme:

⁶⁵ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁶⁶ Khanna, M. (2001) Non-Mandatory Approaches to Environmental Protection, *Journal of Economic Surveys*, Vol.15, No.3, pp.291–324

⁶⁷ Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

- Companies producing a large proportion of final goods and in close contact with consumers;⁶⁸
- Those in industries with a high advertising expenditure per unit sales;⁶⁹
- Those producing larger non-33/50 releases and which are therefore more visible to the public.⁷⁰

Pressures from trade associations as well as from educated employees and management have also been found to be significant motivators for participation in voluntary schemes.^{71 72}

An economic model of 'green-wash' shows that activist pressure can explain the diverging results within the empirical literature with regard to the types of companies which choose to disclose.⁷³ The study suggests that if a company is an 'uninformed green', i.e. it performs well but is not aware of it, that company is likely to disclose less in the face of activist pressure and audit of its environmental records. At the same time, if a company is knowingly 'brown', it will be more likely to increase disclosure in response to such pressures. The study concludes that an EMS could therefore potentially ensure that more 'green' companies disclose. A further conclusion which might potentially be drawn from this analysis is that any new system that encourages or ensures the company is better informed about its environmental performance may be more likely to undertake higher levels of voluntary disclosure, regardless of activist or media pressure relating to the concept of 'green-washing'.

Competitive pressure and benchmarking

Very few studies have conducted empirical analysis on the impact of competitive pressures on incentives for participation in voluntary schemes. Those that have done so come to somewhat mixed conclusions. A study of companies within the 33/50 Program concludes that firms operating under more competitive conditions, that is, in less geographically concentrated industries, were more likely to participate.⁷⁴

In a study of customers who voluntarily used an energy use tool known as 'Portfolio Manager' to benchmark their energy usage, the vast majority (81%) claimed to do this in order to benchmark internally (i.e. against themselves over a period of time). At the same time, 65% stated they did so to benchmark themselves against other similar types in a

⁶⁸ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁶⁹ Arora, S., and Cason, T.N. (1996) Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program, *Land Economics*, Vol.72, No.4, pp.413–432

⁷⁰ Arora, S., and Cason, T.N. (1996) Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program, *Land Economics*, Vol.72, No.4, pp.413–432

⁷¹ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁷² Dasgupta, S., Hettige, H., and Wheeler, D. (2000) What Improves Environmental Compliance? Evidence from Mexican Industry, *Journal of Environmental Economics and Management*, Vol.39, No.1, pp.39–66

⁷³ Lyon, T.P., and Maxwell, J.W. (2011) Greenwash: Corporate Environmental Disclosure Under Threat of Audit, *Journal of Economics & Management Strategy*, Vol.20, No.1, pp.3–41

⁷⁴ Arora, S., and Cason, T.N. (1996) Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program, *Land Economics*, Vol.72, No.4, pp.413–432

national buildings index and 48% did so to compare a building to other buildings within a certain portfolio (i.e. all buildings owned by the same company).⁷⁵

Regulatory pressure

Two separate studies have found that participation in the 33/50 Program was motivated by the threat of liabilities, proxied by the number of 'Superfund' sites (broadly speaking these are contaminated sites) for which the firm is potentially liable.^{76 77}

Past environmental performance

A number of studies have found that firms with poor historic environmental performance are more likely to be targeted by environmental groups, and are thus more likely to participate in voluntary schemes such as the 33/50 program and Responsible Care initiatives.^{78 79 80}

Size

Many authors have hypothesised that larger firms are more likely to participate in voluntary schemes.^{81 82 83} A variety of reasons are put forward to support this hypothesis, including:

1. Larger firms experience lower marginal abatement costs due to economies of scale and have more employee capacity to effectively administrate environmental management systems (albeit opinion on this matter is somewhat divided);
2. Larger firms are more visible and therefore benefit more from an increase in green consumerism and also have an increased ability to deter mandatory regulations in the future by voluntarily 'over-complying';⁸⁴ and

⁷⁵ NMR Group Inc., and Optimal Energy Inc. (2012) *Statewide Benchmarking Process Evaluation. Volume 1: Report*, Report for California Public Utilities Commission, April 2012, http://www.calmac.org/publications/Statewide_Benchmarking_Process_Evaluation_Report_CPU0055.pdf

⁷⁶ Videras, J., and Alberini, A. (2000) The Appeal of Voluntary Environmental Programs: Which Firms Participate and Why?, *Contemporary Economic Policy*, Vol.18, No.4, pp.449–460

⁷⁷ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁷⁸ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁷⁹ Arora, S., and Cason, T.N. (1996) Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program, *Land Economics*, Vol.72, No.4, pp.413–432

⁸⁰ King, A.A., and Lenox, M.J. (2000) Industry Self-Regulation Without Sanctions: The Chemical Industry's Responsible Care Program, *Academy of Management Journal*, Vol.43, No.4, pp.698–716

⁸¹ Arora, S., and Cason, T.N. (1996) Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program, *Land Economics*, Vol.72, No.4, pp.413–432

⁸² Videras, J., and Alberini, A. (2000) The Appeal of Voluntary Environmental Programs: Which Firms Participate and Why?, *Contemporary Economic Policy*, Vol.18, No.4, pp.449–460

⁸³ King, A.A., and Lenox, M.J. (2000) Industry Self-Regulation Without Sanctions: The Chemical Industry's Responsible Care Program, *Academy of Management Journal*, Vol.43, No.4, pp.698–716

⁸⁴ Gallo, P.J., and Christensen, L.J. (2011) Firm Size Matters: An Empirical Investigation of Organizational Size and Ownership on Sustainability-Related Behaviors, *Business & Society*, Vol.50, No.2, pp.315–349

3. Larger firms may be more exposed to environmental liabilities and are thus more incentivised to increase their performance.

Technical feasibility

The technical feasibility of emissions reductions has the potential to influence participation in voluntary schemes. Studies examining this impact have proxied technical feasibility using a number of company-specific characteristics, and have reached mixed conclusions. In general, studies of the 33/50 Program did not find that companies in more 'innovative' (and perhaps, less mature) industries are more likely to participate in voluntary schemes.^{85 86} There is good evidence, however, to demonstrate that firms with older equipment were more likely to participate, perhaps because the environmental benefits of replacing older equipment with newer, less polluting equipment were high relative to the costs of doing so.⁸⁷

3.4.3 Voluntary Schemes (Environmental Management Systems)

A study of over 3,000 facilities regulated under the US Clean Air Act came to the conclusion that ISO 14001-certified facilities reduce their emissions more than non-certified facilities.⁸⁸ The authors present evidence that such changes can be directly attributed to the impacts of EMS adoption and improvement. Specifically, they find that their results are unchanged after controlling both for facilities' environmental performance history and for any potential endogeneity problems between facilities' decision to seek ISO 14001 certification and their environmental performance. The authors suggest that these positive impacts can be specifically attributed to the requirement for third-party audits. No statistical analyses are performed, however, to support this conclusion. Rather, the authors argue this point on the basis of a comparison with a similar scheme, the Responsible Care Initiative, which does not require third-party auditing and has had little if any impact on firm's environmental performance.⁸⁹ We refer the reader to Appendix A.6.4 for an overview of other studies that have looked only at correlation between the goals of such schemes and outcomes, rather than any empirical analysis of causation.

Whilst many authors have suggested that the adoption of an EMS can lead to improved environmental performance, we are only aware of one study which presents an empirical analysis of this causal relationship.^{90 91 92} The authors analysed data from the Toxics Release

⁸⁵ Arora, S., and Cason, T.N. (1996) Why Do Firms Volunteer to Exceed Environmental Regulations? Understanding Participation in EPA's 33/50 Program, *Land Economics*, Vol.72, No.4, pp.413–432

⁸⁶ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁸⁷ Ibid.

⁸⁸ Potoski, M., and Prakash, A. (2005) Green Clubs and Voluntary Governance: ISO 14001 and Firms' Regulatory Compliance, *American Journal of Political Science*, Vol.49, No.2, pp.235–248

⁸⁹ King, A.A., and Lenox, M.J. (2000) Industry Self-Regulation Without Sanctions: The Chemical Industry's Responsible Care Program, *Academy of Management Journal*, Vol.43, No.4, pp.698–716

⁹⁰ Anton, W.R.Q., Deltas, G., and Khanna, M. (2004) Incentives for Environmental Self-Regulation and Implications for Environmental Performance, *Journal of Environmental Economics and Management*, Vol.48, No.1, pp.632–654

⁹¹ Potoski, M., and Prakash, A. (2005) Covenants with Weak Swords: ISO 14001 and Facilities' Environmental Performance, *Journal of Policy Analysis and Management*, Vol.24, No.4, pp.745–769

⁹² Potoski, M., and Prakash, A. (2005) Green Clubs and Voluntary Governance: ISO 14001 and Firms' Regulatory Compliance, *American Journal of Political Science*, Vol.49, No.2, pp.235–248

Inventory (TRI), and found that the extent of EMS adoption has a significant downward impact on the intensity of toxic emissions particularly among firms with past release intensity that exceeded that of the median firm.

Furthermore, the authors could not find any evidence to suggest that the consumer, investor, and future litigation risk factors that influence the comprehensiveness of EMS's have any direct effect on toxic release intensity. Their study therefore suggests that such factors reduce emissions intensity indirectly only, through inducing the adoption of a more comprehensive EMS and therefore encouraging positive behaviour change.

To summarise, there is some evidence that a strong EMS has a positive effect on environmental performance, but the secondary point about the lack of impact of stakeholder pressure should be afforded less credence, given that the studies discussed in Section 0 suggest a more direct causal link between input market pressures and environmental performance.

3.4.4 Voluntary Schemes (Non-EMS)

To date, the majority of empirical research into the direct impacts of voluntary schemes has focused on the US 33/50 Program. There is little consensus within the literature as to whether this scheme had a direct impact on firms' emissions, and therefore it appears that the impact of this scheme was modest at best.

On one side of the debate, there are two main studies which support the notion that the 33/50 Program did in fact spur pollutant reductions. The first study to be released examined the impacts of the program during its first three years on a sample of 123 firms.⁹³ Based on the results of their analysis, the authors argue that the Program had a significant downward impact on releases generated by firms, even after controlling for sample selection bias and the impact of mandatory regulations and firm-specific characteristics. This conclusion is reaffirmed by a more recent study which estimated that the Program had a much larger impact than previous studies suggest.⁹⁴ This study used an econometric model to analyse the chemical releases from 319 companies for seven years (1989–95), giving a total of 1,879 company-year observations. The authors found that the Program had significantly influenced emissions levels.

Other studies, however, have reached opposite conclusions.⁹⁵ One study investigated the changes in health-indexed emissions of target chemicals by several key industries eligible for the 33/50 Program. The author demonstrates that (controlling for participants self-selection into the program) participants in the fabricated metals and paper industries cut emissions relative to non-participants, whilst in the chemical and primary metals industries participants implemented a lower level of emissions reduction than non-participants. Furthermore, even in the industries where participation seemed to be beneficial, the vast bulk of the apparent emission reductions were found to be transfers off-site rather than true pollution prevention. During their modelling, however, the authors do make the simplification that all facilities

⁹³ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

⁹⁴ Innes, R., and Abdoul, S.G. (2008) Voluntary Pollution Reductions and the Enforcement of Environmental Law: An Empirical Study of the 33/50 Program, *Journal of Law and Economics*, Vol.51, No.2, pp.271–296

⁹⁵ Gamper-Rabindran, S. (2006) Did the EPA's Voluntary Industrial Toxics Program Reduce Emissions? A GIS Analysis of Distributional Impacts and By-Media Analysis of Substitution, *Journal of Environmental Economics and Management*, Vol.52, No.1, pp.391–410

belonging to a parent firm that committed to the program actually participated in it, which may not have been the case.

A more sophisticated study of the 33/50 Program⁹⁶ used an empirical model to analyse the toxic releases from a sample of 2,034 facilities belonging to 197 publicly owned parent firms over a fixed time period (1991-1996). The authors make use of two techniques to improve the accuracy of their results. Firstly, unlike the previous study mentioned, only facilities with parent firms committed to the program were included in the data sample, and these were compared with a control group of non-participating facilities, that is, facilities that did not commit to the program, but belonged to parent companies that did. This step allowed the analysis to bypass any added variability introduced by company level incentives. Secondly, the authors use TRI emissions data as their primary information source. In doing so, they effectively eliminate the potential biases of voluntarily reported data. The study demonstrated that whilst more polluting facilities were more likely to make commitments to reduce the releases and transfers of the targeted chemicals, participation in the program alone is not associated with a decline in facility emissions.

3.5 Effectiveness of Mandatory Schemes

The key findings in respect of the effectiveness of mandatory schemes can be summarised as follows:

- They result in better performance than voluntary schemes as they allow a better system for benchmarking companies, but;
- Voluntary systems and other communications can be a reasonable substitute for reporting mandatory information;
- There are possible counterfactual arguments for improvements during mandatory scheme operation;
- Higher costs are associated with mandatory schemes; and
- Mandatory disclosure of poor performance can lead to a negative stock market response in the short term, leading to operational changes to improve environment performance.

Further detail on these issues is provided below, and in Section 0, with regard to the last of the above points.

Whilst many studies have examined the environmental benefits of mandatory reporting and disclosure schemes, only a few authors have addressed causality in detail. These studies have mainly focused on the US TRI, and Indonesia's PROPER scheme.

⁹⁶ Vidovic, M., and Khanna, N. (2012) Is Voluntary Pollution Abatement in the Absence of a Carrot or Stick Effective? Evidence from Facility Participation in the EPA's 33/50 Program, *Environmental and Resource Economics*, Vol.52, No.3, pp.369–393

Although there are many benefits to mandatory programmes, one report provides a series of arguments against mandatory building energy labelling schemes.⁹⁷ Aside from arguing that there is no empirical evidence to support the need for a mandatory policy, the authors consider the interaction between the market and such policies, stating that theoretically they should not be needed as other indicators exist to provide the same information that would be provided through such a mandatory policy. These include building inspections, utility bills and voluntary labelling schemes. On the latter indicator, the authors assume that customers' assumptions would be that non-disclosure hides worse performance, thus 'punishing' building owners who do not voluntarily disclose and in turn using market forces to encourage other owners to disclose.

Since the US TRI Program began in 1986, total reported releases of toxic chemicals listed under the scheme have fallen by at least 45%.⁹⁸ Earlier studies attributed these decreases to the impacts of the scheme, however, recent authors have highlighted a number of barriers to evaluating whether public disclosure is in fact responsible for this decline.⁹⁹ Data are not available on chemical releases before the programme began, or for unregulated facilities, making it difficult to identify a suitable counterfactual and therefore test the hypothesis that the TRI led to a decrease in toxic releases.¹⁰⁰ Some researchers have addressed this question of causality by investigating alternative explanations for the observed decreases in emissions of listed chemicals, such as:

- Plants' practice of substituting towards equally hazardous, but unlisted, chemicals;¹⁰¹
- Plants' shift to chemicals with lower volume but higher toxicity;¹⁰²
- Systematic under-reporting of emissions;¹⁰³ and
- The requirements of other, more conventional regulation.¹⁰⁴

Most authors do not go so far as to propose that the introduction of the TRI had no impact. What we do observe, however, is a substantial number of studies which suggest that the impacts of the TRI are relatively minor compared to other factors.

⁹⁷ Stavins, R.N., Schatzki, T., and Borck, J. (2013) *An Economic Perspective on Building Labeling Policies*, Report for Greater Boston Real Estate Board, March 2013, http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/Stavins_Schatzki_Building_Labels_Research_March2013.pdf

⁹⁸ Powers, N., Blackman, A., Lyon, T., and Narain, U. (2011) Does Disclosure Reduce Pollution? Evidence from India's Green Rating Project, *Environmental and Resource Economics*, Vol.50, No.1, pp.131–155

⁹⁹ Konar, S., and Cohen, M.A. (1997) Information As Regulation: The Effect of Community Right to Know Laws on Toxic Emissions, *Journal of Environmental Economics and Management*, Vol.32, No.1, pp.109–124

¹⁰⁰ Karkkainen, B. (2001) Information as Environmental Regulation: TRI and Performance Benchmarking, Precursor to a New Paradigm?, *Georgetown Law Journal*, Vol.89, No.2, p.257

¹⁰¹ Gamper-Rabindran, S., and Swoboda, A. (2006) *Response to State-Level TRI-Pollution Rankings: Do Plants Really Reduce Their Health-Indexed Emissions? Working Paper*, Report for University of Pittsburgh, 2006

¹⁰² Greenstone, M. (2003) Estimating Regulation-Induced Substitution: The Effect of the Clean Air Act on Water and Ground Pollution, *The American Economic Review*, Vol.93, No.2, pp.442–448

¹⁰³ Koehler, D.A., and Spengler, J.D. (2007) The Toxic Release Inventory: Fact or Fiction? A Case Study of the Primary Aluminum Industry, *Journal of Environmental Management*, Vol.85, No.2, pp.296–307

¹⁰⁴ Bui, L. (2005) *Public Disclosure of Private Information as a Tool for Regulating Emissions: Firm-Level Responses by Petroleum Refineries to the Toxics Release Inventory. Working Paper 05-13*, Report for US Census Bureau, 2005

Whilst less relevant in the context of the UK, much of the research on the impacts of PERPs in developing nations has focused on Indonesia's PROPER scheme. Two studies present rigorous statistical analyses of this scheme based on econometric modelling.^{105 106} The authors make use of both *ex ante* and *ex post* information to study the changes in pollution trends resulting from the policy. By extending their analysis to include a control group of non-participating firms these studies were also able to control for other unobserved factors that could also have affected emissions. The studies both concur that the introduction of PROPER did motivate a significant reduction in emissions. A particularly strong response was elicited from firms with poor environmental compliance records, which were found to cut their emissions intensities by approximately one third. We have also examined the specific scheme factors motivating these emissions reductions in Section 0, based on more recent findings.

In an International Energy Agency (IEA) paper, the pros and cons of mandatory and voluntary building labelling schemes are discussed. This paper suggests that mandatory policies are likely to have a greater influence on the market prices of buildings by allowing customers to compare all buildings, rather than just those for which they specifically request information or enter into a transaction. It therefore concludes that mandatory policies lead to greater emissions reductions. It also notes that mandatory policies are likely to result in greater costs to the administrator for design and implementation, due to the need for a 'well-developed delivery system' as well as additional legislation. Finally, the paper concludes that if a scheme is based on an awards system, where only the top performers are provided with a certificate, the case for a mandatory system is less strong, as only the top performers (who would likely be the most eager to participate) would be recognised.¹⁰⁷

Finally, a study of British Columbia's Public Disclosure Program for Water Pollution examined the relative impacts of both traditional enforcement practices and public disclosure on pollution levels and rates of compliance. The authors present evidence, based on empirical modelling of emissions from 15 plants in the pulp and paper industry, that public disclosure directly influenced plants to improve their environmental performance.¹⁰⁸

3.5.1 Effect on a Company's Market Value

At least three separate studies of the mandatory US TRI scheme conclude that on the day the information was made public (for all years from 1990-1994) there was a statistically significant drop in stock market prices for companies which reported data under the scheme.^{109 110 111} One particular report also noted that this effect was particularly pronounced for firms

¹⁰⁵ García, J.H., Sterner, T., and Afsah, S. (2007) Public Disclosure of Industrial Pollution: The PROPER Approach for Indonesia?, *Environment and Development Economics*, Vol.12, No.06, pp.739–756

¹⁰⁶ García, J., Afsah, S., and Sterner, T. (2009) Which Firms are More Sensitive to Public Disclosure Schemes for Pollution Control? Evidence from Indonesia's PROPER Program, *Environmental and Resource Economics*, Vol.42, No.2, pp.151–168

¹⁰⁷ International Energy Agency (2010) *Energy Performance Certification of Buildings: A Policy Tool to Improve Energy Efficiency*, 2010, http://www.iea.org/publications/freepublications/publication/buildings_certification.pdf

¹⁰⁸ Foulon, J., Lanoie, P., and Laplante, B. (2000) *Incentives for Pollution Control - Regulation and Public Disclosure, Volume 1*, Report for World Bank, February 2000, http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=469372&piPK=64165421&menuPK=64166093&entityID=000094946_00022905315632

¹⁰⁹ Konar, S., and Cohen, M.A. (1997) Information As Regulation: The Effect of Community Right to Know Laws on Toxic Emissions, *Journal of Environmental Economics and Management*, Vol.32, No.1, pp.109–124

whose environmental performance worsened over time relative to other firms, i.e. the effectiveness of the scheme did not seem to decrease year on year as some suggest it might have.¹¹² Similar results are found for the main voluntary pollution disclosure scheme in the US, the '33/50 Program'. One study observed that the immediate effects of disclosure on the return on investment of participating firms were highly negative. The authors suggest that in this case the costs of pollution control were apparently not fully offset in the short-run by improvements in consumer goodwill and gains in input-use-efficiency.¹¹³

Studies of mandatory PRTRs in other countries have also observed a negative stock market reaction to the disclosure of environmental information, including an analysis of a mandatory pollution disclosure scheme in British Columbia, Canada.¹¹⁴ A particularly methodologically robust study, applying multivariate regression modelling (MVRM) techniques, examined the effects of the EPER.¹¹⁵ The authors concluded that new information on pollution has a negative and significant impact on the market value of EPER listed firms. In contrast, firms considered by the Integrated Pollution Prevention Control law (IPPC) to be potential polluters but which did not exceed the legally established thresholds (not listed in the EPER Report) were rewarded with greater investor confidence and their market value increased the day after publication of the EPER.

The study of the mandatory TRI scheme demonstrated that the severity of a negative stock market response is somewhat proportionate to the environmental performance of a firm.¹¹⁶ In other words, poor environmental performance leads to a greater drop in a firm's market value following disclosure. A similar conclusion is also reached in a study of the top 500 Australian companies listed on the Australian Stock Exchange. This report concluded that companies with positive environmental disclosure perform significantly better in the market than companies that disclose negative environmental information.¹¹⁷

A study on the effects of the TRI on toxic emissions from 1989-2002 concluded that the significant falls in share prices provoked by the TRI motivated firms to significantly reduce their toxic emissions.¹¹⁸ From a subsample of the 40 major pollution emitters, the authors

¹¹⁰ Khanna, M., Quimio, W.R.H., and Bojilova, D. (1998) Toxics Release Information: A Policy Tool for Environmental Protection, *Journal of Environmental Economics and Management*, Vol.36, No.3, pp.243–266

¹¹¹ Hamilton, J.T. (1995) Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data, *Journal of Environmental Economics and Management*, Vol.28, No.1, pp.98–113

¹¹² Khanna, M., Quimio, W.R.H., and Bojilova, D. (1998) Toxics Release Information: A Policy Tool for Environmental Protection, *Journal of Environmental Economics and Management*, Vol.36, No.3, pp.243–266

¹¹³ Khanna, M., and Damon, L.A. (1999) EPA's Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

¹¹⁴ Lanoie, P., Laplante, B., and Roy, M. (1998) Can Capital Markets Create Incentives for Pollution Control?, *Ecological Economics*, Vol.26, No.1, pp.31–41

¹¹⁵ Cañón-de-Francia, J., Garcés-Ayerbe, C., and Ramírez-Alesón, M. (2008) Analysis of the Effectiveness of the First European Pollutant Emission Register (EPER), *Ecological Economics*, Vol.67, No.1, pp.83–92

¹¹⁶ Khanna, M., Quimio, W.R.H., and Bojilova, D. (1998) Toxics Release Information: A Policy Tool for Environmental Protection, *Journal of Environmental Economics and Management*, Vol.36, No.3, pp.243–266

¹¹⁷ Gozali, N., O., How, J., C., and Verhoeven, P. (2002) *The Economic Consequences of Voluntary Environmental Information Disclosure*, Report for Proceedings of the 1st Biennial Meeting of the iEMS, 2002

¹¹⁸ Konar, S., and Cohen, M.A. (1997) Information As Regulation: The Effect of Community Right to Know Laws on Toxic Emissions, *Journal of Environmental Economics and Management*, Vol.32, No.1, pp.109–124

found that 32 reduced their TRI-related revenue, whilst only 8 firms increased emissions. Specifically, the most polluting firms reduced their TRI-related revenue by an order of magnitude more than the sample average.

The conclusions reached by a later study were less clear.¹¹⁹ This study aimed to extend previous work, and used an econometrically estimable model to examine the impact of investor response to the disclosure of TRI information on firms' subsequent emissions over a six-year period (1989-1994). Whilst the authors found that market values incurred by firms did induce them to significantly reduce their on-site toxic releases, they also state that this led to a significant volume of 'transfer' of waste materials off-site. This meant that the net effect on aggregate toxic releases was potentially insignificant. A number of the off-site waste transfers, however, were to recycling and energy recovery so there is still a possible net benefit in terms of pollution levels.

To summarise, the majority of studies reached the conclusion that public disclosure leads to an initially negative stock market reaction, with some potential for a more positive reaction over the long term. The question is whether these changes in stock prices have subsequently had an effect on firms' environmental behaviour. The few studies that have tested for such effects have again focused on the impacts of the US TRI.

3.6 Impact of Content and Structure of Reporting and Disclosure

The key findings in respect of the structure and content of reporting and disclosure schemes can be summarised as follows:

- The quality of content required is far more important in driving change than the quantity of data reported;
- League tables and standardised formats have shown to be relatively effective.

These issues are discussed in further detail in Sections 0 and 0.

3.6.1 Data Quality versus Data Quantity

Within the NEE literature, a few studies were found which describe how the reporting structure used to disclose information can affect the impacts of disclosure. Information disclosed by the US TRI is well suited to this type of analysis. Each state is permitted to choose their own approach to analysing and presenting the data to the public, leading to a significant state-level variation in the content and format of the data disclosed. One study assessed the degree to which more sophisticated processing and presentation of TRI has impacted on organisations emissions.¹²⁰ The authors hypothesised that well-presented data will be of more use to the public, who are then more likely to pressure polluting firms to improve their environmental performance. The study finds that, while dissemination of raw TRI data had little effect on mitigating health risks, state-level data processing efforts, in contrast, did lead to significant reductions in health risks, as measured by a decrease in toxic emissions from TRI firms. The authors note that these results match the predictions of 'information

¹¹⁹ Khanna, M., Quimio, W.R.H., and Bojilova, D. (1998) Toxics Release Information: A Policy Tool for Environmental Protection, *Journal of Environmental Economics and Management*, Vol.36, No.3, pp.243–266

¹²⁰ Bae, H., Wilcoxon, P., and Popp, D. (2010) Information Disclosure Policy: Do State Data Processing Efforts Help More than the Information Disclosure Itself?, *Journal of Policy Analysis and Management*, Vol.29, No.1, pp.163–182

overload' theory, that is, programs that produce low-volume, high-quality data are likely to be much more effective than those that simply disseminate large volumes of complex data.

A study on disclosure requirements for electricity companies in the US states that broader literature on information policies suggests that disclosure of performance information is most likely to achieve the desired results when disseminated information is 'simple, understandable, standardized, actionable' and designed to directly benefit at least some of the disclosers themselves.¹²¹

An aspect of disclosure which has seen little research is the link between the quality of disclosure (in terms of accuracy, transparency, and pertinence) and company reputation. One UK study compares these two variables. The authors analysed a sample of 139 companies, comparing corporate environmental reputation data collected from a survey conducted in 2000 with disclosure quality. This was measured through quantitative and qualitative content analysis of organisations' annual reports. The results of this study suggest that the quality of environmental disclosure rather than mere quantity has a stronger effect on the creation of environmental reputation amongst executive and investor stakeholder groups.¹²²

3.6.2 Comparability of Information Submitted

Further studies have investigated the extent to which disclosed information allows for comparability between firms and how this can affect the outcomes of disclosure. A study compared the impacts of disclosure on equity value for listed firms under the TRI and British Columbia's list of polluters.¹²³ This latter scheme consists of the publication by the Canadian Ministry of Environment of a biannual list of polluters that are non-compliant with one or more environmental regulations, or who are of concern because their environmental performance is near the regulatory threshold. The analysis demonstrates that, in contrast to the TRI (see Section 0), public disclosure of a firm's environmental performance had no statistically significant impact on firms' equity value. The authors observe that the impacts of disclosure on firms' equity value appears to be a function of whether firms are ranked with respect to their environmental performance and therefore easily comparable, as well as the regulator's willingness to undertake strong enforcement actions. This may explain why disclosure under British Columbia's list of polluters, which does not provide a ranking of organisations or a detailed analysis of their environmental performance, had little effect on firms' equity value.

There is some research to suggest that reductions in a firm's share prices in response to disclosure, prompts them to subsequently improve their environmental performance. Therefore, if, as the above study suggests, disclosure schemes which rank firms according to their environmental performance have a greater impact on firm's equity value, it is possible that such schemes could also motivate a more substantial improvement in environmental performance.

The comparative value of data releases from a central body versus individual disclosure through, for instance, companies' annual reports is also discussed within the literature. One

¹²¹ Delmas, M., Montes-Sancho, M.J., and Shimshack, J.P. (2010) Information Disclosure Policies: Evidence from the Electricity Industry, *Economic Inquiry*, Vol.48, No.2, pp.483–498

¹²² Hasseldine, J., Salama, A.I., and Toms, J.S. (2005) Quantity Versus Quality: The Impact of Environmental Disclosures on the Reputations of UK Plcs, *The British Accounting Review*, Vol.37, No.2, pp.231–248

¹²³ Lanoie, P., Laplante, B., and Roy, M. (1998) Can Capital Markets Create Incentives for Pollution Control?, *Ecological Economics*, Vol.26, No.1, pp.31–41

study examined the value of government-led reporting, and argued that the data released by companies through corporate environmental reports are of very limited value, particularly for analysts seeking to benchmark the environmental performance of different companies or sites. The authors argue that the data published by governments through PRTRs such as the US TRI or EPER are of much greater value.¹²⁴

It is recommended in a review of the Carbon Disclosure Project that environmental information reported by companies should be related to financial and accounting information to make it as relevant to investors as possible. This means both including it within a company's regular annual report and also ensuring that the environmental reporting period matches that of financial accounting, i.e. that environmental information is reported for the financial year, rather than the calendar year.¹²⁵ As at March 2014, however, the CDP has not yet taken up this recommendation.

It is also commented in a study for Defra that requiring companies to include information in an annual report would be more likely to drive change than disclosure undertaken through a central (governmental) body. This is due to the fact that an annual report would need to be signed off by the company's board, and issue explored specifically in Section 0. The same study also questioned the ability of straight-forward disclosure of energy usage statistics to be of much use to the general public, as comparisons between widely varying companies would be particularly difficult, if not totally meaningless. This would therefore remove the reputational driver which, for 'public-facing companies' can affect action taken on energy efficiency.¹²⁶

As part of the review of the aforementioned Danish 'green accounts', a round-table discussion with various stakeholders, including journalists, NGOs, members of the public and environmental professionals was held.¹²⁷ One theme that emerged from this discussion was that the fact that there was no specific format for companies to use for reporting and that it was therefore very difficult for anyone to draw much use out of the reports. The content varied a lot and there was no way to easily compare companies to each other. Also, the fact that there was little engagement with the public (by the central administrator) at the time of publication meant that few people had actually been encouraged to make use of the data. This is potentially an important factor in the design of any reporting scheme where public awareness is key to its success – scheme owners may need to engage external stakeholders and the general public to ensure the effect of disclosure is maximised.

¹²⁴ Sullivan, R., and Gouldson, A. (2007) Pollutant Release and Transfer Registers: Examining the Value of Government-Led Reporting on Corporate Environmental Performance, *Corporate Social Responsibility and Environmental Management*, Vol.14, No.5, pp.263–273

¹²⁵ Hesse, A. (2006) *Climate and Corporations - Right Answers or Wrong Questions? Carbon Disclosure Project Data - Validation, Analysis, Improvements*, Report for Germanwatch, February 2006, <http://germanwatch.org/rio/cdp-ah06.pdf>

¹²⁶ NERA Economic Consulting, and Enviro (2006) *Energy Efficiency and Trading Part II: Options for the Implementation of a New Mandatory UK Emissions Trading Scheme*, Report for Department for the Environment, Food and Rural Affairs, April 2006, http://www.nera.com/extImage/PUB_Defra_ENV111.pdf

¹²⁷ Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

3.7 Impact of Board Level Sign-off

In a survey of EEO Program participants, 94% agreed that it was important to keep board members informed of progress on energy efficiency measures.¹²⁸ As mentioned in Section 0, 61% also agreed that 'board interest' played a very important role in driving energy efficiency measures, ahead of both government and the public. It could therefore be considered that any requirement to have reports on energy efficiency progress signed by the board would encourage and likely increase board interest and therefore in turn help drive related investment.

The fact that increased reporting or disclosure requirements can support the removal of barriers to energy efficiency by moving responsibility and engagement on the issue up the corporate hierarchy is also supported by survey results from the mid-cycle review of the EEO Program. 'Lack of interest or support from senior management' was listed as a barrier before taking part in the program by 32% of participants in the survey. Following the program, only 12% still listed it as a barrier.¹²⁹ In a question on internal impacts of the EEO Program in the end of cycle review, however, only 52% agreed that 'the EEO requirement to report to the Board has helped to get interest in projects, energy use, funding and staff resources'. It therefore seems that results on the impact of including board level sign-off are mixed.¹³⁰

A separate study for Defra on the potential for a new emissions trading scheme for smaller companies argued that, if a specific barrier to energy efficiency within a company was related to a lack of appropriate information, requiring disclosure of energy usage in an annual report could increase investments in energy efficiency. This is due to the fact that annual reports are very likely to be reviewed by the board before being published, which would place more relevant information in the hands of those more able to make investment decisions.¹³¹

A further Defra report on proposals for mandatory greenhouse gas reporting sums up the results of several strands of research:

*'One finding from all the different research techniques is that senior management commitment is a key driver of companies undertaking initiatives to reduce [greenhouse gas] emissions. It is very likely that in order to get this commitment, information on the current state of emissions must be reported to them. A request to report externally could trigger this whole process, or it could have occurred because of another stimulus.'*¹³²

¹²⁸ OgilvyEarth (2010) *Quantitative Research of CEOs/Senior Level Executives Participating in the Energy Efficiency Opportunities Program*, July 2010, http://www.ret.gov.au/energy/Documents/energyefficiencyopps/events-training-consultation/111005_SeniorManagementResearch.pdf

¹²⁹ ACIL Tasman (2013) *Energy Efficiency Opportunities Program Review*, Report for Department of Resources Energy and Tourism, April 2013, <http://eeo.govspace.gov.au/files/2013/05/EEO-Program-Review-Final-Report.pdf>

¹³⁰ Ibid.

¹³¹ NERA Economic Consulting, and Enviro (2006) *Energy Efficiency and Trading Part II: Options for the Implementation of a New Mandatory UK Emissions Trading Scheme*, Report for Department for the Environment, Food and Rural Affairs, April 2006, http://www.nera.com/extImage/PUB_Defra_ENV111.pdf

¹³² DEFRA (2010) *The Contribution that Reporting of Greenhouse Gas Emissions Makes to the UK Meeting its Climate Change Objectives: a Review of the Current Evidence*, November 2010, <http://archive.defra.gov.uk/environment/business/reporting/pdf/corporate-reporting101130.pdf>

In other words, support from the most senior people within the company is crucial for success in implementing activities and processes which result in GHG emissions reductions. Furthermore, it is likely that to get senior management engaged, it would be necessary to engage with them directly with data relating to the company's emissions. Alternatively, this engagement could be triggered in response to a requirement for mandatory disclosure.

3.8 Impact of Scheme Related Costs

The key findings in respect of scheme related costs can be summarised as follows:

- There is no discernible marginal cost impact between central and public disclosure.
- Compliance with scheme requirements is usually proportionally cheaper for larger organisations;
- There is insufficient consistent evidence on scheme costs from which to derive estimates for different elements of scheme requirements, i.e. data collection, submission, review, authorisation, and audit;
- There is not a solid body of evidence to suggest that similar spending on Board-level sign-off would not be required should schemes have been based on central reporting (rather than public disclosure); and
- There is not sufficient evidence to strongly argue that scheme benefits usually outweigh costs, although future net benefits are predicted in most studies.

Further detail on these findings is provided in Sections 0 to 0.

Our analysis of information from the financial sector suggests that studies which analyse the cost benefit of schemes for the reporting of financial information are prone to bias, depending on the sponsor of the study. For example, in reports generated for umbrella organisations promoting good practice, such as IEMA, GRI and the International Integrated Reporting Council, the significance of administration costs tends to be downplayed.¹³³ This is potentially because any highlighting of high levels of cost might hold back any related agendas to roll out new reporting standards. Whilst this finding cannot be directly attributed to the energy efficiency sector, it should be taken into consideration in this analysis.

3.8.1 Costs of Public Disclosure Versus Central Reporting Only

The evidence on the difference in costs between reporting centrally and publicly is very weak. No studies have directly answered this question and the only evidence we can provide is in the form of conjecture based on general trends suggested by the evidence we have reviewed.

First of all, as the reputational impact of public disclosure is usually higher than under central reporting mechanisms, this can encourage greater board level involvement and thus greater

¹³³ Reading several pieces of promotional material for IIRC only one comment was made regarding costs 'Companies and their stakeholders will need to determine if the added cost of additional assurance... is commensurate with the value received' Deloitte (2011) *Integrated Reporting A better view?*, 2011, http://www.deloitte.com/assets/Dcom-MiddleEast/Local%20Assets/Documents/Services/ERS/me_ers_integrated_reporting_sept11.pdf

costs. This may imply that central, confidential reporting may be less costly, but as discussed in Section 0, we did not find any direct evidence found on this issue. Even if there is no board level involvement, it is likely that companies will instinctively spend longer preparing something for public disclosure than for submission to a central administrative body and thus costs for public disclosure could be higher, but again, the evidence for this is missing. Costs are likely to vary more depending on the specifics of each scheme, such as the structure required (see Section 0), than on whether what is produced is intended for public scrutiny or not.

In general, the tasks of preparing and submitting reports is regarded as having a cost impact, whether or not the disclosure is for global distribution or to a central body only. As discussed in Section 0, for most schemes under the NEE theme, which are centrally managed also involve public disclosure, therefore no attempt has been made in the literature to differentiate cost impacts.

3.8.2 Impact of Costs on Companies of Different Sizes

It was acknowledged in some studies that smaller companies are particularly affected by reporting costs. In recognition of this impact, the EC appears to have adopted a position that it will seek to reduce the 'administrative burden' for companies even if this is to sacrifice the benefits of disclosure it espouses for reporting in its revised Accounting Directive on Annual and Consolidated Accounts (78/660/EEC and 83/349/EEC).¹³⁴

Similarly, a few studies also comment that the larger a company is, the more economical collection of energy or emissions data becomes. A 2006 report on a proposed emissions trading scheme for the UK estimated costs at 2006 prices based on scenarios with a number of sites: with 50+ sites, the participation costs per site was just £162 / year, whereas with one site it was up to £7,120 / year.¹³⁵

3.8.3 Specific Reporting Costs

To identify the marginal costs that a new reporting scheme may incur, it is necessary to understand the level of reporting already being carried out within a company. In addition, internal administration costs, expected court costs, and risk preferences vary between organisations and could be amplified by the imposition of new reporting schemes.¹³⁶

A number of studies have attempted to provide estimates for costs incurred by businesses for reporting under specific schemes. Table 2 provides examples of reported costs. Cost estimates for compliance were also included in a review of the Danish 'green accounts', but as these vary too much in terms of how much information is provided, they are not considered here as they are unlikely to provide any meaningful data for inclusion in this analysis.

¹³⁴ EUBusiness (2013) *Disclosure of Non-Financial and Diversity Information by Certain Large Companies and Groups (Proposal to Amend Accounting Directives)*, accessed 10 March 2014, <http://www.eubusiness.com/topics/sme/envirom-social>

¹³⁵ NERA Economic Consulting, and Enviros (2006) *Energy Efficiency and Trading Part II: Options for the Implementation of a New Mandatory UK Emissions Trading Scheme*, Report for Department for the Environment, Food and Rural Affairs, April 2006, http://www.nera.com/extImage/PUB_Defra_ENV111.pdf

¹³⁶ This was modelled for the introduction of SEC controls in a report by James R. Barth and Joseph J. Cordes *Optimal Financial Disclosure With and Without SEC Regulation*

It should be noted that the costs presented in Table 2 are intended to provide a general picture of the wide range of costs given for a number of schemes, all of which have slightly different data collection and reporting requirements. It should be noted that no attempt has been made within the scope of this study to compare these costs or extrapolate them to any wider context. Some schemes have broken down their costs, and a small number of studies also make general comments on the nature of costs in relation to reporting or disclosure policies. This information, however, is not sufficient to enable us to put a cost against each element of the scheme, but we have provided analysis of the specific perceived costs of board level sign-off below.

Table 2: Examples of Costs Reported or Calculated for Other Schemes¹³⁷

Scheme	Data Collection and Analysis	Data Submission to Central Body	Understanding Rules (one off cost)	Total Costs	Notes
Energy Efficiency Opportunities Program (Aus) ¹				AUS\$95,000 / company / 5-year cycle	Actual Costs. No further break-down of costs is provided.
Proposed ETS for large non-energy intensive users (with half hourly meters) ²	3 person days = £1500 / company	1 person days = £500 / company	3 person days = £1500 / company	7 person-days = £3500 / company with one site (in year 1)	Cost Estimates. Assumes £500/person days. Costs are for one site only. Costs relating to trading have been excluded.
Voluntary agreements (for GHG emissions reductions) ³				Denmark: €17-33k / firm Netherlands: €50,000 / sector	Actual costs. No details are provided as to the nature of the voluntary agreement.
Greenhouse gas reporting mechanism for on-road mobile sources (USA) ⁴				\$292-\$1,754 / vehicle fleet (1-6 vehicles)	Cost estimates. Range of estimates provided across 12 industries.
Mandatory GHG reporting (UK) ^{5 6 7}	£2,240 - £60,000 / company	£100 - £18,000 / company	£120 - £14,268 / company	£2460-£92,268 / company in year 1 of reporting	Cost estimates. Costs are based on the final impact assessment and others' analysis of potential costs.
General Non-Financial Reporting ⁸	€91,000-€331,000	€34,000-€131,000 Additional data €8,000-€23,000 Training €0-€5,000	No separately identifiable	€133,000 – €490,000	Large companies only.

Notes:

1. ACIL Tasman (2013) Energy Efficiency Opportunities Program Review, Report for Department of Resources Energy and Tourism, April 2013
2. NERA Economic Consulting, and Enviro (2006) Energy Efficiency and Trading Part II: Options for the Implementation of a New Mandatory UK Emissions Trading Scheme, Report for Department for the Environment, Food and Rural Affairs, April 2006
3. OECD Environment Directorate, and International Energy Agency (2003) Policies to Reduce Greenhouse Gas Emissions in Industry - Successful Approaches and Lessons Learned: Workshop Report, 2003
4. Department of Ecology - State of Washington (2009) Preliminary Cost-Benefit and Least Burdensome Alternative Analysis: Chapter 173-441 WAC: Reporting of Emission of Greenhouse Gases, September 2009

¹³⁷ Costs are taken from varying years which have not been reported so costs should not be directly compared.

5. Department for Environment, Food and Rural Affairs (2011) Impact Assessment of Options for Company GHG Reporting, August 2011
6. KPMG (2011) Assessing the Administrative Costs of the CRC Energy Efficiency Scheme, Report for DECC, December 2011
7. Adelphi (2011) The Costs and Benefits of Mandatory Greenhouse Gas Reporting: An Independent Analysis of the Defra Impact Assessment, Report for The Aldersgate Group, July 2011
8. Centre for Strategy & Evaluation Services (2011) Disclosure of Non-Financial Information by Companies, Report for European Commission (DG Internal Markets and Services), December 2011

Costs of Board Level Sign-off

Very few studies have been found that provide analysis of the time or cost requirements for Board approval of reports due to be publicly disclosed. The only estimate we have identified comes from a KPMG survey of CRC participants in 2011, which shows that approximately £900 is spent on 'internal audit / sign off by management' on an annual basis.¹³⁸ These costs are spread across management levels, with approximately £200 spent on each of the following two categories:

- 'Directors and department heads' (equivalent to 3.3 hours); and
- 'Senior management' (equivalent to 4.4 hours).

The rest of the spend is stated to be on middle managers and administrators, and there is no analysis to suggest that such a spend would not have been required should the scheme have been one of central reporting (without public disclosure) only.

Costs of Auditing

There are a limited number of relevant studies relating to the costs of auditing. These studies primarily estimate the costs of auditing for organisations, although it should be noted that these estimates vary in accuracy and often apply only to specific sectors. One survey found that external assurance costs for large companies were in the order of €22,000 to €114,000 for non-financial reporting. This would be in addition to statutory auditing requirements.¹³⁹

3.8.4 Scheme Complexity or Simplification

- Divergence from internal reporting methods implies higher scheme reporting costs, although this diminishes over time;

It is logical to assume that the more complicated a scheme is, the more it will cost for companies to comply with it. This is also the case for those *not* required to comply, as they will need to make a one-off assessment of whether they must comply or not. If rules or schemes are amended, these costs will likely be incurred again. The only study found that estimates these

¹³⁸ KPMG (2011) *Assessing the Administrative Costs of the CRC Energy Efficiency Scheme*, Report for DECC, December 2011, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/42934/4759-kpmg-assessing-admin-costs-crc-scheme.pdf

¹³⁹ Centre for Strategy & Evaluation Services (2011) *Disclosure of Non-Financial Information by Companies*, Report for European Commission (DG Internal Markets and Services), December 2011, http://ec.europa.eu/internal_market/accounting/docs/non-financial-reporting/com_2013_207-study_en.pdf

costs relates to a proposed greenhouse gas reporting scheme in the US where costs to non-reporters are estimated at \$150-500 (one-off cost at 2009 prices).¹⁴⁰

Similarly, specifics of reporting requirements are generally the main factors in how much it costs for a company to report. If a company is free to report in whatever format it wishes, it seems likely that this would reduce costs. If flexible templates are used, this can help reduce costs whereas rigid templates that are unlike any other reporting system are likely to result in longer time taken to report, which will ultimately mean higher costs to the company. This is supported by a small pilot greenhouse gas reporting programme run in Victoria, Australia.¹⁴¹ The pilot relied on the current National Pollutants Inventory template which all participants had to fill in anyway and simply added greenhouse gases as another pollutant. This resulted in pilot participants reporting an average of 200 minutes spent reporting their greenhouse gas emissions.

In a report on building labelling policies, the relationship between costs and 'stringency' (and outcomes) of schemes is said to be non-linear but positive.¹⁴² In other words, as more is required in terms of reporting or data, costs will also increase, but the rate of increase will not necessarily stay constant.

There seems to be conflicting views on how costs of reporting develop over time: in an analysis of the Danish Green Accounts, 78% considered that the second year of reporting was 'easier' than the first.¹⁴³ However, in interviews with professionals undertaken greenhouse gas reporting, 57% reported that costs relating to monitoring and reporting had increased over time, with none suggesting it had decreased. This may be explained by a number of factors, however, as this study did not split respondents according to whether they were reporting in response to mandatory requirements and whether the increase in time to measure is related to new requirements, such as increased scope.¹⁴⁴

3.8.5 Offset of Reporting Costs by Resulting Benefits

It is important to highlight that two of the original research questions drawn up by DECC (see Appendix A.1.0), to which we responded in the Interim Report for this study, focused on the 'cost-effectiveness' of energy efficiency measures implemented as a result of public disclosure or central reporting schemes. The term 'cost effective' in this context was interpreted for the purposes of this study to mean any measures that actually improve a company's 'bottom line' i.e. not only do such measures improve environmental and/or energy performance, they are also financially beneficial to firms.

¹⁴⁰ Department of Ecology - State of Washington (2009) *Preliminary Cost-Benefit and Least Burdensome Alternative Analysis: Chapter 173-441 WAC: Reporting of Emission of Greenhouse Gases*, September 2009, <https://fortress.wa.gov/ecy/publications/publications/0902017.pdf>

¹⁴¹ EPA Victoria (2006) *Greenhouse Gas Emissions Reporting and Disclosure Pilot: Findings from Data Collection and Disclosure*, August 2006, <http://www.epa.vic.gov.au/~media/Publications/1056.pdf>

¹⁴² Stavins, R.N., Schatzki, T., and Borck, J. (2013) *An Economic Perspective on Building Labeling Policies*, Report for Greater Boston Real Estate Board, March 2013, http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/Stavins_Schatzki_Building_Labels_Research_March2013.pdf

¹⁴³ Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

¹⁴⁴ PricewaterhouseCoopers, and Carbon Disclosure Project (2010) *Review of the Contribution of Reporting to GHG Emissions Reductions and Associated Costs and Benefits*, Report for DEFRA, August 2010, <http://pwc.blogs.com/files/pwc-emissions-reporting-1110.pdf>

One review of the EEO programme attempted to set all costs of participating in the scheme as well as implementing a number of energy efficiency improvements against all benefits expected from those improvements over a 4 year period against each other and found that, on average, the benefit to cost ratio for the scheme was 3.6.¹⁴⁵

Aside from the study above, however, there is limited empirical evidence which suggests that measures identified as a result of reporting or disclosure schemes which are 'cost effective' are implemented, but no evidence to suggest measures which are not cost effective, i.e. that are not outweighed by the financial benefits, are implemented. This evidence is largely drawn from the financial theme. This is testament to the fact that public disclosure of financial data has been taking place for nearly 100 years and the transparency this creates is almost universally regarded as being beneficial in terms of its overall cost-effectiveness.

Some studies focused on analysis of reporting of financial data use cost benefit analysis (CBA) to highlight, that in principle, the higher cost of presenting high quality, accurate information is partially offset by the decreased risk of litigation and/or consequences of misinformed investor decisions, and more than offset by the wider benefits of enhanced reputation, productivity and investment. It is suggested however, that there is a threshold on company spend after which these benefits recede significantly.¹⁴⁶

In relation to environmental reporting, a few surveys with company representatives responsible for reporting have attempted to draw out whether companies felt the benefits outweighed the costs. The responses vary widely and are rather contradictory. In relation to compliance with the Danish green accounts regulations, companies were asked about the financial benefits associated with submitting public environmental accounts. The responses showed that 48% saw no financial benefits, whereas 52% found a number of benefits (sample size of 512).¹⁴⁷ In interviews conducted by PricewaterhouseCoopers in relation to public and central greenhouse gas reporting (note this evidence is slightly compromised by the small sample size), initial responses to a web-based survey suggested that, of those who felt able to quantify costs and benefits, 60% of respondents found a net cost of reporting, while 40% found a net benefit (survey sample of 55). A follow-up investigation via telephone interviews (sample size of 32) found that 68% of companies saw a net benefit and 28% found a net cost. It is suggested that the companies in the latter survey were more likely to consider additional (non-financial) benefits when responding to this question.¹⁴⁸ Finally, in a survey by IEMA of environmental practitioners who conducted greenhouse gas reporting (either in response to a mandatory requirement or voluntarily), 83% believed that greenhouse gas reporting would eventually result in positive (financial) payback; 69% of the sample believed the payback would occur within 5 years. Figures for general 'added value' to the business were very similar, with 87% believing greenhouse gas

¹⁴⁵ ACIL Tasman (2013) *Energy Efficiency Opportunities Program Review*, Report for Department of Resources Energy and Tourism, April 2013, <http://eeo.govspace.gov.au/files/2013/05/EEO-Program-Review-Final-Report.pdf>

¹⁴⁶ Elliott, R.K., and Jacobson, P.D. (1994) Costs and Benefits of Business Information Disclosure, *Accounting Horizons*, Vol.8, No.4, pp.80–96

¹⁴⁷ Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

¹⁴⁸ PricewaterhouseCoopers, and Carbon Disclosure Project (2010) *Review of the Contribution of Reporting to GHG Emissions Reductions and Associated Costs and Benefits*, Report for DEFRA, August 2010, <http://pwc.blogs.com/files/pwc-emissions-reporting-1110.pdf>

reporting would result in a positive 'payback' of added business benefits (76% believing this to occur within 5 years) (sample size of 29 and 30, respectively).¹⁴⁹

¹⁴⁹ Institute of Environmental Management and Assessment (2011) *Government Consultation on Measuring and Reporting of Greenhouse Gas Emissions by UK Companies: Response by the Institute of Environmental Management & Assessment*, July 2011, <http://www.iema.net/system/files/iema20response20measuring20and20reporting20of20greenhouse20gas20emissions20by20uk20companies.pdf>

4.0 Summary of Key Findings

It is first important to reiterate the core objectives of this piece of research, which are to:

- Identify any organisational incentives, attitudes, and behaviours that are likely to arise according to different ESOS reporting requirements; and
- Inform DECC with regard to which of the reporting options proposed in its Impact Assessment (IA) would be most effective at delivering the objectives of ESOS, the goals of which can be summarised as being:¹⁵⁰
 - To enable the UK to meet the requirements of Article 8 within the EU Energy Efficiency Directive; and
 - To drive energy efficiency and energy reduction among non-SMEs in the UK.
- Highlight whether sufficient evidence exists to clearly demonstrate that there are different quantified impacts which result from different types of reporting options.

Two issues affected the quality and relevance of available evidence, namely:

1. Evidence from other research ‘themes’ cannot easily be transferred to energy efficiency

As discussed in Sections 1.4.2.2, the reputational impact associated with non-compliance under schemes within both GHG and NEE is more tangible than under the energy efficiency (EE) theme, due to the public being less likely to connect energy use to climate change concerns.

Financial reporting and disclosure has relevance to energy efficiency due to the focus on costs. Investor behaviour has been increasingly shown to be influenced by ‘non-financial’ performance data, such as consumption and environmental impact. For many businesses, however, energy consumption is a minor part of the total cost base, and therefore less relevant to investment analysts and boards, aside from companies within the most energy intensive industries. In addition, as discussed in Section 1.4.2.4, financial reporting and disclosure is very mature and already occupies the central position within the boardroom where non-compliance incurs immediate financial penalty. This is in stark contrast to reporting of energy efficiency performance.

Finally, as explored in Section 1.4.2.5, much of the evidence under the Social theme is drawn from research relating to corporate sustainability reporting (CSR). The focus of enquiry of the vast majority of this research is upon how companies’ financial (rather than environmental) performance is impacted by CSR reporting. Whilst the transferability of this evidence has limited

¹⁵⁰ Department of Energy and Climate Change (2013) *Energy Savings Opportunity Scheme: Impact Assessment*, May 2013, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/211471/130521_Energy_Audits_IA_v28_clean.pdf

application to the goals of this research, some relevant analysis has been undertaken with regard to the impacts of 'self-selection' of information for voluntary public disclosure.

The above discussion demonstrates that whilst we have provided analysis within Sections 2.0 and 3.0 of the evidence base, caution should be exercised when considering it in the context of ESOS.

2. The existing evidence base provides a limited reference point for informing certain aspects of ESOS design

- a. There is limited evidence which specifically considers the theme of Energy Efficiency (EE) in relation to on-going company operation and growth, which ESOS is primarily concerned with. The majority of evidence relates to EE and buildings, in the specific context of property value and the buying and selling of property.

Most reporting schemes within the EE theme are relatively immature, such that there is a lack of historical empirical data which might be used to help demonstrate causality.

- b. As set out in detail above, the transferability of information from other themes comes with significant caveats
- c. Some aspects of scheme design could be regarded as transferrable

In our analysis of *perceived* impacts of different schemes (irrespective of analysis of causality) in Section 0, we have split the information on all schemes, according to their key features, into six scheme 'types'. Table 1 in Appendix A.5.0, however, demonstrates that there are many different 'hybrids' within each scheme type (for example, some schemes may require selective reporting of information, which renders the scheme neither a central reporting scheme nor a public disclosure scheme), along with other external variables, incentive and enforcement regimes which differ across schemes. Whilst certain aspects of schemes, such as whether the information is centrally or publicly reported, are not addressed specifically in the literature, other aspects, such as whether the scheme is voluntary or mandatory, are attributed as drivers to the effectiveness of the scheme.

- d. There is limited relevant evidence which effectively demonstrates direct causality between a reporting scheme and environmentally beneficial behaviour change

As discussed in Section 0, many authors have studied the impacts of schemes simply by observing whether there is a direct relationship between the introduction of a scheme and environmentally beneficial change. Far fewer studies have attempted to isolate the specific drivers of behavioural change and therefore quantify to what extent this can be attributed to the scheme itself and not to the influence of other drivers.

Based on the results presented in many studies listed throughout this report, an important question to answer is whether there has been appropriate consideration of the counterfactual argument in all cases. Hence, a study that can separate out the energy (or environmental or carbon-related) factor from the rest is the one that will actually be able to tell us which of the market forces companies are reacting towards.

The only evidence relevant to ESOS that delivers evidence based on a reliable counterfactual is found in a study of the electricity market in the US. In this study electricity comes in one form – and the effect of changing the fuel mix will not affect the kW that customers receive as a ‘product’. Furthermore, the researchers ‘controlled’ for a series of other variables. Consequently, a large proportion of the change seen as a result of companies disclosing fuel mix information could be attributed to the companies’ assumptions about the market’s valuation of a fuel mix which is (potentially) lower in fossil fuels.

This study, however, was relatively unique in the commercial energy sector, and related to just one scheme. Other suggestions of causal links within the literature are almost exclusively based upon ‘expert opinion’ and survey results, without any accompanying quantitative demonstration of behavioural change. Whilst this does add limited strength to specific pieces of evidence (particularly in instances whereby a number of credible experts are cited), without quantitative evidence direct causality cannot be fully demonstrated.

Within the context provided above, the key findings from this study are summarised as follows:

1. Mandatory reporting appears to deliver greater and wider benefits than voluntary reporting

Although there is very limited evidence of causality, the available evidence base suggests that the more comprehensive reporting requirements which is driven by mandatory reporting of information leads to greater benefits due to the more informed decisions made by various stakeholders.

As described in detail in Section 0, the literature demonstrates several ways in which public disclosure can have broader benefits in this context. These benefits include: the potential for growth in (non-energy) consumption and employment by increasing the need for both energy auditors and the installation of new efficient equipment; better investment decisions as a result of improved information; greater public pressure which motivates positive behavioural change among organisations; and greater credibility for the regulator from increased compliance with the relevant environmental standards, which can also have the positive effect of lowering enforcement costs allowing the regulator to concentrate its enforcement efforts on more serious polluters

In the context of mandatory central reporting (i.e. without public disclosure of information), there is also reason in the literature (largely based on theoretical logic, rather than primary evidence) to suggest that more comprehensive reporting requirements will lead to more informed decision-making by Government. This is due to the ability for centrally stored data to help with the development of new policies and policy priorities. Having a good reporting system with relevant information coming to authorities in a usable format allows for analysis and policy development that targets areas which require the most intervention.

2. Public Disclosure alone is not likely to drive significant behavioural change on energy use

As mentioned above, for companies, in contrast to evidence presented under the GHG and NEE themes, the literature suggests that the reputational driver for energy efficiency is generally relatively weak. This is largely because of the aforementioned disconnect in public discourse

between energy efficiency and climate change. The fact that by reducing energy requirements corporations are likely to reduce climate change is generally less visible. Consequently, issues relating to energy efficiency specifically are rarely considered by senior decision-makers, although external reporting may serve to promote energy efficiency as a board level issue.

Furthermore, the evidence suggests that voluntary public disclosure alone will have less of an impact on behavioural change than other reporting options. This is because the lower reputational driver in the EE sector limits the effects of 'outing' those companies which do not choose to publicly disclose information.

It should be noted, however, that there is evidence which suggests that public disclosure required as part of a wider scheme which might, for example, also inform a company about opportunities for energy savings, is likely to encourage behaviour change.

3. Mandatory board-level sign-off could help drive investment in energy efficiency

Whilst the evidence is not substantial, a number of studies show that board interest is a key driver in increasing energy efficiency. The lack of reputational driver (and limited financial driver relative to wider cost issues for most businesses) for energy efficiency performance is such that public disclosure does not appear to guarantee board level interest.

As explained in detail Section 0, the link between reporting to boards and take-up of energy efficiency improvements was only explored by one survey-based study. Within this survey, it was found that a significant majority of those who had found lack of board interest to be a barrier to energy efficiency improvements no longer experienced this barrier following participation in a scheme which mandated board approval of a public report on energy efficiency. This suggests, therefore, that mandating board sign-off would help drive investments in energy efficiency.

4. Requiring structured reporting formats helps improve the quality of information in voluntary public disclosure regimes

As described in Section 0, A potential disbenefit of voluntary reporting schemes is that they can be subject to 'Green-wash'. Both empirical and theoretical studies have suggested that, in general, firms will only voluntarily disclose information when it is in their economic interests to do so. The effect of 'Green-washing' can lead to numerous negative impacts for voluntary reporting schemes, for example: rendering voluntary disclosure as a symbolic gesture; eliciting a false confidence from the public and investors in firms' environmental performance; and possibly delaying the implementation of effective mandatory regulation.

At the same time, where voluntary disclosure is not regarded as 'green-wash', it can result, in the longer term, in an improvement in a company's stock market value. Consequently, structured reporting formats, such as that adopted under the Australian Energy Efficiency Opportunities (EEO), can reduce the chance of real or perceived green-wash. As discussed, below, 'benchmarking' is also important in this context.

It should be noted, however, that such structures may need to be carefully designed to avoid placing significant cost burdens on companies which might already have effective reporting mechanisms in place.

5. Greatest benefit is likely to be derived from ensuring public disclosure schemes are 'low volume, high quality and in a comparable format

The literature described in Section 3.2.2. suggests that the disclosure of a smaller amount of quality information can have a stronger effect upon company reputation than disclosure of a larger amount of lower quality information. Similarly, there is good evidence to suggest that disclosure presented in a form accessible to the general public is more likely to lead to improved performance than simple dissemination of large quantities of raw data. Furthermore, high quality, low volume data (whether publicly disclosed or not) is more likely to be of more use to members of the reporting organisation.

The available evidence also suggests that comparability is important; dissemination of data sets relating to individual companies do not provide accessibility or context in the same way as information by which companies can be compared. There is evidence to suggest that, albeit less in the EE theme than in others, perceived poor performance has an adverse effect on 'reputation' and equity value, which then encourages companies to improve performance.

6. There is limited evidence to suggest that central reporting alone is effective in delivering improved outcomes

As discussed in Section 0, there is some evidence to suggest that centrally managed schemes produce positive outcomes for companies, including improved internal data management and more employee engagement in environmental matters. The marginal benefits of reporting to a central body, however, to be distinguished from reporting externally in general, are difficult to evaluate. Indeed, there is very little evidence of reporting schemes in the themes chosen that would not involve some partial dissemination of the information to a wider audience, which further constrains offering any definitive view on this issue.

7. Central reporting without any voluntary element must be well-enforced to deliver behavioural change

A substantial number of studies have analysed the factors that motivate firms to participate in voluntary schemes. As discussed in Section 0, these studies generally assume that firms are acting in an economically rational manner; that is, their decision to participate is based on the expectation of net-benefits for their firm. The literature suggests that the main determining factors of whether companies will participate in voluntary disclosure schemes are perceived enhanced reputation, stakeholder pressure, competitive pressures and benchmarking, regulatory pressure (which might occur through non-voluntary participation), past environmental performance, company size and perceived technical feasibility of delivering improvements.

In this context, a potential flaw in central mandatory reporting is highlighted by a limited number of studies in that it engages none of the drivers listed above for voluntary schemes, such as public reputation. Consequently, in situations whereby there is no perceived reputational consequence or penalty due to non-compliance, the resulting data quality and actual participation may suffer.

8. Higher costs will be incurred where schemes are complex and diverge from BAU reporting practices. Reputational risk is likely to increase costs.

Evidence in relation to the question of costs is limited to reported figures gathered from surveys of companies currently taking part in a number of schemes as well as modelling of proposals for new schemes. In general, as discussed and demonstrated in Section 3.8.3, costs associated with measurement and reporting of environmental impacts are not often split according to the business activity to which they relate. Even in the cases where this is attempted, the range of values and the large differences between the schemes they represent can often be relatively

large, such that they only provide a vague indication of the costs associated with participation in various reporting or disclosure schemes.

What can be seen from the evidence, however, is that there are various aspects of programme design that will likely affect the costs involved in compliance. First of all, as explored in Section 0, it is likely that the more complicated, extensive and prescriptive a scheme's reporting methods are, the longer it will take for companies to complete and therefore the more it will cost. Furthermore, as described in Section 0 it is also expected that requiring board level approval will result in companies incurring additional cost, though it should be noted that it is unclear what proportion of companies would do this anyway, in other words, the additional costs associated with this requirement is unclear. Furthermore, the little data there is on such costs, is somewhat inconsistent.

Related to the above, as discussed in Section 0, it is thought that there may be a slight increase in costs associated with schemes requiring public disclosure, either due to the extra care taken in presenting a report that may directly influence a company's reputation or due to the higher likelihood of such a report requiring board level approval, albeit the evidence to back this up is very limited. As the evidence shows that reputation is a smaller driver for energy efficiency than for greenhouse gas or environmental reporting, it is likely that the effect of public disclosure on costs will be less for schemes relating to energy efficiency than to the other themes.

Appendices

A.1.0	Original DECC Research Questions
A.2.0	Document Identification and Review Template
A.3.0	Definition of Themes
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A.7.0	Research Bibliography

A.1.0 Original DECC Research Questions

A.1.1 Public Disclosure

- What evidence is there on the impact public disclosure has on reporting energy use and energy efficiency measures?
- Does public disclosure increase take up of cost effective energy measures (than would have been achieved had no disclosure taken place)?
- Does public disclosure lead to any other policy benefits?
- Does public disclosure lead to increased benefits for an organisation?
- Are there any examples of comparable corporate reporting mechanisms where public disclosure has led to demonstrable dis-benefits for organisations?
- Are there any examples of comparable corporate reporting mechanisms where public disclosure has led to demonstrable dis-benefits (e.g. perverse incentives) for the policy?
- Is public disclosure likely to lead to any behaviour change that would not otherwise have taken place? If so, amongst whom?
- What are the likely impacts should public disclosure be mandatory?
- What are the likely impacts should public disclosure be voluntary, encouraged through good practice guidance?

A.1.2 Central Reporting

- What evidence is there on the impact central reporting has on reporting energy use and energy efficiency measures?
- Does disclosure through central reporting increase take up of cost effective energy measures (than would have been achieved had no disclosure taken place)?
- Does disclosure through central reporting lead to any other policy benefits?
- Does disclosure through central reporting lead to increased benefits for an organisation?

- Are there any examples of comparable corporate reporting mechanisms where central disclosure has led to demonstrable dis-benefits?
- Are there any examples of comparable corporate reporting mechanisms where central disclosure has led to demonstrable dis-benefits for the policy?
- Is disclosure through central reporting likely to lead to any behaviour change that would not otherwise have taken place? If so, amongst whom?
- Is organisational behaviour likely to be impacted by the level of detail disclosed from an assessment to a central reporting body? If so, how is behaviour likely to change?

A.1.3 Costs

- Are the costs to business for complying with the Directive likely to differ for public disclosure and centrally reported disclosure? If so, to what extent are they likely to differ? Which reporting method is likely to be more expensive?
- To what extent will the cost of complying with the Directive impact on organisational behaviour?

A.2.0 Document Identification and Review Template

As outlined in the methodology Section 0, for Part 1, Step 2 of the project an 'Online Search Database' was created in Excel to facilitate and record the initial research conducted. This had three sections:

- a) The database – Where source information was entered, including relevance to each question.
- b) Search Tracker – General 'Google' search strings, as well as a number of repository websites that required internal searches was entered here. Additionally, a running total of 'hits', time spent, and estimated percentage of time before the data was exhausted, was recorded.
- c) Progress Summary – hits, time spent and percentage of time remaining was summarised for each theme by the researcher.

In addition, the 'database' section of the Online Search Database comprised three elements:

- Rapid Document Identification - This served to identify whether the text merited further review in the context of the project;
- Evaluation of Identified Document - the second captured high level details of the nature of the text; and
- The third served to summarise the findings of the text of relevance to the project.

Headings used for these three sections in the Online Search Database are listed in Sections A.2.1 to A.2.3.

A.2.1 Rapid Document Identification

The fields input into the worksheet as part of the Rapid Document Identification process were as follows:

- Owner (the project team member reviewing the text)
- Ref ID (an ID number for the text being reviewed)
- Search String Used / Referred From
- Title of Report / Article / Journal
- URL
- Topic
- Useful for Research Objectives (Yes / No)
- Rationale for Selection / Rejection
- Contains References to Pursue

A.2.2 Evaluation of Identified Document

The fields input into the worksheet for each document selected as part of the Rapid Document Identification process were as follows:

- Publication Date and Vintage
- Author
- Source
- Sectoral Coverage
- Type of Document
- Peer Reviewed
- Nature of Evidence
- Geography and Relevance to the UK
- Basis for Reported Figures / Outcomes
- Design of Scheme and Relevance to ESOS
- What are Organisations Reporting?
- Approach to Analysis of Performance of Scheme (causality)
- Assumed effects of the scheme

A.2.3 Summary of findings of the paper in respect of the research questions

The questions which were answered in respect of each document were as follows:

- What does the document say in respect of the benefits and/or disbenefits of reporting?
- What does the document say in terms of the benefits and/or disbenefits of disclosure?
- What does the document say in terms of the benefits and/or disbenefits of voluntary reporting?
- What does the document say in terms of the benefits and/or disbenefits of mandatory reporting?
- Are the costs to business for complying with the scheme likely to differ for public disclosure and central reporting?
- To what extent will the cost of complying with the scheme impact on organisational behaviour?
- Further Actions

A.3.0 Definition of Themes

A.3.1 Energy Efficiency

Energy Efficiency covers all schemes designed to encourage reporting or disclosure of energy-related information. This can mean the energy consumption of a whole company, part of a company, a building or plant. In respect of buildings, the energy information can be either 'asset-based', meaning it's calculated based on standard assumptions specific to the building's physical characteristics and occupancy levels, or 'operational', which refers to the actual energy consumption of the building. The reporting may include provision of more information than just consumption; for example, that relating to audit outcomes, energy saving improvements or potential cost savings.

A.3.2 Greenhouse Gases

Greenhouse Gas (GHG) reporting and disclosure includes emissions of both carbon dioxide (CO₂) and other greenhouse gases, for example, methane (CH₄). As with the energy efficiency theme, emissions can be from a whole company or just part of one. Emissions covered are either Scope 1 and 2 only or also Scope 3.¹⁵¹

A.3.3 Non-Energy Environmental

The Non-Energy Environmental theme defines all schemes or reporting mechanisms relating to environmental information other than GHG emissions or energy efficiency. Most commonly, companies report their emissions of specified toxic pollutants to a range of media, i.e. land, water and air. Much of information under these schemes is voluntary or selectively reported (see Section 0 for discussion of impacts of voluntary versus mandatory schemes), for example, through annual reports. Consequently the nature of what is reported can vary significantly between schemes or between individual companies within the same scheme.

A.3.4 Financial

Financial data is reported by UK and foreign companies to provide information to various stakeholders. This type of reporting falls into three subcategories:

- Statutory reporting: annual accounts (under UK GAAP standards and equivalent in other countries), sector specific reporting requirements, for example, for the banking sector there are obligations under the BASEL accord;
- Voluntary disclosure: annual reports, event-driven press publication, public relations, voluntary standards, for example, voluntary adherence to reporting standards that generally involve an ethical or wider policy factor such as Integrated Reporting (IIRC); and

¹⁵¹ Scope 1 covers emissions resulting from the combustion of fuels, directly emitted by the company. For example, this includes any fossil fuels used in industrial processes or fuel used in vehicles owned by the company. Scope 2 covers emissions associated with purchased heat and electricity. Scope 3 covers indirect emissions such as those embedded within purchased products or emissions associated with transport and commuting.

- Direct communication with fund managers, private investors, business associates etc. These communications can be open, private or tactically secretive.

A.3.5 Social

At the commencement of research it was envisioned that the 'social' theme would be a broad topic encompassing many different types of reporting, covering areas such as education, health, and employment. Our research soon found, however, that the literature on these topics is very thin, with the overwhelming body of work on social reporting centred on Corporate Social Responsibility (CSR) reporting. This is a 'catch all' term for the voluntary reporting of non-financial information in a format similar to that of the standard annual company report, with each report format being particular to the company reporting. CSR is often combined with environmental reporting in a more general 'sustainability reporting', with 'social sustainability' being one aspect of this.

A.4.0 Strength of Evidence Parameters

A.4.1 Publication date and Vintage

The energy policy landscape and associated technological change with regard to energy efficiency and renewable energy generation has developed considerably in the last 10-15 years. Evidence dating back to pre-2000, therefore, in most cases would not carry significant weight compared with a similar study undertaken today. Whilst, therefore, we haven't applied a categorical rule in this respect, as some evidence from pre-2000 is worthy of consideration, this has been used as a guiding criteria by our Research Team when reviewing and synthesising data.

A.4.2 Quantity of Different Schemes or Studies Providing Similar Evidence

Whilst volume alone cannot demonstrate a particular hypothesis, in instances where there may be deficiencies in the quality of evidence provided by studies, we have taken into consideration the volume of evidence which reaches the same conclusion. This is highlighted by the reporting of all sources of evidence in response to DECC's research questions in Appendix A.1.0.

A.4.3 Geography and relevance to the UK

Our search strings have focused on countries which we consider to be similar to the UK in terms of:

- Economic development;
- Policy environment;
- Structural drivers, for example, level of unemployment; and
- Cultural considerations, such as religious or ethnic diversity.

Consequently, we have accorded more weight to studies undertaken in (or relating to) the 34 countries signed to the Convention on the Organisation for Economic Co-operation and Development (OECD) than for those outside of the OECD. Similarly, we have accorded more weight to studies undertaken in (or relating to) 'accession states' to the European Union, than to countries, for example, in Africa, Asia or South America, which can be perceived as being less similar to the UK in terms of the above considerations.

A.4.4 Methodological Robustness of Evidence Base

A.4.4.1 Peer Review

Where a report or article has been subject to peer review, in general one might regard it as holding greater weight than non-peer reviewed work. At the same time, however, it is important to assess:

- The independence of the peer reviewer – do they have any links to organisations which have an interest in a certain conclusion?
- Previous research published by the peer reviewer – do the findings of the report support their own previous work?

Furthermore, in some cases, just because work is peer reviewed, does not mean it is definitely of value. It is therefore necessary to consider each piece of information by its own merits, and thus take into consideration all other criteria set out in this section.

A.4.4.2 Causality

Establishing a direct causal link between public or central disclosure and behaviour change is a significant challenge for any research project. The reports and information we have reviewed for this study vary in how effectively (if at all) causality is demonstrated. The key considerations we have employed, therefore, when reviewing methodological approaches, can be summarised as follows:

- Is there a clear comparison with a counterfactual (control) or alternative scheme?

Where it is suggested that either a central or public reporting scheme has delivered behavioural change, there is still the question of whether an alternative policy instrument might have delivered even greater change

- Is there analysis of historic data prior to introduction of the scheme?

For quantitative data, if an earlier trend cannot be shown, then it is challenging to suggest that a scheme has had a particular influence.

- Is analysis of ‘third variables’ undertaken?

At the same time as considering historic trends, there must be analysis of any variables which might also be affecting outcomes. For example, whilst carbon dioxide (CO₂) emissions from a particular sector might have fallen, that may be the result of either higher fossil energy prices or wider economic recession rather than the introduction of a public disclosure scheme.

- Is the quantitative evidence backed by qualitative evidence?

In instances whereby there is a lack of historical trend information, some studies seek to demonstrate causality via associated qualitative evidence. In some cases, this approach can add greater credibility to evidence, albeit it is important to carefully consider the methodology undertaken as part of the qualitative element.

Where evidence relating to causality was lacking, where possible, we have sought to hold telephone discussions with relevant industry representatives or scheme administrators to explore such issues. Within the scope of this REA, however, such opportunities have been relatively limited.

A.4.4.3 Expert Opinion

Many studies appear to rely upon ‘expert opinion’, when, for example, stating that public disclosure does drive significant behavioural change. Whilst we have not totally discounted this as adding strength to a specific piece of evidence (particularly in instances whereby a number of

credible experts are cited), it has been according far less strength than evidence which can be shown to demonstrate causality.

A.5.0 Example Schemes Analysed for this Report

Table 3: Examples of Reporting/Disclosure Schemes in Operation

Example Schemes	Central Reporting Element (if applicable)			Public Disclosure Element (if applicable)			
	Mandatory / Voluntary	Structured or Selective Reporting ¹	Incentives and or Penalties	Mandatory/ Voluntary	Structured or Selective Reporting ²	Method of Publication ³	Incentives and or Penalties
CRC Energy Efficiency Scheme (UK)	Mandatory	Structured	Civil penalties used as a 'last resort'	Mandatory for organisations that have a half-hourly metered electricity consumption greater than 6,000 MWh per year	Structured	Previously league table, now alphabetical aggregated data, published by administrator.	N/A
Energy Efficiency Opportunities Program (Australia)	Mandatory	Structured	'Cooperative' approach taken. Penalties up to AUS\$110,000 per offence are possible.	Mandatory for firms that use more than 0.5PJ annually	Selective, with minimum information requirements	Self-published report, government template is available, but can also be part of an annual report instead.	'Cooperative' approach taken. Penalties up to AUS\$110,000 per offence are possible.
EU Emissions Trading Scheme	Mandatory	Structured	Penalties set by each individual member country.	Mandatory	Structured	Online database of trades and emissions, published by administrator	Penalties set by each individual member country.
Benchmarking with Energy Star Portfolio Manager (USA)	Voluntary	Structured	More than 75 points can lead to Energy Star certification	Mandatory for those who achieve certification. Voluntary for those who have not been certified	Structured	List of buildings with Energy Star certification available online	N/A

Mandatory GHG Reporting for quoted companies (UK)	N/A	N/A	N/A	Mandatory	Selective, with minimum information requirements	Self-published as part of annual Directors' Report	Penalties available under Companies Act (fines)
Corporate Social Responsibility (CSR) Reporting (Worldwide)	N/A	N/A	N/A	CSR reporting is not mandatory in the UK; however, CSR reporting is mandatory in other countries, e.g. Denmark.	The subject matter of CSR reports will differ according to the choices of individual companies.	CSR reports take a form similar to company annual financial reports, and may be included within these reports.	Although there is no direct incentive mechanism for CSR reporting, companies engage in reporting for the associated indirect financial benefits.
U.S. Toxics Release Inventory (US)	Mandatory	Structured	Civil penalties, including monetary fines	Mandatory	Structured	Exact content and format of publication varies by state. Raw data is disclosed as well as data in a more concise and structured format.	Civil penalties, including monetary fines
U.S. 33/50 Program (US)	Voluntary	Structured	Public recognition by EPA (newsletters, PSA, trade journal articles) as well as awards for innovators and firms with outstanding pollution prevention achievements.	Mandatory	Selective	Light-touch disclosure. Public recognition by EPA (newsletters, PSA, trade journal articles) as well as awards for innovators and firms with outstanding pollution prevention achievements.	Public recognition by EPA (newsletters, PSA, trade journal articles) as well as awards for innovators and firms with outstanding pollution prevention achievements.
ISO 14001 (Worldwide)	Voluntary	Structured	ISO 14001 certification can be used for advertising purposes.	Voluntary	Selective	Light-touch disclosure. Firms publish details of their certification but do not necessarily disclose specific environmental information.	ISO 14001 certification can be used for advertising purposes.

Amendments to the U.S. Safe Drinking Water Act (US)	N/A	N/A	N/A	Mandatory	Structured	Consumer confidence reports with full details of water composition are issued annually to customers.	Civil penalties, including monetary fines
Statutory Accounts (UK GAAP)	Mandatory (specific accounting items). Voluntary (Director's Report).	Structured but some free format reporting e.g. Director's Report.	Fines and prosecutions	Mandatory (published by Companies House). Voluntary (can be distributed via company websites etc.).	Structured but some free format reporting e.g. Director's Report.	Companies House website	None
Notes: <ol style="list-style-type: none"> 1. Some schemes allow companies flexibility as to what they choose to submit to the central body, whereas other schemes have specific data fields which must be completed (to enable certification or compliance) 2. Some schemes allow companies flexibility as to what they choose to publically disclose, for example in annual reports, whereas other schemes specify exactly what data should be disclosed, whether this is by the central body or by the company itself 3. This might be, for example, in the form of a 'league table' of companies, or simply aggregated data for an industry 							

A.6.0 Evidence Relating to Characterised Schemes

A.6.1 Scheme Type 1: Mandatory Central Reporting with Mandatory Disclosure

A.6.1.1 Prevalence of Scheme Type and Related Examples

Energy Efficiency

Within the Energy Efficiency theme, mandatory building labelling policies are the most common type of policy. In Europe, the Directive on Energy Performance of Buildings was adopted in 2002, making Energy Performance Certificates (EPCs) mandatory for all buildings.¹⁵² For residential buildings, these are required at the time of sale or when a new rental agreement is made, but is not required to be publicly disclosed. For public buildings with certain characteristics, such certificates are also required to be disclosed publicly to users of the building. The adoption of this Directive resulted in the UK's implementation of Display Energy Certificates (DECs) which are required to be displayed in buildings with an area greater than 500m². In the UK, Energy Performance Certificates have also been publicly available for the last few years in an online searchable database.¹⁵³ These certificates provide information about the current energy usage characteristics of buildings, based on an assessment by a certified assessor, as well as the building's potential, reviews of specific characteristics of the building, some suggested improvements and their associated energy savings potentials.¹⁵⁴

In the USA, several states and cities have implemented mandatory building energy labelling policies in recent years. A report written for the Greater Boston Real Estate Board in March 2013 provides a good overview of areas with such policies in place for some buildings.¹⁵⁵ This includes Austin, New York, Philadelphia, San Francisco, Seattle and Washington, D.C. as well as two states, California and Washington. Since the publication of this report, Boston has also introduced mandatory building labelling policies. Each of these policies and schemes vary slightly, with variations including which types and sizes of buildings are covered, whether and how much of the information is publicly disclosed and whether any other related activity, such as the take-up of energy efficiency improvements are mandatory.

The majority of the building labelling policies require that buildings are benchmarked against other buildings of similar types, usually using standard software, such as the US EPA's Energy Star 'Portfolio Manager', which provides each benchmarked building with a score between 1 and

¹⁵² The European Parliament and the Council of the European Union (2002) Directive 2002/91/EC of the European Parliament and of the Council on the Energy Performance of Buildings

¹⁵³ <https://www.epcregister.com/home.html>

¹⁵⁴ A sample EPC is available on GOV.UK:

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/5996/2116821.pdf

¹⁵⁵ Stavins, R.N., Schatzki, T., and Borck, J. (2013) *An Economic Perspective on Building Labeling Policies*, Report for Greater Boston Real Estate Board, March 2013, http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/Stavins_Schatzki_Building_Labels_Research_March2013.pdf

100, showing its energy performance relative to other buildings of a similar type.¹⁵⁶ For most schemes, such benchmarking information is not publicly disclosed; however, each state or city's legislation varies on this point. Of states that do require public disclosure of benchmarking information, most do this in a publicly available register, with many using a phased implementation approach where disclosure is not mandatory for the first year of benchmarking.

One specific example of this type of scheme is New York City's Local Law 84 (commonly known as 'the benchmarking law'). This law mandated public sector buildings with over 10,000 ft² to benchmark their energy use annually starting in 2010 (using data from 2009), with public disclosure beginning in 2011. For privately-owned buildings over 50,000 ft² or properties with multiple buildings and a combined total of over 100,000 ft², benchmarking became mandatory in 2011 (using 2010 data), with public disclosure of the results mandatory for non-residential buildings from 2012 and for residential buildings from 2013.¹⁵⁷ Law 84 was introduced as part of suite of measures covering audit and retro commissioning of energy saving installations. Seen as a whole, this is a hybrid scheme similar to that envisaged for ESOS.¹⁵⁸

Other energy efficiency related schemes with mandatory central reporting and automatic public disclosure include Australia's Energy Efficiency Opportunities Program, which applies to all of a company's energy usage, not just that of its buildings. This scheme completed its first 5-year cycle in 2011 and both a mid-cycle and end-of-cycle evaluation has been published.^{159 160} The program requires a mandatory assessment of at least 80% of total energy use for companies with a total energy footprint of more than 0.5 PJ per year. Companies must identify, evaluate and both centrally and publicly report on the outcomes of the assessment in respect of energy efficiency opportunities within their company. Public reports must be presented to the board of the company and be made available to the public (for example, via a company's website). There is a mandatory requirement to report specific information and a template is made available to firms if they choose to use it. Firm's may also report information to the public within their own chosen format as long as the minimum reporting requirements are met.,

Finally, 25% out of 90 countries surveyed by the World Energy Council in 2010 were found to have some kind of mandatory energy consumption reporting legislation. Some of these laws apply to buildings only, some to certain sectors, some have varying inclusion thresholds and some require public disclosure of energy consumption data in an annual report while others publish it in a central database.¹⁶¹

Greenhouse Gases

Within the GHG theme, there are relatively few schemes that are simply focused on reporting, rather most schemes include a combination of reporting of emissions and carbon or emissions trading or allowance purchasing.

¹⁵⁶ See <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager> for more details on Portfolio Manager.

¹⁵⁷ Mayor's Office of Long-Term Planning & Sustainability (2012) *New York City Local Law 84 Benchmarking Report*, August 2012, http://www.nyc.gov/html/gbee/downloads/pdf/nyc_ll84_benchmarking_report_2012.pdf

¹⁵⁸ Ibid.

¹⁵⁹ Department of Resources Energy and Tourism (2010) *Energy Efficiency Opportunities Program: Mid-Cycle Review*, December 2010, <http://eeo.govspace.gov.au/files/2013/01/EEO-Mid-Cycle-Review-Report.pdf>

¹⁶⁰ ACIL Tasman (2013) *Energy Efficiency Opportunities Program Review*, Report for Department of Resources Energy and Tourism, April 2013, <http://eeo.govspace.gov.au/files/2013/05/EEO-Program-Review-Final-Report.pdf>

¹⁶¹ World Energy Council (2010) *Energy Efficiency: A Recipe for Success*, September 2010, http://www.worldenergy.org/documents/fdeneff_v2.pdf

Of most relevance to the UK are two schemes: the EU Emissions Trading Scheme (ETS) and the UK's own CRC Energy Efficiency Scheme. The EU ETS is a 'cap-and-trade' scheme whereby around 11,000 industrial plants and power generators in the 28 EU member states as well as in three other non-EU European countries are required to meet certain emission limits. If these can't be met, carbon allowances can be bought and sold from other participants or from governments (who mostly gave them away for free under National Allocation Plans until 2013). Data on trades and individual companies' emissions are publicly available via an online portal.

The CRC Energy Efficiency Scheme covers emissions from organisations using more than 6,000 MWh of electricity (via half-hourly meters) each year and requires that a 'carbon price' is paid for each tonne of carbon dioxide emitted. Annual carbon emissions results from participating organisations are posted online. Until 2013, the results were published in a 'league table', ranking companies according to a combination of their absolute emissions, the change in emissions per unit growth and as a percentage of the previous year's emissions. The Scheme also includes an 'early action metric' through which companies get more 'points' for having automatic meter reading installed as well as being certified to specific carbon management standards.

From 2013, the results will be published in an alphabetised list which provides information on absolute emissions and other relevant information about organisations. The change from the league table to the list was made following a public consultation with participants in the scheme.

Australia has a National Greenhouse and Energy Reporting (NGER) scheme, which has been operating since 2007. Under this scheme, corporations that fall over a certain threshold (generally speaking, this threshold is emissions of 25,000 tonnes CO₂, consumption of 25,000 MWh of energy or 2.5 million litres of fuel annually) must report carbon emissions, energy use and production centrally on an annual basis. The regulator publicly publishes data of Scope 1, Scope 2 and total energy consumption annually for corporations meeting a higher publishing threshold (50,000 tonnes CO₂ equivalent).¹⁶² This data includes total greenhouse gas emissions and energy consumption and is available in an Excel based database with companies listed in alphabetical order.

Similarly, USA, Canada, Japan, France and New Zealand, among other countries, also have mandatory greenhouse gas reporting policies, some combined with emissions trading, all of which have been implemented in the last ten years.¹⁶³

An issue for companies is that they may have to report to under multiple schemes within a particular country. This underscores the need for careful design of any new reporting schemes to reduce the risk of duplication and additional administrative burden for corporations.

Non Energy Environmental

Mandatory central reporting schemes with subsequent disclosure of this information by the central body are one of the more common scheme types employed by governments in an effort to reduce pollution. Such schemes nearly all include some form of Pollutant Release and

¹⁶² Scope 1 covers emissions associated with fuel combusted by the company itself, whereas scope 2 covers emissions associated with purchased electricity or heating.

¹⁶³ Kauffmann, C., Less, C.T., and Teichmann, D. (2012) *Corporate Greenhouse Gas Emission Reporting: A Stocktaking of Government Schemes*, Report for OECD, May 2012, <http://www1.oecd.org/daf/inv/internationalinvestmentagreements/50549983.pdf>

Transfer Register (PRTR).¹⁶⁴ Qualifying organisations are required to report their transfers and releases of a specified number of pollutants to the PRTR. These data are analysed by the central body, and subsequently made available to the public.

The first, and by far the most well researched, scheme of this type is the US Toxics Release Inventory (TRI). In this scheme, firms with 10 or more employees that use more than a given amount of a listed chemical are required to report emissions of this material to state and local authorities.¹⁶⁵ This information is provided to the public via the TRI database.

At present, more than 20 other countries have set up PRTRs or are in the process of doing so.¹⁶⁶ Schemes for which some form of analytical study has been performed include Canada's National Pollutant Release Inventory (NPRI), Australia's National Pollutant Inventory (NPI), the EU's Pollutant Emissions Register (EPER) and the UK's Pollution Inventory.^{167 168} All of these schemes simply report plant emissions without rating their environmental performance. A further type of scheme, known as performance evaluation and ratings programs (PERPs), uses a rating system in order to provide the public with an easily understandable indicator of the firm's environmental performance based on a plant's compliance with environmental regulations. As far as we are aware, PERPs are confined to developing countries and thus are of limited relevance to this study. The Program for Pollution Control Evaluation and Rating (PROPER) in Indonesia is an example of a particularly well studied scheme.¹⁶⁹

Further mandatory public disclosure schemes include British Columbia's Public Disclosure Program for Water Pollution, which has operated since July 1990. This scheme involves the biannual release by the Ministry of Environment (MOE) of a list of firms who do not comply with existing regulation or whose environmental performance is of concern to the MOE.¹⁷⁰

In Denmark, certain large polluting companies are required to submit so-called 'green accounts' alongside their financial accounts to the Danish government on an annual basis. These include a number of mandatory pieces of information about environmental aspects, impacts, emissions,

¹⁶⁴ A PRTR is defined by the OECD as 'a database or register of chemicals released to air, water and land, and wastes transferred off-site. Based on a list of priority chemicals, facilities that released one or more of the listed chemicals report periodically—usually annually—on the amount of released and/or transferred and to which environmental media. Reported data are then made available to the public.'

¹⁶⁵ Hamilton, J.T. (1995) Pollution as News: Media and Stock Market Reactions to the Toxics Release Inventory Data, *Journal of Environmental Economics and Management*, Vol.28, No.1, pp.98–113

¹⁶⁶ Dasgupta, S., Wang, H., and Wheeler, D. *Disclosure Strategies for Pollution Control*, Cheltenham, UK: Edward Elgar Publishing, Inc.

¹⁶⁷ Kerret, D., and Gray, G.M. (2007) What Do We Learn from Emissions Reporting? Analytical Considerations and Comparison of Pollutant Release and Transfer Registers in the United States, Canada, England, and Australia, *Risk Analysis*, Vol.27, No.1, pp.203–223

¹⁶⁸ Harrison, K., and Antweiler, W. (2001) *Environmental Regulation vs. Environmental Information: A View from Canada's National Pollutant Release Inventory*, Report for University of British Columbia, January 2001, <http://strategy.sauder.ubc.ca/antweiler/public/npri+regulation-1.pdf>

¹⁶⁹ López, J.G., Sterner, T., and Afsah, S. (2004) *Public Disclosure of Industrial Pollution: The PROPER Approach for Indonesia?*, Report for Resources for the Future, December 2004, <http://www.rff.org/rff/Documents/RFF-DP-04-34.pdf>

¹⁷⁰ Foulon, J., Lanoie, P., and Laplante, B. (2000) *Incentives for Pollution Control - Regulation and Public Disclosure, Volume 1*, Report for World Bank, February 2000, http://econ.worldbank.org/external/default/main?pagePK=64165259&theSitePK=469372&piPK=64165421&menuPK=64166093&entityID=000094946_00022905315632

and energy use, as well as more detailed additional voluntary aspects. The accounts are made publicly available by the central government department.¹⁷¹

Finance

The statutory reporting of balance sheet and profit and loss values, in the UK (through UK GAAP standards) and internationally through IFRS and other domestically developed standards), is the most common framework of reporting corporate financial information in most countries, or at least where centralised control of the information is involved. In the UK this involves the mandatory submission of accounts on an annual basis to a Government agency, which in turn has a statutory duty to make public these accounts on request.

There are also a number of other specialist compliance schemes in place, chiefly in response to extra controls required for higher risk industry sectors, such as minimum capitalisation reporting for banks (BASEL 2 Capital Requirements Directive), and insurance (Solvency II).

The basic premise for statutory financial reporting is compliance, risk aversion, and fraud detection, which makes it somewhat different in nature to the kind of 'performance' reporting that might be required under energy efficiency schemes.

A.6.1.2 Outcomes from the Schemes

Energy Efficiency

The Energy Efficiency Opportunities Program (Australia) end-of-cycle review published in 2013 provided some insight into the outcomes of the programme. Headline results suggest that the programme is responsible for approximately 40% of the energy savings seen within industry during the five years of the first cycle. Additionally, a number of changes to energy management procedures were identified. One estimate has suggested that the second five-year cycle will likely be responsible for 20% of energy efficiency improvements in industry due to a number of measures having been taken up during the first cycle.

Specifically, the first mid-cycle review found that 41.6 PJ of energy saving opportunities were taken up, representing 4% of the energy use of the 199 companies reporting during this cycle. By the end of the first cycle, this had increased to 88.8 PJ or 5.4% of energy use assessed, of which 2% can be calculated as attributed to the scheme itself.

The reviews make no attempt to separate out the impacts of the programme according to the specific aspects of it, although survey responses from participating companies provide some information as to changes to barriers to take-up of energy efficiency improvements. This is further discussed in relevant sub-sections of section 0.

With regard to building energy labelling, specific outcomes from schemes are hard to come by, particularly as many of these policies are in very early stages (the 'oldest' building energy labelling policy in the US is from 2009) and have therefore not been analysed as yet. This includes New York City's Local Law 84, from which the second annual report of private sector data was published in September 2013, analysing the first two years of data, from 2010 and

¹⁷¹ Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

2011.¹⁷² Although the report focuses on comparing the quality of data, as well as the number of buildings covered, one of the summary conclusions points to an increase in the median Energy Star score of all buildings eligible for the Energy Star score card from 64 to 67. During this time period there was also an increase in the number of buildings eligible for an Energy Star score, from 20% of all benchmarked buildings to 25%.¹⁷³ The baseline of buildings to receive a score therefore varied significantly between 2010 and 2011.

This increase in eligibility was from 20% of all benchmarked buildings to 25%. Additionally, although not highlighted in summary of the report, of potential significance is the decrease in Energy Use Intensity (EUI, energy used per unit area) from 213 to 207 for commercial office buildings. This category of buildings would have had to publicly disclose their energy usage for the first time in year 2 (2011 data), whereas data from 2010 and from both years of residential would not have been disclosed.¹⁷⁴

Few other schemes have been through a review process, hence the evidence on outcomes of other energy efficiency schemes in this area is limited.

Greenhouse Gases

As with the energy efficiency theme, mandatory GHG reporting is slowly becoming more embedded, with several countries now mandating public disclosure of annual emissions data. Of the specific schemes mentioned in this section, however, few have been subject to rigorous evaluation, so the availability of data and outcomes from these is relatively poor.

The EU ETS, a complex programme, has been reported to have reduced emissions by 2.5 – 5% by 2008, up to 8.3% per installation by 2010, based on a 2005 baseline.^{175 176} As the scheme involves both reporting and trading of carbon, it is not possible to allocate any amount of these emissions savings to any specific elements of the scheme and our review of the evidence has not brought up any studies that have attempted to do this.

The majority of the country-based mandatory schemes are either so new that very little data has been reported so far (USA), or have so far been reviewed, not to provide an indication of programme outcomes and impacts, but rather to scrutinise and amend the methodology (Australia). This has happened in particular where there are overlaps between schemes which have resulted in these requiring amendment or rationalisation to minimise reporting and administrative costs and burdens for companies (and government). This results in very little data remaining available for scrutiny and assessment of outcomes.

An example of this kind of approach is provided by the US Environmental Protection Agency (EPA), which manages the US mandatory greenhouse gas reporting scheme. The EPA recently published the second year of data for the programme. Alongside the data, a press release was

¹⁷² Mayor's Office of Long-Term Planning & Sustainability (2013) *New York City Local Law 84 Benchmarking Report*, September 2013, http://nytelecom.vo.llnwd.net/o15/agencies/planyc2030/pdf/ll84_year_two_report.pdf

¹⁷³ This is likely due to changes within the Energy Star programme. Companies are only eligible for a score once a baseline of buildings of a similar type has been established (against which the building can then be compared).

¹⁷⁴ It should be noted, that this scheme therefore is somewhat of a 'hybrid', in that half of the data is from a scheme of type 2 (within the classifications used in this report, without mandatory public disclosure) and half is from scheme type 1 (with mandatory public disclosure). One conclusion for this result could therefore be that the change in the scheme (the public disclosure of year 2 data) is what caused the decrease in EUI.

¹⁷⁵ European Commission (no date) *The EU ETS is Delivering Emission Cuts*, http://ec.europa.eu/clima/publications/docs/factsheet_ets_emissions_en.pdf

¹⁷⁶ Resources for the Future (2012) *Background: The European Union Emissions Trading System*, November 2012, <http://www.rff.org/RFF/Documents/RFF-Bck-EUETS.pdf>

published which proclaimed that emissions from power stations had fallen by 10% due to a fuel switch from coal to natural gas.¹⁷⁷ Overall, the data from all facilities showed a decrease of 4.5% in emissions, despite an increase of 2.7% in the number of facilities reporting.¹⁷⁸ As with reported outcomes from other schemes, no attempt is made to explain the likely reasons for the figures provided, apart from the fuel switch and a slight decrease in overall electricity production.

Non Energy Environmental

The nature of changes in emissions in TRI firms is well defined. Studies demonstrate that the total releases of toxic chemicals from TRI firms have substantially fallen since the scheme was introduced. For example, total on-site and off-site releases of toxic emissions are reportedly down by 45.5% between 1988 and 1999.¹⁷⁹

A recent study, which to our knowledge is the first of its type, investigated the range of behavioural responses shown by companies to TRI disclosure.¹⁸⁰ The authors came to the following conclusions:

- Facilities which are near their company's office headquarters outperform other facilities;
- Facilities proximate to corporate siblings outperform establishments with remote siblings;
- Large establishments improve more slowly than small establishments in sparsely populated regions, but both groups improve similarly in densely populated regions; and
- Establishments owned by privately held firms outperform those owned by publicly traded firms.

A comparative study of other Pollution Release and Transfer Registers demonstrates that the presence of a PRTR does not automatically lead to reductions in air emissions.¹⁸¹ Specifically, the introduction of PRTRs in the US and England correlates with consistent reductions in emissions on many different measures. The introduction of the Canadian NPRI system, however, correlates with decreases in emissions of listed chemicals by some measures and increases by others, whilst in Australia, emissions have increased by most measures post-implementation of the NPI. The causal factors of changes in emissions are not addressed in this study.

¹⁷⁷ United States Environmental Protection Agency (2013) *EPA Releases Greenhouse Gas Emissions Data from Large Facilities: Carbon Pollution from Power Plants Declines 10 percent from 2010 Due to Growing Use of Natural Gas*, accessed 9 December 2013, <http://yosemite.epa.gov/opa/admpress.nsf/bd4379a92ceceecac8525735900400c27/eeeb62db73ee67b485257c0d0058936b!OpenDocument>

¹⁷⁸ United States Environmental Protection Agency (2013) *Greenhouse Gas Reporting Program 2012: Reported Data*, accessed 9 December 2013, <http://www.epa.gov/ghgreporting/ghgdata/reported/index.html>

¹⁷⁹ U.S. Environmental Protection Agency (2001) *Toxics Release Inventory 1999 - Executive Summary*, 2001, http://www.epa.gov/tri/tri99/press/execsummary_final.pdf

¹⁸⁰ Doshi, A.R., Dowell, G.W.S., and Toffel, M.W. (2013) How Firms Respond to Mandatory Information Disclosure, *Strategic Management Journal*, Vol.34, No.10, pp.1209–1231

¹⁸¹ Kerret, D., and Gray, G.M. (2007) What Do We Learn from Emissions Reporting? Analytical Considerations and Comparison of Pollutant Release and Transfer Registers in the United States, Canada, England, and Australia, *Risk Analysis*, Vol.27, No.1, pp.203–223

In an evaluation of first and second generation 'green accounts' in Denmark, empirical analyses of companies' performance combined with survey results from local authorities, central government and companies were used to ascertain the extent to which 'green accounts' have fulfilled their objectives. In terms of actual environmental improvements, in a survey with companies delivering the accounts, it was found that 41% thought the accounts had led to improvements, with 56% disagreeing. Of those who found improvements, energy efficiency topped the list of most common improvements seen (72%), with reduction in water usage in second place (58%). It is unclear which aspect of the green accounts (the reporting or public disclosure) is likely to have caused the greater improvements, but it is noted in the evaluation that companies who thought the accounts had contributed in this area on average spent 50% longer on completing the accounts than the average. In other words, an increased level of commitment to creating a useful set of accounts was found to result in greater environmental improvements. It was also found that doing the 'green accounts' had led to better internal procedures, such as paving the way for an environmental management system to be adopted.¹⁸²

Finance

Historically, the main impact of financial reporting schemes has been to regulate against fraud and market abuse due to the reporting scheme functioning as a tool to ensure compliance with statutory financial rules. In recent years, however, as markets have been liberalised from government control, financial disclosure to private investors, and their subsequent investment decisions has increasingly been used to regulate the market and seek out 'bad apples'. The shortcomings of this approach have been seen in the recent economic downturn, where it has been widely cited as almost the sole cause of the economic crisis.¹⁸³ Most research we have found, however, does not assess the impacts of disclosure through statutory accounts because, as this is a minimum requirement for all companies, there is no counterfactual data available, therefore one cannot analyse its marginal impact. Instead there is research into the optional aspects of financial reporting and what commercial and social benefits there might be for companies to extend communication of financial performance beyond the minimum required under statute.

A.6.2 Scheme Type 2: Mandatory Central Reporting with Voluntary Public Disclosure

A.6.2.1 Prevalence of Scheme Type and Related Examples

Energy Efficiency

As discussed in Appendix A.6.1, there are many types of building-related schemes, involving some form of central reporting. Some of these may or may not include elements of public disclosure. In this section, we will look at such policies that do not require any public disclosure. Sometimes such schemes are referred to simply as 'benchmarking', though this term is used in multiple ways across different programmes and schemes. In some studies it refers to building

¹⁸² Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

¹⁸³ The President's Working Group on Financial Markets (2008) *Policy Statement on Financial Market Developments*, March 2008, http://www.treasury.gov/resource-center/fin-mkts/Documents/pwgpolicystatemktturmoil_03122008.pdf

owners centrally reporting information on energy usage and then being fed back anonymised information about relative performance compared to other similar buildings. This final step is not always included, however. In a study by Cox et al, 'benchmarking' is considered to mean submission of building usage information by utility companies to the Portfolio Manager software and the development of a registry of commercial buildings, by type.¹⁸⁴ The implication of this is that this will act as a possible pre-cursor for disclosure policies, though it is not clear from the study exactly how this would be possible or what the details of it would be.

As discussed in Appendix A.6.1, the European Directive on Energy Performance of Buildings was adopted in 2002, making energy performance certificates mandatory for all buildings at the time of sale or when a new rental agreement is made – these certificates must be provided to the new owner or renter but are for private residences otherwise not required to be disclosed.¹⁸⁵ Although there is usually no central body to which the results of the energy audits resulting in the energy performance certificates are reported, these certificates are considered under this heading as it is the most relevant.

Greenhouse Gas

No relevant evidence was found for this report.

Non Energy Environmental

No relevant evidence was found for this report.

Finance

No relevant evidence was found for this report.

A.6.2.2 Perceived Outcomes from Scheme

Energy Efficiency

A report by Stavins et al examined previous studies to determine the effect of EPCs and other building benchmarking and labelling policies.¹⁸⁶ The report claims that no studies have shown any impact of EPCs on energy usage of buildings, and expresses concern that results from studies showing an effect on purchase or rental prices do not account for other factors that might increase the price. A break-down of studies concerning the influence of disclosure on price is covered in Section 0.

Several studies, including one by Cox et al, model the *potential* for building 'benchmarking' policies to reduce energy usage in the USA.¹⁸⁷ This study finds energy reductions of 1.3 – 1.4% energy in 2020, rising to 2.2 – 2.4% by 2035, across commercial buildings. The driver for change associated with benchmarking is the degree to which it overcomes information barriers. In terms of modelling outcomes, this meant a decreased discount rate, leading to large energy efficiency

¹⁸⁴ Cox, M., Brown, M.A., and Sun, X. (2013) Energy Benchmarking of Commercial Buildings: a Low-Cost Pathway Toward Urban Sustainability, *Environmental Research Letters*, Vol.8, No.3, p.035018

¹⁸⁵ The European Parliament and the Council of the European Union (2002) Directive 2002/91/EC of the European Parliament and of the Council on the Energy Performance of Buildings

¹⁸⁶ Stavins, R.N., Schatzki, T., and Borck, J. (2013) *An Economic Perspective on Building Labeling Policies*, Report for Greater Boston Real Estate Board, March 2013, http://www.analysisgroup.com/uploadedFiles/News_and_Events/News/Stavins_Schatzki_Building_Labels_Research_March2013.pdf

¹⁸⁷ Cox, M., Brown, M.A., and Sun, X. (2013) Energy Benchmarking of Commercial Buildings: a Low-Cost Pathway Toward Urban Sustainability, *Environmental Research Letters*, Vol.8, No.3, p.035018

investments being made. To a large degree, these decreases are associated with technology changes, such as from natural gas electric space heating.

Many of these studies looking at the future potential of benchmarking base their data on a two-page and often-quoted factsheet from the U.S. Environmental Protection Agency about the impact of the Energy Star Portfolio Manager software, based on a selection of buildings using the software voluntarily. See Appendix A.6.4.2 for details of the results publicised in this factsheet.¹⁸⁸

A.6.3 Scheme Type 3: Voluntary Central Reporting with Automatic Public Disclosure

A.6.3.1 Prevalence of Scheme Type and Related Examples

Energy Efficiency

As explained in discussions of scheme types 1 and 2, there are several types of building 'benchmarking'-styles in existence, particularly in the USA. Scheme type 3 covers schemes where reporting to a central body is optional, but where, once reported, public disclosure is automatic. This form of scheme is not very common within the energy efficiency theme. In fact, one of the main ways that the scheme type is represented is through positive awards for building energy efficiency. For example, companies that use the U.S. EPA's Energy Star Portfolio Manager and who get a score of 75 or above can choose to apply for an Energy Star label. Those that achieve this label are automatically added to an online database of certified buildings.

Greenhouse Gas

In the greenhouse gas theme, there are a number of voluntary reporting schemes that have been established in the last 10-15 years. One of these is the U.S. 1605(b) scheme, which essentially established a publicly available registry where companies could report greenhouse gas emissions reductions from particular projects they had undertaken. The reporting was fully unstructured, with companies able to choose any baseline they wanted and selectively to report only on favourable outcomes. The scheme was suspended in 2011.

A study of the 1605(b) scheme found some rather unexpected results when comparing emissions reductions reported to the scheme with actual emissions of the same companies. Although the companies reported emissions reductions, for 68% of those companies their absolute emissions actually increased during the time period of the study (1998 – 2003). The authors of the study also compared the companies to some who had not participated in the programme and found that non-participants did decrease their emissions during this time period. There are several possible reasons for these results, not least the voluntary nature of the scheme, allowing it potentially to be used to show off dubious 'green' credentials while hiding worse behaviour by not disclosing everything.

Performance of other voluntary programmes has not been fully established. The U.S.-based former Pew Centre on Global Climate Change (now Center for Climate and Energy Solutions) published a report in 2002 with recommendations for a mandatory greenhouse gas emissions

¹⁸⁸ Energy Star (2012) *Portfolio Manager DataTrends: Benchmarking and Energy Savings*, accessed 6 December 2013, http://www.energystar.gov/ia/business/downloads/datatrends/DataTrends_Savings_20121002.pdf?3d9b-91a5

program. It claimed that although voluntary programs in existence had “helped facilitate and document significant emissions reductions [...], experience [suggested] that mandatory reporting [would] stimulate voluntary reductions across the economy – not just among the small group of corporate leaders who typically participate in voluntary programs”.

The results from a 2003 OECD study on greenhouse gas emissions reductions programs discusses the merits of voluntary agreements (VAs) between industry and governments and/or NGOs on emissions monitoring and reporting. These vary in design and opinions as to their effectiveness differ. However, the majority of opinions indicated that VAs involving a specific emissions reductions target were likely to be more environmentally effective (i.e. encourage emissions reductions) than those without a target. Other “soft” benefits, such as increased awareness of climate change and improvement of company systems, were also claimed to result from voluntary agreements. It is expected that these benefits would arise whether or not the VA included a target.

Non-Energy Environmental

By far the most well studied scheme of this type is the 33/50 Program, operated by the U.S. Environmental Protection Agency (EPA) between 1991 and 1995.¹⁸⁹ The goal of the 33/50 Program was to reduce the national releases and transfers of 17 high priority chemicals by 33% by 1992, and by 50% by 1995, compared to their 1988 levels. This included emissions to types of media, that is, land, air and water, and firms had complete flexibility in the degree of emissions reductions and the abatement strategies used. The program was advertised through mail-outs to the Chief Executive Officers of eligible companies, of these, roughly 1,300 companies responded with a commitment to participate.

Voluntary schemes of this type are also prevalent in developing countries, of which one example is India’s Green Rating Project (GRP).¹⁹⁰ This is an example of a voluntary PERP, not dissimilar from Indonesia’s PROPER scheme, and is one of the few developing country public disclosure programs which has been subject to a rigorous evaluation.¹⁹¹ Using life-cycle analysis techniques, it rates the environmental performance of participating plants in four pollution-intensive industrial sectors: pulp and paper, chlor-alkali, cement, and automobiles. In order to collect the data required to conduct this analysis, detailed questionnaires are administered to participating plants. Their responses are then cross-checked by GRP inspectors against secondary data provided by local environmental regulators and other sources. In addition to releasing environmental ratings to the public, the GRP also informs plants about their pollution and pollution abatement options. Plants are sent a detailed profile of their environmental performance prior to public disclosure, and the GRP also publishes specific recommendations for each sector for how they can improve environmental performance.

Many schemes that are only mandatory for a certain group of companies are also open for voluntary inclusion by other companies. One example are the Danish ‘green accounts’. In 1998,

¹⁸⁹ Khanna, M., and Damon, L.A. (1999) EPA’s Voluntary 33/50 Program: Impact on Toxic Releases and Economic Performance of Firms, *Journal of Environmental Economics and Management*, Vol.37, No.1, pp.1–25

¹⁹⁰ Powers, N., Blackman, A., Lyon, T., and Narain, U. (2011) Does Disclosure Reduce Pollution? Evidence from India’s Green Rating Project, *Environmental and Resource Economics*, Vol.50, No.1, pp.131–155

¹⁹¹ To our knowledge the only other rigorous evaluation of a developing country scheme (i.e that addresses the causal factors of behaviour change) is for Indonesia’s PROPER program (see Section 0).

173 companies chose to provide a voluntary 'green accounts' report with 859 submitting a mandatory report.¹⁹²

A.6.3.2 Perceived Outcomes from Schemes

Energy Efficiency

There was no evidence found to be relevant to this report with specific regard to energy efficiency, and thus the focus of our analysis is upon the other two most 'transferable' themes.

Greenhouse Gas

A study of the 1605(b) scheme in the U.S. found some rather unexpected results when comparing emissions reductions reported to the scheme with actual emissions of the same companies. Although the companies reported emissions reductions, for 68% of those companies their absolute emissions actually increased during the time period of the study (1998 – 2003). The authors of the study also compared the companies to some who had not participated in the programme and found that non-participants did decrease their emissions during this time period. There are several possible reasons for these results, not least the voluntary nature of the scheme, allowing it potentially to be used to show off dubious 'green' credentials while hiding worse behaviour by not disclosing everything. See section 3.2.2. for more discussion of these issues.¹⁹³

Non-Energy Environmental

Emissions data reported to the TRI show a significant reduction in toxic emissions from firms participating in the U.S. 33/50 Program.¹⁹⁴ Over the life of the scheme (1991-1995), transfer and release of the 17 targeted chemicals fell by 47%. According to the EPA, this meant that the goal of reducing emissions by 50% relative to 1988 levels was achieved in 1994, a year ahead of schedule.

A detailed study of pulp and paper plants participating in India's GRP found that the environmental performance of plants has generally improved during the scheme.¹⁹⁵ Analysis of wastewater discharge data for 1996-2003 shows a declining trend in water pollutants, measured by both chemical oxygen demand (COD) and total suspended solids (TSS), from 1998 onwards. However, this effect is much more pronounced for plants with poor initial environmental performance.

As discussed in Section 0, the question of attribution, that is, whether such changes can be attributed to the impacts of public disclosure programmes is addressed in Section 0.

Finance

No relevant evidence was found for this report.

¹⁹² Center for Alternativ Samfundsanalyse, Gallup A/S, and Konsulentfirmaet Hanne Eriksen (1999) *Rapport om Evaluering af de Groenne Regnskaber*, Report for Danish Environmental Protection Agency (Miljøstyrelsen), June 1999, <http://www2.mst.dk/common/Udgivramme/Frame.asp?http://www2.mst.dk/Udgiv/publikationer/1999/87-7909-376-0/html/helepubl.htm>

¹⁹³ Kim, E.-H., and Lyon, T.P. (2011) Strategic environmental disclosure: Evidence from the DOE's voluntary greenhouse gas registry, *Journal of Environmental Economics and Management*, Vol.61, No.3, pp.311–326

¹⁹⁴ U.S. Environmental Protection Agency (2001) *Toxics Release Inventory 1999 - Executive Summary*, 2001, http://www.epa.gov/tri/tri99/press/execsummary_final.pdf

¹⁹⁵ Powers, N., Blackman, A., Lyon, T., and Narain, U. (2011) Does Disclosure Reduce Pollution? Evidence from India's Green Rating Project, *Environmental and Resource Economics*, Vol.50, No.1, pp.131–155

A.6.4 Scheme Type 4: Voluntary Central Reporting with Voluntary Public Disclosure

A.6.4.1 Prevalence of Scheme Type and Related Examples

Energy Efficiency

Within the energy efficiency theme, there are a few types of building benchmarking schemes which fall under type 4. As mentioned in Appendix A.6.1.1, the U.S. EPA's Portfolio Manager is one of the most commonly used software packages. Using this software, building owners upload the energy usage (based on operational rather than asset-related data) and are provided with a score between 1 and 100, depending on its score relative to other buildings of similar types. Using the software is voluntary, though currently 40% of commercial building space within the U.S. has used the software, with more than 80 building types covered.¹⁹⁶

Greenhouse Gas

No evidence was found to be relevant to this report.

Non-Energy Environmental

Within the non-energy environmental literature a number of authors have sought to establish whether the adoption of an EMS can lead to improved environmental performance. We analysed a total of six studies from the U.S., Canada, Japan and Mexico during the course of our research. In Mexico, a voluntary initiative not dissimilar from schemes such as ISO 14001 and EMAS was established in 1992 by the Federal Environmental Attorney General's Office, (*Procuraduría Federal de Protección al Ambiente*, PROFEPA), within the Ministry of the Environment.¹⁹⁷ The Clean Industry Program provides public recognition and a temporary inspection amnesty to plants that agree to correct any deficiencies in their environmental behaviour and management identified by a third-party audit. Plants are assessed on their ability to comply with relevant environmental regulations as well as their adherence to a set of environmental management standards not covered by regulations. Following negotiations with PROFEPA on the best course of action, the plants agree to correct any deficiencies identified by the audit by a set deadline. If this is managed successfully, PROFEPA award the plant with a Clean Industry Certificate. The certificate is valid for two years, during which time PROFEPA agree to not inspect the plant except for in certain exceptional scenarios. These certificates are commonly used in market campaigns and are considered to have a substantial positive impact on firms' public image.¹⁹⁸ In total, the numbers of plant participating in the program grew from 78 plants in 1992 to 7616 plants in 2008.

¹⁹⁶ Energy Star (no date) *Use Portfolio Manager*, accessed 4 December 2013, <http://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager>

¹⁹⁷ Blackman, A., Lahiri, B., Pizer, W., Rivera Planter, M., and Muñoz Piña, C. (2010) Voluntary Environmental Regulation in Developing Countries: Mexico's Clean Industry Program, *Journal of Environmental Economics and Management*, Vol.60, No.3, pp.182–192

¹⁹⁸ Alvarez-Larauri, R., and Fogel, I. (2008) Environmental Audits as a Policy of State: 10 Years of Experience in Mexico, *Journal of Cleaner Production*, Vol.16, No.1, pp.66–74

A.6.4.2 Perceived Outcomes from Scheme

Energy Efficiency

A study for the California Public Utilities Commission looked at the potential benefits from using Portfolio Manager to encourage commercial building owners to benchmark their energy usage, investigating options for utility companies to encourage energy saving among their customers.¹⁹⁹ Participants in the study voluntarily chose to take part in a workshop with a utility company, where they were introduced to the benchmarking software. Interviews were subsequently undertaken to determine the perceived usefulness of the programme as a whole, including the use of the benchmarking software.

Overall, it was found that, of a sample of 41 participants that used the benchmarking software, 62% had changed their energy management procedures since benchmarking. Of those 62%, 62% said that the act of benchmarking had had a 'great or very great deal of influence' on energy management, with the rest considering the act of benchmarking to have had at least some degree of influence. Of the original sample of 41 participants, 84% said they had planned or implemented improvements to their buildings since benchmarking. The main types of upgrades included lighting upgrades, HVAC (Heating, Ventilation and Air-Conditioning) and changing energy management systems or behaviours, such as adding energy management system or controls (82%), conducting energy audits or feasibility studies (81%) and changing thermostat set points and turning off lights (80%).

Additionally, an often-quoted and heavily publicised factsheet by the U.S. Environmental Protection Agency provides information about the impact of the Energy Star Portfolio Manager software. Using data from over 35,000 buildings which used the software from 2008 to 2011, the results show an average of 7% energy savings across all buildings. The savings were not uniform across all buildings however: while more than 70% of all buildings achieved a reduction in energy over the three years, more than 25% saw an increase during the same time period.²⁰⁰

Greenhouse Gases

No relevant evidence was found for this report.

Non-Energy Environmental

The literature comes to mixed conclusions as to whether the adoption of an EMS has led to improved environmental performance.

Three studies of US firms under the U.S Clean Air Act and the TRI all suggest that ISO 14001 certified facilities reduce their pollution emissions more than non-certified facilities, and that certification improves compliance with government regulation.^{201,202,203} This impact is found to be

¹⁹⁹ NMR Group Inc., and Optimal Energy Inc. (2012) *Statewide Benchmarking Process Evaluation. Volume 1: Report*, Report for California Public Utilities Commission, April 2012, http://www.calmac.org/publications/Statewide_Benchmarking_Process_Evaluation_Report_CPU0055.pdf

²⁰⁰ Energy Star (2012) *Portfolio Manager DataTrends: Benchmarking and Energy Savings*, accessed 6 December 2013, http://www.energystar.gov/ia/business/downloads/datatrends/DataTrends_Savings_20121002.pdf?3d9b-91a5

²⁰¹ Anton, W.R.Q., Deltas, G., and Khanna, M. (2004) Incentives for Environmental Self-Regulation and Implications for Environmental Performance, *Journal of Environmental Economics and Management*, Vol.48, No.1, pp.632–654

²⁰² Potoski, M., and Prakash, A. (2005) Covenants with Weak Swords: ISO 14001 and Facilities' Environmental Performance, *Journal of Policy Analysis and Management*, Vol.24, No.4, pp.745–769

²⁰³ Potoski, M., and Prakash, A. (2005) Green Clubs and Voluntary Governance: ISO 14001 and Firms' Regulatory Compliance, *American Journal of Political Science*, Vol.49, No.2, pp.235–248

greatest for firms that have inferior past environmental records. This observation is found throughout the literature, not only for schemes of this type. Another study of US firms reached different conclusions with the finding that firms with a higher propensity to pollute are also more likely to adopt a comprehensive EMS.²⁰⁴ This finding is discussed further in the context of potential ‘greenwashing’ activities in Section 3.2.2.

In Mexico, one author demonstrates that adoption of ISO 14001 led to a significant improvement in the self-reported compliance status of firms.²⁰⁵ Similar results are found in a study of Japanese firms, which concluded that adoption of EMSs led to reduced resource use, solid waste generation and wastewater effluent.²⁰⁶ However, a Canadian study found quite the opposite, that is, ISO 14001 certified firms were associated with greater emissions of some water pollutants.²⁰⁷

An analysis of Mexico’s Clean Industry Program found that after the inspection amnesty expired, Clean Industry Participants were not fined at a substantially lower rate than non-participants. In other words, the rates of compliance with environment regulations were roughly similar for firms outside the program as it was for participants. The authors note their usage of a proxy for environmental performance, as well as their reliance on data from a somewhat restricted set of participants.

We remind the reader that for the majority of these studies the precise pathways by which behaviour changes takes place have not been addressed. While a causal link between EMS adoption and environmental performance is often assumed, this is sometimes done only on the basis of a correlation between these two variables, rather than through a detailed appraisal of attribution. Studies that directly address the more complex question of causality are discussed in Section 0.

A.6.5 Scheme Type 5: Mandatory Public Disclosure Directly to the Public

A.6.5.1 Prevalence of Scheme Type and Related Examples

Energy Efficiency

No relevant evidence was found for this report.

Greenhouse Gas

In recent years, several countries have examined options around mandating disclosure or reporting of greenhouse gas emissions. At an OECD study in 2003, policy in this area was still

²⁰⁴ King, A.A., and Lenox, M.J. (2000) Industry Self-Regulation Without Sanctions: The Chemical Industry’s Responsible Care Program, *Academy of Management Journal*, Vol.43, No.4, pp.698–716

²⁰⁵ Dasgupta, S., Hettige, H., and Wheeler, D. (2000) What Improves Environmental Compliance? Evidence from Mexican Industry, *Journal of Environmental Economics and Management*, Vol.39, No.1, pp.39–66

²⁰⁶ Arimura, T.H., Hibiki, A., and Katayama, H. (2008) Is a Voluntary Approach an Effective Environmental Policy Instrument?: A Case for Environmental Management Systems, *Journal of Environmental Economics and Management*, Vol.55, No.3, pp.281–295

²⁰⁷ Barla, P. (2007) ISO 14001 Certification and Environmental Performance in Quebec’s Pulp and Paper Industry, *Journal of Environmental Economics and Management*, Vol.53, No.3, pp.291–306

led by voluntary agreements, some set up privately, some by government, but with little reporting directly mandated.²⁰⁸

The UK made greenhouse gas reporting mandatory from 2013 for all large companies registered under the Companies Act, as part of their annual Directors Report. This is a public document, though is mainly intended to provide investors and shareholders with more information about the state of a company.²⁰⁹

Non-Energy Environmental

Relatively few schemes of this type are discussed in the environmental literature. Here, we discuss two key examples from the U.S. and Sweden, both are government schemes which mandate information disclosure by companies directly to the public.

Amendments to the U.S. Safe Drinking Water Act (SDWA) in 1996 mandated that, from 1998 onwards, community drinking water providers issue their customers with annual consumer confidence reports (CCRs).²¹⁰ Depending on the size of the water system the method of releasing CCRs to the public would vary. Systems with larger numbers of users were obliged to mail CCRs directly to consumers and to present them online, while the smallest water systems had only to notify customers that the report is available upon request. The content of these reports included notification of any detectable amounts of regulated contaminants in their drinking water, as well as detectable levels of some unregulated chemicals if systems are testing for them.

The Swedish Government decided in 2007 to become the first country in the world to mandate that state-owned companies should present a sustainability report in accordance with the Global Reporting Initiative (GRI) guidelines.²¹¹ This scheme had the aim of controlling sustainability reporting and ensuring that the boards of companies take more responsibility for the environmental performance of firm.

In the US some states mandate that electricity companies must disclose information on fuel mix directly to their customers.²¹² The exact nature of this disclosure varies by state but generally involves a quarterly or biannual insert to customers' electricity bills indicating the fuel mix, associated air emissions, tips on energy efficiency and costs related to different methods of generation. As utility companies are disclosing this information directly to the public, there is no involvement of a central body. It is unclear to what extent companies are required to structure

²⁰⁸ OECD Environment Directorate, and International Energy Agency (2003) *Policies to Reduce Greenhouse Gas Emissions in Industry - Successful Approaches and Lessons Learned: Workshop Report*, 2003, <http://www.oecd.org/env/cc/2956442.pdf>

²⁰⁹ Department for Environment, Food and Rural Affairs (2011) *Impact Assessment of Options for Company GHG Reporting*, August 2011, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82354/20120620-ghg-consult-final-ia.pdf

²¹⁰ Benneer, L.S., and Olmstead, S.M. (2008) The Impacts of the 'Right to Know': Information Disclosure and the Violation of Drinking Water Standards, *Journal of Environmental Economics and Management*, Vol.56, No.2, pp.117–130

²¹¹ Borglund, T., Frostenson, M., and Windell, K. (2010) *Increasing Responsibility Through Transparency? A Study of the Consequences of New Guidelines for Sustainability Reporting by Swedish State-Owned Companies*, Report for Government Offices of Sweden, September 2010, <http://www.government.se/content/1/c6/15/23/57/a5d3ccbc.pdf>

²¹² Although potentially not truly an instance of public disclosure (it is unclear from the evidence whether this information also exists in the public sphere), it is considered under this scheme type due to the very large customer base of most of these companies.

the information in a certain way, though it seems likely that all states with such laws require a certain minimum amount of information to be included.²¹³

Financial

No relevant evidence was found for this report.

A.6.5.2 Perceived Outcomes from Scheme

Greenhouse Gas

As mentioned in the section above, mandatory greenhouse gas reporting is a new policy area, with few countries having any significant experience with the policy and little being available in the form of reviews of such programmes.

The UK government's impact assessment of the introduction of mandatory greenhouse gas reporting is based on responses from a consultation on the proposed new policy. From those responses and an evaluation of literature, it was decided that an upper bound of potential emissions reductions from the new policy would be set at 4%, with a lower bound at 0%. It should be emphasised that these are pre-implementation estimates only and that it is not clear from the impact assessment what attempts have been made to separate out the benefits of, for example, internal procedural changes as compared to the public reporting element. The impact assessment does label the reporting requirement as a 'key enabler' for managing and reducing emissions.²¹⁴

Other studies into the potential benefits and disbenefits resulting from mandatory greenhouse gas emissions are discussed in the respective sub-sections of section 0.

Non-Energy Environmental

A study into the effects of amendments to the SDWA found strong evidence that utilities required to mail CCRs directly to customers had lower violations after the CCR rule took effect.²¹⁵ The magnitude of this effect is quite significant. Using a linear and count-data model, the authors find that mailing CCRs reduces total violations for large water suppliers by between 30% and 44%, and reduces health violations by 40–57%. The requirement to mail information to consumers appears to reduce the annual probability of positive violations in the sample by about 50%. The study did not specifically address causality. However, the authors suggest that their results are consistent with a political mechanism, that is, the action of mailing CCRs directly to customers elicits a political response towards the water suppliers, who therefore respond by lowering violations. The authors note that the changes in violations could not be attributed to a more efficient market, as customers essentially have no say in their drinking water provider and cannot therefore exert consumer pressure in the typical sense.

²¹³ Delmas, M., Montes-Sancho, M.J., and Shimshack, J.P. (2010) Information Disclosure Policies: Evidence from the Electricity Industry, *Economic Inquiry*, Vol.48, No.2, pp.483–498

²¹⁴ Department for Environment, Food and Rural Affairs (2011) *Impact Assessment of Options for Company GHG Reporting*, August 2011, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/82354/20120620-ghg-consult-final-ia.pdf

²¹⁵ Benneer, L.S., and Olmstead, S.M. (2008) The Impacts of the 'Right to Know': Information Disclosure and the Violation of Drinking Water Standards, *Journal of Environmental Economics and Management*, Vol.56, No.2, pp.117–130

A study into the effects of mandatory sustainability reporting to Global Reporting Initiative (GRI) guidelines amongst state-owned companies in Sweden found that the reporting requirements have led to increased commitment and awareness of sustainability issues.²¹⁶ The analysis proceeded through a survey of CSR and sustainability reporting managers in 49 Swedish state-owned companies, which elicited a 76% response rate. However, while it was found that sustainability issues have risen up the agenda and been given higher priority by managements and boards, the study found little evidence to suggest that reporting has significantly affected the actual environmental performance of firms. The authors note that the jump from increased awareness to actual changes in practice is a large one.

A study by Delmas et al compared fuel mix of electricity companies subject to disclosure regulation over a period of 9 years starting from before the regulations came into effect.²¹⁷ Controlling for a series of variables, it was found that for every 1% increase in sales subject to disclosure requirements, the proportion of fossil fuels in the fuel mix decreased on average between 0.06 and 0.23 percentage points whereas the proportion of 'clean' fuels (meaning renewables and hydro-electric) increased by 0.02 and 0.27 percentage points on average. It was found that the decrease in fossil fuels in the mix was two times greater for companies with 38% of their fuel mix comprised of fossil fuels compared to companies with 83% fossil fuels in their mix. In other words, companies that were already 'doing better' saw a larger improvement.

A.6.6 Scheme Type 6: Voluntary Public Disclosure Directly to the Public

A.6.6.1 Prevalence of Scheme Type and Related Examples

Energy Efficiency

No relevant evidence was found for this report.

Greenhouse Gas

No relevant evidence was found for this report.

Non-Energy Environmental

Very few specific schemes are associated with this scheme type, rather, this type of disclosure is undertaken voluntarily by organisations, often through annual reports, as a way to communicate with the public and investors.

CSR Reporting

Corporate Social Responsibility (CSR) reporting works on a voluntary basis, with reports being published directly to the public domain in a manner analogous to the traditional corporate financial report. However, to classify CSR reporting as a type of scheme is somewhat disingenuous as there is in fact no unifying schema linking the reporting methods of disparate companies. Rather, each company chooses what information to report and the format in which to present that information it does choose to report.

²¹⁶ Borglund, T., Frostenson, M., and Windell, K. (2010) *Increasing Responsibility Through Transparency? A Study of the Consequences of New Guidelines for Sustainability Reporting by Swedish State-Owned Companies*, Report for Government Offices of Sweden, September 2010, <http://www.government.se/content/1/c6/15/23/57/a5d3ccbc.pdf>

²¹⁷ Delmas, M., Montes-Sancho, M.J., and Shimshack, J.P. (2010) Information Disclosure Policies: Evidence from the Electricity Industry, *Economic Inquiry*, Vol.48, No.2, pp.483–498

What inter-company consistency in CSR reporting there is results from the normative structure of corporate culture, i.e. the expectations on business to report certain things. These expectations also account for the wide prevalence of CSR reporting, with companies keen to demonstrate their social responsibility in order to enjoy the benefits associated with good public image. Indeed, the bulk of the literature on the effects of CSR reporting is concerned with the question of how CSR reporting may be linked to financial performance.

Finance

Voluntary disclosure forms the bulk of financial communication taking place, as it is a way of enhancing commercial interests. The characteristics of different forms of voluntary disclosure are only limited by the creativity of the organisations involved. At the more structured end of the spectrum, most large companies (and all PLCs, and FTSE100 companies) produce an Annual Report, outlining financial results and other qualitative information designed to serve the interests of the company rather than any government policy objectives. There are also a number of variables within international accounting standards (under IFRS) that allow 'voluntary' submission of information that supplements minimum requirements for basic balance sheet figures. In addition to this, financial information can be communicated by press releases, shareholder reports, direct communications designed for fund managers and investors, within some information not shared with the public.

A.6.6.2 Perceived Outcomes from Scheme

Energy Efficiency

No relevant evidence was found for this report.

Greenhouse Gases

No relevant evidence was found for this report.

Non-Energy Environmental

Overall, the literature reached mixed conclusions regarding the impact of disclosure directly to the public on environmental behaviour. While causality is not addressed in any studies, many authors have sought to investigate whether there is a correlation between increased disclosure and improved environmental performance.

One large study of US firms compared trends in toxic releases to amounts of disclosure. The authors used a content analysis index based on the GRI sustainability reporting guidelines to assess the quantity and quality of disclosure this by 191 firms from the five most polluting industries in the US. Their results demonstrate a positive association between environmental performance and the level of voluntary discretionary disclosure by companies.²¹⁸ This conclusion is consistent with the predictions of economic disclosure theory, i.e. investors will favour firms with a good environmental record, thus creating an economic incentive to both improve environmental performance and increase disclosure. Many studies have investigated the link between environmental performance, financial performance and information disclosure. These are discussed further in section 0.

However, many studies have drawn the opposite conclusion, or found there to be no statistically significant link between level of disclosure in annual reports and environmental performance.

²¹⁸ Clarkson, P.M., Li, Y., Richardson, G.D., and Vasvari, F.P. (2008) Revisiting the Relation between Environmental Performance and Environmental Disclosure: An Empirical Analysis, *Accounting, Organizations and Society*, Vol.33, No.4–5, pp.303–327

Using a similar content analysis index based on GRI reporting guidelines, one study of 51 Australian firms reporting to the NPI found a modest improvement in disclosure between 2002 and 2006.²¹⁹ However, the authors also noticed that increased disclosure was more common amongst firms with a higher pollution propensity. Such firms not only disclosed greater quantities of information but the content and structure of their reports also adhered more closely to GRI guidelines. These results provide evidence that organisations use disclosure as a legitimating tool to reduce public policy pressures, consistent with the predictions of socio-political (legitimacy) theory.²²⁰ In other words, high polluting firms may use increased transparency as a greenwashing tool, a behaviour we discuss further in Section 3.2.2

CSR Reporting

As mentioned, the majority of research into CSR reporting is concerned more with the links between reporting and financial performance than the links between reporting and social performance. On this point, the majority consensus is that analysis of company accounts reveals a positive correlation between reporting and financial performance indicators such as cost of equity capital, share prices, and bottom line performance.^{221 222}

There do exist, however, examinations of whether reporting of this kind has an effect on the kinds of things being reported. This literature suggests that ethical investors have power within the market and may be able to steer social policy, and that they may in fact be a prevalent presence.²²³ The literature notes, however, that without real evidence of a causal relationship between reporting and performance the link between ethical investment and ethical performance remains hypothetical.²²⁴

Finance

The majority of the literature points to voluntary disclosure, additional to statutory minimums, as an overall benefit to the organisation, and several reports provide quantitative evidence - in terms of cost of capital, market value and other indicators - that suggest a direct link between communication and the success of the company.

The two main drivers of commercial success through better information are investor confidence and internal management behaviour change. Where surveys of stakeholders took place, investors were positive about further disclosure, and also were increasingly demanding non-financial information. The Global Reporting Initiative interviewed 34 investors and 35 analysts and found that 80% of the sample believed extra-financial information was relevant to their

²¹⁹ Clarkson, P.M., Li, Y., Richardson, G.D., and Vasvari, F.P. (2008) Revisiting the Relation between Environmental Performance and Environmental Disclosure: An Empirical Analysis, *Accounting, Organizations and Society*, Vol.33, No.4–5, pp.303–327

²²⁰ Patten, D.M. (2002) Media Exposure, Public Policy Pressure, and Environmental Disclosure: An Examination of the Impact of Tri Data Availability, *Accounting Forum*, Vol.26, No.2, pp.152–171

²²¹ Dhaliwal, D.S., Zhen Li, O., Tsang, A., and Yang, Y.G. (2011) Voluntary Nonfinancial Disclosure and the Cost of Equity Capital: The Initiation of Corporate Social Responsibility Reporting, *The Accounting Review*, Vol.86, No.1, pp.59–100

²²² Schadewitz, H., and Niskala, M. (2010) Communication via Responsibility Reporting and its Effect on Firm Value in Finland, *Corporate Social Responsibility and Environmental Management*, Vol.17, No.2, pp.96–106

²²³ Anderson, J.C., and Frankle, A.W. (1980) Voluntary Social Reporting: An Iso-Beta Portfolio Analysis, *Accounting Review*, pp.467–479

²²⁴ For example, see Ullmann, A.A. (1985) Data in Search of a Theory: A Critical Examination of the Relationships Among Social Performance, Social Disclosure, and Economic Performance of U.S. Firms, *Academy of Management Review*, Vol.10, No.3, pp.540–557

decision-making.²²⁵ This however, could only be assumed to be good evidence based on the 'rational investor' model. There are several theoretical studies that point to information increasing market risks due to weaknesses in investor behaviour.²²⁶ The second key caveat in several studies was that the information should be 'stable', working best with the framework which allowed data to be benchmarked accurately, without misinterpretation.

In terms of behaviour change, the publication of data, especially targets and objectives, acted as a spur for management to respond to outside pressures to meet expectations, keeping company staff 'on their toes' and alert to avoiding mistakes that may impact personal and corporate-level reputations.²²⁷

²²⁵ Radley Yeldar (2012) *The Value of Extra-Financial Disclosure: What Investors and Analysts Said*, Report for the Global Reporting Initiative and Accounting for Sustainability, July 2012, <https://www.globalreporting.org/resourcelibrary/The-value-of-extra-financial-disclosure.pdf>

²²⁶ Avgouleas, E. (2009) The Global Financial Crisis and the Disclosure Paradigm in European Financial Regulation: The Case for Reform, *European Company and Financial Law Review*, Vol.6, No.4, pp.440–475

²²⁷ Holland, J. (2006) *A Model of Corporate Financial Communications*, Report for The Institute of Chartered Accountants of Scotland, March 2006, http://ek-uat.icas.org.uk/res_holland_report.pdf

A.7.0 Research Bibliography

The list below provides citations for the complete set of texts reviewed during Part 1 of the project. This excludes texts which were subjected to an initial review under the Rapid Document Identification phase using the Online Search Database (as detailed in Appendix A.2.0) but reviewed no further after being judged not to be useful in light of the research objectives.

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