

IMP Conference 2009

**BUSINESS NETWORK DEVELOPMENT UNDER LEGISLATED CHANGE**

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## **BUSINESS NETWORK DEVELOPMENT UNDER LEGISLATED CHANGE**

### **Abstract**

This paper presents a case study of an energy intense manufacturer responding to climate change within the constraints of emerging, legally-binding CO<sub>2</sub> legislation. Our approach is grounded in a behavioural perspective of business. Key findings are that 'CO<sub>2</sub> management' is not yet viewed by manufacturers as a strategic concern equivalent to their focal points of 'throughput', 'quality' and 'cost'. That CO<sub>2</sub> management is seen as a 'compliance' type activity, rather than a 'business opportunity'. And finally, that the legislative context which emphasises the focal point of a 'market based response' is often hindering manufacturers' response to climate change, due to the uncertainty that it introduces. This research approach can potentially be used in analysis of other networks where interaction between actors is subject to a limited number of degrees of freedom, such as other legislated environments. In these situations focal points emerge as a response to the orchestrated network structure and can help explain the interactions and outcomes observed.

**Key Words:** Climate Change, Collaboration, Precedent, Context

### **1. Introduction: Problems of network development under legislative change**

This paper examines business network developments occurring within the context of existing and new climate change legislation. Our case study focuses upon a manufacturing site which is representative of an energy intense manufacturer typically targeted by this legislation.

The manufacturing industry is a major user of energy. Since the energy mix is still dominated by fossil fuels, which represented 81% of global supply in 2007 (International Energy Agency, 2008), this represents a significant contribution to climate change. The Stern Review estimates that manufacturing accounts directly for 14% of the UK's total CO<sub>2</sub> emissions and global studies quote similar figures. It is also the case that at least a similar level of impact again will be attributable to industry's share of emissions from the power (24%), transport (14%) and buildings (8%) sectors (PricewaterhouseCoopers, 2006; Stern, 2006; World Business Council for Sustainable Development, 2005; World Resources Institute, 2007; WWF, 2007).

In this paper, we see that energy costs represent around 20-25% of overhead costs for the manufacturer examined. Rising energy costs, emerging climate change legislation, and industry initiatives to reduce emissions have pushed action on CO<sub>2</sub> and energy efficiency to the forefront of management's attention.

We examine two network level interventions by external organisations; these were designed to foster emissions reductions at the manufacturer's main production facility. First, we look at the response to a report sponsored by the United Kingdom's Carbon Trust to identify energy efficiency opportunities at the site. Second, we examine the manufacturer's engagement with the climate change regulation of the United Kingdom and the European Union. In these interventions, we observe that the manufacturer's response to climate change is framed as a compliance issue with regards to emerging legislation and as an effort to minimise costs through energy efficiency. It is seen that although climate change is recognised as a significant cost, it is not yet treated as a primary strategic concern. Issues such as downtime, throughput and quality are the key concerns of the manufacturer. Potential reasons for this are explored further in the case study.

Previous research flags that legislators face significant challenges in influencing network development to foster collaboration in the response to climate change (Arrow, Wilson, Ross, Tversky, & Mnookin, 1995). The IMP view of business markets is that actors are individually significant (Easton & Hakansson, 1996) and that interactions are often constrained or enabled by a set of explicit or implicit rules, ranging from informal cultural customs, to binding laws (Mouzas & Ford, 2009). There are only a limited number of IMP studies that examine the impact of legislation on the development of business networks (Harrison, 1998). We use Thomas Schelling's theory of focal points to examine network interactions over emerging climate change legislation. Our approach is grounded in a behavioural perspective of decision making and interaction that examines

focal points in order to explore how rules and principles are influencing interactions. Focal points are clues for coordination which help different parties to understand what is expected from themselves and others (Schelling, 1960). Our research questions are:

1. What are the focal points of the European Union and The United Kingdom's government with regards to climate change legislation?
2. What are the focal points held by the manufacturing organisations responding to this legislation?
3. What are the rules, principles and legislation that are guiding the network development?
4. How have these focal points, rules and principles contributed to the outcomes observed in the business response to climate change?

In the following sections we start by examining previous research in the area, we detail our research methodology, and then give a case study of a manufacturer's response to two network level interventions designed to encourage reductions in CO<sub>2</sub> emissions. We seek to understand business interaction in light of emerging climate change legislation, such as the European Emissions Trading scheme. We explore the existing relationships between the current actors in the network, their emerging relationships with the legislators, and new relationships formed as a result of the carbon incentives and penalties introduced.

## 2. Previous research

The view of markets as networks of exchange relationships is based on the observation that actors are individually significant and that they often rely on the resources and capabilities of others (Easton & Hakansson, 1996; Gnyawali & Madhavan, 2001). These interdependencies result in continuing and frequently complex interactions designed to perform exchanges which create joint gains. One of the enduring puzzles in understanding complex interactions refers to the question 'why do disagreements occur'? For example, interacting parties such as manufacturers, suppliers, governmental or non-governmental organisations may have divergent expectations, they may hold asymmetric information, they may be uncertain about the structure of their interaction with others or whether a deal is possible and finally, they may have locked themselves into other irreversible commitments (Farber & Bazerman, 1987). Interactions are often constrained or enabled by a set of explicit or implicit rules, ranging from informal cultural customs, to binding laws (Mouzas & Ford, 2007). Empirical evidence suggests that rules usually draw upon pre-existing bases of agreement among related actors, to articulate an order of shared conventions (Choi, 1993; Young, 1993). Thus, rules comprise of customary, expected, legal, and often non-legal standards and principles. Their validity and legitimacy is continuously challenged and redefined through the evolution of consent over time among related actors (Barnett, 1986, 2003).

Building on this insight that interaction does not occur in a vacuum, Schelling (1960) proposed the theory of 'focal points' which captures the essence of social conventions (Sugden, 1995). Focal points are clues for coordination which help different parties to understand what is expected from themselves and others (Schelling, 1960). A focal point guides and channels the actions of parties towards particular bargaining or coordination outcomes. Effective focal points are usually prominent, easy to recognise, and unique. A focal point is further strengthened when it is simple but non-arbitrary, i.e. it is backed up by a supporting rationale (Schelling, 1960; Sugden, 1995). In general, focal points can be split into two groups that perform different functions (Parson & Zeckhauser, 1995). The first type of focal point is of an informational nature, allowing coordination with regard to measurement and quantification. The second type gives a rhetorical argument or principle that justifies and supports claims or actions (Parson & Zeckhauser, 1995).

Actors often translate collective expectations into group norms (Blois & Ivens, 2007; Feldman, 1984; Heide & George, 1992); they consider them as 'implicit or explicit rules of expected behaviour that embody actors' preferences' (Nee, 1998: 87). In this way, actors are susceptible to rules and principles that come from their surrounding environment, and they often even take them for granted. Similarly, interaction among managers or organizations is a complex process that develops according to a set of rules and principles that guide actors' business behaviour (Mouzas & Naude, 2007). A traditional distinction has been between mandatory rules and yielding rules. This differentiation corresponds to the contemporary distinction between mandatory and default rules

(Ayres & Gertner, 1989; Riley, 2000). In a similar way, Esser (1956) differentiates between 'Rule' (Norm) and 'Principle' (Grundsatz). The later differentiation emphasizes that continuous imitation or replication of existing practices within a large population leads to the development of principles which operate as 'optimization commands' over time (Dworkin, 1967).

The use of a focal point perspective allows us to make contributions to the understanding of empirical observations in which there are multiple equilibria and thus many possible outcomes from interactions (Myerson, 2006). As such, focal points can be the basis of rational decisions or preferences which are socially determined by the network context and efforts to coordinate, rather than purely economically and rationally determined (Janssen, 2006).

Previous research flags that during the provision of public goods, such as the response to climate change, there are three levels at which negotiations occur. First, it is necessary to agree who will participate in the negotiations. Second, the simplifying principles used to structure the negotiations must be agreed. And finally, once it is agreed who is negotiating and which simplifying metrics to use, it is necessary to reach an agreement regarding each actor's level of commitment or contribution to the solution (Parson & Zeckhauser, 1995). Focal points guide all three of these steps during the negotiations over the response to climate change. For example, in stage one, different focal points give rationales for very different parties to be included in the negotiations. Some of the potential focal points guiding the choice of parties to bring to the table include logics that the response should be led by those with the greatest 'historical responsibility for climate change', or the highest 'current absolute emissions' or the highest 'current per capita emissions'. Similarly, the decision over which metrics to use to simplify the negotiations may include 'which greenhouse gases to include', 'which year to set as the baseline to measure progress against', 'which industries to target' and 'whether to take equity issues into account'. The third stage of negotiations, setting the level of each actor's commitment, often relies upon similar focal points that drew the actors into the negotiations in stage one.

This paper describes the focal points of the European Union and The United Kingdom's government with regards to climate change. We also examine the focal points of the organisations in the manufacturing network examined in our case study. Our approach is grounded in a behavioural perspective of decision making and interaction that examines focal points in order to explore how rules and principles are influencing interactions.

### **3. Research Methods**

Our case study concerns a medium sized UK manufacturing company with international interests. Within the United Kingdom there are multiple production sites and a separate head office for the organisation as a whole. We examined the largest UK production site, separately interviewing the plant manager, engineer, accountant, and compliance manager. We were also able to draw upon interviews with the Managing Director of the company, who is based at the head office. The primary researcher for this paper is a consultant in sustainable energy. In partnership with the director of his employing firm, he was hired to support the manufacturing organisation on managing their involvement with the European Emissions Trading Scheme. Research access was through participant observation and supplementary interviews and visits. During data collection, five visits were made to the production facility and three interviews were conducted with the managing director. We were given access to primary data and reports, and sat in on meetings, such as the verifier's annual audit of the European Emissions Trading Scheme. We also conducted semi structured interviews with staff, including the plant manager, finance manager, compliance and administrative manager and the chief engineer. Data collection through participant observation was over a period of six months, with the contextual material on legislation drawing on six years of consultancy in the lead up to the start of the European Emissions Trading Scheme. Data was collected through the development of a case library including project proposals, compliance documentation and other material collected during interviews. The researcher also kept a research diary and was able to share early drafts of the case with the organisation for feedback. Due to the rich nature of data and the need to examine the context of the interactions, a case study methodology was seen to be the most effective way to examine the research questions which were

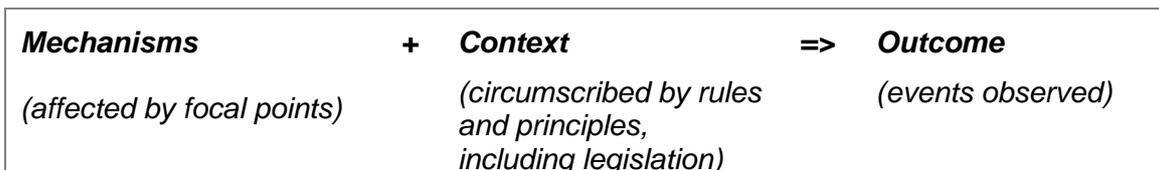
seeking to explain, rather than simply describe the interactions (Easton, 2002; Halinen & Torrnoors, 2005; Yin, 2003).

The choice of case study was guided by a desire to choose a representative organisation that could be used to make observations of their interactions in response to emerging climate change legislation. The case study organisation was chosen for three reasons. Firstly, it has been part of the United Kingdom's 'Climate Change Agreements' for more than five years. As such, it has a relatively long history of engagement with CO<sub>2</sub> legislation. Secondly, it is also covered by the largest and most rigorous piece of CO<sub>2</sub> legislation to date, the European Emissions Trading Scheme. Thirdly, in late 2008, the site had undergone a survey sponsored by the United Kingdom's Carbon Trust to identify energy efficiency opportunities. The ten opportunities identified represent an excellent opportunity to examine the influence of the focal points, network structure and norms upon their response to climate change. Finally, the site in the United Kingdom is approximately 60 years old, but also has a partner facility that was built in the Netherlands within the last five years. The Dutch site is also covered by the European Emissions Trading Scheme. This offers an opportunity to make comparisons between the historic evolution of a site responding to climate change; and one able to incorporate climate change considerations from the outset. This further justification is not relevant to this paper, but comparisons between these sites will be the focus of our next case study.

In section 2, we examined how focal points can capture the essence of social conventions, acting as clues for coordination which help different parties to understand what is expected from themselves and others (Schelling, 1960; Sugden, 1995). We wish to link this to Pawson and Tilley's model of 'mechanism + context => outcome' (Pawson & Tilley, 1997).



We propose that mechanisms, such as actions or programmes, are centred on focal points. Furthermore, we suggest that context in our case refers to the rules and principles in the surrounding network. Finally, combining these two ideas, we augment the model to become:



This is the framework we will use in section 5 to analyse the case.

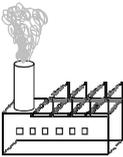
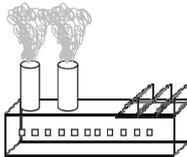
## 4. Case Study

### Legislative context

#### Introduction

At the highest level, the guiding principle used by the regulators for the design of CO<sub>2</sub> legislation is to minimize the costs of reducing emissions, achieving compliance at the minimum cost to the economy and society as a whole (DEFRA, 2007). To this end, two key design criteria are the avoidance of unnecessary regulatory burdens, and seeking flexibility that allows businesses as much freedom as possible in modes of compliance (DEFRA, 2007). Figure 1 illustrates the main three potential mechanisms for regulation of CO<sub>2</sub>; namely a tax, mandate, or emissions trading.

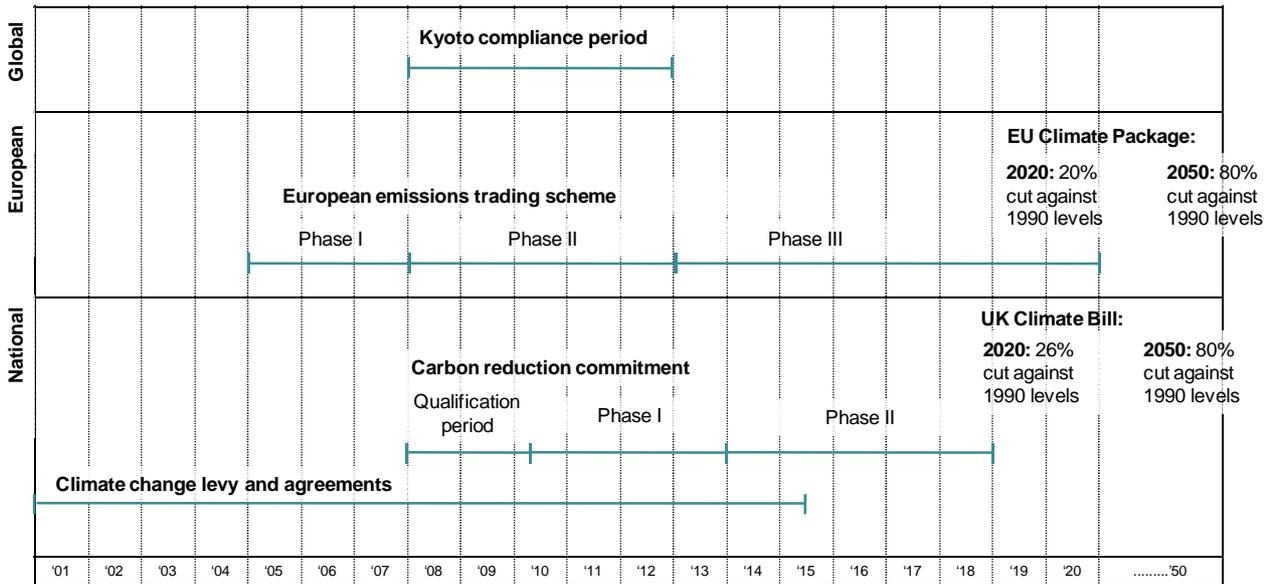
**Figure 1: An illustration of potential regulatory mechanisms for CO<sub>2</sub>**

Regulatory options	Factory A: Cost of reducing CO <sub>2</sub> emissions through changes to plant = \$50/ton 	Factory B: Cost of reducing CO <sub>2</sub> emissions through changes to plant = \$10/ton 	Cost borne by industry	Tons CO <sub>2</sub> saved
<b>1) Tax:</b> Fixed cost of XX\$/ton CO <sub>2</sub> emitted.	Factory A makes CO <sub>2</sub> reductions based upon individual economics and priorities.	Factory B makes CO <sub>2</sub> reductions based upon individual economics and priorities.	> min possible Industry costs are not pushed to cheapest reduction options	can not be predicted since not fixed by legislation
<b>2) Mandate:</b> Fixed reduction of CO <sub>2</sub> mandated across industry. E.g. 20 tons split evenly between factories A and B.	10 tons CO <sub>2</sub> saved in house at a cost of \$500	10 tons CO <sub>2</sub> saved in house at a cost of \$100	> min possible (\$600)	fixed by legislation (20 tons)
<b>3) Emissions trading:</b> Emission reduction target set for whole industry (e.g. 20 tons). Market decides best mode of compliance.	High cost of CO <sub>2</sub> reductions at factory A means compliance comes through buying 10 tons CO <sub>2</sub> from the carbon market (in this case bought from Factory B).	Low cost of abatement justifies 20 tons CO <sub>2</sub> saved in house at a cost of \$200. 10 tons used for compliance. 10 tons sold to carbon market (bought by factory A).	min possible (\$200)	fixed by legislation (20 tons)

As illustrated above, a straight tax on CO<sub>2</sub> faces the criticism that at the outset it is not possible to predict the level of CO<sub>2</sub> savings to be generated. A tax also fails to introduce any flexibility for compliance, neglecting the different costs of CO<sub>2</sub> abatement faced by actors. The second option for CO<sub>2</sub> regulation, a mandate, equally shares a CO<sub>2</sub> reduction target across each facility in the industry. This does set a predictable cut in CO<sub>2</sub> emissions; however the total cost across industry is not minimized, since there is no flexibility to trade emissions reductions across facilities. Finally, 'emissions trading' is a system which sets an industry wide CO<sub>2</sub> reduction target and provides a market for CO<sub>2</sub> savings. CO<sub>2</sub> savings achieved beyond the emissions cap at one facility can be sold into the market as emissions permits to be purchased by facilities with a CO<sub>2</sub> reduction cost higher than the market price. In this example, Factory B makes all the CO<sub>2</sub> reductions required and sells the excess to factory A. Within the emissions trading model, the scale of emission cuts is predictable at the outset and the cost of compliance is minimized, since emission reductions are pushed to the facilities with the cheapest reduction options.

The manufacturing organisation described in the case study faces legislation at a number of levels, as illustrated in Figure 2.

**Figure 2: Different levels of climate change legislation affecting the case organisation**



In the following sections, we give a brief introduction to the different schemes.

**Global and European climate legislation**

As explained in the previous section, the aim of emissions trading is to deliver a market-based mechanism which is more effective and efficient than a straight tax or mandate. The European Emissions Trading Scheme cascades from the Kyoto Protocol, which is administered by the United Nations and represents the main international response to climate change. The protocol sets a target to reduce greenhouse gas emissions to more than 5% below 1990 levels between 2008 and 2012 (UNFCCC, 2005, 2006). The European Union has signed the protocol as a region and has set phase II of the European Emissions Trading Scheme to mirror the timing of the Kyoto Protocol. Phase I of the European Emissions Trading Scheme ran as a trial period in the three years leading up to the Kyoto Compliance Period. Within the European Emissions Trading Scheme, the emission reduction target cascades first to member states, next to industry sectors and finally to individual facilities. Initially the European Emissions Trading Scheme included the electricity, iron and steel, mineral processing, pulp and paper and manufacturing industries. Phase III will expand its scope to include extra sectors, such as the aviation industry. Under the scheme, each individual facility has an allowance of emissions which they are allocated. If their allowances are less than their actual emissions, then facilities must decide whether to ‘make’ the reductions in-house or ‘buy’ the savings required from the CO<sub>2</sub> market.

**National (United Kingdom) Legislation**

The manufacturer in our case study has historically been covered by the UK’s Climate Change Levy. This was introduced in 2001 and targets industrial, commercial, agricultural and public sector uses of electricity, natural gas, oil and coal for lighting, heating and power. The Climate Change Levy is charged at a flat rate per unit of energy used and is designed to be revenue neutral to the government. The payments are recycled back to industry through a cut in employers’ national insurance contributions and support for energy efficiency and low carbon technologies. At the time of introduction of the levy, industry argued that organisations should not be penalised if they are energy intensive and/or exposed to international competition. The argument was that for such industries, the national tax would put them at a disadvantage to international competitors. In response to these pressures, the government set up Climate Change Agreements whereby energy intensive industries could apply for up to an 80% discount on the climate change levy. In return, the government specified that, to be eligible for the discount, energy intensive industries must sign up to

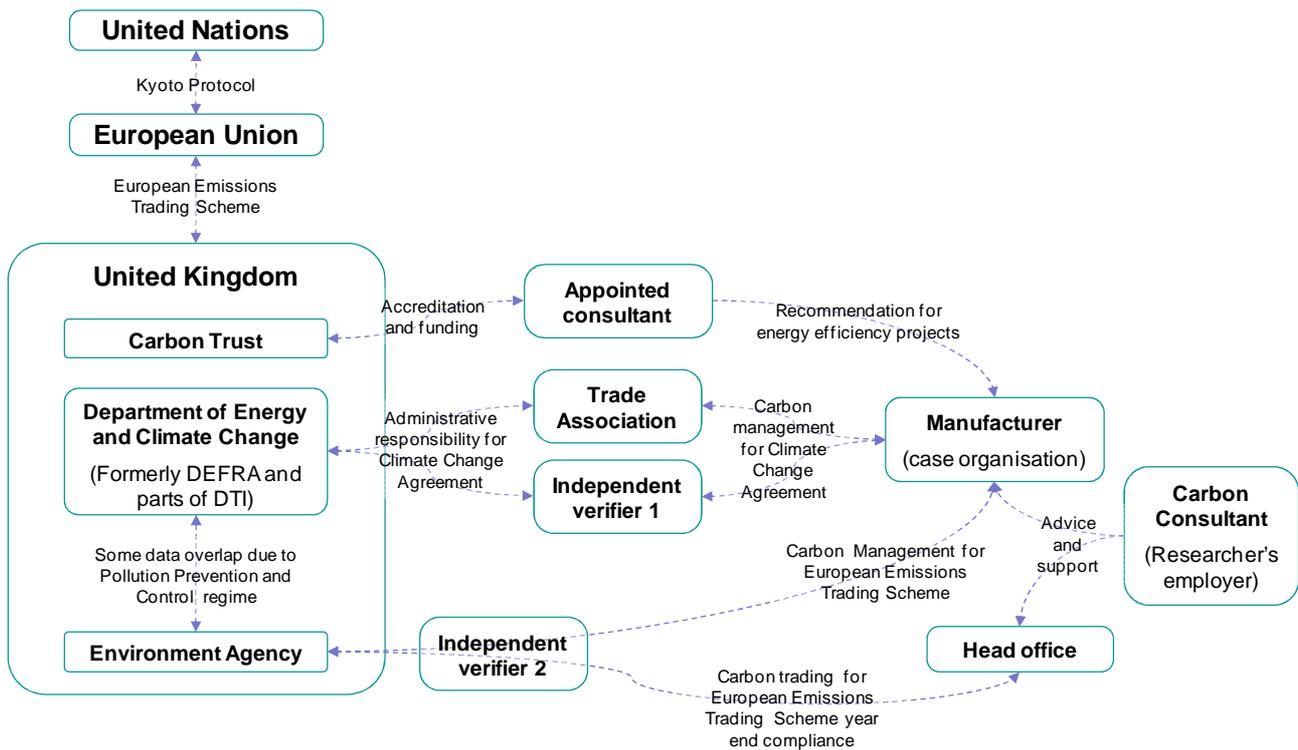
sector-level and site-level targets for challenging energy efficiency or CO<sub>2</sub> reductions. The sector-level target is administered through the relevant trade association. Exposure to the Climate Change Levy and having applied for and received a climate change agreement meant that the case study company had set efficiency targets based upon energy use per unit of throughput since 2001.

Another important upcoming piece of national legislation for the site is the Carbon Reduction Commitment. This is designed to cover the next tier of energy users not covered by the European Emissions Trading Scheme. The Carbon Reduction Commitment will focus upon electricity usage, targeting approximately 5000 organisations in the UK. The scheme comes into force in early 2010. However, in the interest of avoiding any double counting, any organisation which has more than 25% of its emissions covered by a climate change agreement will be exempt from the scheme. For the case organisation it looks like it will meet this 25% threshold. However, the structure of the Carbon Reduction Commitment does set a precedent that is relevant to the site in terms of future legislation. The scheme will be based upon a target emissions reduction and emissions trading. Participants will have to buy CO<sub>2</sub> allowances from the government and at the end of the year they will be required to report their performance and trade their allowances to meet their performance. The government will then release a public league table to give visibility to the best and worst performers in the scheme. It will then recycle the payments received for the carbon allowances, so that organisations at the top of the league table will receive more than they paid and those at the bottom will receive less than they originally paid. This structure will provide a reputational and financial reward for the leaders in the league table, and a penalty in terms of reputation and cost for those at the bottom of it.

### **A view of the business network**

Figure 3 below shows the cascade of the Kyoto Protocol from the United Nations, down through the European Union, the United Kingdom's Environment Agency, and finally to the individual manufacturing site. The Environment Agency also manages data and compliance for Pollution and Prevention Control outside of energy and CO<sub>2</sub> emissions. These permits control other pollutants, such as hazardous chemicals and industrial wastes. Some data related to other pollutants is linked to energy use, and as required, the Environment Agency shares this material with the Department of Energy and Climate Change who administer the Climate Change Levy and Climate Change Agreements through the relevant industry trade associations. Finally, the third government body relevant to this case is the Carbon Trust, which is responsible for facilitating the decarbonisation of the United Kingdom's industry. In this case they sponsored one of their accredited consultants to perform an audit of energy efficiency opportunities at the site. A final group of actors in the network are the verifiers who independently assess the annual submissions for the Climate Change Agreements and the European Emissions Trading Scheme.

**Figure 3: Case organisation within their network**



**Introduction to the manufacturing process**

Our case study focuses upon a manufacturing site specialising in dairy nutrition. We will not give further details of the product, since they are not an important part of our case study. Instead, it is the energy characteristics of the manufacturing process which make the case study representative of an energy intense manufacturer responding to emerging climate change legislation. The process relies heavily upon pumping to move the product around the site. To give an idea of the process, raw material entering at one end typically takes 3 or 4 days to emerge at the other end as a finished product. Pumps are required at all stages to keep the product moving. Heating and cooling requirements are also large draws on energy, as the product requires pasteurisation (heating) and preservation (cooling) at a number of stages in the process. Finally, steam drives large evaporators; these convert the processed liquid to a powder at the end of the process. Another reason that energy use is so intense is that the production process is continuous. All stages of production feed into each other, and hence all parts of the site have to run simultaneously. Extra storage could be introduced between productions stages, but as the product is perishable, this would still require energy for refrigeration. Together, these factors combine to mean that energy costs are estimated to represent ~50% of the overhead costs which can be controlled, or 20-25% of direct costs at the site.

**Interactions during generation and response to the Carbon Trust Energy Efficiency report**

The Carbon Trust has a remit to decarbonise the United Kingdom’s Industry, one of the major arms of its program is to increase the efficiency of existing facilities. The Carbon Trust manages an accreditation programme and keeps a number of energy and carbon consultants on its books to perform energy efficiency audits at sites. In July 2008, one of the accredited consultants visited the case study organisation and agreed the scope of the project to be to “*identify between 7-10 opportunities, which typically have a payback of three years or less and would provide a noticeable reduction in both energy use and carbon emissions*”. Prior to the visit, the Carbon Trust sent a checklist, asking the site to prepare the following material: the last 12-24 months of energy meter readings and invoices; copies of any company energy policies; details of any existing energy reduction work; site plans, and a list of equipment on site.

During the visit, the approved consultant worked with the site engineer to understand the processes. The consultant used his previous knowledge of best practice to eventually identify 9 energy efficiency opportunities. These energy efficiency measures broadly fitted into the following categories:

- Improving the site energy management policy
- Improving site metering, so that energy data would be collected automatically
- Fitting more efficient variable speed drives in some areas
- Using heat recovery to preheat other parts of the process
- Improving insulation of hot processes

Collectively, these measures amounted to a potential saving of 5% of energy use. The average payback of the projects was around 0.5 years, with the maximum payback being 1.2 years. In the recommendations for Energy Management practices, the organisation was scored between 0 and 4 in the areas of Energy Policy, Organising, Training, Performance measurement, Communication and Investment. The average score was 2.4, with training and communication highlighted as areas to work on. The energy policy is currently subsumed within the site's wider ISO 14001 procedures, these manage environmental impacts which include, but are not limited to energy. It was recommended that a specific energy policy be drawn up; the appendix of the report gave an example energy policy. With regards to the energy efficiency projects proposed, each was detailed in a standard table giving projected savings in terms of cost, CO<sub>2</sub> and energy; the project payback; project details; project rationale; a risk assessment; next steps; and relevant Carbon Trust documents which could support the project going forwards. In all, the report consisted of 34 pages, and contained a significant amount of detail for the scoping stage of each project.

At the time of interview, seven months after the survey was completed, there had only been one further interaction with the Carbon Trust. This was when the account manager called to enquire as to progress with the projects. The projects had not yet been started, but the site engineer had taken a few of them forwards, as we will explore later in the case study.

### **Interactions around the European Emissions Trading Scheme and National Climate Change legislation**

The manufacturing site primarily uses electricity and oil; its rural location means that it is not connected to mains gas. Furthermore, electricity is not relevant to the European Emissions Trading Scheme, as it is a secondary form of energy. The European Emissions Trading Scheme covers the large primary energy consumers, i.e. the power station, rather than deal with all the dispersed electricity consumers. Since there is no gas, and electricity is not covered by the European Emissions Trading Scheme, the only items onsite which fall under the European Emissions Trading Scheme are the oil fired boilers. These are primarily used to produce steam to run the evaporators. There are two boilers, with one always running and the other kept up to temperature as a backup. These boilers are the subject of an annual European Emissions Trading Scheme verification, where the verifier checks that the consumption figures and their conversion to CO<sub>2</sub> have been carried out in accordance with the government guidelines. During the audit of the 2008 figures, the verifier praised the systems in place and made small changes to the volumes to account for one missed delivery, and a mistake in data entry. These errors amounted to less than a 0.5% change in the CO<sub>2</sub> volume for the site, the verification was passed with only minor comments. Firstly, it was requested that the temperature of an oil meter be recorded to ensure that consumption was adjusted to take account of differences in temperature. Secondly, the verifier recommended that some of the site practices are recorded in the existing ISO 14001 documentation.

Within the European Emissions Trading Scheme, the number of allowances each site receives is based upon standard factors applied to an inventory of equipment onsite. In terms of the impact of the European Emissions Trading Scheme, the site is in the position where they receive more allowances than they need to run their process. In other words, the site's performance was better than their allocation, meaning that they were and will be left with surplus carbon allowances at the end of each year until phase II finishes at the end of 2012. In terms of scale, the credits gave a surplus that, sold at market value, amounts to approximately 1% of their annual energy bill.

## Site responses- capital project planning and efficiency and CO<sub>2</sub> concerns

During the development of the case study, we separately interviewed the plant manager, engineer, accountant, and compliance manager. It quickly became clear that they were very concerned about the cost of energy and the fact that it represented almost 50% of their controllable overhead costs. In discussions about CO<sub>2</sub>, they did not question the validity of concern over climate change. However, they did state that they found it a much less tangible variable to work with, when compared with energy costs. They also spoke about the government's CO<sub>2</sub> regulation in terms of compliance and standards. This and CO<sub>2</sub> as a whole was spoken of as an issue that had to be managed as a risk of potential non compliance, rather than a strategic, or 'business' concern. There are a few examples that illustrate that CO<sub>2</sub> was yet to make it into strategic decisions, at least at the site level. First we will examine the project planning processes, second, we will give a brief overview of the Key Performance Indicators used at the site and how energy was included.

Looking to the site's CapEx plan, the projects are split into four levels of priority, 'Strategic approved capital', 'Normal approved budget', 'CapEx to be considered' and finally 'CapEx on hold'. In the first section, one of the two projects will have a significant impact upon energy efficiency. The second level included sixteen projects, of which seven will have a significant impact upon energy efficiency. Notably, about half of the projects identified by the Carbon Trust were rolled in to one of the level two projects. Finally, one in four of the projects in level three had a significant impact upon energy efficiency and none of the three CapEx projects on hold impacted upon energy efficiency. When asking how a project comes to be considered as 'Strategic Approved Capital', it was stated that this judgement was somewhat subjective, but would usually involve concerns of increasing production, improving quality performance, or reducing cost. Efficiency and climate change were seen as a subset of the third criteria of cost, but not a strategic concern in their own right.

In a bid to further explore the allocation of CapEx, we were granted access to the project appraisal sheet that all CapEx proposals are submitted on. This is a five page document, with the following structure:

- Page 1:** Project details, such as project name, manager, site contact details etc. This included a tick box section where a project is to be classified as one of the following: 'Replacement', 'Extension', 'Efficiency', 'New developments / Markets', 'Quality', 'Environment / Safety'.
- Page 2:** Two 'free text' boxes for completion, titled 'Motivation for capital project' and 'Description of project'.
- Pages 3 + 4:** Titled 'Financial Information'. Requests details on expenditure level, project timing, specification, and plan.
- Page 5:** Risk analysis with four questions: What happens if we do not invest? Influence on environment and safety? Influence on automation? Influence on factory throughput and storage capacity?

The details above illustrate how climate change was incorporated into decisions affecting future investments. Next we look at how climate change was influencing day to day management of the site. To do this, we examine the site's key performance indicators. At the corporate level, the site must report performance for a number of indicators under the following headings:

1. Deliver Products at a Competitive Cost
2. Deliver and Provide Complete Orders, on Time and in Specification
3. Adherence to Plan
4. Optimise Utilities Efficiency
5. Materials Recovery Variance
6. Manufacture Right-First-Time
7. Customer Complaints Trends Analysis
8. Factory Expenses

The fourth bullet is where energy efficiency is accounted for. 'Utilities' is the term referring to site energy supplies. In the case of this site, the main concern is that the boilers are run efficiently to

produce steam, and then that the steam is used efficiently to produce product. This means that, at the site level, the ultimate measure is tonne of product produced / litre of oil used. This high level target is then broken down to tonne of steam produced / litre of oil used, and tonne of product / tonne of steam. This disaggregation is useful, since the first metric gives a performance measure for the team running the boilers, and the second is a measure of the production team's effectiveness. Supplementing these two measures, there are two further metrics which track compliance with the site's Climate Change Agreements and the number of environmental complaints received.

## 5. Analysis of case

**In sections 2 and 3, we examined how focal points can capture the essence of social conventions, acting as clues for coordination within the network (Schelling, 1960; Sugden, 1995). We then linked this to Pawson and Tilley's model of 'mechanism + context => outcome' (Pawson & Tilley, 1997). We explored how 'mechanisms', such as actions or programmes, are centred around focal points and suggested that 'context' refers to the rules and principles in the surrounding network, including legislation.**

Table 1 uses this framework to analyse the case study.

The first column gives the different focal points held by legislators and manufacturers, answering our first and second research questions. Manufacturers are primarily concerned with throughput, quality and cost management when setting strategy. They see energy costs as a threat to profitability and find CO<sub>2</sub> and the response to climate change to be a much less tangible and immediate concern than tackling energy costs. CO<sub>2</sub> management is perceived as a compliance type activity and framed as being similar in requirements to other health, safety, and environmental management issues. Finally, when responding to climate change legislation and planning future capital investments, one of the primary concerns of manufacturers is to minimise uncertainty. In contrast to the manufacturer focal points, legislators take an industry wide perspective to CO<sub>2</sub> management and aim for market based response designed to give flexibility in compliance modes and allowing CO<sub>2</sub> savings to be made at the least cost to society, see Figure 1 for further explanation of these principles.

### **The second and third columns of**

Table 1 answer our third and fourth research questions, giving the key rules and principles that are guiding the network development and how they interact with focal points to influence outcomes. We now deal with the outcomes observed in turn and try to explain them in light of the focal points, rules and principles observed.

### **Throughput, quality, and cost concerns override CO<sub>2</sub> aspects of CapEx decisions.**

When appraising capital projects, the manufacturer is placing a heavy emphasis upon throughput, quality and cost. These criteria are institutionalised in the site's CapEx plan, and head office's CapEx proposal sheet. Furthermore, CO<sub>2</sub> credit surpluses from the European Emissions Trading scheme only represent ~1% of energy costs, so CO<sub>2</sub> is not material enough to be treated as a strategic concern on the basis of cost alone.

### **CO<sub>2</sub> management is seen as a compliance type activity.**

CO<sub>2</sub> is not spoken about in the capital project appraisal sheet, or in the site KPIs. However energy purchases represent 20-25% of the manufacturer's direct costs, and energy efficiency is covered by both the capital project appraisal sheet and the site KPIs. There is a significant difference between the manufacturer's focal point of 'cost management through energy efficiency' and the legislator's focal point of 'CO<sub>2</sub> management'. This discrepancy could be leading the manufacturer to respond to the legislation with a compliance based approach, since the manufacturer cannot make an easy connection between the legislator's focal point and their site level objectives. This may also be reinforced by the fact that CO<sub>2</sub> is handled by the same environmental agencies that deal with other compliance based environmental legislation.

**Table 1: Summary of case analysis**

Actors	ACTORS' FOCAL POINTS (Affecting Mechanisms)	RULES & PRINCIPLES (Context)	OUTCOMES	
<b>Manufacturer</b>	m1) Throughput m2) Quality m3) Cost management	<ul style="list-style-type: none"> <li>Criteria for projects being included as 'Strategic approved capital' are production, quality and cost.</li> <li>Finance is given two of the five pages of the capital project appraisal sheet.</li> </ul>	<ul style="list-style-type: none"> <li>Throughput, quality and cost concerns override CO<sub>2</sub> aspects of decisions.</li> </ul>	
	m4) Energy costs as a threat to profitability.	<ul style="list-style-type: none"> <li>Energy represents 20-25% of direct costs.</li> </ul>	<ul style="list-style-type: none"> <li>CO<sub>2</sub> is not talked about directly; instead cost management through energy efficiency is taken as focal point for efforts.</li> </ul>	
	m5) Response to climate change seen as less tangible than tackling energy efficiency.	<ul style="list-style-type: none"> <li>CO<sub>2</sub> is not spoken about in Capital Project appraisal sheet or in KPIs.</li> <li>Efficiency is covered by both and was regularly mentioned during interviews.</li> </ul>		
	m6) CO <sub>2</sub> as a compliance issue, seen as similar to existing environmental legislation and health and safety policies.	<ul style="list-style-type: none"> <li>CO<sub>2</sub> is handled by the same environmental agencies that deal with other compliance based environmental legislation.</li> <li>CO<sub>2</sub> credit surplus represents ~1% of energy costs. Isn't material enough to justify strategic treatment on a purely financial basis.</li> </ul>	<ul style="list-style-type: none"> <li>CO<sub>2</sub> is managed 'defensively', with a compliance based approach</li> <li>CO<sub>2</sub> market is not seen as an opportunity, more as an added complexity or threat to be managed.</li> </ul>	
	m7) Need for certainty	<ul style="list-style-type: none"> <li>Market based response means that CO<sub>2</sub> is traded as a commodity. The future price fluctuates significantly.</li> <li>There is currently only a market for CO<sub>2</sub> until the end of Phase II of the European Emissions Trading Scheme in 2013.</li> <li>Investment decisions recognising the cost of CO<sub>2</sub> struggle to assign a value to this cost.</li> </ul>		
	<b>Legislator</b>	l1) Market based response: Flexibility in compliance modes through market based system delivering CO <sub>2</sub> savings at lowest cost to society.	<ul style="list-style-type: none"> <li>Structure of legislation enabling emissions trading is designed to push investment to least cost options.</li> </ul>	<ul style="list-style-type: none"> <li>This mechanism is at least partially thwarted by organisations' needs for certainty and the low relative cost of CO<sub>2</sub> when compared to energy costs as a whole.</li> </ul>
		l2) CO <sub>2</sub> as a strategic concern for organisations.	<ul style="list-style-type: none"> <li>Legislators pushing for CO<sub>2</sub> to receive strategic treatment, e.g. sponsoring energy efficiency surveys to develop business cases, or proposing public performance league tables for future legislation.</li> <li>Legislators take account of a longer time frame and an industry level perspective, as compared to individual organisations' concerns for the shorter term, and a narrower view of the network.</li> </ul>	<ul style="list-style-type: none"> <li>CO<sub>2</sub> is yet to receive true strategic treatment as per considerations afforded to throughput, quality and cost management.</li> </ul>

## **CO<sub>2</sub> trading mechanism does not give the certainty required during CapEx decisions**

Manufacturers had a strong focal point of the need for certainty during investment decisions, for example, when pricing CO<sub>2</sub> into a long term project. However, due to the market based structure of emissions trading, it is not possible to predict the long term price of CO<sub>2</sub>. This uncertainty made it very hard to use the cost of CO<sub>2</sub> to justify changes to CapEx projects to take account of their impact upon climate change. In direct contrast, the legislator held a focal point that a market based response, resulting in a variable CO<sub>2</sub> price, was an essential mechanism to achieving CO<sub>2</sub> reductions at the minimum cost to society.

## **6. Conclusions and further research**

This paper presents a case study of an energy intense manufacturer responding to climate change within the constraints of emerging, legally-binding CO<sub>2</sub> legislation. Our approach is grounded in a behavioural perspective of business interaction. By drawing attention to focal points, rules and principles that guide interaction, a behavioural approach to business interaction offers a more accurate picture of the actual behaviour of businesses responding to the challenge of climate change. Key findings are that CO<sub>2</sub> is not yet viewed by manufacturers as a strategic concern equivalent to their focal points of throughput, quality and cost. That CO<sub>2</sub> management is seen as a compliance type activity, rather than an opportunity. And finally, that the legislative context of a market based response is often hindering manufacturers' response to climate change, due to the uncertainty that it introduces.

These observations suggest the following possible points of departure. First, there is an opportunity for legislation to more closely focus upon energy efficiency, rather than CO<sub>2</sub>. Since most energy is currently still produced from fossil fuels, this would still influence climate change, but would play to the manufacturer's focal point of 'cost management through energy efficiency'. Second, legislators should acknowledge the current manufacturer focal point of seeing CO<sub>2</sub> management as a compliance activity. The objective of encouraging a market based response to climate change will require this compliance centred focal point to give way to viewing the carbon market as a potential opportunity. In line with this, the United Kingdom's 'Carbon Reduction Commitment' hints at another opportunity to move manufacturers away from a compliance mindset, towards framing carbon management as an opportunity. They propose an augmented form of carbon trading, involving a public performance league table giving reputational incentives and opportunities, and also revenue recycling to the top performers which will deliver a further financial incentive. Finally, there is an opportunity to examine potential mechanisms to improve the certainty around the price of carbon, so that it can be confidently built into CapEx appraisals during investment decisions.

Although our case study was carefully chosen to be representative of an energy intense manufacturer covered by CO<sub>2</sub> legislation, further research could explore the focal points held by a wider selection of manufacturing companies, to expand upon the findings in this paper. The role of precedents in establishing focal points would be another potential avenue for future research. A better understanding of the roles of focal points and their relationship to precedents would help us better understand the processes of network development under legislated change. This research approach can also potentially be used in analysis of other networks where interaction between actors is subject to a limited number of degrees of freedom, such as other legislated environments. In these situations focal points emerge as a response to the orchestrated network structure and can help explain the interactions and outcomes observed.

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