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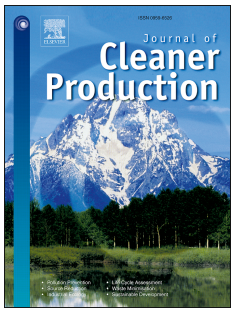

The role of Supplier Relationship Management in reducing Greenhouse Gas emissions from food supply chains: Supplier engagement in the UK supermarket sector

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Supplier engagement for Greenhouse Gas emissions reduction in food supply chains

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Abstract

Food supply chain operations contribute significantly to Greenhouse Gas emissions. In the United Kingdom (UK), supermarkets are leading operators in the food retailing sector. With 75-90% of a typical food product's "carbon footprint" occurring in the supply chain upstream of the point of sale, socially responsible retailers need to influence supplier behaviour to reduce emissions. This paper aims to examine the role of Supplier Relationship Management, including the use of formal Supplier Engagement Programmes, in the UK supermarket sector towards this end. We use secondary data analysis techniques to examine their Corporate Social Responsibility and Sustainability reports. This analysis finds that progress is being made in Sustainable Supply Chain Management, but the use of Supplier Relationship Management for emissions reduction is variable in application. Some Supplier Engagement Programmes operated by UK supermarkets could, nevertheless, act as exemplars of best practice, demonstrating how to achieve emissions reduction alongside other sustainability objectives.

Keywords: Sustainable Supply Chain Management; Supplier Relationship Management; Supplier Engagement; Carbon Management; Greenhouse Gas Emissions Reduction; Food Supply Chains

Abbreviations:
B2B – Business-to-Business
B2C – Business-to-Consumer
CDP – Carbon Disclosure Project
CM – Carbon Management

CO2e – Carbon Dioxide equivalent
CSR – Corporate Social Responsibility
GSC – Global Supply Chain (Programme)
GHG – Greenhouse Gas
LCA – Life-cycle Assessment (or Analysis)
SEP – Supplier Engagement Programme
UK – United Kingdom

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1. Introduction

There is an explicit link between climate change and food production. Food supply chain operations are estimated to contribute 31% of the EU's total Greenhouse Gas (GHG) emissions, and wider food-related activities (i.e. catering as well as production and processing) account for up to 40% of total UK GHG emissions (Government Office for Science, 2011). The UK Government has recently, through the introduction of mandatory disclosure of GHG emissions data in the annual directors' reports of quoted companies after October 2013, given a signal that large corporations should take a lead on reducing GHG emissions in both their own operations and their supply chains. By first measuring and then reporting GHG emissions it is held that companies can easily progress to setting reduction targets and then implementing Carbon Management (CM) initiatives, whilst simultaneously improving competitiveness (Downie & Stubbs, 2013; Rao & Holt, 2005; Hart & Ahuja, 1996). However, whatever progress is made in operations internally, the largest proportion of GHG emissions typically occurs outside the direct control of reporting focal companies and instead within the operations of suppliers within their procurement networks.

It is commonly stated amongst consultancy firms working in the area of CM, by some companies themselves, and also in some academic literature (e.g. Downie & Stubbs, 2013) that as much as 75-90% of a food product's "carbon footprint" (i.e. the total GHG emissions created in its production) may be as a result of upstream supply chain activity. This is activity beyond a reporting company's direct control, yet for which it is corporately responsible. Such upstream GHG emissions are termed "Scope 3" under the Greenhouse Gas Protocol and defined as those emissions caused indirectly by an organisation's activities (WRI/WBCSD, 2011). Even though there is no current legal obligation in the UK to force them to elicit changes in their suppliers' behaviour towards Scope 3 emissions reduction, it is anticipated by some reporting companies that this may become a requirement in the near future. Some companies are, therefore, setting up reporting mechanisms to capture suppliers' data. Leading companies are also starting up Supplier Engagement Programmes (SEP's) with specific CM purposes now in order to get ahead on emissions reduction activities. Such SEP's are formally structured programmes of activity through which a focal company in a supply chain seeks to control or influence the behaviour of suppliers through additional engagement alongside any contractually-related arrangements, often based on a two-way flow of information or knowledge exchange.

Supplier engagement, as a broader corporate practice, has risen in importance generally as a means of influencing supplier behaviour and driving supply chain performance against corporate objectives. Though its potential is not yet fully realised in the fields of sustainability or CM specifically (Ashby et al, 2012; Hajmohammad et al, 2013; Seuring & Gold, 2013, Gualandris et al, 2014). SEP's themselves are only one form of supplier engagement within the wider conduct of the contractual relationship, but they can help create a setting within which it is possible to better pursue collaboration and co-operation between focal companies and their various suppliers along a chain (e.g. distributors, processors, primary producers, etc.).

Focal companies in UK food supply chains notably include supermarkets as the dominant players in the grocery retail sector, though sometimes a large food processor will also assume a focal company role within a particular product's supply chain. This

situation may occur where the latter is supplying a range of supermarkets, both with their own branded products and others produced by them but packaged under the supermarket's own label. In the UK the largest 9 supermarkets (i.e. Tesco, Asda, Sainsbury's, Morrisons, The Co-operative, Waitrose, Aldi, Lidl and Iceland) together account for 96% of retail sales in the sector (Statista, 2015), making them a legitimate focus for enquiry into the carbon emissions performance of food supply chains.

The aim of this paper is to examine the role of supplier engagement, including the use of SEP's, by UK supermarkets in order to reduce GHG emissions in their procurement networks. Supplier engagement as a corporate practice is closely related to the similar but wider concept of Supplier Relationship Management (SRM) found in academic literature. The research questions to be addressed are:

RQ 1. How do corporate practices around Supplier Relationship Management and supplier engagement, particularly in the form of Supplier Engagement Programmes, influence carbon reduction by UK supermarkets?

RQ 2. What are the positive impacts brought about by carbon reduction strategies and measures in the supply chains within the supermarket sector?

RQ 3. What are the limits to future improvements via Supplier Engagement Programmes?

By addressing these questions it is also anticipated that an indication will be given of whether supplier engagement, and therefore SRM, can make a meaningful contribution towards wider objectives under Sustainable Supply Chain Management in such procurement networks.

2. Literature Review

The key specialist bodies of academic literature explored, in order to set the context for the corporate practices under examination, are Sustainable Supply Chain Management (SSCM) and Supplier Relationship Management (SRM). These topics have been selectively analysed via keyword search techniques and, given the focus of this paper, viewed through the lens of what is particularly appropriate to Carbon Management (CM) practices within the food supply chain context. Conceptual and/or systematic literature review-based articles have also been used as touchstones in identifying key gaps and issues (for example, Beske & Seuring, 2014; Ashby et al, 2012; Carter & Liane Easton, 2011; Sarkis et al, 2011; Carter & Rogers, 2008), alongside consideration of recent papers charting future research directions in Supply Chain Management generally (e.g. Ivens et al, 2013; Walker et al, 2014).

2.1 Sustainable Supply Chain Management

There are a number of definitions for SSCM circulating in the literature. Seuring et al (2008) defined it as "the management of material and information flows, as well as co-operation among companies, along the supply chain, while taking goals from all three dimensions of sustainable development (i.e. economic, environmental and social) and stakeholder requirements into account". This was an acknowledgement of the pioneering approach of Elkington (1998) in defining the terms of both "sustainable development" and "sustainability" in relation to business activities, whilst also articulating the concept of the "Triple-Bottom Line" that businesses should be

accountable for (i.e. their Economic/Social/Environmental impacts, or alternatively, People, Planet and Profits).

Linton et al (2007) offered a subtle variation on Seuring et al's perspective, contending that SSCM must also include consideration of "by-products of the supply chain" plus "the entire lifecycle of the product". They thus defined a SSCM perspective as a Life-cycle Assessment (LCA)-based one which seeks to "optimize the product, not only from a current cost standpoint, but also a total cost standpoint. Total cost must include the effects of resource depletion and the generation of by-products that are neither captured nor used (e.g. pollutants and waste)". In the specific area of CM this LCA approach was later refined by Kronborg Jensen (2012), who focussed specifically on product carbon footprints. A key finding was that the standardization of footprinting procedures not only improves the conduct of such carbon emissions measurement exercises, but has the potential to assist more broadly with the conduct of environmental performance assessment across wider supply chain activities.

Alongside the three dimensions of sustainability (economic, environmental and social) and this "life cycle" perspective, Carter & Rogers (2008) also introduced the concepts of relationships (customer-supplier co-operation and stakeholder satisfaction) into SSCM. As stated above, the larger proportion of Greenhouse Gas (GHG) emissions associated with specific products and services often occurs outside the direct control of reporting companies, yet still within their supply chains. So, effectively integrating sustainability-based activity (such as CM) into the operations of firms often requires co-ordination beyond individual organisational boundaries (Seuring & Muller, 2008; Wagner, 2011).

In the field of CM, and particularly around activities for the measurement and control of Scope 3 emissions, Supplier Engagement Programmes (SEP's) are being increasingly seen as a key means of achieving boundary-spanning moves towards common goal setting and assessment of operations against performance standards. This perspective is based on the prevailing view that deeper and closer partnerships with the longest possible part of the supply chain are critical to the success of SSCM (Fabbe-Costes et al, 2011; Hart & Ahuja, 1996; Leppelt et al, 2013; Linton et al, 2007; Rao & Holt, 2005; Steven & Merklein, 2013; Vachon & Klassen, 2006). Therefore, working in combination with SRM, SSCM can potentially have a key role to play in such companies meeting their GHG emission targets as part of improved operational performance (Ashby et al, 2012; Hajmohammad et al, 2013; Seuring & Gold, 2013, Gualandris et al, 2014). At present the supermarket sector is ranked by CM consultants as being at the forefront amongst UK companies of implementing such Programmes. This is partly put down to the higher public profile they hold as Business-to-Consumer (B2C) firms, as opposed to Business-to-Business (B2B) firms, and partly related to the high level of competition within the sector.

There are three key gaps in the SSCM literature which this paper aims to address. Firstly, there is scope for further research specific to food supply chains, particularly to explore and explain the behaviours of supermarkets and their suppliers around CM, similar work having been done in sectors like airlines and chemicals. Further, there is a need to examine how supermarkets look to achieve carbon reductions via improved resource efficiency through common business practices with suppliers, like knowledge exchange, benchmarking and best practice sharing (Prajogo et al, 2012; Sarkis et al, 2011; Steven & Merklein, 2013; Vachon & Klassen, 2006). Secondly, sharing of

information and control for the purposes of CM within a supply chain does, however, open the way for opportunistic exploitation of competitive advantage (Cox, 2004; Kovacs, 2008; Pullman et al, 2009). Thirdly, there is also a dearth of research into SRM for the purposes of CM via collaborative actions. Consequently, further research and analysis is required into appropriate means of managing supply chain relationships to secure mutual advantageous carbon reduction through collaboration. The dynamics of the supply chain, whether classically dyadic, multi-dyadic or extra-dyadic/triadic (e.g. where there is more than one focal company in a chain or where the retailer is not necessarily the focal company) merits further analysis from this perspective as well (Beske, 2012; Boer et al, 2005; Choi & Wu, 2009; Ivens et al, 2013; Spekman et al, 1998).

2.2 Supplier Relationship Management

Supplier Relationship Management is a term from the academic literature meant to incorporate the management of relationships between supply chain actors and is held to be one of the most important aspects of Supply Chain Management (Lambert, 2004, Liker & Choi, 2004, Ross, 2004, Lambert & Schwieterman, 2012). It has been defined as "co-ordination, collaboration and information sharing between supply chain members" (Sanders, 2012). Such forms of activity are carried out in order to jointly plan, operate and execute business decisions, and so can have a major impact on performance, including in terms of the achievement of sustainability objectives (Ashby et al, 2012; Hajmohammad et al, 2013; Seuring & Gold, 2013, Gualandris et al, 2014). Trust and communication are the major hallmarks of successful SRM, whereas mistrust, poor communication or even sabotage are signals of failure to manage relationships in supply chains properly and instead concentrate on the deployment of power within a purely transactional approach. This latter style would put supply chain relationships more in a "monitored" rather than a "managed" category (Cox, 2004).

Supplier engagement is the corporate practice term that equates to the more academically-inclined concept of SRM. This includes, but is not limited to, formally constituted SEP's. These Programmes can be set within various contexts, including a structured partnership, a formal alliance or a loose membership network. Figure 1 shows a diagrammatic representation of the fit of both supplier engagement and SEP's within the practice of SRM in the context of Supply Chain Management.

Insert Figure 1 here.

The academic literature in the area of Supplier Relationship Management is slowly developing in scope as well as importance. Seuring and Muller (2008) found that supplier management was one of the top four issues in Sustainable Supply Chain Management as identified by experts in a Delphi study. Later, Wagner (2011) added to this by stating that supplier development activities lead to performance improvements and the collective competitiveness of supply chain networks, particularly in the context of mature supplier-buyer relationships. Business practices with a specific contribution to make in this area include knowledge exchange, benchmarking and best practice sharing (Prajogo et al, 2012; Sarkis et al, 2011; Vachon & Klassen, 2006).

One view is that a competitive supply chain has three 'R' characteristics (Sanders, 2012): responsiveness; reliability; and relationship management. The focus of the latter is on collaboration and long-term relationships. These take precedence over short-term,

arms-length transactional dealings. This has marked a shift in Supply Chain Management thinking over the past three decades. Supply Chain Management was initially synonymous with the procurement function of firms, but this view began to change in the 1980's (Kraljic, 1983). Later Lamming (1993) posited Supply Chain Management as the key management task without which an industry could not move forward, and made it central to his development of his Lean Supply model as a strategic framework to assist with this task. Underlying the concept of Supplier Relationship Management is the idea that the relationship between buyer and supplier should be based on reciprocal trust, commitment and fairness, but within an appropriate understanding of the power regime that is at work (Cox, 2004).

Various models have been put forward to encapsulate the differing nature of relationships along the supply chain. Kraljic (1983) proposed a basic procurement strategy model. This was developed purely from the perspective of the focal company, and in response to its view of supply risk and business profitability impact. In his 1983 paper "Purchasing must become Supply Management", Peter Kraljic proposed a mixed portfolio approach to supplier management based on an assessment of the relative strength of the buying company vis-a-vis its suppliers' strength. In doing so he exhibits a conceptual approach drawing from key economic theories such as Transaction Cost Economics, the Resource-based View of the Firm and Resource Dependency Theory. These are used to justify the procurement strategy model and develop the purchasing portfolio matrix showing three potential approaches for companies to manage supply (exploit; balance; diversify) in relation to the increasing power of a supplier. The perspective adopted within this model is very much that suppliers are competing vendors to be exploited or played off against each other to the benefit of the purchasing company. There is only a sense of developing partnerships or collaborative approaches with suppliers if it brings an opportunity to capitalise on shared resources. Although the focus is relentlessly on the profit motive of the buying company, Kraljic does introduce the sense of value being placed in long term relationships with suppliers, though this is not at the expense of sacrificing any short-term opportunities for competitive advantage that may become available.

Lamming (1993) evolved the thinking towards a joint customer-supplier relationship approach where the complexity of the purchasing approach (either one-off tactical decisions or cumulative strategic decisions) was related to the duration of the supplier relationship. Partnership was set out as the desired approach, but only where a long-term strategic approach was pursued by the focal company. In devising this lean supply management approach, Lamming shows a clear debt to ideas drawn from the key theoretical fields of Agency Theory and Inter Organizational Relations Theory, whilst progressing a step on from a foundation based on Transaction Cost Economics and the Resource-based View perspectives. He brackets these latter approaches under the term "collaborative theories", but goes on to explain their weaknesses in relation to, specifically, the automotive industries, and how these weaknesses open the way for new approaches incorporating the added perspectives of lean supply chain management as opposed to more limited collaborative approaches.

A model for the evolution of relationships from power-based, arms-length, contractual arrangements to trust-based partnerships is provided by the Keiretsu Supplier-Partnering Model (Liker & Choi, 2004). This concept involves a close-knit network of suppliers that learn, improve and prosper alongside the focal company. This is a direct challenge

to the obligation and power based approaches of Kraljic and Lamming, wherein relationships were operated at arm's length for the intrinsic benefit of the buying firm. It marks a shift towards achieving mutual benefit through collaboration and co-operation, drawing heavily on theoretical approaches like Institutional Theory and Integrated Supply Chain Management. In such an approach, it is the balance between trust (relationship) and power (contract) that characterises relations at work in a supply chain. The greater the degree of trust, allied with the longevity of the contractual relationship, the greater the scope for both supplier and purchaser to jointly achieve their sustainability objectives.

Supplier Relationship Management is a tool that will help in delivery against multiple objectives within the sustainability context, but is especially critical in the areas requiring influence over activities outside the direct control of the focal company (Ashby et al, 2012; Hajmohammad et al, 2013; Seuring & Gold, 2013). This is particularly, though not exclusively, the case in the area of Carbon Management, where cutting the GHG emissions associated with a supply chain requires change in the practices of far-reaching suppliers (Tier 2 and beyond), sometimes even outwith the contractual arrangement that exists between focal company and Tier 1 suppliers. This adds a degree of complexity to supply chain relationships, especially where the degree of emphasis placed on differing sustainability objectives may vary between focal company and suppliers across the tiers of the network. This may involve delicate manoeuvres where it is clear that achievement against one sustainability objective compromises others.

The evolution of Supplier Relationship Management, as outlined above in relation to the three models discussed, could be said to show the gradual incorporation of theoretical approaches towards Supply Chain Management in an ever evolving approach away from a short-term and purely contractual transaction-based approach towards a longer-term and relationally-based approach. This is the working hypothesis behind the research study. There is mileage in developing the theoretical perspectives within this, to avoid the common criticism of many operations research papers, i.e. that they are "theory lite". However, for the purposes of retaining the focus of this paper that theoretical development work is better described elsewhere. Instead, the application of this working hypothesis is confined to testing whether such a hypothesis may adequately describe the evolution of Supply Chain Management approaches via an empirical study of corporate literature for the UK supermarket sector. This may signal if such a change in approach is in evidence, at least in embryonic form.

3. Materials and Methods

The focus of this research is Carbon Management in food supply chains, and specifically, the corporate practices of UK supermarkets around supplier engagement towards the goal of carbon reduction. So the unit of analysis is the individual reporting supermarket and its food supply chains. In order to take in a broad sweep of supplier engagement and carbon reduction activity, the Sustainability Reports and Corporate Social Responsibility (CSR) reports of the main operators in this sector were examined for the most recent three year period where every company had published a report. This was in order to compare like for like across the same period. The UK supermarkets selected for potential analysis were the top 9 of those classified as supermarkets, due to the share of their business that is food retailing and with a national sales and distribution

network, as listed in the UK Grocery Market Share report for 2013 by Kantar Worldpanel, one of the world's leading consumer knowledge consultants: Tesco; Asda; Sainsbury's; Morrisons; The Co-Operative; Waitrose; Aldi; Lidl and Iceland.

Of those 9 supermarkets, 3 of them (Aldi, Lidl, and Iceland) do not publish CSR Reports or Sustainability Reports. They are, therefore, excluded from the analysis by default. All available reports for the 6 supermarkets that do publish, and which were available for the most recent three years of reporting (2012-14), were examined. It was not possible to extend this period of analysis to the current reporting year of 2015, as not all 6 supermarkets have published to date, and two (The Co-Operative and Waitrose's parent company, John Lewis Partnership) will no longer publish standalone CSR/Sustainability Reports, using other mechanisms to reach stakeholders, such as an interactive website.

The use of corporate literature in academic research is emerging as a valid field within which to explore Supply Chain Management perspectives (Seuring & Gold, 2013; Tate et al, 2011). Nevertheless, its use comes with a recognised set of limitations around potential bias and the knowledge that it is aimed at particular audiences of investors and stakeholders (Milne & Adler, 1999; Unerman, 2000). Methodological literature regarding qualitative data analysis techniques within the Supply Chain Management or corporate reporting fields is also increasing in terms of the number of papers published in recent years (Fabbe-Costas et al, 2011; Humphreys & Brown, 2008; Kovacs, 2008; Spence & Bourlakis, 2009; Tate et al, 2010; Wu, 2008). Within this area, thematic analysis is one of the key methods being employed within the range of qualitative methods utilised.

One particular paper (Tate et al, 2010), whilst employing a different software program than the one used in this paper, and having a more delimited set of sources (i.e. Corporate Social Responsibility reports only), provides a helpful framework of steps to follow when seeking to apply thematic analysis to corporate documents:

Steps

Step 1. Select the organisations (i.e. the unit(s) of analysis) under examination according to the rationale of the study;

Step 2. Carry out preliminary content analysis - through careful reading to categorise material and analyse for patterns, to identify valid inferences about the text/author/audience and understand the focus of the document(s);

Step 3. Conduct computer-assisted qualitative data analysis using chosen software;

Step 4. Carry out textual analysis - of results to select most influential codes appropriate to focus and intent of research;

Step 5. Develop themes - employing coherent groups of words and using "latent coding" (i.e. the researcher looks for underlying implicit meanings)

In accordance with Step 2, comparative content analysis of selected corporate disclosures is used in this paper to compare policies and targets with actions and achievements. Content analysis is an established method in its own right in social sciences for exploring the content of communication. Its use in the field of social and

environmental disclosures is more recent and its reliability has been given qualified approval (Milne & Adler, 1999; Unerman, 2000). Thematic analysis is then applied to the same set of corporate publications employing the functionality of Nvivo 10 qualitative data analysis software. In this thematic analysis approach 'codes' are selected from which patterns may be identified and further exploration of the secondary data achieved. Codes are usually single words or simple, short phrases. This is a selective process on the part of the researcher, though it does bring in an element of inductive research where patterns not originally perceived by the researcher in the content analysis stage can emerge from the data through this additional layer of scrutiny.

The researcher must begin by choosing codes as a means of analysis. According to Braun and Clarke (2006) codes can be selected for any amongst a number of reasons (frequency; uniqueness; emphasis; intrinsic to the research questions; key event or crisis-related). Once codes are selected, the Nvivo software can then analyse the text in a short turnaround time. Patterns are detected, such that these codes can then develop into longer statements or phrases, known as 'themes'. So, for example, in the context of Supply Chain Management, "supplier" could be a code, and "the importance of Supplier Engagement Programmes and collaboration to sustainable supply chain management" could be a theme that arises out of that analysing patterns of text associated with that code.

The approach adopted by Tate et al (2010) does seem to downplay the role of the researcher at the expense of the machine, depersonalising this through the use of the term "latent coding", as if the role of the researcher in the latter stages of analysis is purely inductive in spotting what is already in the source material. This contrasts with the more deductive methodological perspective offered by Braun & Clarke (2006). This research study looks to build on the strengths of both approaches by combining them into one. Such a hybrid of a simultaneously inductive and deductive approach has been advocated in other fields (e.g. in Fereday & Muir-Cochrane 2008 for the nursing sector), and looks transferable to the Supply Chain Management context. By using this hybrid approach the facilitation offered by Computer-Assisted Qualitative Data Analysis Software (CAQDAS) in aiding the process of analysis is fully exploited, but the primacy of the human researcher is maintained.

4. Data Analysis and Results

The sequential framework of five steps devised by Tate et al (2010) for their approach to thematic analysis is used below to provide sub-section headings under which the specific approach to and findings from the secondary data analysis are presented:

4.1 Step 1 - Selection of Organisations

Available reports from the following 6 UK supermarkets were analysed (Tesco; Asda; Sainsbury's; Morrisons; The Co-Operative; Waitrose). Table 1 details the documents selected. Interestingly, those supermarkets at the low cost/discount end of the spectrum (Aldi, Lidl and Iceland) do not currently produce Sustainability or Corporate Social Responsibility (CSR) reports, stopping short at the level of publishing policy and their "story" via their websites. This lack of reporting effectively self-excluded them from the analysis.

Insert Table 1 here.

To set the analysis within a wider context on Sustainable Supply Chain Management activity, the latest report of a key body working in the area of voluntary disclosures has also used as a benchmark for corporate practices around supplier engagement. The Carbon Disclosure Project (CDP) is the organisation which represents the largest number of voluntary corporate disclosures made in the area of climate change. Each year CDP send out over 7000 survey questionnaires on climate change to large corporations. The return rate in 2014 was 58%. Of these disclosing companies, 2,868 supply information about their supply chains, together representing 14% of global industrial emissions. These are used to inform CDP's Global Supply Chain (GSC) programme of reporting and activity. So, for an indication of the potential that collaboration within supply chains has for carbon reduction the content of the latest report on CDP's GSC Program has also been analysed. The report is tellingly subtitled "Collaborative action on Climate Change".

Within the UK supermarket sector, alongside the analysis of Sustainability/CSR reports for the 6 that do report, the focus of this research has particularly homed in on Supplier Engagement Programmes (SEP's) specifically designed to help cut Greenhouse Gas (GHG) emissions within the supply chain and, thereby, assist the focal company. There are two supermarkets that currently run such SEP's: Tesco with its Knowledge Hub; and Asda with its Sustain and Save Exchange. Of these organisations Tesco provides disclosures to CDP making it a valid basis for comparison of its returns to CDP and its independent publications. Despite the fact that its parent company, Wal-Mart, is a GSC Lead Member with CDP, it is important to note that neither Asda, nor Wal-Mart provide a disclosure to CDP about UK activities. So, for Tesco this paper has looked at key passages in its CDP Disclosure on supplier engagement, whereas for Asda a wider range of Sustainability and Carbon publications has been examined (Sustainability Strategy 2.0 from 2010, and three publications from 2013: Sustainability Policy and Targets to 2015, Sustainability Story, Carbon Footprint), that together form a fuller picture of its SEP activity.

4.2 Step 2 - Content Analysis

4.2.1 Key Messages & Corporate Policies

The CDP Global Supply Chain Report is the sixth annual report of its type. It is therefore a mature publication which confidently draws conclusions about Supply Chain Management trends and makes declarative statements about patterns in corporate praxis. It was reviewed via content analysis using keyword occurrence and the selection of passages based on emphasis afforded by the authors. Amongst the statements given most emphasis are:

- Consumers are becoming more receptive to low-carbon products and services but regulatory uncertainty is making companies cautious about investing in emissions reductions and supply chain sustainability
- Collaboration is key to supply chain sustainability

- Companies must take a wider view of supply chain sustainability, since carbon is linked to other sustainability issues like water and resource scarcity
- Alongside the benefits from reducing emissions, Companies and their suppliers can increase revenues, improve brand status, lower costs and reduce risks
- Companies and their suppliers need to understand opportunities where emission reduction investments are most effective, where there is scope for collaboration and how to motivate suppliers towards better performance

It is, therefore, instructive to examine whether these high level messages are reflected in the corporate pronouncements of the UK supermarkets selected. Annual director's reports remain focussed on financial performance, though this is expected to change once mandatory carbon reporting comes into effect at the end of the current financial year. So, for an indication of the corporate strategy at work in the area of climate change, the high level disclosures in the form of CSR reports are considered the better place to start. A broad analysis of these documents will, therefore, provide an indication of the emphasis placed therein on climate change and Sustainable Supply Chain Management respectively, before delving down into the specific publications around Carbon Management and GHG reduction activities.

4.2.2 Corporate Targets

CDP state that setting targets is the key to making progress on carbon reduction. Once a target is set it will drive the setting up and running of monitoring and performance systems. However, CDP find that only 34% of companies have both absolute and intensity targets, along with only 7% of suppliers (CDP, 2014). The pattern of target setting varies across the UK supermarkets studied. Both Tesco and Asda have demanding overall corporate targets: Tesco to be a carbon neutral business by 2050 and Asda to contribute to Walmart's global target to eliminate 20 million metric tonnes of embedded carbon by 2015 (for comparison, the UK operation of Asda annually produced 1.09 million metric tonnes in the latest year of reporting, 2012). The scale of the challenge is illustrated by the fact that Tesco's total carbon footprint increased in 2013 due to continuing growth globally and is projected to be 33% higher by 2020, whilst Asda's rose due to growth via the acquisition of 150 stores from Netto. Interestingly, Tesco do not set an absolute target for carbon reduction in the medium term, preferring instead to set intensity targets (e.g. carbon dioxide emissions in tonnes per square foot of store space). This may be a way of hiding an overall increase in carbon emissions in the short-term as a result of continuing expansion and change of marketing strategy towards more convenience outlets and home deliveries, with the attendant increase in transportation emissions.

Of the others, Sainsbury's set a target of 30% reduction by 2020 against a 2005 baseline, Morrisons 30% by 2030 against a 2005 baseline, The Co-operative 50% by 2020 against a 2006 baseline and Waitrose 15% by 2020 against a 2010 baseline. In respect of supply chain activity, Tesco have set a target to reduce the carbon emissions of products by 30% by 2020, without being specific as to which sectors may be targeted. Asda do not set a target for carbon reduction, preferring to target all suppliers being on the Sustainable Products Index by 2016, a precursor to identifying savings or redesign opportunities. Sainsbury's set a target of 50% for its supply chain activity, whilst Morrisons, The Co-operative and Waitrose do not set targets at all. CDP stress the importance of not only absolute but also intensity targets to drive reductions at key

stress points with internal operations and supply chains. Tesco and Asda have reported a variety of intensity targets. Key amongst these are: (Asda) Distribution - Carbon emissions per case; (Tesco) Stores/Depots – Scope 1+2+3 emissions per square foot (metric tonnes of carbon dioxide equivalent (CO2e)); Distribution – Scope 1+3 Emissions per case.

4.2.3 Carbon Reduction Activities and Achievements

The CDP makes sobering reading, in that, whilst 72% of companies identify climate change as a current or future risk and 56% identify opportunities for supply chain collaboration, the majority of sectors report a fall in investment in carbon reduction, with a focus on shorter payback periods as well. However, for the first time, companies have reported emission reduction projects implemented following supply chain engagement, i.e. over 400 initiatives reported with 2.3 million metric tonnes of CO2e savings attached. Encouragingly, a total of 427 initiatives were reported by CDP, yielding a saving of 2.3 million metric tonnes of CO2e, with a further 2,186 collaborative opportunities identified but not yet implemented. In terms of reported emissions cuts by UK supermarkets, Tesco do not report a figure (having no target) but do admit emissions are rising due to its growth model, Asda claims a 16% reduction for its UK activities against a 2007 baseline, Sainsbury's report an 8% reduction up to 2012, Morrisons 24% by 2013, The Co-operative 45% by 2012, whilst Waitrose disclose an increase in absolute emissions of 6% up to 2014. This leads to the admission that absolute emissions reduction is incompatible with its continuing expansion strategy and that it requires a period of corporate reflection to decide how to handle this discrepancy between principle and action. Tesco and Asda, along with the 4 others, are not yet able to report on carbon reduction progress as a result of supply chain activity, but this is understandable, as their SEP's have only launched in 2012 and 2013 respectively.

4.2.4 Supply Chain Management activity and Supplier Engagement Programmes

CDP propagate the message that it is vital for organisations to address carbon reductions within their supply chains, since that is where the majority of savings are possible. Equally it acknowledges that it is also where it is hardest to achieve, given that control of operational processes lies outside the reporting companies' control. Worryingly, it reports that the gap between company and supplier performance is growing, suggesting a dearth of both knowledge and incentives. CDP identify three key steps towards incentivising supply chain transformation: preferential treatment for suppliers (i.e. a greater share of business) depending on sustainability scorecard results; collaborative identification of risks; reaching agreement on the most effective collaborative actions.

When it comes to explaining how their work on their supply chain will contribute to GHG reductions, Tesco and Asda are good at outlining activities which it is claimed will make emission savings. For example, Asda is mapping its fresh food supply chain with the assistance of Price Waterhouse Coopers accountants, and have set a target for all fresh, chilled and frozen suppliers to be actively using the Sustain and Save Exchange. The "Resource Saver" benchmarking tool is already claimed to have helped 700 suppliers identify £1.1. million in potential savings. Tesco have carried out Supplier Carbon Reduction Planning with more than 400 UK dairy farms and is continuing its Carbon Footprinting of products to identify supply chain hotspots. Sainsbury's have

2,500 suppliers in Farmer Development Groups and using Supplier Sustainability Scorecards, claiming to have realised 70,500 tonnes of CO2 savings to date. Elsewhere the scope of supplier engagement is partial or patchy: The Co-Operative report 220 farms involved in its Dairy Group, each undertaking annual carbon assessments and taking actions on green electricity and energy efficiency surveys; Morrisons have Dairy Producer Groups but without a focus on CM; and Waitrose publicises its Farming Partnership but report no group activity.

Despite the range and depth of their SEP activity, less impressive is the fact that neither Tesco nor Asda are able to report on significant carbon reduction impacts as yet. Asda do report that it has completed life cycle assessments for milk, potatoes chicken and egg products that should yield a reduction, but it is too early to measure impact as yet. Likewise, Tesco report working on a web-based "Footprinter" carbon measurement system which will measure the life-cycle carbon footprint of all 70,000 products sold in the UK and suggest areas for greatest impact. So the signs are present that the groundwork is being done against which future progress can be measured and targets tested.

4.3 Step 3 - Computer-Assisted Qualitative Data Analysis

The six companies' corporate reports previously listed in Table 1 were subjected to analysis using computer-assisted techniques using NVivo 10 software. To show the broad scope of terminology used word clouds (based on the frequency of keyword instances) were produced for the CDP Supply Chain report as well as all the Sustainability and CSR reports. Word clouds are a relatively recent way of visualising documents to aid readers in making decisions about relevance and emphasis (Gottron, 2009). They can help readers to take an overview of the content of a document quickly, but they are only a sweeping take on emphasis and repetition of key terms, and so further comparative analysis is required for proper understanding (Wu et al, 2011). The word cloud for the CDP report and the collective word cloud for the 6 supermarket Sustainability/CSR reports are shown in Figures 2 and 3 for the sake of illustrative comparison. Word clouds are useful to show the broad field of terminology, from which key terms relevant to the research can be identified. Relevance is reflected in the relative centrality or peripherality of key words like suppliers, supply, chain, sustainability, carbon, reduction, emissions, in the respective word clouds.

Insert Figure 2 and Figure 3 here.

It is important, however, to examine whether this apparent difference in thematic frequency is borne out in terms of emphasis and interpretation through the use of further thematic analysis. For example, key terms can be isolated in respect of the reports from which they are drawn and some form of collective pattern can begin to be discerned. For example, Figure 4 shows which key terms in relation to Supplier Relationship Management occur within which of the Top 6 reports. It must also be emphasised that the computer-assisted analysis is not a substitute for the researcher's active choices of terms that are significant for the avenues of enquiry relevant to addressing the research questions. This has also been termed the discovery of latent coding (Tate et al, 2010), suggesting a more inductive but still selective approach to analysis.

Insert Figure 4 here.

4.4 Step 4 - Textual Analysis

The process of coding is about recognizing a term as important in the context of the source material, theoretical framework and research questions, then capturing it as a code, before using it in turn as part of the further deep interpretation of the source text. In this way a code is a qualitative reflection of the essential flavour of the phenomena being investigated (in this case Sustainable Supply Chain Management, Carbon Management and Supplier Relationship Management). In line with the methodology outlined at the start of this section above, and through a combination of Nvivo functionality (particularly relational analysis) and latent coding deduction carried out by the primary researcher, the 'machine' and 'human' elements of the selection and analysis are considered to give rise to the significant codes, known collectively as a codebook, shown in Table 2.

Insert Table 2 here.

These were a precursor to further analysis of the source documents. By coding the source documents in this manner, the data is organized according to categories that in turn can be fleshed out further in the form of themes. A theme has been described as a pattern in the data that both describes and organises the possible observations about a phenomena, but more deeply aids the interpretation of key facets of the phenomena (Boyatzis, 1998, Fereday & Muir-Cochrane 2006).

4.5 Step 5 - Theme Development

Thematic analysis is described as a search for themes that emerge as being important for the accurate description of a phenomenon (Daly et al, 1997, Fereday & Muir-Cochrane 2006). The process is essentially to read and re-read the data such that patterns begin to be recognised, and emphasis and significance can be judged. In this way the themes that emerge become in turn categories for further analysis. So, through further reflection on these codes in tandem with repeat comparison and relational analysis across the whole text of the relevant source documents, the key themes shown in Table 3 have been identified, together with the related sub-themes or issues that flow from them. The usefulness of themes in this research study does not just confine itself to the analysis of the source documents, but they can also be a stepping stone to further primary research in the form of framing potential interview or survey questions. They also enable a reverse check on the formulation of the research questions and a clarification of the theoretical framework being applied to the phenomena under investigation (Kvale, 2008).

Insert Table 3 here.

5. Discussion

5.1 Key issues arising from secondary data analysis

As result of the content analysis, reinforced by the thematic analysis described above, a number of key issues were identified:

5.1.1 The issue of where control over supply chain emissions falls

A key issue is that as much as 75-90% of a product's carbon footprint may be as a result of supply chain activity beyond a reporting company's direct control (Scope III emissions). This is not only commonly stated amongst consultancy firms working in the area of Carbon Management (CM) but also in some academic literature (e.g. Downie & Stubbs, 2013). Tesco itself says 85% of its products carbon footprint occurs in the supply chain, with Asda claiming a less discrete 90% of a product's "environmental impact" lies in the supply chain. So, despite mandatory carbon reporting of direct emissions (so called Scope I and II) there is no current legal obligation to report on Scope III, let alone to enforce changes in supplier behaviour towards carbon reduction ends. However, it is anticipated by some companies that the former may become a requirement in the near future. Some companies are therefore setting up SEP's now in order to be prepared, notably Tesco and Asda in the UK supermarket sector. At present the supermarket sector is ranked by CM consultants as being at the forefront amongst UK companies of implementing such SEP's. This is partly put down to the higher public profile they hold as Business-to-Consumer (B2C) firms and partly put down to the high level of competition within the sector.

5.1.2 The need for analysis of supply chain hotspots to target emissions reduction efforts

The Carbon Disclosure Project (CDP) are adamant that proper analysis of supply chain data is required to identify hotspots where investments will be most effective in terms of emissions reduction and return on capital. However, 38% of responders report no documented process for assessing and managing climate-related risks. CDP used the Supply Chain report to announce the launch of its own Action Exchange Initiative – where 6 large corporate members are to work with suppliers and service providers to identify and implement emission reduction opportunities. The technique adopted is Emissions Allocation Analysis, which simply identifies which tier in the supply chain for a product contributes most to Scope 3 emissions. Suppliers are then allocated scores according to propensity to act and business benefits arising. The relationship between these scoring categories, and the typology of suppliers they give rise to, are illustrated in a matrix in Figure 5. The CDP report contains no ranking of specific organisations, but the implications for this research are to test whether Asda and Tesco could be said to fall into the category of "Leaders" based on their corporate disclosures. This would be an indicator that these companies believe that Sustainable Supply Chain Management, and particularly Supplier Relationship Management, can potentially have a key role to play in meeting their Greenhouse Gas (GHG) emission reduction targets as part of improved operational performance (Ashby et al, 2012; Hajmohammad et al, 2013; Seuring & Gold, 2013).

Insert Figure 5 here.

5.1.3 Signs of organisational change as a result

Some of the literature (Boer et al, 2005; Ivens et al, 2013; Spekman et al, 1998) says that evidence of collaborative activity itself is a sign of focal company change, however a truer test is whether the competitive advantage achieved is also shared (Leppelt et al, 2013; Wagner, 2011). Asda make a proud claim to be the first company to allow

suppliers to retain the financial benefit arising from any emissions reduction savings, presumably meaning that the price paid for the product does not track downwards as savings are made. This should mean that suppliers can increase their margin against cost reduction. This also means that the claims Asda makes about passing on the benefits to customers via lower prices must be coming from the savings it is making directly in relation to its own Scope 1+2 emissions. Tesco do not make a similar claim. However, it does emphasise its aim to build strong, long-term relationships with its suppliers. Tesco sources regular feedback from suppliers and the results of its annual survey of suppliers forms one of the Groups' key performance indicators, that of suppliers' satisfaction with their relationship with Tesco. So, at least there is recognition of the desire to sustain reciprocal relationships and to help suppliers identify cost savings, though the impact of this on the bargaining situation is not spelled out.

5.2 Theoretical and Conceptual Contribution

This research study is conducted within a theoretical context that acknowledges a range of influences on the behaviour of firms. In exploring the impact of Supplier Relationship Management on Sustainable Supply Chain Management, and in particular CM as an evolving business practice, it could be put forward that understanding the dynamics of those relationships is key. In particular, through exploring whether relationships between supply chain participants are characterised by the exercise of a balance of power, and also to what extent elements like trust and co-operation are pre-requisites for effective sustainability practices and carbon reduction.

Within the Integrated Supply Chain Management field, Stevens (1989), and then via a further adaptation, Hewitt (1994) together put forward an Integration Model of a firm's transformation from an inward looking, production-orientated approach to outward looking, customer-orientated approach with the associated shift of relationships between firms in the supply chain from an adversarial attitude to one of mutual support and co-operation. This paper represents the first stage in being able to test the applicability of the evolutionary approach represented by this Model in the fields of CM and Sustainable Supply Chain Management, with the aim of suggesting necessary adaptations or improvements. Through this process it has been possible to state that there are signs of an evolution of business strategy (a shift from contractual to relational) in the UK supermarket sector, and of firms moving from a predominantly economic outlook to one where social and environmental factors are incorporated in their business case for action on sustainability, and in particular, carbon management.

The other core theoretical/conceptual contribution achieved in this study has been to extend the analysis of Corporate Social Responsibility (CSR) Reports and Sustainability Reports specifically to the dimension of CM, and further, of CM within the precise context of food supply chains. This is an important stage in furthering the research of the ethical and environmental aspects of supply chains advocated in Pullman et al (2009) as an important corollary to the theory building approach at work in this article and other core texts (Carter & Rogers, 2008; Seuring & Muller, 2008). To do this in the context of food supply chains is also a novel area, with only a few relatively recent equivalent studies in publication (e.g. Beske et al, 2014)

5.3 Managerial Implications

Managerial implications flowing from this revolve around: the issues of power and influence exercised by focal/customer companies over Tier 2 suppliers and beyond, which may be external to any contractual relationship; and for the UK supermarket sector in particular, how benefits arising from increased resource efficiencies and better public relations can be shared along the supply chain (for example, preferential selection processes or lower tendering costs for complaint suppliers, as well allowing suppliers to retain any financial benefits accruing from resource savings).

There is consensus within the Carbon Management (CM) consultancy field, backed up by some of the academic literature that Supplier Relationship Management is a key tool in achieving emissions reductions, given the large proportion of a product's footprint that is usually outside focal company control. If UK supermarkets can show how corporate practice can evolve to achieve both resource efficiency and competitive advantage, whilst sharing the benefits up and down the supply chain, it would establish a business case for enhanced supplier engagement and networking, and so could encourage companies in others sectors to implement similar programmes.

5.4 Limitations and Future Research

The key limitations of this paper centre on the fact that the empirical research carried out to date is confined to the analysis of the corporate disclosures of a single retail sector by one primary researcher. A wider study, looking at multiple sectors, or deeper, looking at disclosures from other actors within the same supply chains (i.e. large food processing companies), would be beneficial to the robustness of the findings. Similarly, the use of multiple coders, whilst introducing the issue of inter-coder reliability, would also employ a measure of triangulation of perspectives, thus enhancing the robustness of the coding and consequent thematic development. The other key issue with regard to the extrapolation of findings is that this research is based on a purposive sample, focussing on the six supermarkets in the UK who report on CSR/Sustainability and put information about their supplier engagement into the public domain, and excluding not only the three that do not (Aldi, Lidl and Iceland) but also other major food retailers who are not classified as supermarkets but who have highly developed Sustainable Supply Chain Management practices (e.g. Marks and Spencer). Extending the secondary data analysis beyond the UK supermarket sector to other exemplars from the Business-to-Consumer or Business-to-Business sectors would be of added benefit and further underpin the validity of any findings.

There are acknowledged reliability and validity issues with using corporate reports as a source of information, as these will be written to present a perspective on an organisation that is normatively positive in outlook. So, any negative messages will usually be repressed. This has been overcome to some extent by viewing the analysis in the light of a report from an organisation (the Carbon Disclosure Project) which acts as a critical friend to business and rates corporate disclosures against its own benchmarking system. The wider research study (of which this paper reports only the first stage) is also structured as a two-phase, sequential approach. So, after the initial secondary data analysis stage, there will be an examination (by means of case studies based on qualitative, semi-structured interviews) of the impact of Sustainable Supply Chain Management and Supplier Relationship Management practices on the Carbon Management measures that are reported on within these disclosures.

6. Conclusions

UK supermarkets have been criticised for many years for operating supply chain relationships based solely on short-term competitive advantage. If there truly is recognition that supply chain efficiencies are best achieved via long-term relationships and close engagement with suppliers, that can be a stepping stone away from a purely transactional approach to the conduct of contractual relationships and towards a relational basis hallmarked by mutual trust and reliance (Boer et al, 2005; Leppelt et al, 2013; Prajogo et al, 2012). If resource efficiencies can be achieved via this route, not only reducing carbon emissions but also making savings financially, then it is possible the resulting benefits will flow out not only to suppliers, but also to consumers and society at large.

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Tables

Table 1: Supermarket Corporate Reports Analysed (Companies ordered by turnover)

SUPERMARKET **(plus the reporting Parent Company as applicable)**	**REPORT TITLE** **AND YEAR OF PUBLICATION**
Tesco	1. Corporate Responsibility Review 2012 2. Tesco and Society Report 2013 3. Tesco and Society Report 2014
Asda (Wal-Mart)	4. Global Responsibility Report 2012 5. Global Responsibility Report 2013 6. Global Responsibility Report 2014
Sainsbury's	7. 20X20 Sustainability Plan – 2014 Update 8. 20X20 Sustainability Plan 2013 9. 20X20 Sustainability Plan – 2012 Update
Morrisons	10. Corporate Responsibility Review 2011/12 11. Corporate Responsibility Review 2012/13 12. Corporate Responsibility Review 2013/14
The Co-operative	13. Sustainability Report 2012 14. Sustainability Report 2013 15. Values and Ethics Report 2014
Waitrose (John Lewis Partnership)	16. Sustainability Report 2012 17. Sustainability Report 2013 18. Sustainability Review 2014

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Table 2: Significant Codes

PROCUREMENT: SUPPLY CHAIN; NETWORK; SOURCING; SUPPLY MANAGEMENT; PURCHASING; PROGRAMME.
ACTORS: COMPANIES; SUPPLIERS; CUSTOMERS; MOTIVES; OBJECTIVES; BEHAVIOUR; ATTITUDES.
SRM: RESPONSIBILITY; RELATIONSHIP; PARTNERSHIP; PARTICIPANTS; EXCHANGE; ENGAGEMENT; COLLABORATION.
CORPORATE PRACTICE: RISK; OPPORTUNITIES; INVESTMENT; COSTS; MARGINS; MONETARY SAVINGS.
SUSTAINABILITY: GROWTH; LIMITS; RESOURCE EFFICIENCY; CORPORATE SOCIAL RESPONSIBILITY; GLOBAL; LOCAL
CARBON MANAGEMENT: EMISSIONS; STRATEGY; TARGETS; MEASURES; CARBON REDUCTION; ENERGY EFFICIENCY.

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Table 3: Key Themes and Sub-themes

KEY THEMES	SUB-THEMES OR ISSUES
T1 Supplier Engagement Programmes (SEP's)	T1A Nature of SEP (Who/What/How) T1B CM-specific Rationale T1C SEP "Fit" to Corporate Practice
T2 Carbon Reduction Strategies & Measures	T2A Internal GHG Reductions T2B Resource Efficiency as Driver T2C Business Case for action
T3 Carbon Reduction Impacts	T3A GHG Reduction Achievements T3B Wider Business Benefits T3C "Fit" with Business Growth Imperative
T4 Limits & Limitations on Carbon Reduction	T4A Targets T4B Ceiling on GHG Reduction Potential T4C Operational Compromises
T5 Buyer-Supplier Relationship Interactions	T5A Contractual Obligations T5B Voluntary SEP Participation Level T5C Variance by Product Sourcing (Global/Local)
T6 Motivations of Supply Chain Actors	T6A B2B - B2C Differences T6B Other Pressures/Drivers T6C Ethos/Principles
T7 Supply Chain Network Complexity	T7A Impact of Intermediaries ($1^{st}/2^{nd}$ Tier) T7B Influence of Focal Position
T8 Impact of SEP on Relationships	T8A Multiple Faces of Customer T8B Exclusivity of Contract
T9 Balance of Power in Relationships	T9A Knowledge of Costs and Margins T9B Destination of Savings T9C Long-term Outworking

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Figures

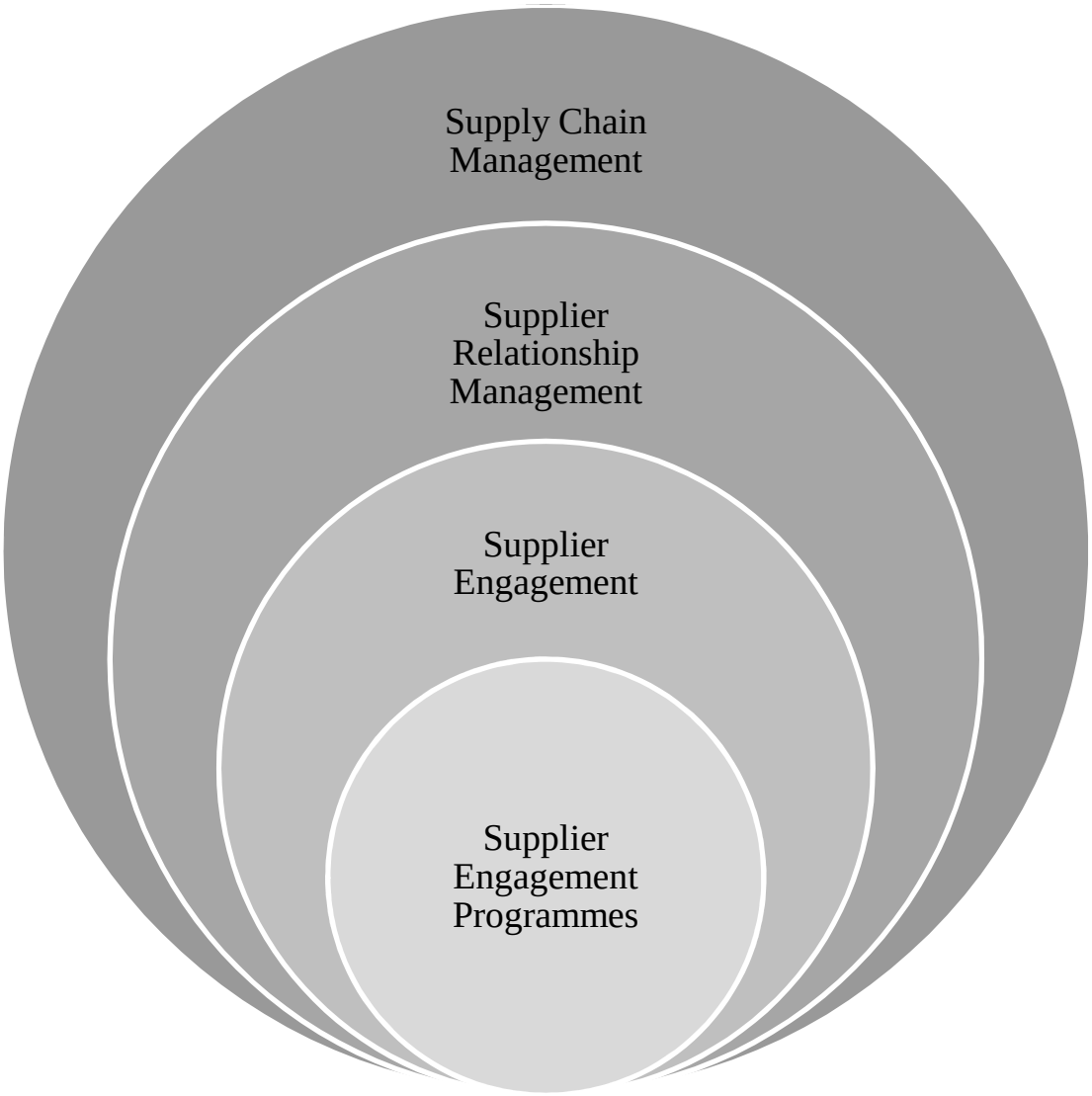

Figure 1: Supplier Relationship Management: Hierarchy of Concepts

Figure 2: Word Cloud for CDP Supply Chain report 2014

Figure 3: Word Cloud – Top 6 UK Supermarkets' CSR Reports

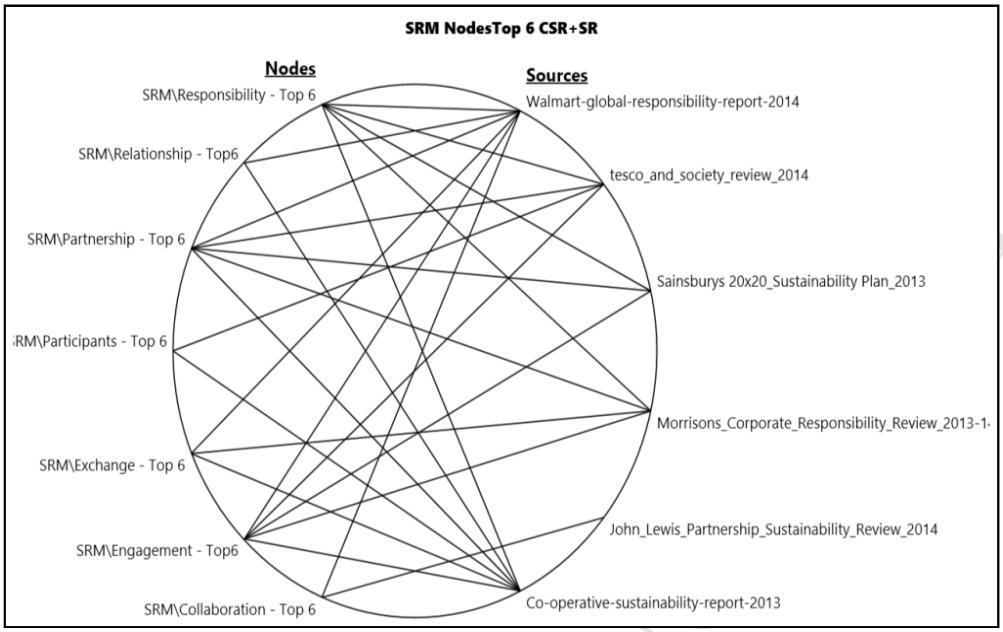

Figure 4: Supplier Relationship Management-related nodes mapped against sources

<<< Business Benefits <<<	**MATERIALISTS** *Earlier investors but efforts trailing off. Need remotivating.*	**LEADERS** *Ongoing investment and benefits*
	Reporting emissions but not targeting opportunities or investing **LAGGARDS**	*Ongoing investment but few benefits arising. Need to target efforts correctly* **CONTENDERS**
	>>> Propensity to Act >>>	

Figure 5: Matrix based on CDP's classification of companies' attitudes towards investment in Greenhouse Gas emissions reduction

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Highlights

- Food supply chains contribute significantly to Greenhouse Gas emissions
- 75-90% of a food product's carbon footprint occurs upstream of the point of sale
- Mandatory corporate carbon reporting in UK is changing Carbon Management practices
- UK supermarkets seek to influence suppliers via Supplier Engagement Programmes
- Signs of a shift from transactional to relational dealings by some UK supermarkets

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