

Sustainability practices and indicators in food retail logistics: Findings from an exploratory study

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Abstract

The aim of this paper is to provide an overview and an analysis of the recent developments and changes with reference to the implementation of sustainability practices by food retailers. It also aims to explore whether the sustainability measurement criteria and indicators identified in the literature can be applied in practise. A literature review identified the current trends, developments and the proposed sustainability objectives, criteria and indicators. Via case study research, we collected empirical data from four retailers. In particular, data collection involved both qualitative and quantitative data drawn from questionnaires and in-depth interviews with logistics directors from retailers' distribution centres. The empirical data collected from the interviews indicate similarities in some of the characteristics of distribution centres, as well as differences. What is also evident is the difficulty to make cross company comparisons in the lack of benchmarks or in the lack of assessments with regard to the relative importance of each sustainability criterion and indicator. This research has focused only on two sustainability objectives. Further research on other sustainability objectives is required. Lessons learnt from the four case studies can be taken into consideration when developing future sustainability performance rating scales. The paper provides an in-depth analysis of the sustainability in the food chain, with emphasis on food retailing. Its value lies on the fact that it presents an attempt to tests in practice how a number of sustainability objectives, criteria and indicators are applied in logistics related processes, identifying the gaps and reporting the potential difficulties.

Keywords: Sustainability practices, food retailing, distribution centres

Introduction

Concerns about sustainability have been expressed widely in the past. Reverse logistics (Stock, 1992), green purchasing (Green *et al.* 1995), and environmentally conscious manufacturing (Sarkis, 1995) are just some of the concepts that were introduced placing emphasis more on the environmental dimension of sustainability, rather than on the societal and the economical one. Nowadays, sustainability has become a central topic in the business agenda of many companies (Linton *et al.* 2007; Peterson, 2009; Fint and Golicic, 2009). Consumers and governments are sustainability-sensitive forcing companies to add the sustainability dimension in their “*modus operandi*”. Sustainability can also influence shareholders and add value to companies' brands. In comparison to the past decades emphasis is now required to all three dimensions of sustainability, namely economical, environmental and societal.

Sustainability expectations are also on the increase in the food chain (Wognum *et al.* in press). For example, starting from the "ethical trade" movement in the late nineties which aimed at creating financial and social benefits for defined groups of producers (ETI, 1997), we have reached the point where governments and food policy makers increasingly develop strategies for sustainable development and establish frameworks for sustainable consumption and production. The Food Industry Sustainable Strategy (FISS) which was recently presented by the UK Department for Environment, Food and Rural Affairs (DEFRA) aims at improving the food industry's environmental, social and economic performance by encouraging the widespread adoption of best sustainable practises by the industry (DEFRA, 2006).

In the case of food transportation, the goal is to reduce both social and environmental costs of domestic food transport by 20% by 2012. There is no doubt that in the years to come, companies in the food chain will have to incorporate social and environmental objectives, in addition, to economic ones to meet the growing sustainability expectations. The role of food retailers is expected to be critical in the successful implementation of sustainability practices as they play a pivotal role by linking primary production and manufacturing to consumers (Fritz and Schiefer, 2008).

Retailers are only one link in the food supply chain. However, nowadays they are, more than ever before, in the position to control and certainly influence some of the companies, if not all of them in their supply chain (Amato and Amato, 2009). Wal-Mart for example, audited nearly nine thousands of its suppliers' factories in 2006, in an effort to portray itself as an ethical and environmentally-conscious company (Food Navigator, 2007).

The aim of this paper is twofold. Initially, to provide an overview and an analysis of the recent developments and changes with reference to the adoption and implementation of sustainability practices in the context of the food chain. Next, to explore how well the sustainability objectives, criteria and indicators identified in the literature, are applied in practise, and what are the difficulties in the assessment process. This is achieved by providing empirical evidence from the distribution centres of four retailers in Greek food retail sector, which is one of the most important sectors of the Greek economy.

The paper is organized as follows: firstly an investigation of the causes of unsustainability in the food chain and the factors affecting the uptake of sustainability practices is provided. Then the paper continues by analysing the potential role of food retailers towards sustainability adoption and presents a number of available sustainability objectives, criteria, and indicators with reference to food retailing. The literature review is weighted towards countries where retailers are more sustainability sensitive (e.g. UK, US and other North European studies) due to the lack of relevant work to the Greek context. Finally, the paper offers empirical insights on the relevant policy and practices followed by food retailers in Greece, with reference to the sustainability objectives of food distribution and urban distribution. The last section presents final conclusions as well as managerial implications and suggestions for further research.

Sustainability and the food chain

Exploring the causes of unsustainability

Significant questions have been raised concerning the adoption and implementation of sustainability practices in the food chain. On the other hand, four major causes of "unsustainability" can be identified: globalization of the food chain, changes in consumer, consumption and shopping patterns, changes in food delivery patterns and concentration of the food industry.

Currently, food chains are more global than ever and are characterized by increased imports and exports and global sourcing of products (Vorley and Fox, 2004; WTO, 2009). The local production-local consumption model, in most cases, is no longer realistic. For example, 95 per cent of fruit and half of all vegetables consumed in the UK are sourced from abroad (Food Production Daily, 2007). Both the increase in food trade as well as, the current organization of food chains has forced processors and manufacturers to start thinking of "food miles" adding the distance ingredients travel to the growing list of environmental concerns they must take into consideration (Van Passel, 2010).

Changes in consumer requirements and consumption patterns have been also very influential. Consumers demand a wider choice of food products often out of season. Subsequently, locally processed products are complemented by products that are processed at longer distances. Consumer demand for different food products (e.g. more prepared and convenience food, smaller packaging sizes) has changed radically over the last 30 years, driven by increased per capita incomes, demographic shifts, and life-style changes (Hughes, 1994; ACNielsen, 2005; Grunert, 2009).

These changes affect the environmental characteristics of food products, particularly in terms of waste packaging. Consumer behaviour is impacting directly to the environment through the way they transport, store and prepare food, how much waste they generate, and how they dispose of it. Recent figures show that up to 20-30% of food is wasted in households, losing all resource inputs used for its production (CIAA, 2007). Consumers seem to be also driven by moral, ethical, and environmental values (Svensson, 2007, Verhees et al. 2008).

Finally, significant changes occurred in the shopping patterns, where frequent pedestrian shop visits are replaced by weekly shopping by car or even Internet shopping (Ho and Gala, 2005; Bigne et al. 2005; IRI, 2008). The concentration of the food chain, particularly at the retailers' and manufacturers' level, has resulted in an ever increased power imbalance in favour of retailers and food manufacturers creating conditions for unfair trade (Competition Commission, 2000).

Factors affecting the uptake of sustainability practices

It can be argued that two types of forces exist that drive a company towards sustainable practices: internal ones stemming from the firm's internal environment and external ones emanating from the firm's external environment. Figure 1 presents these different forces.

Insert Figure 1- Driving forces of sustainability (Source: the authors)

Four major forces are proposed related to the external environment: market competition conditions, supply chain pressures, government regulation-legislation and special interest groups' pressures. The past few years, *market competition conditions* have changed with regard to sustainability initiatives. Retailers are claiming to be increasingly integrating sustainability into their core business moving away from the old approach of niche green consumerism (Jones et al. 2008; Wagner et al. 2008).

In fact, in many cases, many food retailers seem often to compete on 'green' promises much as they do on price due to changes in consumers' perceptions. For example, studies in the USA and the UK indicate that consumers' buying decision is influenced by the performance of retailers on environmental issues (Crain, 2000; Beverage Daily, 2007). A

recent survey conducted by the Natural Marketing Institute, found that half of U.S. consumers consider at least one sustainability factor in selecting packaged goods (NMI, 2007).

Supply chain pressures refer to the way supply chains are structured. The characteristics of the supply chain seem to be a very important factor too in many different business sectors (Kovacs, 2008). In the food sector the chain “captains” are often requesting from their partners, suppliers or even chain service providers (e.g. distributors, carriers) specific actions towards improving sustainability (O’Keeffe and Fearn, 2002; SDC, 2008). Retailers worldwide are in position to put pressure across the food supply chain and to both stimulate and drive sustainability practices.

However, a recent survey by the Economist Intelligence Unit (EUI) regarding business and sustainability challenges for retailers, revealed that the supply chain is the weakest link and that companies find severe difficulties in extending sustainability policy to suppliers (EUI, 2008). About one-fifth of the companies have only implemented supplier controls in the last five years. *Government regulations-legislation* refers to the steps taken towards better understanding and implementing sustainability goals and objectives for their companies and communities. For example, EU policies the last years are trying to promote the integration of sustainable development with policies that foster the EU’s competitiveness.

Sustainability challenges are now explicitly linked to economic development issues, and every European company has a part to play in promoting the concept of sustainability. However, in many cases, governments do not play a very influential role in the adoption of sustainability practices, but just set a compliance standard, which is frequently seen as the minimum of what business should be doing (Collins *et al.* 2007). As a result, most companies feel little or no pressure. The *special interest groups* also play an influential and sometimes crucial role. For example, twenty-three human rights, labour and environmental groups concluded that Wal-Mart’s sustainability programme lacked “real impact on global warming, employee health and welfare” - even if all the targets were met (Food Production Daily, 2007). It is expected that this criticism could force many retailers to adjust the sustainability initiatives taken. The impact of the pressure by interest groups is further accelerated by the new networked social media environments and the new forms of communications (Langley and van der Broek, 2010). These are exposing companies to a much higher risk of not behaving well as messages spread all over the world in an incredible speed and way.

Internal forces refer to the intrinsic characteristics of an organization. These include company’s perceived recognition that has its share of responsibility on the issue of sustainability, technical and operational capacity to implement such practices, the cost of implementing sustainable practices and the perceived benefit or the relative advantage that a company is expected to gain.

The *perceived recognition* relates to each dimension of sustainability. The past few years, food retailers seem to recognize the importance of their role in undertaking sustainability initiatives. The British Retail Consortium (BRC), for example, has launched in 2001 its “Towards retail sustainability” strategy, stressing that its members were keen to play a full and active part in national and international sustainability initiatives (BRC, 2001). Food retailers have a huge network of suppliers, most of which are SME’s and could impose relevant initiatives or measures to them. This is of significant importance as many companies, particularly SME’s, consider that they have insignificant impact on sustainable development (Ammenberg and Hjeim, 2003; Simpson *et al.* 2004).

Company's capacity refers to its actual ability to realize a technical process or operational improvements often linked to human capital. The *cost of implementation* refers to the changes required moving from less or no sustainable practices to more sustainable ones. In a recent survey by the Economist Intelligence Unit regarding business and sustainability challenges for retailers, it was revealed that as many as 40% of respondents (CEO's and business executives) cited the "risk that sustainable practices will raise costs in comparison to competition" (EIU, 2008). Much of the implementation cost is also related to indirect costs. These may include the costs of collecting information, making and complying to standards, informing consumers, producers, and governments for what these standards mean and providing evidence of achievement (Iles, 2007).

Finally, much of companies' zest for sustainability will be directly dependent on the *relative advantage* that companies expect to acquire in terms of expected benefits. Expected benefits could be direct or indirect. For example, Safeway, the US retailer, announced its plans to convert its truck fleet to biodiesel with direct economic benefits emanated from cost reductions, but potentially there were also indirect benefits, with the retailer seeking extra carbon credit under the federal cap-and-trade legislation for it (San Francisco Business Times, 2008).

Sustainability and food retailers: Objectives, criteria and indicators

The concept of sustainability has only lately been migrated into the management literature and practices. This was related to the fact that the concept was very difficult to grasp, often describing future goals and objectives that appear to be very generic, particularly for companies and managers (Linton *et al.* 2007; McIntyre, 2007). Fritz and Matopoulos (2008) based on an extensive literature review (Panell and Glen, 2000; Allen *et al.* 2003; McKinnon *et al.*, 2003; Blanke and Burdick, 2005; Ho and Gala, 2005; Marshall and Toffel, 2005; DEFRA, 2006; CIAA, 2007; IGD, 2007; DEFRA, 2007; Yakovleva, 2007), presented fifteen major sustainability objectives, as well as measurement criteria that are related directly to the food chain (Table 1).

Insert Table 1 – Overview of sustainability objectives & measurement criteria (Fritz and Matopoulos, 2008)

Retailers can definitely play a significant role and affect all these objectives. However, in this paper, emphasis is given to the environmental and social dimensions of sustainability, because the food retail sector, to a great extent, is a logistics intensive one, and much of the critique that retailers face nowadays is related to the environmental and social footprint caused by their logistics operations and strategies. Due to research limitations, it was decided to focus on the following two specific objectives: food distribution, and urban distribution. Both are considered two of the most important issues due to major changes in retailers' delivery patterns (DEFRA, 2006; IGD, 2007).

Modern food distribution takes place through supermarket regional distribution centres using larger heavy goods vehicles, which has an impact in the areas of road congestion, damage to infrastructure and road accidents (McKinnon *et al.* 2003; Ho and Gala, 2005, Santos *et al.* 2010). There are impacts on greenhouse gas emissions, air and noise pollution. In the UK, the direct environmental, social, and economic costs of food transport are over £9 billion each year, and are dominated by congestion (DEFRA, 2005).

A recent survey by Quak and de Koster (2007) researched the impact of governmental time-window pressure on retailers' logistical concepts and the consequential financial and

environmental distribution performance. Results indicated a trade off between improvements of social sustainability issues in the shopping areas but also deterioration in the environment and the retailers' financial performance. Table 2 presents the objectives, criteria, and indicators selected for this study. The selection was based on the literature review presented earlier in this section.

Insert Table 2 – Sustainability objectives, criteria and indicators (Adapted from Fritz and Matopoulos, 2008)

Food distribution is measured with respect to the *transportation mode-tactic used, vehicle use, time utilization, and engine performance*. For the *transportation mode-tactic used*, three specific indicators were selected. The first is the *percentage of air transported products*. This indicator was used since some forms of transport are more energy-efficient than others. Ocean-borne shipping is generally seen as the most carbon-efficient means of freight transportation. On the contrary, air transportation of food has the highest CO₂ emissions per tonne and is the fastest growing mode (DEFRA, 2005). Despite the fact that it accounts for only 1% of food tonne kilometres and 0.1% of vehicle kilometres, it produces 11% of the food transport CO₂ equivalent emissions (DEFRA, 2005).

The second indicator is the *percentage of direct to store deliveries*. Retailers are trying to minimize *direct to store deliveries*, aiming to achieve better control of and in chain performance improvements. According to Pramataris and Miliotis (2008), centralized delivery outperforms direct to store delivery in factors relating to logistics efficiencies, such as increased vehicle fill rates and more efficient freight moves. Subsequently, sustainability improvements are more likely to be realized in centralized deliveries rather than in direct to store deliveries. The third indicator is the *number of store deliveries per week*. Increased number of deliveries could be linked to weaknesses in the design of distribution.

Vehicle use is measured in relation to *vehicle fill*. *Vehicle fill* is a crucial criterion particularly for Europe where typically 25 to 30 per cent of vehicles are running around empty due to sub-optimisation of backhauls or because vehicles are ending up in the wrong place (Financial Times, 2007). Time utilization is linked to the use of advanced *computer vehicle routing and scheduling systems* as well as *vehicle telematics*. The final measurement criterion of food transportation is *engine performance*. This is approached via the use of the following indicators: *percentage of alternative vs. normal fuels, fuel consumption, and emissions*. The use of alternative fuels is gaining attention in the retail sector. Many retailers (e.g. Safeway, Asda, Tesco), have announced that will convert the truck fleet to biodiesel (IGD, 2008; San Francisco Business Times, 2008).

For *urban distribution*, the criteria used were *vehicle kms (congestion, noise & accidents)* and *delivery performance*. Regarding the first criterion, the indicator used included *total vehicle kms used to supply all stores*. Regarding the second criterion, indicators used included *unloading time in stores and the percentage of stores having unloading docks or parking places, vehicles' non congested time on the road and percentage of "Out of hours" deliveries to total number of deliveries*.

All the four aforementioned indicators, but particularly the first two are very important in the case of Greece, as most stores are located in city centres, and therefore serious congestion problems are created by every day deliveries during pick hours. Regarding the *vehicles' non congested time on the road* and the percentage of *"Out of hours" deliveries*, as a recent DEFRA report suggested, scheduling deliveries outside normal working hours can achieve congestion reduction, improvements in freight operational efficiency, reduction of

air pollution from traffic and will allow retailers to put fresh produce on display much earlier in the day (DEFRA, 2007).

To conclude, the above discussion illustrates under a succinct manner specific methods and approaches in relation to sustainability. We should not forget that in many cases, looking for sustainable solutions may lead to contrasting outcomes or even “un-sustainability”. For example, when food products are transported under high distances then the number of food miles will increase resulting to a negative impact on the environment through the creation of high emissions (Van Passel, 2010). Alternatively, aiming for a more sustainable practice, we may opt for local food production. However, in many occasions, this local food production is supported via the use of greenhouses or other similar high energy intensive means that results in a more negative impact on the environment (and higher emissions and even higher carbon footprint). Therefore, it is not surprising that, for example, lamb and apples imported from New Zealand to UK use less energy from their “farm to fork” journey than the same products produced in the UK even if we take into account the large transportation required (12,000 miles) between these two countries (Woods, 2008). These situations have encouraged researchers to use other techniques such as Life Cycle Assessment to encapsulate the broader picture.

Food retailing in Greece

Grocery retailing in Greece is a large and dynamic sector and sales increased by 10% in 2007 that is above the European average (EXPRESS, 2008a). Traditional food convenience stores contribute only 8% of sales, while multiple retailers hold 16% of stores but and enjoy 92% of sales (IRI, 2006). A number of mergers, acquisitions, and new entrances occurred the last few years. The German discounter Plus, was acquired in 2007 by Alfa Beta Vassilopoulos, while another German discount retailer, Aldi, entered the market in 2008. The entrance of multinational players increased the level of competition fostering domestic retailers to accelerate their growth through acquisition of smaller ones, and entry to new markets (Doukidis, 2004).

Despite this trend, Greek food retailing sector is less concentrated compared to other European countries. It is estimated that the top 3 grocery retailers in Greece count for approximately 40% of the market, while the European average is nearly 50%. Total turnover of the sector is calculated at 8.5 billion €, 81% of which is achieved by the top ten of retailers (EXPRESS, 2008b).

Both domestic and multinational retailers have nowadays become the most powerful players in the food sector exercising their power to every other food chain member. The entrance of the multinational retailers initiated changes and improvements in the structure of the logistics systems of companies. Prior to the entrance of the multinational companies, the development of warehousing and the use of third-party companies was limited. The implementation of efficient and effective logistics practices by domestic retailers was also very weak (Bourlakis and Bourlakis, 2001). However, the establishment of a vast network of stores across the country encouraged domestic retailers to re-evaluate their logistics strategy.

Many retailers moved towards the centralization of their logistics processes with establishment of new distribution centres or by investments in Information and Communication Technologies in an effort to increase efficiency and coordination in order to compete and catch up with multinational ones (Bourlakis and Bourlakis, 2006). In many cases

domestic retailers developed new strategic partnerships or outsourced logistics activities to third parties. Table 3 presents the top ten grocery retailers in Greece.

Insert Table 3 –Major food multiple retailers in Greece (Panorama of Greek Supermarkets, 2007)

Research Design

Considering that the research is explorative in nature, case study research and in particular multi-case study was preferred, since it enables a more descriptive approach allowing for more rich insights into the research object (Yin, 1994; Miles and Huberman, 1994). Case study research has been recognised as an increasingly important type of research particularly in the area of logistics (Mentzer and Kahn, 1995; Patton and Appelbaum, 2003; Mangan *et al.* 2004). Moreover, case study method is appropriate for this particular research where detailed and sensitive information were sought by respondents.

Four distribution centres (DC) (located both in the regions of Thessaloniki and Athens) serving an extensive network of stores were examined. Significant difficulties were created for collecting the research material as companies in Greece are rather hesitant to participate in studies, particularly in the case where detailed information and critical data are asked. In fact, not all information was received in full, as there were cases (e.g. cost information) where retailers refused to provide some of the information. In terms of the sustainability objectives, measurement criteria and indicators used, these were identified from the literature (see section 3).

Given that in this paper the emphasis is on sustainable logistics practises, a more restricted number of relevant objectives, criteria, and indicators were selected for assessment. In order to improve the data reliability, a research protocol was developed before starting data collection (Yin, 2003). This research protocol was pre-tested with a Logistics Director of a food retailer in order to ensure the accuracy and suitability of the interview guide. Semi-structured telephone interviews were conducted in a three stage process. Firstly, the purpose of the survey and a short description of the interview guide were explained and the set of question was sent by e-mails. The second step, involved the follow up and the discussion which approximately took 30-45 minutes per interview.

Data collected were both qualitative (e.g. perceptions, critical issues) and quantitative (e.g. number of deliveries, vehicle fill rate). The companies agreed to take part in the research provided that confidentiality was assured. Companies are called company A to D, as indicated. All companies are the Greek branches of multinational retailers and Company D is a discount retailer.

Empirical findings and discussion

The empirical quantitative data collected from the interviews indicate similarities in some of the characteristics of distribution centres, as well as differences. For example, none of the retailers is using alternative fuels, and in addition, no use of air transport is reported. Major variations are identified in the number of stores served from the distribution centre, as well as in the average distance of the DC from stores. In particular, as regard the number of stores served this varies from 144 to 220, while the average distance from stores ranges from 140 kms to 320 kms.

The data also indicate variations in the percentage of stores having unloading docks, and the time needed for unloading a vehicle to the store. For example, in the case of retailer C, 60% of the stores have unloading docks, while for retailer D the number is 15%. This is due to

the way each company has designed its store network. Company D for example, has a network of “city” stores, while company C has also stores which are located away from city centre.

Similarly, regarding unloading time there are significant variations. For example, retailer’s B unloading time is half than that of retailer A. Variations exist also in respect to the percentage of direct to store deliveries (from 4% to 38%) and vehicle’s time on the road not congested (from 193h/ month to 425h/month). In terms of the type of vehicles, most of them are Euro I and II type. Table 4 presents the distribution centres examined, in respect to the sustainability indicators identified and illustrated in Table 2.

Insert Table 4 – Overall characteristics of the Distribution Centres examined

Data indicate differences between the distribution centres examined. In some of the cases, this is due to size variations of distribution centres in terms of the number of stores served and also the average distance of DC’s from the stores. In other cases that’s not the case. For example, differences in *unloading times* could imply deliveries of less than full truck loads, therefore transportation inefficiencies, in terms of cost and sustainability.

An important issue worth analysing it is the direct to store deliveries versus centralized deliveries. Empirical data suggest significant differences. Not surprisingly, the lowest percentage (4%) of direct to store deliveries refers to a discount retail chain (Company D) where emphasis is on cost reduction and therefore emphasis is given on centralized distribution as opposed to direct to store deliveries.

The discussions with the Logistics Directors indicated that retailers do not currently include sustainability issues in the design and implementation of transportation and distribution plans. It seems that it is not part of the overall logistics strategy. In addition, most of the decisions taken are driven by internal forces, cost concerns in particular. Logistics Directors seem to be ready to implement more sustainable practices, but only in the case where cost improvements are clear or at least not causing deterioration of performance.

This was the case in out-of-hours deliveries, where it was clear that all Logistic Directors recognize benefits in adopting this practice. For example, the Logistics Director from DC_D stated that: *“night hour deliveries will definitely have a positive impact on our operations both for us, in terms of operations, and for the city... lack of unloading docks or parking during the day is a nightmare for our drivers”*. The logistics director of DC_A, a company that already does out-of-hour deliveries stated that: *“we definitely going to expand night hour deliveries... more than 10%... we are realizing significant improvements in our daily operations and of course we do avoid the impact on traffic jams etc”*. However, the Logistics Directors of DC_B, DC_C, and DC_D, expect reactions and resistance from drivers. This was particular the case for two of the distribution centres of two retailers (DC_C and DC_D), due to the fact that they do not have a private fleet, but instead they contract individual drivers.

It is worth noting that under the Greek law, there is an oligopoly in the transportation services sector where the number of licences to offer transportation services is very limited and in the hands of a small number of independent drivers (Alpha Bank, 2008). Therefore, these drivers will not probably accept night deliveries. Another interesting point in the discussion was the director’s perceptions regarding their potential role as “chain captains”. Although retailers in Greece are very powerful, it seems that they are not ready to play such

a role. They do not perceive themselves as chain captains at the moment and do not aim to disseminate and apply sustainability practices to the other food chain members.

Conclusions

This paper has examined the issue of sustainability by focusing on food retailers. Our literature review indicated that there is a growing trend worldwide for the uptake of sustainability practices from retailers. In many cases, large retailers are increasingly adopting programmes for safe and sustainable agriculture, playing a role as ‘agents of change’ in the transition process towards more sustainable production methods (van der Grijp *et al.*, 2005). This trend is in many cases the result of pressures expressed by governments or interest groups. In other cases, retailers are positioning the issue of sustainability in the “heart” of their operations, because they have recognized direct benefits (e.g. cost reductions) or indirect (e.g. better positioning in the market for “green” consumers). This paper provided insights for the current state of sustainability practices in the operations of distribution centres of Greek food retailers. The contemporary view of the Greek food retailing sector revealed that, in terms of both food distribution and urban distribution strategies, no sustainability issues are taken into consideration and cost seems to be the sole criterion for the moment.

A very crucial factor that explains this situation could be the lack of relevant governmental (local, regional or central) policies. The sustainability issue is approached in a very narrow way, no specific vision exists, but instead fragmentary actions and very small steps are undertaken. For example, in February 2008, an agreement was signed between nine retailers and the mayor of the city of Athens to reduce plastic bag use. Retailers will have to provide other types of bags such as biodegradable bags. Another important constraint factor is that interest groups representing green consumers are in minority therefore, retailers are not interested in satisfying them. Finally, the structure of the logistics services sector in Greece is also a barrier in the uptake of more sustainable initiatives and the resistance to certain policies, such as night deliveries, is expected to be significant.

This paper has generated many useful findings that will be of particular interest to retail and logistics managers. Specifically, the paper illustrated the retailers that outperform other competing retailers in a range of logistics techniques and practices including, *inter alia*, when unloading docks at store level and unloading time. These exceptional retailers present the industry’s absolute benchmarks and the other retailers will need to follow their practices. Therefore, our study provided key data illustrating areas where some of these retailers need to improve on. As noted in this study, an area where retailers need to act immediately is transportation inefficiencies in terms of cost and sustainability.

A key finding emanating from this paper is that logistics managers do not consider sustainability issues in the design and implementation of transportation and distribution plans. Their strategic decision making pays emphasis on cost improvements and sustainability can be considered only in connection with a drive for cost improvements. This is not the right attitude for implementing sustainability and in general, sustainability should be approached as an initiative that improves business operations and at the same time, it supports corporate objectives. For example, many retailers operating in other European countries have appreciated the role of sustainability and have supported its implementation as it provides many operational benefits notwithstanding its importance for raising the profile of the retailer in the public domain. The latter is the case for a major UK retailer that has implemented a range of sustainability initiatives and, in turn, its corporate social responsibility position has largely improved in the UK retail environment (see for example, Spence and Bourlakis, 2009).

In addition, there are a number of critical issues arising from the case studies and the test of the indicators in practice. These issues require further research work and the first one is related to the need to create sustainability benchmarks for each of the measurement criteria and the indicators used. For example, in this research, six measurement criteria and fourteen sustainability indicators were used. However, it is still difficult to provide any comparison of the distribution centres in terms of their sustainability performance. Another important issue that was identified from the case studies is that there are practical difficulties in assessing the overall sustainability performance of entire supply chains. This is due to the fact, that in many cases a significant percentage of transportation and distribution is provided by 3PL's. Monitoring the performance of 3PL's is an extra barrier for companies. Considering the applied emphasis of this research work, we can stress that these issues present challenges towards the implementation of sustainability for retail and logistics managers too.

Therefore, other future research could embrace under a more integrated and holistic manner the rest of the measurement criteria and indicators too as illustrated in Table 2. For example, it will be of particular interest to examine the use of alternative fuels and air transport within other national retail environments. Another issue that requires attention is the analysis of the relative importance of each of the sustainability objectives, measurement criteria, and indicators that have been proposed in the literature. For example, is urban distribution an issue of equal importance to that of food distribution or waste packaging in terms of impact on sustainability? Answering this kind of questions will enable cross company comparisons and moreover, will facilitate policy makers to focus on specific strategies. Furthermore, it will be worth investigating in more detailed empirical case study work, the companies that have exemplary results in the sustainability issue. Our research work has exposed these companies (e.g. company B in terms of unloading time) and future research could illustrate the specific operational practices and methods that these companies follow to generate these exceptional results.

The importance of sustainability during the crafting of retail firm strategy is another area that merits research attention too. In our research work, retail companies implement sustainability only in connection with a drive for cost improvements that is not the case in other European retail environments. An international survey including various European retailers could expose the managerial attitudes and views on the issue of sustainability.

Finally, we acknowledge the fact that this research has several constraints. Nevertheless, these preliminary results provide useful insights and explanations that could be helpful to other researchers, managers and policy makers involved in the understanding and measuring the uptake of sustainability practices from retailers and other supply chain members.

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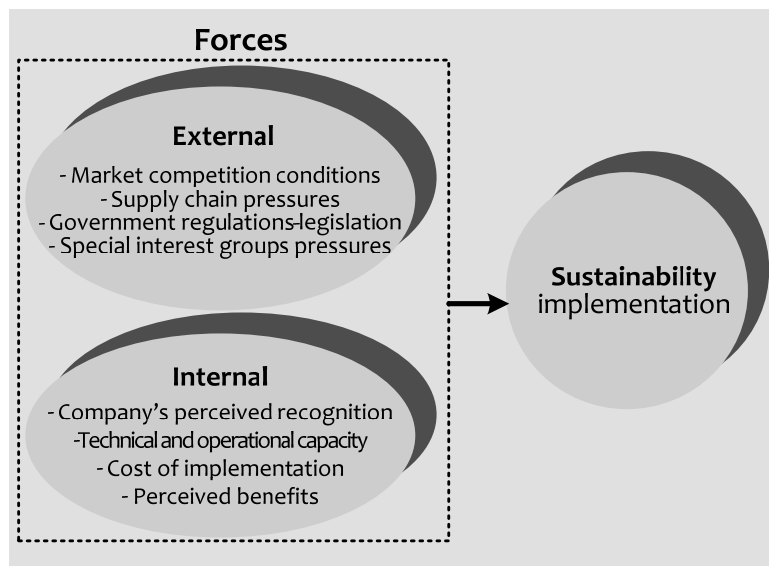


Figure 1 – Driving forces of sustainability (Source: the authors)

Table 1 – Overview of sustainability objectives & measurement criteria (Fritz and Matopoulos, 2008)

Sustainability	Sustainability objectives	Measurement criteria
Economic dimension	Economic growth Work skill investment Open & competitive economy Changing pattern of consumption	Productivity Training Industry's diversity & structure Transportation reduction of imports
Environmental dimension	Waste Water Energy Biodiversity Food distribution	Packaging Water used Energy used Contributions to biodiversity Transportation mode-tactic used Vehicle fill Time utilization Engine performance
Social dimension	Urban distribution Nutrition & health Food safety Workplace improvements Community Ethical trading	Vehicle kms (congestion, noise and accidents) Unloading Total driving time Signposting Contamination Equality Health & Safety Employment volumes Employment quality Contribution to community Economic linkages with communities Ethical trading schemes

Table 2 – Sustainability objectives, criteria and indicators (Adapted from Fritz and Matopoulos, 2008)

Sustainability	Objective	Measurement criteria	Indicator
Environmental dimension	Food distribution	Transportation mode-tactic used	% of air transported products to total products on the shelf
			% of direct to store deliveries to total number of deliveries
			Frequency of deliveries to store (per week)
		Vehicle use	%Vehicle fill of delivery to total capacity
			Time utilization
		Engine performance	Alternative vs. normal fuels % Fuel consumption Emissions (vehicle type- EURO classification: I, II, III, IV)
Social dimension	Urban distribution	Vehicle kms (congestion, noise & accidents)	Total vehicle kms used to supply all stores
			Delivery performance

Table 3 –Major food multiple retailers in Greece (Panorama of Greek Supermarkets, 2009)

Rank	Company	Turnover 2008 (in thousands of €)
1	CARREFOUR - MARINOPOULOS S.A.	1.994.600
2	ALFA BETA VASSILOPOULOS S.A.	1.337.074
3	SKLAVENITIS, I. & S., S.A.	1.088.653
4	VEROPOULOS BROS S.A.	922.926
5	ATLANTIC S.A.	650.658
6	METRO S.A.	614.365
7	MASOUTIS, D., SUPERMARKET S.A.	576.420
8*	MAKRO (Greek branch of the German METRO)	472.234
9	DIA HELLAS S.A.	434.281
10	PENTE S.A.	389.310
	Top 10	8.480.521
	Total	10.238.521

* Involved both in wholesaling and retailing

Table 4 – Overall characteristics of the Distribution Centres examined

DC	General characteristics				Urban distribution			
	Number of stores served	Average distance from stores (in kms)	Stores with unloading docks or parking	Unloading time in stores	Vehicle kms used to supply all stores (per month)	Vehicles' kms per store (per month)	Vehicles' time on the road non congested	Out of hours delivery
A	168	300	30%	40 min	192.784	1148	193 h/month	10%
B	175	320	25%	20 min	290.000	1657	235 h/month	0%
C	220	151	60%	30 min	580.000	2636	Not announced	0%
D	144	140	15%	40 min	361.000	2507	425 h/month	0%

DC	Food distribution											
	Air transport food	Direct to store deliveries	Type of vehicles (Emissions)*					Vehicle fill rate	Frequency of store deliveries (per week)	Computer vehicle routing	Telematics	Alternative fuels
			Euro I	Euro II	Euro III	Euro IV	Euro V					
A	0%	13%	-	21	26	4	1	90%	6	No	Yes	0%
B	0%	n.a.	8	15	6	-	-	85%	6	No	No	0%
C	0%	18%	-	-	-	-	-	85%	3-6	No	No	0%
D	0%	4%	-	23	12	-	-	90%	5	Yes	Yes	0%

* not all vehicles of the fleet are included (difficult to calculate accurately due to the use of 3PL's)