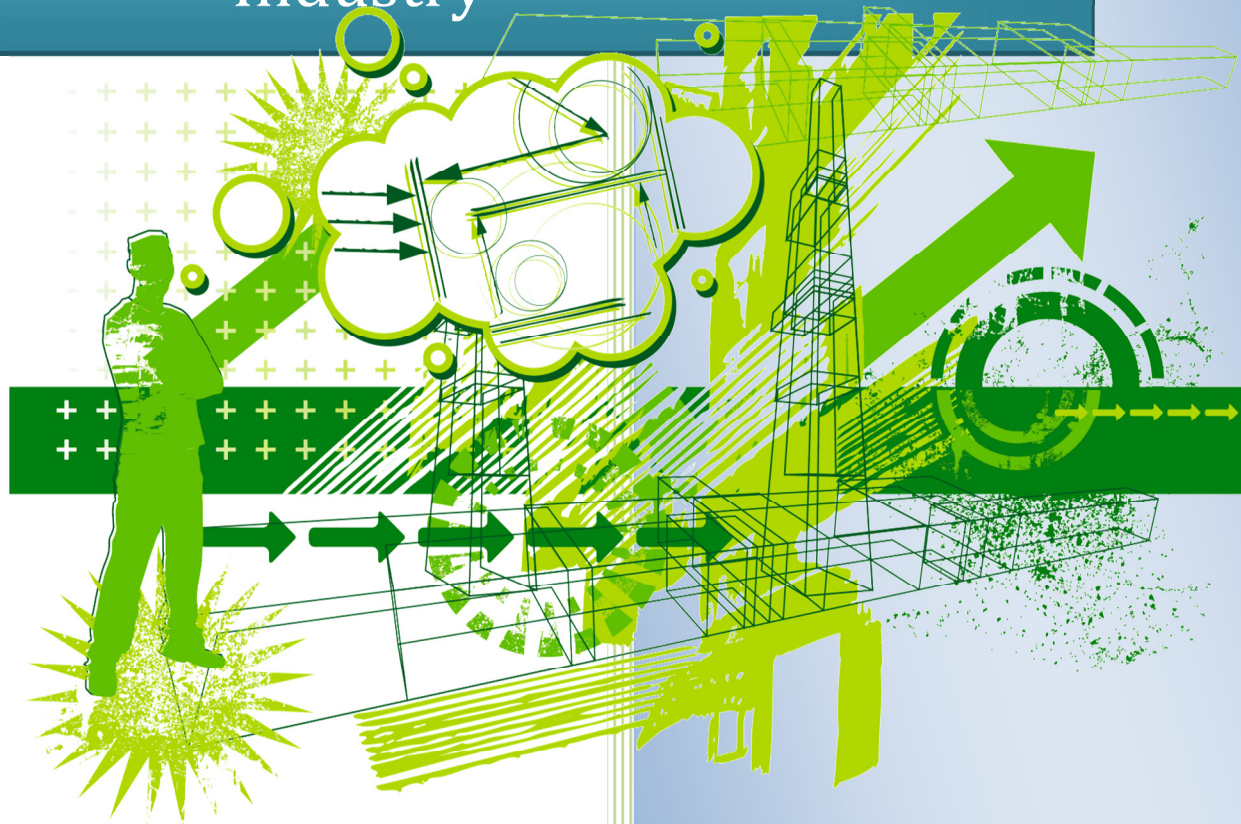


2012

Maturity Assessment of Green Supply Chain Management in the South African FMCG Industry



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10/17/2012

Maturity Assessment of Green Supply Chain Management in the South African FMCG Industry

by

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Executive summary

There is a general uncertainty about the current state and maturity of green supply chains in South Africa's fast-moving consumer goods sector. Although some frameworks exist, there appears to be a lack both of clear measurements and of an understanding of them; and this leaves companies unable to measure themselves against a standardised scale. Determine if there is a potential for green supply chains to function in South Africa. Questions that must be answered in order to determine the involvement of companies in green supply chain management include the following:

- What environmentally-sustainable activities are they busy with?
- What has worked in the past? (That is, what are their success stories?)
- What accreditations are they looking at?
- What are they measuring themselves against?
- Are they aware of green supply chains and environmental issues?

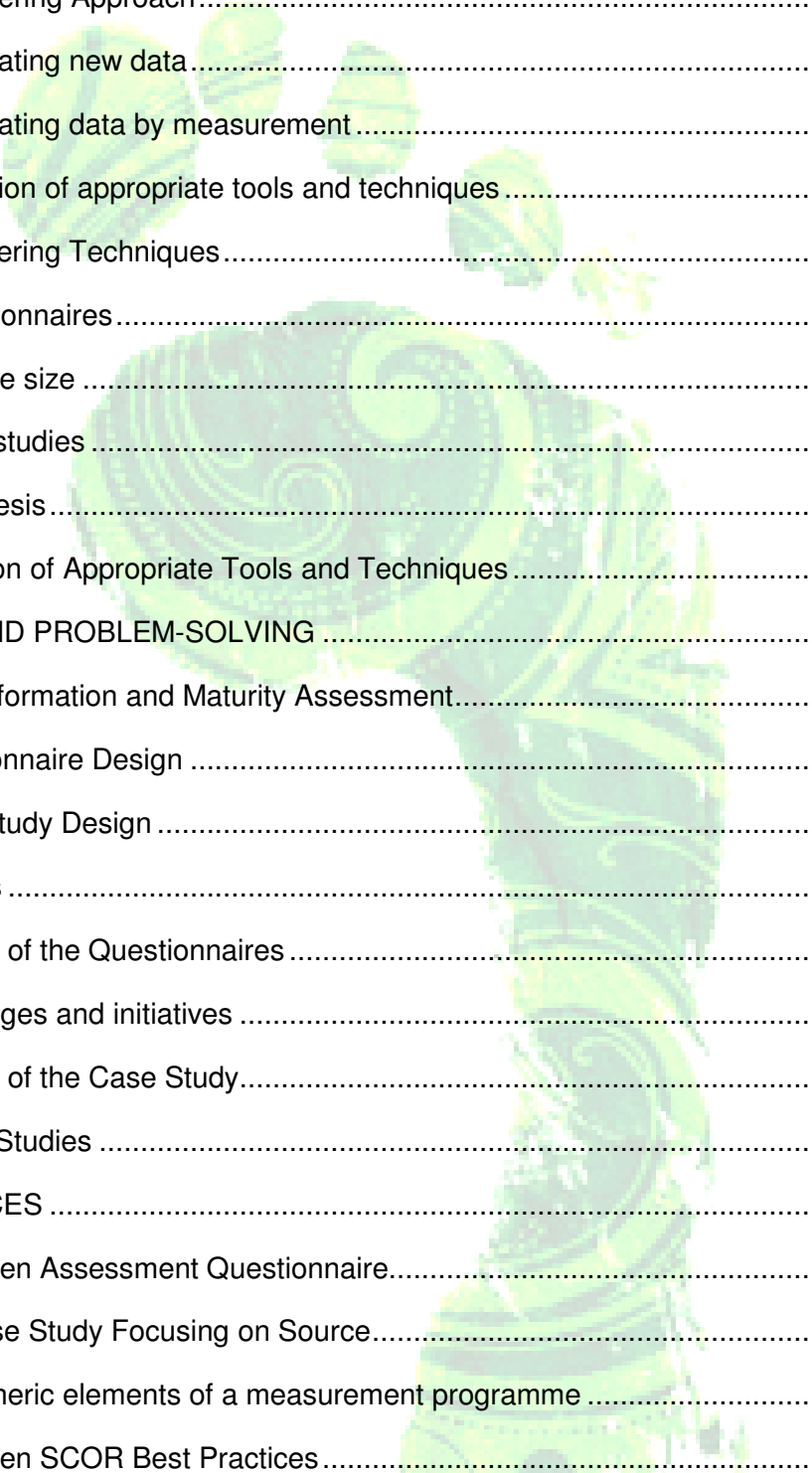
The focus of the project is on green supply chains and on how companies are applying them. Specifically, the focus is on the fast-moving consumer goods sector in South Africa. The areas of focus within the supply chain will be the suppliers, packaging, producers, retailers, and transport.

This paper outlines the need for a quick assessment tool to map the maturity of a company's green supply chain operations, investigates what is green supply chain management and its current maturity in the South African FMCG sector by presenting a 'green supply chain maturity assessment questionnaire' as a potential answer to this need. The experiences that the researchers have gained in the development of the questionnaire are summed up, as are the strengths and weaknesses of green supply chains in South Africa. Guidelines for a green supply chain procedure are presented, and a research agenda for further development is proposed.

The surveys showed that in South African green supply chains there is a definite need for green supply chain management with a specific focus that has to be placed on the sourcing processes. The case studies demonstrate how successful 'green' focused retailers have gone about installing 'green' sourcing methods. There is a general lack in the awareness, some shortcomings in the transportation departments and a focus on money instead of environment.

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List of acronyms



Green SCOR	The environmentally friendly version of the original SCOR (Supply Chain Operations Reference) model.
FMCG	Fast Moving Consumer Goods
KPI	Key Performance Indicator
SCM	Supply Chain Management
GrSCM	Green Supply Chain Management
TPM	Total Productive Maintenance
TQM	Total Quality Management
CSCMP	Council of Supply Chain Management Professionals
SCC	Supply Chain Council

1. INTRODUCTION

1.1 Background

1.1.1 Media, Public, and Environmental Awareness

As consumers and customers become increasingly aware of the environmental issues at hand, they ask questions about the products they are buying. Companies are also responsible for the actions of their suppliers, and in particular for the environmental problems that their suppliers create. The media have picked up on the 'green wave', and are quick to identify companies that deal with environmentally-unfriendly companies, especially if something goes wrong. Companies cannot afford such negative publicity. Questions can be expected from the public about how 'green' their supply chain and manufacturing processes are, about their carbon footprint, and about how they are managing their waste and water.

These environmental considerations are not to be taken lightly, since they affect not only climate change, but also the depletion of resources. Leading developing countries like India and China are growing at double digit rates, while the population of the world is growing continually, creating a shortage of resources. The World Bank reports that 80 countries now have water shortages that threaten their health and economies, while 40 percent of the world (more than two billion people) has no access to clean water or sanitation. Ultimately, we shall run out of resources completely if we continue at this destructive rate. Hawkens (2012) states: "Humankind has inherited a 3.8 billion per year store of natural capital. At present rates of use and degradation, there will be little left by the end of the next century". Based on all the above facts, it is evident that something has to be done.

1.1.2 Creating a Potential Profitability & Competitive Advantage

Companies have come to realise that converting to green might not be such a bad business idea, since there are definite advantages, ranging from improved profits to marketing of the new environmental awareness (Murry, 2011).

A good example is General Motors, who reduced their disposal costs by \$12 million by establishing a reusable container programme for their suppliers. Obviously they were not as interested in the environment as they were in the profits they made, but the fact remains that their attempt to save on their supply chain costs complemented the company's commitment to the environment. In the United States, an 'ecomagination' programme was put in place, through which they tried to develop and grow their revenue stream from environmentally friendly products, possibly resulting in \$20 million revenue by 2010. They realised that there is a great opportunity in saving the environment.

Woolworths, for instance, are offering environmentally-friendly products, and are charging premium prices for them. They are also able to charge higher prices for organic food, since people are more than willing to pay for organically grown food. Sustainability can offer a company a distinct competitive advantage. Creating a sustainable supply chain creates an opportunity to save a lot of money that would have been spent on disposing of waste materials and harmful by-products. It decreases the amount spent on scrap by making money out of it, and not having to waste resources spent on obeying regulations. Companies have begun to generate money from the by-products they used to throw out. They use sustainability as a tool to increase their competitive advantage (Mazumder, 2010).

1.1.3 Green Supply Chain versus Traditional Supply Chains

Traditional supply chains have been defined as a one-way, integrated manufacturing process through which raw materials are converted into final products and then delivered to customers. In these circumstances, the traditional supply chain was associated only with the manufacturing operations, from the acquisition of the raw materials to the delivery of the final products (Beamon, 1999).

However, green supply chains can be defined as a process of using environmentally friendly inputs, and transforming those inputs through change agents whose byproducts can be improved or recycled within the existing environment. The process develops outputs that can also be re-used at the end of their life cycles; this, in return, creates a sustainable supply chain. The idea of a green supply chain was always thought of as a costly process in the past, because it focused on reducing unit cost instead of looking at the total landed cost with the onset of global trade. The focus should also change from looking at the usage cost of an item of equipment (e.g. the cost per page of using a certain copier) to the life cycle cost of this part, equipment, or supply chain process.

Creating sustainable practices and processes in a company should be a way to save costs, rather than being a burden. There are many areas in which to improve a company's supply chain through sustainable practices. A definite focus point will be on issues that can be addressed through the design and production of the product.

1.1.4 Problem Statement

There is a general uncertainty about the current state and maturity of green supply chains in South Africa's fast-moving consumer goods sector. Although some frameworks exist, there appears to be a lack both of clear measurements and of an understanding of them; and this leaves companies unable to measure themselves against a standardised scale. Determine if there is a potential for green supply chains in South Africa.

1.1.5 Project Aim

The objective of the study is to determine the current state and maturity of green supply chains, and in particular in South Africa's fast-moving consumer goods sector. It should be remembered that some frameworks do exist, but that there seems to be a lack of clear measurements and of

an understanding of them, such that companies are unable to measure themselves against a standardised scale.

To understand the current maturity of green supply chain management in South Africa's fast-moving consumer goods sector, the following objectives must be addressed:

- What is green supply chain management and best practices
- Understanding the current status of the green supply chain in South Africa's fast-moving consumer goods sector
- Understanding the potential value of Green SCOR in the implementation process
- Researching current and past success stories of implementing a green supply chain in the industry or in specific companies

1.1.6 Project Scope

In-depth research needs to be completed to investigate green supply chains, to discover what drives them, and what specific factors need to be considered. This will highlight the notion that green supply chains can be helpful in the fast-moving consumer goods sector.

Second, market research needs to be done using a questionnaire, and possibly case studies, to determine and investigate the current state and maturity of the green supply chain (end-to-end as seen in Figure 1) in South Africa's fast-moving consumer goods sector, looking in particular at manufacturing, production, packaging, transportation, and retailers. Which at current methods are successful – or unsuccessful – in implementing a green supply chain?

The final part of the project will analyse the data and show that there is a need for green supply chains.

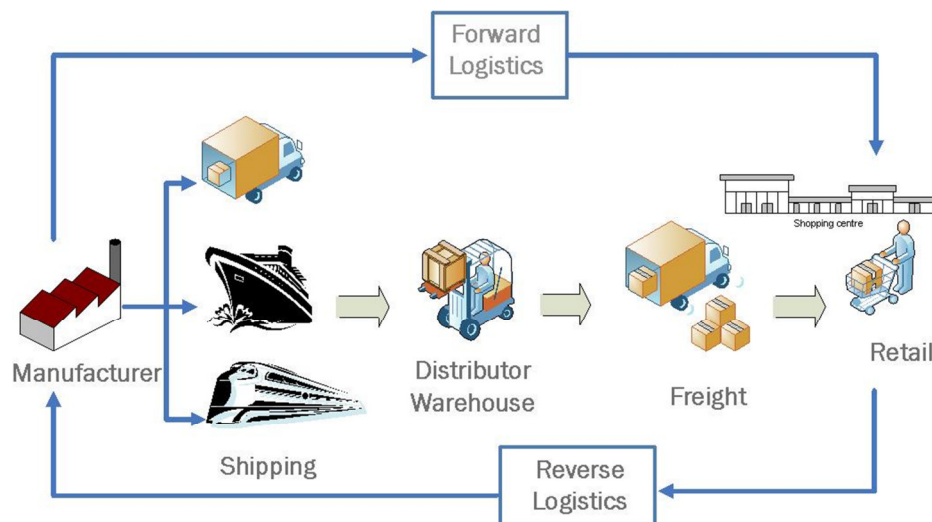


Figure 1 End-to-end supply chain (Source: ENC Group, 2012)

1.1.7 Project Deliverables

The primary deliverable for this study will be a comprehensive document outlining the current status and maturity of green supply chains in South Africa's fast-moving consumer goods sector. A questionnaire will be developed to aid the further study and development of a concept framework (a green supply chain dashboard) by proving that there is a need for green supply chains. The results of the questionnaire will quantify the need for a framework while documenting current trends in the green supply chain environment.

1.1.8 Project Approach

In order to ensure the execution of the project, the following steps will be followed:

1. Conduct a complete literature review of green supply chain management, investigating the differences between traditional supply chain and green supply chain to determine and orientate the current methodologies used.

2. Examine existing green supply chain frameworks and Green SCOR, summarising their content and showing how they can be used to add value to a company's supply chain.
3. Assess the fast-moving consumer goods sector:
 - Define and justify why this specific industry was chosen, and perform a case study to examine the current status and maturity of the green supply chain.
 - Create an experimental design for the framework.
 - Decide what needs to be investigated:
 - the companies' high level supply chain (SCOR) and the supply chain drivers that are driving the company, from the sourcing of raw materials (suppliers) to warehousing, packaging, producers, and the delivery of final products to the retailer);
 - environmental impact and awareness, and companies' initiatives;
 - the green measures and frameworks used within specific companies;
 - the companies' requirements to measure their influence; and
 - the dashboard (vision).
 - Develop the questionnaire based on Green SCOR.
 - Setup interviews.
 - Conduct interviews.
 - Process results.
 - Perform company case studies (if necessary).
 - Document the current state and its requirements.
4. Formulate a concept framework for fast-moving consumer goods (green supply chain dashboard).

The framework and the structure of the research done is on the next page in Figure 2. It illustrates the different chapters that will follow and how the content is integrated.

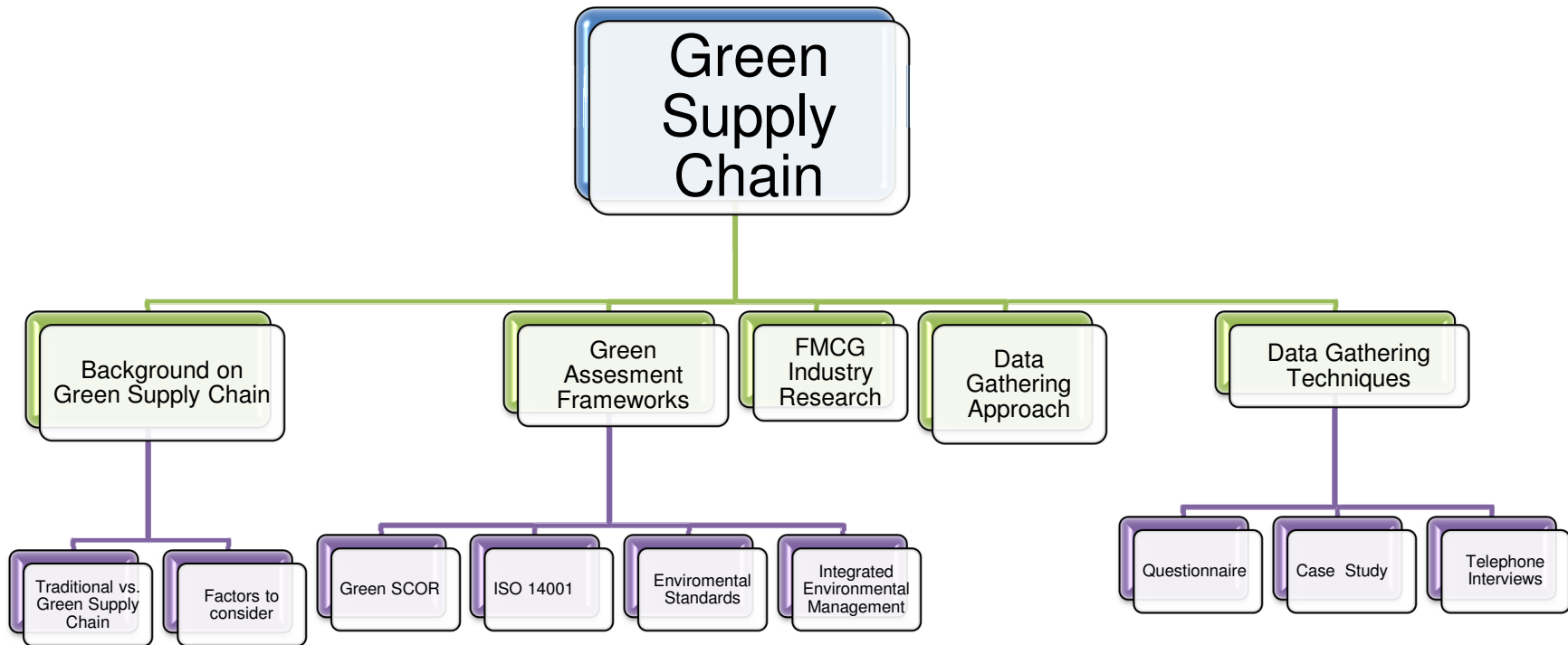


Figure 2 Research framework

2. GREEN SUPPLY CHAIN RESEARCH

2.1 Traditional Supply Chain versus Green Supply Chain Management

Supply chain management (SCM) is the organisation of a network of interconnected companies or businesses involved in producing or providing products and service packages to end customers (Harland, 1996). A supply chain spans all movement from the storage of raw materials, through work-in-process inventory and finished goods, from the starting point to the point of consumption. The APICS Dictionary defines supply chain management as the “design, execution, control, and monitoring of the supply chain activities with the objective of creating net value, building a competitive infrastructure, leveraging worldwide logistics, synchronizing supply with demand and measuring performance globally”.

The Council of Supply Chain Management Professionals (CSCMP) defines supply chain management as the planning and managing of activities involved in sourcing, procurement, conversion, and logistics management. It is also concerned with the coordination and collaboration of all the partners within a channel, who could be suppliers, intermediaries, third party service providers, or the end customers. Essentially, supply chain management integrates supply and demand within and across companies.

A supply chain, as opposed to supply chain management, is a set of organisations directly linked by one or more of the upstream and downstream flows of products, services, finances, and information from a source to a customer. Managing a supply chain is called “supply chain management” (Mentzer et al., 2001).

But the traditional supply chain has been evolving over time into a green supply chain. What used to be important has changed. The basic building blocks of sustainability are captured in the following diagram.

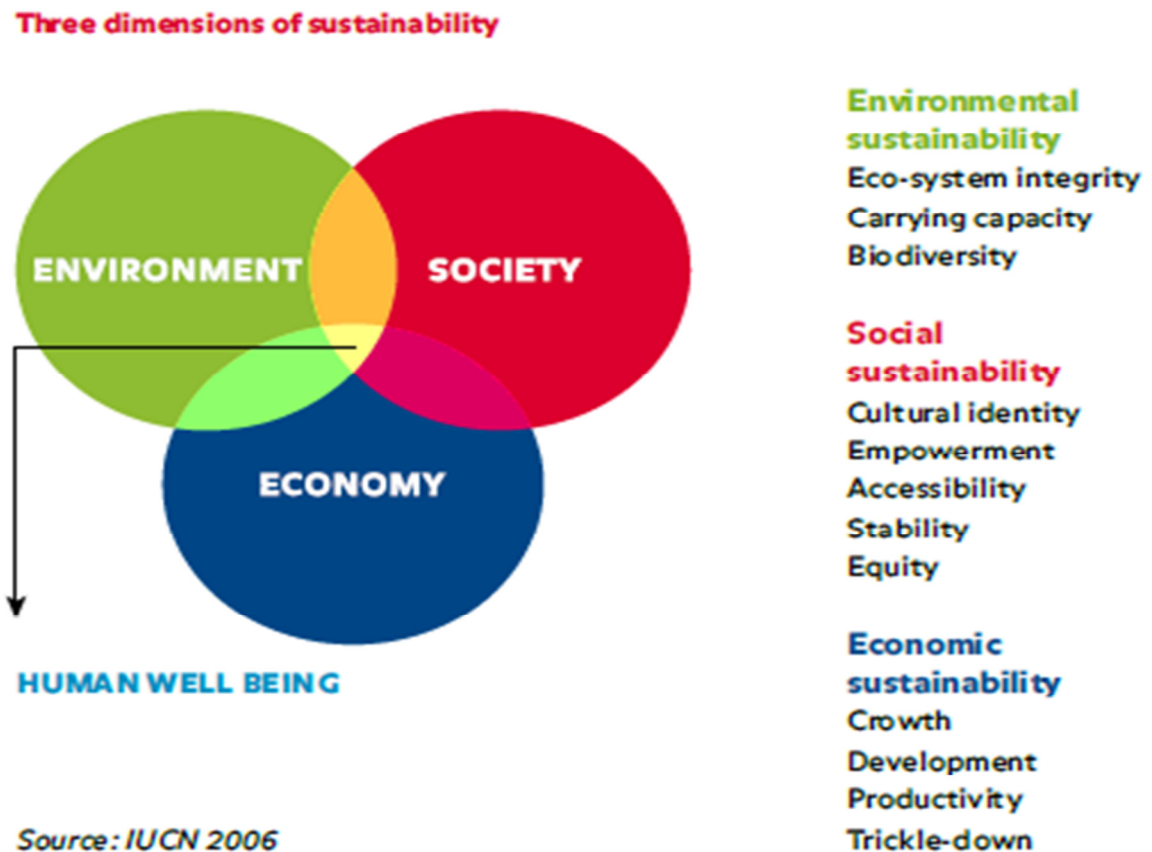


Figure 3: Dimensions of sustainability (Source: IUCN, 2006)

Green supply chain management (GrSCM) is achieved through the integration of environmental thinking and supply chain management, including material sourcing and selection, product design, manufacturing processes, delivery of final products to the consumers, and the end-of-life management of the product after its useful life (Srivastava, 2007).

A green supply chain has the following advantages:

- Improves agility (quickness): a green supply chain helps to tone down risk and speed up innovation.
- Increases flexibility: a green supply chain analysis often leads to ground-breaking procedures and continuous development.

- Promotes alignment: a green supply chain involves negotiating policies with suppliers and customers that results in a better positioning of business procedures and values.

The core focus of the green supply chain will be on the necessity for 'green', and on green supply chain operations. These include network design, reverse logistics, transportation, green manufacturing, re-manufacturing, and waste management.

The evolution of the supply chain involves swift changes in the business surroundings, including increased internationalisation and worldwide competition population growth and ageing, wealth accumulation and distribution, nourishment, health, and education; and it affects companies' supply chains in various ways, resulting in new and evolving necessities on the supply chain blueprint.

Well-known features of the top green supply chains include an emphasis on life-cycle costing, asset efficiency, waste reduction, service reduction, service innovation, and recycling. If GrSCM is executed successfully, it stimulates product and service improvement, advances asset utilisation, and deepens customer relations and service levels through a shared focus on reducing waste and cost.

The following two companies exemplify the impact of GrSCM.

- Nestlé employs an ongoing, environmentally sustainable strategy that has created considerable environmental and monetary benefits. Their approach is to use their product packaging, employing a technique that implements source cutback, re-use, recycling, and energy revival.
- Heineken is dedicated to minimising fuel and electricity use through its "Aware of Energy" campaign. In the company's sustainability report, it states that the objective was to reduce its costs by 15% between 2002 and 2010. At the time of the Diamond report, Heineken had accomplished savings of 6% – even after the addition of new breweries.

Studies have shown that increasing demands are placed on supply chains to supply products that are environmentally friendly in their sourcing, production, distribution, usage, and disposal – not just for marketing purposes or 'green washing'..Companies tend to limit their environmental innovation to their flagship products to benefiting from that status, while the actual need is that the entire product range should be adjusted. Greening the supply chain is a subject that will gain importance in the years ahead. Using network design, optimising and planning systems that

integrate carbon footprint considerations and sourcing, procurement and end-of-life issues, will help to 'green' the supply chain and give supply chain executives a clear view of the complete supply chain. Although sustainability programmes are different from industry to industry, the essential elements in their success will be clarity, communication, and teamwork.

Once companies gain a clearer inspiration and start looking in earnest at the greening of their supply chains, supply chain managers will need to focus on three significant areas:

- Greener product and packaging design
 - Designers need to make the most of the quantity of environmentally-safe product components, and completed goods and packaging will need to be more biodegradable and less damaging to the surroundings.
- Supply network fulfillment
 - It doesn't help if a company is environmentally friendly but its suppliers – as far removed as they may be from the finished product – are not themselves green. It will become crucial for companies to do a review of their suppliers, and of their suppliers' suppliers, to guarantee that every firm – both internationally and locally – that has an impact on their products is complying with green policies.
- Reverse logistics
 - As governments introduce new rules and regulations on recycling, up-cycling, etc., supply chain systems will have to accommodate products being returned for recycling or being discarded at the product's end of life. This will need a closed-loop supply chain where goods have to be returned to the supply chain in order for them to be properly broken down or disposed of.

2.2 Specific Factors and Measurements to Consider

The supply chain is responsible for 75% of companies' carbon footprint, proving that a greater focus should be placed on this area (Ashcroft, 2007). Taking action in this field is not the result of a temporary trend; companies choose to follow the green supply route and commit to the matter in the long run. These companies have systems in place to measure their carbon footprint, and of these companies, 70% evaluate it at least annually (Loebich, 2011).

Waste management can also be used to a company's advantage. When producing products, we should adapt our mindsets and stop thinking that anything that does not end up in the product is to be considered as waste, and therefore as a sign of poor quality (Esty, 2009). The 3M system sees everything coming out of the plant as being a product, a by-product (that can be re-used or sold), or waste. If all companies had this mindset we would not have the environmental problems and the landfills we have today. Many companies are also looking at their indirect purchases, such as packaging and transportation, to reduce environmental issues. Typical ideas include the following:

- Reducing the amount of cardboard or filler by designing 'smarter packages' can save companies a great deal of money.
- Filling trucks as full as possible. For example, Dell upped its average truck loads from 18,000 to 20,000 pounds, and worked with UPS to optimise delivery strategies. 3M invented a system that places pallets on two levels, allowing Dell to reduce the number of truck loads by 40%, saving them \$110 million a year.

According to the Reusable Packaging Association, reusable packaging in its broader sense includes bulk containers, reusable pallets, pallets, hand held containers, and dunnage (loose materials to support) that move products through the supply chain in an efficient way (Reusable Packaging Association, 2012). They are mostly constructed from durable materials – metals, wood, or plastic – that are tough enough to withstand typical logistic elements. The key performance indicators (KPI) used for these specific factors are summarised in Table 1 below:

Table 1: SCOR key performance indicators (Source: Supply Chain Council, 2008)

Metric	Units	Basis
Carbon Emissions	Tons CO₂ Equivalent	This is the unit of measure currently used for green house gas emissions and is a measure of the climate impact from CO ₂ and other global warming air emissions.
Air Pollutant Emissions	Tons or kg	This would include emissions of major air pollutants (CO _x , NO _x , SO _x , Volatile Organics (VOC) and Particulate). These are the major emissions that EPA tracks.
Liquid Waste Generated	Tons or kg	This includes liquid waste that is either disposed of or released to open water or sewer systems (these emissions are generally listed on water emissions permits).
Solid Waste Generated	Tons or kg	The total solid waste generated by the process.
% Recycled waste	Per cent	The per cent of the solid and liquid waste that is recycled.

Implementing sustainable energy practices might require great initial capital expense, but they save money in the long run. The *FMCG Supplier News* (2012) reports that Woolworths has saved itself about R80 million since adopting ‘sustainability initiatives’ such as energy efficiency, and plans to save another R100 million by 2015. One of the biggest savings in the sustainability initiatives was the relative energy use (kWh/m²), with a relative decrease of as much as 24%.

The question remains whether South Africa is lagging behind on policies, initiatives, and the implementation of environmentally sustainable activities. What are companies currently busy with? What are they measuring themselves against? Are they accredited? It seems that environment awareness is generally a grey area.

2.3 Fast-Moving Consumer Goods as a Target Industry

According to the Economy Watch, the fast-moving consumer goods industry (FMCG) (which can also be called consumer packed goods (CPG)) is one that deals primarily with the production, marketing, and distribution of consumer packed goods. These are goods that are

consumed by users at regular intervals. The industry is engaged in operations, production, general management, and supply chains.

2.3.1 Market research and growth

A very wide variety of consumables is offered by the FMCG industry, which greatly increases the amount of money in circulation. As interest grows in the FMCG sector, so the competition also grows – especially in India, where the fast-moving consumer goods industry is the fourth largest with a market size of R110 billion. By 2010, India had grown by 60% (EconomyWatch, 2010).










Massmart (Makro) is planning to revamp 10 of its 17 stores so that they offer fresh produce, butchery items, and new brands. Kevin Vyvyan-Day says that the new stores will be more environmentally and shopper friendly (FastMoving, 2012). Food Lovers' Market (Fruit and Veg City) is expanding even more by adding their flagship to the Norwood Mall. The Cavaliers Group say that they are excited to welcome the Food Lovers' Market, as it is a strong match and is ideal for meeting the growing needs of shoppers.





Nampak is planning on expanding business through Africa, starting with Zambia. The goal is to reach the whole of Africa by the end of 2017. One of their strategies is to generate 25% of their revenue from the rest of Africa. Clover has been voted the company most actively trying to improve living standards and conditions in South Africa; it was also elected one of the top ten brands in the community upliftment category of the annual *Sunday Times* top brands survey.

Some of the leading FMCG companies internationally are Pepsi, Kleenex, Coca-Cola, Unilever, Nestlé, Carlsberg, Sara-Lee, and Reckitt Beckiser. The leading FMCG companies locally that supply alcohol include Distell, SAB, and KWV. In the local food and beverage sector, they include Alphen, aQuelle, Bokomo, Clover, Food Corp, Hullets, Kraft, Nestlé, Pick n Pay, Premier Foods, and Simba. Homecare and personal companies include Unilever, ACDOCO, Bayer, and Johnson & Johnson.

From the initial 53 companies selected the following companies listed in Table 2 were successful in completing questionnaires.

Table 2: List of targeted FMCG companies

Companies	Description
Suppliers	
	Africa's leading sugar producer and a top five player worldwide.
	Tsb Sugar is in the sugar business and farming.
	Clover's mission is to market, sell, produce, and distribute dairy and other related food products and drinks through the use of strong brands
Fresh Produce	Fresh produce suppliers.
Packaging	
	Paper sack and bag manufacturers, flexographic printing of extruded surfaces.
	Sealed Air's business is about protective packaging.
Producers	
	Producer and marketer of South African wine, spirits, and flavoured alcoholic beverages.
	The home of British American Tobacco (BAT), the world's most international tobacco group.
	Kraft Foods in Lithuania. Kraft Foods Inc. (NASDAQ: KFT) is an American multinational confectionery, food, and beverage conglomerate.
	The L'Oreal Group international portal, leader in cosmetics and beauty: make-up, colouration, fragrances.
	Simba, a snack empire that spans Africa; chips, Fritos, Niknaks, salted or flavored snacks.

	Nestlé is the world's leading nutrition, health, and wellness company, with headquarters in Switzerland.
Retailers	
	Woolworths Holdings Limited (JSE: WHL) is a South African chain of retail stores and one of the largest in the country, modelled on Marks & Spencer's in the United Kingdom.
	The Pick n Pay Group is one of Africa's largest and most consistently successful retailers of food, general merchandise, and clothing.
Transport	
	Dekson Transport is one of South Africa's leading transport companies.

All the companies mentioned in Table 2 above can be divided into specific categories in the FMCG sector as seen in Figure 4. The supply chain follows the order seen in the picture.

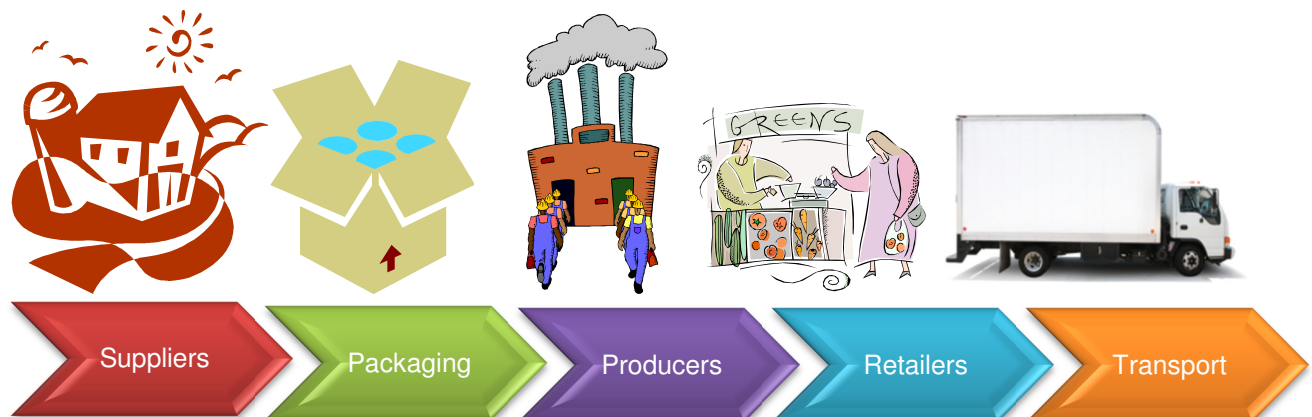


Figure 4: End-to-end supply chain focus of the project

2.3.2 Reason for targeted companies

Table 2 shows that the supply chain is divided into specific categories. Companies in the table were specifically chosen so that the information gathered would cover the entire supply chain. A summary of each category identified in Figure 4 (above) follows.

- **Suppliers**, also known as vendors, are usually providers of products or services. In the supply chain a vendor is more commonly an enterprise that contributes goods or services to the supply chain. Usually they produce inventory or stock items that are then sold to the next link in the chain.
- **Packaging**, and specifically re-usable packaging in this project, includes re-usable pallets, hand-held containers, racks, bulk containers, and dunnage. They all aid the process of getting the product through the supply chain in a safe and effective way.
- **Producers** or manufacturers are persons or companies that make products that are for sale. In the supply chain, a producer would normally supply the products to the distribution centres.
- **Retailers** are the 'middle men' who sell the produced products or goods from the manufacturers to the end-users in the supply chain – not for resale, but to be used or consumed by the purchaser.
- **Transport** is the movement of products, material, or goods around the world, and includes land, water, air, and rail. It is the link connecting all the parts of the supply chain, and is one of the largest expenses in the supply chain cost.

2.3.3 Justification of FMCG as target industry

The supply chain of the fast-moving consumer goods industry is a key driver for attaining a competitive advantage (Mazumder, 2010). A large paradigm shift is required, from merely satisfying the basic needs of a customer to satisfying the self-esteem and self-actualisation needs of a consumer. This change reflects and adapts to the evolving social and economic

landscape of a country over the years. Some of the key areas that are still important to the FMCG industry, according to Mazumder, are:

- Speed: from understanding customer requirements to the development of the product
- Efficiency: managing and optimising costs while still passing value to the end consumer
- Marketing: expanding market coverage while still reaching a wide audience
- Research and development: developing new products that cater for evolving needs
- Networking: strong backward (supply) and forward (distribution) networks that ensure low costs and high service levels.

The traditional approach focused on the obvious generic strategy of cost. In time, the competition became aggressive, causing companies to adopt more focused strategies to improve their supply chain, using new strategies such as a lean supply chain, vendor management inventory, total quality management (TQM), and total productive maintenance (TPM).

In modern times, paradigms to achieve a competitive advantage have changed, especially business performance measurements. The focus is not placed solely on the profitability and value returned to stakeholders: there is a new expectation from the public, government, and investors to do it in a sustainable and environmentally friendly manner.

“A recent survey conducted by the Economist Intelligence Unit was designed to show the increased level of awareness as well as the operational changes taking place as more companies go ‘green’. According to the survey, 52% of the companies report that they are implementing some form of green-minded supplier qualification. An additional 39% say that they have plans in the near future” (Mazumder, 2010).

Examples of developing global environmental trends:

- A leading global retailer announced that it will begin using green scorecard readings in the process of selecting its suppliers.

Maturity Assessment of Green Supply Chain Management in the South African FMCG Industry

- A major food company begins using spent coffee grounds and bio-gas from wastewater to fuel its boilers, and enlists its supply chain to use less energy and decrease costs within a global logistics initiative.
- A household name consumer electronics company begins implementing certification programmes that include significant green standards for power consumption, waste products, hazardous materials, shipping characteristics, and packaging methods and materials.

The evolving green supply chain strategy is apparent in different forms. Some of the reasons that organisations follow the green path are the following:

- Complying with government rules and regulations
- Improving their corporate image
- Reducing costs by improvements in the tactical/operational perspective
- Finding substitutes for rapidly-depleting resources

Governments enforce this by imposing a carbon tax on companies that import from less eco-friendly countries and companies. This forces such companies to investigate their sourcing and production options – where to obtain their products, and where to produce them – as this is linked to the cost effectiveness of the supply chain, which is especially important in the FMCG sector.

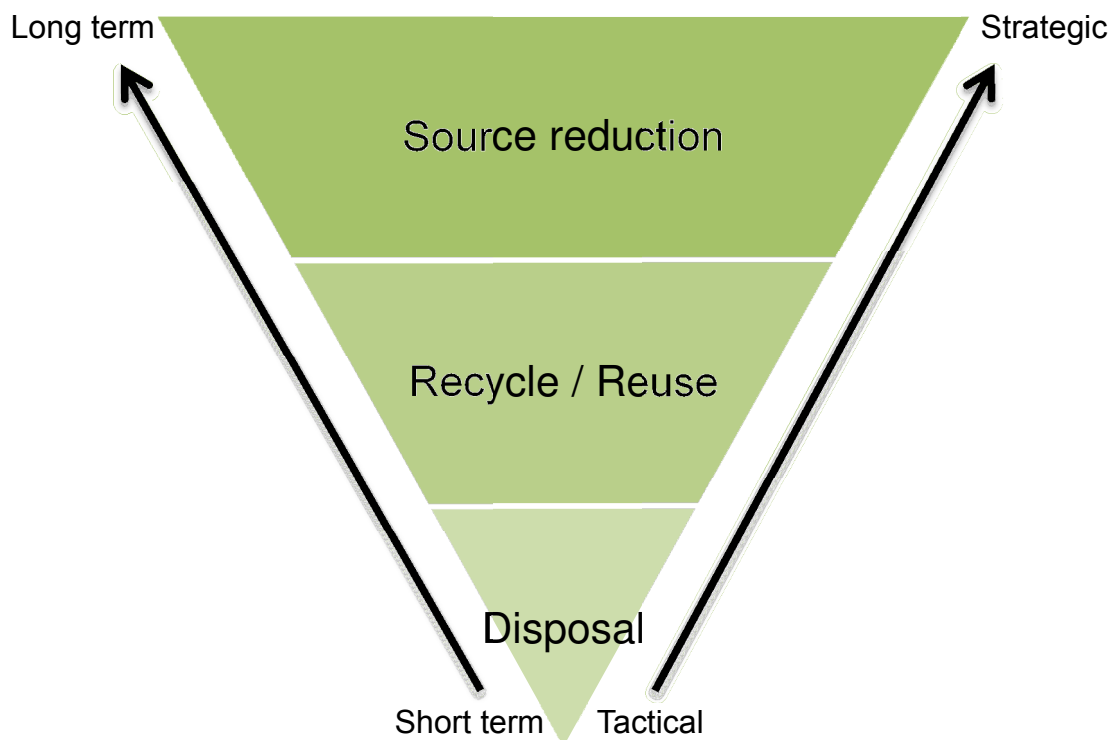
Best practices for a green supply chain in the FMCG sector will have to be considered carefully, since the efficiency of the sector's supply chain relies on efficient supply chain principles to maintain its competitive advantage. The good news is that the green supply chain incurs unnecessary overhead costs and makes the companies less agile.

Best practices for implementing a green supply chain focus on the following points:

- Evaluate the supply chain as a single life cycle system.
 - It is important to see the entire picture and not look at different parts of the supply chain as silos. It is not enough to ensure cost reduction with greener equipment

in-house, while logistics aspects such as warehousing and outsourced transport are not seen as part of the problem.

- Since transportation is such a major cost component in the overall logistics of FMCG companies, organisations are working to improve the fuel efficiency of their trucks. They are also trying to reduce the idle time spent by trucks in transit, by combining delivery and pickup strategies.
 - By optimising the entire supply chain (not just some parts of it), the value delivery will be greatly enhanced through both tangible and intangible (social and environmental) benefits.
- Reduce the source of material in order to reduce the waste.
 - Most FMCG companies are process-based, creating a lot of waste with disposal at various stages in the supply chain.
 - Responsible waste management is key in the greening initiative, since it has immediate effects on the surroundings.
 - The inverted pyramid below illustrates the waste management principle in Figure 5.



· **Figure 5 Waste management** (Source: Mazumder, 2010)

A leading FMCG beverage company has taken the initiative to apply 'reverse logistics' by accepting used bottles. This leads to a reduction in waste (both plastic and glass) and produces cost savings because new bottles and materials do not have to be sourced again.

- Use the green supply chain as a catalyst for innovation.
 - Introduce customer service quality by introducing innovative product buyback or exchange schemes.

- Align the green supply goals with the overall goals.
 - It does not help if a FMCG company decides to use biodegradable packing materials that cost 25% more than the traditional materials; this is not in alignment with one of its most important objectives – cost saving.

It is important to note that, even though a lot of companies are walking down the 'greening path', it is still in the development phase. FMCG companies need to realise the important role that the environment plays in their business, and then select the initiatives that are in line with their business strategy. The successful implementation of these 'greening' strategies or programmes is becoming a leading indicator of business success, and gives the companies a competitive advantage. In the decade ahead, when competition will only become tougher, FMCG companies that have ventured into different green supply chain management initiatives will be better placed than most traditional companies to win the customer's goodwill – and to be game changers in the industry.

2.4 Green Assessment Frameworks

The different frameworks available to companies in the FMCG were investigated to see which would be the suited framework for the specific task at hand.

2.4.1 Green SCOR

a. Definition of SCOR

The Supply Chain Council (SCOR) is the framework from which GeenSCOR was born, so a little background about SCOR first. It is an independent, non-profit, global organisation with membership open to all companies interested in applying state-of-the-art supply chain management systems and practices (Supply Chain Council, 2012). The SCOR represents the consensus view of supply chain management. While much of the underlying material of the model has been used by practitioners for a number of years, the SCOR model uses a unique framework that links the important business processes, metrics, best practices, and technological features into a structure that summarises and unifies the entire system to support communication among the supply chain partners. It also improves the supply chain management activities related to the supply chain.

SCOR helps to manage a common set of business problems through common business practices: standardised metrics that contribute to accelerated business change and to improved overall performance. An annual bottom line improvement of one to three percent is expected in all organisations implementing the SCOR model.

SCOR as aid in solving business problems:

- Strategy development
 - identify, instrument, and deploy supply chain strategies within and across organisations

- Merger, acquisition, or divestiture (of companies or supply chains)
 - merge or split up functioning supply chains to achieve merger, acquisition, or divestiture operational goals
- Supply optimisation and re-engineering
 - improving individual, clusters, or networks of supply chains
- Standardisation and streamlining
 - improve operational control and cost by standardising core processes
- Management alignment
 - create standardised management tools, reporting, and organisational structures
- New business start-up
 - create and deploy supply chains
- Benchmarking
 - competitive assessment of qualitative and quantitative performance
- Process outsourcing
 - identifying and outsourcing non-value-adding processes

b. Technology services:

- Implementation of software (ERP, PLM, QC)
 - pre-implementation definition and optimisation of supply chains
- Workflow and service-orientated architecture
 - optimisation of IT service provisioning

c. How to use SCOR

SCOR is typically used to identify, reorganise, and improve supply chains through cyclical processes of:

- Capturing the configuration of a supply chain, which is driven by:
 - Plan:
 - levels of information sources and aggregation
 - Source:
 - location and products
 - Make:
 - production sites and methods
 - Deliver:
 - channels, inventory deployment, and products
 - Return:
 - locations and methods

Each of the subsections is explained in the section below as from (Supply Chain Council, 2012):

Plan:

The Plan process represents the activities behind the planning to operate the supply chain. It forms part of the gathering of information and requirements from the available resources, balancing these resources and requirements to determine gaps and the planned capabilities in demand and resources and identifying activities to close these gaps.

Make:

This process describes the activities associated with the transformation of materials or the creation of the content that provides service. Conversion of materials is used rather than production or manufacturing as Make represents all types of material transformations: remanufacturing, refurbishment, recycling, overhaul, repair, maintenance, chemical processing, assembly and all other common names for material conversion processes. As a general

guideline these processes are represented by one or more item entering the system and one or more different items exits the system.

Source: (Focus of the case study)

The Source process describes the ordering (or scheduling of deliveries) and receiving goods and services. The Source process comprises of the issuance of purchase orders or scheduling deliveries, accepting the invoice from suppliers, storage of goods, validation and receiving. But with the exceptions of Engineered-to-Order goods and services, all qualification and contract negotiation, identification processes are not discussed by the source process elements.

Deliver:

The processes that describes the activities associated with creation and maintenance and fulfillment of customer orders. It signifies the receipt, validation and creation of customer orders, invoicing the customers, pack and shipment, picking and delivering. The Deliver Retail process provides a simplified view of source and deliver processes operated in Make-to-stock-only retail operations.

Return:

Describes the activities associated with the reverse flow of the goods in the supply chain. It embodies the identification of the need to return, the scheduling of the return, the shipment and receipt of returned goods, the disposition decision making and the scheduling of return. Repair, refurbishment, recycling and remanufacturing processes are not described using the return process element. (See Make)

Measuring the performance of the supply chain, and comparing that against its external and internal company goals. The performance drivers of SCOR:

- Reliability:
 - achievement of customer demand fulfillment on-time, complete, without damage, etc.
- Responsiveness:
 - the time it takes to react to and fulfill customer demand

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- Agility:
 - the ability of the supply chain to increase/decrease demand within a given planned period
- Cost:
 - objective assessment of all components of supply chain cost
- Assets:
 - the assessment of all resources used to fulfill customer demand

Re-aligning the processes of the supply chain and the best practices to meet unachieved and changing business objectives. This is achieved through a combination of:

- Process re-engineering
- Lean manufacturing
- Six Sigma
- Theory of constraints
- ISO-9000
- Balancing SCOR cards and benchmarking
- Industrial engineering-based best practices

Best Practices is another crucial part of SCOR and especially in designing the Green SCOR questionnaire. A best practice is a unique way to configure a process or a set of processes (Supply Chain Council , 2010). The uniqueness of the process can be related to the automation in the process, a technology applied to the process, special skills, a unique sequence for the process, or a unique method for distributing and connecting processes between organisations.

SCOR recognises that there is several types of practices in within any organisation:

- Poor practices
- Best practices
- Common practices
- Leading or emerging practices

In the design of the questionnaire the best practices currently in industry were considered. Best practices have are current, structured and repeatable practices that have had a proven and positive impact on the supply chain performance .

Current: not emerging, not outmoded

Structured: feature a clearly structured goal

Proven: demonstrated in working environment and linked to metrics

Repeatable: proven in multiple organisations and industries.

These practices have been chosen by SCOR practitioners in diverse industries. It is understood that not all practices will yield the same results to all industries.

These practices may also be called different things in different organisations, but what's important to recognise is that different practices have different performance expectations. The classification of practices will vary from industry to industry. For some organisations practices that are common may be considered best practices to another industry. The SCOR classifications of practices has been established based on input from practitioners and experts from a diverse range of industries.

d. Definition of Green SCOR

In 2002 it was realised that the SCOR model provided an ideal platform for tallying the entire environmental impact of the supply chain. Maintaining the integrity of the model, the Supply Chain Council worked in conjunction with the US Department of Defense, and added elements that define the environmental processes, performance matrices, and best practices. Formally adopted in 2008 as 'Green SCOR' in SCOR version 9.0, these additions allow the framework to do environmental accounting. The additional elements added to SCOR can be seen in Figure 6.

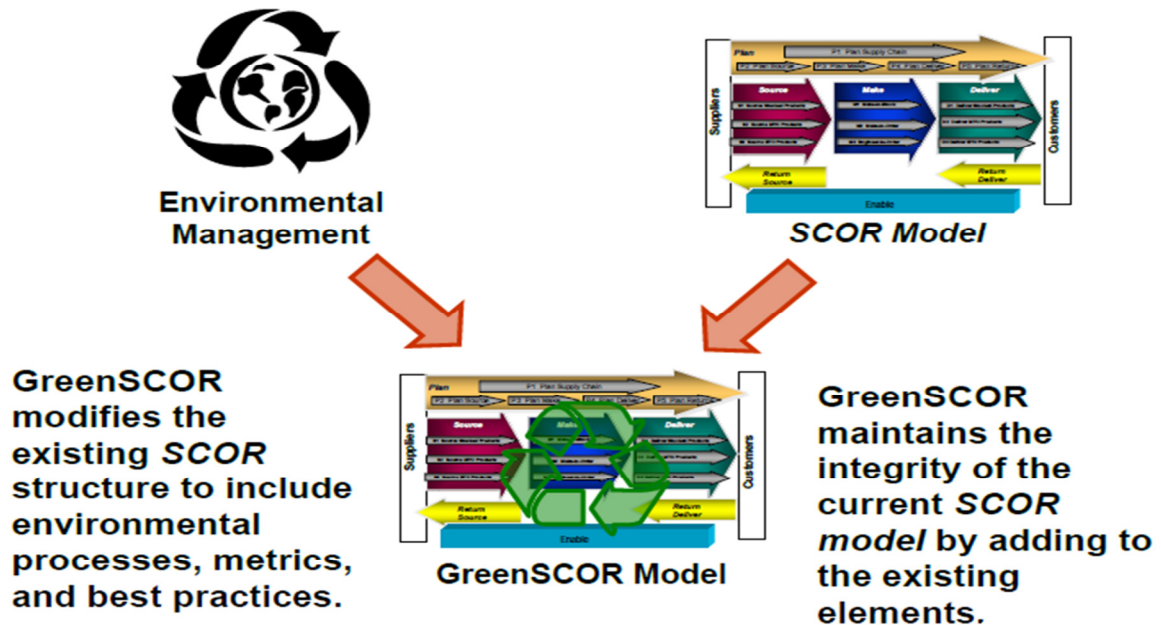


Figure 6: Integration of Green SCOR into SCOR (Source: Supply Chain Council, 2012)

Green SCOR identifies five environmental metrics that can be measured across the entire supply chain. The traditional SCOR model details hierarchy levels for processes and metrics that measure up to strategic organisation-wide levels. The Green SCOR metrics are focused on air pollution, carbon emissions, solid waste generated, liquid waste generated, and the percentage waste that is recycled, as seen in Figure 7. When this is applied within the existing SCOR framework, these metrics allow for the targeted data collection that will ultimately make it easier to create a full view of an organisation’s internal and supply-chain-wide environmental performance.

Metric	Units	Basis
Carbon Emissions	Tons CO ₂ Equivalent	This is the unit of measure currently used for green house gas emissions and is a measure of the climate impact from CO ₂ and other global warming air emissions.
Air Pollutant Emissions	Tons or kg	This would include emissions of major air pollutants (CO _x , NO _x , SO _x , Volatile Organics (VOC) and Particulate). These are the major emissions that EPA tracks.
Liquid Waste Generated	Tons or kg	This includes liquid waste that is either disposed of or released to open water or sewer systems (these emissions are generally listed on water emissions permits).
Solid Waste Generated	Tons or kg	The total solid waste generated by the process.
% Recycled waste	Per cent	The per cent of the solid and liquid waste that is recycled.

Figure 7: Proposed Environmental Footprint Metrics (Source: Supply Chain Council (2012))

The Supply Chain Council is also working with other organisations to create advanced supply chain practices. Organisations such as the World Resource Institute (wri.org) and World Business Council for Sustainable Development (wbcsd.org) are developing supply chain standards for greenhouse gas accounting as part of the Greenhouse Gas Protocol (ghgprotocol.org).

e. Obstacles companies might face implementing Green SCOR

As has been the case in recent years, the general state of the economy will continue to be a major barrier to the adoption of any environmentally sustainable business practice, which many executives see as an extra expense when they are struggling to maintain profitability. Despite the fact that there is a lot of interest in environmental issues, some business and government leaders will continue to show no interest in them. This is partially because environmental progress is not a core element of how investors measure company performance.

Another obstacle is the diverse range of maturity levels. When organisations consider their supplier base, they typically find that their vendors vary greatly in their environmental awareness and performance. The suppliers are just getting started, and those who are still learning will not be able to contribute much when a company launches, or attempts to renew, its environmental initiatives.

Internally, skills and knowledge are in short supply. Few people possess the unique skill set to join the supply chain management experience with sustainable management skills. Companies are overcoming this barrier by allowing cross-functional collaboration from supply chain and sustainability experts.

Solutions to these problems are overcome by using a number of available resources. Companies can form alliances with trade and industry associations, such as the Supply Chain Council, that work to collect and share helpful information between member organisations. These include the Environmental Defense Fund (edf.org), the World Wildlife Federation, and others who are working together on these environmental issues. Another source of assistance is

the academic world, where extremely knowledgeable experts are working with companies to analyse and modify their business practices and environmental viewpoint.

f. Example of companies leading the way

Wal-Mart is one of the best companies to consider, since they have a very broad product offering that will cause a great deal of action across a wide range of divisions. They have mostly done this by establishing complete sustainability scorecards for all their suppliers, and handing over the fine-tuning of the metrics to a third-party organisation, the Sustainability Consortium (sustainabilityconsortium.org), which is jointly administered by Arizona State University and the University of Arkansas. Some brand name companies have long had sustainability as a core part of their business model. In the apparel and footwear industries, examples are Patagonia and Timberland.

The early adopters tend to have a strong sustainability ethos in their organisations. Leadership makes it a high priority for market reasons, or from personal convictions. Not surprisingly, the leaders of these companies all have a good track record of building strong relationships with supply chain partners on the other issues, such as speed-to-market and factory conditions, which they have expanded to include supply chain sustainability.

2.4.2 ISO 140001

a. What is ISO 14001?

Investigating, ISO 140001, one of the other possible frameworks that might have worked for the specific project. ISO is the International Standards Organization. It has a membership of 160 national standards institutes from countries large and small. ISO's portfolio of more than 18,000 standards provides practical tools for all three dimensions of sustainable development: economic, environmental, and societal. ISO makes sure that only market-related standards are developed to ensure the relevance of the management system (International Standards Organisation, 2009).

The approach used by ISO is multi-faceted, incorporating all the needs of the stakeholders from business, industry, government authorities, non-governmental organisations, and consumers in the environmental field. Some of the aspects covered by ISO, include:

- Standards that help organisations to take a proactive approach to managing environmental issues: the ISO 14000 family of environmental management standards can be implemented in any type of organisation in either public or private sector – from companies to administrations to public utilities.
- ISO is helping to meet the challenge of climate change with standards for greenhouse gas accounting, verification, and emissions trading, and for measuring the carbon footprint of products.
- ISO develops normative documents to facilitate the fusion of business and environmental goals by encouraging the inclusion of environmental aspects in product design.
- ISO offers a wide-ranging portfolio of standards for sampling and test methods to deal with specific environmental challenges. It has developed some 570 international standards for monitoring such aspects as the quality of air, water, and the soil, as well as noise and radiation, and for controlling the transport of dangerous goods.

Improving the environmental impact of companies is one way to limit environmental damage. For this reason environmental management systems (EMS) such as ISO 140001 were put into place. ISO provides a framework that guides corporations that wish to manage their environmental affairs effectively. ISO is a set of international standards that improves the environmental performance of various organisations. Key aspects of ISO 140001 (Techpros, 2011) are that it

- is voluntary
- is flexible and non-prescriptive
- puts the focus on continual improvement
- increases cost savings by integrating environmental standards into company structure.

b. Advantages

ISO international standards and related normative documents provide customers, regulators, and organisations in both private and public sectors with the following environmental tools and advantages:

- They are technically credible
 - The standards represent the sum of knowledge of a broad pool of international expertise and stakeholders
- They fulfill stakeholders' needs
- They facilitate the development of uniform systems
 - Built on participation by its national member institutes from every region of the world
- They promote efficiencies
 - When the same standards are implemented across markets, sectors, and jurisdictions, things work more easily.
- They support regulatory requirements
- They enhance investors' confidence
 - because the standards can be used for conformity assessment by audit, inspection, or certification. This enhances confidence in products, services, and systems that can be demonstrated to conform to ISO standards.

The ISO family is designed to be implemented according to a Plan Do Check Act (PDCA) cycle underlying all the ISO management systems, as seen in Figure 8.

It is very important for a company to get accreditation for the efforts it puts into greening the supply chain. A good form of accreditation might be . The following benefits result from such a certification (Smithers Quality Assessments, 2012):

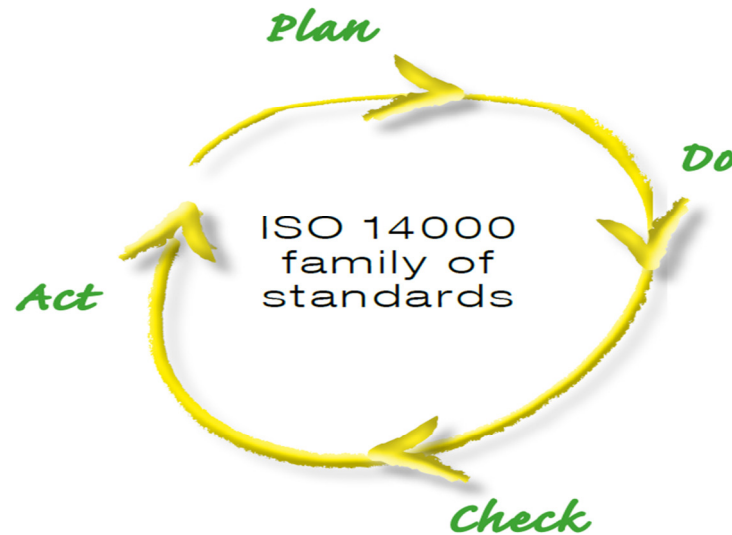


Figure 8 Plan Do Check Act (PDCA) cycle (Source: ISO 140001 family of international standards, (2009))

- Providing your company with the assurance that you meet, and will continue to meet, your environmental management system commitments and corporate policy requirements.
- Providing potentially fewer surveillance visits from regulatory agencies.
- Showing your business partners, regulatory agencies, and community that you are environmentally responsible.
- Increasing competitiveness.
- Increasing profits through potential process improvements and energy conservation.
- Reducing your environmental liability.
- Reducing costs as a result of potentially lower insurance rates.
- Verifying your systems for recognising and complying with environmental laws and regulations.
- Improving relationships with regulators. Organisations that implement an EMS often report improved relations with government regulatory agencies, finding that regulators are quicker to provide technical support and much more supportive in general.
- Capturing institutional knowledge. ensures that this information is properly documented, communicated, and retained. The cyclical nature of this management system further ensures that all system information is reviewed and updated at least annually.

- Streamlining operations. Organisations often save money as a result of greater operational efficiency and energy conservation, and reduce their use of hazardous materials and their generation of hazardous wastes.
- Increased awareness and participation. Organisations benefit from better communication about environmental issues inside and outside the organisation. gives people an avenue to raise environmental issues, and makes it clear that environmental performance is an important part of the corporate culture.
- Safety benefits. By reviewing the procedures for controlling significant operations, including a review of emergency preparedness and response procedures, organisations are able to identify and implement significant safety improvements.

2.4.3 Environmental standards

Environmental standards might have also provided a good insight into environmental frameworks to manage companies. An environmental standard is generally defined as a policy or guideline that is set in place to protect the environment from human activities. The American Society for Testing Materials (ASTM) has published hundreds of standards that promote environmental safety. These standards focus on cleaner air and water; eco-friendly homes and office buildings; improved waste management programmes and recycling; new inventions in dealing with oil spills; and improved environmental assessment processes. The environmental standards specified by ASTM are: atmospheric analysis standards, environmental assessment standards, risk management standards, environmental toxicology standards, waste management standards, and water testing standards (ASTM International, 2012).

a. Atmospheric analysis standards

ASTM's atmospheric analysis standards are involved in the analysis of certain properties of the atmosphere. These atmospheric analysis standards discuss various tests and practices used in determining whether certain materials and chemicals are present in the atmosphere. These materials and chemicals may include particulates, dusts, residues, airborne fibres and single-crystal ceramic whiskers, volatile organic compounds, aerosols, toxic gases, and vapours.

Some properties of the atmosphere that are discussed include air quality, surface pressure, surface temperature, and humidity. The atmospheric analysis standards also discuss the calibration and performance of certain measuring instruments, including rotameters, air filters, air analysers, Type S Pitot tubes, sonic anemometers, sonic thermometers, and diffusive samplers.

b. Environmental assessment standards and risk management standards

ASTM's environmental assessment and risk management standards provide the proper procedures for carrying out specific evaluations to identify and predict the possible biophysical, social, and other relevant impacts that certain products and projects may have on the natural environment, as well as on the health and safety of the immediate users of such products or projects. These environmental assessment and risk management standards are valuable to environmental scientists and engineers, impact assessment institutions, and real estate firms in implementing the appropriate environmental impact designs to ensure overall prevention of the associated contamination risks.

c. Environmental toxicology standards

ASTM's environmental toxicology standards provide the proper procedures for carrying out tests and other evaluations to assess and identify the potential impacts of certain substances on the species and constituents of the ecosystem into which the toxins were released. These toxins are released into the natural environment by natural or synthetic pollutants. These environmental toxicology standards are valuable to environmental scientists, ecotoxicologists, and other environmental groups in implementing the appropriate measures to ensure overall prevention of the associated contamination risks.

d. Waste management standards

ASTM's waste management standards provide the guides, practices, and test methods pertinent to the process of handling residential, commercial, and industrial waste. This process involves the collection, transport, processing, and recycling or disposal (whichever is applicable) of waste materials for health, environmental, or aesthetic purposes. These waste management standards are indispensable to local government authorities, which are responsible for residential and metropolitan wastes, and to industrial plants and laboratories, which are responsible for the wastes they generate.

e. Water testing standards

ASTM's water testing standards are instrumental in specifying and evaluating the methods and facilities used in examining the various characteristics of, and contaminants in, water for health, security, and environmental purposes. These water testing standards allow concerned local government authorities, water distribution facilities, and environmental laboratories to test the quality of water and ensure safe consumption.

2.4.4 Integrated environmental management

According to Margerum (1999), IEM is “a holistic and goal-oriented approach to environmental management that addresses interconnections through a strategic approach”. Even though no models of IEM have emerged, practitioners from all over the world are still forging ahead with the concept. It is clear that stakeholder and public involvement is crucial to the success of the model, because the feedback from these parties provides a more integrated approach and more effective support for implementation. Although this is such an effective concept, it is uncertain what steps and conditions should be followed to translate the concept into an effective model.

a. What is IEM?

According to Margerum (1999), integrated environmental management is based on the concept that environmental regions need to be managed holistically. Born and Sonzogni (1995) state that “IEM is a response to much of traditional natural resource management, which has been largely reactive, disjointed, and for narrow or limited purposes”. A recent review of the literature on IEM revealed four substantive elements (Margerum and Born, 1995). It is a holistic approach, considering the entire system rather than certain elements of subcomponents (Slocombe, 1993; Thomas et al., 1988). IEM also acknowledges interconnections in both physical and human systems (Johnson and Agee, 1988, Moote et al., 1994). Many authors also emphasise that IEM is goal-oriented or focused on end points (Grumbine 1994, Mitchell 1990, Moote et al. 1994). Finally, IEM must be strategic, which includes focusing analysis early and biasing planning towards implementing actions (Born and Sonzogni 1995, Lang 1986a).

Set standards are specified by Margerum (1999) to ensure that IEM will succeed:

Initiation

- Laws and policies support or do not prevent an integrated approach.
- There are resources to support the collaborative planning process.
- Major stakeholders are willing to participate in a collaborative effort.
- Stakeholder committee membership and selection processes are deemed legitimate.

- There are people with the skills and time to lead the effort.

Operation

- Stakeholders develop clear and effective processes for communicating.
- Stakeholders use clear decision rules.
- Stakeholders effectively identify and manage conflict.
- Stakeholders consult with the general public.
- Stakeholders base management decisions on a sound system understanding.

Outputs and outcomes

- Stakeholders foster familiarity, common goals, and mutual understanding.
- Stakeholders develop a strategic and flexible strategy to guide implementation.
- Stakeholders identify management actions that address a full range of factors.
- Stakeholders support implementation actions.
- Stakeholders identify a model for intervention to achieve management goals.
- Stakeholder committees assert their role in management activities.
- Stakeholders create structures and mechanisms for coordinating decision-making.
- Stakeholders support implementation with information and education programmes.
- There are resources to support or induce implementation.
- Stakeholders implement immediate actions to build confidence and momentum.

3. Research Design

3.1 Data-Gathering Approach

Gathering data is an integral part of a research project. To do this, formalised data-collecting approaches should be finalised. In most cases, generating new data will be limited by the resources available, and prioritisation will be needed. Data collection procedures are necessary to find and process existing data that will be used in the case studies of the project, as well as generating new data with surveys or measurement campaigns that will be used in the questionnaires of the project. Other methods include maintaining data flows, improving estimates, generating estimates for new categories, or replacing existing data sources (Goodwin, 2006).

- Goodwin also specifies the following methodological principles of data collection to ensure that good practice is followed:
 - Focus on the collection of data needed to improve estimates of key categories that are the largest, have the greatest potential to change, or have the greatest uncertainty.
 - Choose data collection procedures that iteratively improve the quality of the inventory in line with the data quality objectives.
 - Put in place data collection activities (resource prioritisation, planning, implementation, documentation, etc.) that lead to continuous improvement of the data sets used in the inventory.
 - Collect data/information at a level of detail appropriate to the method used.
 - Review data collection activities and methodological needs on a regular basis, to guide progressive and efficient inventory improvement.
 - Introduce agreements with data suppliers to support consistent and continuing information flows.

3.1.1 Generating new data

The generation of new data is best undertaken with appropriate expertise and guidance. This project has been guided by two experts and is based on the Green SCOR framework. Activities like this are often resource-intensive and are most appropriately considered when the category is key and no other options are available. To optimise the resources used, it is always better to generate the required data from an extension of existing programmes (such as Green SCOR) rather than the initiation of completely new ones.

3.1.2 Generating data by measurement

When considering using measurement data, it is very important to ensure that it covers a representative sample – that is, to make sure that it covers a substantially large enough portion of the whole category, and also to check whether a suitable measurement method was used. The best measurements to use are usually those that were developed by official standards organisations and were field-tested to achieve their operational characteristics. Using these methods will increase the consistency of the measured data, and provide the inventory compiler with additional information about the method. (See Table 3, Appendix C.)

3.1.3 Selection of appropriate tools and techniques

The best-suited green assessment tool, the Green SCOR model, was selected. From this model a questionnaire was developed and sent out to the companies. It focused on transportation, packaging, logistics, accreditation, energy, environmental management, waste management, recycling, and training.

The data-gathering approach followed was that of generating new data through a questionnaire built on the above-mentioned Green SCOR model. The generation method was through the optimisation of resources.

The data-gathering technique consisted of a combination of questionnaires and telephonic interviews. Later in the project, one or two case studies were completed to get an in-depth view of the successful implementations of a green supply chain management framework or system.

3.2 Data Gathering Techniques

3.2.1 Questionnaires

The purpose of data collection and analysis is to uncover facts, relationships, and causations. It is about discovering objective facts, and not about getting people's views and opinions (Buys, 2010). Fanning (2005) describes how the success of a survey lies in the response rate, or how many people actually respond to the survey.

See Appendix B for the project's questionnaire.

a. Formatting (Fanning, 2010)

This specifically refers to how well the questionnaire is laid out, how information is presented and organised, and even the size, shape, and colour of the paper it is printed on. Why is formatting a questionnaire important? (Bradburn, Sudman & Wansink, 2004)

- A well-formatted survey is easier to read and complete.
- It improves the response rate
- It reduces the number of errors
- It reduces chances of mis-read or overlooked questions (Dillman, 2000).

b. Design considerations according to Dillman (2000):

- What is the goal or purpose?
 - Current green supply chain status/maturity
- Define the topics
 - Plan, make, source, deliver, return
- Define the concepts
 - Water, air, waste, re-usable packaging, fuel (carbon emissions), and energy
- What is the content or scope to be covered?
 - Fast-moving consumer goods
- Consider your question wording and order
- Length of the survey
 - 23 questions
- How should the responses look?
 - Yes/no
 - Multi-choice
- Use a consistent responding method
- Make sure the wording of questions avoids bias
- Minimise apprehension (make sure that respondents know their feedback is valuable and confidential).

c. The questions – ordering

The way that questions are ordered is important. Questions should be grouped into topics; the questions establish both the logic and the flow of the questionnaire survey (Dillman, 2000; Babbie, 1973; Bradburn, Sudman & Wansink, 2004).

d. The questions – first question

The first question is crucial, since it sets the mood for the rest of the questionnaire. It should pertain to the purpose of the survey, as stated in the title. It is important to pay close attention to the question, since it motivates the respondent to complete the rest of the survey (Dillman, 2000). The following pointers should be carefully considered, according to Dillman. The first question should:

- apply to all the respondents
- be easy and quick to complete
- be easy to read, understand, and respond to (Babbie, 1973)
- be interesting
- connect with the purpose of the survey

e. The questions – dangerous questions

Dangerous questions can offend and completely ruin the response rate. The questions to avoid, according to Dillman (2010), are:

- personal questions – these could dampen the respondent's enthusiasm to continue, and break trust
- confidential information – for the same reasons as above
- demographics – these are uninteresting, and may have little to do with the purpose of the questionnaire

f. The questions – grouping

Assuming that best practice is followed and that questions are ordered by type, it is necessary to consider the order of the questions within these groupings. The respondent will respond according to cognitive and normative influences. Cognitive influences, according to Dillman (2000), include:

- anchoring effect – the preceding question determines the answer to the next question
- addition effect – the respondent's answer to the next question is influenced by the first question
- subtraction effect – balancing responses by following a very negative response with a highly positive question
- a “norm of evenhandedness” – this tries to be fair in how the respondent answers the next question, based on the answer of the previous question

Guidelines on how to group the questions in a logical flow through the survey (Dillman, 2010; Knowles, 1975):

- group by content
- group by type
- keep logical ordering
- manipulate the design to increase the probability of respondents understanding questions and processing them in the same sequence, as if in an interview.
- use colour to establish groupings
- Ask objectionable questions at the end

g. Survey length

The length of the survey is very important, since it can create a loss of interest or lower the response rate. According to Dillman (2010), when determining the length of the survey, one must always determine the respondent's level of:

- responsibility
- commitment
- interest

In addition to these, it is important to pay attention to the respondent's stamina. If the survey is too long, the respondent may begin to choose from the first answer choices (in a multiple choice survey) out of fatigue. Shorter surveys may improve the response rates, but there is a downside to shorter surveys: information is cramped into questions, and the survey length is inconclusive. However some tricks can be used, such as decreasing font size and line spacing.

h. Key questions that should be answered through the questionnaires:

- Determining the current status and maturity of the green supply chain in the FMCG sector of South Africa.
- The potential value that Green SCOR and green supply chains can offer a company.
- Possible case study of successful or partial green supply chain implementation.
- Success stories.
- Key challenges in implementing a green supply chain.
- Aspects to consider.
- What to measure.

3.2.2 Sample size

According to iSix Sigma (2012), it is important to measure the process capability before and after, to prove that the process has been improved. In the green supply chain, the 'before' still has to be measured, and that is one of the project aims. What is the minimum amount of data or samples required to represent the entire population of FMCG companies across South Africa? If the data has been acquired, how is it determined if there is enough data (the 'required sample size')?

So the next crucial step is determining the sample size. How many questionnaires should be sent out before a feasible answer is reached? As described by Buys (2010), there is no prescribed

sample size, but different sample sizes can provide different degrees of reliability (probability of getting the same results if the survey were repeated) and accuracy (estimated margin of error).

If the sample size is too large, precious time and resources are wasted; while sample sizes that are too small will produce inaccurate results. iSix Sigma (2012) states that, in many cases, it will be easy to determine the minimum sample size needed to establish the process parameters, such as population mean μ .

After all the data has been collected and a sample mean \bar{x} has been calculated, that sample mean is typically different from the population mean. The difference between the sample and population means can be thought of as an error. The margin of E is the maximum difference between the observed sample mean and the true value of the population mean:

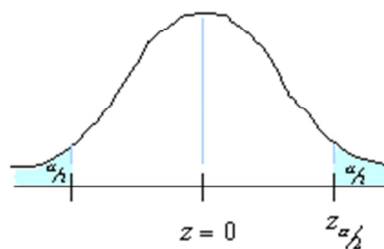
$$E = z_{\alpha/2} \cdot \frac{\sigma}{\sqrt{n}}$$

where:

$z_{\alpha/2}$ is known as the critical value, the positive z value that is at the vertical boundary for the area of $\alpha/2$ in the right tail of the standard normal distribution.

σ is the population standard deviation.

n is the sample size.



By rearranging this formula, the sample size can be calculated such that, within the specified confidence and margin of error:

$$n = \left[\frac{z_{\alpha/2} \sigma}{E} \right]^2$$

Due to the sensitivity of the sample size and all its special cases, help and consultation from the study leaders was asked. After some discussion and advice from my study leaders it was decided to set a goal for a sample size of $n=20$.

3.2.3 Case studies

a. What is a case study?

Case studies are stories of interest from individuals, organisations, processes, programmes, or organisations. The case study is the story behind the results that captures what happened to bring it about. It can also be a very useful tool to highlight a project's success.

b. Advantages and limitations

The main advantage of case studies is that they provide much more detailed information than surveys or questionnaires. Case studies also allow data collection from a wider variety of sources such as questionnaires, surveys, interviews, documentation, review, and observation. A couple of limitations and pitfalls of case studies are listed below (Neale, 2006).

- They can be lengthy
 - because they contain detailed information about a case, it could be easy to lose the reader's attention
- There are concerns that case studies lack rigour
 - they are seen as less rigorous than surveys in the research field
- They are not generalisable
 - this is a common complaint, because it is difficult to generalise from one case study to another.

c. Process of conducting a case study according to Neale (2006)

- Plan
 - Identify stakeholders who will be involved.
 - Brainstorm a case study topic, considering types of cases, and why they are unique or of interest.
 - Identify what information is needed and from whom (see “What are potential sources of information?” and “What are the elements of a case study?”).
 - Identify any documents needed for review.
 - List stakeholders to be interviewed or surveyed (national, facility, and beneficiary levels) and determine sample if necessary.
 - Ensure research will follow international and national ethical research standards, including review by ethical research committees. (For more information, see the international ethical guidelines for biomedical research involving human subjects, available at http://www.cioms.ch/frame_guidelines_nov_2002.htm.)
- Develop an instrument
 - Develop interview/survey protocols – the rules that guide the administration and implementation of the interview/survey. Put simply, these are the instructions that are followed to ensure consistency across interviews/surveys, and thus increase the reliability of the findings. The following instructions should be included in the protocol:
 - what to say to interviewees when setting up the interview/survey;
 - what to say to interviewees when beginning the interview/survey, including ensuring informed consent of the respondent (see Appendix 1 for an example);
 - what to say to respondent in concluding the interview;
 - what to do during the interview (for example, take notes? audiotape? both?); and
 - what to do following the interview (for example, fill in notes? check audiotape for clarity? summarise key information for each? submit written findings?)
 - Develop an interview guide/survey that lists the questions or issues to be explored and includes an informed consent form. (The researcher will likely need

interview guides/surveys for each group of stakeholders, as the questions may differ.)

- Where necessary, translate guides into local languages and test the translation(s).
- Collect data
 - Gather all relevant documents.
 - Set up interviews/surveys with stakeholders (taking care to explain the purpose, why the stakeholder has been chosen, and the expected duration).
 - Seek the informed consent of each respondent (written or documented oral). Re-explain purpose of interview, why the stakeholder has been chosen, expected duration, whether and how the information will be kept confidential, and the use of a note taker/tape recorder.
 - If the respondent has consented, conduct the interview/survey.
- Analyse data
 - Review all relevant documents.
 - Review all interview/survey data.
- Disseminate findings
 - Write report.
 - Solicit feedback.
 - Revise.
 - Disseminate.

3.3 Hypothesis

One of the reasons for the research in this section is to test the following hypothesis:

“Green supply chain management has the potential to improve the impact of companies on the environment, while also having a positive influence on the companies of the fast-moving consumer goods sector in South Africa.”

3.4 Selection of Appropriate Tools and Techniques

The best-suited green assessment tool that was selected is the Green SCOR model. From this model, a questionnaire was developed that was sent out to the companies. It focused on transportation, packaging, logistics, accreditation, energy, environmental management, waste management, recycling, and training.

The data-gathering approach followed was the generating of new data through a survey/questionnaire built on the Green SCOR model. The method of generation was through the optimisation of resources, as it is always better to generate the required data from an extension of existing programmes (Green SCOR) rather than the initiation of completely new ones.

The data-gathering techniques consisted of a combination of questionnaires/surveys and telephonic interviews. Later in the project, two case studies were to be completed to get an in-depth view of the successes of implementing a green supply chain management framework or system.

4. DESIGN AND PROBLEM-SOLVING

4.1 Data Information and Maturity Assessment

An initial careful study of the range of available green supply chain frameworks was done to gain some insight into the industry. Green SCOR was found to be one of the best-suited frameworks to satisfy the need of covering the widest range of the supply chain, since it is composed of the following frameworks (Supply Chain Council , 2010):

- Process re-engineering
- Lean manufacturing
- Six Sigma
- Theory of constraints
- ISO-9000
- Balancing SCOR cards and benchmarking
- Industrial engineering-based best practices

An entire list of questions was designed from the best practices of Green SCOR. The best questions were then selected from the list, to suit the study best.

The questions were then sent to experts to review and to analyse whether they were sufficient, and in the light of their feedback, a scientific questionnaire was designed according to questionnaire guidelines. The questionnaire was then sent out to various companies in the FMCG sector, including transport, packaging, producers, suppliers, and retailers. Feedback from these companies was then analysed.

4.2 Questionnaire Design

The questionnaire was divided into sub-sections during the design process. The sections, according to SCOR, are:

- plan

- make
- source
- deliver
- return

To ensure that the analysis of the results would be according to the specified sections (that is, to see whether specific areas of the company should be improved), specific questions were compiled. Questions one to seven are based on the 'plan' section of SCOR, question 7.2 is an 'enable' question, questions eight to ten are based on 'source', questions 11 to 15 are 'make' and 16 to 20 is based on 'deliver'. For more information about this sub-section, refer to section 2.

The questions were compiled from the best practices section in SCOR 10 which can be found in Appendix E.

Theme colours were assigned according to the sub-sections so that the company answering the questionnaire should distinguish which department could answer specific questions.

It was also asked what company the person was from, in order to distinguish the role that the specific shop played in the supply chain. The position of the person within the company was needed to see whether there was an environmental department in the company.

Included in almost every question were columns for the person to fill out, either the challenges faced by the company or the initiatives implemented by the company in the specific case of the question.

4.3 Case Study Design

Since it was noted from the questionnaires that there was a problem in the sourcing departments of most companies, it was decided that sourcing would be the focus of the case studies.

The Green SCOR best practices in appendix E was used again, but this time it was filtered by looking for all the sourcing best practices. The following questions were compiled and after each

question the SCOR reference code is shown with the definition (Supply Chain Council, 2012) of the process it represents:

- Is there access to supplier environmental management and compliance data?

sES.3 Maintain Source Data

The process of collecting, sorting, defining hierarchy, and managing the configuration control of supplier information and source data that are required to make sourcing and related planning and manufacturing decisions. Source data to be maintained includes supplier profile data, financials, quality and delivery performance, spend analysis at various levels of the enterprise, from major business units to material part number

- Are there collaborative environmental management processes with suppliers, including EMS integration?

sES.1 Manage Sourcing Business Rules

The process of defining requirements and establishing, maintaining and enforcing decision support criteria, in alignment with business strategy, goals and objectives. The business strategy defines the criteria for sourcing business rules that are translated into guidelines and policies for conducting business within the enterprise and other legal entities. Sourcing business rules include: supplier selection and negotiation processes, fulfilment and delivery performance and relationship definition for specific levels of collaboration and partnership.

- Is there a partnership developed with suppliers to help them implement and maintain environmentally sustainable business practices?

sES.2: Assess Supplier Performance

The process of measuring actual supplier performance against internal and/or external standards, providing feedback to achieve and maintain the performance required to meet the customers' business and/or competitive needs

- Are deliveries of different products bundled into single shipments when possible?

sS1.1 Schedule Product Deliveries

Scheduling and managing the execution of the individual deliveries of product against an existing contract or purchase order. The requirements for product releases are determined based on the detailed sourcing plan or other types of product pull signals.

- Have direct shipments been enabled between customers to reduce overall transportation and handling?
- Are there any environmental partnerships with suppliers?
- Is the need for frequent shipments minimised by accurately determining product needs?

sS1.1 Schedule Product Deliveries

- Are products reviewed for compliance with environmental specifications, including the packaging?

sS1.3 Verify Product

- Are firms offering product “-take-back-” programmes chosen?

sS.3.2

- Are previously used supplies purchased?

sS3.1 Identify Sources of Supply

The identification and qualification of potential suppliers capable of designing and delivering product that will meet all of the required product specifications.

- Are products produced by recyclers and remanufacturers purchased?

sS3.1 Identify Sources of Supply

Same as above

- Are firms selected that have implemented Environmental Management Systems?

sS3.2 Select Final Supplier and Negotiate

The identification of the final supplier(s) based on the evaluation of RFQs, supplier qualifications and the generation of a contract defining the costs and terms and conditions of product availability.

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- Are firms selected that are ISO 14001 certified or similar?

sS3.2 Select Final Supplier and Negotiate

Same as above

- Are alternative vehicles used?

Transfer Product

- Are green purchasing practices used?

sS1 Source Stocked Product

The process of ordering, receiving and transferring raw material items, sub-assemblies, product and or services based on aggregated demand requirements. The intention of Source-to-Stock is to maintain a pre-determined level of inventory for these materials, subassemblies or products. No customer reference or customer order detail is exchanged with the supplier, attached to or marked on the product, or recorded in the warehousing or ERP system for Source-to-Stock products. Examples of alternative or related names for Source to-Stock are: replenishment inventory, drip parts, kan-ban, andon, and bulk or generic stock

- Are high efficiency fuel vehicles used?

sS2.4 Transfer Product

- Utilize energy-efficient lighting and heating systems throughout warehouse and production areas?

sES.4 Manage Product Inventory

The process of establishing and maintaining physical inventories and inventory information. This includes warehouse management, cycle counting, physical inventories and inventory reconciliation. For Services, this may include tracking the number of service providers and the financial resources committed at any given point in time.

- Use energy-efficient HVAC systems?

Same as above

- Establish supplier environmental requirements?

sS3.2 Select Final Supplier and Negotiate

- Implement rigorous pollution prevention programme?

sS1.4 Transfer Product

- Use reusable pallets?

sES.4 Manage Product Inventory

The process of establishing and maintaining physical inventories and inventory information. This includes warehouse management, cycle counting, physical inventories and inventory reconciliation. For services, this may include tracking the number of service providers and the financial resources committed at any given point in time.

- Develop a set of environmental performance criteria for all suppliers?

sES.2: Assess Supplier Performance

The process of measuring actual supplier performance against internal and/or external standards, providing feedback to achieve and maintain the performance required to meet the customers' business and/or competitive needs

- Maintain and manage current foreign environmental regulations?

sES.8 Manage Import/Export Requirements

The process of identifying and complying with import/export regulatory documentation and process standards set by external entities (eg, government).

- Use maintenance free batteries in warehouse/short haul vehicles?

sES.4 Manage Product Inventory

The process of establishing and maintaining physical inventories and inventory information. This includes warehouse management, cycle counting, physical inventories and inventory reconciliation. For services, this may include tracking the number of service providers and the financial resources committed at any given point in time.

5. Conclusions

5.1 Results of the Questionnaires

All of the questionnaires results were then compiled into different tables, as seen in the screen capture in , to summarise the information in Microsoft Excel. First each company was analysed separately and initial results were then grouped into the deliver, enable, make, plan and source. From this the specific company can see on what part of the supply chain should be focused.

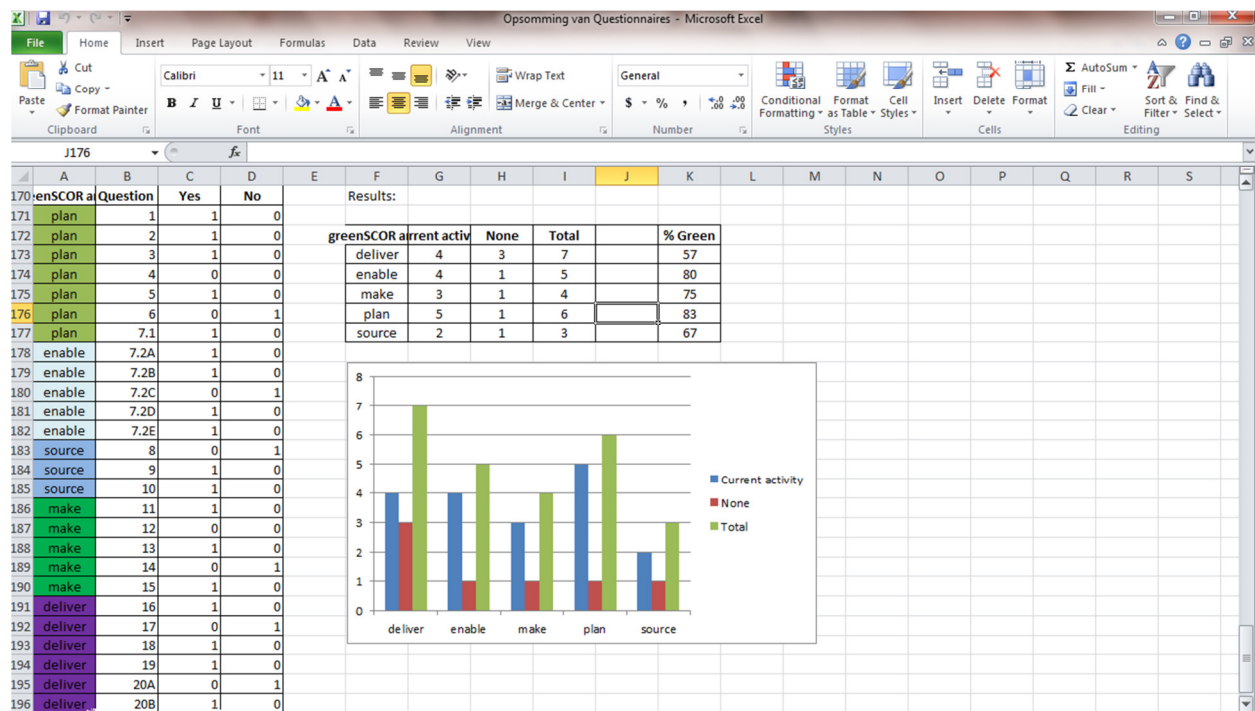


Figure 9 Initial results per company

The individual company results were then compiled into pivot tables in order to abstract the necessary conclusions as seen in Figure 10.

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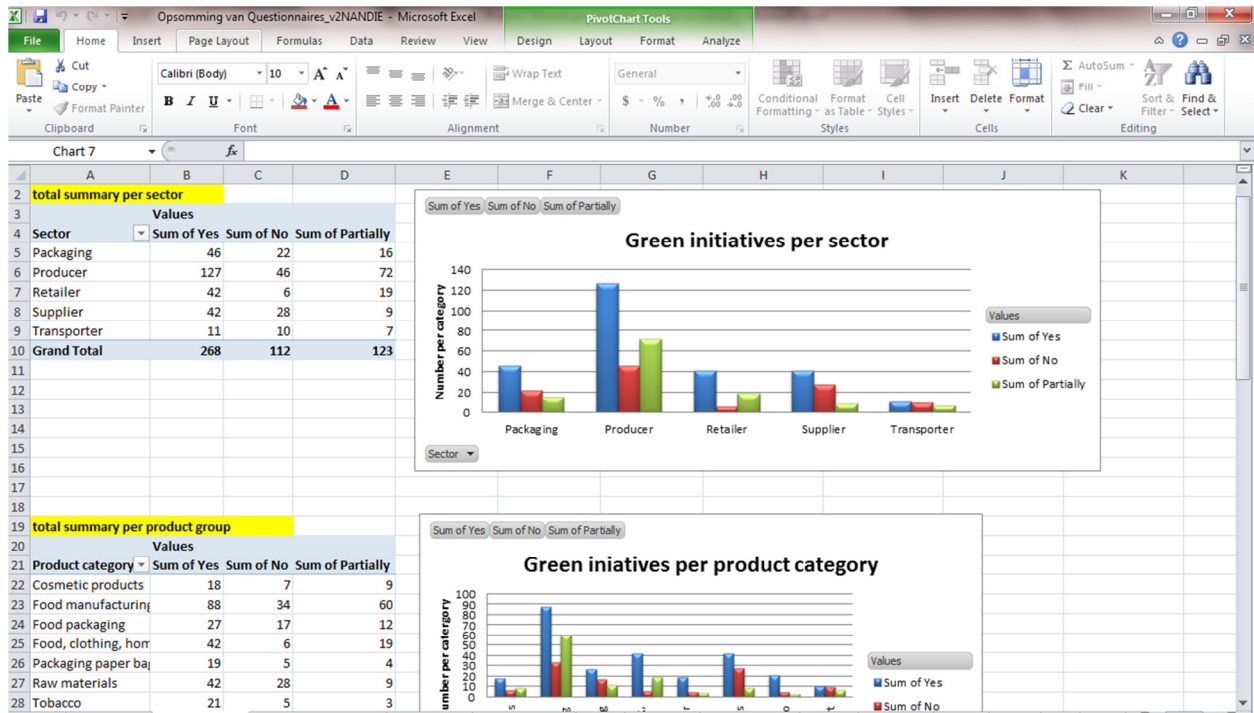


Figure 10 Pivot tables of combined results

The total summary per specific sector is the first results considered. It should be noted that producers are clearly in the lead, with the number of questionnaires completed resulting in a current ratio of 127:46, equating to 2.76 ‘yes’ answers for every ‘no’ answer. Transportation is at the bottom, but unfortunately this category cannot be compared, since the sample size is too small. One questionnaire was returned in this category with a ratio of 11:10, equating to 1.1.

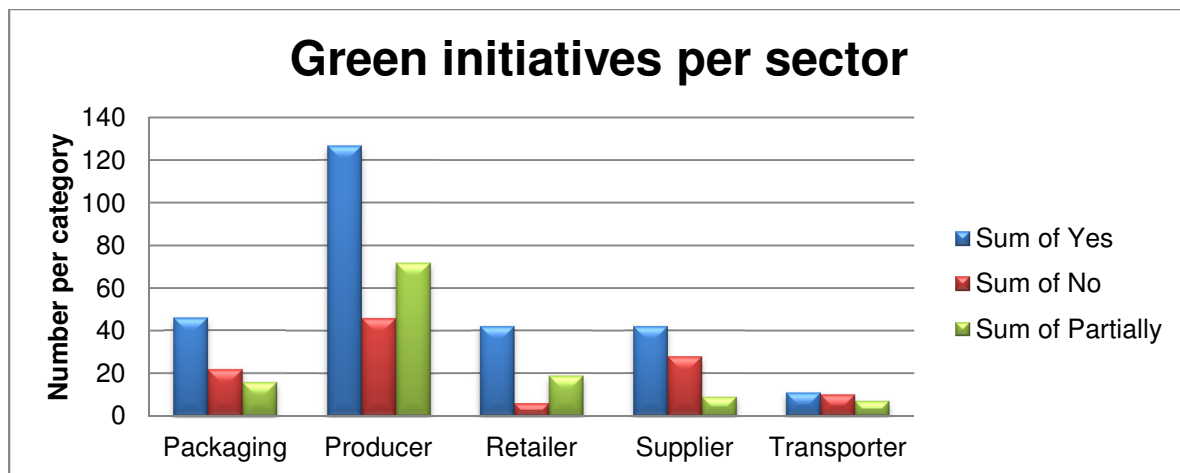


Figure 11 Summary per section

The results depicted in and are the categorised according to the various products of the companies assessed. The food manufacturing category is the leader amongst the categories with transport in last place, but Keep in mind, though, that the transport questionnaires were not sufficient to make valid assumptions.

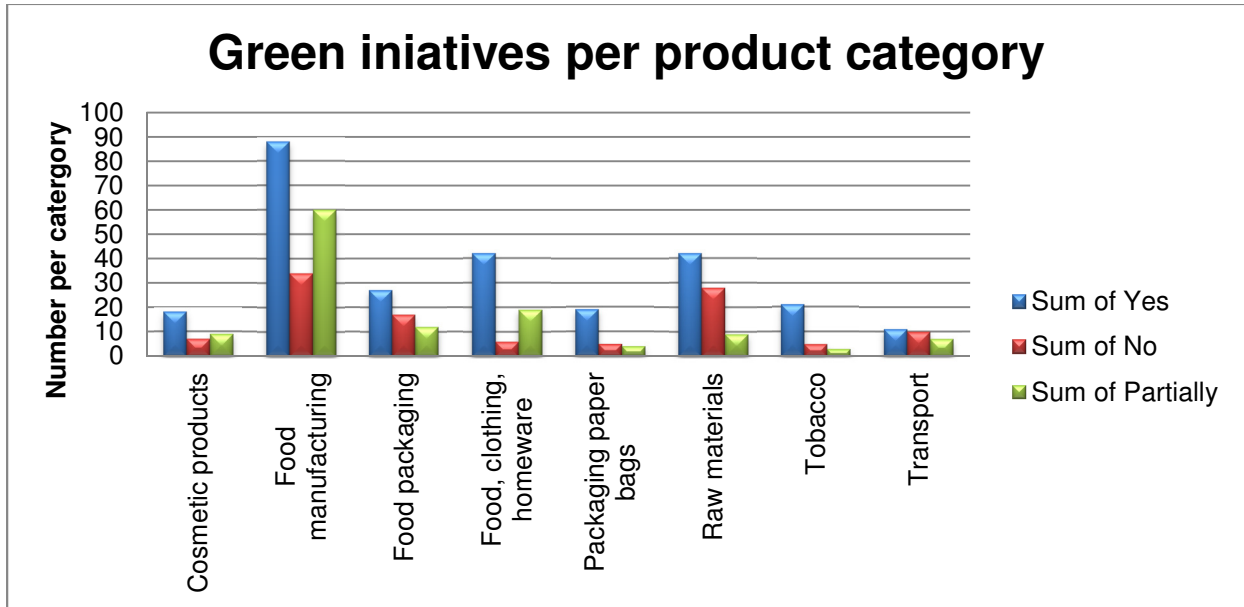


Figure 12 Summary per product group 1

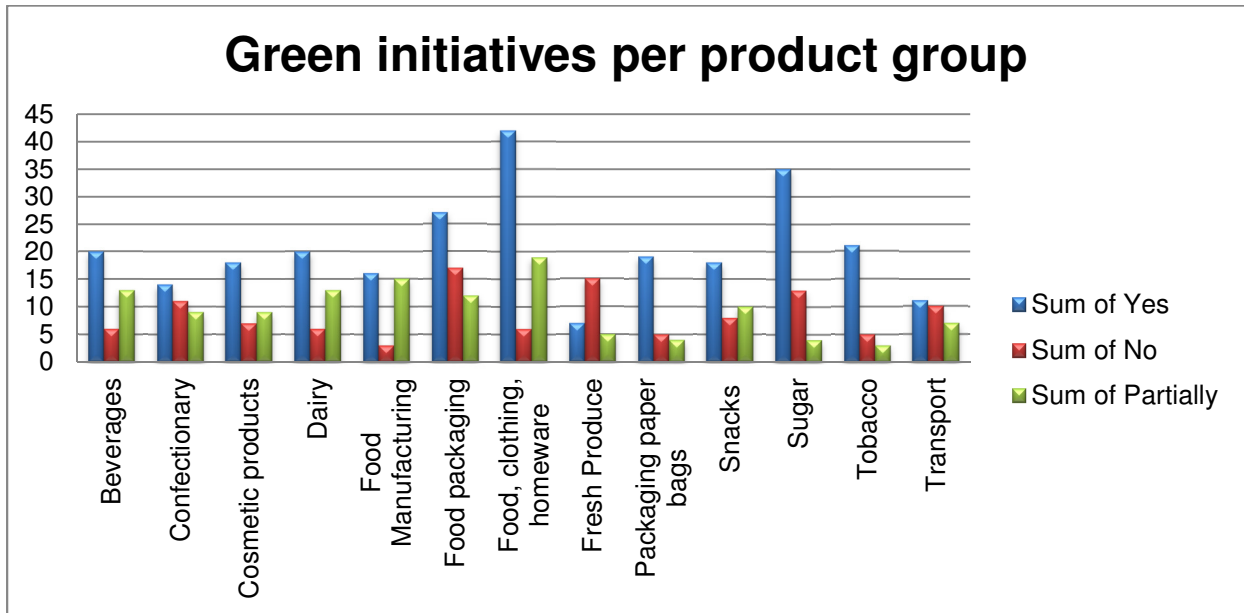


Figure 13 Summary per product group 2

Considering the categories of Green SCOR, source seems to be the lowest targeted area by the companies in the sample size as seen in Table 3. Thus two case studies will be conducted, focusing on the Green SCOR source category. From the case studies it will be shown what companies are currently doing in their sourcing departments. The case studies can be seen in Appendix C.

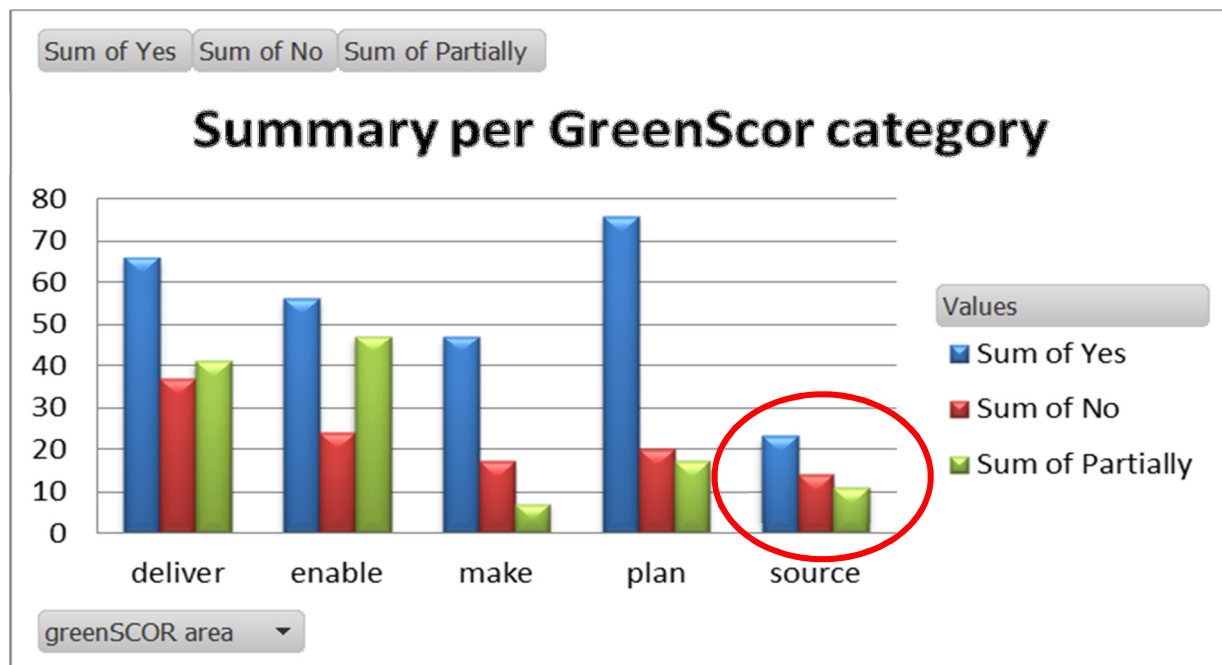


Figure 14 Conclusion of Green SCOR categories summary

Some general conclusions were noted while the author was busy with the questionnaire interviews:

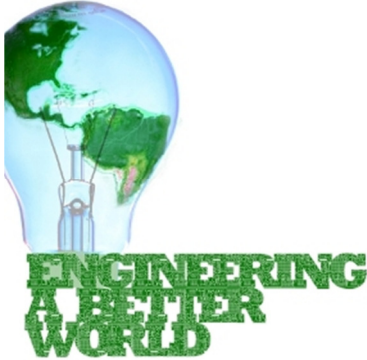

Awareness: While conducting the interviews, it was noted that a lot of the companies do not have an ‘environmental awareness’: there were no environmental experts or teams focused on this issue and working within the companies. They did not have frameworks or tools to measure themselves against, thus they were unable to fill out any questionnaires.



Money – cost: The focus of every company is first on saving money and maximising profits. A way to make money has to be shown in order for a company to adapt company policies and processes, or legislation has to force a company to do so.


Transport: The companies have contracts with external companies that handle the transport. Thus the companies are generally uninformed about the environmental procedures. The fact that transportation is outsourced takes a lot of the responsibility away from the company.

5.2 Challenges and initiatives

Since the questionnaires have shown that there is a need for green supply chain management and in specific the sourcing department, two case studies was conducted on the sourcing of FMCG retailers. Listed below is some of the challenges and initiatives faced by companies grouped and categorised:

<p>Energy</p> 	<p>Initiatives</p> <ul style="list-style-type: none"> • 24 grid monitoring • Annual objectives set for energy reduction; various initiatives from process optimisation to engineering initiatives. • backup generators • changing lighting, eskom initiative , aircons, light sensors, shower head, natural light • energy from sugar wheat that is by product in the system...generate own energy • generate own electricity, coalsupply to Eskom • battery packs with solar panels • Sensors for lights and aircons • Heat recovery from refrigeration; energy from biomass • Generation of energy through steam • reallocation of air conditioning units; flash steam recovery • RECON CAPEX Projects: Motion sensors in all offices
<p>Recycling</p> 	<p>Challenges</p> <ul style="list-style-type: none"> • Practical strength and integrity of packaging has to be maintained • Availability of affordable packaging material with high recyclable content; barrier/protection properties of certain renewable packaging material. • Al lot of the materials are not recyclable especially multi layered packaging

	<p>Initiatives</p> <ul style="list-style-type: none"> • Ablution block & Waste Management areas use solar geysers • All cardboard is provided by and recycled by New Era • Anything not used by customers is returned and recycled • Crates are reusable and bags are reusable • Give back get back campaign (glass) with deposit's • Capturing the rain water in tanks • Workshop mats made from recycled materials • Contracts with their partners to recycle (collaborative) • Nampak recycles paper and cardboard for us • Water membrane filtration system •
<p>Green Frameworks and accreditation</p> 	<p>Initiatives</p> <ul style="list-style-type: none"> • All our own plants are accredited: ISO 9001:2008, HACCAP, SANS:2009, (measuring containers)) • FMCG requirements, Walmart focus • Focused food safety and manufacturing , upgrading to iso 22000
<p>Transport</p> 	<p>Challenges</p> <ul style="list-style-type: none"> • 30 % own transport 70% outsourced • Mostly outsourced to 3rd party • Cost is always a challenge to overcome <p>Initiatives</p> <ul style="list-style-type: none"> • All procurement done in South Africa especially to Africa, and deliveries to Africa are consolidated as far as possible due to risk of traveling so far • All transport is outsourced to 3PL's • At the moment only through smarter delivery...after that alternative vehicles • Barloworld's responsibility...they do have environmental programmes in



	<p>place</p> <ul style="list-style-type: none">• Making use of more train transport• Central distribution centre• Currently using lpgas on forklifts• Full loads• Specific trees planted for CO₂ emissions compensation• Optimised inbound modelling (Full truck Loads), minimal redistribution• Pick n Pay home shopping provides consolidated deliveries• Production and distribution planned between plants to avoid trucks "-passing in the night-"• Route optimisation, centre of gravity studies for distribution centre locations
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Through these case studies an insight is gained into the obstacles and success stories of these specific companies leading the way into a 'greener' future.

5.3 Results of the Case Study

Table 3 below shows the sourcing methods by two green orientated retailers compared with normal retailers.

Table 3 Results comparing case studies

Question	PnP Nicol 	 WOOLWORTHS	Normal retailers
Is there collaborative environmental management processes with suppliers, including *EMS integration? *environmental management system	PnP is busy working with Unilever, one of the largest suppliers in the world, to reduce waste to landfills by 30% by 2014.	Yes, specifically Farming for the Future, but also on specific biodiversity and other environmental issues e.g. Sustainable fishing	Normal waste generated and increasing each year.
Are deliveries of different products bundled into single shipments when possible?	A consolidated delivery system is created where customers order products over the internet and deliveries are then consolidated and delivered on worked out routes.	Yes, where possible	Customers come one by one with their cars to come and buy personal groceries.
Are there any environmental partnerships with suppliers?	Collaborations with the suppliers to create green product lines . In each product line there is a green range available for the customers if they prefer buying green products. Organic fresh produce & free range meats	Yes, both with product suppliers e.g Farming for the future, but also with logistics suppliers/partners such as Imperial Organic & Free range available. Environmental	The normal products is available with no green alternatives to choose from.

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	available in butchery.	packaging	
Are firms offering product “take-back” programs chosen?	There are large recycling bins in the front of the shop allocated for recycling of florescent and neons, batteries and electronic components.	Where available, yes	A customer has to deal with his/her own waste and recycling.
Is previously used supplies purchased?	All the plastic bags used in the store and retrieved in the take-back program is recycled and turned into trolleys used in the shop.	Yes, also for store operations – e.g. trolleys/baskets/hangers	Previous used supplies is sent to landfills.
Is green purchasing practices utilized?	An example of green purchasing is the SASSI program that focuses on sustainable fishing .	Yes	Normal purchasing without an idea of what happens to the environment because of the purchasing.
Is high efficiency fuel vehicles used?	As far as possible, but the technology and equipment limited	Yes – Euro 5 technology etc	Normal vehicles used
Utilize energy-efficient lighting and heating systems throughout warehouse and production areas?	Natural light through large windows, light sensors adjusting light as outside becomes darker, all heating systems is powered by solar power panels.	Yes	Normal florescent lighting and air-conditioning regulating the temperature and light inside shops.
Utilize energy-efficient *HVAC systems? *Heating, ventilation and air-conditioning	Fridges use an innovative air cooling design that functions without the environmentally dangerous gasses like R-134a. All the grey water is captured in the parking lots through porous cement into tanks. This water is then cooled down cooling towers until it is	Yes	Makes use of normal refrigeration and gasses.

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	turned into ice. The cold air from the ice is used in fridges in the shop.		
Develop a set of environmental performance criteria for all suppliers?		Yes, being rolled out at present	Normal ordering without performance criteria for suppliers.
Implement rigorous pollution prevention program?	The building itself is reducing the carbon footprint on the environment. Grease traps in the main water disposal lines eliminating greases from the water.	Yes – policies around use of chemicals	Normal building using electricity and water etc. disposal of water without any filtration.
General initiatives	Water retention dams in nearby rivers to stop ground erosion. Solar powered traffic robots		

5.4 Future Studies

As always, time is an issue with these kinds of projects. There are a thousand things that could still have been done to improve the quality, content, and experiments of the project.

For future studies the scope could be broadened. This specific questionnaire was very basic in nature, touching only the surface of what is still out there. There is so much detail that can be added in this field. In this specific study, two or more questions were chosen from each sub-section: plan, make, source, deliver and return in Green SCOR. The case studies were only focused on the 'source' section.

With more time and motivational tools (for companies), more questionnaires could be completed. This might prove useful, especially if the sample size can be improved so that more substantial and specific results can be deduced.

There is definitely a place for a tool to be developed that can produce a kind of a green rating for companies in South Africa. This might be done in conjunction with a roadmap to greening a company, with specific guidelines helping companies to start at the right places.

A study can also be done focusing on the carbon emissions of a company. There is a large area of interest from the companies' side, since it is becoming a legislative issue for them and their corporate image.

6. REFERENCES

- fastmoving_Kraft Food*. (2012). Retrieved May 4, 2012, from <http://www.fastmoving.co.za/fmcg-suppliers/kraft-foods-79/food-9>
- Ashcroft, J. (2007, December). *Green Supply Chain Network*. Retrieved May 3, 2012, from Thursday, May 5th, 2011 at 12:43 pm: <http://www.greenscn.com/?p=19>
- ASTM International. (2012). *Environmental Standards*. Retrieved August 31, 2012, from ASTM International: <http://www.astm.org/Standards/environmental-standards.html>
- Beamon, B. M. (1999). *Designing the green supply chain*. Retrieved Maart 14, 2012, from Emerald: <http://0-www.emeraldinsight.com.innopac.up.ac.za/journals.htm?articleid=852096&show=abstract>
- Broek, F. v. (2010). Marketing Tool or Revolution. *Green Supply Chain Management.*, 1(1), 40.
- Buyis, A. (2011). Prof. *Research Designs*. Pretoria, Gauteng, South Africa: University of Pretoria.
- Daniel C. Esty, A. W. (2009). *Green to Gold: How Smart Companies Use Environmental Strategy to Innovate, Create Value, and Build Competitive Advantage*. (2nd ed.). (J. W. Sons, Ed.) Canada: Yale University Press.
- EconomyWatch. (2010, June 30). *Economy Watch*. Retrieved August 31, 2012, from FMCG Industry: <http://www.economywatch.com/world-industries/fmcg.html>
- Fanning, E. (2005). Formatting a Paper-based Survey Questionnaire: Best Practices. (peer-reviewed, Ed.) *Practical Assessment, Research and Evaluation*, 10(12), 14.
- FastMoving. (2012). *Makro revamps stores to compete*. Retrieved August 31, 2012, from FastMoving - The retail exchange: <http://www.fastmoving.co.za/news>
- Fastmoving the retail exchange. (2012, June 20). Retailers reap rewards of energy efficiency initiatives. *FMCG SUPPLIER NEWS*, p. 1.
- Gitlow, H. S. (2005). *Quality Management* (3rd ed.). Singapore: Mc Graw Hill.

Goodwin, J. W. (2006). APPROACHES TO DATA COLLECTION. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*, 2.1 - 2.24.

Hart, M. K. (2007). Statistical Process Control Techniques. *Statit Custom QC Overview*, 1, 5.

International Standards Organisation. (2009). The ISO 14000 family of International Standards. *Environmental management*, 1-12.

iSix Sigma. (2012). *How to Determine Sample Size, Determining Sample Size*. Retrieved August 23, 2012, from iSixSigma: <http://www.isixsigma.com/>

Juran, J. M. (2012). Guidelines for Implementing Effective SPC System.

Loebich, M. D. (2011). Green Supply Chain:. *4th Supply Chain Monitor*, 9-11.

Margerum, R. (1999). Integrated Environmental Management: The Foundations for Successful Practice. *ENVIRONMENTAL MANAGEMENT*.

Mazumder, S. a. (2010). Green Supply Chain as a competitive advantage enabler in the FMCG sector.

Murry, M. (2011). *Introduction to the Green Supply Chain*. Retrieved march 20, 2012, from [about.com/logistic/supply chain](http://about.com/logistic/supply%20chain): [about.com/logistic/supply chain](http://about.com/logistic/supply%20chain)

National Geographic Society. (2011). *Environment*. Retrieved March 21, 2012, from National Geographic: <http://environment.nationalgeographic.com/environment?vm=r>

Neale, P. T. (2006). PREPARING A CASE STUDY: A guide for designing and conducting a case study for an evaluation input. *PATH FINDER INTERNATIONAL TOOL SERIES*.

Netland, T. ,. (2007). A PRACTICAL TOOL FOR SUPPLY CHAIN IMPROVEMENT EXPERIENCES WITH THE SUPPLY CHAIN MATURITY ASSESSMENT TEST (SCMAT). *How mature is your supply chain?*

Nist Sematech. (2009). *Engineering Statistics Handbook*. Retrieved May 5, 2012, from <http://www.itl.nist.gov/div898/handbook/pri/section1/pri11.htm>

Paul Hawken, A. L. (2012). *Natural Capitalism*. Snowmass: Rocky Mountain Institute.

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- Reusable Packaging Association. (2012). *What is reusable packaging?* Retrieved August 30, 2012, from Reusable Packaging Association: <http://reusables.org/why-choose-reusables/what-is-reusable-packaging>
- Smithers Quality Assessments. (2012). *Benefits of* . Retrieved August 30, 2012 , from Smithers Quality Assessments: <http://www.smithersregistrar.com/iso14001/page-benefits-iso14001.shtml>
- Stake, R. (1995). *The Art of Case Study Research*. New York: SAGE Publications.
- Supply Chain Council . (2010). *Supply Chain Operations Reference Model*. United States of America: Supply Chain Council.
- Supply Chain Council. (2008, March 17). *Introduction to Green SCOR* . Retrieved August 31, 2012, from Supply Chain World: www.supplychainworld.org
- Supply Chain Council. (2012). *SCC - What is SCOR*. Retrieved April 23, 2012, from <http://www.supply-chain.org/about/scor/what/is>
- Techpros. (2011). *ISO 140001 Facts*. Retrieved August 15, 2012, from Techpros Realising Solutions: www.techpros.co.za

Appendix B: Green Assessment Questionnaire

Questionnaire: Assessment of Green Supply Chain Awareness and Current Status	
<p>Dear Sir/Madam</p> <p>I am a final year student at the University of Pretoria doing my final year project on the current status/maturity of the Green Supply Chain within the South African FMCG industry. Your assistance in sharing current activities, successes and problems to implement environmental friendly initiatives will assist our efforts to determine the potential for green supply chains and to develop an assesment tool to measure the impact of green environmental engineering in South Africa.</p> <p><i>All information will be treated as confidential and no company specific information will be disclosed without written approval. The aggregate results will be made available to all participants.</i></p> <p>Thank you kindly for the assistance Jan-Adrian Craggs</p>	
<p>Company:</p> <p>Position of contact person providing response:</p> <p>Position of company in FMCG supply chain (supplier, manufacturer etc.):</p> <p>Main product/service of company:</p>	<p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>The questionnaire considers environmental considerations taken into account when planning & executing operations.</p> <p>Please indicate which of the following apply to your company:</p>	
<p>1. We use reusable packaging where possible? (e.g. returnable crates, reusable corrugated cartons boxing, exc.)</p>	
<p>Yes: <input type="text"/></p> <p>Initiatives: _____</p> <p>Challenges: _____</p>	<p>No: <input type="text"/></p> <p>Partially: <input type="text"/></p>
<p>2. We plan transport and movements to minimise fuel usage in order to limit carbon emissions?</p>	
<p>Yes: <input type="text"/></p> <p>Initiatives: _____</p>	<p>No: <input type="text"/></p> <p>Partially: <input type="text"/></p>
<p>3. We plan to optimise packaging requirements without reducing effective protection and unit load formation?</p>	
<p>Yes: <input type="text"/></p> <p>Initiatives: _____</p>	<p>No: <input type="text"/></p> <p>Partially: <input type="text"/></p>
<p>4. We use only key suppliers that have green accreditation? (For example ISO 14001)</p>	
<p>Yes: <input type="text"/></p> <p>What accreditation? _____</p>	<p>No: <input type="text"/></p> <p>Partially: <input type="text"/></p>
<p>5. We have initiatives to optimise energy usage?</p>	
<p>Yes: <input type="text"/></p> <p>Initiatives: _____</p>	<p>No: <input type="text"/></p> <p>Partially: <input type="text"/></p>

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6. We plan to use high-efficiency, low-emission, or alternative-fuel vehicles?		
Yes:	<input type="text"/>	No: <input type="text"/>
Partially:	<input type="text"/>	
Initiatives:	<input type="text"/>	
7.1 Do your company have an environmental program in place or are you in process to implement? (for example ISO 14001 accreditation, GreenSCOR)		
Yes:	<input type="text"/>	No: <input type="text"/>
Partially:	<input type="text"/>	
Comments:	<input type="text"/>	
7.2 If yes to previous question, which of the following actions applies to your company:		
Have an Environmental management system (EMS) in place	<input type="text"/>	
Maintain and manage current foreign environmental regulations	<input type="text"/>	
Take-back program at end of product life	<input type="text"/>	
Utilise reusable pallets/ crates	<input type="text"/>	
Manage hazardous inventory	<input type="text"/>	
Please indicate other activities not listed above:	<input type="text"/>	
8. Are <i>different products</i> from <i>different suppliers</i> grouped into single shipments?		
Yes:	<input type="text"/>	No: <input type="text"/>
Partially:	<input type="text"/>	
Initiatives:	<input type="text"/>	
9. Is direct shipment options from supplier used (no middle man)?		
Yes:	<input type="text"/>	No: <input type="text"/>
Partially:	<input type="text"/>	
Initiatives:	<input type="text"/>	

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10. Is suppliers selected that use recycled material for manufacturing?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	
11. Is a HAZMAT (hazardous materials system) implemented?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	
12. Is storm water prevention and spill control plans for waste accumulation areas in place?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	
13. Is energy consumption activities scheduled to manage peak loads or support load shedding?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	
14. Do you have any form of energy generation? (For example solar panels)		
Yes:	<input type="text"/>	No: <input type="text"/>
If yes, please specify:	<input type="text"/>	
15. Is environmental training provided to all employees?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	
16. Are customer deliveries consolidated to reduce transport cost and fuel consumption?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	
17. Are environmental costs included in inventory carrying cost calculations?		
Yes:	<input type="text"/>	No: <input type="text"/> Partially: <input type="text"/>
Comments:	<input type="text"/>	

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18. Is packaging retrieved after use or installation for reuse or recycling?											
Yes:	<input type="text"/>	No:	<input type="text"/>	Partially:	<input type="text"/>						
Comments:	<input type="text"/>										
19. Do you select transport carriers with good environmental records?											
Yes:	<input type="text"/>	No:	<input type="text"/>	Partially:	<input type="text"/>						
Comments:	<input type="text"/>										
20. What is the approach or procedure followed with returned goods from customers? Which of the following applies?											
Returned with special trip											<input type="text"/>
Returned with return trip (backhaul)											<input type="text"/>
Customer keeps, claims discount and destroys product											<input type="text"/>

Appendix C: Case Study Focusing on Source

Company	
Position of contact person providing response	
Position of company in the FMCG supply chain	
Main Product	

Is there access to supplier environmental management and compliance data?	
Is there collaborative environmental management processes with suppliers, including *EMS integration? *environmental management system	
Is there a partnership developed with suppliers to help them implement and maintain environmentally sustainable business practices?	

Are deliveries of different products bundled into single shipments when possible?	
Has direct shipments been enabled between customers to reduce overall transportation and handling?	
Are there any environmental partnerships with suppliers?	
Is the need for frequent shipments minimized by accurately determining product needs? *For example fresh, long life or cold products	
Is products reviewed for compliance to environmental specifications, including the packaging?	
Are firms offering product “take-back” programs chosen?	

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Is previously used supplies purchased?	
Are products produced by recyclers and remanufacturers purchased?	
Is firms selected that have implemented an Environmental Management Systems? Is firms selected that is ISO 14001 certified or similar?	
Is alternative vehicles used?	
Is green purchasing practices utilized?	
Is high efficiency fuel vehicles used?	
Utilize energy-efficient lighting and heating systems throughout warehouse and production areas?	
Utilize energy-efficient *HVAC systems? *Heating, ventilation and air-conditioning	
Establish supplier environmental requirements?	

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Implement rigorous pollution prevention program?	
Utilize reusable pallets?	
Develop a set of environmental performance criteria for all suppliers?	
Maintain and manage current foreign environmental regulations?	
Utilize maintenance free batteries in warehouse/short haul vehicles?	
Other Initiatives not mentioned:	

Appendix D: Generic elements of a measurement programme

Table 4: Generic elements of a measurement programme (Source: IPCC Guidelines for National Greenhouse Gas Inventories)

TABLE 2.1 GENERIC ELEMENTS OF A MEASUREMENT PROGRAMME	
Measurement objective	Clear statement of the parameter(s) to be determined, e.g., HFC-23 emissions from HCFC-22 production.
Methodology protocol	<p>Description of the measurement methodology to be used. This should include:</p> <ul style="list-style-type: none"> • The components to be measured and any associated reference conditions; • Methods to ensure that representative samples are taken that reflect the nature of the source category and the measurement objective ^a; • The identification of any standard techniques to be used; • The analytical equipment needed and its operational requirements; • Any source/sink or installation access requirements; • Any accuracy, precision or uncertainty requirements; • Data capture requirements to be met; • QA/QC regimes to be followed.
Measurement plan with clear instructions to the measurement personnel	<p>Measurement plan specifies for those carrying out the measurements that includes:</p> <ul style="list-style-type: none"> • Number of sampling points for each parameter to be measured and how these are to be selected; • Number of individual measurements to be made for each sampling point and set of conditions; • Measurement dates and periods of the measurement campaign; • Reporting arrangements; • Additional source or process related information to be collected to enable data processing or interpretation of the results; • Conditions (or range of conditions) of the source (or for industrial plant the capacity, load, fuel or feedstock) to be met during the measurements; • Personnel responsible for the measurements, who else is involved and the resources to be used.
Data processing and reporting procedures, and documentation	<p>Data processing requirements, including:</p> <ul style="list-style-type: none"> • Reporting procedures that will form an account of the measurements, the description of the measurement objectives, and the measurement plan; • Documentation requirements to enable the results to be traced back through the calculations to the collected basic data and process operating conditions.

Appendix E: Green SCOR Best Practices

GreenSCOR

Best Practice	Description/Definition	Process
Access to supplier environmental data	Access to supplier environmental management and compliance data	sES.3
Aggregate requirements	Aggregate requirements to minimize transportation requirements	sP4.1
Avoid returns beyond economic repair	Estimate damage to product and do not physically return product that is beyond economical repair or offers no diagnostic value	sDR1.1, sDR2.1
Balance environmental requirements	Balance environmental requirements as well as supply/demand requirements	sP1.3, sP3.3
Benchmark practices	Benchmark practices of other firms	sM1.3, sM2.3, sM3.4
Bulk Packaging	Package larger groups of items in a single package (bulk)	sM1.4, sM2.4, sM3.5
Bundle deliveries	Bundle deliveries of different products into single shipment when possible	sS1.1, sS2.1, sS3.3
Collaborate with supply chain partners	Supply chain partners collaborate to improve the environmental performance of the supply chain	sP1.4
Collaborative environmental management processes	Collaborative environmental management processes with suppliers, including EMS integration	sES.1
Communicate environmental requirements	Include environmental requirements in communications.	sP1.4
Consider environmental impacts	Consider environmental impacts when identifying requirements	sP1.1, sP1.2
Consider environmental production constraints	Environmental constraints are considered as part of production capacity	sP3.2
Considerations emissions in transportation decisions	Integrate environmental emissions considerations to transportation decisions. Feature: Implement Environmental Management System	sEP.6
Consolidate shipments where possible	Consolidate shipments where possible	sDR2.2
Consolidate to minimize energy consumption	Consolidate to minimize fuel/energy consumption	sD1.4, sD2.4, sD3.5
Daily HAZMAT Inspection	Daily inspection of any hazardous waste storage areas	sM1.7, sM2.7, sM3.8
Develop environmental performance standards.	Develop environmental performance standards.	sEM.2
Develop supplier partnerships	Develop a partnership with suppliers to help them implement and maintain environmentally sustainable business practices	sES.2
Enable customer direct shipments	Enable direct shipments between customers to reduce overall transportation and handling.	sSR.3, sDR.3

4.2.1

GreenSCOR

Best Practice	Description/Definition	Process
Energy-efficient buildings	Utilize energy-efficient lighting and heating systems throughout warehouse and production areas	sES.4
Energy-efficient HVAC systems	Utilize energy-efficient HVAC systems	sES.4
Ensure environmental documentation	Ensure all required environmental documentation is obtained	sM1.6
Environmental Management System (EMS)	Implement an Environmental Management System (EMS) to track and manage environmental performance and to track performance against regulatory requirements	sP1, sEP.8
Environmental performance standards.	Develop environmental performance standards.	sEP.1
Establish environmental partnerships	Establish environmental partnerships with suppliers	sS3.2
Establish environmental requirements	Establish supplier environmental requirements	sES.7
Establish spill controls	Establish spill controls for finished goods inventory storage	sD1.3, sD2.3
Factor environmental considerations into planning	Factor environmental considerations/restrictions into capacity planning	sEP.5
Identify and manage environmental impacts	Identify and manage environmental aspects and impacts of supply chain operations to mitigate the impacts mitigate the impacts	sP1
Identify green products	Identify products that are manufactured to minimize environmental impacts	sP2.2
Identify items to return	Identify MRO items that will need planned maintenance during the planning horizon	sP5.1
Identify recyclable/reusable materials	Identify recyclable/reusable materials	sP2.2
Identify take-back programs	Identify products in take-back programs that are near end of life	sP5.1
Implement pollution prevention program	Implement comprehensive pollution prevention program and include environmentally preferable purchasing.	sM1.3, sM2.3
Implement an EMS	Implement an EMS	sEM.2, sEM.8, sM1.3, sM2.3, sM3.4, sEM.1, sM3.7, sM1.6, sM2.6
Implement HAZMAT "pharmacy" system	Implement hazardous materials "pharmacy" system	sM1.6, sM2.6, sM3.7, sEM.5

4.2.2

GreenSCOR

Best Practice	Description/Definition	Process
Implement pollution prevention program	Implement rigorous pollution prevention program	sEM.8, sEM.4, sEM.6, sS1.4, sS2.4, sS3.6, sM1.2, sM2.2, sM2.7, sM3.3, sM3.8
Include environmental costs	Include environmental costs in inventory carrying costs	sD1.3, sD2.3
Include environmental requirements	Include environmental requirements in deliver rules	sED.1
Include product's environmental attributes	Include product's environmental attributes information	sEM.3
Include supplier environmental information	Include supplier environmental information in addition to product environmental information	sM1.6
Infrequent product delivery	Minimize need for frequent shipments by accurately determining product needs	sS1.1, sS2.1, sS3.3
Integrate environmental considerations	Integrate environmental considerations into the business rules.	sEP.1
Manage environmental performance	Manage environmental performance of the supply chain.	sEP.2
Manage foreign environmental requirements	Manage foreign environmental requirements	sED.8
Manage hazardous inventory	Manage hazardous inventory	sED.4
Material content classification	Material content classification (HAZMAT, recyclable, etc.)	sEP.7
Maximize Container Loading	Re-design container shapes to minimize material used but retain amount of product stored	sM1.4, sM2.4, sM3.5
Maximize loads, minimize runs	Maximize load size; minimize transportation runs	sP4.3, sP4.4
Measure environmental impacts	Measure environmental impacts of the supply chain	sP1
Minimize energy use	Plans are created to minimize energy use	sP3.4
Minimize Make emissions	Plans are established to minimize emissions (e.g., release VOCs after dark)	sP3.4
Minimize packaging	Work with suppliers to minimize packaging requirements and use reusable packaging material	sP2.2, sP4.2
Minimize vehicle fuel use	Plan the use of high-efficiency, low-emissions, or alternative-fuel vehicles where possible	sP4
Monitor product compliance	Review product for compliance with environmental specifications, including product packaging	sS1.3, sS2.3, sS3.5

4.2.3

GreenSCOR

Best Practice	Description/Definition	Process
Monitor supplier environmental compliance	Determine supplier environmental compliance performance/Actively participate in regulation development	sEP.8
Plan for proper product disposal	Plan for proper product disposal	sED.7
Pollution prevention program	Implement comprehensive pollution prevention program and include environmentally preferable purchasing.	sM3.4
Product "take-back" programs	Select firms that offer product "take-back" programs	sS.3.2
Provide environmental training	Provide environmental training to all employees	sM2.3, sM3.4, sM1.3
Purchase environmentally friendly materials	Purchase environmentally friendly materials	sP2
Purchase previously used supplies	Purchase previously used supplies	sS3.1
Purchase recycled product	Purchase products from recyclers or remanufactures	sS3.1
Reduce Make environmental impacts	Identify processes that reduce environmental impacts of manufacturing	sP3
Retrieve packaging after installation	Retrieve packaging after installation for reuse	sD1.12, sD2.12, sD3.10, sM1.4, sM2.4, sM3.5
Reusable pallets	Utilize reusable pallets	sES.4
Route to minimize fuel consumption	Route to minimize fuel consumption	sD1.6, sD2.6
Schedule air emissions after sunset	Schedule air emission emitting activities after sunset	sM1.1, sM2.1, sM3.2
Schedule high energy consumption at night	Schedule electricity consuming (large amounts) activities from sunset to sunrise	sM1.1, sM2.1, sM3.2
Schedule to maximize transportation capacity	Schedule to maximize transportation capacity	sD3.4
Select carriers using retread tires	Select carriers using retread tires	sD1.7
Select carriers with EMS	Select carriers that have adopted an EMS or otherwise demonstrated environmental commitment	sD1.5, sD1.7, sD2.5, sD2.7, sD3.6
Select carriers with good records	Select carriers with good environmental records	sD1.5
Select complaint carriers	Select carriers that have not violated environmental laws	sD1.7
Select firms with EMS	Select firms that have implemented an EMS	sS3.2
Select ISO 14001 firms	Select firms that are ISO 14001 certified or similar	sS3.2
Select suppliers with EMS	Select suppliers with active EMS systems	sP2, sS1, sS2, sS3

4.2.4

GreenSCOR

Best Practice	Description/Definition	Process
Spill control	Spill control	sED.4
Storm water management plans	Implement storm water management and spill response plans	sES.4
Stormwater prevention plans	Stormwater prevention and spill control plans for waste accumulation areas	sM1.7
Supplier environmental performance criteria	Develop a set of environmental performance criteria for all suppliers	sES.2
Take-back program	Take-back program at end of product life	sED.7
Track foreign environmental requirements	Maintain and manage current foreign environmental regulations	sES.8
Track supplier environmental records	Processes to identify suppliers with good environmental records	sP2
Use multi-purpose packaging	Use multi-purpose packaging that can be used by customer	sM1.4, sM2.4, sM3.5
Use non-toxic solvents	Use non-toxic solvents for machinery cleaning	sEM.5
Use recyclable packaging	Use recyclable packaging	sM1.4, sM2.4, sM3.5
Use reusable packaging	Use reusable packaging where possible	sP4.2
Utilize alternative fuel vehicles	Utilize alternative fuel vehicles	sS1.4, sS2.4, sS3.6, sM1.2, sM2.2, sM3.3, sEM.6
Utilize energy-star (or similar) equipment	Utilize energy-star (or similar) equipment whenever possible	sEM.5
Utilize green purchasing practices	Utilize green purchasing practices	sS1, sS2, sS3
Utilize high efficiency vehicles	Utilize high fuel efficiency vehicles	sS1.4, sS2.4, sS3.6, sM1.2, sM2.2, sM3.3
Utilize maintenance free batteries	Utilize maintenance free batteries in warehouse/ short haul vehicles	sM2.2, sES.4
Utilize non-toxic materials	Utilize non-toxic solvents and cleaning materials	sEM.5
Utilize non-wood or recycled pallets	Utilize non-wood pallets or recycled pallets	sEM.6
Utilize off-peak shifts	Utilize off-peak shifts for production workers (e.g. shift 1 = 11:00-19:00)	sM1.1, sM1.2, sM3.2
Utilize retread tires	Utilize retread tires	sEM.6
Waste accumulation EMS	EMS covering waste accumulation processes	sM1.7, sM2.7, sM3.8

4.2.5