

## DEVELOPMENT OF THE GREEN SUPPLY CHAIN APPROACH

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### Abstract

Increased demands on strong economic performance of these supply chains, organizations are now held responsible for the environmental and social performance of their suppliers and partners. The concept of sustainability started to incrementally enter the corporate environmental management system and strength over collaborative connections between enterprises. There are more end more new concepts that includes environmental requirements. This trend can be also observed in logistic and supply chain management. The main objective of this paper is to contribute to a further understanding of reverse logistics and green activities that take place in the supply chain, how reverse logistics and green contributes to improve the supply chain. A theoretical frame work is made so as to have a good understanding about the concepts and research work in the relevant area. The main idea area was the presentation how similar this process can be no matter in which industry it will be analyzed.

**Keywords:** Supply chain, green logistics, reverse logistic

### 1. INTRODUCTION

Common knowledge is that the public becomes more aware of environmental issues and global warming; consumers will be asking more questions about the products they are purchasing. Companies will have to expect questions about how green their manufacturing processes and supply chain are, their carbon footprint and how they recycle. However some companies have seen that this is not a bad thing and indeed have been able to convert the public's interest in all things green into increased profits. A number of companies have shown that there is a proof of the link between improved environmental performance and financial gains. Companies have looked to their supply chain and seen areas where improvements in the way they operate can produce profits. Development can badly affect the environment; however under the phrase Green Supply Chain Management a new direction can be find, but not only toward safety for the environment but also opportunity to gain new sources of financial flow. Currently companies are doing their best to come up with new ideas, machines which could help them introduce savings and earn but also preserve the environment in good condition due to the change of customers' attitude.

This paper show the development of Green Supply Chain Management (GSCM) approach in logistic concepts. The functions of GSCM and which areas are the most vulnerable and tractable for changes were also shown. Companies can find cost savings by reducing the environmental impact of their business processes by re-evaluating the company's supply chain, from purchasing, planning, and managing the use of materials to shipping and distributing final products, savings are often identified as a benefit of implementing green policies. No matter how hard it seems to be way of people perceiving this opportunity prompted to come up with new ideas and innovations. This reorganization however requires big amounts of money and highly qualified workers, who understand the process and are aware of benefits which can be gained thanks to this.

### 2. GREEN SUPPLY CHAIN AS A CATEGORY OF GREEN LOGISTICS

Green Logistics describes all attempts to measure and minimize the ecological impact of logistics activities. This includes all activities of the forward and reverse flows of products, information and services between the

point of origin and the point of consumption. It is the aim to create a sustainable company value using a balance of economic and environmental efficiency. McKinnon [11] has created categories which divide green logistics research into five different fields;

- Reducing freight transport externalities
- City logistics
- Reverse logistics
- Logistics in corporate environmental strategies
- Green supply chain management.

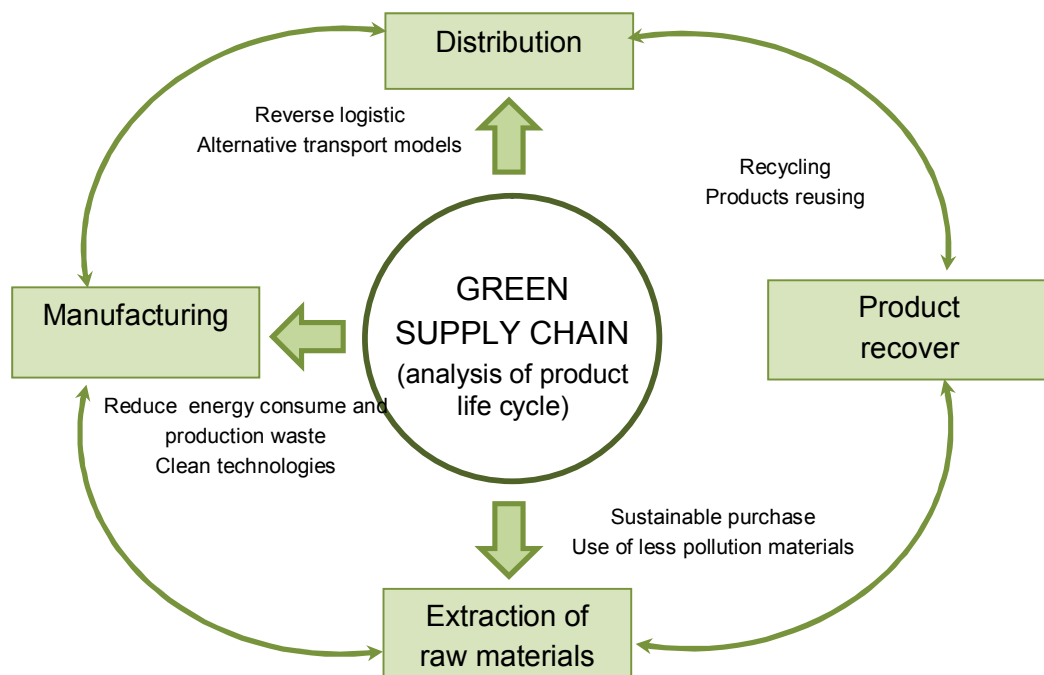
The research area of reduction of freight transport externalities is responsible for decreasing transports' effects on the environment. This research is focusing on improving vehicle technology has been established to take in logistics systems of firms, since these are said to be closely linked to the expansion of transport growth [10]. Studies that consider the design of companies' logistics systems have been led by [2] for instance, who notice a complicated relationship between companies' logistics decisions and environmental influence from logistics. What is more, choice of transport mode is chiefly related to the reduction of freight transport externalities since it is recognized that road, air, rail and water-borne modes have different influence on the ambience [12]. Within this area of research, there appears to be little connection to the interface between LSPs and shippers and how this situation can provide chances, as well as barriers, for the reduction of freight transport externalities. Added to this, second research field distinguished by McKinnon [10] is the area of city logistics, which focuses on freight transports in urban areas. In such places, there has traditionally been a difficulty with low fill-rates in lorries, causing not only high financial costs but also as environmental impact. McKinnon [10] recognizes that a recent establishment within this field is the increase of home-deliveries as a part of companies' service offerings, and this obviously changes the conditions for city logistics. As mentioned above, service offerings from both shippers and LSPs can have an effect on the research field of city logistics. Reverse logistics is concerned with the return of waste product and packaging for reuse, recycling and disposal [10, 15]. Within this field, Sarkis et al. [17] implicitly mention the service offering of LSPs when they write that e-commerce gives LSPs a business opportunity. Products sold via the internet will inevitably cause product returns, and the LSPs can offer to pick up these returns and thus increase efficiency in their transport and distribution systems. Thus, even though the focus within the field of reverse logistics may not be on the logistics market's green supply and demand, there are aspects of the field that can be of interest in such a market. The field of corporate environmental strategies deals with how companies address environmental impact that their logistics operations may cause, and this work is often linked to strategic business considerations [11]. One such practice is environmental management systems, such as ISO 14001, which can be applied to shippers, as well as to LSPs. Nawrocka et al. [14] investigate the role of ISO 14001 in supply chains practices and note that companies commonly use ISO 14001 as a requirement for suppliers. As a matter of fact, it is noted that ambience adjustments within logistics often is interconnected with cost savings [2, 20] and this is inevitably a stimulus for companies to put a green focus on their logistics operations. Rao and Holt [16] even state that "[if companies] green their supply chains not only would firms achieve substantial cost savings, but they would also enhance sales, market share, and exploit new market opportunities to lead to greater profit margins, all of which contribute to the economic performance of the firm."

Green supply chain management recognizes that a company's ambience influence is not limited to the corporate boundaries, but is instead affected by several dimensions outside these borders [10]. Companies can for instant influence environmental impact by choosing who to cooperate with or which new technology to introduce in the supply chain [17]. The greening of purchasing activities is also involved in this field of research [5, 11].

### 3. GREEN SUPPLY CHAIN MANAGEMENT CONCEPT

The conceptions of Green Supply Chain Management is based on the sustainable development approach which comprehends many components for instant that the needs of the present society are to realize without compromising the ability of future generations to meet their own ones. As the implementation of this approach within a company influences nearly all the company's functions, it has a major impact on a company's supply chain. The reason is that SCM encompasses all functions of a corporation as it aims to optimize the management of all flows of material, funds and information between the various companies and departments which make the product or service available to end-consumers. L. Jingjing and Z. Yingchao came out with a definition that „supply chain refers to focus on core business, through the logistics, information flow and capital flow control, from procurement of raw materials, intermediate goods and even the final product, finally from the sales network to the hands of the consumer, products will be sent to suppliers, manufacturers, distributors, retailers, end-users, and will connect the functions of a whole network structure.” [22]. Scott and Westbrook [18] pointed out that SCM stands for the chain connecting each element of the manufacturing and supply process from raw materials through to the end users, and handling integration of all participating firms' contributions in the supply chain. Over the past decade, SCM has played an important role for organizations' success and subsequently the green supply chain (GSC) has emerged as an important component of the environmental and supply chain strategies of a large number of companies. Although the term “environment” or “greening” has an ambiguous meaning in various fields, the term indicates not only harmonizing corporate environmental performance with stockholders' expectations but also developing a critical new source of competitive advantage in terms of management perspective [7]. As Gupta [8] viewed environmental management relieves environmental destruction and improves environmental performance by institutionalizing various greening practices and initiating new measures and developing technologies, processes and products. In recent years, numerous studies have attempted to find and explore GSCM. Green supply refers to the way in which innovations in supply chain management and industrial purchasing may be considered in the context of the environment. Narasimhan and Carter [3] define GSCM as the purchasing function including reduction, recycling, reuse, and the substitution of materials. The GSC covers wide areas of GSCM practices and SCM's participants and practices from green purchasing to integrated supply chains flowing from suppliers, to manufacturers, to customers, and to the reverse supply chain (16, 22). Brown et al. [13] suggests two main types of green supply management process: greening the supply process and product-based green supply. Greening the supply process stands for accommodations made to the firm's supplier management activities for considering environmental perspectives. In addition, product-based green supply focuses on changes to the product supplied and attempts to manage the by-products of supplied inputs.

Leaders of the logistics and supply chain department should balance low cost and innovation process while maintaining good environmental performance [2, 9]. Through supply chain analysis, organizations are able to check whether environmental issues can be incorporated into industrial transformation processes [5]. Green supply commitment through the corporate environmental approach and management commitment to environmental issues improve the possibility of green supply implementation [5]. However the motivation for implementing GSCM process may come entirely outside the firm's normal supply management process if the companies capabilities are insufficient to launch green supply chain on its own. The literature strategy stresses that environmental management can play a critical role as both social responsibility and important corporate duty [1]. The social and political interest in green issues has promoted implementing GSCM. In addition, the response to environmental issues in socially responsible manner still remains as a social and business matter [13].



**Fig. 1** Green supply chain area of inters  
Source: Adopted from: [22]

**Fig. 1** presents main area of interes in GSCM . Each phase comprise of subsystems. Manufacturing mean reducing energy consumptions using new technologies and reducing production waste. Product recovery puts an effort into reusing used products and recycling the rest. In terms of distribution comes to proper choice of the form of the transport. Each process has its own action to perform. They mutually influence each other and conduct their task. All blends together present a new approach and idea of green chain management which implementation brings benefits. There are many factors which can initiate the adoption of Green Supply Chain Management by companies, but mostly there are:

- **Customer Requirement:** Customer requirements play an important role in SC design and specifications, and suppliers usually comply with these requirements. Green thinking lets the customers, especially major customers, use their influence on suppliers to adopt green practices. This demand has cascade effect and goes through the entire supply chain. Also, major customers should help suppliers achieve this goal by partnering in product and process design.
- **Governmental and International Laws and Regulations:** Governments, national standard institutes, industrial development bureaus, and local authorities have a great impact on industries by passing laws and regulations and controlling the industries to implement these regulations. International unions, such as UN and EU, also pass laws and regulations which make countries conform to GSCM practices.
- **Organizational Green Awareness:** The economic impacts of using old and worn products for purposes such as repairing, reusing, reassembly, refurbishing and recycling on organizational productivity and cost reduction is another important initiative for companies to develop GSCM practices.
- **Environmental Activists and Non-Governmental Organizations (NGOs):** These groups can create green awareness within both societies and industries as well. First, they can encourage people to buy green products instead of their non-green counterparts. Despite the lack of expertise in technical

fields, environmental activists, and NGOs can still have impact on industries by promoting green awareness among people and requiring industries to adopt green practices.

#### **4. THE DESIGN OF THE GREEN SUPPLY CHAIN**

The design of effective supply chain supply chain is a necessary prerequisite to the successful operation, it can improve customer service, achieve effective balance between cost and service, enhance corporation's competition power, increase flexibility, develop new markets and increase work efficiency. In the design of the supply chain, based on the successful supply chain in manufacturing, construction supply chain should be designed in terms of different construction corporations. Different types of products require different supply chain design. Generally, from the broad sense, basic products can be divided into two basic types: functional products and innovative products. The so-called functional products, which refer to a lower profit margin, the demand for the products is more stable; so-called innovative products refer to higher profit margins and unstable demand products. It is easy to forecast future demand for the functional products due to their tiny changes and stable demand. In addition, these products have long life cycle and can be used to meet consumers' basic requirements. Construction products are functional products, in order to avoid fewer profit margins, construction corporations should improve current product and management mode to achieve higher profit margins by researching customer psychology and considering market demand, the existing production and management methods need to be improved. The processes of green products supply chain design of construction products are showed as follows: the construction market analysis, in order to understand the current market demand for construction products and the situation of construction products, features and development trends, while summing up the status of construction enterprises, researching direction of the supply chain development, analyzing the problems may affect the supply chain design, analyzing the necessity set a study of Enterprise Green Supply Chain Management in cyclic economy model up supply chain design goals, and the access to lower unit costs, higher customer service levels and environmental benefits, analyzing the balance between objectives; analyzing the construction of the supply chain, and form the basic framework of the supply chain [7]. The supply chain analysis of the composition of materials, including the main equipment suppliers, construction, engineers and contractors and the choice of location, if it is feasible, the programmed can be carried out following the design, otherwise, they should re-design, the main issues to be addressed include: the composition of the supply chain members, the source of raw materials, production planning, information management system design, logistics management systems design. After green supply chain design has completed, testing through certain techniques methods is necessary.

#### **5. CONCLUSION**

The main objective of this paper has been to contribute to a further understanding of conception and activities that take place in the supply chain while it's become greener. A theoretical frame work is made so as to have a good understanding about the concepts and research work in the relevant area. Greening the supply chain means much more than just a mere reducing usage and pollution. The GSCM principle can be applied to all departments in the organization and links in supply chain. The effects of GSCM expand to all area, both tangibly and intangibly. Some studies mentioned benefits of adopting GSCM. The benefits of GSCM concerning different roles of supply chain including environment and society and dividing them into terms of different categories: material, immaterial, and emotion. For material, GSCM helps lower environmental load for environment, lower cost prices for supplier, lower cost for producer, lower cost of ownership for customer, and less consumption of resources for society. In terms of immaterial, GSCM helps overcoming prejudice and cynicism for environment, less rejects for supplier, easier to manufacture for producer, convenience and fun for customer, and better compliance for society. For emotion, GSCM helps motivation of stakeholder for environment, better image for supplier and producer, feel good and quality of life for customer, and make industry on the right track for society. Companies are successfully in adoption of GSCM. Duber-Smith [4] identified ten reasons that the company should adopt the green: target marketing,

sustainability of resources, lowered costs/increased efficiency, product differentiation and competitive advantage, competitive and supply chain pressures, adapting to regulation and reducing risk, brand reputation, return on investment, employee morale, and the ethical imperative. Further proceeding with this project work could test the model to a specific case company and develop an industrial integration model for Green based on company specific scenarios, potentials, drivers, barriers etc., Such a further study could encourage the companies to consider and concentrate on Green Supply Chain Management to establish a sustainable and responsible development.

## REFERENCES

- [1] ARLOW P., GANNON M. J. *Social Responsiveness, Corporate Structure, and Economic Performance*, The Academy of Management Review, Vol. 7, No. 1982, pp. 235-241.
- [2] ARONSSON H., BRODIN M.H. *The environmental impact of changing logistics structures*, International Journal of Logistics Management, The, Vol. 17 Iss: 3, 2006, pp. 394 - 415.
- [3] CARTER C. R., ELLRAM L.M. *Reverse logistics: A review of the literature and framework for future investigation*. Journal of Business Logistics, 1998, pp.85-102.
- [4] DUBER-SMITH D.C., *The Green Imperative*. Soap, Perfumery, and Cosmetics, August 78 (8), 2005, pp.24
- [5] GREEN K., MORTON B., NEW S. *Purchasing and environmental management: interactions, policies and opportunities*. Business Strategy and the Environment, Vol. 5, No. 3, 1996, pp.188-197.
- [6] HARLAND C.M. *Supply Chain Management, Purchasing and Supply Management, Logistics, Vertical Integration, Materials Management and Supply Chain Dynamics*. In: Slack, N (ed.) Blackwell Encyclopedic Dictionary of Operations Management, Blackwell, UK 1996, pp. 233-256.
- [7] HERVANI A.A., HELMS M.M., SARKIS J. *Performance measurement for green supply chain management*, Benchmarking: An International Journal, Vol. 12, No. 4, 2005, 330-353.
- [8] GUPTA M.C. *Environmental management and its impact on the operations function*, International Journal of Operations & Production Management, Vol. 15 No. 8, 1995, p.34-51.
- [9] LENORT R., WICHER P. *New trends in supply chain management and their comparison & integration*. Logistyka No. 2, 2012.
- [10] MCKINNON A.C. *Environmental Sustainability - A new Priority for Logistics Managers*, Kogan Page, London 2010.
- [11] MCKINNON, A.C. AND EDWARDS, J.B. *The Greening of Retail Logistics* [in:] Fernie, J. and Sparks, L. (ed.) *Retail Management and Logistics*, 3rd edition, Kogan Page, London, 2009.
- [12] MURPHY P.R, POIST R.F, AND BRAUNSCHWEIG C.D. *Green logistics: Comparative views of environmental progressives, moderates, and conservatives*, Journal of Business Logistics. 1996 17 (1), pp. 191-211.
- [13] NAWROCKA D., BRORSON T., LINDHQVIST T. ISO 14001 in environmental supply chain practices, Journal of Cleaner Production, 17, 2009, pp. 1435-1443.
- [14] PRAHINSKI C. KOCBASOGLU C. *Empirical Research Opportunities in Reverse Supply Chains*, Omega, The International Journal of Management Science, 2006, 34 pp. 519-532.
- [15] RAO P., HOLT D. *Do green supply chains lead to competitiveness and economic performance?* International Journal of Operations and Production Management, Vol. 25, No. 9, 2005, pp. 898-916.
- [16] SARKIS J., MEADE L. M., TALLURI S. *E-logistics and the natural environment*. Supply Chain Management: An International Journal Vol. 9, No. 4, 2004, pp. 303-312.
- [17] SCOTT CH., WESTBROOK R. *New Strategic Tools for Supply Chain Management*, International Journal of Physical Distribution & Logistics Management, Vol. 21 No. 1, 1991, pp. 23-33.
- [18] THIERRY M., SALOMON M., VAN NUNEN J., VAN WASSENHOVE L. *Strategic Issues in Product Recovery Management*. California Management Review, Vol. 37, No. 2, 1995, pp.114-136.
- [19] WU H. J., DUNN S.C. *Environmentally responsible logistics system*. International Journal of Physical Distribution, Vol. 25, No. 2 1995, p.20-38 .
- [20] ZHU Q. SARKIS J. *Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises*, Journal of Operations Management, Vol. 22, No. 3, pp. 265-289.
- [21] ZHUMING Q., YOUQI Y. *The Principle of Supply Chain Management in Real Estate Enterprise*, Proceedings of the 2009 International Symposium on Web Information Systems and Applications (WISA'09), Nanchang, P. R. China, May 22-24, 2009, pp. 375-378
- [22] Supply Chain Monitor "How mature is the Green Supply Chain?", Insight, Survey Report, BearingPoint, 2008