

Implementation of Green Supply Chain Management in South-East Europe – A Literature Review

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Purpose – With the recent economic progress and the increasing attractiveness of the region of South-East Europe (SEE) and the growing shift of production facilities from Western European countries to the regions of Eastern and South-East Europe the concept of Environmental (Green) Supply Chain Management (GSCM) will play a growing role in these countries. This research aims in its initial stage to give an overview of the existing literature about the various aspects related to green supply chain management with the intention to examine their application for the region of SEE. **Design/methodology/approach** – The above purpose will be achieved through an extensive literature review surveying professional publications and scholarly research in the areas of green supply chain management, sustainability and waste management with reference to EU efforts and initiatives and the current situation in SEE. **Findings** – Summarising relevant literature this paper will provide a base for future discussions about the application of green supply chain management in the economies of SEE. The findings identify major problems to be addressed in this process. **Research limitations/implications** – As green supply chain management is still a rather new subject in the region of SEE, there is limited research about its appropriate application. An implication of this paper is the need for more studies in this field. **Practical implications** – This work can serve as a source of valuable information for researchers and other parties interested in the development of mechanisms of green supply chain management in SEE. **Originality/value** – This work extends the research of green supply chain management into the area of South-East Europe.

Keywords

Green supply chain management, sustainability, waste management.

1. Introduction

1.1 Awareness of environmental performance

The interest in an organisation's environmental performance has been steadily growing over the last decade [1-6]. Research has explored many aspects of firms' approaches towards the natural environment and looked at possible responses to the challenges imposed by tighter environmental regulations, restricted natural resources, customer demands, competitive pressures and ethical responsibility [7-16]. Companies all over the world are globalising more and more of their operations, resulting in increasing value chain complexity entailing physical, financial and information flows. Western European manufacturers have a strong focus on cost reduction and outsourcing of operations. They are moving production to low labour cost regions such as South East Asia and China but also to the region of Central, Eastern and South-East Europe. The increased activity in manufacturing and goods transportation means also increased generation

of waste in those regions, produced by industry and households. This creates also a threat for the environment. Manufacturing and production enterprises will have to develop ways in which industrial development and environmental protection can symbiotically coexist [17]. The challenge is to redefine the basic structure of the entire supply chain. The globalisation of supply chains extends requirements for environmental-friendly operations and strategies also to “newcomers” from the transient and emerging economies.

1.2 The region of SEE

While the regions of South East Asia and China have been put in the focus of latest research concerning greening the supply chain [18-22] also the countries neighbouring the European Union, such as the region of South East Europe (SEE), will have to reconsider their standpoint regarding corporate environmental strategies if they want to take advantage of their proximity to the European Union and be part of a supply network that is characterised by a greater awareness of environmental protection. The impact of the growing EU environmental legislation will be felt across almost every sector of the European economy and all its vicinity. Businesses responding too slowly or ineffectually are likely to incur significant cost increases, while businesses responding in a timely and structured manner can expect to enjoy not only a competitive advantage, but also a potential reduction in costs [23]. The countries of South-East Europe, who are already part of the European Union such as Greece and since 2004 also Cyprus and Slovenia, and the candidate countries Bulgaria and Romania, as well as Croatia and Turkey, and other countries of the region, such as Albania, FYROM, Serbia and Montenegro, and Bosnia-Herzegovina have an interest and incentive to comply with the environmental guidelines being implemented in Europe if they wish to become competitive in an extended European market.

1.3 Aim and objectives of the research

In a first stage this research attempts to review the existing literature in order to identify the major topics related to green supply chain management and to explore the challenges to be faced in the attempt to facilitate implementation of GSCM in the region of SEE.

2. Research methodology

Performing an extensive state-of-the-art literature review a taxonomy will be created identifying the contributions and gaps of the various existing approaches. The base for this taxonomy is a taxonomy table containing a number of categories as shown in example Table 1:

A continuous review of this taxonomy table will gradually allow drafting a web of interconnected fields of research related to the area of GSCM.

3. Definition

The definition of green supply chain management evolves from the understanding of supply chain management.

3.1. Supply Chain Management

There are various attempts in literature to define supply chain management (SCM). [24-26] As a typical example may serve the one given by Handfield and Nichols [25] who describe SCM as all those activities associated with the flow and transformation of materials from the raw extraction of materials through to

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Publication Type	Journal article	Journal article
Publication name	Production and Operations Management	International Journal of Operations & Production Management
Volume (No)	10(2)	25(5)
Pages	174-89	449-68
Date/Year	2001	2005
Thematic Topic	Analysis of the role of supply management capabilities in green supply	Evaluating GSCM drivers, practices and performance in China
Concept/Theory	Focusing on development of firm's specialised internal resources; relationship with supplier	Defining status-quo of GSCM in Chinese manufacturing enterprises
Methodology	Two-phase survey of 70 operating units in public companies, broad cross-section of industries, "clean" and "dirty", semi-structured interviews, questionnaires, LISREL analysis	Survey questionnaire with 54 items , 314 responses; exploratory factor analysis to make groupings; comparative analysis with previous research
Issue/Challenge	How to develop appropriate internal supply management capabilities in order to effectively implement green supply initiatives	Reaction of a transient economy to environmental pressures
Country	United Kingdom	China
Contribution	Development of a basic predictive model; Supply management capabilities are jointly developed by proactive corporate environmental attitude and more strategic purchasing and supply management approach; SMC facilitate implementation of product-based green supply but not greening the supply process <> contrary to current research	Defintion of factors for GSCM analysis; higher awareness in Chinese enterprises through external pressure but no translation into strong GSCM implementation
Supporting	Drumwright 1994; Cramer 1996; Green, Morton and New 1996; Lamming and Hampson 1996; Min and Galle 1997; Noci 1997	Russel 1998
Contradicting	partially Carter 1998	Min and Galle, 1997: US firms: potential liability and disposal cost-Chinese firms: regulatory issues; Zsidisin and Hendrick 1998: Western firms:investment recovery, Chinese firms: less important
Impact	Supporting evaluation and development of corporate readiness for green behaviour	extending GSCM research into China
Shortfall	small sample; unusual sampling strategy; focusing only on purchasing function	little previous research about China, little comparison ; limited sample from special economic zones
Future direction	Role of firms internal capabilities in supporting enviromental management in other process and functional areas besides purchasing and supply; different capabilities needed for different green initiatives?; > Resource-based perspective	Relationship between identified factors

Table 1 Taxonomy table example for Green Supply Chain Management

the consumption of goods and services by an end user, along with the attendant information flows, both up and down the supply chain.

3.2. Green Supply Chain Management

A helpful definition of green supply chain management (GSCM) is given by Hervani et al [27] who characterise GSCM as a composition of green purchasing, green manufacturing /green materials management, green manufacturing, green distribution/marketing and reverse logistics.

4. Major topics of research

At the current stage this literature review focuses on the past approximately ten years. Research in green supply chain management and related areas has covered a wide variety of topics. Also some major case studies both related to specific industrial sectors and geographic areas have been conducted. Figure 1 gives a preliminary overview of the various topics of research grouped in related thematic fields.

Among the various identified research fields there is a group of thematic topics of special interest for researchers dealing with the firms' operational level focusing on the relation between firms' proactive behaviour [28-32] and innovation level [33-38], environmental cost accounting [28,30,39-47] and performance measurement [2,29,31,37,43,48-51].

4.1 Proactivity

Sadgrove [52] classifies firms' environmental behaviour along a range from reactive to proactive approaches. A proactive approach entails the ability to foresee future trends in society and regulations and adapt operations, processes, and products accordingly in order to avoid negative impacts on the environment. [47] Russo & Fouts [46] find a positive relationship between proactive environmental strategies and organisational performance results when firms develop complex capabilities. According to Aragón-Correa [9] strategically proactive firms approach natural environment both correctively and proactively. Shrivastava [53] points out the difficulty for less proactive firms to invest in new technologies.

4.2 Innovation

Starik and Rands [38] stress the need for sustainable firms to design their internal processes to enable employees to get involved in innovative measures that are directed towards sustainability. Bringer and Benforado [54] add the point that it is important for environmentally advanced firms to invest in R&D and to support natural environmental aims throughout the entire organisation. Angel de Brio and Junquera [55] hint to the obstacles faced by SMEs when trying to adopt innovative measures. Geffen and Rothenberg [48] examine the role of suppliers as an important source for innovation, while Porter and Van der Linde [56] find competitive and regulatory pressures as the main motivators for innovation.

4.3 Environmental cost accounting

Nehrt [57] considers environmental consciousness as a source of competitive advantage in international markets. Similarly, Hansmann and Claudia [58] see implementation of GSCM as a new opportunity for competition and a new way to add value to core business programmes. Also Hutchison [59] assigns to GSCM the major role for addressing key factors for competitive advantage through environmental performance. Van Hook and Erasmus [60] see profit and market share objectives met through lowering

Ecological Sustainability									
Supply Chain	Green Supply Chain Management								
Various Issues in Supply Chain Management		Operational Level	Inbound Logistics	Production	Outbound Logistics			Performance Measurement Within & Across Organisations	Case Studies
Definition	Definition	Strategic Level							
			Green Procurement	Green Manufacturing	Environment-friendly (Green) Distribution	Environment-friendly Packaging			Industry Sector
Supply Relationship & Supplier Development	Rising Awareness							Environmental Performance	
			Green Material Management	Total Quality Environmental Management		Warehousing			e.g. Automotive
Transaction Cost Theory	Firms Approach towards Natural Environment/ Implementation of GSCM							Operational Performance	
		Proactivity	Green Purchasing	Environmental Management Systems		Logistics Network Design & Implementation			Geographic region
Information Sharing	Competitiveness							Economic Performance	
		Innovation	Supplier Evaluation	Pollution Prevention		Transportation			e.g. South-East Asia
	Coopetition							Extended Balanced Scorecard	
		Utility Theory	Environmental Auditing	Lean Production/ Six Sigma	Green Marketing				e.g. China
	Incentives							Data Envelopment Analysis	
			Environmental Certification	Design for Environment/ Eco-Design	Waste Management	Waste Exchange			
	Contingent RBV	Resource-Based View (RBV)							
			Supplier Assistance	Cleaner Production		Reverse Logistics/ Closed-loop/ End-of-life Practices		Resource Reduction	
	Development of Industrial Ecosystems	Internal Environmental Management							
Product-Based Systems Perspective			Environmental Life-Cycle Analysis	Process Design		Scale, Benefits, Drivers & Obstacles		Reuse	
		Cost Reduction							
Geographically Defined Local-Regional Industrial Ecosystem			Environmental Cost Accounting			Tools for reverse logistics management		Remanufacturing	
		Benefits to Organisation							
Webs of Relationships			Stock Price			New Models of Accounting		Recycling	
		Investment Recovery							
					Product Stewardship/ EPR				

Figure 1 Research topics related to GSCM

environmental risks and raising ecological efficiency. Klassen and McLaughlin [29] make a clear statement in their research that proactive corporate environmental strategies result in improved financial performance and lead to environmental and competitive improvements in association with the development of certain strategic managerial and manufacturing processes. Sharma & Vredenburg [47] explain in the framework of the resource-based view (RBV) competitive advantage as an outcome of the development of valuable organisational capabilities associated with a proactive environmental strategy.

4.4 Performance measurement within and across organisations

While Wagner et al [61] state in their research that the effect of environmental measures on economic performance is still unclear, Frosch [51] finds potential patterns of a positive effect of GSCM on environmental performance. Alvarez et al [62] discover a positive effect of greening the supply chain on a firm's economic performance. Contrary to that, Bowen et al [40] declare that they could not find short-term profitability and better sales performance as a result of GSCM. In a study on Chinese enterprises Zhu et al [19] confirm that there is no improved economic performance through implementation of GSCM. Hanna et al [63] find in their research a strong relationship between meeting operational goals and staff involvement on environmental management. Sroufe [64] creates a framework with performance indicators and supplier assessment metrics for gaining competitive advantage and reducing risk. Hervani et al [27] give an overview of performance measurement literature and draft an integrative framework for study, design and evaluation for GSCM tools. Kainuma & Tawara [65] construct a multi-attribute utility function of the supply chain and refer to the impact of information sharing. Simpson et al [66] ascertain that customer performance requirements on suppliers have an impact on suppliers' environmental performance. Rao [41] conducts a study on performance measurement in South East Asia commenting on the progress and difficulties of implementing GSCM in that particular region. Harvey and Schaefer [67] discover that external reporting serves as pressure for better performance results.

5. Review of controversial issues

One of the topics finding controversial response through research results refers to the issue if value can be created through an environmentally responsible supply chain. Although there is little doubt that more stringent environmental standards have to be met and many organisations have to devote increasing resources to develop and implement corresponding measures, there is no clear answer to the question if a better environmental performance results also in a better economic performance.

In this context falls also the discussion if an environmental proactive approach is a guarantee for better economic performance. It is arguable if a company going beyond simple compliance can achieve a sustainable competitive advantage.

A related topic concerns performance measurement. It is still to be tested which is best way to measure environmental performance. It is debated which metrics and which tools are best suitable for this task. .

Thus the development of a conceptual model linking green supply chain management, competitiveness and economic performance has not found a final answer yet. [66,68]

Researchers are still arguing what constitutes an environmentally excellent supply chain. There is a continuous challenge to find out what are the crucial factors and best implementations to achieve environmental excellence in a supply network.

6. Challenges for environmental research topics towards South-East Europe

While environmental decline has taken place in the region of South-East Europe during the time of Soviet authority, economic hardship did not allow the development of new techniques in the field of protection of the natural environment after the end of the cold war. Still many of the newly independent states have big financial difficulties to undertake the efforts necessary to make industrial processes more environment-friendly in spite of a recent shift of attitude. The enlargement of the European Union and the interest in stability in the neighbouring states has put the development of the economy in the region of SEE into focus. The development of green supply chain management in countries that are on the way to play a stronger economic role in the global market without having yet adopted a clear strategic approach toward the natural environment will gain increasing importance in the near future. SEE, which is in close proximity to the European Union, is one of the regions that faces the challenge to comply to rigid regulations, customer demands and competitive pressure if it intends to take a more active part in the European and international supply chains.

Issues that will have to be addressed are the question how the gap between awareness of the necessity to introduce green supply chain management and its practical implementation can be successfully bridged and how support from management and government has to be shaped. It may be worth examining if the encouragement of voluntary initiatives, as it has been done in Asia, could be a promising path to go in the political, economic and cultural context of SEE. As in other economies the examination of the increasingly important topic of performance measurement combining environmental, operational, and economic level in order to show a clear linkage between good environmental performance and improved economic performance may prove to be a useful way to persuade organisations in the region of SEE to adopt GSCM. The development and improvement of good performance measurement tools for green supply chain management is a promising field of further research.

Based on a number of topics suggested for further research by Hervani et al [27] in the field of performance measurement tools of green supply chain management the following challenges can be identified:

Research must examine the business and environmental results of a GSCM performance measurement system and their impact within the organisation, industry, and society in SEE. In this framework further investigation should go into inter-organisational agreement on performance management and measurement. Different types of metrics need to be developed, potential designs and tools of a GSCM/PMS. In order to determine which type of performance measurement systems work best in which sector, industry-specific research is recommendable. The development of appropriate data and information with respect to GSCM is an important topic for further studies. The question is to be answered which roles new technologies including information technology can assume in this process. It should also be scrutinized how appropriate the current tools and management of supply chain management are for incorporating environmental management dimensions. From a global perspective the question is how the firms in the SEE can be incorporated efficiently into global supply chains in respect to environmental issues. To what extent can other management tools, such as life cycle analysis, in combination with performance measurement help implement GSCM.

The common understanding is that GSCM creates and improves synergy and efficiency among business partners and helps to enhance their environmental performance, reduces waste and supports cost savings measures. In spite of these apparent advantages companies in SEE will have to be shown a clear link between the adoption of such measures and resulting better economic performance and competitiveness. Research should test an empirical link between such efforts and subsequent improvements in competitiveness and economic performance. In this context research should also investigate the question what is environmental excellence in a firm's supply chain management response to all the environmental pressures it faces. The definition of environmental operating models, operational objectives, and new supply chain processes is needed for the firms of the region of SEE. Research may establish a relationship

between the quality of a supply chain response and the extent of competitive advantage. It can provide to firms a framework that addresses environmental pressures, and show them a way how to assume a proactive approach to create supply chains resulting in improved profitability and environmental sustainability.

7. Conclusion

This work has given a preliminary review of the existing literature over the last decade concerning green supply chain management and has identified some of the major current research topics in that area. The paper has made the attempt to point out controversial issues and the need for further research in these thematic fields. With society's growing understanding that the environment should not have to pay the price for economic growth research will continue to examine the relationship between business and environment on a multitude of layers. Transition economies such as the region of SEE necessarily will have to focus on environmental issues if they want to compete in the global supply chain networks. Being a latecomer in the field firms from that region have the advantage to be able to avoid mistakes made by their competitors in the past and apply modern practices and tools of corporate environmental management on strategic and operational level.

This literature review needs to be extended to cover a larger period of time to serve as a base for a further in-depth research focusing on the particular conditions of selected countries of the region of SEE and evaluating various models and mechanisms to implement GSCM. The result of such a research should help firms of the region to gain insight how to develop an environmental approach that allows them to become more competitive and successfully integrate themselves into global supply chains.

Abbreviation list

ERP	Enterprise Resource Planning
GSCM	Green Supply Chain Management
PMS	Performance Measurement Systems
RBV	Resource-Based View
SEE	South-East Europe

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