T.C.

BAHÇEŞEHİR ÜNİVERSİTESİ

AN ANALYSIS OF ENVIRONMENTALLY CONSCIOUS PRACTICES IN TURKISH COMPANIES

Master Thesis

İPEK ÖZER

İSTANBUL, 2009

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THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
INDUSTRIAL ENGINEERING

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Supervisor

İSTANBUL, 2009

Dedicated to Nuran & Mesut ÖZER

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ÖZET

TÜRK ŞİRKETLERİNDE ÇEVREYE DUYARLI UYGULAMALARIN İNCELENMESİ

Özer, İpek

Endüstri Mühendisliği
Tez Danışmanı: Doç. Dr. Erkan Bayraktar

Temmuz 2009, 112 Sayfa

Günümüzde özellikle küresel ısınma konusundaki duyarlılığın arttığı bir dönemde çevre ile ilgili konuların başında karbon salınımlarını azaltmak geliyor. Toplumun bu konuda yaşadığı endişeler artık herkesi çevreye duyarlı olmaya çağırıyor. Yapılan araştırmalar çevreye en büyük zararın; enerji, taşıma ve ağır sanayi sektörlerinin neden olduğunu gösteriyor. Aynı zamanda, toplumun ekolojik çevre konusunda artan hassasiyeti, Türk şirketlerinin kurumsal sosyal sorumluluk kavramına daha fazla önem vermesini gerektiriyor. Bu kapsamda şirketlerin çevreye verebileceği zararı en aza indirgemek durumunda olduklarını kabul etmeleri ve buna uygun davranmaları konusunda daha duyarlı hale gelmeleri kaçınılmaz bir gerçek olmuştur.

Bu ampirik çalışma; Türk şirketlerinde çevreye duyarlı yönetim anlayışının ve uygulamaların değişik faktörlere göre nasıl etkilendiğini, istatistiki verilere dayanarak açıklamaktadır. Şirketlerin çevresel bilincini ölçmek amacıyla yapılan 519 katılımcılı bu çalışmada altı ayrı bölümden oluşan toplam 34 soru sorulmuştur. Yapılan anket çalışması sonucunda çoklu regresyon analizi kullanılarak; çevreyi kirleten potansiyel tedarik zinciri süreçlerinin, çevre yönetimini destekleyen faktörlerin, çevresel rekabetin, farklılaştırmaya dayalı rekabet önceliklerinin ve müşteri ilişkilerinin farkındalık seviyesi arttıkça, çevreye duyarlı uygulamaların farkındalık seviyesinin de olumlu yönde arttığı sonucuna varılmıştır.

Anahtar Kelimeler: Çevreye duyarlı uygulamalar, Yeşil Tedarik Zinciri Yönetimi, Kurumsal Sosyal Sorumluluk, Türkiye.

ABSTRACT

AN ANALYSIS OF ENVIRONMENTALLY CONSCIOUS PRACTICES IN TURKISH COMPANIES

Özer, İpek

Industrial Engineering
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Nowadays, in a period where awareness on global warming is increasing, reducing carbon dioxide emissions is one of the leading concerns regarding the ecological environment. The concerns that the public has regarding this topic call everyone to be more environmentally conscious. Previous research studies prove that the greatest damage to the environment comes from the energy, transportation and industrial sectors. At the same time, the public's increasing sensitivity on the ecological environment has been driving Turkish companies, which are socially responsible; to reduce the damage they have on environment to a minimum and behave according to this.

This empirical study explains using statistical data, how the level of environmentally conscious practices by Turkish companies varies according to different factors. A total of 34 questions in a six separate sections were asked to 519 participants to determine the environmental awareness of companies. Using multiple regression analysis, the survey results showed that as the level of awareness in the five items; supply chain management potential polluters, environmental management drivers, competitive environment, differentiation based competitive priorities and customer relationship increases, the level of environmentally conscious practices increases positively.

Keywords: Environmentally Conscious Practices, Green Supply Chain Management, Corporate Social Responsibility, Turkey.

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ABBREVIATIONS LIST

Carbon Dioxide Information Analysis Center	:	CDIAC
Corporate Environmental Management	:	CEM
Corporate Environmental Responsibility	:	CER
Corporate Sustainability	:	CS
Corporate Social Performance	:	CSP
Corporate Social Responsibility	:	CSR
Design-for-environment	:	DFE
Environmentally Conscious Business Practices	:	ECBP
Environmentally Conscious Practices	:	ECP
Environmentally Conscious Supply Chain Management	:	ECSCM
Environmentally Conscious Manufacturing	:	ECM
Environmental Protection Agency	:	EPA
Environmental Management System	:	EMS
Green Supply Chain Management	:	GSCM
International Energy Agency	:	IEA
The International Standards Organization	:	ISO
Life Cycle Analysis	:	LCA
Non-Governmental Organizations	:	NGOs
Organization for Economic Cooperation and Development	:	OECD
Purchasing Social Responsibility	:	PSR
Supply Chain Management	:	SCM

1. INTRODUCTION

Competition between institutions has gained high importance in the present global economy. Institutions have to estimate and forecast better than their competitors and differentiate themselves; hence they need to develop strategies. As a matter of fact institutions and corporations have to comply with customs, rules and laws of the society they belong to.

In order to have a long life-circle in today's competitive environment, institutions need to develop a corporate mission and vision which combine the society needs and rules with the business needs and rules. Interaction of society and business needs have to create a consistent environment to live. Industrial societies are increasingly recognizing the need for shifting to more environmentally conscious practices. Therefore, there is a need for modifying existing processes and developing new technologies that minimize environmental impact or pollution while providing stimulating economic value to businesses.

In the global competition environment, the organizations that given importance to social responsibilities, could achieve their missions and increase their brand value; moreover they get competitive advantage against competitors. One of the important issues of corporate social responsibility projects is minimizing the environmental damages during their production.

Today all stakeholders of an organization are more sensitive to the production levels and started to examine the given environmental damages related to organization. For instance customer's knowledge about the environment is improving and they are starting to examine the environmental damages caused by the organizations too. Moreover in some cases customers' behaviors are changing whether the firms produce environment friendly products start to prefer more than the other organizations.

Since the level of CO2 emissions started to increase after the industrial revolution, there is a strong need to control the environmental pollution around the world. Where

awareness on environmental issues like global warming is increasing, reducing carbon dioxide emissions is one of the leading concerns regarding the ecological environment. With this issue, the environmental awareness of management's approach is significant. Because of different drivers that force the companies to go green, each organization has to be aware of the environment and natural resources. In this dissertation, the main goal is to identify the implementation level of environmentally conscious practices

Previous research studies prove that the greatest damage to the environment comes from the energy, transportation and industrial sectors. At the same time, the public's increasing sensitivity on the ecological environment has been driving Turkish companies, which are socially responsible; to reduce the damage they have on environment to a minimum and behave according to this.

This dissertation is mainly focused on an empirical study that measures how the level of environmentally conscious practices by Turkish companies varies according to different factors. A total of 34 questions in a six separate sections were asked to 519 participants to determine the environmental awareness of companies. It is expected that; supply chain management potential polluters, environmental management drivers, competitive environment, differentiation based competitive priorities and customer relationship are positively associated with the level of environmentally conscious practices.

As the theoretical background of this dissertation, social responsibility concept is examined; moreover, environmental pollution around the World and especially in Turkey is searched thoroughly. The industrial sectors which have the biggest importance on environmental pollution and CO_2 emissions are discussed. As a result of all these investigations, in the literature review of this dissertation, importance of corporate social responsibility is given. Moreover, the corporate social responsible practices in the supply chain based on the degree or effect of responsibility that a firm has for the different stakeholder groups is discussed.

In Chapter 3, environmentally conscious practices are examined in details; especially green supply chain management concept is discussed. Environmental management drivers and barriers are also given in this chapter. Lastly, five hypotheses are generated to measure the implementation level of environmentally conscious practices. A survey

is developed according to the previous studies in the literature and an analysis of environmentally conscious practices in Turkish companies is discussed.

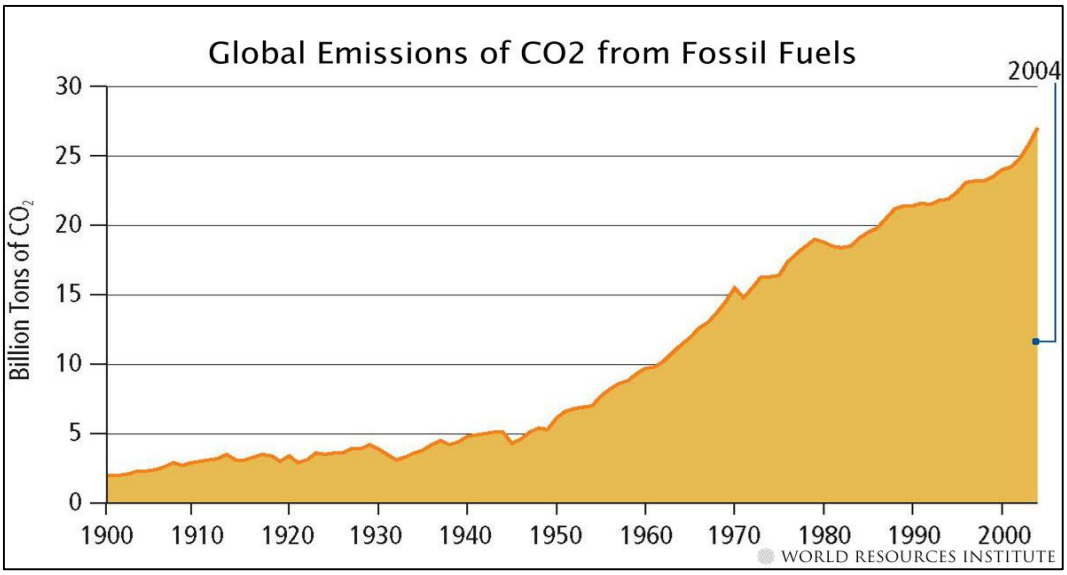
In Chapter 4, research methodology of the questionnaire is presented. The general information about survey instruments, sample and data collection, and operationalization of variables are provided. The reliability analysis is analyzed to measure the internal consistency of the constructs used in the survey. In Chapter 5, the results and discussions are provided, analysis of descriptive statistics is undertaken to test the hypotheses.

As a conclusion chapter, summary of findings is given and implications for managers and government are discussed, and some advices are mentioned for future studies.

2. THEORETICAL BACKGROUND

Industrial activities have created serious ecological problems in the past half century. The fact that unlimited and unconscious use of natural resources caused irreversible environmental destructions. Environmental issues include; global warming, greenhouse gases, carbon dioxide (CO_2) emissions, ozone depletion, loss of biodiversity, natural resource scarcity, air pollution, acid rain, toxic wastes, and industrial accidents (Shrivastava 1995b, p.183).

Since the Industrial Revolution, as a result of burned fossil fuels, the emission amounts have increased - to the atmosphere outspreaded emissions caused to huge changes in the earth climate. Especially, increase at the level of CO_2 emissions caused to greenhouse effects in the atmosphere. Figure 2.1 demonstrates that worldwide emissions of CO_2 have risen steeply since the start of the industrial revolution, with the largest increases coming after 1945 (Earth Trends Country Profiles, Climate and Atmosphere Turkey 2003).



Source: Baumert, K.A., Herzog, T. & Pershing, J., 2005. *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy.* World Resources Institute.

Figure 2.1: Global Emissions of CO_2 from fossil fuels

In Appendix A.1, the list of countries by carbon dioxide emissions due to human activity is given. The data presented in the table corresponds to the emissions in 2004. In 2007, CDIAC for United Nations collected the data that considers only carbon dioxide emissions from the burning of fossil fuels, but not emissions from deforestation, and fossil fuel exporters, etc. Table 2.1 shows the top 10 countries around the world, according to the total annual carbon dioxide emission percentages (Appendix A.1).

Table 2.1: List of top 10 countries and Turkey by 2004 Emissions

Ranking	Country	Annual CO_2 emissions (in thousands of metric tons)	Percentage of total emissions
1	United States	6,049,435	22.2 %
2	China and Taiwan	5,010,170	18.40%
3	European Union	4,001,222	14.70%
4	Russia	1,524,993	5.60%
5	India	1,342,962	4.90%
6	Japan	1,257,963	4.60%
7	Germany	860,522	3.10%
8	Canada	639,403	2.30%
9	United Kingdom	587,261	2.20%
10	South Korea	465,643	1.70%
23	Turkey	226,125	0.80%
	Others	5,280,059	41.70%
	World (207 Countries)	27,245,758	100.0 %

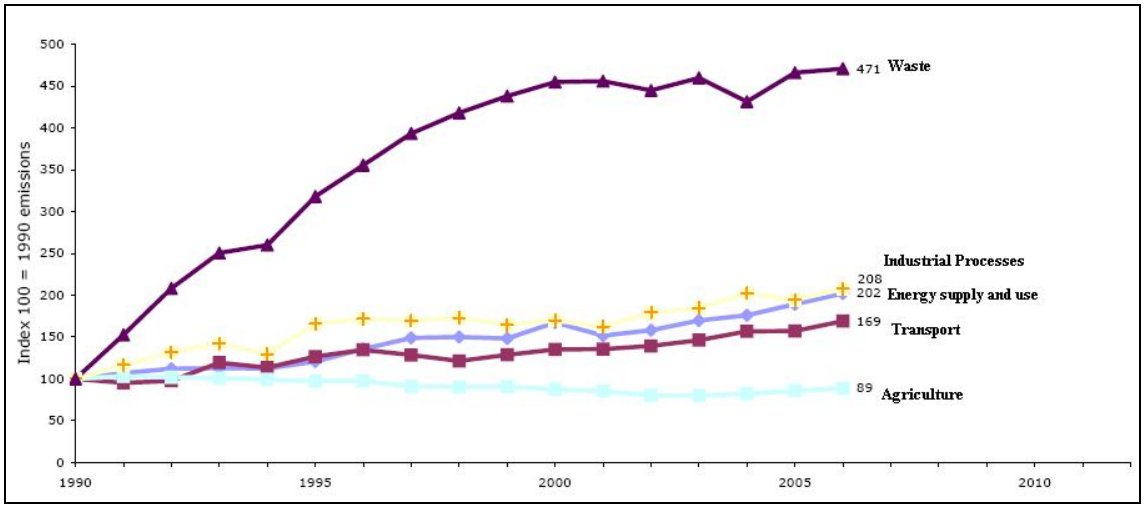
Source: CDIAC (Carbon Dioxide Information Analysis Center), 2004.

In Appendix A.2, the list of countries by carbon dioxide emissions per capita from 1990 through 2004 is given in details. All data were calculated by the US Department of Energy's Carbon Dioxide Information Analysis Center (CDIAC), mostly based on data collected from country agencies by the United Nations Statistics Division. The United States is the 1st largest in accord with the percentage of total carbon dioxide emissions; whereas 10th largest emitter of carbon dioxide emissions per capita in 2004 (Appendix A.2). According to preliminary estimates, since 2006 China has had a higher total emission due to its much larger population and an increase of emissions from power generation. China is the 91st largest emitter of carbon dioxide emissions per capita as of 2004. If we analyze the Turkey's ranking, she is the 98th largest emitter country around the world (Appendix A.2).

CO_2 emissions according to the sectors around the world between years 1990-2030 is given in World Energy Outlook report that was prepared by International Energy Agency (IEA), in 2004. The sectors of power generation, other transformation, industry and transport are analyzed. According to the report from IEA, CO_2 emissions in power generation and transport are expected to increase the most in the following two decades all around the world.

Different industries in Turkey affect environmental pollution and have different CO_2 emission rates. Share of greenhouse gases by main sources are; agriculture 4.9%, waste 9.1%, transport 13.4%, energy supply and use excluded transport 64.4% and industrial processes 8.2%. CO_2 has the biggest ratio with 82.7% besides CH_4, N_2O and F-gases (Greenhouse gas emission trends and projections in Europe 2008).

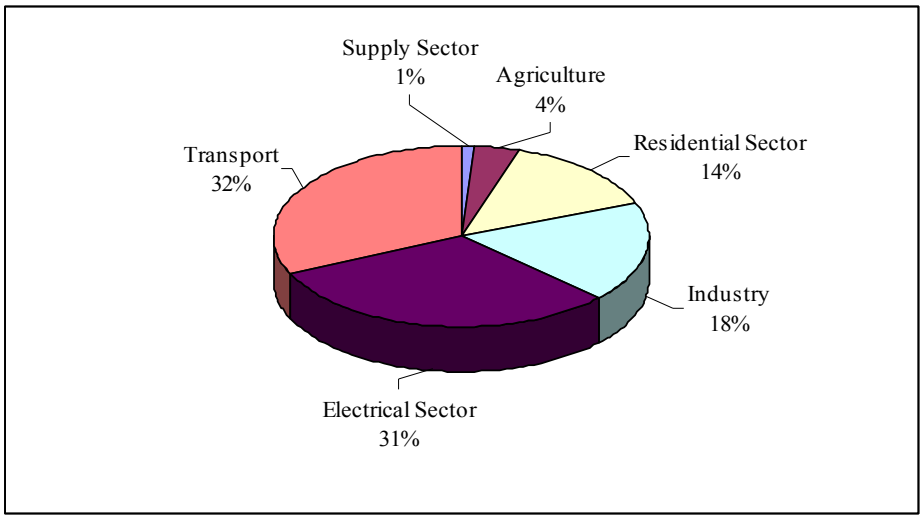
In Figure 2.2, sector-specific trends between 1990 and 2006 in Turkey are given. In 2005-2006, the important increase in emissions was mainly due to the energy sector (202). Also, in general emissions almost doubled since 1990. Environmental pollution increased in all sectors except agriculture (89).



Source: Greenhouse gas emission trends and projections in Europe, 2008. *EEA Report,* **5**.

Figure 2.2: Sector-specific trends in Turkey (1990-2006)

Another report published in 2007 displays the share by sectors of 2010 greenhouse gas emissions according to the "With Measures" projections. As seen in Figure 2.3, in 2010 supply sector will take place in the share by greenhouse gas emissions.



Source: Greenhouse gas emission trends and projections in Europe. Turkey, 2007.

Figure 2.3: The share by sectors of 2010 greenhouse gas emissions

Lise (2006) studied on the decomposition of CO_2 emissions over 1980-2003 in Turkey. A decomposition analysis was undertaken to answer the following question: which actors -i.e. scale, composition, energy and carbon intensity- explain changes in CO_2 emissions. As a result of this study, the decomposition analysis indicates that the largest increase in CO_2 emissions is caused by the expansion of the economy (scale effect). In per capita terms, the scale effect is more dominant in the 1980s than in the 1990s in explaining the increase in CO_2 emissions. The composition of the economy and the carbon intensity has also contributed to the increase in CO_2 emissions. The main conclusion according to research done by Lise (2006) is; no significant reduction in carbon emissions is observed in any sectors in the Turkish economy (Lise 2006, pp.1850-1851). Therefore, in the absence of carbon policies, no significant reduction in CO_2 emissions can be observed in the Turkish economy in the future.

To reduce the greenhouse gas emissions and promote technological development and spread of renewable energy, recent policies and proposals employ a broad range of incentives (Fischer & Newell 2005, p.1). The primary concern of most businesses now is how to manage their environmental impacts effectively and efficiently. Also, environmentally sustainability – the need to protect the environment and conserve natural resources- is now a value embraced by the most competitive and successful multinational companies (Berry & Rondinelli 1998, p.38).

> *"Sustainable development involves control over population growth, providing worldwide food security, preserving ecosystem resources, and reorienting energy use and industry to ecologically sustainable directions" (Shrivastava 1995b, p.184).*

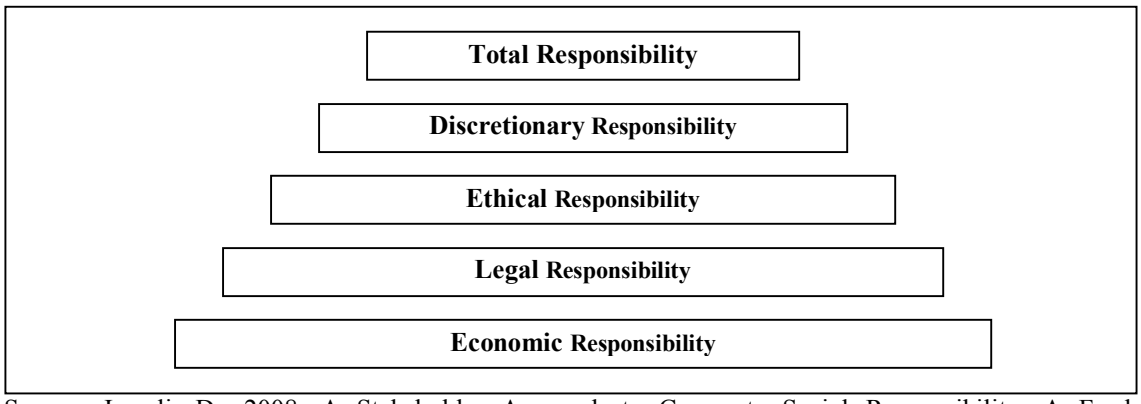
Related to the data sets, analysis and research; industry, energy and transportation has great impact on CO_2 emissions (Baumert, Herzog & Pershing 2005). Therefore, the organizations must be aware of the environment whether it's a manufacturing or service company. Greening the processes of a company and being aware of the environment has become a "social responsible" concept. As a theoretical background research, corporate social responsibility is clarified in this chapter.

2.1 CORPORATE SOCIAL RESPONSIBILTY

The definition of social responsibility has been subject to changes within the time. In the beginning of 1980s, it was defined as managing of the enterprise without damaging the interests of any related parties such as; stock holders, employees, customers and the whole society (Carter & Jennings 2002, p.38). Today due to the increase in environmental consciousness, the responsibility regarding ecological environment has become an important part of the social responsibility concept.

The term corporate social responsibility (CSR) has been defined in various ways from the narrow economic perspective of increasing shareholder wealth, to economic, legal, ethical and discretionary strands of responsibility, to good corporate citizenship (Jamali 2008, p.214).

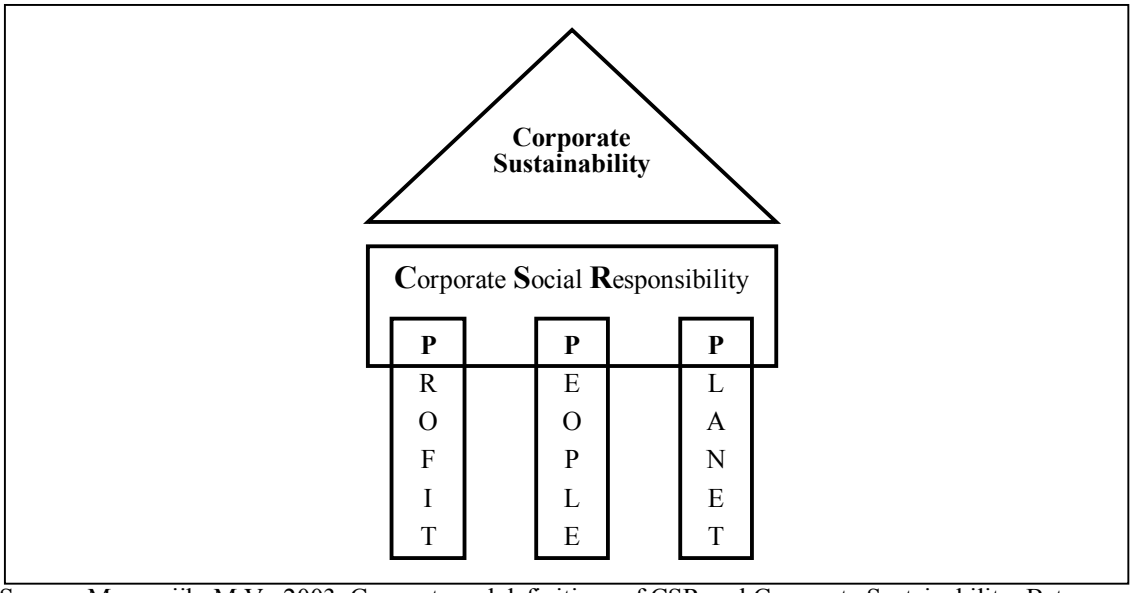
Carroll (1991) organized the notion of multiple corporate social responsibilities in a pyramid construct. In this pyramid shown in Figure 2.4, economic responsibility is the basic foundation. This conceptualization implies that the four responsibilities are additive or aggregate. Economic and legal responsibilities are socially required (i.e., mandatory), ethical responsibility is socially expected, while philanthropy is socially desired and each of these responsibilities comprises a basic component of the total social responsibility of a business firm (Jamali 2008, p.215).



Source: Jamali, D., 2008. A Stakeholder Approach to Corporate Social Responsibility: A Fresh Perspective into Theory and Practice. *Journal of Business Ethics* **82**: 213-231, p.215.

Figure 2.4: A hierarchy of CSR

Corporate sustainability is considered as the ultimate goal; meeting the needs of the present without compromising the ability of future generations to meet their own needs. The base three aspects related with corporate social responsibility are; profit, people and planet (seen in Figure 2.5)In spite of the traditional bias of CS towards environmental policies the various contributions showed sufficient interest in integrating social aspects into CS (Marrewijk 2003, p.102).



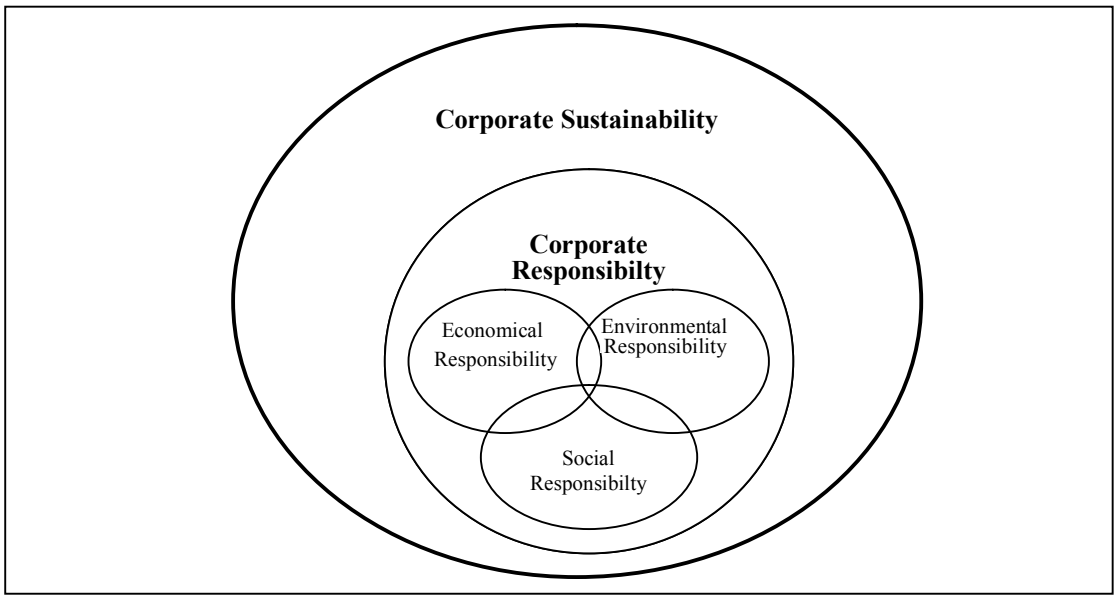
Source: Marrewijk, M.V., 2003. Concepts and definitions of CSR and Corporate Sustainability: Between Agency and Communion. Journal of Business Ethics, *Kluwer Academic Publishers*, **44**: p. 101.

Figure 2.5: Relationships 3P, CS and CSR

In the early 21st century, the corporate social responsibility concept seems to have great potential for innovating business practices with a positive impact on people, planet and profit (Zwetsloot 2003, p.203). Simultaneously, Marrewijk (2003) mentions on the three

aspects of sustainability (economic, environmental, and social) that can be translated into a CR approach that companies have to be concerned with. The simple illustration in Figure 2.6 depicts the relationship of corporate sustainability (CS), corporate responsibility (CR) and corporate social responsibility (CSR), and, the economic and environmental dimensions. This also shows how CSR fits into the current CR or CS framework to complete the picture of corporate sustainability (Marrewijk 2003, p.102).

CSR relates to phenomena such as transparency, stakeholder dialogue and sustainability reporting, while CS focuses on value creation, environmental management, environmental friendly production systems, human capital management and so forth (Marrewijk 2003, p.102). Figure 2.6 is the general model of corporate sustainability and corporate responsibility with its dimensions (Marrewijk 2003, p.101).



Source: Marrewijk, M.V., 2003. Concepts and definitions of CSR and Corporate Sustainability: Between Agency and Communion. Journal of Business Ethics, *Kluwer Academic Publishers*, **44**: p. 102.

Figure 2.6: General model of CS/CR and its dimensions

In recent years, a management term called environmentally conscious supply chain management (ECSCM) is emerged (Beamon 2005, p.222). It refers to the control exerted over all immediate and eventual environmental effects of products and processes associated with converting raw materials into final products. Beamon (2005) states that ECSCM is aligned with the safety, health, and welfare of the public and related with sustainability. Supply chain management practices related with corporate social responsibility practices are discussed in the next section.

2.2 CORPORATE SOCIAL RESPONSIBILTY PRACTICES IN THE SUPPLY CHAIN

Environmental or conservation practices are sometimes compared to socially responsible practices. The type of required performance is different between these practices. About environmental topics, organizations try to decrease their impact on the natural environment; one of these topics argues that the goal is to have no effect on the environment and to guarantee that their "environmental footprint" is insignificant (University of North Carolina at Chapel Hill and the Environmental Law Institute 2001, p.194).

The term *footprint* is used as an indicator of environmental sustainability. Carbon footprints measure the sustainability and environmental impact of our day-to-day actions on climate change. It is also used to measure and manage resources throughout the national and global economy (Visser *et al.* 2007, p.168).

The ultimate objective of the organization is to increase the welfare and life standards of the society around the organizations' location. Besides decreasing effects, the organization tries to improve the positive impacts on the social context. In addition to that, according to stakeholders; corporations should be involved in the development of human welfare without discriminate their locations (Ball 2006, p.A1). As a result, organizations need to be proactive in their social responsible practices to guarantee their positive societal effect as they reduce environmental footprint.

Zutshi and Sohal (2004) support that; when firms have corporate social responsibilities, then their supply chains become more efficient. Therefore, corporate social responsibility concept has various benefits for the enterprises. These benefits are listed below:

- "More effective communication with customers hence more sales,
- Better relations in the society
- Decreasing the tension in relations with competitors
- The increase in the loyalty of the employees
- More trust towards the managers and the products of the company
- Improved corporate image, etc" (Zutshi & Sohal 2004, pp.374-376).

The firms that acted appropriate to its corporate social responsibilities, they create their business strategy and policies according to those. In fact corporate social responsibilities bring good business strategies and policies together. This includes to be given more importance to the environment, as well as to be established good relations with the stakeholders, both from employees and suppliers to customers and distributors. For instance contemporary business cycle gives importance to establishing good relations with employees. The aim is to get fully employee involvement that is seen as a prior condition for successful business (Zutshi & Sohal 2004, p.372).

Clark (1999) points out that many multinational companies are adopting environmental management systems (EMS) to satisfy customer pressures and to ensure that their suppliers are operating in environmentally and socially responsible ways. Some are doing so in response to peer pressure as more corporations adopt environmental management systems and require their second and third tier suppliers to do so as well. Growing interest among corporate stakeholders is also driving more corporations to adopt EMS and to certify them (Morrow & Rondinelli 2002, p.160).

Clarkson (1995, pp.92-94) categorizes the social responsible practices based on the degree or effect of responsibility that a firm has for the different stakeholder groups. These categories are;

- Internal social responsible practices,
- Stakeholder social responsible practices,
- Community social responsible practices,
- Supplier social responsible practices.

2.2.1 Internal Social Responsible Practices

There are many benefits of CSR for employees. For instance in this wise employees' trust to the business increase, and they become more loyal to the business. In fact, businesses give more importance to their employees. Today, to be successful, managements develop a climate of trust, and friendly and respectfully environments in their businesses (Marrewijk 2003, p.99).

In nowadays business circle is given very importance to full employee involvements. In fact the employees enjoy from taking responsibilities, having key roles in businesses; therefore, given responsibilities to the workers impact their efficiencies positively. Also the team works constitute efficient working possibilities for employees. For improving their abilities, businesses encourage their employees by education and training. The International Standards Organization (ISO) management system identifies 'full employee involvement', as a prior condition for successful working and achievement of environmental and quality objectives (Zutshi & Sohal 2004, p.372).

An organization is mainly responsible to improve the employees' welfare and work conditions. The reason is work behaviors are affected from several operating practices and pressures that are related to safety. Therefore, safety in the workplace and the pressures on employees decrease or increase the performance or efficiency of the employees. The injuries and accidents should be reduced by job trainings and education. Firms should be proactive to guarantee that the work procedures keep a long-term focus that will make workers happier and healthier (Brown, Willis & Prussia 2000, pp. 445-448). As a result of these, the firm performance and efficiency will be increased and the employees will be much more productive.

According to Zutshi and Sohal (2004), employee involvement and empowerment management style has some obstacles from the managers' point of view:

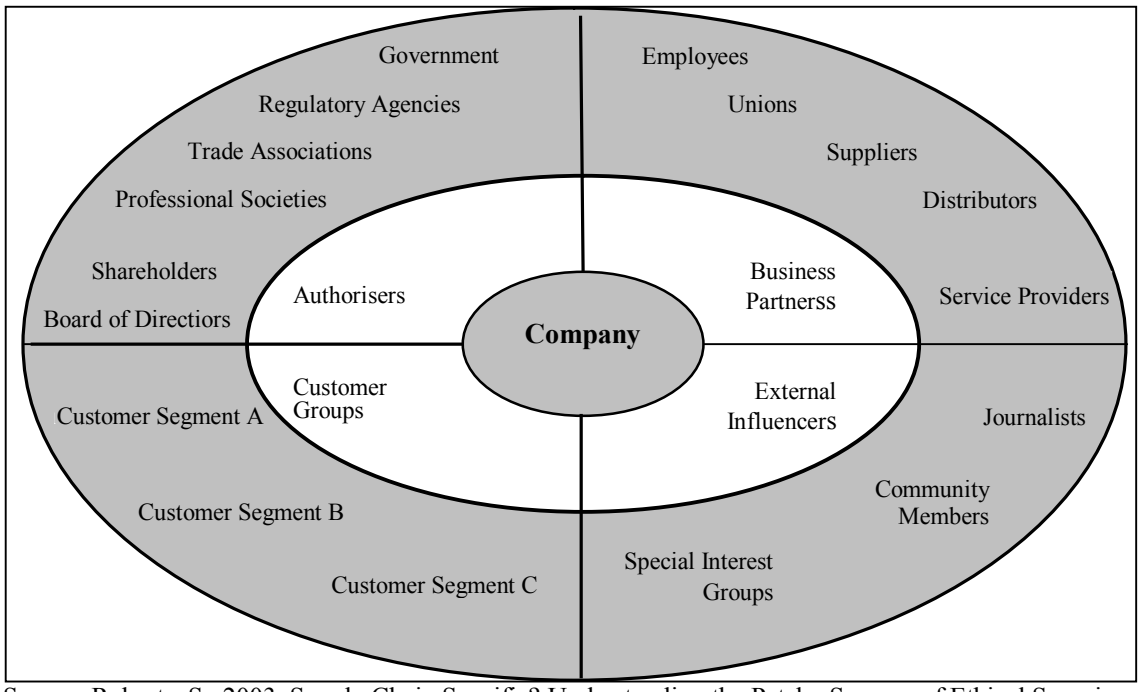
- Resistance to change [by employees],
- Lack of trust by employees of management motives, due to sudden change in working styles,
- Lack of clear expectation of the extent of involvement in the problem solving process,
- Lack of participative skills from the employees, as they may not have previously experienced such concepts, and
- Lack of on-going commitment from the top management, who after initial encouragement leave rest of the delegating and maintenance to the managers.

Employees will be more likely to go out of their way to ensure that the firms perform well when they recognize that the organization is truly committed to them. Previous

empirical research has proven that organizations whose employees feel a higher level of commitment and well-being perform better. Those firms are better able to exclude their strategies and receive tremendous dedication from the employees in return, when they are more committed to them (Lee & Miller 1999, p.579).

2.2.2 Stakeholder Social Responsible Practices

The CSR's utilities are including all corporate stakeholders. Stakeholders means employees, community, non-governmental organizations, as well as suppliers, distributors, service providers, consumers, shareholders, etc (Roberts 2003, p.160). In Figure 2.7, corporate stakeholders are shown in details. Stakeholder is a broad term and can encompass a number of individual(s) or group(s) directly or indirectly impacted by organizational activities (Zutshi & Sohal 2004, p.373).



Source: Roberts, S., 2003. Supply Chain Specific? Understanding the Patchy Success of Ethical Sourcing Initiatives. *Journal of Business Ethics*, Kluwer Academic Publishers, **44**: p.162.

Figure 2.7: Corporate stakeholders

There is a macro-level shift in the role of business in society where environmental and stakeholder initiatives could reshape the basis of economic competitive advantage. The field of corporate social responsibility has been largely disconnected from corporate strategy while functioning in a competitive environment. It is necessary to explore the shifts in the role of business to integrate with environmental and stakeholder

engagements and to find out its influence on competitive value (Swift & Zadek 2002, p.2).

Environmental and social problems and challenges do not stop at the gates of companies, but have to be considered along the supply chains as the unit across this related material and information flows are organized (Seuring *et al.* 2008, p.1545).

Brown (2000) indicates that stakeholders are increasingly exerting pressure for information on business activities aside from financial performance:

- Investors are looking for evidence of good corporate governance, particularly sound business strategy and effective management of risk,
- Customers are asking about the origins of products, their manufacturers and what they contain,
- Employees are looking to work for companies that visibly account for their responsibilities to society and the environment,
- Governments and civil society are increasingly placing pressure on businesses to report on social and environmental performance.

2.2.3 Community Social Responsible Practices

Companies that do not balance strategic intent with community expectations are likely to find their business goals and opportunities damaged. Those that are positioned favorably in the community are treated differentially and respectfully. As a result of these issues, what a company does in a community and how it does, it can serve as a competitive advantage in the market (Burke 1999).

Burke (1999) also states that a successful company should pursue two goals. An organization must redesign its community and operational practices in ways that respond to the community's expectations that increasingly now define how a company should operate. The second optional goal is defined as follows: "An organization should take advantage of the public's shift in attitudes and design its community involvement programs to support its business goals and enhance its competitive advantage" (Burke 1999).

Corporate social responsibility philosophy increases the quality of the goods and services. Community requests the needs and determines the complaints and satisfaction. By the reason of community feedback, companies give more importance to the environment, they act more environmental-friendly during its activities. In this way the environment wouldn't be damaged and the society could get a chance to live in a sustainable environment (Beamon 2005, p.225).

Another benefits that corporate social responsibility is preventing environmental pollution by protecting the environment, decrease the greenhouse gases, and increasing voluntary responsibilities towards benefits for humanity. Therefore enterprises act together with non-governmental organizations when they take upon responsibility on these issues (Eren 1990).

Environmental NGOs have increased pressure on organizations to review their supply practices (Beamon 2005, p.222). Companies also need to meet with the expectations of NGOs, activists, communities and governments. NGOs and activists, aided by the increasing societal transparency and electronic communication, are well known sources of pressure. The capacity of activists and interest groups to mobilize, to disseminate negative information about companies, and to take action, have never been greater and we have seen this force in action a lot in the past few years. They expect more responsibility, more information, more leadership, and often require a lot of attention from a chief executive and its team (Karp 2003, p.16).

Therefore, some social responsibility campaigns could be more effective if enterprises involve large layers of the society in the campaign. In this situation, collaboration can be made with non-governmental organizations (NGOs) that are responsible about environment. Thus the number of NGO members will increase the success of this organization and also their contribution to the society will increase. NGOs believe that public-private partnerships can regenerate neighborhoods (Marrewijk 2003, p.96-98). NGOs are increasingly using corporate reputational innocently as a lever for environmental and social change (Roberts 2003, p.160).

2.2.4 Supplier Social Responsible Practices

Research in corporate social responsibility philosophy is beginning to recognize an important role that supply chain management plays in the specification of possible options, processes, and outcomes. In regard to the management of quality, supply chain, and the environment, leading to improved competitiveness, the extension of horizons of analysis that major advances in theory and practice can occur (Kovács 2008, p.1-3).

> *"Corporate Culture can be defined as an organization's unique body of knowledge that is nurtured over a long period of time resulting in commonly held assumptions, values, norms, paradigms and world views. These shape the behavior and thinking of the people within the organization and thus form the organization's core identity characterizing the way of doing business with qualities distinct from others" (Visser et al. 2007, p.102).*

Organizations started to constitute their own corporate culture to put into practice the CSR philosophy. According the corporate culture, firms have to form their vision and mission. To manage its suppliers, organizations dedicate their cultural values clearly to the suppliers so that they have to be aware of the culture and the general rules of the firms. Suppliers would recognize that if there will be lameness in the process, they would have to pay penalty or if they improve their cultural values, they will get extra credit. Organizations have to manage these processes carefully and clearly to obtain its borders according to the organizational culture (Visser *et al*. 2007).

Many supply chain practices and systems have an impact on stakeholder social well-being and welfare. Larger and more powerful firms are more likely to be targeted to help improve worker conditions in the supply chain. These firms may be perceived as being able to force suppliers to change their practices (Kovács 2008, p.1-3).

3. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The goal of this chapter is to synthesize the relevant literature into an integrated conceptual model linking the different environmentally conscious practices in the supply chain management. At this point, only broad associations between major constructs are made, and a more detailed conceptual framework is presented.

Segments of three large bodies of literature are reviewed in this chapter. The first sub-section reviews the environmentally conscious practices in details. The second sub-section presents the drivers and barriers to implement environmentally conscious practices. In the third section of this chapter, renewable energy, resources and cleaner technologies are discussed. In the light of the literature review, the conceptual framework and hypotheses development will be discussed.

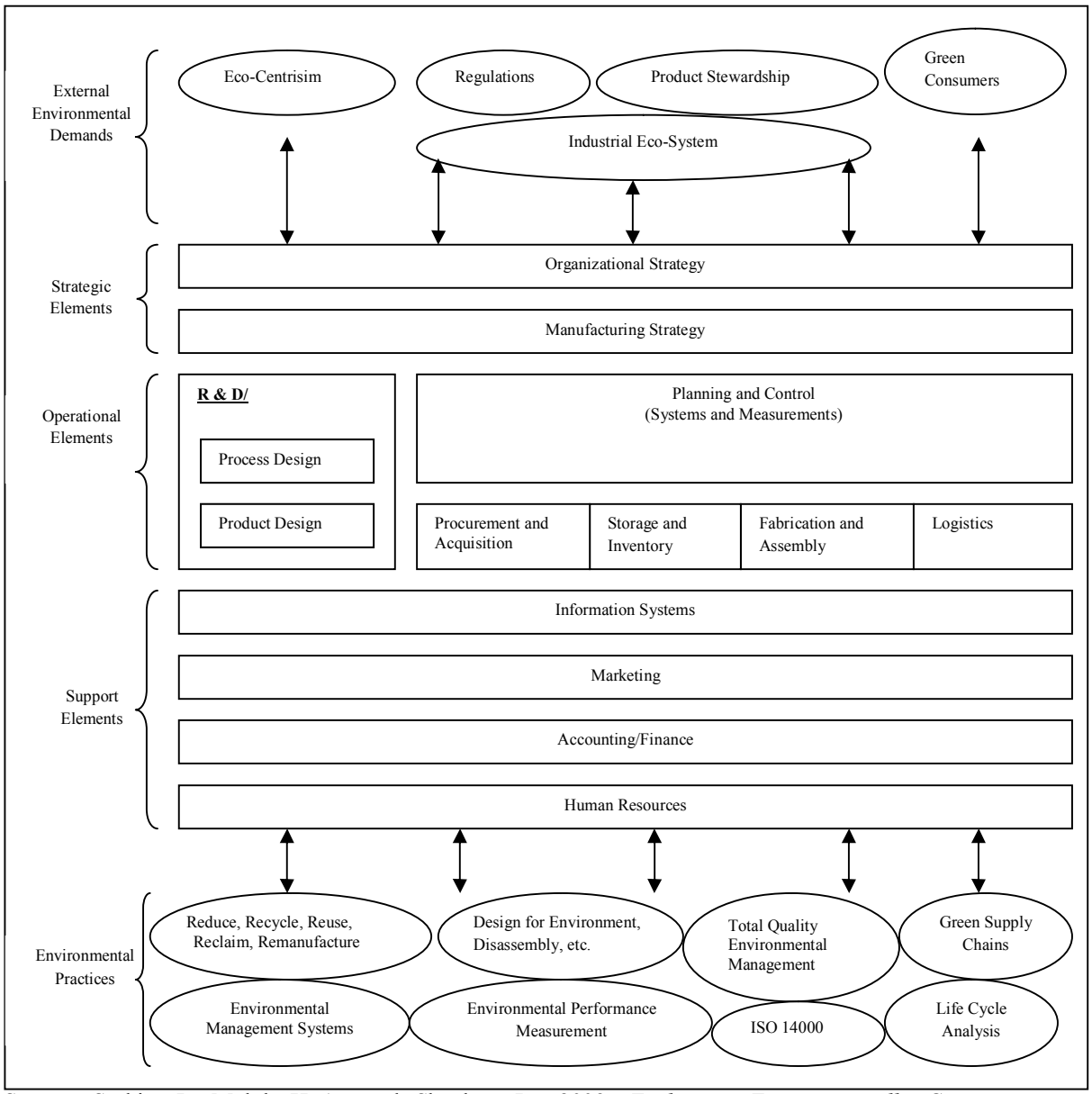
3.1 ENVIRONMENTALLY CONSCIOUS PRACTICES

Environmental consciousness has been increasing in the last few decades. More people are aware of the world's environmental problems such as global warming, toxic substance usage, and decreasing in non-replenish resources (Khiewnavawongsa & Schmidt 2008, p.244)

Today, environmentally - friendly firms want to adopt their green practices to their supply chains. Organizations think when they achieve this idea; the overall success of the firm will increase suddenly. Therefore, within the framework of corporate social responsibilities, most industrial firms use environmental management system(s) (EMS) (Zutshi & Sohal 2004, p.371).

Figure 3.1 illustrates the strategic components of environmentally conscious management. Environmentally conscious manufacturing (ECM) and its practices has a variety of definitions and dimensions. It ranges from smaller focused and operational programs to broader, organization-wide strategic programs with long-term implications for an organization. Sarkis (2001) has defined ECM within the broader context of

organizational corporate environmental management. A summary of the various elements and considerations within ECM are shown in Figure 3.1 that illustrates the pervasiveness of the decision to integrate ECM and its many dimensions into an organization's culture, functions and business processes (Sarkis, Mohd & Shankar 2009, p.16).



Source: Sarkis, J., Mohd, H..A., and Shankar, R., 2009. *Evaluating Environmentally Conscious Manufacturing Barriers with Interpretive Structural Modeling.* http://ssrn.com/abstract=956954, p.23.

Figure 3.1: Strategic components of ECM.

Environmental practices represent actions and programs within the firm that improve environmental performance, remediate problems, and minimize any environmental

burden. Environmentally conscious business practices require a powerful supply chain and improved relations between parts (Sarkis 1998, p.161). ECBP also require a well-coordination and cooperation. That is to say the capability of supply chain should be sufficient (New & Westbrook 2004, pp.232). Because of this, before their environmentally conscious business practices organizations should identify supply chain strategies. Sarkis (1998) and New and Westbrook (2004) groups the components of ECBP as; design for the environment, life cycle analysis, total quality environmental management, green supply chain management, and environmental regulations.

Table 3.1: Summary of components and sub-components of major ECBP

ECBP components	ECBP sub-components
Design for the Environment (DfE)	Design for Recyclability
	Design for Reuse
	Design for Remanufacturability
	Design for Disassembly
	Design for Disposal
Life Cycle Analysis (LCA)	Inventory Analysis
	Life Cycle Costing
	Impact Analysis
	Improvement Analysis
Total Quality Environmental Management (TQEM)	Leadership
	Strategic Environmental Quality Planning
	Environmental Quality Management Systems
	Human Resources Development
	Stakeholder Emphasis
	Environmental Measurements
	Environmental Quality Assurance
Green Supply Chain Management (GSCM)	Inbound Logistics/Procurement
	Materials Management
	Outbound Logistics/Transportation
	Packaging
	Reverse Logistics
IS0 14000 EMS Requirements	Environmental Policy
	Planning
	Implementation and Operation
	Checking and Corrective Action
	Management Review

Source: Sarkis, J., 1998. Evaluating environmentally conscious business practices: Theory and Methodology, *European Journal of Operational Research*. **107**, p.161.

In the sub-section, the sub-components of environmentally conscious practices will be discussed in details.

3.1.1 Design for the Environment (DFE) or Eco-Design

The goal of design for the environment (DfE) or eco-design is to consider the complete product life cycle when designing environmental aspects into a product or process. In fact DFE is concurrent engineering. The DFE is a concept that supports the philosophy of environmental factors needs to be integrated into the early design of any product or process. Joseph Sarkis (1998) indicates in his research that;

> "*DFE incorporates the types of materials that are used in the manufacture of the product, materials' recyclability and reusability capabilities, the materials' long term impact on the environment, the amount of energy (and efficiency) required for the product's manufacture and assembly, the capability for easy disassembly for remanufacturing, considerations of the product's design to include remanufacturing characteristics, and consideration of the products durability and disposal characteristics. The DFE concept supports the philosophy that environmental factors need to be integrated into the early design of any product or process*".

If the supply function is involved at an early stage in the product design process, then this can provide benefits to the organization. Design for the environment is also called as green product design. DFE or green product design is an important element in environmental management, with potential benefits including less waste, greater productivity, and higher levels of innovation. New and Westbrook (2004**,** p.239) quotes that "the shift from regulatory-driven pollution control, to pollution prevention product technologies, necessitates changes in engineering design, research, and education".

Eco-design or design for the environment (DFE) is a helpful tool to improve companies' environmental performance by addressing product functionality while minimizing life-cycle environmental impacts. The success of eco-design requires the internal cross-functional cooperation among the organization and the external cooperation with other partners throughout the supply chain (Zhu & Sarkis 2006, p.474).

It has been argued that for effective product stewardship and reverse logistics practices, eco-design (that includes design for disassembly, design for recycling, and design for other reverse logistics practices) is important (Hoek & Erasmus 2000, pp. 28-33). One of key aspects for eco-design is to facilitate reuse, recycle and recover through smart design like disassembling used products, a critical design characteristic for closed-loop supply chain management (Zhu, Sarkis & Lai 2008, p.14).

DFE has a number of functional sub-components. Another categorization could be the consideration of technological and organizational sub-components. The functionality perspective encompasses design for recyclability, remanufacturability, reuse, disassembly, and disposal. The functionality grouping is used to compare attractiveness and viability of various ECBP alternatives. Descriptions of these sub-components are stated in Table 3.2 (Sarkis 1998, p.161).

Table 3.2: Descriptions of sub-components of design for environment (DfE)

		Descriptions
DESIGNING FOR ENVIRONMENT	Reusability	The amount of treatment required, where minimal treatment of a material is more closely associated with reuse of a product.
		The on-site or off-site use, with or without treatment, of a waste product.
		Focus on the overall product and less so on the components.
	Recyclability	The amount of treatment required, while a material that requires a large amount of treatment is more characteristic of recycling.
		The capabilities of the materials that can be recycled or at least capabilities of the materials and sub-components of the product.
	Remanufacturing	Design of a product with respect to repair, rework, or refurbishment of components and equipment to be held in inventory for either external sale or internal use.
		In a typical remanufacturing process, identical 'cores' (the worn-out components and equipment) are grouped into production batches, completely disassembled, and thoroughly cleaned before being reassembled.
	Disassembly	Designing a product that may be dismantled for recycling, remanufacturing or reuse purposes.
	Disposal	Consideration of materials and transportation requirements of materials that will be used in a product.

Source: Sarkis, J., 1998. Evaluating environmentally conscious business practices: Theory and Methodology. *European Journal of Operational Research,* **107**, p.161.

3.1.2 Life Cycle Analysis (LCA)

Life cycle analysis (LCA) is closely linked to DFE outputs. Life cycle analysis focuses on the analysis of the design (Sarkis 1999, p.161). LCA appraises various characteristics of a product's life cycle from the preparation of its input materials to the end of its use. With LCA of the product design could evaluate the types and quantities of product inputs, such as energy, raw material, and water, and of product outputs, such as atmospheric emissions, solid and waterborne wastes, and end-product (Sarkis 1998, p.161). When addressing supply chain activities and processes, a product life cycle

perspective is required in order to consider all of its parts i.e., suppliers, manufacturers, distributors and customers (Mosovsky, Dickinson & Morabito 2000, p. 231).

The LCA methodology can be used as an objective tool. LCA could identify and evaluate opportunities to reduce the environmental impacts, which associated with a specific product, process, or activity (Sarkis 1998). The four basic interrelated components of an LCA include: inventory analysis, life cycle costing, impact analysis and improvement analysis (Lin, Jones & Hsieh 2001, p.72).

Inventory analysis is the identification and quantification of energy and resource use and the environmental effects on natural resources throughout a product's lifetime (Lin, Jones & Hsieh 2001, p.72). For inventory analysis the processes of acquiring inventory data and component analysis are required (Sarkis 1998, p.162).

Life cycle costing (LCC) is a methodology in which all costs are identified for a product throughout its lifetime. LCC should be performed before the product is manufactured. Therefore, the changes in the design process can be performed at the end of an existing product's life-cycle (Sarkis 1998, p.162).

Impact analysis is the assessment of the consequences and risks related to wastes. Impact analysis evaluates an array of alternatives and identifies the activities with greater and lesser environmental consequences (Lin, Jones & Hsieh 2001, p.72).

Improvement analysis or environmental analysis is the evaluation and implementation of opportunities that effect environmental improvements (Lin, Jones & Hsieh 2001, p.72). Sarkis (1998) states that "improvement analysis systematically documents periodic reviews of a facility's operations, ensuring waste minimization and pollution prevention".

3.1.3 Total Quality Environmental Management (TQEM)

Total quality environmental management is the application of total quality management (TQM) with environmental regards. Total quality management basically deals with quality and TQM is a management approach that aims for long-term success by focusing on customer satisfaction (Rao *et al.* 1996, p.26). Thus total quality

environmental management refers to quality in environment and Sarkis (1998) defines the term as follows:

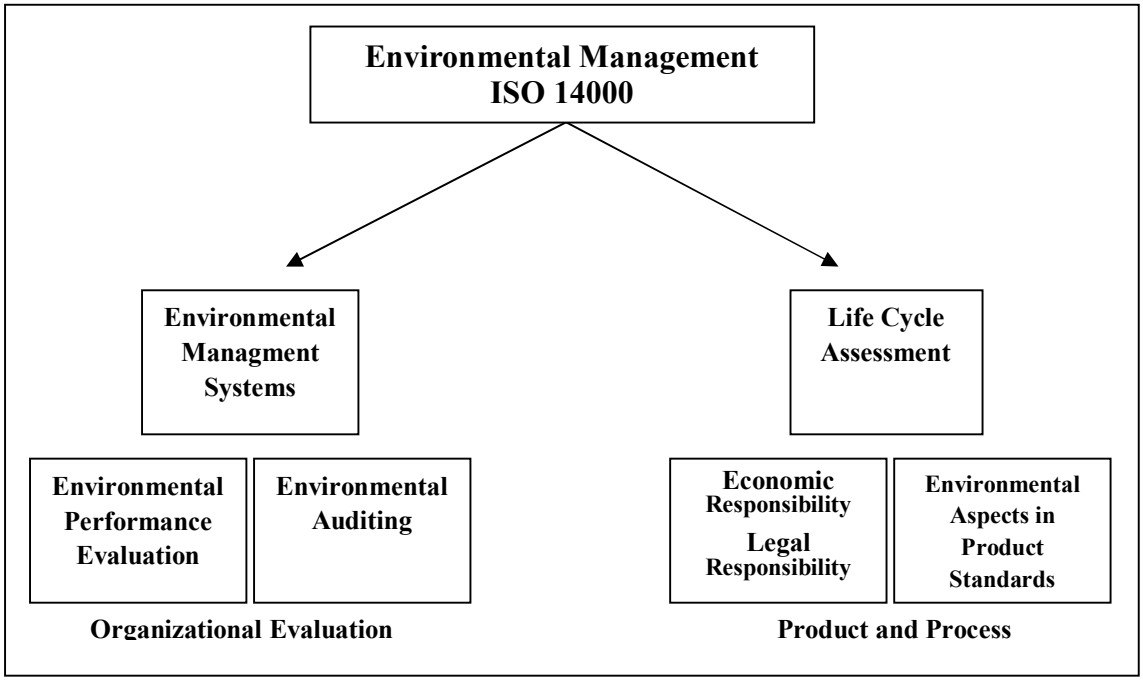
> *"The elements of TQEM have been characterized by the Malcolm Baldrige Award criteria for a number of organizations and the environmental protection agency (EPA). These criteria are redefined for TQEM and introduced as the following sub-components, leadership, human resources development, environmental quality management systems, strategic environmental quality planning, environmental quality assurance, environmental measurements, and stakeholder emphasis" (Sarkis 1998, p.162).*

3.1.4 Environmental Regulations

The ISO 14000 Standard

ISO 14000 is the most popular kind of environment management system (EMS). An environment management system is defined as a management model established on the basis of risk analysis and developed for decreasing systematically and rationally the damages or risks that enterprises caused in the environment (Clark 1999). ISO 14001 is an international standard that was first published in 1999 as ISO 14000:1996 by the International Organization for Standardization (ISO) and it was reviewed and published again in 2004 (Sarkis 1998). Today businesses that want to bring their environment related efforts systematical put forth determined objectives and want to take regulative measures; they then run to establish their environment management systems and certificate.

As an analytical model, the ISO environmental management system consists of five principle components as shown in Figure 3.2 (Melnyk, Sroufe & Calantone 2003); environmental policy, planning, implementation and operation, checking and corrective action, and review and improvement (Sarkis 1998, Lin, Jones & Hsieh 2001, Melnyk, Sroufe & Calantone 2003).



Source: Melnyk, S.A., Sroufe, R.P. & Calantone, R., 2003. Assessing the impact of environmental management systems on corporate and environmental performance. *Journal of Operations Management*, **21**: p.331.

Figure 3.2: ISO 14001 and environmental management systems

ISO 14000 guidance directs that the organization should identify or evaluate;

- the various activities, processes, products or services those are included within the scope of the EMS, distinguishing them in such a way that they are "large enough for meaningful examination and small enough to be sufficiently understood".
- all the environmental aspects of each of its activities, products and services, including all those that the organization "can control and over which it can be expected to have an influence".
- as many as possible of the actual or potential environmental impacts associated with each aspect of its activities, either positive or negative.
- the significance of each of the identified environmental impacts, using both environmental criteria (for instance the scale, severity, probability, and duration of the impact) and other business concerns such as regulatory or legal exposure, difficulty and cost of changing the impact, concerns of interested parties, and public image (Melnyk, Sroufe & Calantone 2003, p.331).

In the light of its significant impacts, the organization should set performance objectives for implementing its environmental policy goals, and specific and measurable targets and dates for achieving progress (University of North Carolina at Chapel Hill and the Environmental Law Institute 2001, pp.9-11)

ISO 14001 forces the enterprises to implement a system about the environment. It regulates the use of raw materials, production, process and poison waste regimes. It enables enterprises to develop plans and strategies about this issue (Sarkis 1998). A summary of the relevant sections and sub-sections for IS0 14001 Quality Standard is shown in Table 3.3. Briefly ISO 14001 Standard defines the essential elements of an effective environment management system.

Table 3.3: IS0 14001 certification sections for EMS

1. Environmental policy
2. Planning
2.1 Environmental aspects
2.2 Legal and other requirements
2.3 Objectives and targets
2.4 Environmental management program(s)
3. Implementation and operation
3.1 Structure and responsibility
3.2 Training, awareness and competence
3.3 Communication
3.4 Environmental management system documentation
3.5 Document control
3.6 Operational control
3.7 Emergency preparedness and response
4. Checking and corrective action
4.1 Monitoring and measurement
4.2 Non conformance and corrective and preventive action
4.3 Records
4.4 Environmental management system audit
5. Management review

Source: Sarkis, J., 1998. Evaluating environmentally conscious business practices: Theory and Methodology. *European Journal of Operational Research,* **107**: p.161.

WEEE

The Weee directive is a regulation including restricting the waste of electrical and electronical equipments. It is one of the important directives of The Commission of European Union, which published by 2002/96/EC number and called as "Waste of Electronic and Electrical Equipment-WEEE" on 27 Jan 2003. It requires manufacturers selling electrical or electronic equipment to member countries of the European Union to be responsible for end-of-life disposal of their finished goods (Coombs 2007).

The Weee directive attempts to limit the stream of waste materials to be more environmentally friendly. The end results are tariffs for purchasing electronic products to help with disposal costs and encouraging electronic manufacturers for cycling (Coombs 2007). Mainly, the directive obliges to separate collecting of electrically and electronically equipments and to recycle them.

RoHS

The RoHS is other one important directive of The Commission of European Union, which included restricting the use of some hazardous substances on electrical and electronical equipment. This directive was published by 2002/95/EC number and called as RoHS "Restriction of the Use of Certain Hazardous Substances" (Coombs 2007).

Actually the RoHS directive has a supplemental attribute for the Weee directive. According to the RoHs Directive, though the electrically and electronically equipment wastes collected separately, yet they entertain risks by virtue of hazardous substances in its. The RoHS directive targets six widely used materials. The materials impacted by RoHS legislation are; lead, mercury, cadmium, hexavalent chrome, PBB (poly-bromine biphenyl) and PBDE (poly-bromine diphenyl etheryl) (Coombs 2007).

The RoHS Directive restricts the use of these substances, and also aims to reduce the environmental effects of point at issue product wastes and at the same time in supplementary manner with the Weee Directive to provide recovering and eliminating these products for providing protection to human health and environment (Coombs 2007).

3.1.5 Green Supply Chain Management (GSCM)

Adoption of supply chain management (SCM) practices in industries has gradually increased since the 1980s (Borade & Bansod 2008, p.8). A number of definitions are proposed and the concept is discussed from many perspectives. Oliver and Webber (1982) define supply chain management as the flow of goods from supplier through manufacturing and distribution chains to end-user. Saunders (1995) defines supply chain management as the total chain of exchange from original source of raw material, through the various firms involved in extracting and processing raw materials, manufacturing, assembling, distributing and retailing to ultimate end customers. Messelbeck and Whaley (1999) defines it as the network of suppliers, distributors, and consumers. It also includes transportation between the suppliers and consumers, as well as the final consumer.

Hervani, Helms and Sarkis (2005) support that supply chain management is "the coordination and management of a complex network of activities involved in delivering a finished product to the end-user or customer. It is a vital business function and the process includes sourcing raw materials and parts, manufacturing and assembling products, storage, order entry and tracking, distribution through the various channels and finally delivery to the customer". According to Russell (2001), SCM is the practice of co-coordinating the flow of goods, services, information, and finances as they move from raw material to parts supplier to manufacturer to wholesaler to retailer to consumer.

The supply chain comprises all stakeholders of a company including the suppliers, transporters, warehouses, retailers, and customers themselves (Darnall, Jolley & Handfield 2008, p.7).

Resource productivity can be viewed as the efficient use of a range of inputs such as raw materials and energy that can increase production as well as offset the costs of reducing environmental impact. Eco-efficiency allows quantifying the balance between value creation, environmental impact, and carrying capacity. By measuring eco-efficiency supply chain constraints can be identified and removed. Eco-efficiency includes; greater durability, minimum materials design and manufacturing, recovery of

scrap, repair, reuse and remanufacturing, recycling and down cycling (Visser *et al*. 2007, p.166). Resource productivity and eco-efficiency provide the necessary, practical link between environmental performance, sustainability, and business value. Both these can be considered drivers of market value.

On the other hand, the term "ecocentric management" is used by Shrivastava in 1995, to mention on the importance of environmental consciousness in companies. This management style generally focuses on the environment. The ecocentric paradigm aims at creating sustainable economic development and improving the quality of life worldwide for all organizational stakeholders. In Table 3.4, the key differences between traditional and ecocentric management is given (Shrisvastava 1995a, p.127). Ecocentric management term is commonly used as environmental management in literature.

Table 3.4: Traditional versus ecocentric management

Goals	Economic growth & profits	Sustainability and quality of life
	Shareholder wealth	Stakeholder welfare
Products	Designed for function, style, & price	Designed for the environment
	Wasteful packaging	Environment friendly
Organization	Hierarchical structure	Nonhierarchical structure
	Top-down decision making	Participative decision making
	Centralized authority	Decentralized authority
	High-income differentials	Low-income differentials
Environment	Domination over nature	Harmony with nature
	Environment managed as a resource	Resources regarded as strictly finite
	Pollution and waste are externalities	Pollution/waste elimination and management
Business Functions	Marketing aims at increasing	Marketing for consumer education consumption
	Finance aims at short-term profit	Finance aims at long-term sustainable maximization growth
	Accounting focuses on conventional costs	Accounting focuses on environmental costs
	Human resource management aims at increasing labor productivity	Human resource management aims to make work meaningful & the workplace safe/healthy

Source: Shrivastava, P., 1995. Ecocentric Management for a Risk Society. *Academy of Management Review*, **20(1), p.127**.

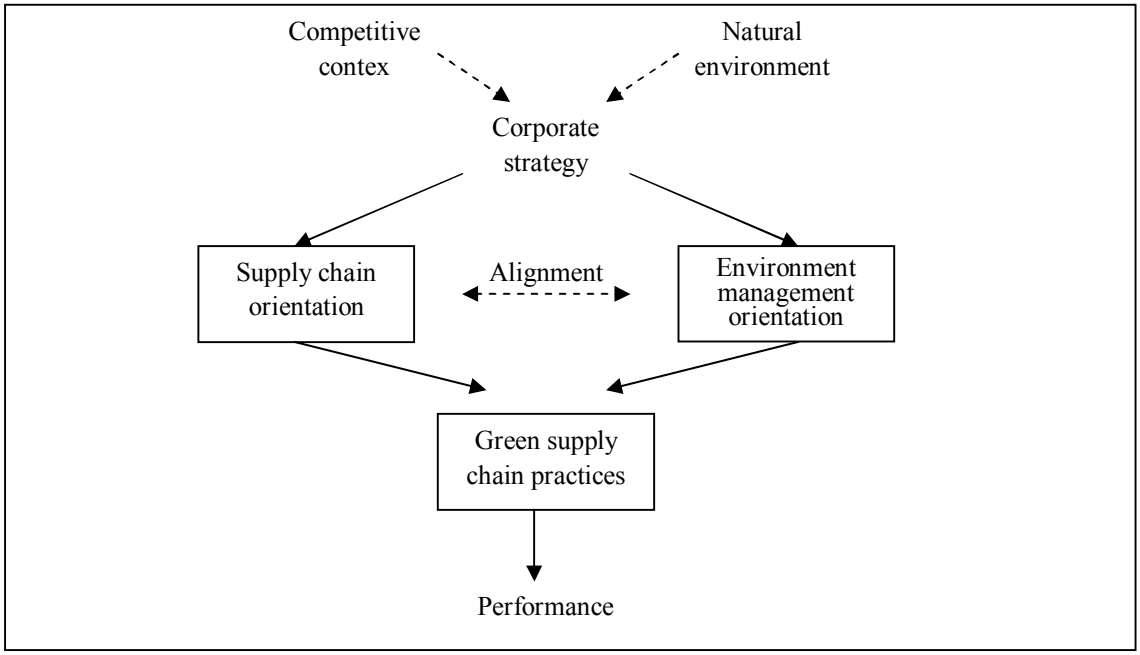
Environmental management and supply chain management generates the term green supply chain management (New & Westbrook 2004, p.242). Adding the "green" component to supply chain management involves addressing the influence and

relationships of supply chain management to the natural environment. Motivated by an environmentally-conscious mindset, it can also stem from a competitiveness motive within organizations (Hervani, Helms & Sarkis 2005). GSCM is defined as: "Green Supply Chain Management (GSCM) = Green Purchasing + Green Manufacturing / Materials Management + Green Distribution / Marketing + Reverse Logistics" (Hervani, Helms & Sarkis 2005).

Several researches made in the past showed that there is a positive relationship between green and financial performance (Clemens 2006, p.492). Because of this, nowadays businesses apply environmentally conscious supply chain management in their organizations. Environmentally conscious supply chain management (ECSCM) refers to the control exerted over all immediate and eventual environmental effects of products and processes associated with converting raw materials into final product (Beamon 2005, p.221).

The most common green supply chain management practices involve organizations assessing the environmental performance of their suppliers, requiring suppliers to undertake measures (Bansal & Roth 2000, p.717). There are many benefits for firms to apply green supply chain management, for instance the environmental quality of products increase, products become more healthy and the amount of waste decreases. This increases the reputation of any company in a consumers' eye; this way a firm could increase its selling performance. Hence, due to reduction in waste amounts, total costs decrease in the long run (Darnall, Jolley & Handfield 2008, p.7).

Green supply chain management is a new approach that includes evaluating the environmental issues by transforming them as beneficial tools for the organization. In this way, managers integrate the environmental concerns as a component into their supply chains. A company becomes green and thus increases the firm's performance (New & Westbrook 2004, p.241). Figure 3.3 illustrates the relationship between supply chain, environmental management and performance.



Source: New, S. & Westbrook, R., 2004. Understanding Supply Chain. *Oxford University Press,* Oxford, England, p.242.

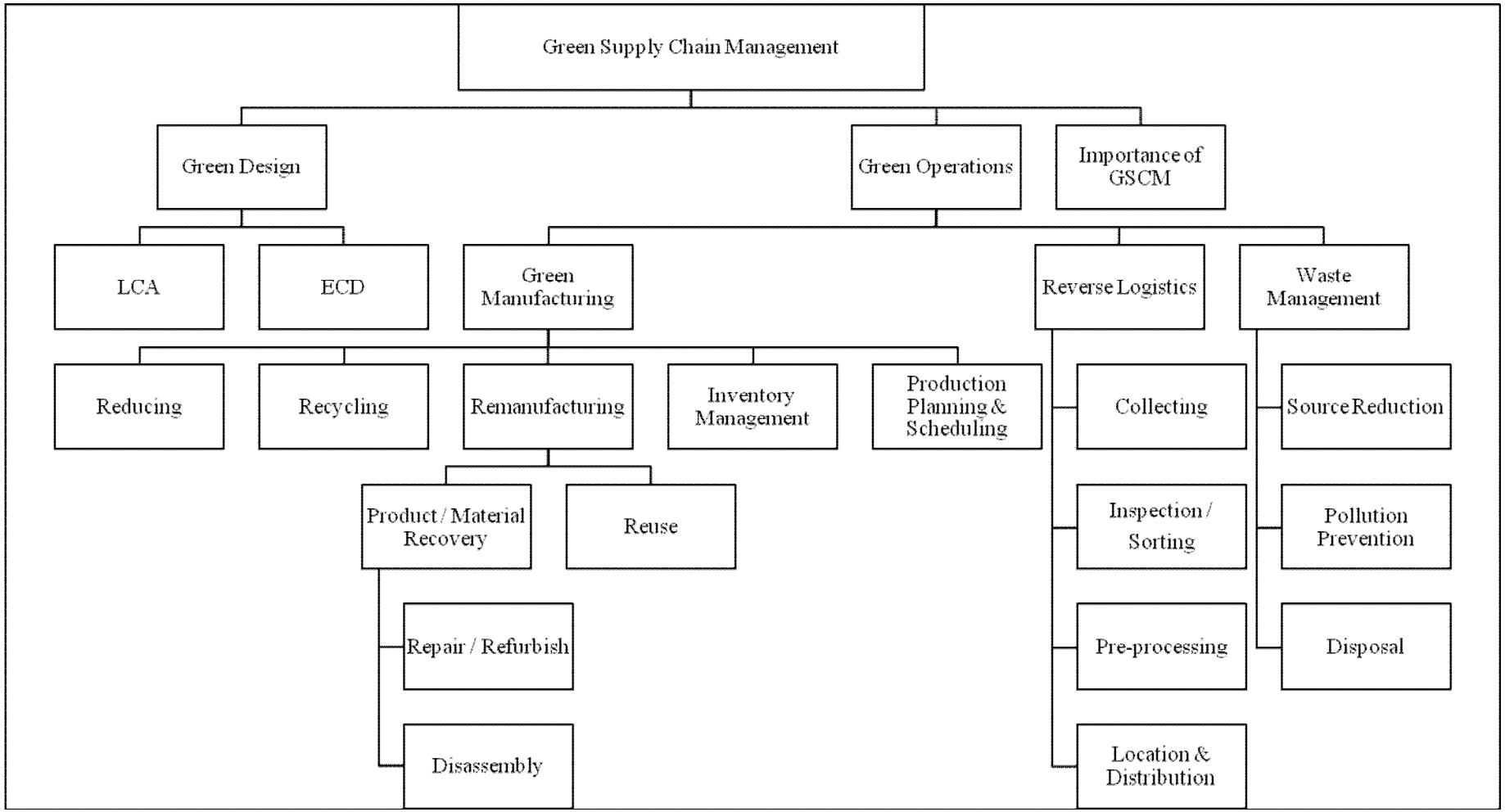
Figure 3.3: Environmental management and supply chain orientation

The perception of environment by businesses has changed. Managers have begun to see environmental issues as a requirement for their supply chain rather than being just constraints. Thus, supply chain managers could play a critical role in assessing the impact of product and process changes on the natural environment. The aim of green supply chain management is to increase the environmental performance of firm through supply chain channels (New & Westbrook 2004, p.234).

Srivastava (2007) classifies the existing GSCM literature into three board categories based on the problem context in supply chain design as shown in Figure 3.4.

Supply chain management potential polluters

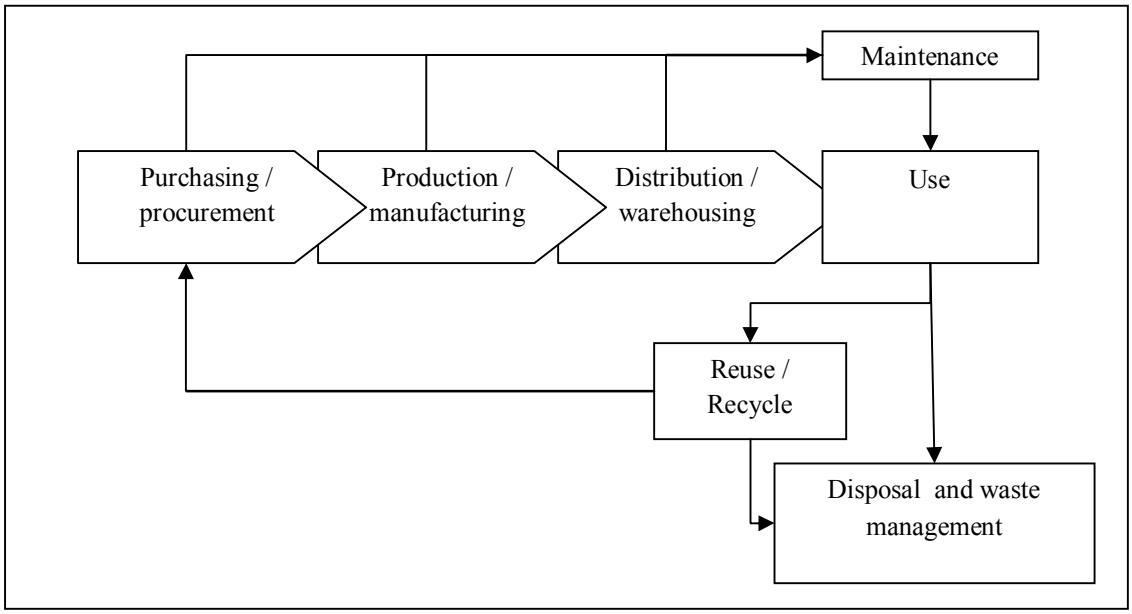
According to Sarkis (1999), the concept of supply chains and the supply chain management topic and field has evolved from number sources including purchasing, marketing (distribution channels), logistics, and operations management. The issues include management of inventory, customer-supplier relationships, delivery time, product development, and purchasing.



Source: Srivastava, S.K., 2007. Green Supply Chain Management: A state-of-the-art literature review, *International of Management Reviews*, **9(1)**: p.55

Figure 3.4: Classification based on problem context in supply chain design

The operational life cycle (or value chain) of an organization means a set of organizational elements that will influence how the supply chain is to be managed (either internally or externally). The major elements of the operational life cycle typically include procurement, production, distribution, reverse logistics and packaging (Sarkis 2003, p.398). Waters (2007) demonstrates the common supply chain functions in Figure 3.5.



Source: Waters, D., 2007. Global logistics: New directions in supply chain management, *Chartered Institute of Logistics and Transport in the UK*. Kogan Page Publishers, England, **5,** p.212.

Figure 3.5: Common supply chain functions

In the literature there are different kinds of definitions according to various case studies and methodologies. In this dissertation, supply chain "system" members are categorized according to the contribution to CO_2 emissions to the environment. As Bloemhof-Ruwaard *et al*. (1995) have argued the waste and emissions caused by the supply chain "system" members have become the main sources of serious environmental problems especially global warming. Therefore; logistics/distribution, reverse logistics/de-distribution, energy production, manufacturing process and packaging are analyzed as the biggest contributors to CO_2 emission in an organization's supply chain.

Logistics / distribution

The understanding of supply chain management has been re-conceptualized from integrating logistics across the supply chain, and managing key business processes

across the supply chain. Logistics is the part of supply chain management that plans, implements, and controls the efficient, effective forward & reverse flow and storage of goods, services, and related information between the point-of-origin and the point-of-consumption in order to meet customer's requirements (Waters 2007, p.213-217).

There are two aspects of logistics activities in a firm's supply chain, i.e., inbound logistics (materials management) and outbound logistics (physical distribution). The former is concerned with products moving into a firm rather than away from it, while the latter deals with the movement, storage and processing of order for a firm's outputs (Zhu *et al*. 2008, p.577).

Logistics is essentially a planning orientation and framework that seeks to create a single plan for the flow of product and information through a business. Supply chain management builds upon this framework and seeks to achieve linkage and co-ordination between the processes of other entities in the pipeline, i.e. suppliers and customers, and the organization itself (Mentzer *et al*. 2001, p.7). Logistics management is the means whereby the needs of customers are satisfied through the co-ordination of the materials and information flows that extend from the marketplace, through the firm and its operations and beyond that to suppliers.

Wu and Dunn (1995) in their review of the literature found a number of areas within standard practice of implications for greening the logistics function. The design of a logistics network and its planning are two of the more strategic issues facing logistics managers in this function. Many trade-off decisions need to be made with regard to the firm's market, customer, product and logistical resources. Sarkis (1999) gives the examples of typical logistics such as direct shipping or hub-and-spoke, central warehouse or distributed network, intermodal or single mode, and third party services or private fleet.

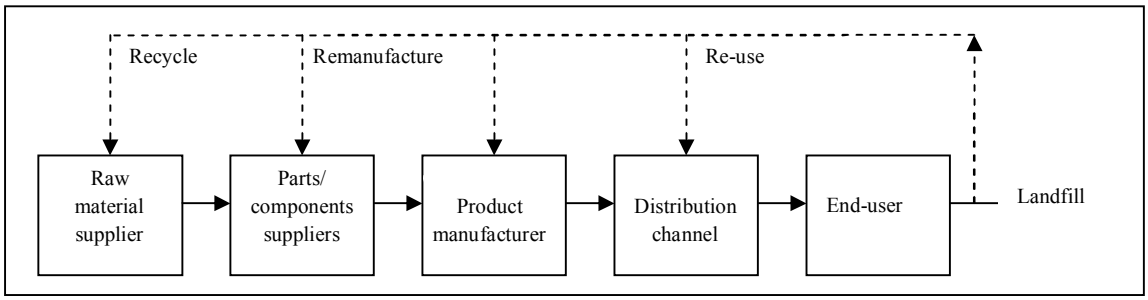
Some of the design and management criteria that support environmental planning in this area include fewer shipments, less handling, shorter movements, more direct routes, and better space utilization. Conversely, these issues have tradeoffs like delivery time, responsiveness, quality and cost, as well as environmental performance (Sarkis 1999, p16).

Reverse logistics / de-distribution

Broadly defined, reverse logistics includes shipments of packaging waste, recyclable packages, and customer returns in the logistics system. Efforts that reduce reverse flows are considered part of the reverse logistics program because they also reduce the total amount of waste in the system (Wu & Dunn 1995, p.33).

Increased waste amounts are one of the big problems or costs of manufacturing firms. The firms seek to find ways to reduce or eliminate the waste created during the production stage (Melnyk, Sroufe & Calantone 2003, p.329). The innovative approaches to reduce the amount of waste are reuse of wastes, remanufacturing or recycle methods.

Environmental regulation of both the firm and its suppliers remains an important factor that focuses management attention on environmental supply chain management. Reverse logistics is defined as the materials management activities needed to perform product recovery including the upstream movement of materials and source reduction (New & Westbrook 2004, p.230). Several types of operations can be involved in product recovery like seen in the Figure 3.6; recycle, reuse and remanufacture, at both the product and component level.



Source: New, S. & Westbrook, R., 2004. *Understanding Supply Chain*. Oxford University Press, Oxford, England, p.231.

Figure 3.6: Reverse supply chain

The reverse logistics operation is probably the least developed and studied of the operational functions. The definition of reverse logistics according to Sarkis (2003, p.399) is an environmental perspective primarily on the return of recyclable or reusable products and materials into the forward supply chain. Reverse logistics has also been studied from the perspective of returned and warranted items that may not even have been used (Wu & Dunn 1995, p.33).

On the other hand, if the topic of reverse logistics is extended to include the relationships between manufacturing firms and final customer in the supply chain, then the reverse supply chain emerges and this integration means minimizing the overall environmental impact, that is 'ecological footprint', of both the forward and reverse supply chains should be termed green supply chain management (New & Westbrook 2004, p.232).

Manufacturing Process

The role of manufacturing and production processes in corporate environmental management has been investigated in the literature for last decade. The performance of the internal supply chain's performance can be best managed within manufacturing process. Florida (1996), Gupta (1995), Hanna and Newman (1995), Sarkis (1998) and New and Westbrook (2004) have studies about environmentally conscious practices.

As mentioned before, total quality environmental management is the managerial philosophy that includes empowerment of employees, continuous improvement, team efforts, functional collaboration, and leadership elements (Sarkis 1998). Empowerment (means allowing workers to attain responsibility) or employee involvement is the most important issue when pollution prevention is the goal. Worker participation is a need when it is about environmentally consciousness (Gupta 1995).

Remanufacturing, that includes disassembly, remanufacturing, and material recovery principles, is also important within manufacturing process of the green supply chain. Sarkis (1999) mentions on the awareness of environment with these words:

> *"The effectiveness of remanufacturing from an environmental and economic perspective is still in its infancy. Currently, in a number of industries, remanufacturing, and reverse logistics are relatively novel concepts. Since this operation is not as mature, a number of inefficiencies still exist. Certainly, to be economically feasible and environmentally benign, the systems flowing into and within the organizations operations need further development. The determination of whether the lengthening of the life of these products and materials is worth the additional efforts of energy use and waste generations have yet to be determined"(Sarkis 1999, p.13).*

Closed-loop manufacturing, that means zero-emissions, is another terminology used for environmentally conscious practices. Closed-loop manufacturing is the process of producing products with no negative environmental impact or no effect on environment (Hasek 1997, pp.13-16). This internal loop helps to minimize some waste streams that

flow from the production function, but may require additional energy and resources to function and maintain. As part of the source-reduction philosophy closed-loop manufacturing a related issue to the zero-emissions philosophy is substitutability, which has become much more popular with design for the environment linkages (Sarkis 1999, p.13).

Therefore, manufacturing processes can be the biggest contributor to CO_2 emissions in an organization's supply chain, if the processes are not well-designed accordingly to the protection of the environmental pollution or the workers participation is not supported by the top level management to go green.

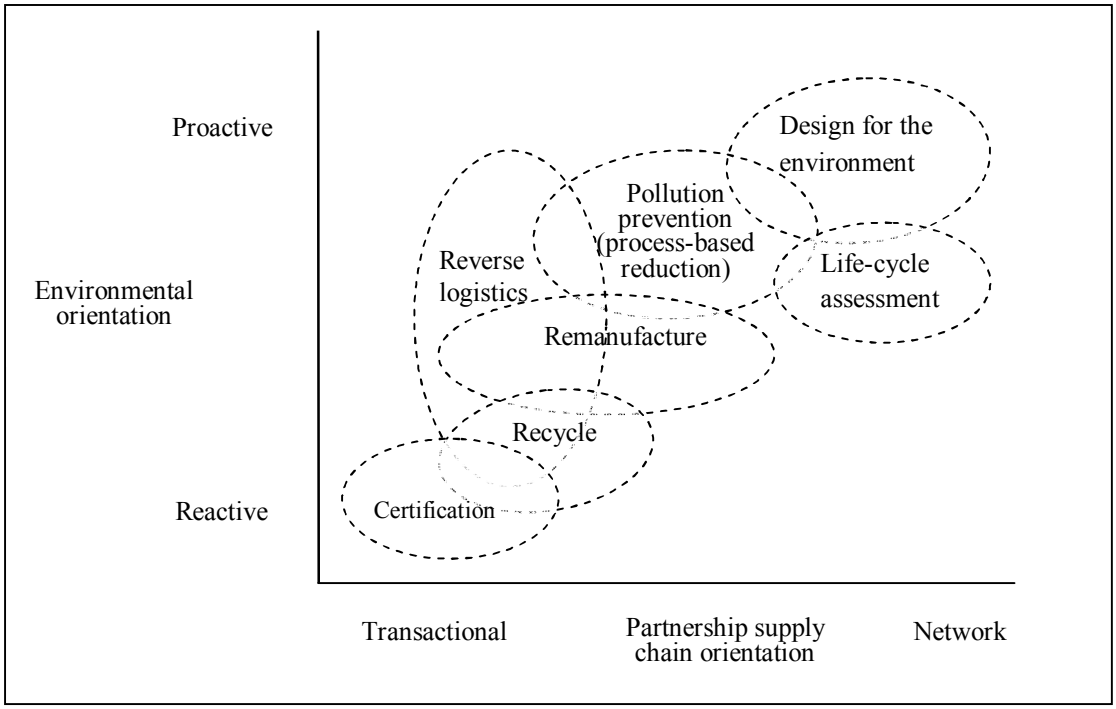
Packaging

Packaging is required for products to reach the market. According to Kotler (1984) there are typically three kinds of packaging: primary, secondary, and shipping packaging. Primary packaging contains the product itself and is the immediate and required container. Secondary packaging is the material that protects the primary package and is discarded when the product is about to be used. Shipping packaging refers to packaging necessary for storage, identification, and transport. It is discarded when the product reaches its destination (Wu & Dunn 1995, p.32). Packaging operations are usually performed at the manufacturing site.

Packaging has been a very sensitive issue among European manufacturers and consumers. The presence of packaging take-back laws has caused many organizations to rethink the design of their product's packaging as well as how to manage the packaging delivery and logistics, once it is used. One controversy that seems to be growing in the packaging area is whether single use packaging is more environmentally sound than reusable packaging (Sarkis 1999, p.20).

Packaging has a strong relationship with other components of the operational life cycle. Size, shape and materials have an impact on distribution due to their affect on the transport characteristics of the good. Sarkis (2003) supports that "better packaging, along with rearranged loading patterns, can reduce materials usage, increase space utilization in the warehouse and in the trailer, and reduce the amount of handling required". Systems that encourage and adopt returnable packaging will require a strong

customer supplier relationship as well as an effective reverse logistics channel. Efficiencies in packaging directly affect the environment. In some countries, take-back legislation on packaging has made the packaging operation and planning a critical environmental logistics consideration (Sarkis 2003, p.399).



Source: New, S. & Westbrook, R., 2004. *Understanding Supply Chain*. Oxford University Press. Oxford, England, p.244.

Figure 3.7: Aligning environmental and supply chain orientation

As a conclusion, as seen in Figure 3.7 environmental and supply chain issues are connected to each other. The capabilities across the supply chain orientation scale are cumulative, not mutually exclusive. It's this cumulative mature that yields a competitive advantage and allows significant progression toward growth-scale sustainability. The figure demonstrates that firms that have a network orientation can make use of practices such as recycling and certification. On the other hand, if such a firm fails to develop a proactive environmental management orientation, opportunities to achieve new competitive advantages are being missed (New & Westbrook 2004, p.245).

3.2 DRIVERS AND BARRIERS TO IMPLEMENT ENVIRONMENTALLY CONSCIOUS PRACTICES

Today there are many factors for organizations that drive or hinder them to implement environmentally friendly practices, environmental or green supply chain management philosophy. An explorative study is conducted by Walker, Sisto and McBain (2008) based on interviews from seven different private and public sector organizations.

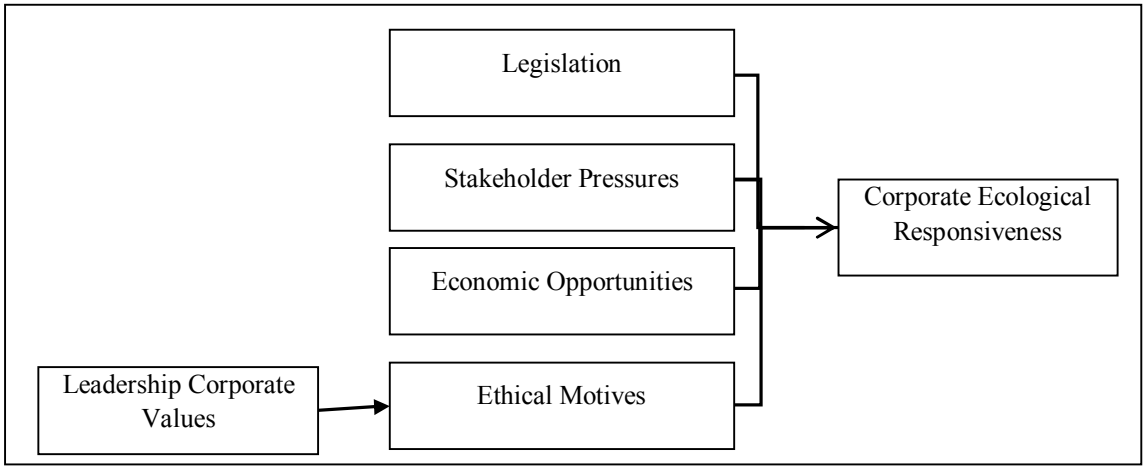
Literature review identifies the main categories of internal and external drivers of green supply chain management practices, including organizational factors, regulation, customers, competitors, society, and suppliers. It has been indicated that; internal barriers include cost and lack of legitimacy, whereas external barriers include regulation, poor supplier commitment and industry specific barriers (Walker, Sisto & McBain 2008, p.69).

In this section, literature review identifies and groups drivers and barriers to implement environmentally conscious practices.

3.2.1 Environmental Management Drivers

The literature on drivers for environmentally conscious practices is reviewed in the next section, and grouped into internal and external drivers. Internal drivers are described here as organizational factors, and the external drivers include regulation, customers, competition, and society (Walker, Sisto & McBain 2008).

The motives demonstrated in Figure 3.8 suggest that firms may be ecologically responsive to comply with legislation, to build better stakeholder relationships, to acquire economic wealth and competitive advantage, and to maintain ecological balance (Bansal & Roth 2008, p.718).



Source: Bansal, P. & Roth, K., 2000. Why Companies Go Green: A Model of Ecological Responsiveness. *Academy of Management Journal* **43(4)**: 717-736, p.718.

Figure 3.8: A preliminary model of corporate ecological responsiveness

Company

Today the organizations which are aware of the benefits of environmental management foresee proactive initiatives to develop and implement green strategies (Paulraj 2008, p.2).

In fact internal drivers are more important than external pressures for companies. This is because, in the course of giving decision to environmental management, there are some determinants that affect making a decision more than external drivers including management capability, environmental management capability, internal resources, and organizational culture. So, for companies internal drivers become more important than external drivers (University of North Carolina at Chapel Hill and the Environmental Law Institute 2001, pp.7-8).

An organization's internal drivers towards environmental management practices include the personal commitment of leaders, middle management, policy entrepreneurs, and investors. Organizations' managers are able to avert negative public attention and build stakeholder support by being responsive (Bansal & Roth 2000, p.718). Internal organizational drivers include focusing on cost reduction through minimizing waste and pollution, often leading to quality improvements (Walker, Sisto & McBain 2008, pp. 70-72).

The companies that implement environmentally conscious practices entirely change their management policies, implement environmental management systems, use ecologically sustainable resources, and reduce their energy consumptions and waste generation, so they get cost efficiencies as well as competitive advantages in the market (Bansal & Roth 2000, p.717).

Government policy (Regulations)

A motive of legislation refers to the desire of a firm to improve the appropriateness of its actions within an established set of regulations, norms, values, or beliefs (Bansal & Roth 2000, p.726). Stringent government regulations can be instrumental to the timing and direction of many firms' responses to environmental preservation. Several researches show that firms adopted ecologically responsive practices to merely meet legislative requirements and accordingly engage in only those activities that are mandated. So, firms adopt ecologically responsive practices in their companies (Paulraj 2008, Bansal & Roth 2000).

A significant body of research indicates that government regulation and legislation is a major driver for companies' environmental efforts (Walker, Sisto & McBain 2008, p.72). Government regulations can encourage the firms to implement environmental management. Proactive efforts towards environmental regulation are more likely to be drivers of successful green supply chain management projects. Environmental regulations can be seen as a motivator to innovate and reduce the environmental impact at low cost, rather than only legislation (Bowen *et al.* 2001, p.59).

In sum, governmental policy or external regulation and legislation appears to be a strong driver for environmental supply chain projects, particularly if companies are proactive and innovative in their approach (Walker, Sisto & McBain 2008, p.72).

Competition (Market)

Competitors, as potential environmental technology leaders, may be able to set industry norms and/or legal mandates and thus clearly have the ability to drive environmental innovation. A proactive environmental strategy can help a firm gain competitive advantage. Environmental management improves the financial performance of a firm (Walker, Sisto & McBain 2008, p.72).

Market forces are an important driver for businesses, which seek to get competitive superiority in the market. In terms of environment, for a firm, competitiveness constitutes the potential for ecological responsiveness to improve its long-term profitability (University of North Carolina at Chapel Hill and the Environmental Law Institute 2001, p.7). Firms' ecological responses improve their competitiveness abilities including energy and waste management, source reductions resulting in a higher output for the same inputs (process intensification), eco-labeling and green marketing, and the development of "eco-products". Competitive advantage can be gained through environmental responsibility (Bansal & Roth 2000, p.724).

In sum, external competitors can act as a driver for environmental management, for firms seeking competitive advantage and to improve their performance (Walker, Sisto & McBain 2008, p.72).

Customers

Customers are important drivers for environmental management. The purchasing decision of most of the customers in the US is influenced by a company's environmental reputation, and customers are also willing to pay more for environmentally - friendly products. Today consumers are more aware of environmental issues and are demanding that the businesses take appropriate action in preserving the environment (Paulraj 2008, p.12).

The ways in which customers drive environmental management varies significantly. For instance customers could encourage the organizations to improve their environmental performances. Customers exert pressure on organizations to engage environmental management. Stakeholders have also been instrumental in inducing environmental management to organizations (Bansal & Roth 2000, p.718). It's known that high-profile firms are often under considerable pressure from a range of stakeholder groups. On the other hand the amount of pressure firms experience on environmental issues can partially be explained by their environmental visibility.

In sum, a further external driver is the customer, influenced in turn by the end-consumer. In reality small companies are also under particular pressure from their customers (Walker, Sisto & McBain 2008, p.72). It is essential for the media, the

government organizations and the NGOs to come forward and take steps to increase environmental awareness of customers with respect to the importance of green products and packaging.

Society

In the field of business and management, the role of organizations in society has been changing and their main responsibility has become to minimize impacts on the environment (Walker, Sisto & McBain 2008, p.69).

Today people are concerned with the environment and climate change as never before. There are many environmental issues in our world, such as global warning, ozone depletion and industrial accidents (Paulraj 2008, pp.1-4).

The deterioration of the environment over recent decades has drastically increased the public's awareness of environmental issues. The public is increasingly influenced by a company's reputation with respect to the environment when making purchasing decisions. They demand more environmentally friendly products and are more socially conscious (Routroy 2009, p.20).

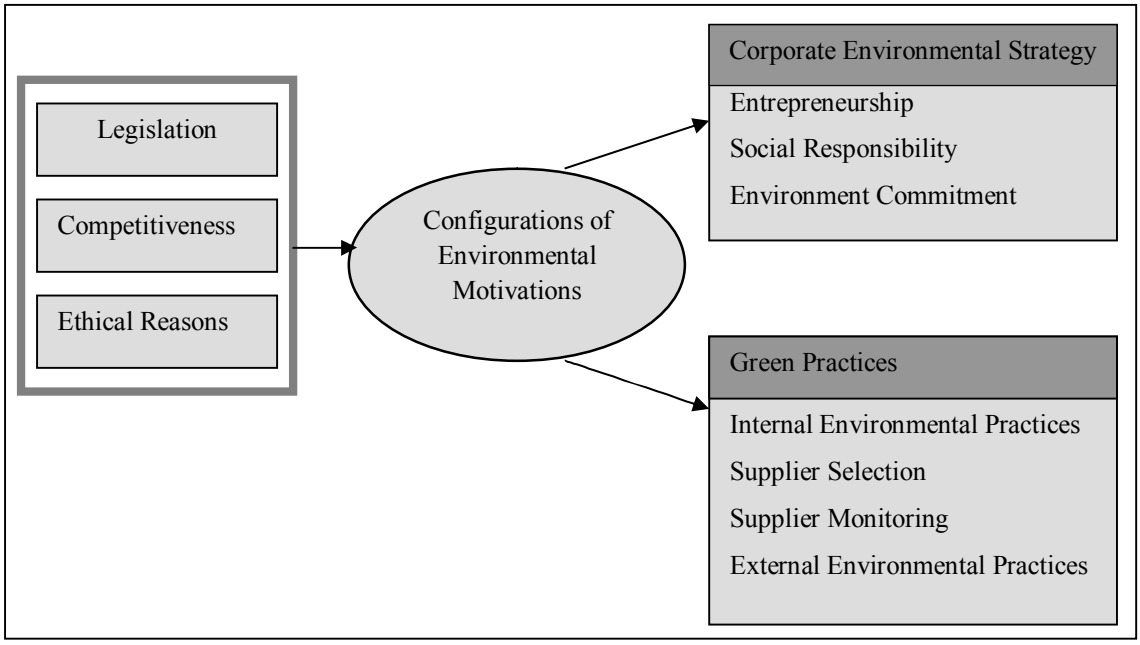
Public pressure and stakeholders are causing firms to review their efforts related with the environment. On the other hand the threat of increased environmental awareness creates an opportunity for companies to win new customers by dealing in an exemplary way with environmental issues. Briefly external societal drivers include increasing public awareness, consumer demand for environmentally friendly performance, and the influence of NGOs (Walker, Sisto & McBain 2008, pp.72-73).

Suppliers

Suppliers can help to provide valuable ideas used in the implementation of environmental projects. However, they generally do not act as a direct driving force (Walker, Sisto & McBain 2008, p.73). Whilst suppliers may not be the drivers for environmental management, integration and cooperation in supply chains can support more environmentally conscious practices (Walker, Sisto & McBain 2008, p.73).

Internal environmental management is a key to improving enterprises' performance (Melnyk, Sroufe & Calantone 2003, p.329). Customers exert pressure on their suppliers

for better environmental performance, which results in greater motivation for suppliers to cooperate with customers for environmental objectives (Zhu & Sarkis 2006, p.472).



Source: Paulraj, A., 2008. Environmental Motivations: a Classification Scheme and its Impact on Environmental Strategies and Practices. *Business Strategy and the Environment*, John Wiley & Sons, p.3.

Figure 3.9: Environmental motivations

Firms must also focus on the greenness of their supply chain activities due to their significant influence on total environmental impact (Handfield *et al.* 1997, p.293). Therefore, in order to meet the challenges of environmental wellness, it is important for firms to select suppliers based on their advances in green products, source reduction and packaging design. Moreover, buying firms must involve suppliers in environmental programs to meet their environmental expectations.

In sum, supplier selection and evaluation focuses on the outcome of environmental efforts made by the suppliers in terms of gaining certifications, being in compliance with particular regulations or having the environment-related documentation in order (Paulraj 2008)

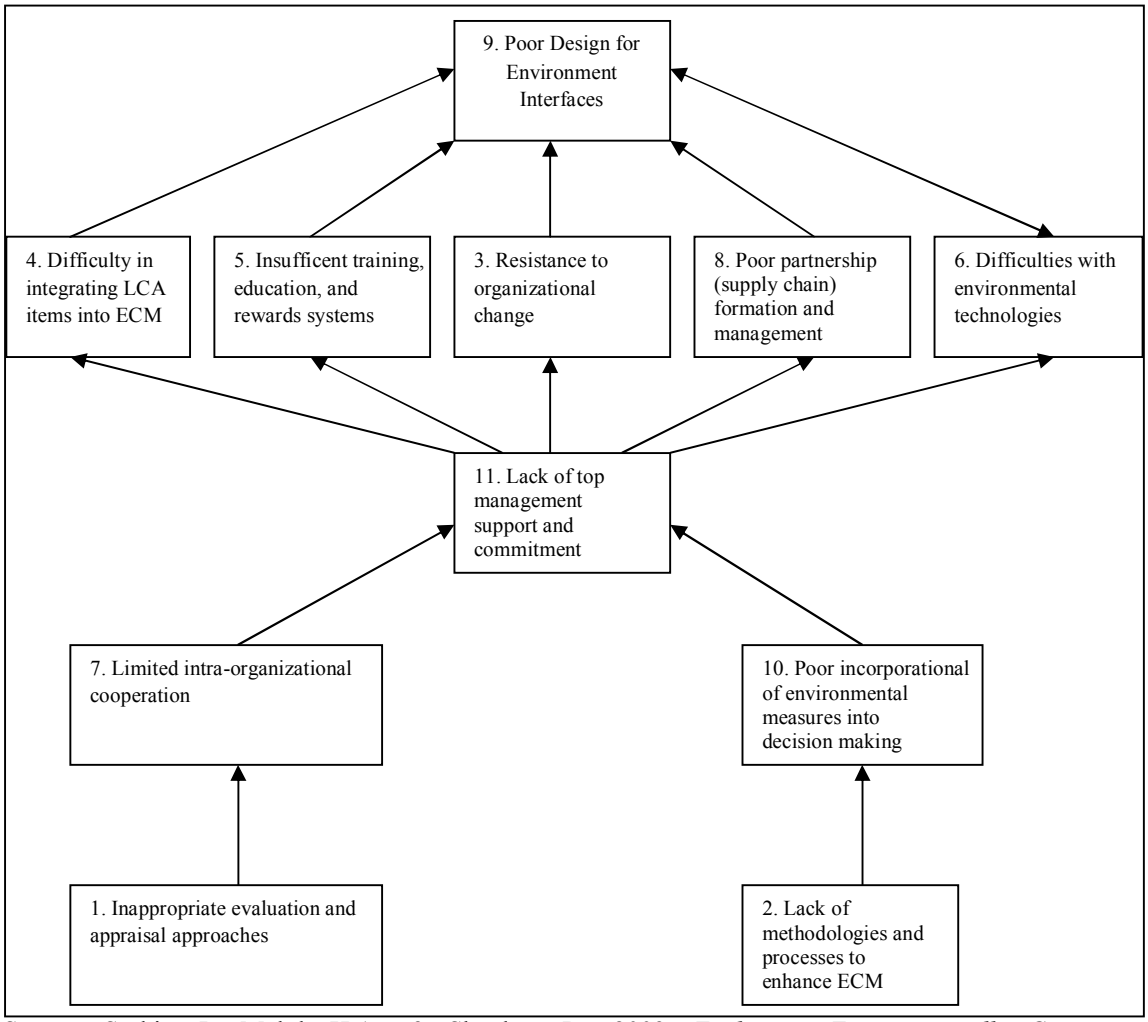
3.2.2 Environmental Management Barriers

In addition to identifying drivers of green supply chain management practices, the literature review gave an opportunity to identify barriers to implement environmental management (Walker, Sisto & McBain 2008, p.73). With the existence of particular

barriers the relative performance and success of firms may be poor (Sarkis, Mohd & Shankar 2009, p.17).

A further observation is that some of the drivers identified can also act as barriers. For example, regulation can help or hinder green supply chain management acting as a catalyst for proactive firms or perceived as a limitation by others (Walker, Sisto & McBain 2008, p.73).

In Figure 3.10, the barriers of poor design for environment interfaces are shown as a model. Sarkis, Mohd and Shankar (2009) find out eleven barriers typically facing ECM adoption by using the literature.



Source: Sarkis, J., Mohd, H.A., & Shankar, R., 2009. *Evaluating Environmentally Conscious Manufacturing Barriers with Interpretive Structural Modeling.* http://ssrn.com/abstract=956954, p.23.

Figure 3.10: Structural model of ECM barriers.

Sarkis, Mohd and Shankar (2009) generated a model of barriers that are classified into four clusters as; 'autonomous barriers' that have weak driver power and dependence, 'dependent barriers' that have weak driver power but strong dependence, 'linkage barriers' that have strong driver power, strong dependence and are unstable due to the fact that any action on these barriers will have an effect on others and also a feedback on themselves. The last cluster includes 'independent barriers' having strong driving power but weak dependence.

The barriers simply can be grouped as internal barriers and external barriers. Internal barriers include costs and lack of legitimacy. External barriers are regulations, poor supplier commitment and some industry specific barriers (Walker, Sisto & McBain 2008, p.70).

Costs

The desire to reduce costs represents a common driving force for environmental projects. Throughout a product's life cycle, pollution reflects hidden costs in the form of wasted resources and effort. On the other hand, environmental regulations are motivators to innovate and reduce the environmental impact at low cost (Bowen *et al.* 2001, p.41).

An organization's most important effort is reducing its costs. By intensifying production processes, firms reduce their environmental impacts while simultaneously lowering the costs of inputs and waste disposal (Bansal & Roth 2000, p.718). Today organizations focus on reducing their costs through minimizing waste and pollution (Walker, Sisto & McBain 2008, p.72). Cost reduction constitutes an important motivation for EMS adoptions in companies. So cost factor becomes one of the important drivers for the companies (University of North Carolina at Chapel Hill and the Environmental Law Institute 2001, p.7).

In reality consumer desire lower priced products. This may inhibit the implementations of environmental management. Cost concerns are the most serious obstacle for taking environmental factors into account for companies. Also if a company gives decision to implement environmental management, in a short term this means additional costs

including costs for consultants and third-party certification fees (University of North Carolina at Chapel Hill and the Environmental Law Institute 2001, p.6).

Cost factor is even more significant for SMEs which have generally less resources available and thus are more vulnerable. Costs can function as a barrier especially if people act with the fixed trade-off in mind of ecology versus economy (Walker, Sisto & McBain 2008, p.73).

Lack of Legitimacy

Some people have a much unimpassioned view about environmental issues, and there is often a problem with management commitment. Walker, Sisto and McBain (2008) support the idea to overcome this internal lack of legitimacy of the issue and to make other people sympathetic to the project and environmental management philosophy.

Regulation

Environmental regulations can be seen as a motivator to innovate and reduce the environmental impact at low cost, rather than a cause for litigation. External regulation and legislation appears to be a strong driver for environmental management, particularly if companies are proactive and innovative in their approach to regulatory compliance. On the other hand, regulations can act as a barrier. For instance environmental legislation and regulation can inhibit innovation by prescribing best available techniques and setting unreasonable deadlines (Walker, Sisto & McBain 2008, p.74).

Poor supplier commitment

Confidentiality is a major difficulty in green supply chains. Companies are often unwilling to exchange information on green supply for fear of exposing weaknesses or giving other companies competitive advantage. If the firms could adopt cooperative customer-supplier relationships, then their organizations' abilities in managing environmental issues will be more effectively. The firms whose environmental strategy comprises close supply chain relations get the chance to reduce wastes and environmental innovation (Walker, Sisto & McBain 2008, p.73).

There are some industry specific barriers which become different according to different industries. In fact companies in different industries have differing drivers, barriers and

practices. As a result of Walker, Sisto and McBain's research (2008) industry specific barriers can affect the implementation of environmental management.

An example to industry specific barriers can be given in manufacturing industry. For at least two decades environmentally conscious manufacturing (ECM) is the mainstay of sustainable organizational practices in this sector (Sarkis, Mohd & Shankar 2009). But during ECM practices in this sector firms come face to face with various barriers. This sector has a different structure if compared with the other sectors. Also the relationships with the other parts are complex in the sector. Creative and innovative approaches are also very important in this sector. A central issue manufacturing organizations face is the lack of appropriate roadmaps for ECM's implementation and adoption (Sarkis, Mohd & Shankar 2009).

Main barriers in this sector are lack of top management support and commitment; resistance to organizational change; inappropriate evaluation and appraisal approaches; lack of methodologies and processes to enhance ECM; difficulty in integrating LCA elements into ECM; insufficient training, education, and rewards systems; poor design-for-environment (DFE) interfaces; poor partnership (supply chain) formation and management; poor incorporation of environmental measures into decision making; difficulties with environmental technology; and limited intra-organizational cooperation (Sarkis, Mohd & Shankar 2009, p.2).

3.3 USING RENEWABLE ENERGY, RESOURCES AND CLEANER TECHNOLOGIES

Energy is essential to economic and social development and improved quality of life in all countries (Bilen *et al.* 2008, p.1530). The problem of massive emissions of carbon dioxide (CO_2) from the burning of fossil fuels and their climatic impact has become major scientific and political issues. Future stabilization of the atmospheric CO_2 content requires a drastic decrease of CO_2 emissions worldwide (Kaygusuz 2003, p.1671). Today, one of the most important points is to decrease the pollution amounts in the world by using renewable energy and resources during production of goods. In this context the importance of solar energy, wind energy, etc. gradually increase. Renewable resources correspond to sources that are limitless in any regard (Dincer 2000, p.157).

> *"Renewable energy technologies rely on the use of natural energy resources such as solar radiation, the winds, waves and tides, which are continually replenished and will therefore not run out" (Elliott 2000, p.261).*

The need for renewable energy and its sources increase because the earth, as a resource system, has a limited capacity for supporting a growing human population with an intensive exchange of materials and energy with its environment (Tsoulfas & Pappis 2006, p.1593). Today renewable energy resources appear to be the one of the most efficient and effective solutions. For instance, relative to fossil fuels, renewable energy is an environmentally benign source of electricity (Moore & Wüstenhagen 2004, p.238). In fact there is an intimate connection between renewable energy and sustainable development (Dincer 2000, p.157).

> *"Currently, there is much enthusiasm for renewable energy systems, such as wind turbines and solar cells, which many see as the archetypal 'sustainable technologies', that is, technologies that can continue to be used in the future without irreparably or irreversibly damaging the eco-system" (Elliott 2000, p.261).*

From a global perspective renewable energies offer many benefits: they help to reduce CO_2 emissions, thus promoting climate protection. They replace fossil fuels, therefore reducing the economic dependency on energy imports that many nations struggle with (Bilen *et al*. 2008, p.1533).

Renewable energy resources and their utilization are intimately related to sustainable development (Dincer 2000, p.173). The increasing world population requires the definition and successful implementation of sustainable development. There are various essential parameters that can help in achieving a successful sustainable development in a society. Such parameters are; public awareness, information, environmental education and training, innovative energy strategies, promoting renewable energy resources, financing, monitoring and evaluation tools (Dincer 2000, pp.172-173).

Cleaner production is the continuous application of an integrated preventive environmental strategy applied to processes, products, practices and services to increase eco-efficiency and reduce risks for humans and the environment. Cleaner technologies extract and use natural resources more efficiently, generate products with fewer harmful components, minimize pollutant releases to air, water and soil during manufacturing and

product use, and design durable goods that can be reused or recycled (Tsoulfas & Pappis 2006, p.1595).

A substantial increase in global energy supplies will take time but cleaner technologies will underpin a low carbon economy. A low carbon economy means increasing the efficient production and use of fossil fuels and managing the greenhouse gases which are generated by them (World Energy Council 2007).

As a source of production process improvements, such as cleaner technologies and pollution control, they can change the production cost function within firms and industries. By making products and packaging more environmental friendly, organizations can enhance product quality and attractiveness. And by reducing waste, pollution, and hazards these innovations or improvements can make firms more attractive to communities (Shrivastava 1995b, p.186)

3.4 CONCEPTUAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

Environmental management has been considered as a new management approach for organizations. After the industrial revolution, the CO_2 emission values have started to increase all around the world. Industry and transportation are the significant sources for environmental pollution (Earth Trends Country Profiles, Climate and Atmosphere Turkey 2003).

For an organization, green/environmental operations should be a part of the corporate culture. Improving eco efficiency, that is based on the concept of creating more goods and services while using fewer resources and creating less waste and pollution and resource productivity (renewable energy and resources like wind power, biodiesel, etc.) provide the necessary, practical link between environmental performance, sustainability, and business value.

As a part of environmentally conscious practices, recycling or reusing the waste materials is the key point of implementation. At this point, environmental collaboration with suppliers also have an important value because the organizations should request suppliers to conform certain environmental regulations like ISO 14001, WEEE, RoHS,

etc. This way supplier involvement to environmentally conscious business practices will impact the both the supplier and the firm. In conclusion, the company that implies GSCM practices and be aware of the global environment gives more importance to environmental performance than cost effectiveness.

The selection of environmentally conscious practices (ECP) to be tested in this dissertation is based on Sarkis (1998)'s list of environmentally conscious business practices.

The framework proposes competitiveness, customer relations, drivers and SCM polluters which will have a positive impact on environmentally conscious practices. A detailed description of the development of GSCM practices construct is provided in the following paragraphs.

Using literature support, the expected relationships among environmentally conscious practices; SCM potential polluters, environmental management drivers, competitive environment, competitive priorities and customer relations are discussed, and hypotheses relating these variables are developed. The conceptual framework of the hypothesized relationships is delineated in Figure 3.11.

3.4.1 SCM Potential Polluters and Environmentally Conscious Practices

In the literature, researchers define supply chain operations in various different ways with respect to survey instruments and case studies. In this survey analysis, supply chain "system" members are categorized according to CO_2 emissions. As Bloemhof-Ruwaard *et al*. (1995) have argued waste and emissions caused by the supply chain "system" members have become the main sources of serious environmental problems especially global warming, increase in CO_2 emission levels, environmental pollution, etc. Therefore; logistics/distribution, reverse logistics/de-distribution, energy production, manufacturing process and packaging are analyzed as the potential factors for environmental pollution in an organization's supply chain.

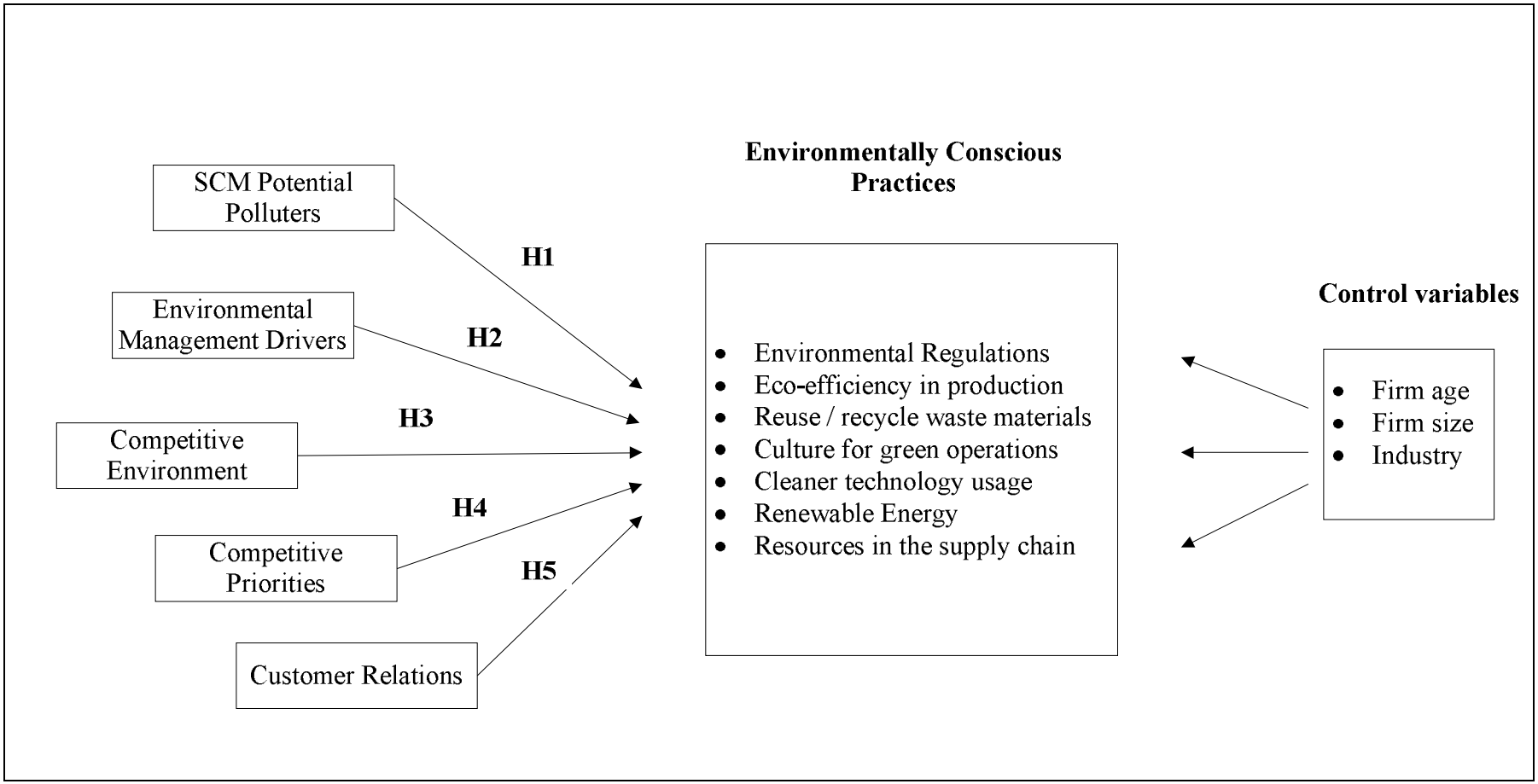


Figure 3.11: Conceptual framework

As it is discussed in the previous literature; Wu and Dunn (1995) found that the design of a logistics network and its planning are two of the more strategic issues facing logistics managers in this function. Many trade-off decisions need to be made with regard to the firm's market, customer, product and logistical resources. Environmentally responsible logistics activities in the entire supply chain, bring awareness of environmental issues to the transport and logistics community, and highlight some environmentally friendly practices employed by leading edge firms (Wu & Dunn 1995, p.21).

Sarkis (1999) gives the examples of typical logistics such as direct shipping or hub-and-spoke, central warehouse or distributed network, intermodal or single mode, and third party services or private fleet. Some of the design and management criteria that support environmental planning in this area include fewer shipments, less handling, shorter movements, more direct routes, and better space utilization. At the same time, these issues have tradeoffs like delivery time, responsiveness, quality and cost, as well as environmental performance (Sarkis 1999, p16).

The reverse logistics operation is the least developed and studied part of the operational functions. The definition of reverse logistics according to Sarkis (2003, p.399) is "an environmental perspective primarily on the return of recyclable or reusable products and materials into the forward supply chain". Reverse logistics has also been studied from the perspective of returned and warranted items that may not even have been used.

The firms seek to find ways to reduce or eliminate the waste created during the production stage (Melnyk, Sroufe & Calantone 2003, p.329). Increased waste amounts are one of the biggest problems of production firms. Therefore, reverse logistics should be the least important pollutant as a supply chain process.

Manufacturing processes can be the biggest contributor to CO_2 emissions in an organization's supply chain, if the processes are not well-designed according to the protection of the environment and prevention of pollution or if the workers' participation is not supported by the top level management to go green. Closed-loop manufacturing is the process of producing products with no negative environmental impact or no effect on environment (Hasek 1997). This internal loop helps to minimize

some waste streams that flow from the production function, but may require additional energy and resources to function and maintain. As part of the source-reduction philosophy closed-loop manufacturing, a related issue to the zero-emissions philosophy is substitutability, has become much more popular with design for the environment linkages (Sarkis 1999, p.13).

Packaging has a strong relationship with other components of the operational life cycle. Sarkis (2003) supports that "better packaging, along with rearranged loading patterns, can reduce materials usage, increase space utilization in the warehouse and in the trailer, and reduce the amount of handling required". Efficiencies in packaging directly affect the environment (Sarkis 2003, p.399). As a result of literature review, in an organizations' supply chain the packaging process does not affect the CO_2 emission besides manufacturing or logistics processes.

Besides the supply chain management practices, energy production of a company could have an effect on environmental pollution. In today's world, the natural resources in the environment exist. To save the energy sources, organizations has to be more aware of the use of energy. In other words, if an organization could produce its own energy, it can save the global energy sources and the costs of the resources decreases. There are so many expensive methods to apply these issues as stated before. These methods can be efficient for the companies, but may be, bad for the global environment. Therefore, energy production can be a contributor to CO_2 emissions in the supply chain of an organization.

As a result of literature review and previous survey research; logistics/distribution, reverse logistics/de-distribution, energy production, manufacturing process and packaging are analyzed as the potential factors to increase the level of CO_2 emissions or environmental pollution in an organization's supply chain.

H1: SCM potential polluters have a positive effect on the implementation level of environmentally conscious practices.

3.4.2 Environmental Management Drivers and Environmentally Conscious Practices

Several studies have identified drivers, pressures or motives for environmental management, such as regulatory compliance, competitive advantage, stakeholder pressures, ethical concerns, critical events, and top management initiative (Dillon & Fischer 1992; Lampe, Ellis & Drummond 1991; Lawrence & Morell 1995; Vredenburg & Westley 1993; Winn 1995). The reasons as to why companies go green are investigated in existing literature. Bansal and Roth (2000) developed a model of the motivations for corporate ecological responsiveness, and three basic motivations were found as competitiveness, legitimation and environmental responsibility.

Zhu, Sarkis and Geng (2005) derive groupings of GSCM pressures, practices and performance in the research analysis among various Chinese manufacturing organizations. The survey question's statistical computations show that the environmental awareness Chinese enterprises have increased due to regulations, competitiveness and marketing drivers.

Zhu, Sarkis and Lai (2007) supports that the pressures from different directions have caused the Chinese automobile supply chain managers to consider and initiate implementation of GSCM practices in China. According to the results of the survey research, the Chinese enterprises have experienced high and increasing regulatory and market pressures and at the same time have strong internal drivers to implement GSCM practices (Zhu, Sarkis & Lai 2007, p.1041).

On the other hand, Walker, Sisto and McBain (2008) discusses that the main drivers for implementing environmental management can be divided into two groups: internal and external drivers. In this research; organization-related internal driver is mainly senior management; whereas government policies, customers, and competition are the external drivers for implementing environmental management philosophy. An organization's internal drivers towards environmentally conscious practices include the personal commitment of individuals, senior management, 'policy entrepreneurs' and investors. The goal of environmental projects is to reduce costs through minimizing waste and pollution in regard to quality improvements (Bowen *et al.* 2001).

A significant body of research study exhibits that government policies and legislation is a major driver for companies particularly if companies are proactive and innovative in their approach to regulatory compliance (Bansal & Roth 2000, p.726). Regulations can be considered as a motivator to reduce the cost and the waste. Therefore, following the regulations for environment is a "win-win" situation for both the company and environment. As an external driver force, the customer is the key point at purchasing because it has been proven that customer demands have a positive impact on environmental management (Paulraj 2008). If customers or society are not aware of the environment, then they do not purchase the green products. Therefore, it will be impossible to implement GSCM practices.

Several researches show that competition is also a driver for environmental management. A proactive environmental strategy can help a firm gain competitive advantage through the development of supply chain capabilities. In sum, competition is an external driver for firms seeking competitive advantage and to improve their performance (Walker, Sisto & McBain 2008, pp.72-75).

As a result of literature review, the four main drivers that should have significant positive impact on the implementation level of environmentally conscious practices are selected. Customers, competition, government policy and senior management of the company are expected to be the common drivers for the companies that need to go green.

H2: Environmental management drivers are positively associated with environmentally conscious practices.

3.4.3 Competitive Environment and Environmentally Conscious Practices

In the 1950s and 1960s, minimizing unit cost was the first goal of most manufacturers. This was accomplished using mass production methods and new product development was slow and relied exclusively on in-house technology and capacity. However, as competition between organizations started to rise up, modern management philosophies such as quality management, environmentally conscious business practices, supply chain management, customer driven corporate strategy gained more importance (Tan *et al.* 1999, pp.1034-1036).

Supplier-buyer relationships have been changing or in other words have to change in this competitive arena. Relationships that were once adversarial are now being developed as strategic alliances. Manufacturers are increasingly tapping into suppliers' technologies and expertise in product design and development, a concept commonly known as early supplier involvement. Increasing numbers of companies also are developing a more customer oriented focus to improve their competitive position (Tan *et al.* 1999, p.1036).

A proactive environmental strategy can help a firm gain competitive advantage. Environmental management improves the financial performance of a firm (Walker, Sisto & McBain 2008, p.72).

Tan *et al.* (1999) supports that, a firm's overall performance will be positively affected by implementing environmental conscious practices, if the company is also concerned with competitive environment.

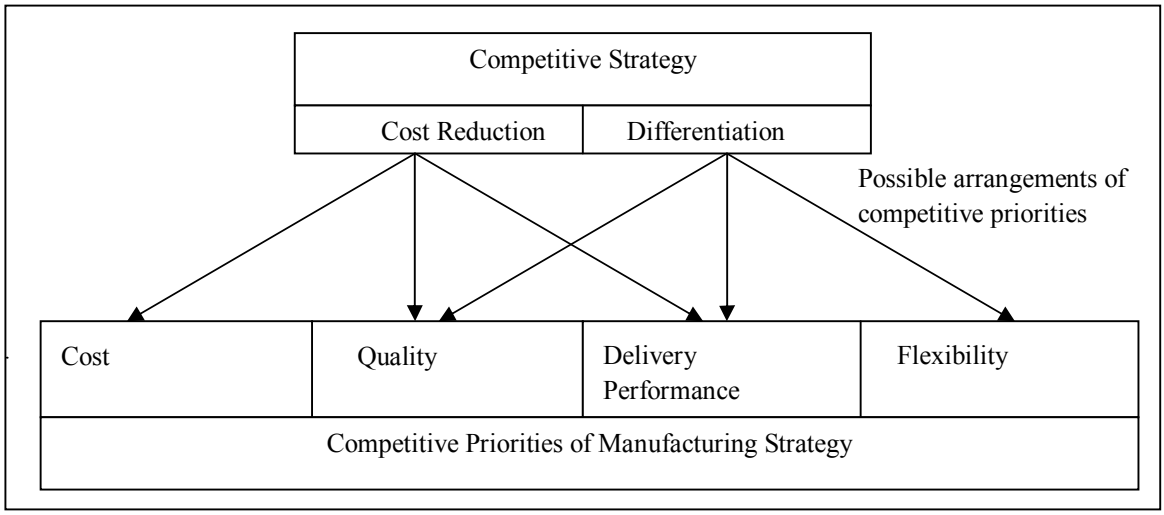
H3: A firm's competitive environment is positively associated with the implementation level of environmentally conscious practices.

3.4.4 Competitive Priorities and Environmentally Conscious Practices

According to Porter (1998), competitive advantage is commonly defined as a position attained by a business unit and perceived by its customers when it is compared with its competitors. Business units may dispose two basic strategies such as low cost or differentiation; in order to develop competitive advantages within their competitive environment.

- Cost reduction, which may imply the offering of goods and/or services with the lowest prices in its market.
- Differentiation, which aims at offering differentiated goods and/or services generally to niches of a market. A price policy with a greater unitary profit margin could be practiced.
- Focus, which selects one or more segments of the company's markets and tries to develop competitive advantages (focusing on one of the two previous strategies).

Among several approaches, competitive priorities are used to describe manufacturers' choice of manufacturing tasks or key competitive capabilities (Chen & Paulraj 2004, p.124). Santos (2000) categorized the competitive priorities as seen in Figure 3.12 into four groups: *Cost*, that means seeking a lower manufacturing cost, *Flexibility*, that is mainly related to the innovation of products and services, the product mix and the production volume, *Quality* which implies offering high quality products and services to the customers and *Delivery* which represents the accomplishment of two basic objectives, i.e. lower and more reliable delivery deadlines, are adopted.



Source: Santos, F.C.A., 2000. Integration of human research management and competitive priorities of manufacturing strategy. *International Journal of Operations and Production Management,* **20(5)**, p.628.

Figure 3.12: Natural alignments of competitive strategies and the competitive priorities of manufacturing strategy

Differentiation advantage can result from best practices of environmental management that focus on product characteristics and product markets. These product focused best practices include redesigning, packaging and products in more environmentally responsible ways, developing new environmentally responsible products, and advertising the environmental benefits of the products. Differentiation advantage creates the potential to increase product prices, which results in higher revenues (Christmann 2000, p.665). The companies that are conscious about environmental management practices should focus on differentiation business strategy. The quality performance, innovation, customer service, delivery performances will be higher and more important than the price or cost of the products.

From the generic business strategy literature, the term competitive priorities are used to draw manufacturing function attention toward a range of market demands as seen in Table 3.5 (Santos 2000, p.630).

Table 3.5: Market demands associated with competitive priorities

Competitive Priority	Main Market Demands
Cost	To offer products and/or services with the lowest price
Quality	To offer with high performance To differentiate products from competitors To deliver appropriate technical assistance To build and improve products and company image To improve products reliability and durability
Delivery Performance	To manufacture products with agility To warrant reliability of delivery deadline To provide technical assistance services with replacement parts
Flexibility	To change products design or to launch new products quickly To offer a broad product mix To change the production volume quickly

Source: Santos, F.C.A., 2000. Integration of human research management and competitive priorities of manufacturing strategy. *International Journal of Operations and Production Management*, **20(5),** p.630.

As a result of previous literature, an organization that produces or services in the light of competitive priorities, it is expected that the company should concern about the environmental pollution and environmentally conscious practices. The company would be acting coherently by including its commitment to the environment among its differentiated based priorities and strategic objectives.

H4: Differentiation based competitive priorities are positively associated with the implementation level of environmentally conscious practices.

3.4.5 Customer Relations and Environmentally Conscious Practices

A company's customer relations practices can affect its success in implementing environmental management. A key element of successful supply base management involves downstream integration of customers as well as the management of upstream suppliers. Each entity in the supply chain is a supplier as well as a customer. When a customer driven corporate vision is implemented simultaneously with effective TQM and supply base management practices, it can produce a competitive edge in a number of different ways. These include increases in productivity, reductions in inventory and

cycle time, increased customer satisfaction, market share and profits (Tan *et al*. 1999, p.1037).

On the other hand, customer relationships are greatly influenced by green marketing policies. Many companies are putting pressure on their suppliers and suppliers are listening to corporate customers and the end-user (Lamming & Hampson 1998). According to Earl and Clift (1999), individual and business-to-business consumers have similarities like behaviors, attitudes and understanding of purchasing green products, whereas Karna and Heiskanen (1998) support that business-to-business consumer are more aware of environmental issues. Sarkis (1999) supports that, both consumer groups have equal levels of environmental issues with regard to purchasing green products will affect organizational marketing practices and strategies.

Therefore, for an organization the voice of customer is important at the different levels of management. If the company realizes and analyzes what are the customers' complaints, needs, or wants, then the relationship will become much more reliable. On the other hand, if the society or the customers are conscious about the environment and prefer environmental-friendly products, then it is expected that the organizations should be aware of environmental practices and the management should focus on green philosophy.

H5: A customer relations focus is positively associated with the implementation level of environmentally conscious practices.

4. RESEARCH METHODOLOGY

4.1 QUESTIONNAIRE DEVELOPMENT

A questionnaire was used to measure the implementation level of environmentally conscious practices. The questionnaire for this survey was carefully designed to be easy to complete and restricted to five-point Likert scales ranging from 1 'strongly disagree', 2 'disagree', 3 'neutral', 4 'agree' and 5 'strongly agree'.

The survey contains six sections; (a) environmentally conscious practices in a company, (b) the functions in the supply chain that are potential polluters, (c) items motivating implementing environmental management, (d) competitive environment, (e) differentiation based competitive priorities, and (f) customers relationship. To avoid confusing respondent's five-point scales, a brief explanation is provided at the beginning of each section in the survey questionnaire. Detailed items for are shown in Appendix A.3.

The preliminary questionnaire was also discussed with a number of faculty members from Faculty of Engineering and Faculty of Economics and Administrative Sciences at Bahcesehir University, Turkey. The general purpose of this survey was to gain a deeper understanding of the factors that relate to the implementation of environmentally conscious practices in Turkish companies. In the analysis part of this thesis project, the environmental consciousness of Turkish companies and the factors that positively affect the environmental implementations are discussed and the results are shown by using the statistical software program SPSS 16.

4.2 DATA COLLECTION AND SAMPLING CHARACTERISTICS

This study targeted managers at middle or higher management levels. The sampling frame for the Turkish firms was drawn from the website of TOBB (The Union of Chambers of Commerce, Industry, Maritime Trade and Commodity Exchanges of Turkey; http://www.tobb.org.tr), which provides an Industrial Database that contains

approximately 40,000 firms that are registered to any of 10 Chambers of Industry, 19 Chambers of Trade and 64 Chambers of Industry and Trade in Turkey. The names and addresses of these companies are available from the websites of these chambers, which are linked to the website of TOBB. Through a random sampling selection procedure, a total of 2000 firms from different sectors, was generated and constituted the sampling frame for the study.

The survey questionnaire was mailed to the CEO of each company with a letter requesting that the CEO, or his/her senior executive in charge of supply chain management within the organization, should complete it. After one reminder a total of 570 questionnaires were returned, of which 519 were usable (the remaining 51 were excluded owing to missing data), representing an effective response rate of 25.95%, which was satisfactory, given the confidentiality and complexity of the questionnaire.

The distributions of the respondents were 44.70% president/vice presidents and 55.3% managers from different departments of the organizations as shown in Table 4.1. The subgroups of the managers were distributed as; 30.66% manufacturing department, 19.51% purchasing, %18.12 supply chain, 17.42% sales, 6.97% customer relations and 7.32% marketing. ANOVA tests were used to examine the differences among means for the respondent categories. No significant differences ($p>0.1$) were detected. Given the level of responsibility of respondents, the findings provide a good reflection of senior management's views on supply chain management practices and firm performance.

Table 4.1: Respondent profile of the survey

Title	Count	Percent
President / Vice President	232	44.70%
Managers	287	55.30%
Manufacturing	88	
Purchasing	56	
Supply Chain	52	
Sales	50	
Customer Relations	20	
Marketing	21	

The responding firms were also compared across the main characteristics of the sample such as industry type and geographical location, and again showed no systematic differences as seen in Table 4.2 ($p>0.1$). The sample of 519 firms had mean number of employees of 452. The sample is composed of relatively medium size firms given the scale of the Turkish economy, with only 15.6% of the firms classified as small size (less than 50 employees). The average age of sample firms is 22.21 years.

Table 4.2: Characteristics of the sample

	No	**%**
Firm size (number of employees)		
Small size (Less than 50)	81	15.6
Medium size (50 to 249)	280	53.9
Large size (More than 250)	158	30.5
Age (years)		
Young firms (Less than 10)	84	16.2
Middle age firms (10 to 19)	181	34.9
Mature firms (More than 20)	254	48.9
Broad sector of operation		
Industrial, automotive and electrical equipment	58	11.2
Food, textile and paper	149	28.7
Metal, wood, leather and glass	91	17.5
Chemical and pharmaceuticals	28	5.4
Other manufacturing	45	8.7
Wholesale and retail trade	42	8.1
Computer engineering services	24	4.6
Financial services and consultancy	11	2.1
Hospital and leisure services	32	6.2
Other services	39	7.5
Geographic location		
Marmara	435	83.8
Aegean	34	6.6
Black Sea	16	3.1
Other	34	6.5
Total	**519**	**100**

The distribution of the sample in terms of the sector of operation is as follows: industrial, automotive and electrical equipment, 11.2%; food, textile and paper, 28.7%; metal, wood, leather and glass, 17.5%; chemical and pharmaceuticals, 5.4%; other

manufacturing, 8.7%; wholesale and retail trade, 8.1%; computer and engineering services, 4.6%; financial services and consultancy, 2.1; hospital and leisure services, 6.2%; and other services, 7.5%. The characteristics of the sample are shown in Table 4.2.

Characteristics of the sample show that the medium sized companies have the highest percentage with regard to small and large size organizations; whereas, most of the Turkish companies have been in their sector for more than 20 years. According to the sectors of the operation, the food, textile, paper and metal, wood, leather, glass sectors have the biggest part in the analysis of the questionnaire. On the other hand, the density of the geographic location of the companies is Marmara Region, where most of the companies' head departments are located.

4.3 OPERATIONALIZATION OF VARIABLES

All data used in the empirical analyses were from the administered questionnaire used earlier by Sarkis (1998), Tan *et al*. (1999), Chen and Paulraj (2004), Zhu, Sarkis and Geng (2005), Zhu, Sarkis and Lai (2007). The primary data is collected by asking the respondent to respond to statements which will be discussed in this section. The responses are organized on a Likert scale with five options such as "1= strongly disagree, 2= disagree, 3= neutral, 4= agree, 5= strongly agree".

4.3.1 Dependent Variable

The environmentally conscious practices were treated as the dependent variable. The emphasis increases on the environment by organizational stakeholders, including governments, stockholders, customers, employees and communities (Sarkis 1998). Based on prior literature, it is recognized that the business practices is so wide that previous studies have taken either a subjective or an objective approach to measure the environmental awareness.

The selection of environmentally conscious practices (ECP) to be tested in the analysis part is based on Sarkis (1998)'s list of environmentally conscious business practices. Industry and transportation are the significant factors for environmental pollution. Therefore, for a company, green/environmental operations should be a part of the

corporate culture. Improving eco efficiency, that is based on the concept of creating more goods and services while using fewer resources and creating less waste and pollution, is a part of environmental culture. Resource productivity (renewable energy and resources like wind power, biodiesel, etc.) and eco-efficiency provide the necessary, practical link between environmental performance, sustainability, and business value.

On the other hand, as a part of green supply chain management practices recycling or reusing the waste materials is the key point of implementation. At this point, environmental collaboration with suppliers also have an important value because the organizations should request suppliers to conform certain environmental regulations like ISO 14001, WEEE, RoHS, etc. By this way supplier involvement to environmentally conscious business practices will impact both the supplier and the firm. In conclusion, the company that implies GSCM practices and is aware of the global environment gives more importance to environmental performance than cost effectiveness.

The framework proposes competitiveness, customer relations, drivers and SCM polluters will have a positive impact on environmentally conscious practices. Using literature support, the expected relationships among environmentally conscious practices; SCM potential polluters, environmental management drivers, competitive environment, differentiation based competitive priorities and customer relations are discussed, and hypotheses relating these variables are developed.

4.3.2 Independent variables

SCM potential polluters (SCM_POL) were measured by an index composed of five items. Respondents were asked to indicate on a 5 point Likert-type scale, ranging from 'strongly disagree' through 'neutral' to 'strongly agree', which of the supply chain components from Logistics / Distribution, Reverse logistics / De-distribution, Energy Production, Manufacturing Process and Packaging is the biggest factor to increase the level of CO_2 emissions. These five items in SCM potential polluters were based on supply chain and environmental management literature. In the literature, researchers define supply chain operations in various different ways with respect to survey instruments and case studies. In this survey analysis, supply chain "system" members are categorized according to the contribution to CO_2 emissions to the environment. As

Bloemhof-Ruwaard *et al*. (1995) have argued waste and emissions caused by the supply chain "system" members have become the main sources of serious environmental problems especially global warming, increase in CO_2 emission levels, environmental pollution, etc. Therefore; an index measure composed of these five items (Logistics/Distribution, Reverse logistics/De-distribution, Energy Production, Manufacturing Process and Packaging) captures the organization's implementation level of environmentally conscious practices.

Environmental management drivers (EMD) were measured similarly, relying on a five-point Likert scale (e.g. 1= strongly disagree, 2= Disagree, 3= Neutral, 4=Agree, 5= strongly agree), an index composed of four items was also used to rate the environmental management drivers – related implementation level of environmentally conscious practices. The four main drivers that forces the companies to go green have significant positive impacts on the implementation level of environmentally conscious practices are given according to the previous literature review. The survey questions investigate which drivers mostly impact on the level of environmentally conscious practices. The survey items extend the level of the drivers that forces the companies to go green; customers, competition, government policy and senior management of the company.

Competitive environment (CENV) was measured by six items. Relying on a five-point Likert scale (ranging from 1 = strongly disagree, 5 = strongly agree), the respondents indicated the overall level of competition in the firm's primary industry for each of the six dimensions. The competitiveness of the environment is therefore analyzed with related to the GSCM practices. Six indicators of competitive environment were used by the guide reference of Tan *et al.* (1999). These include management's perceptions of the aggressiveness of competitors, the time and effort taken by management to analyze and respond to the strategies and actions of competitors, and management's perceptions of overall industry competitiveness (Tan *et al*. 1999, p.1039).

Competitive priorities (CPRI) were measured by an index composed of six items. The term differentiation based competitive priorities are used to describe manufacturers' choice of manufacturing tasks or key competitive capabilities, which are broadly

expressed in terms of low cost, flexibility, quality, and delivery. Hayes and Wheelwright (1984) define competitive priorities as strategic preferences or the ways in which an organization chooses to compete in the marketplace. Today, the list has been enlarged by the additions of innovativeness, time, delivery speed, and delivery reliability. These lists are closely related to the idea of generic strategies from the business strategy literature. Therefore, extant research has noted that supply chain strategy should not be based on cost alone, but rather on the issues of quality, flexibility, innovation, speed, time, and dependability. This theoretical construct of competitive priority is derived based on these initiatives (Chen & Paulraj 2004). The first two items ask the respondents to what extent the firm's strategy is related with the lowest price or high quality performance. The third and fourth items quantify to what extent the firm places greater emphasis on innovation or customer service than price. The last items are the indication the level of delivering products with high performance and launching new products quickly (1 = Strongly Disagree to 5 = Strongly Agree).

Customer relationship (CREL) was measured through an index, consisting of five-point scales (1 = Strongly Disagree to 5 = Strongly Agree). Customer relationship practices with seven elements of customer service were identified. These include the evaluation of customer complaints and the measurement of customer satisfaction. A company's performance on these dimensions is an indicator of whether it is aware of the importance of customer satisfaction and of the company's dual roles as buyer and supplier in the value chain (Tan *et al.* 1999, p.1039). The following questions were asked to the respondents: (i) do they frequently evaluate the formal and informal complaints of their customers? (ii) do they frequently interact with customers to set reliability, responsiveness, and other standards for them? (iii) do they have frequent follow-up with their customers for quality/service feedback? (iv) do they frequently measure and evaluate customer satisfaction? (v) do they frequently determine future customer expectations? (vi) do they facilitate customers' ability to seek assistance from them? (vii) do they share a sense of fair play with their customers? (viii) do they periodically evaluate the importance of relationship with their customers?

4.3.3 Control Variables

In addition to the dependent and independent variables discussed above, a set of three variables were included in the model to control possible extraneous variation:

Firm age (AGE) was included as a control variable, since firms with more business experience have gone through implementation of environmentally conscious practices. We expect a positive relationship between firm age and environmentally conscious practices.

Firm size (LN_SIZE) was also controlled for as large firms may allocate more resources to the business and may tend to have more developed environmentally conscious practices. Then a positive relationship may exist between firm size, and environmentally conscious practices. Firm size was measured as the logarithm of the total number of employees in the firm.

To control for industry variations, industry dummies were created for nine industry categories: (1) industrial, automotive and electrical equipment (IND_ELECT); (2) food, textile and electrical equipment (FOOD_TEXT); (3) metal, wood, leather and glass (METAL_WOOD); (4) chemical and pharmaceuticals (CHEM_PHAR); (5) other manufacturing (OTH_MANUF); (6) wholesale and retail trade (TRADE); (7) computer and engineering services (COMP_ENG); (8) financial services and consultancy (FIN_CONS); and (9) hospitality and leisure services (HOSP_LEIS).

5. RESULTS AND DISCUSSION

The descriptive statistics of the dependent variable (ECP) and independent variables; supply chain management potential polluters (SCM_POL), environmental management drivers (EMD), competitive environment (CENV), differentiation based competitive priorities (CPRI) and customers relationship (CREL) are analyzed in this chapter. The survey questions are given in details. All dependent and independent variables are analyzed with respect to their descriptive statistical results. Results and relevant discussions are provided in the following subsections.

Descriptive statistics and alpha coefficients are used to initially analyze the survey data to assess the reliability of each scale. All of the factors have a reliability (alpha) value above 0.70, the threshold value recommended by Nunnally (Cronbach 1951). Therefore, calculated alpha values in excess of 0.7 can be considered to be reliable (Nunally 1978).

5.1 DESCRIPTIVE STATISTICS

5.1.1 Environmentally Conscious Practices

The environmentally conscious practices item has seven questions and 509 valid numbers of answers in total. It has been analyzed that the culture for green/environmental operations of the organizations is the most important value. Also, the eco-efficiency in the production process of most of the companies is another important issue with the force on the suppliers' environmental regulations. A research on Chinese enterprises proves that integrating environmental considerations into supplier selection positively affect the performance of environmental practices (Zhu, Sarkis & Geng 2005). On the other hand, using renewable energy and resources in the supply chain is the least important value for the organizations in this study. Reusing or recycling waste materials, using cleaner technologies and the importance of environmental performance rather than cost effectiveness have a fair attendance for the organizations (Sarkis 1998).

Table 5.1: Descriptive statistics of environmentally conscious practices

Environmentally Conscious Practices (α = 0.714)		Mean	S.D.
Variables	Survey Questions	3.68	0.622
ECP1	There is a culture for green/environmental operations.	4.06	0.863
ECP2	We request our suppliers to conform certain environmental regulations, e.g. ISO14001, WEEE, and RoHS.	4.05	0.991
ECP3	We place increasing emphasis on improving eco-efficiency in our production.	4.03	0.885
ECP4	We reuse/recycle waste materials.	3.73	1.091
ECP5	There is a need for exploiting cleaner technologies in your company.	3.67	0.977
ECP6	Environmental performance is more important than cost effectiveness.	3.62	1.014
ECP7	Your company uses renewable energy and resources in the supply chain (e.g. wind power, biodiesel, etc).	2.62	1.307

Zhu, Sarkis and Geng (2005) evaluate and describe GSCM drivers, practices and performance among Chinese manufacturing organizations by using the method of survey analysis. Environmental Practices are divided into four groups: Internal Environmental Management, External GSCM including green purchasing and cooperation with customers including environmental requirements, investment recovery and eco-design practices. According to the descriptive statistics on GSCM practices, internal environmental management item has the highest mean value with the second important item being eco-design. At the same time, external GSCM item has the least mean value that also has the suppliers' ISO14000 certification (Zhu, Sarkis & Geng 2005, p. 460).

The least important factor for the respondents is using renewable energy and resources. The reason is mainly related to the Turkish government and policies. Therefore, most of the respondent companies indicate that the company does not use renewable energy and resources in their supply chain.

5.1.2 SCM Potential Polluters

In an organization' supply chain processes, logistics/distribution, reverse logistics/de-distribution, energy production, manufacturing and packaging are all the factors that increase the CO_2 emission levels or environmental pollution (Sarkis 1999). In the analysis part of the questionnaire it is analyzed that the companies are not aware of which process is exactly the most important factor.

The overall mean of this item is equal to 3.03. Logistics or distribution is the most important polluter for respondent companies. Reverse logistics and manufacturing processes are placed as the second and the third. The results of the survey analysis illustrate to us that the organizations cannot control and also measure the data of the pollution in their processes. Each supply chain process has the average answer.

Table 5.2: Descriptive statistics of SCM potential polluters

SCM Potential Polluters (α = 0.837)		Mean	S.D.
Variables	Survey Questions	3.03	0.886
SCM_POL1	In your supply chain, logistics/distribution is the biggest contributor to CO_2 emission.	3.17	1.148
SCM_POL2	In your supply chain, reverse logistics/de-distribution is the biggest contributor to CO_2 emission.	3.07	1.100
SCM_POL3	In your supply chain, manufacturing process is the biggest contributor to CO_2 emission.	3.06	1.150
SCM_POL4	In your supply chain, energy production is the biggest contributor to CO_2 emission.	2.98	1.135
SCM_POL5	In your supply chain, packaging is the biggest contributor to CO_2 emission.	2.84	1.184

5.1.3 Environmental Management Drivers

In the previous research, it has been argued that in most of the developed countries, the government policy has great impact on environmental practices. Similarly, as a result of the survey analysis, it has been investigated that government policy and senior management of the company commonly drives the organizations to go green. On the other hand, customers and competition has pressure on the implementation level of environmental management.

Table 5.3: Descriptive statistics of environmental management drivers

Environmental Management Drivers (α = 0.841)		Mean	S.D.
Variables	Survey Questions	3.72	0.862
EMD1	Government policy drives the need to green.	3.92	0.942
EMD2	Senior management in the company drives the need to go green.	3.90	0.966
EMD3	Customers drive the need to go green.	3.53	1.154
EMD4	Competition drives the need to go green.	3.51	1.124

According to the descriptive statistics of the competition item, it is clear that competitiveness is the least important one. This item is also supported by the hypotheses about the competitive environment in the next sub-section.

5.1.4 Competitive Environment

The valid number of the survey is 511 and also this part has the mean 3.97. This part has one of the most reliable data with regards to overall. Number of competencies required surviving in industries, the time, effort, resources and managerial attention required to keep up with competitors and high overall competitiveness level in the industries are the key important points. Amount of time spent analyzing major competitors' strategies and actions, importance of potential competitor reaction and aggressiveness of the major competitors seen significant in the results.

Table 5.4: Descriptive statistics of competitive environment

Competitive Environment (α = 0.723)		Mean	S.D.
Variables	Survey Questions	3.97	0.593
CENV1	Number of competencies (i.e. things a firm must do well) required surviving in this industry.	4.34	0.792
CENV2	The time, effort, resources and managerial attention required to keep up with competitors.	4.24	0.898
CENV3	Overall competitiveness of our industry is commonly high.	4.02	0.919
CENV4	Importance of potential competitor reaction or retaliation to decisions made in our firm.	3.90	0.981
CENV5	Aggressiveness of our major competitors.	3.88	0.913
CENV6	Amount of time spent analyzing major competitors' strategies and actions.	3.44	0.971

5.1.5 Competitive Priorities

Competitive Priorities item has the highest mean value (4.29). This also proves that concentration on the differentiation is important for Turkish market. In the descriptive analysis of Turkish companies' differentiation based competitive priorities, it has been concluded that the most significant issue is delivering products with high performance and quality rather than price.

Table 5.5: Descriptive statistics of competitive priorities

Competitive Priorities (α = 0.796)		Mean	S.D.
Variables	Survey Questions	4.17	0.607
CPRI1	Our strategy places importance on delivering products with high performance.	4.30	0.824
CPRI2	Our strategy is based on quality performance rather than price.	4.25	0.814
CPRI3	We emphasize launching new products quickly.	4.19	0.838
CPRI4	Our strategy cannot be described as the one to offer products with the lowest price.	4.17	0.951
CPRI5	We place greater emphasis on customer service than price.	4.13	0.854
CPRI6	We place greater emphasis on innovation than price.	4.03	0.884

Launching new products quickly with the lowest price is precious. However for Turkish companies, the innovation emphasis is less valuable than all the other survey questions.

5.1.6 Customer Relations

Customer relations items have the second highest mean (4.17). One of the reasons for this result is, these survey questions were identified many times in the prior literature. Most of the calculated means of each question are in the interval of 4.07 through 4.5. The results show that customer relations have a significant place with in Turkish companies. Sense of fair play, evaluation of formal and informal complaints of the customers and the interaction with customers to set reliability, responsiveness, and standards are the most important issues. Also, evaluation of customer relationship, aid for customers, determination of customer expectations, satisfaction has an important sequence. Turkish companies reflect that the least considerable issue is to follow-up the customers for quality/service feedback.

Table 5.6: Descriptive statistics of environmentally conscious practices

Customer Relations (α = 0.896)		Mean	S.D.
Variables	Survey Questions	4.29	0.586
CREL1	We share a sense of fair play with our customers.	4.50	0.703
CREL2	We frequently interact with customers to set reliability, responsiveness, and other standards for us.	4.34	0.759
CREL3	We periodically evaluate the importance of our relationship with our customers.	4.29	0.776
CREL4	We facilitate customers' ability to seek assistance from us.	4.25	0.772
CREL5	We frequently determine future customer expectations.	4.21	0.783
CREL6	We frequently measure and evaluate customer satisfaction.	4.20	0.809
CREL7	We have frequent follow-up with our customers for quality/service feedback.	4.07	0.832

5.2 HYPOTHESES TESTING

Table 5.7 shows the descriptive statistics and correlation coefficients of independent variables in this survey study. The pair-wise correlations do not seem to present serious multicollinearity problems for the multivariate analysis, as none of the variables have correlation coefficients above 0.50 (Hair *et al*. 2006).

Table 5.7: Descriptive statistics and correlation coefficients of the variables

Variable name	Definition	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. SCM_POL	SCM Potential Polluters	3.03	0.88	1.00															
2. EMD	Environmental Management Drivers	3.72	0.86	0.29*	1.00														
3. CENV	Competitive Environment	3.97	0.59	0.16	0.35*	1.00													
4. CPRI	Competitive priorities	4.18	0.61	0.07	0.30*	0.39*	1.00												
5. CREL	Customer relations	4.29	0.59	-0.01	0.35*	0.39*	0.48*	1.00											
6. LN_SIZE	Logarithm of firm size	5.08	1.24	-0.08	0.08	-0.04	-0.06	-0.02	1.00										
7. AGE	Firm age	22.2	17.11	-0.09	0.02	0.05	-0.07	0.02	0.29*	1.00									
8. IND_ELECT	Industrial, automotive and electrical equip.	0.11	0.31	-0.10	-0.09	-0.03	-0.04	-0.03	0.05	0.10	1.00								
9. FOOD_TEXT	Food, textile and paper	0.29	0.45	0.02	0.03	0.02	0.00	0.01	0.07	-0.07	-0.23*	1.00							
10. METAL_WOOD	Metal, wood, leather and glass	0.18	0.38	0.04	-0.01	-0.01	-0.05	-0.01	-0.02	0.06	-0.16	-0.29*	1.00						
11. CHEM_PHAR	Chemical and pharmaceuticals	0.05	0.22	0.07	0.05	0.02	0.06	0.04	-0.06	-0.05	-0.09	-0.15	-0.11	1.00					
12. OTH_MANUF	Other manufacturing	0.09	0.28	-0.07	0.07	-0.04	0.01	-0.05	0.06	0.01	-0.11	-0.20*	-0.14	-0.07	1.00				
13. TRADE	Wholesale and retail trade	0.08	0.27	0.02	-0.04	0.04	-0.02	-0.01	-0.05	0.02	-0.11	-0.18	-0.14	-0.07	-0.09	1.00			
14. COMP_ENG	Computer and engineering services	0.05	0.21	-0.03	-0.02	0.03	0.04	0.02	-0.03	0.00	-0.08	-0.14	-0.10	-0.05	-0.07	-0.07	1.00		
15. FIN_CONS	Financial services and consultancy	0.02	0.14	-0.01	-0.04	0.03	0.03	0.06	-0.02	0.02	-0.05	-0.09	-0.07	-0.04	-0.05	-0.04	-0.03	1.00	
16. HOSP_LEIS	Hospitality and leisure services	0.06	0.24	0.07	0.01	0.03	0.05	-0.02	-0.03	-0.08	-0.09	-0.16	-0.12	-0.06	-0.08	-0.07	-0.06	-0.04	1.00

*p <0.001 (two-tailed test)
N = 519

In order to test the study's hypotheses, a series of regression models were estimated with the dependent variable of the environmentally conscious practices (ECP). The effects of independent variables on the dependent variable of ECP are shown in Table 5.8 respectively. A set of seven models were tested for the dependent variable. As the first step, the control variables were entered (Model 1 in Table 5.8). Of these variables, the firm size (LN_SIZE) does not have a significant effect on environmentally conscious practices all seven models in Table 5.8 ($p<0.01$). While the firm age (AGE) had no significant effect on any of the implementation level of environmentally conscious practices, the industrial dummies had only modest effects.

The individual effects of the hypothesized variables were then tested in Models 2 to 6, and all independent variables along with control variables were tested in Model 7, as shown in Table 5.8, respectively. The F statistics indicate that all models in Table 5.8 are significant ($p<0.01$) and hence are useful for explanation purposes.

5.2.1 Regression Analysis

Analyzing the regression results in Table 5.8, Hypothesis 1, stating, '*SCM potential polluters have a positive effect on the implementation level of environmentally conscious practices'* is supported. The effects of supply chain management potential polluters (SCM_POL) on environmentally conscious practices are shown in Models 2 and 7 (Table 5.8). Strong support was noted for this item as the coefficients of SCM_POL are positive and significant in Model 2 ($p<0.001$) and Model 7 ($p<0.001$) in Table 5.8, respectively. These findings reveal that, these SCM processes have a strong support on the implementation level of the environmental practices. Thus, it would appear that a greater emphasis on SCM potential polluters will improve environmental consciousness and the practices will be more focused on the prevention of environmental pollution. This reflects Sarkis' (1999) view that the functions could be drivers or factors to implement environmental management within green supply chain; include purchasing and in-bound logistics, production, distribution and out-bound logistics, and reverse logistics.

Table 5.8: Regression results on the extent of the level of environmentally conscious practices

Variable name	Definition	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
Predictor variables								
SCM_POL (H1)	SCM Potential Polluters		0.32***					0.23***
EMD (H2)	Environmental Management Drivers			0.42***				0.26***
CENV (H3)	Competitive Environment				0.17**			0.14*
CPRI (H4)	Competitive priorities					0.41***		0.20***
CREL (H5)	Customer relations						0.40***	0.16***
Control variables								
LN_SIZE	Logarithm of firm size	0.01	0.02	-0.01	0.02	0.02	0.01	0.01
AGE	Firm age	0.01	0.01	0.01	0.00	0.01	0.00	0.01
IND_ELECT	Industrial, automotive and electrical equipment	-0.28*	-0.22	-0.14	-0.32*	-0.28*	-0.25*	-0.15
FOOD_TEXT	Food, textile and paper	-0.14	-0.15	-0.13	-0.21	-0.17	-0.14	-0.16
METAL_WOOD	Metal, wood, leather and glass	-0.17	-0.22	-0.14	-0.22	-0.17	-0.16	-0.17
CHEM_PHAR	Chemical and pharmaceuticals	-0.04	-0.13	-0.10	-0.11	-0.12	-0.08	-0.20
OTH_MANUF	Other manufacturing	-0.24	-0.20	-0.31*	-0.27*	-0.29*	-0.21	-0.27*
TRADE	Wholesale and retail trade	-0.26	-0.29*	-0.19	-0.33*	-0.26	-0.23	-0.24*
COMP_ENG	Computer and engineering services	-0.10	-0.08	-0.05	-0.19	-0.15	-0.10	-0.08
FIN_CONS	Financial services and consultancy	-0.26	-0.23	-0.16	-0.43*	-0.34	-0.35	-0.35
HOSP_LEIS	Hospitality and leisure services	0.01	-0.09	0.02	-0.07	-0.05	0.06	-0.08
Intercept		3.77***	2.76***	2.30***	2.33***	2.02***	2.01***	0.46*
F statistic		0.97	11.14***	23.14***	6.95***	8.93***	8.32***	31.52***
R-square		0.02	0.22	0.36	0.15	0.18	0.17	0.52
Adjusted R-square		0.01	0.20	0.35	0.13	0.16	0.15	0.50

Notes:
*p <0.05; **p <0.01; ***p <0.001 (two-tailed test)
N = 519

Hypothesis 2, stating, '*Environmental management drivers are positively associated with environmentally conscious practices'* is also supported. The coefficients of the environmental management drivers (EMD) in Model 3 ($p<0.001$) and Model 7 ($p<0.001$) in Table 5.8 are positive and significant indicating that there exists strong support for ECP. These findings prove that the implementation level of environmentally conscious practices is strongly supported by customers, government policies, senior management and competition. In the previous literature is has been seen that this hypothesis is also supported by many of the research studies. Zhu *et al*. (2008) indicates that internal environmental management is one of the most important GSCM practices organizations must adopt to improve environmental performance. Another survey results shows that the Chinese automobile supply chain enterprises has experienced high and increasing regulatory and market pressures and also have strong interval drivers for GSCM practice adoption (Zhu, Sarkis & Lai 2007, p.1041). Whereas another article supports that governmental environmental regulation has the highest mean value with respect to supply chain, cost related and marketing pressure (Zhu, Sarkis & Geng 2005). Yu and Bell (2007) that, support according to the survey findings of Chinese enterprises governments have to extent produced a positive effect on the level of awareness of business managers concerning the risk of pollution and the opportunity to incorporate environmental design more effectively into their businesses.

Hypothesis 3, stating, '*A firm's competitive environment is positively associated with the implementation level of environmentally conscious practices'* is accepted. Some support was also found for competitive environment (CENV). The coefficients in Model 4 ($p<0.01$) and Model 7 ($p<0.05$) is not significant providing some partial support for ECP. At a certain level, this finding is not surprising. Most of the medium-sized Turkish Companies is not aware of the competition in the market. Competition is commonly seen for economical benefits or profit. Turkish companies try to establish their economies without considering the environment, as environmental consciousness is seen as a huge cost. Firms adopt environmentally responsive activities to remain competitive (Clark 1999). In the literature review, it is seen that firms are more likely to mimic the environmentally responsive behavior of their competitors who are successful (DiMaggio & Powell 1983; Guler *et al*. 2002). The firms that are motivated by competitiveness believe that their ecological responsiveness can lead the competitive

advantage sustainability, thereby increasing profits in the long term (Paulraj 2008, p.2). By streamlining production processes, such firms simultaneously reduce their environmental impacts and cost of inputs and waste disposal (Cordano 1993). Moreover, adoption of ecological responses also helps them to build corporate reputation and create value (Hart 1995), thereby distinguishing themselves from their competition (Sharma & Vredenburg, 1998).

Hypothesis 4, stating, '*Differentiation based competitive priorities are positively associated with the implementation level of environmentally conscious practices'* is also supported. Strong support was also found for differentiation based competitive priorities (CPRI) as seen in Model 5 and Model 7. The significant impact on the implementation level of environmentally conscious practices was seen by the coefficients of competitive priorities in Model 5 ($p<0.001$) and Model 7 ($p<0.001$). Focus on the differentiation business strategy gives rise to being conscious on the environmental friendly practices. The quality performance, innovation, customer service, delivery performances will be higher and more important than the price or cost of the products. Chen and Paulraj (2004) support that supply chain strategy should not be based only on cost, but rather on the issues of quality, flexibility, innovation, speed, time, and dependability. This theoretical construct of competitive priority is derived based on these initiatives. Therefore, concentration on differentiation based competitive priorities strongly associated with the implementation level of environmentally conscious practices.

Hypothesis 5, stating, '*A customer relations focus is positively associated with the implementation level of environmentally conscious practices'* is also supported. The effects of the focus on customer relations (CREL) on the environmentally conscious practices are shown in Model 6 ($p<0.001$) and Model 7 ($p<0.001$). ECP is strongly supported in that the coefficients of CREL are significant indicating that there is a relationship between customer relations and environmentally practices. Customers or society's awareness on the environment affects the organizations' processes. The result is consistent with the environmental management drivers. Customers are one of the important drivers that force the company to go green. Therefore, a strong positive effect of customer relations is accurate with the environmental management drivers. According to Li *et al.* (2006) customer relationship means the entire array of practices

that are employed for the purpose of managing customer complaints, building long-term relationships with customers, and improving customer satisfaction. Noble (1997) and Tan *et al.* (1998) support that customer relationship management is an important issue for supply chain management practices. Close customer relationship allows an organization to differentiate its products from competitors, sustain customer loyalty, and dramatically extend the value it provides to its customers (Li *et al*. 2006, p.110).

6. CONCLUSION

As a conclusion part of this research; summary of findings, implications for managers and government, also the limitations of this research are discussed and future research studies are suggested.

6.1 SUMMARY OF FINDINGS

As a result of survey analysis of Turkish companies, it is proven that the survey items are positively associated with the implementation level of the environmentally conscious practices. Table 6.1 respects the support level of Turkish companies hypotheses constructed according to the literature.

Table 6.1: Summary of findings

Hypotheses Definition		Level of Support
H1	SCM potential polluters have a positive effect on the implementation level of ECP.	Strong Support
H2	Environmental management drivers are positively associated with ECP.	Strong Support
H3	A firm's competitive environment is positively associated with the implementation level of ECP.	Partial Support
H4	Competitive priorities are positively associated with the implementation level of ECP.	Strong Support
H5	A customer relations focus is positively associated with the implementation level of ECP.	Strong Support

The summary of findings proves that Turkish companies do not give high importance to competitive environment. On the contrary, the literature review supports that most of the firms adopt environmentally responsive activities to remain competitive (Clark, 1999). It has been analyzed that firms are more likely to mimic the environmentally responsive behavior of their competitors who are successful (DiMaggio & Powell, 1983; Guler *et al.*, 2002). The firms that are motivated by competitiveness believe that

their ecological responsiveness can lead the competitive advantage sustainability, thereby increasing profits in the long term (Paulraj 2008, p.2).

Supply chain processes in an organization; logistics/distribution, reverse logistics/de-distribution, energy production, manufacturing and packaging describe all the factors that increase the CO_2 emission levels or environmental pollution (Sarkis 1999). Therefore, companies should increase the level of awareness on these processes, to perform better for the environment.

Environmental drivers have the highest impact on the implementation level of environmentally conscious practices in Turkish companies. Zhu *et al*. (2008) indicates that internal environmental management is one of the most important GSCM practices organizations must adopt to improve environmental performance. Governmental regulation is the significant driver for most Turkish companies; this result has parallel results with the research in Chinese Enterprises. The research supports that governmental environmental regulations as a driver have the highest mean value in comparison with other drivers; suppliers', cost and marketing' pressure (Zhu, Sarkis & Geng 2005).

Yu and Bell (2007) also support the same results according to the survey findings of Chinese enterprises. Governments have to some extent produced a positive effect on raising the awareness of business managers concerning the risk of pollution and the opportunity to incorporate environmental design more effectively into their businesses. Since China is an emerging country like Turkey, the results are consistent with the economical and industrial background.

For Turkish companies in this survey analysis, competitive priorities have great impact on the environmentally conscious practices. Focus on the differentiation business strategy gives rise to be conscious on the environmentally practices. The quality performance, innovation, customer service, delivery performances are more important than the price or cost of the products. Chen and Paulraj (2004) support that supply chain strategy should not be based only on cost, but rather on the issues of quality, flexibility, innovation, speed, time, and dependability. Therefore, concentration of Turkish

Companies on competitive priorities is strongly associated with the implementation level of environmentally conscious practices.

The survey findings show that customer relations have a significant place within Turkish companies. Customer relationship practices with seven elements of customer service were identified. These include the evaluation of customer complaints and the measurement of customer satisfaction. A company's performance on these dimensions is an indicator of whether it is aware of the importance of customer satisfaction and of the company's dual roles as buyer and supplier in the value chain (Tan *et al.* 1999, p.1039). Turkish companies reflect that the least considerable issue is to follow-up the customers for quality/service feedback. Customers designate the demand variations and the society becomes more conscious about environmental pollution rates. The demand will differentiate according to the environmental-friendly products. Therefore, companies have to change the management strategies with respect to environmental consciousness.

6.2 IMPLICATIONS

Even though some implications have been identified in the presentation of results in the previous sections, additional implications from both managerial and theoretical perspectives are built on. Both companies and government have responsibilities to protect the environment.

The present study validates the environmentally conscious practices (ECP) that has generally been a new concept for companies. Although some organizations have realized the importance of implementing environmentally conscious practices, they often do not know exactly what to implement, due to a lack of understanding of what constitutes a comprehensive set of ECP.

Environmentally conscious practices, green supply chain management, environmental management systems or namely green approaches are seen as cost related issues. However, it is proven that in the long term, for the company, society and especially for the environment, there are various benefits and profits. Therefore, as a management philosophy related to the corporate social responsibility concept, the company should act considering the environmental pollution and natural resources.

As today's competition is moving from "among organizations" to "between supply chains", more organizations are increasingly adopting GSCM practices to increase their corporate image. On the other hand, policy implications are valuable and feasible for Turkish companies. The government should support the companies to go green with legal regulations and incitements. The developed countries should be a model for these implementations.

6.3 LIMITATIONS AND FUTURE RESEARCH

Environmental management has become an emerging issue for organizations to improve environmental image and gain economic profit. Turkish companies have initiated environmentally conscious practices. Though the adaption level is still immature, the positive relationships are significant.

Recently, Turkish enterprises have increased their environmental awareness due to regulatory, competitive, and marketing drivers. Most of the Turkish companies have experienced increasing environmental drivers to implement ECP, whereas organization's management needs to be aware of these additional pressures. Supply chain management functions are potential polluters, and most of the companies are conscious about this problem. The awareness level of customer relations and competitive priorities are positively associated with the implementation level of ECP. In contrast to previous literature, competition or competitive environment does not strongly affect the environmental consciousness.

In arriving at these overall results, we must mention the limitations of this study. First, the sample is based on Turkish companies. These enterprises are only recently adopting many of the environmentally conscious practices and have very different characteristics compared to firms in other countries. Yet, even with the definitions and education on environmental management concepts and also the education level in Turkey, it may still be possible that some respondents may not fully realize the principles. This study does not examine relationships between the implementation level of environmentally conscious practices and firm performance. Further analyses are needed to examine the performance and other company characteristics will be needed to help tease out additional information on industry practices and differences. Other aspects such as

general operational performance and possible strategic financial and organizational performance could be investigated. Additional moderators like types of enterprises (FDI, joint ventures) could be studied as a new topic.

By using AMOS or LISREL statistical application tools, it is possible to make a factor analysis to improve the model. As an example, the research can examine the relationships between a firm's competitive environment, total quality management, supply chain management, customer relation practices, and firm performance (Fynes, Voss & Búrca 2005). Another empirical research presents details of a survey carried out to determine whether particular quality management, supply base management, and customer relations practices can impact corporate performance. In addition to that it analyzes the impact of competitive environment on performance (Tan *et al*. 1999).

Expletory, confirmatory and SEM (Structural Equation Model) analysis can be applied to examine the casual ordering in the research model by using data collected from Turkish companies. Structural equation models (SEMs) describe relationships between variables. They are similar to combining multiple regression and factor analysis. SEMs also offer some important, additional benefits over these techniques including an effective way to deal with multicollinearity, and methods for taking into account the reliability of consumer response data.

On the other hand, a new questionnaire can be generated that focuses also on the performance dimension. This survey has to be implemented after 2012, since new ecological sanctions will be available in the following years. The Kyoto Protocol is one of the newest ones that strengthens the international response to climate change and legally binds emission targets for developed countries. Turkey had announced in June its intention to sign the accord in late August 2009. Signing the Kyoto Protocol does not put an additional burden on Turkey until 2012. Therefore, after the Kyoto Protocol, the CO_2 emissions should be under the level of 5%.

For a future research, the data after 2012 is more important to compare the environmental consciousness' level of companies in Turkey. A new questionnaire should be developed in the light of the literature. As a conclusion, a survey analysis

after 2012 will show the improvement level of being conscious on environmental resources and pollution, in Turkish Companies.

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APPENDICES

Appendix A.1. List of countries by carbon dioxide emissions, 2007

Rank	Country	Annual CO_2 emissions (in thousands of metric tons)	Percentage of total emissions
-	World	27,245,758	100.0 %
1	United States	6,049,435	22.2 %
2	China and Taiwan	5,010,170	18.4 %
-	European Union	4,001,222	14.7 %
3	Russia	1,524,993	5.6 %
4	India	1,342,962	4.9 %
5	Japan	1,257,963	4.6 %
6	Germany	860,522	3.1 %
7	Canada	639,403	2.3 %
8	United Kingdom	587,261	2.2 %
9	South Korea	465,643	1.7 %
10	Italy	449,948	1.7 %
11	Mexico	438,022	1.6 %
12	South Africa	437,032	1.6 %
13	Iran	433,571	1.6 %
14	Indonesia	378,25	1.4 %
15	France	373,693	1.4 %
16	Brazil	331,795	1.2 %
17	Spain	330,497	1.2 %
18	Ukraine	330,039	1.2 %
19	Australia	326,757	1.2 %
20	Saudi Arabia	308,393	1.1 %
21	Poland	307,238	1.1 %
22	Thailand	268,082	1.0 %
23	Turkey	226,125	0.8 %
24	Kazakhstan	200,278	0.7 %
25	Algeria	194,001	0.7 %
26	Malaysia	177,584	0.7 %
27	Venezuela	172,623	0.6 %
28	Egypt	158,237	0.6 %
29	United Arab Emirates	149,188	0.5 %
30	Netherlands	142,061	0.5 %
31	Argentina	141,786	0.5 %
32	Uzbekistan	137,907	0.5 %
33	Pakistan	125,669	0.5 %
34	Czech Republic	116,991	0.4 %
35	Nigeria	114,025	0.4 %
36	Belgium	100,716	0.4 %

37	Kuwait	99,364	0.4 %
38	Vietnam	98,663	0.4 %
39	Greece	96,695	0.4 %
40	Romania	90,425	0.3 %
42	Iraq	81,652	0.3 %
43	Philippines	80,512	0.3 %
44	North Korea	79,111	0.3 %
45	Israel	71,247	0.3 %
46	Austria	69,846	0.3 %
47	Syria	68,42	0.3 %
48	Finland	65,799	0.2 %
49	Belarus	64,89	0.2 %
50	Chile	62,418	0.2 %
51	Libya	59,914	0.2 %
52	Portugal	58,906	0.2 %
53	Hungary	57,183	0.2 %
54	Colombia	53,634	0.2 %
55	Serbia and Montenegro	53,322	0.2 %
56	Sweden	53,033	0.2 %
57	Denmark	52,956	0.2 %
58	Qatar	52,904	0.2 %
59	Singapore	52,252	0.2 %
60	Norway	43,149	0.2 %
60	Bulgaria	42,558	0.2 %
61	Ireland	42,353	0.2 %
62	Turkmenistan	41,726	0.2 %
63	Morocco	41,169	0.2 %
64	Switzerland	40,457	0.2 %
65	Hong Kong	37,411	0.1 %
66	Bangladesh	37,165	0.1 %
67	Slovakia	36,289	0.1 %
68	Trinidad and Tobago	32,557	0.1 %
69	New Zealand	31,57	0.1 %
70	Peru	31,493	0.1 %
71	Azerbaijan	31,365	0.1 %
72	Oman	30,899	0.1 %
73	Ecuador	29,268	0.1 %
74	Cuba	25,818	0.1 %
75	Croatia	23,501	0.1 %
77	Tunisia	22,885	0.1 %
78	Yemen	21,114	0.1 %
79	Dominican Republic	19,64	0.1 %
80	Estonia	18,944	0.1 %

Appendix A.2. List of countries by carbon dioxide emissions per capita, 2007

Rank	COUNTRY	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
1	Qatar	22.5	37.4	55.3	62.1	60.2	60.4	61.4	68.7	60.3	56.9	60.1	66.3	67.4	63.1	69.2
2	Kuwait	21.1	5.5	10.0	16.4	20.6	32.3	28.4	28.1	33.8	32.6	31.7	28.8	27.1	31.1	38.0
3	United Arab Emirates	29.3	30.2	29.4	31.0	33.0	30.2	16.9	17.7	36.4	36.0	35.6	33.5	33.7	33.6	37.8
4	Luxembourg	26.3	27.8	30.5	27.5	25.6	20.6	20.5	19.0	17.4	17.9	18.9	19.5	21.1	22.0	24.9
5	Trinidad and Tobago	13.9	17.1	17.0	13.5	15.4	16.1	16.5	14.6	15.8	18.7	19.7	20.1	21.5	22.1	24.7
6	Brunei	22.7	19.6	18.7	18.9	17.8	17.7	17.0	17.7	10.7	13.3	17.2	16.1	15.1	12.7	24.1
7	Bahrain	22.5	21.9	19.5	27.2	26.6	27.2	25.9	27.9	28.8	27.4	27.8	26.4	30.6	31.0	23.9
8	Netherlands Antilles	6.3	20.8	21.3	29.7	28.7	28.5	26.9	40.6	19.0	18.3	18.7	19.0	19.2	22.7	22.2
9	Aruba	27.7	27.8	23.6	23.0	22.0	21.4	21.1	21.2	18.9	18.8	22.7	22.4	22.5	22.3	21.3
10	United States	18.9	18.7	18.4	19.3	19.5	19.3	19.4	20.2	19.8	19.9	20.4	20.1	20.0	19.8	20.4
11	Canada	15.0	14.7	14.8	15.1	14.3	15.3	15.3	16.2	15.3	15.6	16.2	16.0	17.1	17.9	20.0
12	Norway	7.8	7.8	7.1	7.6	7.1	8.5	9.2	9.5	9.4	10.1	9.9	11.6	15.8	18.0	19.01
13	Australia	16.2	15.4	15.8	16.0	16.3	16.5	17.4	17.2	17.8	18.4	18.3	19.1	18.2	18.0	16.3
14	Falkland Islands	19.0	18.4	17.7	16.9	16.2	16.7	17.1	17.5	13.6	13.1	12.7	13.9	13.8	15.1	14.8
15	Nauru	13.9	13.6	13.5	13.2	12.9	12.8	12.5	12.2	11.9	11.3	11.1	11.0	10.8	10.8	14.2
16	Estonia			16.1	13.3	13.6	12.5	13.4	13.6	12.6	11.6	11.7	12.1	11.8	13.6	14.1
17	Faroe Islands	13.0	12.3	13.8	12.8	11.5	14.1	14.4	14.4	14.4	14.4	14.2	14.1	14.1	14.2	13.8
18	Saudi Arabia	12.1	16.4	17.1	18.4	17.7	13.1	14.2	12.6	10.9	11.1	12.7	12.8	12.7	13.0	13.4
19	Kazakhstan			15.5	13.2	12.3	10.4	8.9	8.3	8.0	7.4	8.1	8.4	10.6	10.7	13.3
20	Gibraltar	2.3	2.6	1.8	10.8	13.1	11.0	6.6	3.1	11.3	11.7	12.1	12.4	12.6	13.0	13.0
21	Finland	10.3	10.7	9.5	10.3	11.4	10.7	12.2	11.6	10.9	10.7	10.0	10.9	11.8	13.0	12.6
22	Oman	5.6	5.7	6.1	6.5	7.2	7.3	6.8	6.8	7.1	8.7	9.0	9.9	12.2	12.9	12.5
23	Singapore	15.0	14.4	14.2	16.3	19.1	13.5	15.0	16.8	14.8	14.3	14.1	13.8	13.4	11.3	12.2
24	Palau	15.3	15.0	14.8	13.9	13.6	13.8	13.8	13.1	13.0	12.8	12.6	12.0	11.9	12.3	11.9
25	Montserrat	3.2	3.2	3.4	3.4	3.4	4.2	4.4	5.9	8.4	10.1	12.6	14.1	15.7	16.0	11.7
26	Czech Republic			13.1	12.9	12.5	11.8	12.2	12.0	11.5	10.6	11.6	11.6	11.2	11.4	11.48
27	Equatorial Guinea	0.3	0.4	0.3	0.3	0.3	0.3	0.3	0.4	0.6	0.6	0.6	0.6	9.7	9.4	11.47
28	New Caledonia	9.4	10.2	9.8	9.6	9.1	8.9	8.9	9.0	8.7	9.6	8.4	8.3	8.1	8.2	11.2
29	Israel	7.4	7.3	8.3	8.8	8.8	9.7	9.4	10.6	10.2	9.8	10.6	10.3	10.8	10.6	10.8
30	Russia			13.4	12.2	10.6	10.2	10.1	9.7	9.5	9.7	9.9	9.9	9.9	10.3	10.5
31	Libya	8.7	8.9	8.4	8.6	8.3	9.1	8.2	9.7	8.9	8.5	8.8	8.9	8.9	8.9	10.3
32	Ireland	8.7	9.5	8.9	9.0	9.3	9.2	9.8	10.0	10.4	10.8	10.9	11.3	10.8	10.3	10.4

33	Greenland	10.0	9.8	8.6	9.0	9.0	9.0	9.2	9.3	9.5	9.6	9.9	10.0	10.0	10.0	10.0
34	Japan	8.7	8.8	8.9	8.7	9.1	9.1	9.3	9.3	8.9	9.2	9.5	9.4	9.5	9.5	9.84
35	Saint Pierre and Miquelon	15.7	17.2	16.2	12.7	12.2	12.2	12.2	7.9	9.5	9.5	9.5	9.5	10.1	11.3	9.83
36	Denmark	9.7	12.1	10.3	11.3	11.7	10.6	12.8	10.8	10.3	9.4	8.7	9.0	8.9	10.1	9.80
37	United Kingdom	10.0	11.3	9.9	9.6	9.5	9.5	9.9	9.3	9.2	9.2	9.5	9.6	9.3	9.4	9.79
38	Germany	12.4	11.2	10.8	10.5	10.4	10.2	10.5	10.2	10.1	9.6	9.7	10.0	9.7	9.8	9.79
39	South Korea	5.6	6.1	6.6	7.2	7.7	8.3	9.0	9.3	7.9	8.5	9.1	9.3	9.4	9.6	9.77
40	Belgium	10.1	10.5	10.4	9.9	10.3	10.5	10.6	10.3	10.6	10.2	9.9	9.2	6.8	8.3	9.7
41	South Africa	7.8	7.9	7.2	7.5	7.6	7.8	7.6	7.6	7.6	7.4	7.2	7.2	7.7	7.8	9.2
42	Turkmenistan			7.2	6.9	8.2	8.3	7.4	6.9	5.9	7.9	7.9	8.7	9.1	9.2	8.8
43	Netherlands	9.4	9.3	9.2	9.5	8.8	9.0	9.9	9.3	9.4	9.0	8.8	8.8	9.4	8.7	8.74
44	Greece	7.1	6.5	7.1	7.1	7.3	7.3	7.6	7.7	7.9	7.8	8.2	8.4	8.5	8.7	8.73
45	Bermuda	9.9	8.2	6.6	7.6	7.5	7.4	7.5	7.5	7.4	7.4	7.4	7.3	7.9	7.8	8.6
46	Austria	7.5	8.0	7.2	7.1	7.2	7.3	7.4	7.4	7.7	7.5	7.5	8.0	8.0	8.7	8.5
47	Cyprus	6.8	6.5	7.1	7.2	7.3	7.0	7.1	7.2	7.8	7.8	8.2	8.1	8.1	8.9	8.2
48	Slovenia			6.3	6.5	5.5	7.1	7.5	8.1	7.7	7.6	7.3	7.7	7.8	7.8	8.1
49	Poland	9.1	9.0	8.9	9.1	8.8	9.0	9.4	9.0	8.4	8.1	7.8	7.8	7.7	7.9	8.0
50	New Zealand	6.9	7.2	7.5	7.1	7.3	7.3	8.2	8.5	8.1	8.4	8.7	9.1	8.9	8.8	7.8
51	Spain	5.4	5.5	5.7	5.2	5.4	5.9	5.8	6.1	6.3	6.8	6.9	6.9	7.3	7.3	7.72
52	Italy	6.9	7.0	7.1	6.9	6.8	7.2	7.1	7.1	7.3	7.3	7.4	7.4	7.5	7.7	7.69
53	Iceland	7.9	7.0	7.0	7.6	7.6	7.3	8.2	7.7	7.6	7.4	7.7	7.4	7.7	7.6	7.6
54	Malaysia	3.1	3.7	4.0	4.7	4.7	5.9	5.9	5.8	5.2	4.8	5.5	5.8	5.9	6.4	7.05
55	Ukraine			11.6	9.9	8.2	8.3	7.8	6.5	6.3	6.4	6.2	6.3	6.4	6.6	6.98
56	Cayman Islands	9.5	9.8	9.6	9.5	9.1	8.7	8.3	7.9	7.6	7.3	7.1	6.9	6.9	7.1	6.98
57	Slovakia			8.1	7.1	7.0	7.7	7.4	7.2	7.4	7.2	6.6	6.9	6.9	7.0	6.7
58	Belarus			9.2	7.6	6.8	6.2	6.3	6.1	5.9	5.8	5.9	5.9	6.0	6.4	6.6
59	Venezuela	6.0	5.9	5.3	6.2	7.7	6.7	6.9	6.7	7.0	6.8	6.7	6.4	5.4	5.6	6.57
60	Seychelles	1.6	1.9	2.3	2.2	2.5	2.5	2.6	5.5	5.7	6.7	7.3	8.3	6.9	6.9	6.4
61	Iran	3.9	3.9	4.1	3.8	4.8	4.4	4.8	4.9	4.7	4.2	4.4	4.5	5.5	5.6	6.31
62	Bahamas	7.7	6.9	6.8	6.4	6.3	6.2	6.1	6.0	6.1	6.0	6.0	5.9	6.7	6.0	6.29
63	France	6.4	6.8	6.3	6.2	5.7	6.0	6.4	5.9	6.4	6.1	6.0	6.3	6.2	6.2	6.2
64	Malta	6.2	6.8	7.2	7.4	7.2	7.8	8.2	8.7	5.4	5.9	5.4	5.2	5.3	6.2	6.1
65	Algeria	3.0	3.1	3.0	3.0	3.1	3.4	3.4	3.0	6.0	5.5	5.4	5.2	5.3	5.1	5.99
66	Sweden	5.8	6.0	5.9	5.5	5.7	5.3	6.1	5.4	5.4	5.1	5.2	5.4	6.2	5.9	5.89
67	Hungary	5.8	5.9	5.4	5.7	5.3	5.6	5.8	5.7	5.6	5.6	5.3	5.5	5.5	5.7	5.65

68	Portugal	4.2	4.3	4.7	4.6	4.7	5.0	4.8	5.0	5.4	5.9	5.8	5.7	6.0	5.6	5.63
69	Switzerland	6.3	6.1	6.2	5.9	5.9	5.6	5.7	5.9	5.9	5.7	5.5	6.0	5.7	5.6	5.47
70	Bulgaria	8.7	6.8	6.0	7.8	6.3	6.8	6.3	6.1	5.9	5.3	5.3	5.6	5.3	5.6	5.46
71	French Guiana	6.9	6.8	6.9	6.7	6.6	6.5	6.3	6.0	6.3	6.1	6.0	5.8	5.8	5.6	5.38
72	Hong Kong	4.6	4.8	5.4	5.8	4.9	4.8	4.4	4.5	5.8	6.1	5.7	5.3	5.1	5.5	5.36
73	Uzbekistan			5.3	5.4	5.0	4.3	4.4	4.3	4.9	4.8	4.8	4.8	4.8	4.8	5.26
74	Croatia			3.7	3.7	3.6	3.8	4.0	4.2	4.5	4.6	4.4	4.7	4.9	5.3	5.18
75	Macedonia			5.5	5.3	5.3	5.4	6.0	5.4	6.1	5.6	5.7	5.7	5.1	5.2	5.13
76	Suriname	4.5	5.2	5.2	5.2	5.2	5.2	5.0	5.0	5.0	5.0	4.9	5.2	5.1	5.1	5.08
77	Serbia and Montenegro			4.3	3.7	3.6	3.8	4.4	4.7	4.9	3.5	3.9	4.1	4.5	4.8	5.07
78	Antigua and Barbuda	4.8	4.5	4.4	4.6	4.6	4.6	4.5	4.7	4.5	4.7	4.6	4.5	4.7	5.0	5.06
79	Macau	2.8	2.9	2.8	3.0	3.1	3.0	3.4	3.5	3.6	3.5	3.7	3.8	4.1	4.1	4.72
80	Barbados	4.2	4.7	3.8	4.3	2.9	3.2	3.2	3.4	4.3	4.6	4.5	4.6	4.6	4.4	4.36
81	Thailand	1.8	2.1	2.3	2.5	2.7	3.1	3.4	3.5	3.1	3.2	3.3	3.5	3.7	3.9	4.28
82	Mexico	4.5	4.3	4.5	4.1	4.3	4.0	3.9	4.1	4.0	4.0	4.0	4.0	3.9	4.0	4.24
83	Romania	6.7	5.8	5.3	5.1	4.9	5.5	5.4	5.0	4.4	3.8	3.9	4.2	4.0	4.2	4.16
84	Lebanon	3.3	3.4	3.9	3.9	4.1	4.3	4.3	4.8	4.8	4.9	4.5	4.8	4.7	5.4	4.10
85	Bosnia and Herzegovina			1.2	1.0	1.1	1.2	1.5	3.6	4.6	4.2	5.1	5.1	4.8	4.9	3.99
86	Guadeloupe	3.3	3.4	3.5	3.6	3.7	3.7	3.7	3.7	3.6	3.7	3.8	3.8	3.9	3.9	3.99
87	Jamaica	3.4	3.4	3.4	3.5	3.5	3.9	4.1	4.2	3.8	3.8	4.0	4.1	3.9	4.1	3.97
88	British Virgin Islands	3.0	2.9	3.0	2.9	2.9	2.8	3.1	3.0	2.9	2.9	2.8	2.8	3.2	3.6	3.88
89	Chile	2.7	2.5	2.6	2.6	2.9	3.1	3.5	3.9	3.8	4.1	3.9	3.5	3.6	3.7	3.87
90	Lithuania			5.8	4.8	4.8	4.4	4.4	4.2	4.5	3.8	3.4	3.6	3.6	3.7	3.87
91	China	2.1	2.2	2.2	2.3	2.5	2.6	2.7	2.7	2.5	2.2	2.2	2.3	2.7	3.2	3.84
92	Azerbaijan			6.3	5.9	5.4	4.2	3.9	3.6	3.8	4.1	3.7	3.4	3.4	3.5	3.78
93	Syria	2.8	3.1	3.1	3.3	3.0	2.9	2.9	2.6	3.0	3.0	2.9	2.8	2.9	2.7	3.72
94	Argentina	3.4	3.5	3.6	3.4	3.5	3.4	3.6	3.7	3.7	3.9	3.7	3.4	3.2	3.4	3.70
95	North Korea	12.4	12.6	12.7	12.8	12.6	12.4	12.2	11.0	3.0	3.3	3.5	3.6	3.4	3.5	3.36
96	Mongolia	4.5	5.4	4.8	4.0	3.4	3.3	3.3	3.2	3.1	3.1	3.0	3.1	3.2	3.1	3.35
97	Martinique	5.7	5.1	5.6	5.5	5.5	5.4	5.4	5.4	5.4	5.4	5.4	5.5	5.8	3.4	3.27
98	Turkey	2.6	2.5	2.5	2.6	2.5	2.7	3.0	3.1	3.1	3.0	3.3	2.9	3.0	3.1	3.14
99	Jordan	3.1	2.9	3.4	3.1	3.3	3.2	3.2	3.1	3.1	3.0	3.1	3.0	3.1	3.2	3.07
100	Latvia			4.8	4.4	4.3	3.8	3.8	3.3	3.2	2.7	2.5	2.8	2.7	2.9	3.07

Appendix A.3. A survey on environmentally conscious practices

Environmentally Conscious Practices

On a scale of 1 = strongly disagree to 5 = strongly agree, indicate the practices related with environment:

1. There is a culture for green/environmental operations.
2. We request our suppliers to conform certain environmental regulations, e.g. ISO14001, WEEE, and RoHS.
3. We place increasing emphasis on improving eco-efficiency in our production.
4. We reuse/recycle waste materials.
5. There is a need for exploiting cleaner technologies in your company.
6. Environmental performance is more important than cost effectiveness.
7. Your company uses renewable energy and resources in the supply chain (e.g. wind power, biodiesel, etc).

SCM Potential Polluters

On a scale of 1 = strongly disagree to 5 = strongly agree, indicate the potential polluters in your company's supply chain:

1. In your supply chain, logistics/distribution is the biggest contributor to CO_2 emission.
2. In your supply chain, reverse logistics/de-distribution is the biggest contributor to CO_2 emission.
3. In your supply chain, manufacturing process is the biggest contributor to CO_2 emission.
4. In your supply chain, energy production is the biggest contributor to CO_2 emission.
5. In your supply chain, packaging is the biggest contributor to CO_2 emission.

Environmental Management Drivers

On a scale of 1 = strongly disagree to 5 = strongly agree, indicate the factors that drive your company to go green:

1. Government policy drives the need to green.
2. Senior management in the company drives the need to go green.
3. Customers drive the need to go green.
4. Competition drives the need to go green.

Competitive Environment

On a scale of 1 = strongly disagree to 5 = strongly agree, indicate the overall level of competition in your firm's primary industry for each of the dimensions below:

1. Number of competencies (i.e. things a firm must do well) required surviving in this industry.
2. The time, effort, resources and managerial attention required to keep up with competitors.
3. Overall competitiveness of our industry is commonly high.
4. Importance of potential competitor reaction or retaliation to decisions made in our firm.
5. Aggressiveness of our major competitors.
6. Amount of time spent analyzing major competitors' strategies and actions.

Competitive Priorities

On a scale of 1 = strongly disagree to 5 = strongly agree, indicate the importance given to each item in your organization:

Our strategy places importance on delivering products with high performance.

1. Our strategy is based on quality performance rather than price.
2. We emphasize launching new products quickly.
3. Our strategy cannot be described as the one to offer products with the lowest price.
4. We place greater emphasis on customer service than price.
5. We place greater emphasis on innovation than price.

Customer Relations

On a scale of 1 = strongly disagree to 5 = strongly agree, rate your firm's ability to monitor and manage customer relationships in the following areas:

1. We share a sense of fair play with our customers.
2. We frequently interact with customers to set reliability, responsiveness, and other standards for us.
3. We periodically evaluate the importance of our relationship with our customers.
4. We facilitate customers' ability to seek assistance from us.
5. We frequently determine future customer expectations.
6. We frequently measure and evaluate customer satisfaction.
7. We have frequent follow-up with our customers for quality/service feedback.

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