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Facoltà di Ingegneria dei Sistemi

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**HRM and SCM interaction for environmental  
performance: a conceptual model and research design**

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*To our families*

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# Abstract

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Il tema della sostenibilità ambientale ha iniziato a svilupparsi negli anni '60 e al giorno d'oggi sta diventando sempre di più centrale a livello mondiale, soprattutto dopo gli avvenimenti catastrofici che si sono verificati recentemente e che hanno messo in pericolo non solo l'ambiente, ma anche la vita degli esseri umani. Numerose aziende, infatti, si stanno dotando di sistemi di environmental management che permettono di sviluppare, implementare e monitorare una politica ambientale che mira al raggiungimento di performance green quali ad esempio la riduzione di rifiuti o emissioni nell'atmosfera. I sistemi di gestione ambientale riguardano l'implementazione di pratiche considerate Green all'interno delle diverse funzioni che costituiscono l'azienda.

Il seguente lavoro di ricerca affronta il tema delle possibili relazioni esistenti tra pratiche di due importanti funzioni aziendali, la Supply Chain e le Risorse Umane, e come queste possono portare a miglioramenti della performance ambientali di una azienda. La struttura del lavoro è la seguente: partendo da un'ampia analisi della letteratura scientifica riguardante i due ambiti da noi presi in considerazione, si procede con la definizione di possibili modelli teorici di configurazione delle relazioni tra pratiche per giungere, infine, alla descrizione del metodo di ricerca da noi utilizzato. Vengono da ultimo riportate le possibili implicazioni manageriali e future derivanti dalla nostra ricerca.



# Executive summary

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## Introduzione

“Mai come oggi le persone sono interessate all’ambiente e ai cambiamenti climatici” recita una frase tratta da un report pubblicato nel 2007 dall’Intergovernmental Panel on Climate Change, un istituto scientifico formato dalle Nazioni Unite che ha lo scopo di studiare e fornire informazioni riguardanti i rischi e le conseguenze che derivano dai cambiamenti climatici che stanno avvenendo sulla Terra. La situazione ambientale del nostro pianeta, infatti, sta ottenendo una significativa attenzione da parte non solo degli studiosi e ricercatori, ma anche da parte dei governi, del pubblico e dei media, soprattutto a causa di eventi disastrosi che si sono verificati recentemente come ad esempio il tragico incidente nucleare di Fukushima del 2011.

Sempre più le aziende stanno implementando pratiche green all’interno delle loro funzioni, per tentare di raggiungere prestazioni ambientali che siano conformi agli standard ISO 14001, che sono norme accettate a livello internazionale che definiscono le modalità per predisporre un sistema di gestione ambientale efficace.

## Il quadro teorico

Il tema della sostenibilità ambientale viene trattato ampiamente nella letteratura di Supply Chain, mentre la letteratura scientifica delle risorse umane ha iniziato solo recentemente ad affrontarlo.

Una supply chain viene definita sostenibile dal punto di vista ecologico se aspetti e prestazioni ambientali sono considerati e pienamente integrati nelle

normali pratiche di supply chain quali design del prodotto, approvvigionamento dai fornitori, processi di produzione, consegna del prodotto al cliente finale e reverse logistic. Numerosi autori affrontano il tema di come l'implementazione di pratiche di green supply chain possa portare ad una migliore performance aziendale, sia di tipo ambientale che economico: ad esempio, secondo (Kenneth W.Green Jr et al 2012; Wu et al 2012; Diabat e Govindan, 2011) l'attuazione di pratiche ecologiche non solo conduce a miglioramenti dal punto di vista economico e competitivo, ma comporta uno sviluppo delle prestazioni ambientali, come riduzione delle emissioni in atmosfera, scarichi e produzione di rifiuti e consumo di materiali ritenuti tossici.

La definizione di green human resource management è del tutto simile: infatti Mandip (2012) lo definisce come l'utilizzo di politiche di gestione delle risorse umane per promuovere l'uso sostenibile delle risorse all'interno delle organizzazioni aziendali e, più in generale, promuovere la causa della sostenibilità ambientale. Anche nella letteratura HR sta iniziando ad affermarsi la convinzione che l'utilizzo di pratiche green possa portare a dei benefici per le aziende: in una sua review del 2012, infatti, Renewick suggerisce che pratiche di risorse umane di tipo ambientale possano avere un ruolo importante nel miglioramento della performance green delle aziende.

Dall'analisi della letteratura è però emerso che la maggior parte degli articoli affrontano solamente il tema dell'effetto che le pratiche hanno singolarmente sulla performance ambientale, perciò la tematica della relazione tra attività della stessa funzione o tra pratiche di funzioni diverse risulta essere ancora non del tutto esplorata. Le pratiche ambientali di Risorse Umane che abbiamo individuato in letteratura sono state classificate secondo il modello AMO, Ability Motivation and Opportunity, (Appelbaum, E., et al., 2000), che è stato sviluppato partendo dalle considerazioni base della psicologia; per cui nell'Ability sono comprese tutte quelle pratiche che impattano sulla conoscenza e sulle capacità di un individuo, come ad esempio la selezione e il training del personale aziendale; nella

Motivation, invece, tutte quelle pratiche che spingono e incentivano un individuo nel suo lavoro, come il sistema retributivo e la misurazione delle performance; e infine nell'Opportunity rientrano pratiche che creano un ambiente favorevole in cui l'individuo può lavorare, come la creazione di una cultura aziendale orientata al green oppure empowerment ed engagement.

Riguardo alle pratiche di Supply Chain, esse sono state classificate in base al modello SCOR (Supply Chain Operations Reference), che individua e descrive i processi fondamentali presenti in una supply chain, dall'acquisto delle materie prime alla consegna del prodotto al cliente finale. I processi che sono individuati nel modello SCOR sono Plan, processo che sviluppa le linee di azione volte all'acquisizione delle risorse necessarie alla supply chain, Source, che riguarda negoziazione, approvvigionamento e ricevimento dei materiali, Make, ossia realizzazione vera e propria dei prodotti, Deliver, logistica in uscita e consegna di prodotti finiti, e infine Return, che comprende tutto il ciclo di gestione dei resi. Ad esempio, nel Plan sono state inserite pratiche come creazione di un sistema di gestione ambientale interno all'azienda, nel Source pratiche come acquisti eco-sostenibili, nel Make riduzione dell'utilizzo di materiali o produzione eco-sostenibile, nel Deliver pratiche come distribuzione e logistica eco-sostenibile, infine nel Return pratiche come il recupero di investimenti.

Dall'analisi della letteratura è emerso, inoltre, che solamente pochi recenti articoli scientifici suggeriscono che "bundle" di pratiche HR possano comportare risultati evidenti sulle prestazioni ambientali: Renwick et al. (2012), infatti, affermano che non ci sono in letteratura degli studi che si focalizzano su come l'intero sistema di HRM impatti sulle performance aziendali. Essi ipotizzano che le pratiche HR da loro studiate singolarmente nella review possano avere effetti maggiori se implementate congiuntamente. Un paper molto importante sul quale ci siamo concentrati è quello di Chadwich (2010), il quale affronta per primo il tema delle sinergie che possono esistere tra pratiche. Le stesse considerazioni sono state ipotizzate anche in ambito Supply Chain, ad esempio Vachon e Klassen

(2006, 2008) affermano che la potenziale relazione tra pratiche di supply chain è un tema ancora sconosciuto e che potrebbe avere impatti positivi sulla performance ambientale delle aziende.

Infine, riguardo al tema delle relazioni inter-funzionali tra SCM e HRM, sono stati individuati alcuni articoli che ipotizzano e propongono delle possibili connessioni esistenti tra queste due funzioni, come ad esempio Fisher et al. (2010) ragionano su come utilizzare pratiche di risorse umane possa migliorare la gestione della supply chain. Un articolo che abbiamo reputato molto interessante e che si avvicina al focus della nostra ricerca è quello di Birdi et al. (2008), in cui gli autori tentano di analizzare le possibili relazioni che esistono tra alcune pratiche di risorse umane (Empowerment, training and teamwork) e di supply chain (total quality management, just-in-time, advanced manufacturing technology, and supply-chain partnering) che portano al raggiungimento della performance di una azienda: il risultato del loro studio è incoraggiante, in quanto essi hanno riscontrato che tutte le relazioni sono positive e che quindi esistono delle sinergie tra pratiche che hanno un impatto sulla performance aziendale.

La nostra ricerca parte da qui e il suo scopo è quello di colmare il vuoto esistente nella letteratura scientifica di entrambi i mondi riguardo alla possibile relazione tra pratiche della stessa funzione e tra pratiche di funzioni diverse, Supply Chain e Human Resource nel nostro caso, che abbia un'influenza sul raggiungimento della performance ambientale delle aziende.

## **I Modelli proposti in questa tesi**

Per la formulazione delle ipotesi che ci siamo proposti di testare per colmare le lacune evidenziate nell'analisi della letteratura, ci siamo basati sulle teorie di Chadwick (2010).

Chadwick e altri autori in letteratura, come Delery (1998), Green et al., (2006) and Kepes & Delery, (2007), identificano due tipi di sinergie, dette *fit*, tra pratiche: fit orizzontale, che riguarda prevalentemente le relazioni tra i componenti del sistema di HRM, ossia pratiche e policy HR, e il fit verticale, che invece riguarda le relazioni tra pratiche di HRM e fattori esterni, quali ad esempio pratiche di un'altra funzione aziendale. Nell'articolo di Chadwick viene affrontato solamente il tema del fit orizzontale tra pratiche, mentre nella nostra tesina estendiamo il focus e applichiamo le sue teorie anche per cercare di spiegare il fit verticale che può esistere tra la funzione HR e la funzione SC.

Chadwick propone tre possibili approcci alla sinergia:

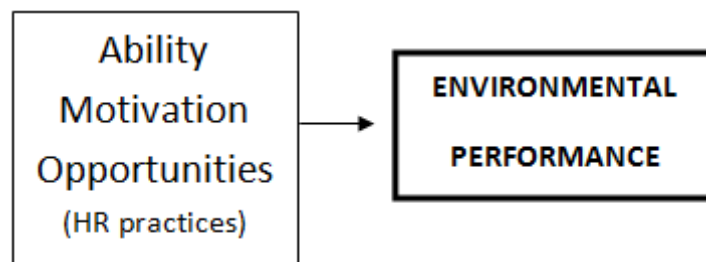
- virtuous overlap: basato sull'assunzione che le pratiche HR si rinforzano l'una con l'altra e hanno un effetto congiunto sulla performance maggiore della somma degli effetti individuali che possono portare le singole pratiche;
- independent effect: basato sull'assunzione che le pratiche HR hanno un effetto totalmente indipendente sulla performance;
- efficient complementarities: basato sull'assunzione che l'effetto di una singola pratica HR sulla performance, modera ed è moderato dalla presenza delle altre pratiche all'interno sistema HRM.

Noi abbiamo riproposto queste teorie per la formulazione delle nostre ipotesi: Chadwick parte da un concetto generale di sinergia e si focalizza poi sulle sole pratiche di risorse umane, ma data la generalità delle definizioni di Virtuous overlaps, indipendenza ed effetti complementari, riteniamo che sia possibile estendere le sue teorie anche all'ambito supply chain e alle relazioni tra le due funzioni HR e SC.

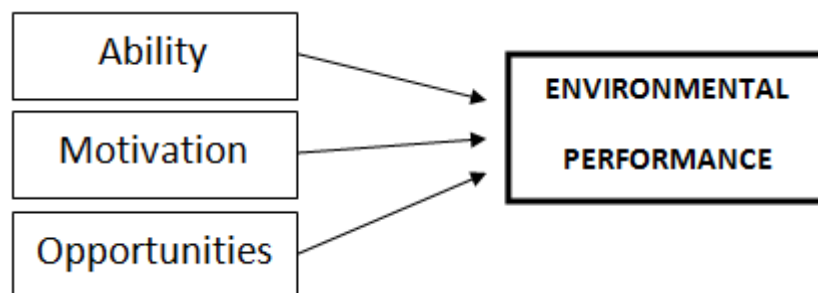
Le seguenti ipotesi che proponiamo sono suddivise in tre famiglie composte da tre proposizioni. I primi due gruppi rappresentano delle assunzioni di base, ovvero che pratiche di HR abbiano delle connessioni tra loro per raggiungere le prestazioni ambientali e stessa cosa per le pratiche di SC. L'ultimo gruppo di ipotesi definisce invece le possibili relazioni esistenti tra le due funzioni.

### *Ipotesi lato HR*

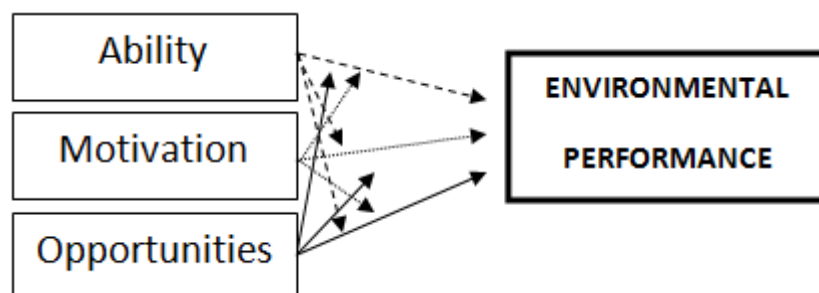
1a: le pratiche appartenenti al modello AMO hanno un impatto congiunto e positivo sulla performance ambientale che è maggiore dell'effetto additivo delle singole pratiche.



1b: le pratiche appartenenti al modello AMO hanno un effetto indipendente sulla performance ambientale delle aziende.

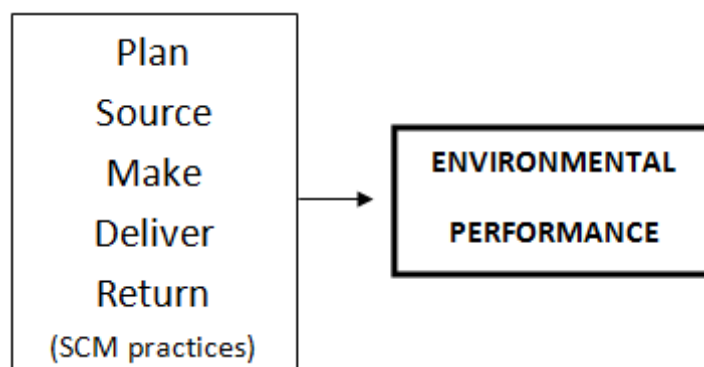


1c: le pratiche appartenenti al modello AMO hanno un impatto complementare sulla performance ambientale, in cui l'effetto della singola pratica modera ed è moderato dall'effetto delle altre.

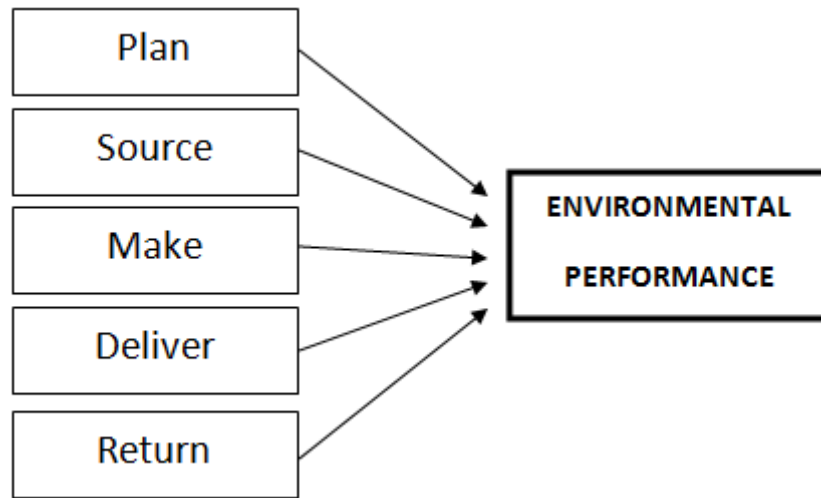


*Ipotesi lato SC*

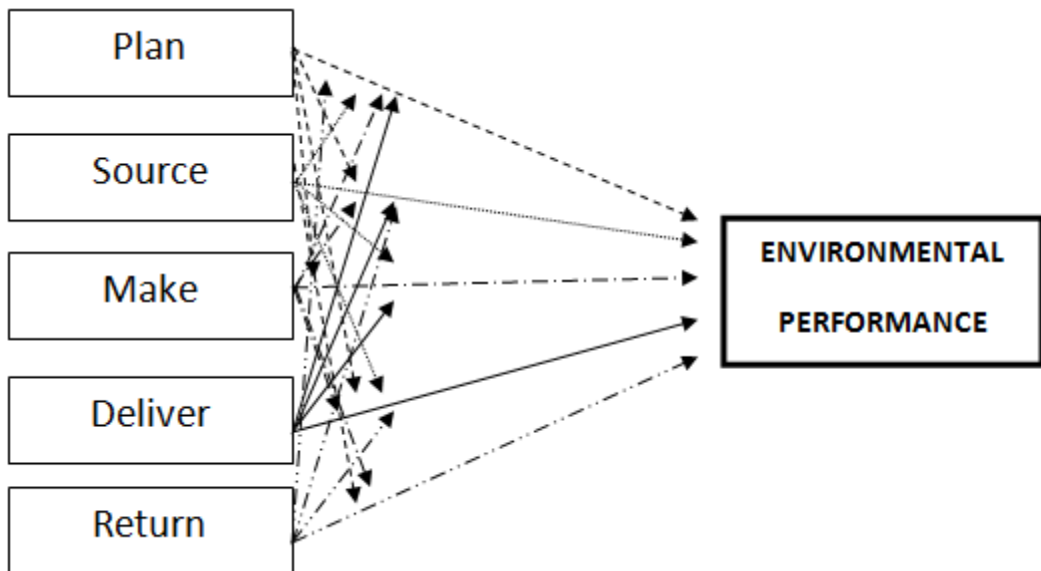
2a: le pratiche appartenenti al modello SCOR hanno un impatto congiunto e positivo sulla performance ambientale che è maggiore dell'effetto additivo delle singole pratiche.



2.b: le pratiche appartenenti al modello SCOR hanno un effetto indipendente sulla performance ambientale delle aziende.



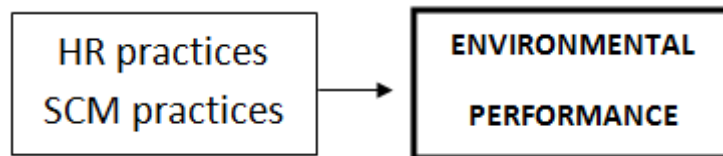
2c: le pratiche appartenenti al modello SCOR hanno un impatto complementare sulla performance ambientale, in cui l'effetto della singola pratica modera ed è moderato dall'effetto delle altre.



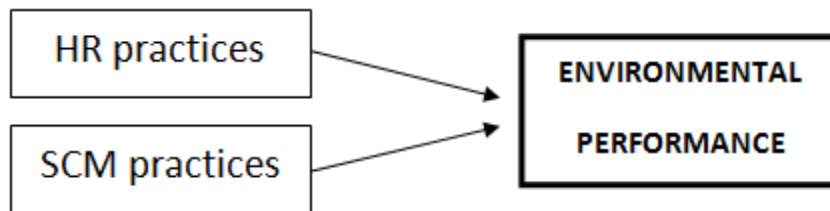


### *Ipotesi inter-funzionali*

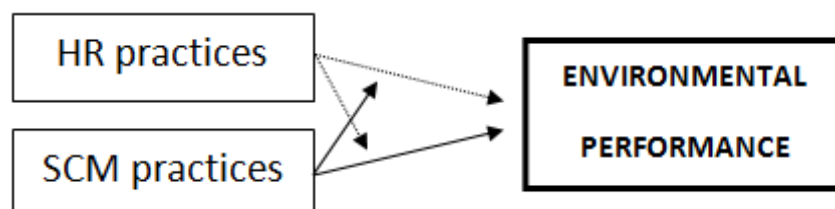
3a: le pratiche appartenenti al modello SCOR e al modello AMO hanno un impatto congiunto e positivo sulla performance ambientale che è maggiore dell'effetto additivo delle singole pratiche.



3b: le pratiche appartenenti al modello SCOR e al modello AMO hanno un effetto indipendente sulla performance ambientale delle aziende.



3c: le pratiche appartenenti al modello SCOR e al modello AMO hanno un impatto complementare sulla performance ambientale, in cui l'effetto della singola pratica modera ed è moderato dall'effetto delle altre.



## **Metodo**

Come afferma Forza (2002) se lo scopo è testare l'adeguatezza di concetti sviluppati in relazione ad un fenomeno, dei collegamenti tra i concetti ipotizzati e del confine di validità dei modelli, la survey è lo strumento più adatto. Esso è stato infatti considerato il mezzo migliore per raccogliere un ampio numero di dati dai quali potere poi tradurre un'analisi. In particolare abbiamo somministrato un questionario online perchè numerosi studi hanno evidenziato i vantaggi di un suo utilizzo rispetto ai questionari tradizionali cartacei o telefonici: basso costo, semplicità d'uso, risposta rapida ecc (Watt et al.2002, Evans e Mathur, 2005, Kannan et al. 1998). La tipologia di risposta a domanda chiusa su scala Likert a "sei punteggi" è stata scelta sulla base di ricerche scientifiche precedenti ed è stata preferita rispetto ad una scala a "cinque punteggi" (utilizzata da Zhu et al.,2008; Kenneth W. Green Jr et al., 2012) poichè elimina la possibilità di dare una risposta neutrale (Chomeya, 2010).

Il campione di rispondenti utilizzato per questa ricerca sono i direttori/responsabili delle funzioni Risorse Umane e Supply Chain delle aziende che operano in Italia. In realtà i destinatari delle domande relative alla funzione Supply Chain sono stati ampliati ai direttori/responsabili Acquisti, che spesso in Italia ricoprono queste duplici funzioni. Per raggiungere un buon numero di contatti siamo stati supportati da due importanti associazioni italiane di categoria: ADACI (Associazione direttori acquisti e supply chain italiani) e GIDP (Gruppo intersettoriale direttori del personale). Quest'ultime hanno contribuito a diffondere il questionario alle loro migliaia di associati permettendo di raggiungere un numero adeguato di rispondenti completi in tempi molto ridotti. Le due Associazioni hanno contribuito inoltre ad identificare le domande più adeguate ai professionisti e ad approvare la versione definitiva del questionario.

Il primo invio di email è stato a metà Febbraio 2013 ad una lista di contatti personali e di contatti di ADACI; a seguito di esso abbiamo provveduto ai reminder ai non rispondenti. Un mese dopo è partita la campagna email di GIDP.

La costruzione del questionario è partita con un'attenta analisi della letteratura scientifica, cercando di capire come precedenti ricercatori hanno misurato la nostra variabile dipendente, ossia le performance ambientali delle aziende: la scelta è ricaduta criteri di rating della performance ambientale proposti da Kinder, Lydenberg e Domini (KLD Analytics, 2007), usati anche in recenti articoli da Bonnie F. Daily, Bishop, Massoud (2012). Successivamente ci siamo focalizzati sulle variabili indipendenti, ossia i costrutti sia di HR che di SC che hanno dimostrato in letteratura una maggior efficacia nel raggiungimento di obiettivi green delle aziende. Quelli che soddisfacevano requisiti di affidabilità (valutata tramite alpha di Crombach e numero di citazioni sui vari portali di ricerche scientifiche) sono stati inseriti nel questionario. I costrutti utilizzati sono stati, inoltre, classificati secondo il modello SCOR per quanto riguarda le pratiche di supply chain e secondo la teoria AMO le pratiche di risorse umane.

## **Survey**

Abbiamo provveduto a realizzare due questionari: uno dedicato ai rispondenti di Risorse Umane e uno ai destinatari della funzione Supply Chain.

Essi sono formati da una parte comune che riguarda:

- i dati che definiamo di “anagrafica”, sia aziendali che personali del rispondente (nome azienda, settore, N° di dipendenti, classe di fatturato, anni di lavoro del responsabile presso quella funzione..);

- una domanda che invece raccoglie risultati sulle percezioni dei fattori abilitanti di contesto all'implementazione di pratiche green (pressioni dei clienti, normative..);
- domande relative all'impatto che le pratiche green delle due funzioni hanno sulla variabile dipendente EP.

C'è poi una parte specifica costruita ad hoc a seconda della tipologia di rispondente che raccoglie:

- domande sull'implementazione di pratiche green in ambito SCM per i rispondenti di questa funzione (Supply Chain/Acquisti)
- domande sull'implementazione di pratiche green in ambito HRM per i rispondenti di quest funzione.

### **Limitazioni e spunti per ricerche future**

Questa ricerca vuole essere un punto di partenza per lo studio analitico su come le partiche di risorse umane e supply chain possono relazionarsi per raggiungere miglioramenti nelle performance ambientali. I futuri risultati di questo tipo di ricerca potranno definire quali pratiche o cluster di pratiche sia HR che SC siano più correlate con le prestazioni ambientali definendo una possibile priorità di implementazione. Inoltre potrà essere una ulteriore guida per quelle aziende che già implementano le tipologie di pratiche trattate in questo studio.

Bisogna però tenere sotto osservazione alcune limitazioni. Partendo dallo stretto punto di vista di causalità lineare; lo studio infatti presuppone che gli input generano gli output mentre potrebbe accadere anche una situazione inversa. Questo problema potrebbe essere risolto conducendo studi longitudinali che verifichino come questa correlazione evolve nel tempo (Marchington and Zagelmeyer, 2005).

Inoltre bisogna tener conto dell'influenza dell'intervallo di tempo considerato: gli effetti dell'implementazione delle pratiche, infatti, potrebbero essere osservabili solo a distanza di tempo (Boselie et al., 2005:79). Come affermano Kozlowski e Klein (2000) ci si aspetta che ci voglia tempo tra l'introduzione di pratiche di gestione e i cambiamenti nelle prestazioni ambientali: sarebbe quindi opportuno riproporre il questionario a distanza di tempo.

Ulteriori ricerche potrebbero ragionare su un ottica più ampia senza focalizzarsi, come nel nostro caso, su pratiche HR incluse nella teoria Ability Motivation e Opportunity e quelle SC incluse nel modello SCOR. Esistono anche implicazioni derivanti dal campione di rispondenti del questionario; ci siamo concentrati infatti su aziende che operano in Italia e quindi sarebbe opportuno estendere l'analisi comparativa anche ad altre aree geografiche e contesti culturali diversi.

# 1. Environmental sustainability

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In this first chapter we want to introduce a short overview on sustainability theme, in particular on the environmental one: we start from an explanation of what sustainability is in general and then we concentrate on environmental sustainability and on the way it could be reach inside firms.

## 1.1 Triple Bottom Line sustainability

Over the last few years, researcher and practitioner interest in sustainability emerged in part due to concern for the potential impact that regulatory compliance and stakeholder pressure may have on planning and management decisions and resulting corporate financial performance (CFP) (Krause, Vachon and Klassen 2009; Porter and van der Linde 1995). A survey conducted by McKinsey and Company (2010) revealed that more than 50 percent of organizations consider sustainability initiatives to be “very” to “extremely” important.

The term sustainability refers to an integration of social, environmental, and economic responsibilities and has recently begun to appear in the literature of business disciplines: John Elkington (1998) tried to measure sustainability by defining a new framework to measure performance in companies. This accounting framework, called the triple bottom line, went beyond the traditional measures of profits, return on investment, and shareholder value to include environmental and social dimensions: the idea behind the TBL paradigm is that a corporation’s success can and should be measured not just by the traditional financial bottom line, but also by its social/ethical and environmental performance (Norman and MacDonald, 2004).

The most adopted definition of sustainability is given by the Brundtland Commission (World Commission on Environment and Development, 1987, p. 8), whose mission is to unite countries to pursue sustainable development together. Sustainability is the “development that meets the needs of the present without compromising the ability of future generations to meet their needs.” In this definition the three main elements of TBL are included: the economic aspect which aims to understand the impact of economic activity in both developing and industrialized economies (Erlich and Erlich, 1991); the social aspect that aims to ensure worldwide food security (Lal et al., 2002) and that basic human needs are met (Savitz and Weber, 2006); and, eventually, the environmental aspect that aims to assure the conservation of non-renewable resources (Whiteman and Cooper, 2000). In figure number 1 here is a representation of these three components

### *The Three Spheres of Sustainability*



**Figure 1: The Triple Bottom Line framework**

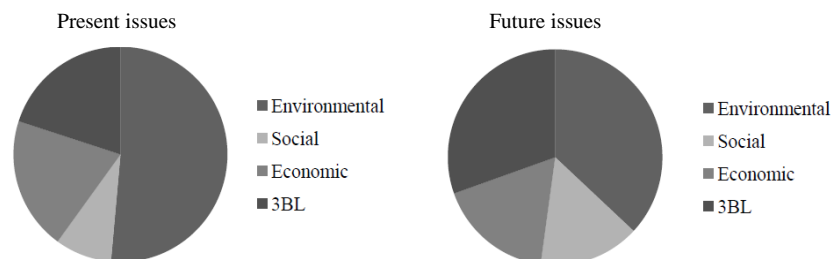
The triple bottom line suggests that at the intersection of social, environmental, and economic performance, there are activities that organizations can engage not only to positively affect the natural environment and society, but also to result in long-term economic benefits and competitive advantage for the firm (Carter, 2008).

It is a very important theme also for companies, especially in supply chain field: in fact, a team of experts of Cambridge Business School in 2012 made a research among 66 respondent, who were academic, professors and private expert of SC, about the present and the future issues of TBL that are considered to be the key past and future issues in SSCM. They identified the top issues and classified them according to the dimensions of the triple bottom line (environmental, social and economic): they also distinguished between stand-alone issues (one dimension) and those referring to the 3BL as a whole (see figure number 2).

Most cited issues in past 10 years	Most cited issues in next 10 years
Carbon	Integrated/Holistic sustainability
Climate change	Sustainability in emerging/developing countries
Linking sustainability to performance	Social sustainability/challenges

**Figure 2: Top issues identified in Cardiff Business School' survey**

The result of this survey showed that future issues are more balanced over the 3BL dimensions, as you can see from the figure below.



**Figure 3: Distribution of issues found in survey**



## **1.2 Sustainability from an environmental perspective**

Nowadays, researchers' and firms' attention is direct to the environmental part of TBL: also our thesis focuses especially on it, also because the sustainability theme is very broad.

Today, as never before, people are concerned with the environment and climate change (Intergovernmental Panel on Climate Change, 2007): in fact, gradually, as the damaging effects of industrial pollution and waste became evident, some governments and Non-Government Organizations promulgated regulations and policies with hopes of slowing and perhaps even reversing the rapid destruction of natural resources and its negative societal consequences (Christmann & Taylor, 2002; Shrivastava & Berger, 2010). Lazlo and Zhexembayeva (2011) make a business case that growing pressures from three trends will oblige organizations to deal with sustainability: declining resources (such as energy, metals and minerals), increasing expectations (from customers, employees, investors and regulators), and radical transparency (made possible by technology, media).

Already today, the UN Global Compact in collaboration with several educational organizations has developed the Principles for Responsible Management Education (PRME), encouraging scholars and managers to jointly work on developing new knowledge to promote environmental responsibility (PRME, 2010).

Management scholars from the different functions of the companies, as accounting, marketing, human resources and supply-chain management are now analyzing how and which practices in these areas can contribute to environmental management goals.

Also in the field of business and management, there is an increasing onus on the role of organisations and their responsibilities to minimise impacts upon the environment (Hart, 1995; Henriques and Sadosky, 1999). While some companies

interpret “green” as a threat, the others may see it as an opportunity and it is the reason that strategies in the direction on sustainable business models vary (Delmas & Montes-Sancho, 2010). A study conducted by Shane and Spicer (1983) shows that poor external rating of pollution performance had a significant negative impact on a firm’s stock price and market’s expectation of future profitability was become different. As a reason, corporates strategies for environmental management are moving from pollution control to pollution prevention (Brockhoff et al., 1999).

Today companies that want to be “green” have to be ISO 14001 certificated: ISO 14001 is an environmental management standard that specifies a set of environmental management requirements for environmental management systems. The purpose of this standard is to help all types of organizations to protect the environment, to prevent pollution, and to improve their environmental performance. Theoretically, ISO 14001 could serve as a comprehensive framework for significantly improving performance in a firm with minimal environmental management capacity or as a set of common sense guidelines for enhancing performance in a firm with regulatory compliant practices. Some firms may, indeed, simply use ISO 14001 as a ‘label’ for image-building.

Steps to introduce an Environmental system into a firm are the following:

- commitment to environmental policies that should be communicated to all employees in public (Woodside et al., 1998)
- planning for environmental management program which should be very precise in assigning individuals responsibility for environmental improvements (Jackson, 1997).
- Implementation and operation in which an organization should identify qualified resources, train employees of all levels, promote internal and external communication specially for important environmentally issues from the top to the

bottom, complete documentation to better meet the requirements for reporting, prevent conditions that causes harmful environmental impacts and also to have a vigilance to response in negative circumstance (Woodside et al., 1998).

- Corrective and preventive actions and support of top management are the last steps. Managers may change policies, targets and elements to improve EMS.

Following this cycle, increasilingly, companies are implementing proactive environmental strategies (PES), which refers to systematic environmental approaches that companies develop voluntarily that go beyond what is legally required (Aragon-correa and Sharma, 2003). Implementing quicky and efficiently PES is essential for companies to remain competitive: in fact, according to Martinez del Rio et al, (2012), was found a significant positive relationship between PEA and firm financial performance. Proactive environmental strategies are associated with the developement of complex resources and capabilites and give the opportunity to reduce costs and improve product differentiation,which may explain the positive relationship between PES and financial performance. As we saw before, leadership is the starting point of implementing Environmental Managemente systems inside firms; this requires that top-level management work to incorporate environmental sustainability as a key part of the organization's mission statement and that the necessity to develop processes and deliver products and services that are environmentally friendly be communicated throughout all levels of the organization (Kenneth et al, 2012). Leadership has three main tasks: setting direction, creating alignment, and building commitment related to environmental sustainability. Setting direction means developing environment-related visions (the "why"), strategies (the "how"), and long-term sustainability goals that can be divided into shorter-term goals (the "what") into all levels of business, communicating organizational direction to emphasize the importance of environmental responsibility, current activities, and in-progress goals, and resetting all of them during time based on changes in stakeholder issues,

unexpected events, changes in market, and increased understanding of context are key factors shape direction toward environmental sustainability (Van Veslor & Quinn, 2012). Creating alignment means perationalizing sustainability with specific employee job roles and descriptions, considering the fact that leading organizations to environment sustainability calls for a relevant involvement of external stakeholders, and steadily monitoring high-level standards set of performances.

In the next paraghaps we are going to explain what kind of actions Supply Chain function and Human Resource function could implement in order to reach environmental sustainability in firms. In fact, Jackson and Seo (2010), laid out the need for HRM involvement in sustainability; on the other hand, Vachon and Klassen, (2007) state that environmental sustainability is a supply chain imperative.

# 2. Green (environmental) Human Resource Management

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## 2.1 Chapter scope

In this chapter we are going to demonstrate the importance that human resource practices have in the environmental field. First of all, we are going to explain the concept of HRM system and of the AMO Theory in order to clarify the context in which our research is intert, then we are going to present the role of HR in firm's environmental management system. Finally, there is a short explanation of green human resources practices that can be implemented by companies.

## 2.2 Introduction

Despite the topic of environmental sustainability is attracting increased attention among management scholars, there are very few research studies that consider the role of human resource management systems in organizations to achieve environmental sustainability (Mandip, 2012). An exhaustive literature review by Renwick et al. (2008) supports the conclusion that the field of HRM has been slow to see the relevance of environmental concerns and performance.

In this review we want to collect the available literature that explain the growing interest existing in Human Resource Management (HRM) in undertaking practices which are relevant and have an impact in the Environmental Management (EM). We examine and draw together the Human Resouces (HR)

aspects of Environmental Management and investigate in this field, to detail a model of the HR processes involved in Green HRM.

This review proposes to focus attention on contemporary empirical and theoretical contributions in HRM scholarship which may be used to help solve environmental issues.

Companies are now realizing that they have to develop a sense of responsibility on green issues: the HR function becomes the driver of environmental sustainability within the organization by aligning its practices and policies with sustainability goals and aligning them with the company's strategy.

### **2.3 Human Resource Management**

Human resource management “is not merely a composition of HR practices but a dynamic bundle of HR practices that is deliberately designed to achieve the organization's goals” (Lado and Wilson 1994). So, HR practices do not function in isolation but work in concert, and employees are simultaneously exposed to multiple practices. The aim of HRM is to attain firm's strategic goals by generating inimitable human resources that help companies achieve high performance (Becker & Huselid, 1998). A lot of studies in HR literature examine the relationship between HRM practices and firm's productivity, and show, according to AMO theory, that employees can be resourceful to the company. They also suggest that when employees are managed well, they can contribute positively to the company's performances.

The AMO Theory was proposed by Appelbaum et al (2000) and Bailey et al (2001) and states that a firm's performance is a function of employees' ability, motivation and opportunity to participate. Ability-Motivation-Opportunity theory (Appelbaum et al. 2000) suggests that HRM practices that enhance the firm's human capital via increased human capabilities translate into performance outcomes, such as higher productivity, reduced waste, higher quality and profit.

There are different frameworks that use AMO theory, but in human resource management motivations/incentives, abilities/skills, and opportunity are theorized to be direct determinants of effective discretionary effort by employees, which then determine performance of the firm (Hughes, 2007).

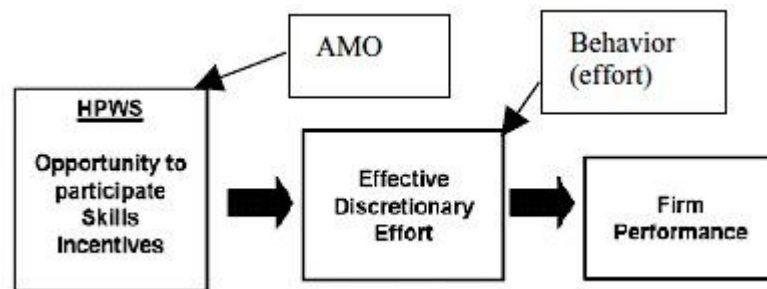


Figure 4: AMO in Human Resource Management (Applebaum et al, 2000)

Firms can generate competitive advantage through improving employees ability, motivation and provide employees opportunities to participate in value creation, which will results in higher productivity and better organisational performance (Bailey et al 2001; Miller and Le Breton Miller, 2005).

Employee ability goes beyond the limit of performance, motivation is the spark to turning abilities into taking an action and opportunity is about removing barriers, increasing channels and chances for motivated employee’s ability to get a voice within organization that forces it directly to modify performance behavior (e.g., pay for performance) and provide employee a ground to effect their work through high-involvement practices (Macky & Boxall, 2007).

So in the AMO framework there could be found: in the “A” of ability HR practices like elective hiring, training, education and developing talented staffs; in the “M” of motivation HR practices like incentive system, performance based payments; finally in the “O” of opportunity HR practices like expanding communication, team membership, suggestion systems.

Therefore, the HR practices role is to define steps for an organization to attract, recruit, develop and train employee ability and additionally, describe favorable behavior which the company's desire by providing both opportunity and motivation for optional attempt (Macky & Boxall, 2007).

It is expected that basing on the AMO theory - which is the most used theory in all article published after 2000 according to Bosselie et al. (2006) - an organization have an increase and improvement through its human resources (Kabst & Matiaske, 2005).

Companies who want to become Green have to combine the AMO components with sustainable practices like, for example establishing environmental trainings, putting incentives for employees who work toward becoming green, shaping teams and other chances as a foundation to attract employees working green.

Employee involvement and participation has great influence on providing mentioned opportunities and also motivating employees to utilize their abilities (Dietz et al., 2009; Gollan & Wilkinson, 2007). Environmental policy without commitment to quality, services and employee involvement is meaningless. For this reason, successful companies in environmental management system try to implement environmental policies in a way that is linked to organizational culture and every actor, even suppliers and customers, should be involved (Berry & Rondinelli, 1998).

While contingency theory (e.g., HRM has an impact on performance via contingent factors such as business strategies) (Schuler & Jackson, 1987), resource-based view (RBV) (e.g., HRM effects performance in accordance with human and social capital supported through the organization) (Barney, 1991) challenge HRM at the organizational level and are mainly focus on its performance effect from a business perspective, AMO frameworks traditional logic is interested in industrial/organizational psychology (Paauwe, 2009). Then, the HR practices role is to define steps for an organization to attract, recruit,



develop and train employee ability and additionally, describe favorable behavior which the company's desire by providing both opportunity and motivation for optional attempt (Macky & Boxall, 2007).

What makes AMO theory unique is that it covers set of mediating changes in employees' abilities, motivation and opportunities to practice. Among these three different elements, motivation is explicitly 'HR-related' mediator and the rest have "direct" influences on performance (Boselie et al., 2005).

It has found no studies linking HR practices and AMO outcomes in the HR practices and business performance literature (Kabst & Matiaske, 2005).

In according to Lepak et al., (2006), the construct of HR systems is based on the three key constructs in a theoretical framework: HR policy domains, HR policies and HR practices.

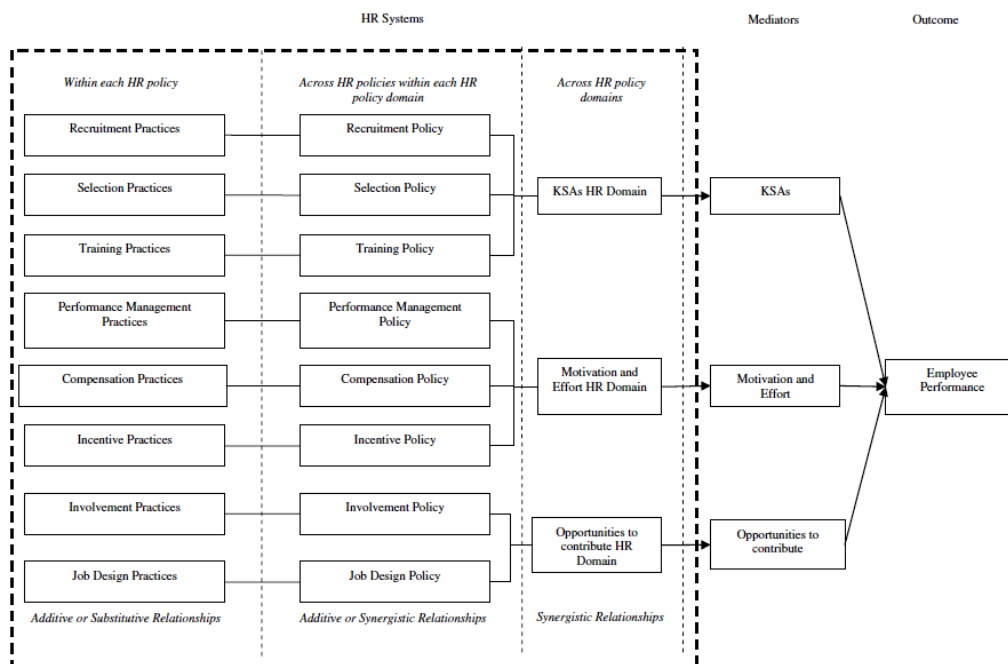
HR policies refer to "the firm or business unit's stated intention about the kinds of HR programs, processes, and techniques that should be carried out in the organization" (Wright and Boswell, 2002). HR policies can provide guidelines for action on people-related business issues and HR programs (Schuler, 1992). For each HR policy, there is a huge variety of implementable practices.

According to the framework of Lepak at al, (2006), in order to maximize employee performance, HR policies may be viewed as being oriented toward influencing one of three primary HR policy domains: (1) the knowledge, skills, and abilities (KSAs) domain; (2) the motivation and effort domain; and (3) the opportunities to contribute domain.

Employee performance is a reasonable outcome directly associated with the extent of internal fit among HR practices. Internally aligned HR practices operate to influence employee abilities, motivation, and opportunities (AMO theory) in a potentially harmonious manner (Becker & Huselid, 1998; Delery & Shaw, 2001; Guest, 1997). As such, we comprehensively cover how different aspects of HR systems may influence abilities, motivation and opportunities. So, the HR

domains are substantially groups of HR policies that influence employees' ability to perform, motivation to perform and opportunity to perform.

The KSAs HR policy domain consists of a group of HR policies and practices that focus on HR efforts that influence the competencies of employees; the motivation and effort HR policy domain is composed of HR policies that are implemented to influence employee motivation and effort rather than abilities during their work performance; beyond improving employees' KSAs and motivation required to perform well, an organization needs to design work in a way that allows them to exert their KSAs and efforts via opportunities to contribute HR domain (Jiang et al, 2012).



**Figure 5: Relationships among HR practices within human resource systems. (Jiang et al. 2012)**

From the definition of HRM it is easy to understand that HR system contributes to reach firm's goals through HR practices that have interactions with each other. Jiang et al, (2012), on the basis of Delery (1998) researches, conceptualize that there are three different potential relationships among HR practices: additive, substitutive or synergistic.

In an **additive relationship**, HR policies and/or practices have independent and non-overlapping effects on employee outcomes (Delery, 1998). For example two HR practices that have this type of relationship might generate greater effects on employee performance than each one used alone, but the effects of using two practices together are not more than the sum of the effects of the individual practices. Moreover, the effect of each practice is sufficient independent on other practices.

A **substitutive relationship** occurs when one practice is replaceable with another practice and therefore using two practices does not have a greater impact compared to their individual effects.

As noted by Delery (1998), the relationship among HR practices is **synergistic** if they work together interdependently so that the effectiveness of one practice depends on the other practices. This relationship can be positive or negative.

## **2.4 Green HRM**

According to Mandip's definition (2012), Green HR is the use of HRM policies to promote the sustainable use of resources within business organizations and, more generally, promotes the cause of environmental sustainability. Boudreau and Ramstad (2005) state that the principles of sustainability are rarely explicit in strategic plans of human resources, as well as the fact that its implications for human resource management have not been given enough attention. Green HRM can decisively contribute to successful environmental management. In fact, environmental sustainability typically begins with development of a successful vision and strategy: enacting there requires changing work processes and behaviour through training, talent management and the basis competencies of HRM (Cohen, 2012; Dobuis & Dobois, 2012). Nevertheless, many companies are trying to effectively influence and increase employees' environmental behaviour. A discrepancy between environmental

policies and actual behavioural patterns in organizational everyday life has been identified as a challenge in the HR literature from many authors, such as Antoni & Bauer, 2005; Daily, Bishop, & Govindarajulu, 2008; Fernandez, Junquera, & Ordiz, 2003; Ramus, 2001; Riechmann, 2000. It can be assumed that the full potential of Green HRM in theory and practice has not yet been realized. Once organizations incorporate the environmental dimension into their dynamics, human resources have a crucial role in stimulating the success of its integration with the Environmental Management.

## **2.5 The role of HR in Greening the firm**

According to Kolk & Mauser, (2002), companies implement different environmental strategies: some of them see 'Green' as a threat, while others recognize 'green' as an opportunity. The diversity of sustainable strategies leads to diverse requirements for business functions and the role of human resource management is really dependent on strategic decisions and is influenced by a firm's corporate strategy (Campbell, 2007). In fact, environmental issues do not necessarily influence all companies in the same way.

Staffelbach in a research published in September 2012 says that there are different types of impact of environmental issues on corporate strategy:

- type A in which environmental issues are seen like a threat by the company. A firm adopting a type A initiative implements a corporate control strategy to mitigate potential risks, through a compliance strategy, in the areas in which environmental issues may arise: in fact if the company join the regulation or the compliance standard, then the risk will appear to be neutralized. This initiative may be motivated also by the need to comply with existing regulations or standards.

- type B in which environmental issues are seen like an opportunity by the company. The company wants to change radically its value chain and core beliefs. Type B initiatives address the need to transform a company into an environmentally friendly business, trying to integrate the stakeholders into the process from the very beginning.

- type A/B which is a hybrid of the two previous strategies. In diversified companies, in fact, different divisions of the company can follow different environmental strategies; the objectives of the environmental initiatives may vary between the business units. As a result, there might be more than one environmental culture and understandings of environmental issues.

Schuler and Jackson (2001) propose a framework for the different roles that HR functions can adopt in supporting the firm becoming Green:

1. Strategic Partner: understands the business model of the corporation including strategies in a global context, encourages the dialogue across multiple stakeholders, including employees, customers, shareholders and society and shares with the managers strategies, the value of human resources and the consequences of managing people effectively. Being a strategic partner means building as a long-term relationship to achieve defined objectives common to all partners;

2. Innovator: enables the organization to develop a learning culture, finds new approaches to leading and directing people and does not just copy what others are doing and contributes special knowledge on environmental aspects to the initiative;

3. Collaborator: understands how to build win-win situations, cooperates and supports and works task-oriented across internal and external organizational constraints. The collaborator takes an active part in the development and execution of the initiatives by bringing together the specific competences of each function.

4. Change Facilitator: is aware of the need for change and creates favorable conditions in the organization for it, helps leading changes in strategy and energizes others for the desired change. The change facilitator supervises the execution of the initiative.

According to Dubois & Dobuis (2012), HRM system can play a powerful role in embedding environmental system throughout an organization: in fact it could create a strong situation that includes consensus and conformity among employees to align their actions with organizational ES goals.

Substantially, according to Mandip (2012), a key role for HR environmental executives could be to guide line managers in terms of gaining full staff cooperation towards implementing environmental policies which means HR needs to nurture supporters and create networks of problem-solvers willing to act to change the current status quo.

A number of studies have shown the range of HRM practices that can contribute to the successful implementation of a firm's corporate strategy.

The revision of literature identifies some human resource dimensions which are considered as powerful tools for aligning employees with a company's environmental strategy (Renwick, 2008):

- recruitment and selection;
- environmental training and personal development;
- performance appraisal and reward;
- teamwork.

These practices are directly linked to the human resource management model practised by an organization, but they are also influenced by the way the other management areas incorporate environmental concerns. Distinguished policies in the field of recruitment, performance and appraisal management, training and personnel development, employee relations and reward systems are considered powerful tools for aligning employees with a company's environmental strategy (Renwick, 2008).

The HR practices, taken from the existing literature, have been classified on the basis of the AMO Theory, revealing the role that each practice has in greening the HR system.

## **2.6 Greening the firm via HRM practices**

In this paragraph, we are going to see in detail how companies can transform HR practices, classified on the AMO Theory bases, in green ones and which is their contribute to the environmental management.

In literature, the AMO Theory is often used to identify the key HRM areas that have an impact on the sustainability of a firm. According to AMO theory, HRM works through increasing employees' Ability through attracting and developing high-performing employees; enhancing employees' Motivation and commitment through practices such as contingent rewards and effective performance management (PM); and providing employees with the Opportunity to engage in knowledge-sharing and problem solving activities via employee involvement (EI) programmes (Renwick, 2012). The main purpose of this is to bring economic value to the firm.

In fact, according to Cappelli & Neumark, 2001, HR practices are highly related to business performance.

Next chapters will describe each green HR practice classified in AMO Theory; a full collection is reported in the Appendix 1.

### **2.6.1 Ability practices**

In psychology Ability is defined as the set of skills and capabilities requisite to the performance of a behavior; the word “performance” is important, in fact Riordan et al. (2005) says that exploiting and controlling employees’ skills and knowledge can bring economic value and improve the performance of the company. In this section we want to describe which are, according to the literature, the Human Resources practices that are classified as “Ability” and that have an influence on the firm’s environmental performance. In literature we found out that these practices are about recruiting, selecting and training employees.

#### *Greening the firm via recruitment and selection practices*

Bohlander et al. define recruitment as the organizational activity that aims at “head hunting and stimulating potential candidates to apply for previous and foreseen vacancies”. Recruitment is important because can influence the quantity and the types of candidates for a certain position inside the company; in fact attracting high-quality employee is crucial for the firms that want to obtain a certain performance. Recruiting guidelines and regulations play a significant role in environmental initiatives: the green performance of a company is used as an element for attracting talented people.

Over the years, recruitment research has focused on the characteristics of traditional sources of recruitment information (such as newspaper advertisements and brochures), but today, Internet provides a common medium for relaying information to potential applicants (Behrend, 2009). Web sites, in fact, offer more space for advertising that includes more information and are less expensive than the traditional recruiting methods. When creating their organizational web sites,



companies must give serious consideration to how they want to portray themselves (Behrend, 2009); in the last years social and environmental matters have become important themes for attracting talented people, in fact it has become increasingly common for organizations to incorporate messages concerning their company values. For example, according to Ehnert (2009), the recruitment websites of major European employers provide considerable detail on the environmental activity of the organization: German companies such as Siemens, BASF and Bayer use their institutional image in order to attract competent staff that is committed to the environment.

On the other hand, also people who are seeking jobs, pay lot of attention to the environmental capability of a firm: many researches, in fact, show that an environmental message posted on a recruitment web site increased job pursuit intentions (Behrend, 2009). So, a positive environmental image is one of the criteria that are used by job-seeking individuals.

Candidate preferences for Green organizations also seem to be impacting on organizational practice, with some employers increasingly influenced by ‘Green job candidate’ thinking in planning their recruitment strategies (Brockett 2006). A KPMG survey of 1000 HR professionals found 47% stating that they feel that employees would prefer working for firms that have a strong Green approach, and this would attract potential high-quality recruits (Phillips 2007).

Concerning the selection, environment can be a criterion for the selection of new employees: according to Jabbour (2008), while the process of recruitment aims at increasing the quantity of candidates, the aim of short listing is to reduce this number by choosing the candidate who best meets the criteria of the offered vacancy.

Examples of HR practices, in the field of recruitment and selection, that impact on the firm’s environmental performace are:

- Green job candidates, applicants use Green criteria to select organizations;
- Green employer branding;

- Firms recruit employees who are ‘Green aware’;
- Green issues in induction.

### *Greening the firm via training*

Training is the preferred practice for changing the skills, knowledge and behavior of management and non-management employees in environmental matters; it is defined as a systematic process that leads the employees’ behaviour towards accomplishing the set of organizational objectives (Ivancevich, 1995). If company decides to implement advanced environmental behaviours, it must make an effort to adapt its procedures to environmental requirements: in doing so, it must provide employees with requisite knowledge and skills via specific and adequately formative programmes (Vidal-Salazar et al., 2012).

Several research studies have demonstrated that the higher the percentage of environmentally trained employees, the higher the firm’s capacity to adapt to new legal environmental requirements (Hart, 1995; Vidal-Salazar et al., 2012). In recent years, company employees must receive training in the environment: a KPMG survey reported 42% of UK organizations educating and training employees in business practices that are environmentally friendly and training employees to comprehend the threats that climate change may pose on firms (Phillips 2007).

A systematic formulation of training programs which qualifies employees to identify not only the problematic environmental issues but also the best way to treat them is necessary for the empowerment of the workforce to be recognized as an essential factor for the planning and maintenance of environmental management practices in organizations (Gomez, 2005).

According to Wehrmeyer (2006), there are seven different principles that firms can follow when developing environmental training programs:

- The environmental message has to be kept simple and relevant;

- The training sessions have to be kept short, informal and for small groups;
- Employees have to be involved in the open thematic sessions;
- It is important to notice who the leaders of the environmental management are among the employees of a session;
- The ecological dimension has to be treated as a new value of organizational culture;
- The environmental results achieved by employees of other companies are important to be highlighted;
- The effects of training in the employees' routine of work have to be evaluated.

It is important that training programs are offered not only to employees, but also to the company's management: the main purpose of this practice is to create an environmental knowledge base, starting from the top of the firm. In fact, managers should aware employees that changes toward green can also improve workers' health and safety. According to Starkey and Crane (2003), business schools may play a key role in educating and developing environmental leaders in the future. Environmental management is also increasingly being included in MBA programme curricula in countries (Fryxell and Lo 2003). Siebenhuner & Arnold, (2007) have introduced two leadership styles: participatory and consultative. While participatory style motivates and supports employees especially for active research as well as transferring and diffusing generation of new knowledge. Conversely, directive or consultative style leads information and new knowledge flow to be constant and change process with only one exception of medium-sized construction companies.

Some examples of training practices impacting on the firm's environmental performance are:

- Employee training in EM to increase awareness, skills and expertise;

- Training for Green jobs, and integrated training to create an emotional involvement in EM;
- Green knowledge management;
- Training workshops for managers and Green MBAs.

## **2.6.2 Motivation practices**

Motivation is defined as the impetus toward a behavior, it can be considered as a driving force that arouses an organism to act towards a desired goal and elicits, controls.

According to Sindell (2012), motivation is composed by three different factors:

- Security: Maslow theory states that humans are driven to first fulfill basic needs which include food, shelter and safety. In the context of the workplace, security is identified by 2 sub-factors: “compensation” and “job security.” If compensation needs are not adequately met, you may want to offer stronger incentives and bonus. Moreover people are motivated to work for a company that is thriving, so they can have a secure job.

- Identity: humans being are social creatures and driven by the need to “affiliate” with things they care about.

- Stimulation: humans desire to be challenged and stimulated.

Employees’ motivation for taking green actions is the main component for a company to introduce advanced environmental approaches.

In the Human Resources literature we found out that practices that can motivate employees towards environmental goals are about performance management and appraisal and pay and reward system.

### *Greening the firm via Performance Management System*

Performance Management System (PMS) is defined as a challenge of how to measure environmental performance standards between different departments of a firm and gathering beneficial data about the environmental performance for managers (Wehrmeyer, 1996).

One of the part of PMS is the performance appraisal which is defined by Ivancevich (1995) as the dimension of human resources which is used to analyse an employees' performance based on their responsibilities, and aiming at global improvement of people's performance and productivity over time. Concerning environmental issues, many companies are establishing Green objectives for their employees, whose performance is evaluated as one of the criteria of the organizational programmes of individual performance appraisal, and which affects the variable fraction of the amount of rewards and compensation attributed to an employee (Jabbour, 2008). Measuring environmental performances need a set of standards that should be start from managers. Approaches to measuring environmental performance include adopting corporate-wide metrics for assessing resource acquisition, usage and waste; implementing information systems to track resource flows; and conducting field audits to provide employees opportunities to identify problems while gaining information and feedback about the environmental performance of the firm (Milliman & Clair, 1996).

Performance appraisal programmes are necessary to guarantee the effectiveness of environmental management work over time.

There are not only good rewards for people who have good environmental performance, but there might be negative consequences, such as suspensions, criticisms and warnings, in performance management systems to get employees to make environmental improvements (Renwick, 2009).

Some examples of Green performance measurement practices can be:

- Green performance indicators included in PM system and appraisals;
- Communication of Green schemes to all levels of staff through performance management and appraisal scheme, establishing firm-wide dialogue on Green matters;
- Managers/employees are set Green targets, goals and responsibilities;
- Managers are set objectives on achieving Green outcomes included in appraisals.

### *Greening the firm via Pay and Reward System*

Monetary and non-monetary rewards are another potentially powerful tool for supporting environmental management activities. For example, Merriman and Sen, (2012) in their research found out that pay incentives do increase management attention to environmental initiatives.

In the environmental field, reward system is defined as the aligning of pay practices and corporate objectives, in order to incentivate environmental management, especially for top levels. Fernandez et al. (2003) conduct a lot of studies that evidence that paying for EM performance is really effective. Compensation practices are also being transformed in order to incorporate the ecological dimension. Rewards policies aim at attracting, retaining and motivating the best employees, encouraging the development of knowledge, attitudes and skills that help to fulfil the objectives of a company (Gomez, 2005).

The creation of a pay and reward system regards both top management and the other levels of a firm.

There are lots of researches that investigate the linkage between CEO compensation and firm's environmental performance: according to Berrone & Gomez-Mejia, (2009) CEOs are rewarded for pursuing environmental strategies because the outcomes associated with these strategies may provide intangible benefits that go beyond the financial performance. Nevertheless, developing

effective monetary incentives can be challenging due to the difficulty of accurately and fairly evaluating environmental behaviours and performance (Fernandez, Junquera, & Ordiz, 2003).

Although Pay and EM linkages for other staff are rarely reported in the literature, the structure of an organization's base pay can also be used to reward employees who contribute to achieve environmental objectives, by including factors such as knowledge of environmental regulations and assessing responsibility for decisions with potential environmental consequences when conducting job evaluation studies (Jackson, 2011). There are some examples of competence-based reward schemes for frontline staff acquiring specific designated environmental competencies (such as knowledge of environmental legislation), as they are seen to help organizations stop serious environmental accidents or illegal emissions occurring (Ramus 2002).

However, there are not only monetary rewards, in fact some employees may feel more motivated by the recognition and praises than by financial incentives: in Britain, some examples of company practice include the use of a 'carbon credit card' and cash incentives for staff to purchase hybrid cars (Brockett 2006), incentive schemes rewarding good attendance/performance with a 'Green benefit card' enabling staff purchases of Green products, and annual awards dinners to recognize exemplary behaviour in EM (Simms 2007, p. 39).

Among the many HR practices available, incentives and rewards are often presumed to be the most powerful means for connecting organizational interests to employees' interests; some examples of them are:

- Reward schemes linked to staff gaining EM skills via skill-based pays;
- Green benefits (transport/travel) rather than pay benefits cards to gain Green products;
- Monetary-based EM reward system;
- Monthly managerial bonuses for good EM;
- Executive compensation for managers partly based on EM stewardship;

- Recognition-based rewards in EM for staff (public recognition, awards, paid vacations, time off, gift certificates).

### **2.6.3 Opportunity practices**

Opportunity is defined as contextual and situational constraints relevant to the performance of the behavior, it is an appropriate or favorable time or occasion. Management in the firm has to give the chance or the opportunity to employees to reach environmental goals. It can be attained through four different elements as employee involvement, supportive climate, culture and union role in EM.

#### ***Greening the firm via Employee Involvement***

Wider employee participation in environmental management is a crucial factor for the success of the outcomes. Involving employees in EM has been reported as improving the key outcomes of EM systems, including: efficient resource usage (Florida and Davison 2001); reducing waste (May and Flannery 1995); and reducing pollution from workplaces (Denton 1999; Kitazawa and Sarkis 2000).

There are a wide range of practices to increase employee involvement in EM, such as newsletters, suggestion schemes and problem solving groups or ‘low carbon champions’ or encourage staff becoming more environmentally friendly (through car sharing or home working).

Employee involvement improves a tacit knowledge inside people: tacit knowledge has great influence in identifying pollution sources, managing emergency circumstances and expanding preventive solutions (Boiral, 2002). Rothenberg (2003) state that tacit knowledge makes an important contribution to improving environmental performance as employees possess knowledge and skills that managers lack.



On the other hand, employee involvement can be reached through two different ways: empowerment and engagement. Empowerment is the process which enables individuals/groups to fully access personal/collective power, authority and influence, and to employ that strength when engaging with other people, institutions or society. In other words, "Empowerment is not giving people power, people already have plenty of power, in the wealth of their knowledge and motivation, to do their jobs magnificently (Blanchard, K)". It encourages people to gain the skills and knowledge that will allow them to overcome obstacles in life or work environment and ultimately, help them develop within themselves or in the society. A case study conducted by Kitazawa and Sarkis (2000) states that empowerment increases the willingness of employees to make suggestions for environmental improvements. Ramus and Steger's (2000) study of employee "eco-initiatives", defined as any action taken by an employee that she or he thought would improve the environmental performance of the company, found a strong relationship between managerial behaviours such as competence building, communication, rewarding and recognizing employees and their engagement with innovative environmental activities.

### ***Green in the firm via supportive organizational culture***

According to Schein (1990), organizational culture refers to a set of basic assumptions that a group has created, discovered or developed in its process of learning in order to deal with problems of either external fit or internal integration. An organizational culture that supports EM is one that encourages employees to make suggestions for and the freedom to engage in, activities that improve the environment (Renwick, 2012). In fact, effective outcomes are achieved not just by making changes to production processes, products or raw material, but also by changing the corporate culture such that organizations have deeply embedded values which support long-term sustainability (Kitazawa and Sarkis 2000).

According to Fernandez et al. (2003), organizational culture and human resource management are closely linked: in fact, organizations, that have solid mechanisms of environmental management supported by an organizational culture which values environment, tend to attract more motivated and competent workers; and a organizational culture for environment tends to be more powerful when a company has a group of collaborators who are environmentally aware.

Top management support is central to green organizational culture; Johnson (2004) theorise five steps that firms have to follow for creating a green organizational culture:

- top management recognizes and spreads the environmental dimension as a new value of a company;
- top management recognizes and spreads how environmental practices can influence the routines of a company;
- top management shows how the environmental values have to support the various phases of EMS;
- there are systems for training, performance appraisals, and rewards focused on employees' environmental performance;
- employees incorporate the ecological dimension as a new organizational value.

Several researches have noticed that one of the reason for the failur of a change in the company is that management ignores the strenght of organisational culture; it is important to consider culture because companies which have a rigid and burocratic structure have a more difficult time of implementation of change than a company that has a flexible structure (Janson and Gunderson, 1994).

### ***Greening the firm via Union role***

Trade unions generally have a long history of action on environmental issues but now they are trying to encourage employers to create new Green jobs in the

workplace. Recently the Trade union Council (TUC) makes some development in sustainable issue such as including environmental education programmes for rank and file union members, jointing management and union training programmes in EM, and the developing of workplace environmental representatives, the so-called 'union Green representatives' (Renwick, 2012).

## **2.7 Barriers to Green HRM**

It is not so easy making sustainable a firm and especially greening a Human Resource System; there are a lots of barriers that the progress requires to overcome. In this section we want to briefly present some of which found in the existing literature:

### **- Apathy**

According to Jackson and Seo, 2010, apathy is perhaps the single most significant barrier to the development of an improved understanding of the role of HRM in achieving environmental sustainability.

Apathy is defined as “a state of indifference, or the suppression of emotions such as concern, excitement, motivation and passion. An apathetic individual has an absence of interest in or concern about emotional, social, spiritual, philosophical and/or physical life” (source: Wikipedia). Environmental scientists have found out that the general public does not rank environmental issues as among the most important challenges of today and appear to feel little sense of urgency or responsibility for achieving environmental goals (Jackson and Seo, 2010). Fortunately things are changing: not only firms, but also people in general are becoming more active in undertaking environmental initiatives.

#### - Complexity

Complexity is another barrier that HRM scholars must face if they want to conduct useful research on environmental sustainability or to implement some sustainable practices.

Designing and evaluating effective sustainable interventions requires an understanding of the environmental consequences associated with an organization's operations, supply chain, distribution processes, customer behaviors, product life cycles, and so on (Jackson and Seo, 2010).

As is true for most strategic issues, developing a strategic HRM system to support environmental sustainability requires addressing issues at multiple levels of analysis, including individuals, organizations, political-economic systems, social-cultural spheres, and ecological systems (Starik and Rands, 1995).

#### - Confusing terminology

This is a less important barrier than the two we have described in advance, but the lack of clear terminology regarding the use of the term “sustainability” is another obstacle. There are different definition of the term sustainability such as “The goal of sustainability is to meet the needs of the present generation without compromising the ability of future generations to meet their own needs” (Brundtland Commission - World Commission on Environment and Development, 1987), or “Environment's ability to meet present and future human needs with theories of social justice – both within and between generations – as a basis for ecological, economic and social aspects of sustainability” (Langhelle, 2000) and at last “A more human more ethical and more transparent way human, ethical, of doing business” (van Marrewijk, 2003).

Even considering only the “green part” of the sustainability' definition, there are little shades on meaning; for example Pfeffer (2010) used the term “sustainable HRM” to draw attention to internal workforce issues, such as safety, health and well-being or “socially responsible HRM” has been suggested as an

appropriate term to use when the focus is human rights and collective bargaining (Muller-Camen et al., 2010).

Scholar and researchers have to find a unique terminology in order to standardize the language.

#### - Careerism

If HRM scholars hope to provide useful, actionable knowledge to organizations, they will have to give serious thought to the implications for their careers. Hundreds of college presidents have pledged to increase their focus on sustainability issues. Many universities now devote significant space to sustainability initiatives in their strategic plans, and several have created administrative units focused solely on sustainability. New ranking entities have emerged to rate and rank universities on their commitment to environmental sustainability (Jackson and Seo, 2010).

## **2. 8 Greening the firm via individual behaviours**

### **2.8.1 Employee green behaviour at work**

Although individual behaviors that impact the environment have been studied by environmental psychologists for over half a century (such as littering, polluting, recycling, conserving, petitioning the government for environmental causes, use of public transportation), there has been little effort directed at studying such behaviors in work settings. Rather, environmental sustainability in work settings has mostly been studied at the organizational level (Ones and Dilchert, 2012).

Ones and Dilchert in 2012 give also a definition of “Employee green behaviors” as scalable actions and behaviors that employees engage in that are

linked with and contribute to or detract from environmental sustainability. For most people, environmentally friendly behaviors start and end with the 3Rs: Reduce, Reuse and Recycle are important, but do not incorporate the entire spectrum of green behaviors at work. Over the year Ones, Dilchert and their team have built a taxonomy, called The Green Five Taxonomy, which is a classification model of employee green behaviors.

The model presented by that team has at the apex of its hierarchy the general green performance, and below has been identified five categories of behaviour that can have an impact in the performance. These categories are five, as the name of the model suggests:

1. Working Sustainably: this category is mainly related to employees' behaviors adopted to enhance the environmental sustainability of work products and processes. There are two fundamental ways in which working sustainably behaviour can be classified: the first one include actions that focus on current products and processes and try to make them more environmentally friendly and the second focus on creating, innovating, and adopting technological innovations. Examples of these category can be using eco-friendly chemicals or natural ingredients in productions or developing new manufacturing process with less environmental impact.

2. Avoiding Harm: this category is composed by actions that try to avoid and inhibit negative environmental behaviors or by behaviors that help the environment enhance the health of the Earth's ecosystems and aid natural biological, chemical, and physical processes that help the planet recover from distress. Examples can be monitoring emissions of operations or maintaining wildlife area around work facilities.

3. Conserving: employees' conserving behaviors can be distinguished into Reducing Usage of materials, Reusing, Repurposing, and Recycling. It substantially means that people try to avoid wastefulness and preserve resources. Some examples of conserving behaviours that employee have on the workplace can be turning off lights when not needed or recycling bottles and paper; these seem to be minimum action if compared with reducing carbon emission or pollution, but they are important. In fact, Young (1993) said that a sustainable planet is not possible without patterns of conserving behavior.

4. Influencing Others: this category focuses on employee behaviors that want to spread sustainability behaviors to other individuals. In fact, although each employee's individual behaviors and contributions are important when moving toward environmental sustainability goals, economies of scale are needed to achieve sizable impact (Ones and Dilchert, 2012). Some examples of this category of behaviour can be hiring a sustainability education coordinator or encouraging carpooling and providing benefit for it. It is important to underline that influencing others to be more environmentally friendly and responsible requires both environmental educating and training.

5. Taking Initiative: this category includes behaviors that break the mold and go against societal expectations. It is the employee himself that has a proactive behaviour towards green questions and takes actions to improve the environmental sustainability of his firm. Examples of this particular behaviour are starting a new environmental program or arguing for environmental issues on board.

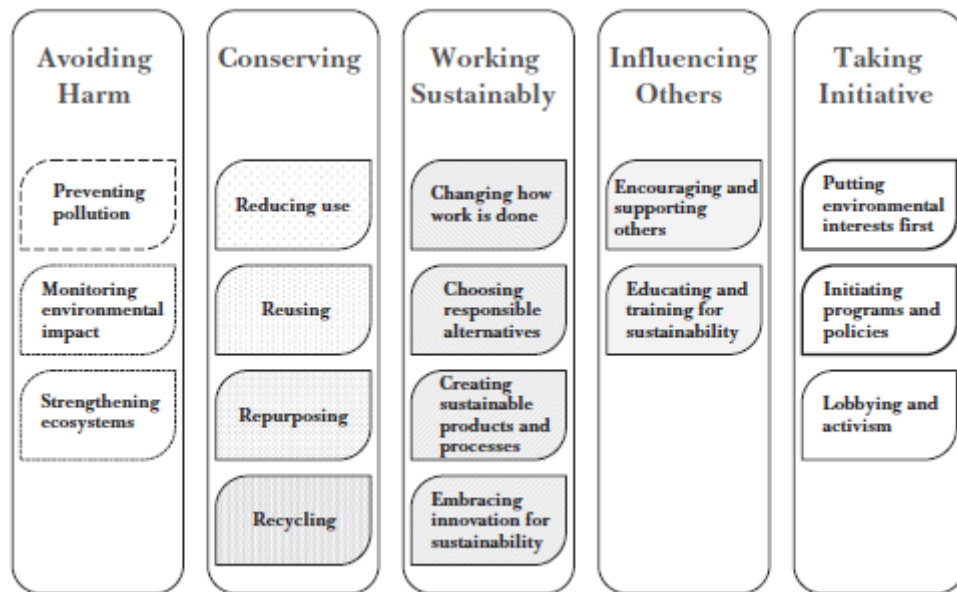


Figure 6: The Green Five Taxonomy (Ones and Dilchert, 2012)

It's also important to underline that individuals' gender, age, education level, and income level affect the behaviors. Many researches have been done to demonstrate the scale of these factors on employees' behavior in workplace.

Women are raised to be nurturing, warm, and cooperative in order to take the responsibilities of children, housework, and health related issues. On the other hand, men are raised to be independent and competitive in order to take the responsibility of financially needs satisfaction in the public domain (Gilligan, 1982). Klein et al. (2010) found that female employees are more engaged with pro-environmental workplace behavior than men considering the difference is small.

Savicks et al. (2009) stated that since younger generations are in a different stage in their life compare to older people, on average, the remaining lifespan of them is longer so it is more likely for them to encounter the consequences of their own environmental actions. Therefore, it is more probable that younger individuals should be more concern about environmental issues. Morris and



Vankatesh (2000) focused their research on employees' age: in fact they demonstrated that younger employees not only tend to accept new ideas and changes more than older employees, but also like to be in social positions that motivate them to think about future more than older individuals. Younger employees get involved in environmental issues and green behaviors more than older employees while older employees only want to be opposed to new ideas until a clear map consists benefits is showed or the social pressure is quite high.

Education and income levels are not necessarily fixed characteristics of an individual and a company can equipped its employees with better education or resources so they may be better engaged with pro-environmental behaviors (Klein et al., 2012). But it is not clear the role of education and income on green behaviours: while some scholars (Kinneer et al., 1974; McEvoy, 1972) defend a positive relationship between them, some other (Roberts, 1996; Samdahl & Robertson, 1989) confirm a negative relationship among them.

### **2.8.2 A new theory: Green Work-Life Balance**

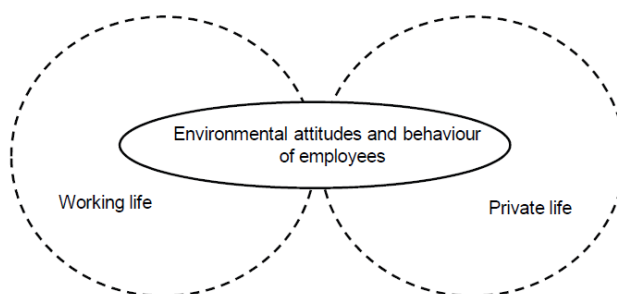
In the HR literature there are increasingly theories that state that Green HRM can meet its full potential only by considering employees as producers and consumers: in fact employees learn different kinds of behaviour not exclusively at the workplace, but also in private life. For example Muster et al, (2011), propose that since reciprocal interactions between working life and private life occur, a "green work-life balance concept" is suggested to facilitate environmentally friendly behaviour in both life domains.

While contemporary HRM already considers the complex array of employees' work-roles and non-work-roles by developing, for instance, work-life balance policies (e.g. Barnett & Hyde, 2001; Elloy & Smith, 2003; Kossek, 2003; Marks & MacDermid, 1996), Green HRM so far ignores employees' non-work roles. It is important to admit that environmentally relevant attitudes and behaviour are not

learned exclusively at the workplace, but also in private life. People have distinctive modes of living: they practice specific consumption patterns in their everyday life, which have different effects on the environment (Reusswig, 1994; Söderholm, 2010). So private experiences influence peoples' environmental behaviour in working life.

Building on the assumption that culture can be managed at all, Green HR policies are aimed at promoting an environmental corporate culture (Crane, 1995; Fernandez, Junquera, & Ordiz, 2003; Harris & Crane, 2002). Referring to Schein's definition of corporate culture (Schein, 2004, p. 17), it can be defined as a pattern of shared basic assumptions about the environment and environmental issues. Once an environmental corporate culture is formed, individual behavioural changes are assumed to be most likely; these cultural improvements are assumed to increase employees' motivation and their commitment to the company and its environmental ambitions (Govindarajulu & Daily, 2004).

Employees also learn environmental attitudes and behaviour in private life. Employees' private environmental performance is closely attached to their individual ways of living and their everyday behaviour (Reusswig, 1994; Söderholm, 2010). Environmentally relevant behaviour in everyday life is particularly expressed in *consumption* patterns (Stern, 1997), which is defined as the process of selection, purchase, usage and disposal of products (Blackwell et al., 2006): all consumption behaviour is likewise environmentally relevant behaviour (e.g. Hansen & Schrader, 1997).



**Figure 7: Environmental attitudes and behaviour as composition of experiences (Muller-Camen et al. 2011)**

While Green HRM focuses on promoting employees' environmental behaviour in the company, employees carry on with their consumption practices in private life: these two scopes have a great influence on each other.

### **2.8.3 Interaction between working and private life**

Both life domains are usually conceptualized as reciprocally influenced by each other (Edwards & Rothbard, 2000). In literature there are different models that conceptualize these theory but the most recognized are the conflict model, the enrichment model, the spillover model and the compensation model (Edwards & Rothbard, 2000; Rothbard, 2001; Guest, 2002).

According to Guest (2002), the *conflict model* assumes that requirements of one life domain are difficult to reconcile with requirements of a different life domain. Resources, such as time, energy, attention, are considered as limited. Since these resources are unequally consumed in different life domains, inter-role conflicts occur, for instance, between the family role and the work role (Greenhaus & Beutell, 1985). They can occur in two directions, for instance as work-family interferences, with negative outcomes for the family, and family-work interferences, with negative outcomes for work.

The *enrichment model*, in contrast to the conflict model, assume that different requirements of domains have a positive effect on each other and, in general, that multiple roles enrich peoples' lives (e.g. Barnett & Hyde, 2001). So, resources and experiences that are generated in one role are supposed to improve or facilitate the role performance in the other life domain.

The *spillover model* can be understood as a component of both the conflict and the enrichment model. It can be distinguished between positive and negative spillovers, meaning that transferred effects either enrich or constrain the other domain (Edwards & Rothbard, 2000).

Finally, the *compensation model* refers to experiences within one domain that cause contradictory or opposing behaviour in the other life domain (Lambert, 1990; Zedeck, 1992). People can make compensation efforts when experiences in one domain are unsatisfactory.

People are not considered as passive, but are perceived as active managers of their life domains and they are described as “border-crossers” that manage daily transitions from one domain to another (Clark, 2000). Depending on peoples’ personal competences and the specific conditions of their life domains, employees might benefit or suffer from work-life interactions.

A lot of scholars, such as Ryan & Kossek, (2008), treat this argument and propose some policies called work-life balance, that are supposed to create win-win situations for employees and the company. There are many examples of these kind of policies in the HR literature because, if they are used, they are supposed to increase attraction, productivity and retention of employees. For example, work-life balance policies are dominated by time based instruments (like flexible work schedules and part time arrangements) (Thompson & Bunderson, 2001); or other services can be discussed, which can be information-based, like parental counselling, service-based, like corporate nurseries, or finance-based, like family allowances (Thompson, Beauvais, & Allen, 2006; Kaiser et al., 2010).

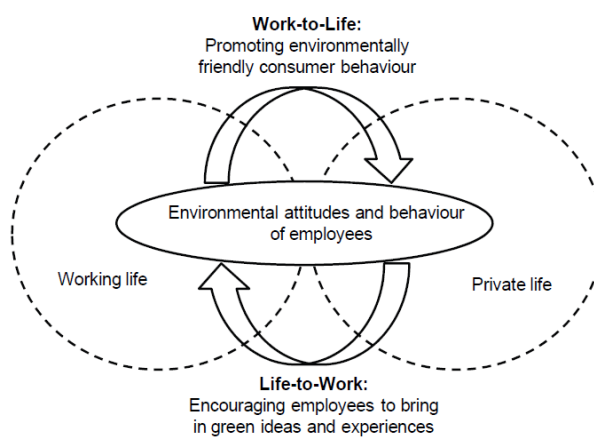
#### **2.8.4 Work - life balance in Green HRM**

Green work-life balance is defined as the reconciliation of working life and private life with regards to environmental values, attitudes and behaviour (Muster, 2011). So, as we explained before, there can be four types of interactions between these two worlds; the purpose is to facilitate positive interactions and to limit the negative ones. An example of the positive effect of the interaction between private and working life is highlighted by a research of Berger and Kanetkar; in 1995 they have shown that employees’ participation in successful waste management

programs can have positive effects on their perception of environmental issues in private life and their individual effectiveness of dealing with these issues.

On the other hand, an example of a negative effect can happen when a company and its environmental management fails in setting up successful environmental activities or in providing an infrastructure for environmentally friendly behaviour. However, the interaction between working and private life can also have a third effect, called the opposite behaviour. It occurs when employees that are obliged to behave in an environmentally friendly way at the workplace and they could tend to neglect environmental concerns in private life; in contrast, employees who don't have the chance to act in an environmentally friendly way at the workplace, could be motivated to behave in a more environmentally friendly manner at home.

The usage of Green work-life balance policies should harmonize environmentally friendly orientations in private life and working life. On the one hand, a company can promote environmentally friendly consumer behaviour in employees' private life, which we call *work-to-life interventions*. On the other hand, companies can encourage employees to use environmentally relevant ideas and experiences they have developed in their private life within their working life (*life-to-work interventions*) (Muster, 2011).



**Figura 8: Two directions of achieving a green work-life-balance (Muller-Camen et al. 2011)**

Work-to-life interventions focus on employees' environmental behaviour in private life and support them in consuming in an environmentally friendly fashion. According to Thompson, Beauvais, & Allen, (2006) and Kaiser et al., (2010), like traditional work-life balance instruments, these interventions can be differentiated in:

- information-based that provide employees with relevant information about environmental issues and give recommendations for environmentally friendly living; examples of these instruments can be flyers and brochures, internet and intranets, blogs, wikis and forums or newsletters.

- service-based that focus on practical assistance and easy access to environmentally friendly consumption experiences; some example can be Green concierge services, that can help to arrange these activities in an environmentally friendly way, centralized shopping for organic and fair trade products or rental services for bikes and a car-sharing system.

- finance-based include special discounts for services such as job tickets for public transport or discounts for green company offers.

- time-based instruments that can be flexible working (considering temporal and local aspects) might increase the potential scope of action for environmentally friendly living, for example the reduction of car use or fast food consumption.

On the other hand, life-to-work interventions encourage employees to bring in and develop their environmental values, ideas and private experiences to the workplace. Established green human resource instruments can be used for these life-to-work interventions if they consider employees' private values and experiences. Employees' involvement and participation in designing, implementing and evaluating environmental activities in the company are considered particularly crucial to integrate their private experiences (Brio, Fernandez, & Junquera, 2007). Proactive environmental behaviour and

environmental initiatives originating from private life can be advanced by incentives and rewards (e.g. Daily & Huang 2001; Massoud, Daily, & Bishop, 2008; Ramus, 2001). Recruitment can explicitly focus on proactive environment-friendly applicants to bring in employees with outstanding personal environmental knowledge and competences (e.g. Wehrmeyer, 1996). Obviously, all these possible work-to-life interventions and life-to-work interventions need to be adjusted with the companies' preconditions (e.g. financial, structural, cultural preconditions, etc.). (Muster, 2011).

Finally what is emerged by this new theory is that the success of a green work-life balance strategy depends on how organisations can motivate employees to be green consumers outside companies and how they will be able to motivate employees to bring green ideas, experiences and innovations to the work place.

# 3. Green (environmental) Supply Chain Management

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## 3.1 Chapter scope

In this chapter we are going to demonstrate the importance that supply chain practices have in the environmental field. After an introduction on what supply chain management is and, in particular, what green supply chain management is, we are going to explain the concept of SCOR system in order to clarify the context in which our research is intert. Then, there is a short explanation of green supply chain practices that can be implemented by companies and finally we present drivers pushing green supply chain practices and barriers curbing them.

## 3.2 Introduction

Historically, the study and management of industrial pollution has been a critical issue for society, since the early days of the industrial revolution. Part of the industrial revolution was sparked by Adam Smith's policies of the specialization of labor and also corporations. Out of this specialization grew the need to develop specific supplier and distribution channels (Lun et al., 2011).

With increase in environmental concerns during the past decade, a consensus is growing that environmental pollution issues accompanying industrial development should be addressed together with supply chain management, thereby contributing to green supply chain management (GSCM) (Sheu et al., 2005). In recent years, in fact, the interest in green supply chain management



(GSCM) is increasing for both companies and scholars. The growing importance of GSCM is driven mainly by the escalating deterioration of the environment, for example, diminishing raw material resources, overflowing waste sites and increasing levels of pollution (Srivastava, 2007). This is an important theme for companies because supply chain disruptions frequently have a direct impact on an organization's reputation and, as a consequence, on its financial and environmental performance. Global sourcing strategies such as just-in-time inventory or cheap raw materials can lead to problems as hardly quantify risks derived from second and third-tier suppliers that could subject firms to serious damages of their images. For example, in 2003 Coca-Cola had to face some environmental problems with one of its supplier: in fact, the largest Coca-Cola plant in India have been accused of putting thousands of farmers out of work by draining the water that feeds their wells, and poisoning the land with waste sludge that the company claims is fertiliser. The company denies the shortages have anything to do with this and Sunil Gupta, vice-president of Coca-Cola India, says the company has been the target of a handful of extremist protesters and it is lack of rainfall that has caused local water supplies to be exhausted (Fonte: <http://www.guardian.co.uk>). This event led to an image damage for Coca-Cola all around the world.

Companies are looking at their supply chain in order to increase their sustainability profile mainly because focal companies are responsible for environmental problem caused by their supplier, as we have seen in different examples of the recent years. Focal companies are those companies that usually rule or govern the supply chain, provide the direct contact to the customer, and design the product or service offered (Handfield,1999); focal companies of supply chains might be held responsible for the environmental and social performance of their suppliers.

Extending the environmental control on the entire supply chain can cause several benefits not only for the focal company of the supply chain but also

upstream and downstream. So in the recent years many important companies are adopting supply chain practices that can be defined “Green”: for example in 2005 Wall Mart, the largest retailer in the world, adopted a sustainability strategy establishing goals of being 100% fueled by renewable energy, producing zero waste, and selling sustainable products. Wall Mart now is pushing this strategy down into the supply chain, as for example it wants suppliers to rate their products on sustainability criteria. Bristol- Myers Squibb, IBM and Xerox have encouraged their Chinese suppliers to develop environmental management systems consistent with ISO 14001, while Ford, GM and Toyota have required their Chinese suppliers to obtain the ISO 14001 certification (Source: GEMI, Global Environmental Management Initiative).

So, environmental theme is very important in supply chain field and in this review we want to collect the available literature in order to introduce the concept of Green Supply Chain Management and to report the state of supply chain practices that are used in companies in order to obtain environmental sustainability. In fact, according to Corbett CJ and Klassen RD (2006), environmental management in the supply chain does matter for performance.

### **3.3 Supply Chain Management**

There is a very consistent literature that deals with sustainability in supply chain and that indicates the importance of measuring the sustainability of a SCM.

First of all we want to explain the concept of Supply Chain Management giving two definitions that are generally shared by academics: the first one is given by Mentzer et al.(2001) who define the supply chain management as the systemic, strategic coordination of the traditional business functions and the tactics across these business functions within a particular company and across businesses within the supply chain, for the purposes of improving the long-term

performance of the individual companies and the supply chain as a whole; the second one is given, more recently, by Lambert et al.(2006) who state that SCM refers to the integration of key business processes from end-user through original suppliers, that provides products, services, and information that add value for customers and other stakeholders. So, as we can deduce from the two definitions, the firm is not a stand alone entity but it is part of a network of interconnected company that work together in order to make products that create value for the entire supply chain. The focus of SCM is to build solid relationships among the components of the chain in order to achieve a more profitable outcome for everyone. For example, Cooper and Elram (1993) view SCM as a lying between fully vertically integrated systems and those in which channel members operate separately.



**Figura 9: Typology of supply chain partnership (Source: Hagelaar and van der Vorst, 2002)**

So in Supply chains members should establish partnerships among themselves: according to Cooper and Gardner (1993), partnership refers to a relationship that attempts to built interdependence, enhance coordination, improve market position focus or to achieve other shared goals.

All the processes of Supply chain are represented in an important model that is recognized by all scholars in the supply chain field: the SCOR or Supply-chain operations reference-model, which describes the business activities associated with all phases of satisfying a customer's demand.

The SCOR model has been developed by the Supply Chain Council (SSC) which is a global non-profit organization whose framework, improvement methodology, training, certification and benchmarking tools help member organizations make dramatic, rapid, and sustainable improvements in supply chain performance. The Supply Chain Operations Reference is the world standard for supply chain management, a model that provides a unique framework for defining and linking performance metrics, processes, best practices, and people into a unified structure. (Source: <http://supply-chain.org/>).

The model identifies five main business processes:

1. Plan: in this process the basis of actions and plans have been posed for all the actors of supply chain.
2. Source: actions that can be inserted in this process are supplier selection and assessment, receive and verify products from supplier.
3. Make: this process includes all the transformation actions from raw materials to finished goods, for example schedule production activities or production and testing.
4. Deliver: in this process are included practices as warehouse management or delivery of the finished good to the client or selecting the transport method.
5. Return: this is a process that has been recently included in the SCOR model and it involves all activities connected to products and material recovery and adjustment.

The model is important because it allows represent the interactions between the focal company and its customers and suppliers, the flows of materials and the integration with the market. In this thesis we based on SCOR model when searching the SC constructs that we insert in the questionnaire: with the choice of the constructs we tried to cover all the processes included in this reference framework.

### **3.4 Green Supply Chain Management**

In literature we found many definitions of Green Supply Chain Management: for example Gilbert (2001) states that greening the supply chain is the process of incorporating environmental criteria or concerns into organizational purchasing decisions and long-term relationships with suppliers. But in this literature review and, as a consequence, in this thesis we do not want to refer to this definition because it seems to be too restrictive: in fact it includes only a small part of the supply chain, the upstream one. We are more aligned with other two definitions that involve all the processes of supply chain that are included in the SCOR model. In fact, according to Zhu and Sarkis (2004) and Zhu et al. (2008), green supply chain management encompasses a set of environmental management practices which are useful for logistics management and are designed to incorporate environmental considerations into the forward and reverse logistics. The first one is given by Kogg (2003) who used the definition of GSCM given by Zsidisin and Siferd (2001): “the set of supply chain management policies held, actions taken and relationships formed in response to concerns related to the natural environment with regard to the design, acquisition, production, distribution, use, re-use and disposal of the firm’s goods and services”. The second definition is given by Srivastava (2007) who define GSCM as “integrating environmental thinking into supply chain management, including product design, material sourcing and selection, manufacturing processes, delivery of the final products to the consumers, and end-of-life management of the product after its useful life”. These two definitions are very similar, but they are complete and involve all the processes and the actors that compose the entire supply chain: environmental supply chain management presupposes information sharing among all the actors of SC about all production stages of the product life in order to be more effective (Hagelaar and van den Vorst, 2002).

In recent years, in the supply chain field a change in the competition occurred: in fact from a competition “company vs company” we have moved to a “SC vs SC” competition. With competition at the supply chain level and a focus on the changing demands of final customers, it is necessary to identify and adopt practices that yield competitive advantage at the supply chain level which, in turn, yield improved performance for the individual supply chain partners (Green et al., 2008). Environmental sustainability is a supply chain imperative (Vachon and Klassen, 2007).

Implementing environmental supply chain practices does not only lead to economic improvements but the implementation of GSCM practices is expected to result in improved environmental performance as measured by reductions in air emissions, effluent waste, solid waste, and the consumption of toxic materials (Green et al. 2011).

### **3.5 From SCM to GSCM**

In some countries (Denmark, Germany, Norway, Sweden, etc.) and in high environmental risk industries (chemicals and plastics, automotive, heavy engineering, etc.), managers consider improvements in environmental performance one of the basic competitive priorities, alongside lower costs and production lead time or higher quality (Noci, 1995).

The transition to GSCM is a logical extension of SCM merging of a firm’s environmental management policies and goals with its SCM programs (Krut and Leslie, 1999 US-AEP). In literature there are different frameworks that theorize the transition from SCM to GSCM, but in this literature review we choose two of them that are generally recognized.

The U.S. Environmental Protection Agency (2000) provided four basic steps to implementing a green supply chain in a company:

- Identify costs: in this phase firms conduct a review of the materials or processes in order to identify where there are significant environmental costs inside the company. This analysis enables the firm to find out where the probability for significant improvement is greatest and to invest wisely.

- Determine opportunities: in this phase firms determine the changes that can be made in order to produce cost savings and to reduce emissions. At the end of this step, it is generated a set of alternatives of Supply Chain practices that can be implemented.

- Calculate benefits: in this phase firms try to calculate costs and benefits of any alternative that has been generated in the previous step. This estimate can be qualitative or quantitative and it is generated by different tools and methods.

- Decide, implement and monitor: in this phase firms decide whether to adopt one of the alternatives and how to implement, in case, the new one. After implementation, a periodic review and assessment allows decision makers to evaluate their progress and take additional opportunities.



**Figure 10: Steps in implementing a Green Supply Chain. (Source: <http://www.usaep.org/ctem/greening.htm>)**

This decision-making framework is based upon the best practices of several companies that have successfully started or implemented environmental practices:

this model is the realization that environmental considerations should be integrated into each and every core business process (United States Environmental Protection Agency, 2000).

The second one is given by Beamon (1999) and includes the following tasks:

- Identify processes with all inputs, outputs, products, and resources;
- Develop a performance measurement system, because a single performance measure will likely be inadequate in assessing the true performance of the supply chain;
- Measure the supply chain system calculating the actual composite performance at each step in the supply chain process for each product;
- prioritize the process steps in order of increasing composite performance;
- Develop alternatives for performance improvement and select the appropriate approach;
- Establish auditing and procedures for continuous improvement.

These two frameworks are very similar and have many points in common; the most important thing that we want to underline including them in our thesis is that in order to achieve environmental advantages there is a change needed in the organizational structure of SC but also in the decisional process.

As the organizations making up a supply chain become aware of customer demands for products and services provided without damage to the environment, managers will make decisions that support the integration and coordination of GSCM practices throughout the supply chain (Vachon and Klassen, 2007; Vachon and Klassen, 2006).



Supply chains and organizations can gain competitive advantage by being the first to adopt environmental sustainability and implement GSCM practices (Sen, 2009; Barratt and Oke, 2007; Handfield et al., 1997).

The scope of GSCM ranges from reactive monitoring of the general environment management programmes to more proactive practices implemented through various Rs (Reduce, Re-use, Rework, Refurbish, Reclaim, Recycle, Remanufacture, Reverse logistics, etc.) (Srivastava, 2007).

### **3.6 Greening the firm: GSCM practices**

The introduction of environmental management practices has a significant impact on supply chain practices. Products affect the environment at many points in their lifecycles: several articles, such as for example Gungor and Gupta (1999) and Arena et al. (2003), proposed a method of analysis called life-cycle assessment/analysis that is described as a process for assessing and evaluating the environmental, occupational health and resource-related consequences of a product through all phases of its life, as extracting and processing raw materials, production, transportation and distribution, use, remanufacturing, recycling and final disposal. From materials used in manufacturing to locations of vendors along the supply chain to transportation carriers used to the final consumption of the product, supply chain management decisions interact with sustainability in many ways (Wu et al. 2012).

The main purpose of implementing GSCM practices is to create a sustainable production, which means that "products are designed, produced, distributed, used and disposed with minimal (or none) environmental and occupational health damages, and with minimal use of resources (material and energy) (Alting and Jorgensen, 1993).

Next chapters will describe each green SC practice classified in SCOR model; a full collection is reported in the Appendix 2.

### 3.6.1 A classification of the existing literature

There is an extensive literature about the theme of Green Supply Chain Management and in this thesis we classify it on the basis of two different criteria: the methodology used in the paper and the topic of the paper. For the first one, papers can be classified in regarding literature review, survey or interviews, case study or theoretical ones.

<b>Criterion</b>	<b>Articles</b>
Literature review	Styles et al, (2012); Morali and Searcy (2012); Seuring and Muller (2008); Golobic and Smith (2013); Srivastava (2007); Sarkis et al. (2011); Ashby et al. (2011); Jayant et al (2012); Bras et al (1999); Bechtel and Jayaram (1997); Barney (2011);
Survey or interview	Liu et al, (2012); Ageron et al, (2012); Lai and Wong (2012); Ageron et al, (2011); Walker et al (2008); Green et al. (2012); Zhu et al (2007); Zhu et al. (2006); Min and Galle (1997); Simpson et al. (2007); Tan and Cross (2012); Zhu and Sarkis (2004); Hervani et al (2005); Daniel (2000); Zsidisin and Hendrick (1998); Murphy and Herberling (1994); Zhu et Sarkis (2004); Sun et al (2009); Tsireme et al. (2012); Chiou et al. (2011); Zhu et al. (2008); Gowen et al. (2003); Menon (2012); Paulraj (2011); Li et al (2006);
Case study	Seuring, (2004); Caniato et al., (2012); Styles et al, (2012); Hagelaar and van der Vorst (2002); Maxie (1994); Wu et al (2012); Yang and Sheu, (2007); Clean Technology Environmental Management (CTEM), (1999); Diabata and Govindan (2011); Zhu et al (2007); Ninlawan et al. (2010); Nakano and Hirao (2011);
Theoretical papers	OTA (1992); Sarkis (2003); Lowe (1990); van Hoek (1999); Walton (1998); Beamon (1999); Angell (1999); Azzone, G. and Noci, G. (1996); Buysse (2003); Shi et al. (2012); Giunipero et al. (2012); Dean and Brown (1995); Hsu and HU (2008); Sarkis et al (2010); Chen and Paulraj (2003); United States Environmental Protection Agency (2000); Khan et al (2012); McAfee et al. (2002); Koulikoff-Souviron and Harrison (2010); Cantor et al (2012);

**Table 1: SC literature classification according to the methodology used criteria**

Among papers that we analyzed, the most were articles based on surveys and interviews because these are considered as the best way to collect data in less time. As you can see from the table 1, we found out only few papers having as

topic literature review of GSCM. Fink (1998) provides the following definition: “A literature review is a systematic, explicit, and reproducible design for identifying, evaluating, and interpreting the existing body of recorded documents”. The analysis of documents pursues the aim of opening up material that does not have to be created on the basis of a data collection by the researcher. Literature reviews usually aim at two objectives: first, they summarize existing research by identifying patterns, themes and issues. Second, this helps to identify the conceptual content of the field and can contribute to theory development (Meredith, 1993).

But for our research the most important classification criterion of literature is the second one; on the basis of it, existing literature is divided in the one highlighting the general importance of GSCM and literature that is specific on a single practice of GSCM. This classification has the purpose of easier understanding different problem contexts of GSCM in order to highlight the SC processes that are considered in the literature and involve them in our research.

<b>Criterion</b>	<b>Articles</b>
General importance of GSCM	Ageron et al, (2012); Seuring, (2004); Caniato et al., (2012); Styles et al, (2012); Styles et al, (2012); Hagelaar and van der Vorst (2002); Morali and Searcy (2012); Sarkis (2003); Lowe (1990); Wu et al (2012); Yang and Sheu, (2007); Ageron et al, (2011); van Hoek (1999); Walker et al (2008); Clean Technology Environmental Management (CTEM), (1999); Beamon (1999); Diabata and Govindan (2011); Seuring and Muller (2008); Golicic and Smith (2013); Green et al. (2012); Zhu et al (2007); Zhu et al. (2006); Buysse (2003); Sarkis et al. (2011); Tan and Cross (2012); Ninlawan et al. (2010); Ashby et al. (2011); Nakano and Hirao (2011); Shi et al. (2012); Zhu and Sarkis (2004); Hervani et al (2005); Giunipero et al. (2012); Zsidisin and Hendrick (1998); Bechtel and Jayaram (1997); Dean and Brown (1995); Zhu et Sarkis (2004); Hsu and HU (2008); Sarkis et al (2010); Sun et al (2009); Tsireme et al. (2012); Chen and Paulraj (2003); Zhu et al. (2008); United States Environmental Protection Agency (2000); Gowen et al. (2003); Menon (2012); Barney (2011); McAfee et al. (2002); Koulikoff-Souviron and Harrison (2010); Cantor et al (2012); Paulraj (2011); Li et al (2006);
Specific on a single practice	Liu et al, (2012); Lai and Wong (2012); Murphy (1995); Ashley (1993); OTA (1992); Maxie (1994); Walton (1998); Wu and Dunn

	(1995); Chen (2005); Carter (1998); Carter (2000); Van der Laan (1996); Cattanaach (1995); Zhang et al. (1997); Navinchandra (1991); Fiksel (1996); Min and Galle (1997); Thierry et al. (1995); Ishii et al. (1995); Dekker et al. 2004; Guide et al. (2003); Fleischmann et al. (2001); Poist (2000); White et al. (2003); Angell (1999); Azzone, G. and Noci, G. (1996); Simpson et al. (2007); Jayant et al (2012); Bras et al (1999); Daniel (2000); Murphy and Herberling (1994); Chiou et al. (2011);
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**Table 2: SC literature classification according to focus criterion**

In literature there are lots of articles that deals with green supply chain management in general, providing frameworks for creating the “perfect” green supply chain as Yang (2007) or Beamon (1999) or Tachizawa (2012) and listing the benefits and barriers of the implementation of Green practices such as Walker (1998) or Diabat (2011). On the other hand, there are also many papers that focus only on a single green practice and on how to achieve environmental advantages by implementing it such as Zhang et al. (1997) and Azzone, G. and Noci, G. (1996) for eco-design. At a first glance of the table 3, it can be seen that there is a wide literature that deals with the themes of Green purchasing and green manufacturing.

<b>Type of practice</b>	<b>Articles</b>
Green Design	OTA (1992); Ashley (1993); Zhang et al. (1997); Navinchandra (1991); Fiksel (1996); Bras and Mc-Intosh (1999); Ishii et al. (1995); Azzone, G. and Noci, G. (1996);
Green Manufacturing	Van der Laan (1996); Cattanaach (1995); Zhang et al. (1997); Ishii et al. (1995); Linnhoff (1993); Thierry et al. (1995); Dekker et al. (2004); Angell (1999); Bras et al (1999); Daniel (2000);
Green Purchasing	Maxie (1994); Walton (1998); Chen (2005); Carter (1998); Carter (2000); Min and Galle (1997); Simpson et al. (2007); Zsidisin and Hendrick (1998); Murphy and Herberling (1994); Chiou et al. (2011); Bai and Sarkis (2010);

Green Logistic and marketing	Lai and Wong (2012); Murphy (1995); Wu and Dunn (1995); Rodrigue, (2013); Liu et al, (2012)
Investment recovery	Dekker et al. (2004); Guide et al. (2003); Fleischmann et al. (2001); Poist (2000); White et al. (2003); Jayant et al (2012);

**Table 3: SC literature classification according to practices criterion**

As we said before, we take practices from the existing literature that cover all the processes of Supply Chain included in SCOR model such as “green design”, “green sourcing/procurement”, “green manufacturing”, “green distribution, “green logistics” and “reverse logistics”.

### **3.6.2 Green and eco product design**

The aim of this kind of literature is to understand how design decisions affect a product’s environmental compatibility (Glantschnig 1994; Navin-Chandra 1991).

Environmentally design practices will allow manufacturers to minimize waste and to turn waste into a profitable product: therefore, it is necessary to support the design function with tools and methodologies that enable an assessment of the environmental consequences (such as emissions, exposure, and effects) in each phase (Zhang et al., 1997).

Green product design is defined by Navinchandra (1991) as the study of an approach to product and process evaluation and design for environmental compatibility that does not compromise product's quality or function; another important definition was given in 1993 by the Office of Technology Assessment

(OTA) that in one of its annual reports defined product design as a design process in which environmental attributes are treated as design objectives, rather than as constraints. A key point is that green design incorporates environmental objectives with minimum loss to product performance, useful life, or functionality.

Generally green design involves two goals: waste prevention and better materials management (OTA, 1993). Waste prevention refers to activities by manufacturers and consumers that avoid the generation of waste in the first place; waste discharges, emissions, and energy consumed at each stage of the materials life cycle will decrease in proportion to the amount of material used (Zhang et al., 1997). Examples implemented by companies are using less material to perform the same function, or designing durable products so that extending the product's service life or replacing a potentially hazardous material by one that appears less problematic or planning to recycle and reuse materials when producing and designing a product.

Better materials management, instead, refers to activities that allow product components or materials to be recovered and reused in their highest value-added application (Zhang et al., 1997). Examples include designing products that can be readily disassembled into constituent materials, or using materials that can be recycled together without the need for separation. In literature it has been recognized that disassembly of used products is necessary to make recycling economically efficient; disassembly is defined by Brennan and Gupta (1999), as "the process of systematic removal of desirable constituent parts from an assembly while ensuring that there is no impairment of the parts due to the process." One of the most important challenges today is to design a product that is easy to disassembly because there are both economic and environmental reasons connected to it.

Finally in literature you can find articles that deal with design under legislation and regulations topic, which is also important to consider; in fact government

regulations typically influence the design process by imposing external constraints. In the last years a huge number of laws and regulation have been passed by “polluted” countries: for example in July 2005, the EU adopted a directive establishing a framework for setting eco-design requirements for energy using products (“EuP Directive”), that has the potential to regulate a wide range of energy using products marketed in Europe and contemplates new environmental performance and product design requirements.

### **3.6.3 Green manufacturing**

The term green manufacturing can be looked at in two ways: the manufacturing of green products, particularly those used in renewable energy systems and clean technology equipment of all kinds, and the greening of manufacturing, as reducing pollution and waste by minimizing natural resource use, recycling and reusing what is considered waste, and reducing emissions during the production process (Salema et al., 2006).

Green manufacturing means mainly using some techniques, as recycling or using renewable energy, in order to minimize energy and resource consumption in the production and in order to reduce the use of virgin materials.

Recycling is the process of collecting used products, components, and/or materials from the field, disassembling them (when necessary), separating them into categories of like materials (e.g. specific plastic types, glass, etc.), and use them to product new components and/or materials: this is considered in literature a technique of green manufacturing (Beamon, 1999).

Also remanufacturing is a SC practice discussed in literature: Hoshino et al. (1995) define it as recycling-integrated manufacturing, but a completed definition in literature is given by Lund (1983), who stated that remanufacturing is “an industrial process in which worn-out products are restored to like-new condition. Through a series of industrial processes in a factory environment, a discarded

product is completely disassembled. Useable parts are cleaned, refurbished, and put into inventory. Then the new product is reassembled from the old and, where necessary, new parts to produce a fully equivalent and sometimes superior in performance and expected lifetime to the original new product". The resulting product is tested, with the goal of meeting or exceeding the quality standards of brand new products. In some cases, the remanufactured product can exceed the original product in quality and/or function: this is due to the fact that during the remanufacturing process, the design of the replaced parts and/or components may have been improved since the original product was manufactured (Beamon, 1999).

There are estimated to be in excess of 73,000 firms engaged in remanufacturing in the United States directly employing over 350,000 people (Lund, 1998).

Another approach to green manufacturing considered in the existing literature is the environmentally conscious design and manufacturing (ECD&M), that is a proactive approach to minimize the product's environmental impact during its design and manufacturing, and thus to increase the product's competitiveness in the environmentally conscious market place (Zhang, 1997).

### **3.6.4 Green Purchasing**

Environmental purchasing is defined as purchasing's involvement in supply chain management activities in order to facilitate recycling, reuse, and resource reduction (Carter et al. 1998). Effective green purchasing practices can contribute to an organization's overall environmental goals and undertakings in a number of ways: purchasing can identify packaging that can more easily be recycled or reused. This is an activity that can have a significant environmental impact, since packaging is the primary material disposed of in landfills. Also according to Min and Galle (1997), purchasing can have a significant effect on environmental performance through source reduction strategies that include recycling, reuse, and



waste elimination strategies that encompass scrapping, sorting for non-toxic incineration, and biodegradable packaging.

There is also a part of literature that identified suppliers as a key driver of environmental supply chain management practices: supplier characteristics in terms of geographical location, company size, vision with well articulated strategic plans, and global or domestic operations can influence their commitment and support for sustainable supply management (Ageron et al., 2012).

A key to reach environmental goals in the field of relationship between supplier and customer is the integration of environmental and social principles that requires upstream or downstream interaction with other organizations in the supply chain. This integration, which can be implemented at an operational or strategic level, helps generate risk management measures and environmental and social standards to which suppliers may be expected to conform, such as ISO 14001 for environmental management systems and SA8000 for social accountability (Vachon and Klassen 2006b; Koplin et al. 2007; Mueller et al. 2009). Examining their own operational processes and monitoring supplier activities have become important sustainability tasks for many managers. Also Carter (1998) state that collaboration with supply partner is fundamental in order to achieve environmental goals: strategic partnerships incorporate long-term collaborative business relationships leading to sustainable supply and chain management (Ageron, 2012).

There are also papers that are focused on including environmental criteria in supplier selection (for example Bai and Sarkis, 2010): many firms have approved suppliers lists including green criteria of selection. There are many important firms that are adopting green purchasing's practices: for example at Advanced Micro Devices (AMD) the companies environmental audit of suppliers has in the past even led to the removal of a firm from the approved suppliers list or at Xerox, suppliers must commit to working toward fulfilling the company's supplier

environmental requirements before they can be an approved vendor (Clean Technology Environmental Management, 1999).

The results of a recent focus group of ten materials managers (unrelated to this study's furniture companies) emphasizes the importance of carefully developed supplier evaluation criteria (Industry Executive Advisory Team, 1996). They underline the ten of environmental criteria of supplier evaluation on the basis of a survey conducted among ten managers of important US companies. Also rationalization of the supplier base is becoming a trend and it makes to change the supplier-customer relationship: the supplier is now encouraged to become a consultant to the customer (Clean Technology Environmental Management, 1999). Customer and supplier are establishing partnerships that go beyond merely providing products, services, and materials to actively meeting the needs of companies and participating in forming solutions and problem solving.

In conclusion, purchasing and supply chain managers are in a critical position to influence the implementation of environmental practices of a company such as supplier selection and evaluation, supplier development, and purchasing processes, that can be changed in order to significantly reduce waste and cost.

### **3.6.5 Green distribution**

The globalization of production highlights the importance of Green Logistic Management on prevention of environment alarm arising from product manufacturing and distribution activities (Lai and Wang, 2012). Green distribution is defined as the supply chain management practices and strategies that reduce the environmental and energy footprint of freight distribution. It focuses on material handling, waste management, and transport (Rodrigue, 2013). Nowadays the transportation industry is recognized as a major contributor to environmental issues through its modes, infrastructures and flows, but also manufacturing firms are dealing with problems of green distribution. Such

approach involves the collective efforts from transporters, warehouses, and retailers to undertake environmental management practices, such as using transports that are eco-friendly by reducing emissions. Short-term activity often promotes incremental improvement in fuel efficiency and vehicle emissions controls while long-term goals include migrating transportation from fossil-based energy to other alternatives such as renewable energy and use of other renewable resources (Lai and Wang, 2012).

### **3.6.6 Reverse logistic and investment recovery**

Environmental and economic issues have significant impacts on reverse supply chain management and are thought to form one of the developmental cornerstones of sustainable supply chains. Investment recovery consists of finding alternative uses for items that are no longer of direct value for a firm: the purpose of investment recovery is to derive the greatest financial recovery for the disposal of scrap items (Zsidisin, 1998), while the reverse logistic is the management or return flow due to product recovery, goods return, or overstock, form a closed-loop supply chain (Jayant, 2012). Redesigning logistics networks to accommodate product returns and remanufacturing and re-use of such parts and components can often be profitable and is assuming greater importance in business as well as in research (Tibben-Lembke 2002). Companies, in these last years, are realizing the hidden value in reverse logistic and are starting to focus in this area: although most companies realize that the total processing cost of returned products is higher than the total manufacturing cost, it is found that strategic collections of returned products can lead to repetitive purchases and reduce the risk of fluctuating the material demand and cost (Jayant, 2012). Transportation of used products is the most challenging issue in reverse logistic (Jayant and Garg, 2012) because smaller return quantities and variability in product types increase the transportation costs. In literature there are lots of authors that deal with the theme

of reverse logistic and try to give a framework to design a reverse supply chain in order to minimize costs and the environmental impact: some examples are Ferrer & Whybark (2000) who describe how to decrease the impact of transportation on reverse logistic, or Kara et al. (2007) who propose a model to design the reverse supply chain.

### **3.7 GSCM approaches**

In studying the scientific literature we found out only few authors that face the theme of GSCM approaches: Kopicki et al. (1993), van Hoek (1999), Yang and Sheu (2007), and Walton et al. (1998). The first that suggest three different approaches to GSCM that are named reactive, proactive and value-seeking approach is Kopicki et al. (1993) and his theory is universally recognized in the supply chain literature; in fact the other authors that we mentioned before based their theories on his studies.

In the *reactive* approach, companies commit minimal resources to environmental management, start labelling products that are recyclable and use 'end of pipeline' initiatives to lower the environmental impact of production (Kopicki et al., 1993). Companies pursuing this approach often try to find ways to "clean up" or store the waste once it is created. While embracing environmental issues without changing current processes provides the company with a sense of social legitimacy, it usually leads to narrow, incremental solutions (Corbett and Van Wassenhove, 1993). Companies that are using a reactive approach are not realizing the competitive implications of environmentally-friendly supply chain practices but they merely experience penalty avoidance (Walton et al., 1998).

In the *proactive* approach, companies start to preempt new environmental laws by realizing a modest resource commitment to initiate the recycling of products and designing green products. In this approach the company assumes

responsibility over product reuse and recycling as an element of environmental management and designing green products (van Hoek, 1999).

In the *value-seeking* approach, companies integrate environmental activities into a business strategy and operate the firm to reduce its impact on the environment as a strategic initiative: an example could be adopting SC practices such as design of product, green purchasing or ISO implementation as strategic initiatives into business strategy. The CEO establishes a strong environmental commitment and the capital commitment is shared among partners in the supply chain (van Hoek, 1999). Substantially Companies that adopt this approach look beyond their current processes to find and eliminate sources of waste and in order to maximize benefits attained from environmental initiatives (Walton et al., 1998).

<b>Reactive approach</b>	<b>Proactive approach</b>	<b>Value-seeking approach</b>
Minimal resources committed	Modest resources committed	Strategic commitment; integrate environmental project in strategy
Responsibility falls on individual who initiates program or government affairs office	Top management commitment	Supply chain initiative
Filters and other end-of-pipeline solutions	Initial recycling and re-use initiatives	Systematic, Flexible

Procure products with recycled content	Prepare environmental policy statement	Design products for dis-assembly and recycling or re-use
Label products that are recyclable	Perform environmental audit	Environmental life-cycle analysis to evaluate products
Ad hoc organization	Designing green parts and products	Ask suppliers to commit to waste reduction goals

**Table 4: Management approaches to greening (van Hoek, 1999)**

These three approaches to GSCM, according to Yang (2007), have an interaction with the kind of relationship that can be established among supply chain actors.

For company which has a reactive strategy the primary focus is complying with regulatory requirements: these companies reacted to a change in the regulators' environmental requirements. This company follows a traditional and conservative approach in SCM not only in terms of environmental protection but also in other areas of SCM, such as inventory replenishment and information sharing. This type of company generally does not to initiate any collaboration with its supply chain partners (Yang, 2007). Such pattern of environmental behaviour is common in contexts where external pressures are not significant, or a radical shift in environmental regulations is not likely (Azzone and Noci, 1998).

Companies that adopt a proactive strategy with the goal of surpassing compliance with regulations recognise the necessity of collaborating with supply chain partners and have engaged in dialogue with them; especially suppliers. They generally identify the value of supply chain alliances for recycling and waste reduction. However, most of the supply chain partnership is limited to control or end-of-pipe initiatives, and has less to do with prevention types of activities, such

as design and process improvement. They limit R&D collaboration with government-sponsored institutes and have no interaction with their local community to actively promote corporate image (Yang, 2007). The sustainability and the effectiveness of a proactive strategy depends on the type of relationships a company establishes with suppliers, e.g. whether the latter are integrated at design phase and in the take back of end-of-life products (Azzone and Noci, 1998).

With a value-seeking environmental management (EM) strategy, companies aggressively integrate supply chain partners into their EM systems. Not only are more constituencies involved, but also there is a higher intensity of involvement. Without the participation of its supply chain partners, many EM initiatives would be difficult to implement. For instance, many suppliers, after gaining greater understanding of a firm's EM goals, can make specific suggestions on how use of their products could improve performance. All participants involved in supply chain can have benefit for example opportunity to advance both financial and environmental performance (Yang, 2007).

				<b>Strategies</b>		
				<b>Reactive</b>	<b>Proactive</b>	<b>Value-seeking</b>
<b>Partnership</b>				LOW	MEDIUM	HIGH

**Table 5: Environmental partnership and EM strategy (adapted by Yang, 2007)**

### **3.8 Drivers towards GSCM**

Increasing pressures from a variety of directions have caused the supply chain managers to consider and initiate implementation of green supply chain management (GSCM) practices to improve both their economic and environmental performance. In this paragraph we are going to explain which are

drivers that push organizations to implement green supply chain management initiatives.

In literature, drivers for greening supply chain practices are grouped into internal and external drivers: internal drivers are described as organisational factors that push from inside the firm, while the external drivers include regulation, customers, competition, and society (Walker et al, 2008; Diabata and Govindanb, 2011).

Regarding the *internal* drivers, personal commitment of individuals (including founder and owner) has been found to be positively related to green supply chain management (New et al., 2000): the term “individual” in this contest is related not only to the top management commitment but also to the total involvement of every single employee in the firm. To successfully drive green supply chain management practices, personal commitment and impetus have not necessarily resided at top-management level (Drumwright, 1994; Walker, 2008). In fact, in literature, middle management’s support is positively related to environmental purchasing (Carter et al., 1998) and operational and environmental improvement has been found to be positively related to employee involvement (Hanna et al., 2000). Members of top management are instrumental in encouraging firms to evaluate their role in society and are responsible for the firms’ environmental management leadership (Anderson and Bateman, 2000).

The personal and environmental values of the entrepreneur of the company are certainly important to spread into the firm sustainable behaviours, but they have to be related to the motivation of a single employee.

An increased pressure from investors that can be considered internal in the firm, has also been observed in the development of environmental policies (Green et al., 1996; Trowbridge, 2001).

Economic opportunities drive corporate ecological responsiveness: by intensifying production processes, companies can reduce their environmental impact while simultaneously lowering the costs of inputs and waste disposal



(Cordano, 1993; Lampe et al., 1991; Porter and Van Der Linde, 1995). Companies, in fact, have recognized various benefits and incentives to green their supply chains: benefits from sustainable supply management include customer satisfaction, quality, and innovation, trust, managing supply risk, fillrate, optimal inventory, flexibility, lead time and cost control. These benefits must be considered when determining whether sustainable supply management initiatives such as ISO14001, greening logistics, greening production, recycling, remanufacturing, design for sustainable products and processes, reducing carbon footprints, and life cycle assessment and costing merit investment or not (Ageron,2012). Potential economic advantages include cost savings due to reduced packaging waste and the ability to design for reuse and disassembly, lower labor costs – better working conditions can increase motivation and productivity, and reduce the absenteeism of supply chain personnel, reduced costs, shorter lead times, and better product quality associated with the implementation of ISO 14000 standards, which provide a framework for environmental management systems, enhanced reputation – engaging in sustainable behavior can make an organization more attractive to suppliers and customers, to potential employees and to shareholders (Carter and Rogers, 2008).

Internal organizational drivers include focusing on cost reduction through minimising waste and pollution, often leading to quality improvements.

<b>Drivers</b>	
<b>Internal</b>	<b>External</b>
Employee involvement and commitment	Regulation
Top mgmt involvement and commitment	Customers and suppliers
Investor pressure	Competition

Economic opportunities and cost reduction	Society

**Table 6: Internal and external drivers to GSCM**

Regarding *external* drivers, increasing pressures from governments, customers, employees, shareholders, and other stakeholder groups have prompted corporations to address the economic, environmental, and social implications of their activities (Morali and Searcy, 2012). In fact, in literature these are the external pressures that we have found.

A significant part of research indicates that government regulation and legislation is a major driver for companies' environmental efforts (Beamon, 1999; Green et al., 1996; Handfield et al., 1997; Walton et al., 1998; Zhu et al., 2005). MIT Sloan Management Review (2009), for example, conducted a survey in which the respondent were asked to rate the pressures to sustainability in a scale from "no impact" to "mayor impact" and the result was that government legislation related to sustainability is the most important driver towards the implementation of GSCM practices (67% of respondents). Escalating penalties, fines, and legal costs have punctuated the importance of complying with legislation (Cordano, 1993). However, compliance driven companies, which were in a reactive mode, did not appear to have integrated environmental concerns into their value chain processes as thoroughly as companies which were initially motivated to do so (Handfield et al., 1997). Proactive and innovative approach efforts towards environmental regulation are more likely to be drivers of successful green supply chain management projects (Bowen et al., 2001a; Carter and Dresner, 2001).

The literature points to several interesting issues regarding customers as a driving force for green supply chain management practices: customers exert pressure on organisations to engage in environmental supply chain practices

(Green et al., 1996; New et al., 2000), in fact customers may switch if a product violates environmental laws or pollutes the environment. This phenomenon gives rise to an increasing trend for manufacturing enterprises seeking ISO14000 certification, environmental auditing, and retrieving reusable products for reuse to satisfy the environmental requests of their customers. Small companies are especially under pressure from their customers (Hall, 2001). According to Giunipero et al. (2012), the individual consumer's belief that they can help solve environmental problems was found to be the best predictor of ecologically conscious consumer behavior. Simpson et al. (2007), in his research found out that the customer's environmental performance requirements can have a positive influence toward environmental responsibilities of the firms.

Several authors identified also competition as a driver for green supply chain management practices: 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 (Henriques and Sadorsky, 1999). A proactive environmental strategy can help a firm to gain competitive advantage through the development of supply management capabilities (Ferguson and Toktay, 2006; Sarkis, 2003). Also Walton et al. (1998) reviewed integrating environmental management with the day to day processes of the organization and concluded that purchasing and supply chain managers can have a major impact on the ability of a company to establish and maintain a competitive advantage through environmentally- friendly practices.

Also society and the general thought of people can powerfully influence the adoption of GSCM practices: the public is increasingly influenced by a company's reputation with respect to the environment when making purchasing decisions (Drumwright, 1994) and so customer's demand is changing towards more environmentally friendly products. Berns et al. (2009) found that consumer concerns about sustainability were a significant impact on the businesses in their study.

There are also researches that identified suppliers as a key driver of environmental supply chain management practices. It has been suggested that suppliers can help to provide valuable ideas used in the implementation of environmental projects, but they generally do not act as a direct driving force (Carter and Dresner, 2001). In an environmental study based on chemical firms in the US, it was found that firms whose environmental strategy comprises close supply chain relations are likely to be leaders in waste reduction and environmental innovation (Theyel, 2001).

### **3.9 Barriers to GSCM practices**

Resistance to change always exists in organizations. Sources for resistance are multiple, potentially including top management, financial issues, location, system capacity, culture, type of business, supply network configuration, costs, performance objectives, human resources and knowledge management (Ageron et al., 2007). While there are forces driving firms to sustainability, on the other side, there are factors that impede firm's decisive actions to adopt sustainable practices; as drivers, in literature also barriers can be classified in two different categories: internal barriers and external ones (Walker et al. 2008).

Regarding *internal* factors, one of the most important identified in literature is the lack of consensus at top management levels of the firm. Generally, companies do not understand what sustainability is and they do not have a common definition or language for discussing it: most of the times entrepreneurs see it just like a pure cost and do not understand the benefits linked with implementing environmental practices. Sharma (2000) found that in the Canadian oil and gas industry, environmental strategies were associated with managerial interpretations of environmental issues as either threats or opportunities.

An investigation of green purchasing practices in US firms revealed that cost concerns are the most serious obstacle for taking environmental factors into

account in the purchasing process (Min and Galle, 2001). In fact, many companies are convinced that the more environmentally friendly they become, the more the effort will erode their competitiveness (Giunipero et al., 2012), believing that sustainability is only a cost. Also Walley and Whitehead (1994) state that, responding to environmental challenges has always been a costly and complicated proposition for managers, and suggest that, win-win situations are very rare and will likely be overshadowed by the total cost of a company's environmental program. A company that decides to initiate a green revolution will have to front certainly the cost for a wide array of upgrades from more energy efficient machines to recycled printer paper; there are a variety of other related expenses when considering green changes, specifically to manufacturing processes (Koplin et al., 2007). Incurring costs are even more significant for small and medium enterprises which have generally less resources available and thus are more vulnerable (Hervani and Helms, 2005; Wycherley, 1999).

The most important *external* barrier found in literature is the lack of sustainability standards and appropriate regulations: in fact environmental legislation and regulation can inhibit innovation by prescribing best available techniques and setting unreasonable deadlines (Porter and Van de Linde, 1995). It is interesting to observe that environmental regulation is a driver and a barrier at the same time: according to Porter and Van de Linde (1995), regulation can help or hinder green supply chain management acting as a catalyst for proactive firms or perceived as a restraint by others. Another thing to underline about laws is that today globalization is driving firms having plant in different countries: each country has its own environmental regulation depending on circumstances in various locations. So a global enterprise has to face different laws: compliance is complicated as environmental regulations vary by country, by state or region, and even by city (Nidumolu et al., 2009).

Suppliers can be not only drivers that push green supply chain practices introduction, but on the other hand they can be also barriers, in particular in

literature poor commitment of suppliers is identified as an obstacle: in fact, companies are often unwilling to exchange information on green supply for fear of exposing weaknesses or giving other companies competitive advantage (Walker, 2008).

It also has been found that companies in different industries have differing drivers, barriers and practices (Zhu and Sarkis, 2006): these can influence how reactive or proactive firms in a particular sector are to environmental supply.

<b>Barriers</b>	
<b>Internal</b>	<b>External</b>
Costs	lack of sustainability standards and appropriate regulations
Lack of consensus in the company	Industry specific barriers

**Table 7: Barriers to GSCM**

# 4 Research framework and Hypothesis

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## 4.1 SCM, HRM and Environmental Performance: what we know

In the previous chapters we explained how there is an evidence of the extent to which firm's environmental performance can be influenced by the implementation of supply chain practices; the same result can be observed thanks to the implementation of human resources practices.

Regarding supply chain field, in literature there are several authors stating that a more sustainable supply chain in the global context may help improve the overall performance of the supply chain thus creating a competitive advantage for the members along the supply chain (Wu et al 2012; Diabat and Govindan, 2011). Other authors concentrate on the implementation of a single green practice in order to improve environmental performance, as for example Sarkis (1995) that discusses about green manufacturing or Zhu and Geng (2001) that investigate the impact of green purchasing.

Kenneth W.Green Jr et al (2012) studied with empirical investigations the impact of green supply chain management practices on environmental performance. Results of their research supported the proposition that GSCM practices are both environmentally necessary and good business. Also Zhu and Sarkis (2004) studied the relationship between green supply chain practices and stated that the direct relationships between GSCM practices and environmental performance expectations are very promising and that GSCM practices seem to be doing what is expected of them in terms of positive environmental performance. For example, the green supply chain practice of remanufacturing is an

environmentally and economically sound way to achieve many of the goals of sustainable development; there are estimated to be in excess of 73,000 firms engaged in remanufacturing in the United States directly employing over 350,000 people (Lund, 1998). Remanufacturing operations account for total sales in excess of \$53 billion per year (U.S. Environmental Protection Agency, EPA 1997). In their nation-wide assessment of remanufacturing, Nasr et al. (1998) report average profits margins of 20%, showing that remanufacturing is also profitable. The EPA also reported that remanufacturing as an integral foundation of reuse activities and reports that less energy is used and less wastes are produced with these type of activities (U.S. EPA 1997).

Regarding human resources, an emerging literature has pointed out the need for HRM involvement in environmental initiatives because it contributes to reach competitive advantages for those organizations that effectively implement them, by enabling the development of knowledge that is embedded in firm's culture and history (Dubois and Dubois, 2012). Also the commitment of all employees and top management is important to improve green performance: the work of many authors as Bowen et al., (2001) or Buysse and Verbeke, (2003) state that higher levels of environmental commitment will lead to a greater likelihood of improving environmental performance.

Renwick et al (2012) make a study of green human resources practices and suggest that they may have a role to play in improving the environmental performance. For example, recruitment practices can support effective environmental management by ensuring that new recruits understand an organization's environmental culture and share its environmental values (Wehrmeyer, 1996). Or also environmental training is called "one of the most important tools to develop human resources and facilitate the transition to a more sustainable society"(Agenda 21,1992,Chapter36).

Examples of the outcomes in environmental management that can be gained from using environmental involvement programs can be seen from firms in the



U.S. Since 1975, 3M has encouraged employees to propose changes to generate revenue and reduce pollution through their Pollution Prevention Pays (3P) program. So far, 3M claim their 3P initiative has produced more than 2,500 pollution solutions, halving their waste release, and saving them nearly \$300million. Indeed, later estimates for 3M are that their 3P program has seen employees propose more than 4,750 projects worldwide, preventing 1.7 billion pounds of pollution, and saving them \$850 million in pollution control and raw material costs (Reed, 2002).

#### **4.2 HRM, SCM and Environmental Performance: what we don't know**

Renwick et al. (2012) stated there are no reported studies of the impact of GHRM *systems as a whole* on either environmental outcomes, such as waste reduction, or on wider organizational performance metrics. The individual GHRM activities discussed in his review may be better viewed as interdependent and reinforcing 'bundles' of activities with a synergistic link between practices so that the impact of each element is enhanced when the others are also implemented (Becker and Huselid 1998; Combs *et al.* 2006).

Therefore a part of purpose of our thesis is to investigate exactly how these practices work together to reach EP. In fact, also many authors deal with this issues and specifically, Lepak et al. (2006, p. 249) said that analysis of fit among practices is an important void in HR research.

Furthermore, notwithstanding some reasonable conjectures in the literature, a number of observers have concluded that no one has yet described where such synergies in HRM systems really come from (Bowen & Ostroff, 2004; Delaney & Huselid, 1996; Delery, 1998; Dyer & Reeves, 1995; Wilk & Noe, 1998).

Concurrently, most operationalization of synergy in empirical HRM research seem to be driven by convenience rather than by theory, with little justification given for the methodologies chosen (Becker & Gerhart, 1996). This lack of theoretic and methodological precision, in turn, makes it difficult to create theory-driven definitions of strategically effective HRM systems (Chadwick, 2010). In our literature scientific analysis we haven't found articles that study how SCM practices interact with each other. We found out only authors that deal with inter-firms relationships about environmental practices (e.g. Q. Zhu, J. Sarkis, 2004) or Alison Ashby et al. (2012) who said that a key research direction for progressing sustainable supply chain management would be the role of supply chain relationships in achieving sustainability.

The relationship element of SCM and its potential impact on sustainability is underexplored in the reviewed literature and yet could hold the key to moving beyond the current reactive approach (Vachon and Klassen, 2006) and join isolated processes into a "closed loop"(Alison Ashby et al. (2012).

Research in green SCM to date may be considered compartmentalized into content areas drawn from operations strategy. The primary areas of emphasis have been quality, operations strategy, supply-chain management, product and process technologies, which are collectively beginning to contribute to a more systematic knowledge base. However, more integrative contributions are needed in the longer term, including intra-firm diffusion of best practices and environmental performance measurement (Samir K. Srivastava, 2007).

### **4.3 A theoretical model for analyzing "fit"**

About this theme we have found many articles from HR literature. Synergy can be defined as a notion of positive outcomes deriving from the interrelations among a system's components. As noted by Delery (1998), the relationship among HR practices is synergistic if they work together interdependently so that the

effectiveness of one practice depends on the other practices. This relationship can be positive or negative.

In formulating our research hypothesis we follow Chadwick's theory (2010) that points toward a more theory-driven approach to synergy within HRM systems. Scholars typically address two general types of synergy (or fit) in research on HRM and organizational performance (Baird & Meshoulam, 1988). Also other authors like Green et al., (2006) and Kepes & Delery, (2007) identified the same types of fit. The first type of synergy is called vertical fit and it refers to the relationship between HRM systems and factors external to such systems. According to Paauwe (2004), these factors can be both within and outside the organization and they can include strategy, other functions of the organization (e.g., marketing and sales), industries, production technologies, and so forth. A second type of synergy, called horizontal fit, concerns interrelationships among the components of HRM systems that can be usually HRM policies and practices: individual HRM practices fit with each other in a way that elicits the workforce attributes required to meet the key business goal identified (Samnani and Singh, 2013).

In his research Chadwick focused only on the second type of fit (horizontal) and he stated that most treatments of synergy lack precision in describing how interrelationships among system components create synergistic benefits for organizational performance.

An ideal approach to demonstrating synergies would be to explicitly compare the performance effects of a set of HRM practices with a contextually and theoretically appropriate aggregation of those same practices (Chadwick, 2010). As Whittington et al. (1999), described, researchers should compare "the contributions of individual practices with the performance payoffs of them all together" to determine if the estimated effects of an HRM system measure exceed the "sum of the marginal effects from adopting each practice individually" (p. 585; see also Horgan & Muhlau, 2006).

Chadwick describes three different approaches to synergy: virtuous overlaps, independent effects, and efficient complementarities. In particular he applies them to HRM system but they can be viewed in a broader context.

*Virtuous overlaps* emphasizes component interactions, *independent effects* emphasizes component specialization, and *efficient complementarities* emphasizes both component interactions and component specialization.

		Emphasis on component specialization	
		Low	High
Emphasis on component	Low	No synergy	Independent effects (independence)
	High	Virtuous overlaps	Efficient complementarities (configuration)

Figure 11: Three theoretic approaches to synergy (Chadwick 2010)

The virtuous overlaps approach (the lower left quadrant of figure 11) is built on the assumption that HRM practices can be mutually reinforcing to such a high degree that their interactions are the primary determinants of HRM system effectiveness (Chadwick, 2010). The virtuous overlaps approach assumes that the degree to which interrelated HRM practices function jointly determines system effectiveness and that the decomposable effects of individual practices are much less important to HRM system effectiveness (Hackman, 1985; MacDuffie, 1995)

The independent effects (additive relationship for Delery, 1998) approach to synergy in HRM systems is based on the assumption that the effects of HRM practices on organizational performance are largely independent. In other words, whether HRM practices interact is not pertinent to their effectiveness as a system (see the upper right quadrant of figure 11) so independent effects assumes that no significant interactions that could justify functional redundancies among HRM practices exist.

The efficient complementarities (configuration) approach to synergies simultaneously emphasizes both HRM practice interactions and HRM practice

specialization (see the lower right quadrant of figure 11). In efficient complementarities, HRM practices are aligned with each other to capture desirable interactive (complementary) effects, exploiting reciprocal interdependence among system components. Reciprocal interdependence in HRM systems occurs when the effects of component HRM practices on system outcomes both moderate and are moderated by the effects of the other HRM practices in the system (Chadwick, 2010).

#### **4.4 The application of the theoretical model on HRM, SCM, Environmental Performance: hypothesis development**

The theories we introduced in the previous subchapter referred only to HRM field, but we assumed that they could be generalized and applicable to our analysis context. In particular we assume that these theories could be valid also in the supply chain world. In our thesis environmental performance represent the *dependent variable*, while supply chain and human resources practices represent the *independent one*. In literature we found out that SC and HR practices have an impact on firm's environmental performance, so we want to use Chadwick's theory as base to explain how the effect of the relationships between practices can improve green performance.

Consequently the research question of this thesis is formulated as follow:

*Does a relationship between HR and SC practices that improve firm's environmental performance exist?*

We propose our research hypothesis following the three types of synergies that Chadwick (2010) explains. Following subchapters deal with these kind of

relationships in HRM perspective, SCM perspective and a joined perspective between these two functions.

#### **4.4.1 Relationship between human resource practices and environmental performance**

Regarding HR, we referred to the AMO model: as we said in the literature review chapter, Ability-Motivation-Opportunity theory suggests that HRM practices that enhance the firm's human capital via increased human capabilities translate into performance outcomes, such as higher productivity, reduced waste, higher quality and profit (Appelbaum et al. 2000).

First three hypothesis hereunder are well discussed by Chadwick (2010); we propose again them only enclosing HR practices within the AMO's model.

First proposition of first group of hypothesis agrees also with Delery & Doty, (1996) and Martin Alcazar et al. (2005): they proposed the "configurational theory of HRM", that suggested that certain bundles of HR practices will produce alignment within these configurations and yield superior outcomes (Lepak & Shaw, 2008). Indeed, a few researchers have found empirical support for the configurational theory of HRM (e.g., Arthur, 1994; Ichniowski et al., 1997; MacDuffie, 1995; Messersmith & Guthrie, 2010; Subramony, 2009).

*Hypothesis 1a: AMO's practices have a joint positive impact on environmental performance, which is stronger than the additive effects of individual practices.*

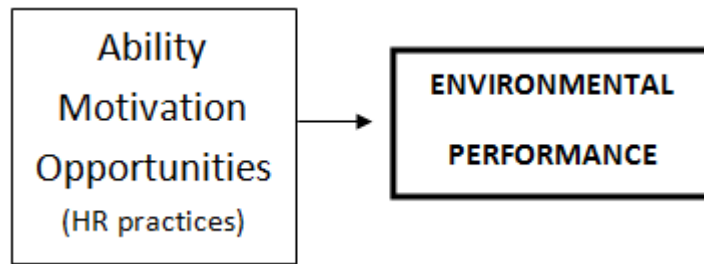


Figure 12: Virtuous overlaps's approach among HRM practices

The second proposition has been largely discussed in the beginning of chapter four and in the HR literature review.

*Hypothesis 1b: AMO's practices have an independent effect on environmental performance.*

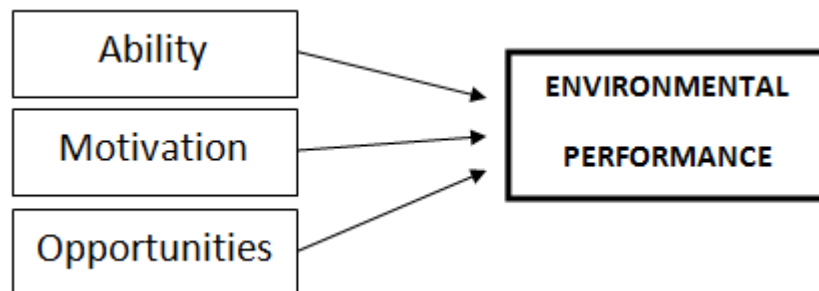


Figure 13: Independent effects's approach among HRM practices

The last proposition of the first group of hypothesis deals with the complementarities's approach. Similar investigation was conducted by Daily et al. (2010) who through a survey, discovered that environmental training and empowerment for employees were related to environmental performance as mediated through teamwork. Their research supports the theoretical concept, proposed by Massoud et al., (2009), that teamwork is the vehicle upon which employees can manifest change to complex environmental problems. So, while teamwork may be the vehicle to manifest environmental change, Daily's et al.

(2010), research clearly suggests that empowerment and training are essential catalysts for teamwork to occur. For these reasons we suggest the following hypothesis:

*Hypothesis 1c: AMO's practices have a complementary effect on environmental performance, in which the effects of component HRM practices on system outcomes both moderate and are moderated by the effects of the other HRM practices in the system.*

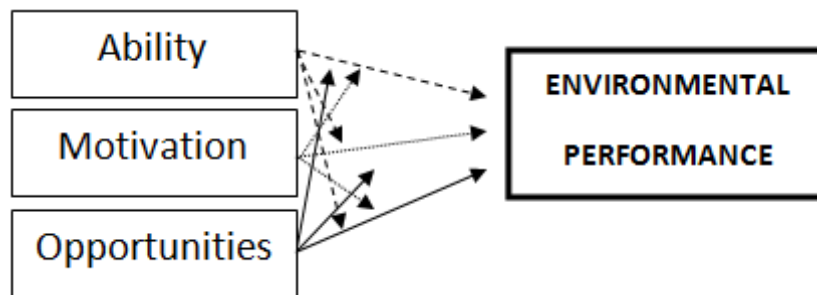


Figure 14: Efficient complementarities's approach among HRM practices

#### **4.4.2 Relationship between supply chain practices and environmental performance**

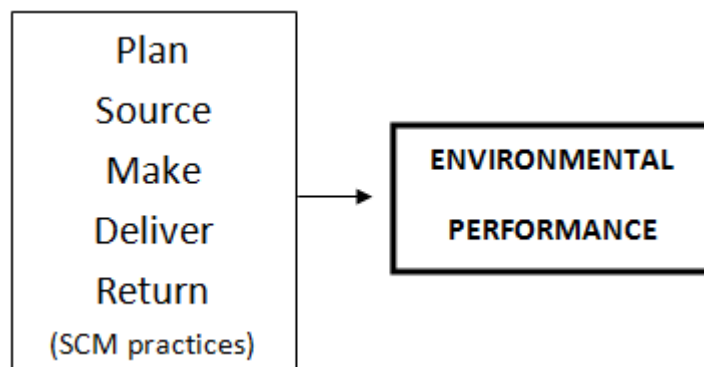
Regarding SCM, we support classification by SCOR model and we follow Chadwick theories in the same identically manner the process of previous subchapter.

Q. Zhu, J. Sarkis (2004) in the summary of their research arose this practical lesson: GSCM practices tended to have win-win relationships in terms of environmental and economic performance. Vachon and Klassen (2006), Vachon and Klassen (2008) note that supply chain processes have a direct impact on the natural environment, and practices to manage and reduce this impact can develop capabilities to improve performance.



For the second group of hypothesis we start suggesting that certain bundles of SCM practices interacts with each other impacting on environmental performance.

***Hypothesis 2a: SCOR's practices have a joint positive impact on environmental performance, which is stronger than the additive effects of individual practices.***

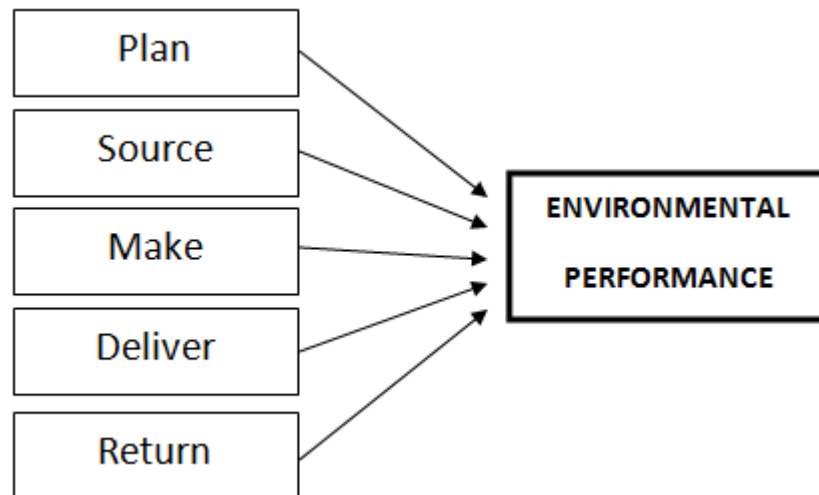


**Figure 15: Virtuous overlaps's approach among SCM practices**

The following hypothesis instead suggest the already discussed proposition about independent effect of individual following SCM practices represented in the figure 16. In supply chain literature, in fact, we found out lots of articles saying that single practices of supply chain have a direct impact on environmental performance; for example Zsidisin and Hendrick stated that purchasing have a critical role, and significant influence, in a firm's environmental performance or Zhang et al. (1997), who wrote that environmentally conscious design and manufacturing is a view of manufacturing that includes the social and technological aspects of the design, synthesis, processing, and use of products in continuous or discrete manufacturing industries; the benefits of these techniques include safer and cleaner factories, worker protection, reduced future costs for disposal, reduced environment and health risks, improved product quality at lower cost, better public image, and higher productivity. The need for environmentally responsible logistics systems is highlighted by Wu and Dunn (1995): redesigning

logistics networks to accommodate product returns and remanufacturing and reuse of such parts and components can often be profitable and is assuming greater importance in business as well as in research (Tibben-Lembke 2002). From these examples we introduce second proposition of the SCM group of hypothesis:

***Hypothesis 2b: SCOR practices have an independent effect on environmental performance.***



**Figure 16: Independent effects's approach among SCM practices**

It is reasonable to expect that also for SCM practices there can be an efficient complementarities relationship as Chadwick theorized for HR practices.

For example Kenneth W. Green Jr et al. (2012), in their research tried to investigate not only the relationship that green supply chain practices have with environmental performance, but also the existing relationships among green supply chain practices: in fact, for example they discovered that the construct of internal environmental management is positively associated with the construct of green information systems and both appear as antecedents to successful

implementation of green purchasing, cooperation with customers, eco-design, and investment recovery.

*Hypothesis 2c: SCOR practices have a complementary effect on environmental performance, in which the effects of component SCM practices on system outcomes both moderate and are moderated by the effects of the other SCM practices in the system.*

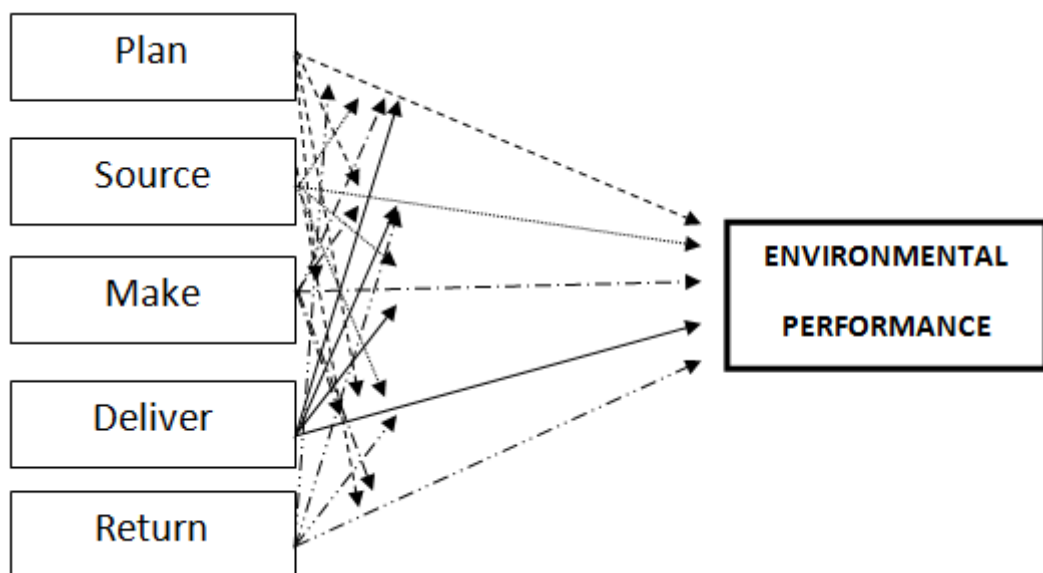


Figure 17: Efficient complementarities's approach among SCM practices

#### **4.4.3 Vertical fit between supply chain and human resource practices for environmental performance**

The hypothesis we generated until now are all referred to the concept of horizontal fit that Chadwick taken in consideration: instead the latest group of hypostesis we are going to introduce change their perspective and try to

investigate the vertical fit that can be established among different functions of a firm.

The theme of cross-functional relationships is widely addressed in literature: Craig R. Carter et al. (1998), stated that additional research is needed to thoroughly assess the interactions of environmental purchasing and distribution personnel with other internal functions, such as marketing, engineering, and manufacturing. Q. Zhu, J. Sarkis (2004) in their empirical results indicate that the SC practice “eco-design” has direct, positive effects on environmental performance, but the success of eco-design requires the internal cross-functional cooperation among the entire company (Lenvis and Gretsakis, 2001). In human resource field contingency theory posits that there should be alignment between HRM practices and other internal and external aspects of the organization, particularly with the business strategy (Delery & Doty, 1996; Lepak & Shaw, 2008).

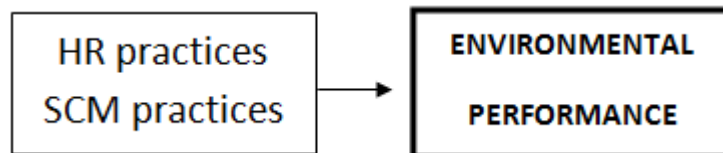
In literature we found out few articles talking about possible synergies between supply chain and human resources fields. The aspect of the development of internal human resources as a means to enhance SCM practices has yet to be studied in any formal way. However, Gowen and Tallon (2002) have indicated that such effort may improve the likelihood of a firm maximizing its performance. The interaction between HR and SC is important not only for improving Supply Chain Management performance, but a substantive enhancement of HR systems across firms could yield potentially sizeable financial payoffs and also may serve as a potentially valuable source of competitive advantage (Lengnick-Hall et al. 2012). So the HR function with its practices could be enhance supply chain performance.

Birdi et al. (2008) conducted a research that aims to investigate the relationship between some human resources practices like empowerment, extensive training and teamwork, and supply chain practices as total quality management, just in time, advanced manufacturing technology and supply chain

partnering improving the performance of a company. They found out that virtually all interactions are positive, providing evidence for the existence of some synergy between various practices and indicating partial support for their hypothesis, that stated that empowerment, extensive training, and teamwork will positively interact with total quality management, just-in-time, advanced manufacturing technology, and supply-chain partnering to predict company performance.

According to all these studies, it is reasonable to assume that general HRM practices have a relationship with general SCM practices in order to enhance company performance, in particular the one we consider: the environmental performance.

***Hypothesis 3a: HRM and SCM practices have a joint positive impact on environmental performance, which is stronger than the additive effects of individual practices.***

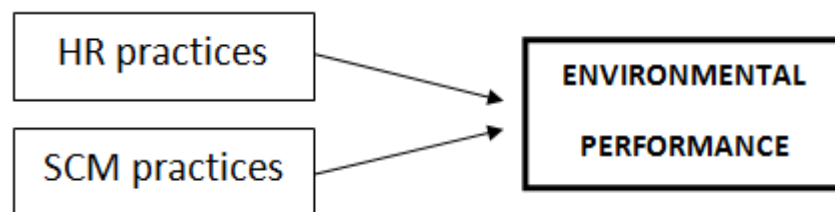


**Figure 18: Virtuous overlaps's approach between SCM and HR practices**

Starting from the analysis of literature and resuming all the considerations about these themes explored by the researchers, we introduce the second proposition about hypothesis between HRM and SCM practices. It is based on the assumption that the effects of HRM practices and SC practices on environmental performance are largely independent. Independent effects's theory assumes that no significant interactions among HRM and SCM practices exist and therefore

HRM practices and SCM practices have their own relationship with environmental performance:

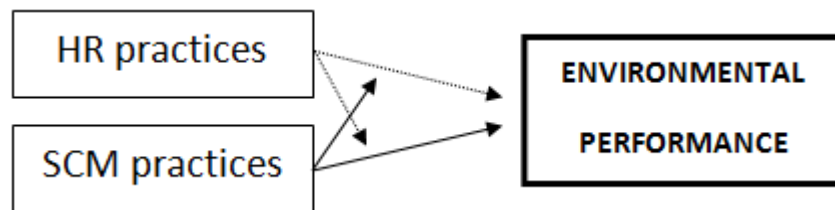
***Hypothesis 3b: HRM and SCM practices have an independent effect on environmental performance.***



**Figure 19: Independent effects's approach between SCM and HRM practices**

Sarkis et al. (2010) conducted a survey in which the results show that automotive companies are only adopting environmental practices if training programs are in effect, in order to achieve effective response to pressures. The strongest relationship with training as a mediator seemed most evident with regards to eco-design practices; in fact among all the environmental practices, this one may be believed the most technical, which may explain the need for training in order to successfully convince internal users of these methods about the importance of integrating eco-design practices into their activities. Training may need to serve a dual purpose in this situation, requiring a focus on both competency and motivation. Technical personnel typically have need of both dimensions for eco-design innovation (Johansson, 2002). These two dimensions in training also further the likelihood of adoption of these practices by human resources due to the building of their capacities (Boks, 2006). From Chadwick's third theory and from the previous example we derive the following hypothesis:

*Hypothesis 3c: HRM and SCM practices have a complementary effect on environmental performance, in which the effects of component HRM practices on system outcomes both moderate and are moderated by the effects of the other SCM practices in the system.*



**Figure 20: Efficient complementarities's approach between SCM and HRM practices**

# 5. Methodology

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This research aims to investigate the relationship between the Supply Chain practices and the Human Resources practices, and specifically the impact that both of them have on the environmental performance of a firm. As shown in the literature chapter, it is evident that this theme is still not well explored among the scholars; in fact, while in the SC literature there are lots of studies that underline the SC practices impact on the company's environmental performance, in the HR world the role of human resource management systems in organizations to achieve environmental sustainability is less analyzed.

## 5.1 General key features of survey

The knowledge of a phenomenon articulated in a theoretical form using well-defined concepts, models and propositions described in the previous chapter is the scope of our research.

Babbie (1990) and Kerlinger (1986) claim that survey research, like the other types of field studied, can contribute to the advance of scientific knowledge in different ways. Accordingly, researchers often distinguish between exploratory, confirmatory (theory testing) and descriptive survey research (Pinsonneault and Kraemer, 1993; Filippini, 1997; Malhotra and Grover, 1998). In case of *confirmatory survey research*, data collection is carried out with the specific aim of testing the adequacy of the concepts developed in relation to the phenomenon, of hypothesized linkages among the concepts, and of the validity boundary of the models (Forza, 2002). This definition is perfectly suitable for the purpose of this thesis so we choose to utilize *survey research method*.



Survey research is used: “to answer questions that have been raised, to solve problems that have been posed or observed, to assess needs and set goals, to determine whether or not specific objectives have been met, to establish baselines against which future comparisons can be made, to analyze trends across time, and generally, to describe what exists, in what amount, and in what context.” (Isaac & Michael, 1997). This method allows collect data from a large number of firms, it uses a selected portion of the population from which the findings can later be generalized. According to McIntyre (1999), surveys have lots of strengths as requiring minimum investment to develop and administer, easy for making generalizations and they are capable of obtaining information from a large samples of the population; finally surveys can accurately document the norm, identify extreme outcomes, and delineate associations between variables in a sample (Attewell and Rule, 1991).

## **5.2 The specific key features of the survey performed for this study**

Data are collected through two questionnaires that have common part dealing about the environmental performance and the registry of the firm, but they differ for a single part that is about specific practices. One is dedicated to Supply Chain practices and the second to Human Resources practices. We also have two kind of respondent, one for each questionnaire: for the SC part, the respondent is possibly a Supply Chain manager or a Chief Purchasing Officer or a Purchasing Director, while for the second one the respondent is a Human Resources Director or a Human Resource Manager.

Because of the fact that for our research we need to contact high level professionals, we chose to involve two important Associations of both the professional categories:

- *ADACI*, “*Associazione Italiana Acquisti e Supply Management*”, an Italian association that joins professionals who work in Supply chain, Purchasing and procurement, facility management, material management and Logistic area. Its scope is to analyze and optimize the organization of these functions, enhance and promote the evolution within the enterprise, institutions, government agencies, universities and research institutes. ADACI is the only industry association comprising over 1500 businesses and professionals belonging to a wide range of production companies and services. It is a founding member of the IFPSM, “International federation of purchasing and supply management”, a global body representing more than 150000 professionals from forty countries and cooperates with the main existing supranational organizations.

- *GIDP*, “*Gruppo Intersettoriale direttori del personale*”, an association whose primary purpose is to bring together all Personal Directors, involving them in various activities. The events that GIDP organizes are both prestigious and actively promote opportunities for professional growth and cultural enrichment, interesting moments of culture, in order to build relationships not only working, but also human. Currently, GIDP operates a network of more than 3800 managers of human resource area which represent the major Italian businesses.

These two Associations contribute to identify the best question to ask practitioners, to approve the ending questionnaires form and to collaborate with us to spread the survey to their associates; it has been an important support for reaching many potential respondents and to formulate the right question ensuring that the language of the questionnaire was consistent with the respondent's level of understanding. In fact if a question is not understood or interpreted differently by respondents, the researcher will get unreliable responses to the question, and

these responses will be biased (Forza, 2002). Furthermore the role of expert managers of the associations is to prevent the inclusion of some obvious questions that might reveal avoidable ignorance of the investigator in some specific area.

In our research respondents are asked to answer closed questions because they facilitate quick decisions and easy information coding. We use a six-point Likert scale questionnaire to evaluate the presence of certain practices in their organizations. This method was developed by the American educator and organizational psychologist Rensis Likert in 1932 as an attempt to improve the levels of measurement in social research through the use of standardized response categories in survey questionnaires; the Likert Scale is an ordered, one-dimensional scale from which respondents choose one option that best aligns with their view (Source: [www.infosurv.com](http://www.infosurv.com)).

We use this type of scale because is the most widely used approach to scaling responses in survey research, as we have seen in the scientific literature. This scale used in different papers as, for example, Zhu et al (2008) and Kenneth W. Green Jr et al (2012), which was 1= Not considering it, 2 = planning to consider it, 3 = Considering it currently, 4 = Initiating implementation and 5 = Implementing successfully, but we decide to transform it in a six point scale because we prefer not to give the respondent a neutral or ambivalent answer choice. The respondents cannot choose the moderate value, middle point in this kind of rating scale because they have to choose between one of the two qualifications of the scale to be the answer, with this method, the respondents have to consider for a while or a level (Chomeya, 2010).

The theme of choosing a five point or a six point Likert scale is very discussed in literature: for example in February 2006, Infosurv conducted a forum of market researchers to understand their preference between 5-point and 6-point Likert scales. Their conclusion is that the most of researchers agree that it is preferable to adopt a 5-point scale when conducting survey research (71% of tested people),

because survey respondents might feel neutral about a given topic, and so, with a 5-point Likert scale, which has a neutral midpoint, respondents are not forced to choose a more positive or negative response. But we want to avoid neutral answers, we want that respondent take a stand on the research theme therefore we choose the six point one. Our choice is supported by a study of Rungson Chomeya in 2010 which compares the two scales that we discussed before; his result is that the Likert's scale six points tend to give the discrimination and reliability values which are higher than the Likert's scale five points and that in the six scale the deviation or the risks which might be happened from the deviation of personal decision making are reduced (Chomeya, 2010). So the scale we used in our questionnaire is a six point Likert that we translate into Italian language that is 1 = non considerate; 2 = si prevede di considerarla; 3 = oggi in considerazione; 4 = in fase di progettazione operative; 5 = in piena fase di attuazione; 6 = implementata con successo.

The next step was to decide the diffusion method of the survey: Watt et al. (2002) note that using web-based evaluation questionnaires can bypass many of the bottlenecks in the evaluation system (e.g. data entry and administration) and move to a more "just in time" evaluation model so we choose to create an online questionnaire using the most commonly used survey tool online, Survey Monkey, which allows users to create their own surveys using question format templates.

We decide to use Internet for our research for several reasons:

- Simplicity of usage for both the creator of the survey and the respondent: surveys can be created quite quickly, once you learn how to use the tool and on the other hand it is relatively simple for respondents to complete online surveys and for their responses to be tabulated and analyzed.

- Low Cost: survey costs can be divided into two categories: preparation and administration. Regarding to preparation costs, with the diffusion of Internet and with the availability of advanced survey software online questionnaire development tools, preparation costs are minimum. The major cost is not the acquisition cost of the survey capabilities, but rather, the time to learn how to use the survey software tool. In terms of survey administration, online surveys are automatically collected into the database, and then tabulated and analyzed in a coordinated, integrated manner that greatly reduces costs. So surveys are self-administered and do not require high costs. Also Pitkow and Recker (1995) claim the minimal cost compared with other means of distribution.

- Global reach: unlike telephone or direct surveys, you can survey a high number of people very easily. Internet is a very efficient way for collecting information from a large number of respondents, reducing or obviating geographical dependence. The internet will then be an even more valued tool to obtain information from respondents living in different parts of a country or around the world, simply (Evans and Mathur, 2005).

- Faster response: Online surveys can be administered in a very time-efficient manner; Kannan et al. (1998) say that the speed and global reach of the internet allow real-time access for interactions with geographically diverse respondent groups and information servers.

- Flexibility: Internet web form surveys are flexible: they can be conducted in several ways like e-mail with embedded survey, e-mail with a link to a survey URL, visit to a web site by an internet surfer who is then invited to participate in a survey. For example ADACI put the link to the questionnaire on the home page of its website.

- “Comfortable” for respondent: with online surveys the respondent can start responding and then abandon it and decide to complete the survey at a

convenient time for them or they can look at the instructions and decide not to reply.

- Question diversity: Online surveys are capable of including dichotomous questions, multiple-choice questions, scales, questions in a multimedia format, both single-response and multiple-response questions, and even open-ended questions.

- It reduces errors in transcribing the data from the original documents to a computer database. In this process with no-web based survey, about 2-4 per cent of the data can be incorrectly transcribed (Swab and Sitter, 1974).

Survey Monkey tool, that we decide to use, allows us to reach all these advantages: in fact its goal is “to enable anyone to create professional online surveys quickly and easily” ([www.surveymonkey.com](http://www.surveymonkey.com)). Its primary strength is an intuitive web interface, which makes it easy for even non-technical folks to create surveys and export collected data, but it is also plenty of feature that give the possibility to customize the survey. Survey invitations are typically sent electronically through an email which contains a link to an HTML form that is the survey questionnaire and data are stored in a database that makes simple analyzing the responses. This database can be export in a format like “.csv” or “.xls” ready to be used in statistical software. If we had chosen a paper questionnaire we would have collected data and copy them on computer, extending the time of analysis and introducing redundancy in the activities.

The survey consisted of emailing a cover introduction and the questionnaire to the appropriate executive of each corporation. We kept in mind some basic rules suggested by Forte (2002): courtesy, presentability, readability are key for successful data collection. Questionnaire contains an appropriate introduction, instructions, and a well-arrayed set of questions with good alignment and response

alternatives to make it easier for the respondents to answer the questions. First page have a colored banner with logos of Politecnico of Milan and the logos of ADACI and GIDP because bright and colored image remind the respondent about the request to complete the questionnaire.

The first email was sent at the middle of February 2013 to a list of personal contacts (about 100 from SCM world and 90 from HR one) and ADACI's associates: about two weeks later to the non-respondents of SC were sent a reminder including another copy of email with link to the SC online questionnaire and the same for HR non-respondent. Many organizations might also be reluctant to disclose concrete environmental data due to the sensitive nature of such information, so the respondents were guaranteed confidentiality and we ensure they would have received the overall averaged results of the survey. GIDP sent the questionnaire to its associates one month after ADACI.

Currently we have 149 questionnaire responses with 55 usable surveys from services and manufacturing firms.

Other research into green supply involving surveys has used a sample size of similar proportion to this research. Rao (2002) in particular produced significant findings of green supply with a sample of only 52 firms and Bowen et al. (2001a) used a sample of only 24 firms (with two sets of respondents within each firm), Dayna Simpson, Damien Power and Daniel Samson (2007) distribute 400 surveys and receive 56 usable surveys for a response rate of 15 percent.

Our number of respondent is a good sample for conduct the analysis; according to Hair et al. (1998) a minimum number of 50 observations are in fact required to conduct a factor and regression analysis.

### **5.3 Measurement development**

Action of reducing abstract constructs so that they can be measured presents several problems: alignment between the theoretical concepts and the empirical measures, the choice between objective and perceptual questions, or the selection of one or more questions for the same construct. According to Forte (2002) these problems can be overcome by using operational definitions that have already been developed, used and tested.

In fact we chose variables always referring constructs and measures already existing in literature and comparing them with opinions of professors and practitioners. Variables that we introduced in our questionnaire will be explained in the very next subchapters.

We had several meetings with the presidents of the respective associations to get feedback about the applicability of the questionnaires and they gave us some pointers as a limited length and number of questions and the use of the Italian language. The latter information was necessary: in fact our research is focused on companies located in Italy and so ADACI and GIDP advised us against the use of English language, because in their opinion we would have “lost” a good portion of potential respondents due to the burden of translation. Therefore we decided to translate in Italian our English version of the questionnaire. They also insisted that we homogenize the descriptions of the scale of judgment: this is important to help the respondent to fill in the survey with logic of interpretation common for each question: so, as we said before, we chose a six point Likert scale for all questions in our survey.

Regarding the translation of the questionnaires, we used the TRAPD approach that is a protocol for a team translation model. Team approaches to survey translation and assessment have been found to provide a richer source of options to choose from for translating items, and a balanced critique of versions (Guillemin et al., 1993; Acquadro et al., 1996; McKay et al., 1996; Harkness and



Schoua-Glusberg, 1998). TRAPD is an acronym for Translation, Review, Adjudication, Pretesting and Documentation, the five interrelated procedures recommended as the framework for SHARE translation and assessment (cf. Harkness, 2003, Harkness, Pennell and Schoua-Glusberg 2004).

Three different sets of people are required in the team to produce the final version of a translated questionnaire: translators, a reviewer, and an adjudicator. Adjudicators make the final decisions about which translation options to adopt and he ends the review process.

In this case we were the translators, in fact we separately translated the questions into Italian, professors were the reviewer of our work and finally ADACI and GIDP were the adjudicator because they approved the translation.

### **5.3.1 SC constructs**

In the scientific literature we found out many articles that propose different supply chain constructs, we collect them and we transform them into the questions of our surveys. We select the most significant constructs on the basis of two different criteria: the value of Cronbach alpha (Cronbach, 1951) which has to be greater than 0,7 and the number of citations of the construct on the search portals like Isiknowledge, Google Scholar and Scopus. In fact, one of the most popular reliability statistics in use today is Cronbach's alpha, that determines the internal consistency or average correlation of items in a survey instrument to gauge its reliability (J. Reynaldo A. Santos, 1999).

Cronbach's alpha is also the most used reliability indicator in Operational Management (OM) survey research. Cronbach's alpha can be expressed in terms of  $\rho$ , the average inter-item correlation among the  $n$  measurement items in the instrument under consideration, in the following way (Forza, 2002):

$$\alpha = \frac{n\bar{\rho}}{1 + (n - 1)\bar{\rho}}$$

Cronbach's alpha is therefore related to the number of items,  $n$ , as well as to the average inter-item correlation  $\rho$ . Nunnally (1978) states that new developed measures can be accepted with  $\alpha > 0.6$ , otherwise  $\alpha > 0.7$  should be the threshold. With  $\alpha > 0.8$  the measure is very reliable.

An extract of the supply chain constructs that we have chosen are represented in the table below, while others are reported in Appendix 3:

<i>Internal environmental management</i>		<i>Cronbach <math>\alpha</math></i>
<b>PLAN</b>	Commitment of GSCM from senior managers (IEM1)	0,947
	Support for GSCM from mid-level managers (IEM2)	
	Cross-functional cooperation for environmental improvements (IEM3)	
	Total quality environmental management (IEM4)	

**Table 8: Extract of the supply chain constructs inserted in the survey**

It's interesting to note that constructs chosen cover all the processes included in the SCOR model: these constructs represent supply chain questions that we use to investigate the implementation of green practices into firms.

### **5.3.2 HR constructs**

Also some HR authors, as shown in the literature review, have suggested that theoretically some HR practices could have an impact on green performance, so we have chosen from the existing literature the most relevant HR constructs, in order to create a list that composes a very important part of our HR questionnaire. Among constructs we found out, a panel of experts selected and validated the measures that we eventually inserted in the questionnaire: the panel was

composed by HR directors and professors of Politecnico of Milan. It's important to underline that we chose to classify these practices according to the AMO theory. In the table number 9 there is an example of practices, taken from the questionnaire, classified on the basis of AMO, other constructs we took in consideration is reported in Appendix 4.

		Construct
Ability	Selection	Green criteria to select job candidates
		Green employer branding
		Green issues in induction/socialization processes
Motivation	Pay and reward systems	Staff suggestions in EM rewarded
		Green benefits (transport/travel)
		Monetary-based EM reward system
		Recognition-based rewards in EM for staff
		Executive compensation for managers partly based on EM stewardship
Opportunity	Employee involvement	Green issues specified in job descriptions
		Encouraging employees to make suggestions for EM improvements
		EM education programmes for union members
		Joint management/union training programmes in EM
		Green union representatives

Table 9: Extract of HR construct inserted in survey

### 5.3.3 Collaboration

Regarding the collaboration part, presidents of ADACI and GIDP have required us to introduce into the survey this question in order to underline a possible collaboration between Supply Chain and Human Resource functions. The inclusion of this part is important to understand how much the two functions really interact with each other about the aspect of environment sustainability. Collaborative interdepartmental integration involves predominantly informal processes based on trust, mutual respect and information sharing, the joint ownership of decisions, and collective responsibility for outcomes (Griffin and Hauster, 1996). Collaboration between departments is often needed to improve departments performance and involves the ability to work together and the ability

of individuals from interdependent departments to build meaningful relationships (Ellinger, 2000).

The question that we inserted in our questionnaire is based on an adaptation of a collaboration construct we found in some papers like Kahn (1996) and Ellinger (2000): in table 10 we reported the construct.

Collaboration		Loading
measures	Achieve goal collectively	0,84
	Have a mutual understanding	0,87
	Informally work together	0,84
	Share ideas, information and/or resources	0,86
	Share the same vision of the company	0,78
	Work together as a team	0,9

Table 10: Question of collaboration inserted in the survey

### 5.3.4 Environmental Performance

The environmental performance (EP) is the *dependent variable* of our research and it “is related to affirmative outcomes for organizations in regards to the natural environment” (Bonnie F. Daily, John W. Bishop, Jacob A. Massoud, 2012). This may include a multitude of results depending on the industry such as: decreases in hazardous effluent, decreases in emissions, decreases in green house gases, reductions in solid waste, and fewer environmental emergencies among others (Zhu and Sarkis, 2004). These efforts usually have a positive effect on the overall performance of the same firms by reducing costs, like several researchers argue (Al-Tuwaijri et al., 2004; Hart and Ahuja, 1996; King and Lenox, 2002; Klassen and McLaughlin, 1996; Molina-Azori’n et al., 2009).

Our research about environmental measures starts with a review of currently used measures, considering the context in which they are used, and classify them distinguishing from qualitative and quantitative ones.

Starting from the concept that environmental performance can basically be conceived as the extent to which companies meet the expectations of their stakeholders regarding environmental responsibility (Ruf et al. 1998; Carroll 2000), the empirical research uses a large variety of approaches to measure it. For example James (1994) collects them into process, resource consumption, emissions and waste, efficiency, risk, ecological impact, consumer perception and financial impact related measure. Bartolomeo (1995) develops a more systematic approach by separating performance indicators from impact indicators. Performance indicators are based on processes (efficient use of raw materials) and systems (effectiveness in achieving eco-efficiency targets) or refer to a financial dimension (economic efficiency in implementing environmental programs). Impact indicators evaluate environmental impacts in physical and monetary terms.

Other commonly utilized metrics often consider a mix of business costs, profits, besides environmental impact (Characklis and Richards, 1999; Illinitch et al., 1998; Peacock, 1993). Illinitch et al. (1998) identify four dimensions of the environmental performance construct. These dimensions include organizational systems, stakeholder relations, regulatory compliance, and environmental impact. Others claim that developing appropriate measures of environmental performance is complex, and there is no consensus on a “best” measure (Characklis and Richards, 1999; Illinitch et al., 1998; Rikhardsson, 1998; Young and Welford, 1998). In fact, in literature, we found also researchers who rely on self-report measurements. Subjective measures of organizational performance have been commonly used and frequently exhibit convergent validity with objective measures (Dess and Robinson, 1984). Some studies have also operationalized and measured the construct in a self-report fashion (Daily et al., 2007; Melnyk et al., 2003).

Jung et al. (2001) instead separate operational measures into four causally linked subcategories, namely input, process, output, and outcome measures. Input and output measures refer to companies’ physical interactions with the natural

environment, e.g. raw material, water and energy consumption, land use, emissions, waste arising, and noise. Also the physical impacts of companies' products and services are considered. Process measures deal with process changes regarding the manufacturing process, the use of new technology, recycling activities, transportation, and supplier management. Also changes of inputs, package and design of products and services are included in these measures. Jung et al (2001) support that crucial is the category of outcome measures where corresponding metrics do not measure inputs and outputs but their impacts on stakeholders, e.g., customers, employees, investors and society as a whole, including economic impacts.

In the table below we have summarized the review of the literature reporting only paper that described the item in a complete way.

MEASURE	TYPE	RESPONDENT	FIRM	REFERENCE
The independent variable environmental performance was determined on the basis of KLD environmental performance ratings. To evaluate environmental performance, KLD evaluated a number of activities that were indicators of environmental strengths or environmental concerns. Environmental performance was developed as a continuous variable by subtracting the pro-rata concern score from the pro-rata strength score for each firm.	Qualitative		Firms were included in the study sample if they were (a) included in the S&P 500 in 2005 and 2006,(b) evaluated for environmental performance in the 2005 KLD performance ratings; and (c) received a request from Ceres to participate in the Ceres 2006 Climate Disclosure Project survey.	<i>Beyond Acclamations and Excuses: Environmental Performance, Voluntary Environmental Disclosure and the Role of Visibility</i> " Cedric E. Dawkins John W. Fraas. <i>Journal of Business Ethics</i> (2011) 98:387-397
survey: Seven-point Likert scales were used to measure the following attitudinal variables as perceived by managers: level of managerial environmental training, hourly employee environmental training, managerial environmental empowerment, hourly employee environmental empowerment, hourly employee use of environmental teams, and environmental performance. The scale items ranged from "strongly disagree" to "strongly agree."	Qualitative	Respondents were mostly senior level employees such as environmental or plant managers;	Mexican maquiladora industry	<i>"The role of training and empowerment in environmental performance: A study of the Mexican maquiladora industry"</i> Bonnie F. Daily, John W. Bishop, Jacob A. Massoud. <i>International Journal of Operations &amp; Production Management</i> (2012)
We measure environmental performance here by the ratio of total emissions to total sales (TOTAL RELEASES/SALES).	Numeric		relies on firm-level data on EMPs for S&P 500 firms included in the Corporate Environmental Profile Directories compiled from firm surveys by the Investor Research Responsibility Center for 1994-1995	<i>"Incentives for environmental self-regulation and implications for environmental performance"</i> Wilma Rose Q. Anton, a George Deltas, b and Madhu Khannac <i>Journal of Environmental Economics and Management</i>

**Table 11: Extract of environmental measures found in literature. The complete table is reported in Appendix 5**

Environmental ratings provided by rating agencies are often used for measuring EP. For example the Franklin Research and Development Corporation (FRDC) (Russo and Fouts 1997), Kinder, Lydenberg and Domini (KLD) (Griffin and Mahon 1997; Waddock and Graves 1997) and the Swiss bank Sarasin & Cie (Ziegler et al. 2002).

For our questionnaire we have chosen to employ the Kinder, Lydenberg and Domini (KLD) ratings of environmental performance (see appendix for complete KLD criteria) because how Cedric E. Dawkins John W. Fraas (2011) state it shows some advantages from the other:

- they utilize an objective set of evaluative criteria;
- they are consistently applied across companies by a specialized or independent staff;
- they employ a wide variety of company, government and media sources;
- they have been widely used in Corporate Social Performance (CSP) research;

KLD covers approximately 80 indicators in seven major Qualitative Issue Areas including Community, Corporate Governance, Diversity, Employee Relations, Environment, Human Rights and Product. In particular to evaluate environmental performance, KLD evaluated a number of activities that were indicators of environmental strengths or environmental concerns. The KLD environmental performance strength assessment considered proactive measures of performance such as pollution prevention programs, use of recycled materials in manufacturing, maintenance of equipment, and ISO certifications. Instead, the environmental weakness assessment accounted for negative outcomes such as recently paid fines for waste management violations, high toxic emissions, and regulatory fines or controversies (KLD Analytics, 2007).

KLD measures used in our questionnaire were:

- Recycling. The company either is a substantial user of recycled materials as raw materials in its manufacturing processes or a major factor in the recycling industry.

- Clean energy. The company has taken significant measures to reduce its impact on climate change and air pollution through use of renewable energy and clean fuels or through energy efficiency. The company has demonstrated a commitment to promoting climate-friendly policies and practices outside its own operations.

- Hazardous waste. The company has recently paid substantial fines or civil penalties for waste management violations.

- Beneficial products and services. The company derives substantial revenues from innovative remediation products, environmental services, or products that promote the efficient use of energy, or it has developed innovative products with environmental benefits.

- Substantial emissions. The company's legal emissions of toxic chemicals (as defined by and reported to the Environmental Protection Agency (EPA)) from individual plants into the air and water are among the highest of the companies followed by KLD.

We have also chosen to integrate these KLD item with measures having high factor of loadings used by a recent research of Bonnie F. Daily, John W. Bishop, Jacob A. Massoud, (2012). First three line measures highlighted in light-gray were preferred for good factor of loading and because they weren't redundant with KLD's measures.



Environmental performance		Loading
measures	Our facility's environmental efforts have significantly reduced waste within the production process	0,93
	Our facility's environmental efforts have resulted in improved product quality	0,91
	Focusing on environmental efforts has helped enhance our facility's reputation	0,97
	Our facility's environmental efforts have lead to improved plant performance	0,98
	The benefits of the environmental efforts have outweighed the costs	0,85
	Our environmental efforts have caused us to investigate alternate technologies and procedures	0,8
	Our facility's environmental efforts have helped our company design/develop better products	0,89

Table 12: Environmental measures used in questionnaire

### 5.3.5 Enablers

Manufacturing organizations have begun to implement green supply chain management practices in response to customer demand for products and services that are environmentally sustainable and that are created through environmentally sustainable practices and in response to governmental environmental regulations (Murray, 2000; Green et al., 1998).

According also to Kee-hung Lai and Christina W.Y.Wong (2011), as the regulations directed at the manufacturing sector can bring operations and performance implications for example, it will be important pay attention to the *moderating role of the environmental regulations*.

The non compliance penalties and fines as well as the public disclosure are regulatory punishments for polluting firms (Wallace N. Davidson III, 2001).

For example to deter such enormous waste production, Chinese government imposes higher fee of waste disposal and encourages organizational adoption of environmental management practices to retrieve reusable products in the hope of saving costs and alleviating pollution problems.

In many instances, companies are forced to be proactive in environmental protection in the hope of reach both environmental and productivity benefits, while gaining recognition by their markets on regulatory compliance. Such pressures highlight the needs of manufacturing enterprises to improve their environmental management practices in the logistic chain (Kee-hung Lai and

ChristinaW.Y.Wong, 2011), so is reasonable to assume that pressures push many firms to improve green practices among all supply chain.

Environmental regulatory pressure is concerned with regulations that are enacted by local or oversea regulatory bodies to control environmental damages caused by organizational activities ranging from production, transportation, to product disposal. In many cases, these environmental regulations are mandatory for enterprises to produce, distribute, and sell their products under the legal requirements.

In the analysis of Kee-hung Lai, ChristinaW.Y.Wong (2011) results that regulatory pressure moderates the performance link. Specifically, they found that Green Logistic Management, that is an answer to regulatory pressures, is positively associated with environmental performance in reducing carbon emission, waste water, solid waste, and consumption of hazardous materials.

Many articles suggest that sourcing from environmentally irresponsible manufacturers has negative impact on the reputation of downstream customer firms, e.g., retailers, which often interact directly with individual end consumers. This phenomenon gives rise to an increasing trend for manufacturing enterprises undertaking actions to improve the environmental sustainability, seeking ISO14000 certification, environmental auditing, and retrieving reusable products for reuse to satisfy the environmental requests of their customers. According to Gonzalez-Benito (2006), stakeholder pressure is the main factor that leads organizations to seek more advanced green management.

In fact, besides regulatory considerations, firms pursue environmental sustainability due to customer pressures. To gain acceptance in the global market, companies, in particular those with export orientation, prefer to have a green image: by adopting green supply chain practices, firms can meet the preferences of customers about related products with avoidance for environmental incidents and the consequential fines and legal costs.

As we said in the literature review, the implementation of green practices improves environmental reputation of firms, cultivating a positive publicity and corporate image to attract environmentally conscious customers (Douglas A. Schuler and Margaret, 2006). There are many products in the market labeling their environmental consciousness, and considering customers may switch if a product violates environmental laws or pollutes the environment is correct to assess how the customer's pressures may moderate the implementation of green practices in both HR and SCM and the environmental performance. These kind of external pressures on the organization's environmental responsibilities considered from the perspective of public or institutional stakeholders or the end-consumer, are already included in some construct of our Supply Chain questionnaire part.

But customers are not only end consumer, they can be also other firms in a relationship between supplier and customer. Dayna Simpson, Damien Power and Daniel Samson (2007) studied how this phenomenon manifests in the automotive supply chain. They have explored the moderating impact of relationship conditions existing between a customer and its suppliers on the understanding and effectiveness of the customer's environmental performance requirements. In other words their research provides support for the hypothesis that customers may be able to directly and indirectly improve a supplier's environmental performance.

They found that existing conditions of the supply relationship can moderate the impact that the customer's environmental performance requirements have on the environmental commitment of its suppliers.

The major finding of their research was that the customer's environmental performance requirements can have a positive influence on a supplier's strategic level of commitment toward its environmental responsibilities. Besides the presence of relationship conditions that promote greater levels of financial commitment between the supplier and the customer is expected to increase this influence (Simpson and at, 2007).

Often a range of measures is used by customers to encourage their suppliers to meet such performance requirements. Klassen and Vachon (2003) investigated the role of supply-chain-level evaluation and collaboration activities on plant level environmental investment. They found that greater customer involvement and scrutiny of suppliers tended to: “capture the attention of plant managers and encouraged greater environmental investment” (Klassen and Vachon, 2003).

Already established in prior research is that higher levels of environmental commitment is likely to generate higher levels of environmental performance in the organization (Simpson et al, 2007).

This topic about the customer pressures between firms is dealt in our part of enablers questions.

At last also Preuss (2002) identified that customer requirements, environmental legislation and regulation, as drivers of the adoption of green practices.

We developed a specific structured part of the survey to measure the practicing managers’ perception about constructs like customer pressure, and regulatory pressure suitably adopting the same scales. The scale is based on Zhu and Sarkis (2004) that in a previous research have evaluated the environmental regulatory pressures experienced by manufacturers.

We generated a pool of measurement items from the literature on environmental management: then we chose them considering a high value of Crombach alpha. Light-grey highlighted cells hereunder shown are utilized in the survey (see figure 13). These measurement items are based on Zhu Q H, Sarkis J, Lai K-H (2007) survey that were used also by Dayna Simpson, Damien Power, Daniel Samson (2007) and Kee-hung Lai, ChristinaW.Y.Wong (2011) and they were systematically amended to be easily read in Italian.

Environmental regulatory pressure	
measures	Our products are sold to countries with specific environmental laws
	Environmental regulations governing our products are very strict
	The materials used in our products are controlled by regulations that limit the consumption of hazardous materials
	We comply with regulations that limit the disposal of waste
	Our products comply with environmental regulations of many countries

Customer pressure	
measures	Our major customer requires us to achieve ISO14000 certification
	Our major customer has a clear policy statement on their commitment to the environment
	Our major customer would withhold our supply contract if we did not meet their environmental performance requirements
	Our customers consider that it is our responsibility to retrieve usable products from the markets
	Our customers carry out environmental audits of our firm
	Our customers take part in our product return program

**Table 13: Enablers question used in questionnaire**

### 5.3.6 Economic Performance

This variable has been required by presidents of ADACI and GIDP to investigate the perception of the sample of respondents regarding the economic / financial results of the actions taken by the company towards environmental sustainability.

Financial performance is a construct emphasizing the profitability and growth of the firm. We used a set of well-established perceptual measures of financial performance from the literature, asking each respondent to rate their organization's performance in four categories relative to their competitors. The measures in our study is based on Miller and Friesen (1984) research, but highly similar variations of these items can be found in the planning and resource-based literature (e.g. Boyd, 1991; Powell, 1995; Ramanujam et al., 1986) or in William Q. Judge, JR Thomas J. Douglas (1998). Latter found that the level of integration of environmental management concerns in the strategic planning process was positively related to financial and environmental performance. For example, the General Motors Corporation integrated environmental issues into its strategic planning process (General Motors, 1994) and this has resulted in improved financial and environmental performance.

Economic / Financial performance	
measures	Return on investment
	Earnings growth
	Sales growth
	Market share change

Table 14: Economic question used in questionnaire

### 5.3.7 Firm Descriptive

The unit of analysis in this research is the company. However the company can't give the answers: people who work in the firm provide information on that company (Forza, 2002).

For collecting data that describe both the firm and the respondent, we adopted a consolidated module taken from the International Purchasing Survey (IPS) that is an academic research project exclusively designed to investigate how organizations plan their purchasing strategies and which performances are achieved. Items like sector, main customers, number of employees, approximate annual sales describe the firm and items like job title and number of year worked in the firm describe the respondent.

The reliability of this form is supported by the leading research institutions that have collaborated for that kind of project. They are 13 institutions between Europe and North America, which have contributed to design the research framework and to conduct that survey. Naturally we have changed the reference specific for "purchasing respondent" and replaced it with terms for "Human resource" or "Supply chain" respondents. Some information will be useful for future researchers for classify and give consistency to the answer and the results; dimension can be used as control variables and sector as moderator variables. For example Al-Karim Samnani and Parbudyal Singh (2013) said that two important contextual factors as firm size and industry (e.g. services) could influence fit

results. Larger firms or firms in specific industries typically have more resources to implement different practices (e.g., Gonzalez-Bonito and Gonzalez-Bonito 2005; Pullman et al. 2010; Rahman, Laosirihongthong, and Sohal 2010).

### **5.3.8 Survey composition**

In the previous sub-chapters we have shown the variables that we want to measure through the questionnaire. Below there is the description of the composition of our two surveys:

#### *Supply Chain questionnaire*

- general information about the company and the respondent;
- collaboration between supply chain and human resources department;
- current Green SC practices adopted in the company;
- impact that practices have on firm's environmental and economic performance;
- institutional and operational enablers that prompt the adoption of green supply chain practices

#### *Human Resource questionnaire*

- general information about the company and the respondent;
- current Green HR practices adoption in the company;
- impact that practices have on firm's environmental and economic performance.
- institutional and operational enablers that prompt the adoption of green human resource practices

It is important to note that there is a part in common between the two questionnaires which is composed by the firm descriptive and the measure of environmental and economic performance: we decided to insert in both questionnaires the firm descriptive in order to match HR and SC responses of the same company. Regarding the environmental performance, we inserted it in both questionnaires for two reasons: first of all because in this way we can study the relationship that HR and SC practices have on EP separately, and then because in case of non response of one respondent (HR or SC), we would have the measure of the impact of the other respondent in any case.

The two complete questionnaires are reported in the appendix 6 and 7.

#### **5.4 Potential Managerial Implication**

This research tries to give an explanation about the implementation of environmental management and to help firms in understanding how they can improve environmental performance working on human resource and supply chain functions.

Several implications for companies can be derived from the future results of this research. This study, in fact, will better define which HR practices or cluster of HR practices could be more correlated with environmental performance: the same thing will be defined for SC practices. In a company, in fact, it is important to give a priority to the implementation of practices, considering economic budget, so, thanks to this study, companies would understand which actions adopt, implementing first practices that have a more impact on dependent variable Environmental Performance.

In an other perspective this thesis can contribute to choose not only individual practices, but also a set composed by SC and HR practices that will result good to reach a better efficiency in environmental issues.



Eventually, for firms who have already implemented green supply chain practices and green human resource practices, this study will be a guide in order to improve their sustainability purposes.

## **5.5 Limitations**

The results from this study should be interpreted with an acknowledgment of the following limitations. Concerns over the validity of the causality of links have been often reported (Paauwe and Boselie, 2005; Guest, 2011). Past research points out to both the overuse of cross-sections research designs (Wright and Boswell, 2002:263), the lack of longitudinal designs, that may test the directions of causality (Marchington and Zagelmeyer, 2005), and the bias caused by time-lag. A serious limitation of the current research is, in fact, the problem of strict linear view of causality; in fact, we assume that input generates output but there's another type of causality, named reverse causality, in which is the opposite: output generates input. For example firms already known as sustainable company, have to activate green practices in their processes like firms with important economic performance can use some particular practices. A possible solution to this problem would be to conduct longitudinal studies that understand how this correlation evolves during the time (Marchington and Zagelmeyer, 2005). Another problem could be the bias caused by time-lag: considering that the effect of HRM and SCM on performance might require years, in fact, measuring HRM/SCM and performance at the same time-point is problematic (Boselie et al., 2005:79). We would expect to see a time lag between the introduction of a management practice and a subsequent change in environmental performance (Kozlowski & Klein, 2000). These temporal issues are rarely considered in organizational theory and research (Mitchell & James, 2001). To avoid this limitation there might be different solutions as to conduct case studies or submit two questionnaire in moment distant between them.

This research utilizes only functional view of HRM system through AMO theory, but also work practices that doesn't belong to AMO exist, like diversity, job security or teamwork. Same limitation exists for practices not included in SCOR model. Future research should analyze the relation between HR green practices and SC green practices, in a more general and overall survey, that includes practices that are not part of the AMO theory and SCOR model.

Another limitation to underline is that practices we include in our survey are called "intended HR practices", that are defined by the top level of the firm: in real work life, there are also "actual practices", which are mainly implemented by direct manager, and "perceived practices" that explain worker's point of view. Furure researches should analyze these two kind of practices addressing the survey to other type of respondents.

We only considered environmental and economic performance influenced by GSCM practice. Other aspects such as general operational performance and possible strategic financial and organizational performance could be investigated.

Regarding measurement, we assess the status of implementation of practices in companies but other measures could be used, as the intensity of sophistication or the coverage and the perceived quality. Latter measure asks not only if a practices is already implemented but also if it works well: in fact poor implementation of a specific hr practices may be more damage than not having it.

Moreover we used conceptually based descriptions of the practices that were derived from expert and a review of the literature but these may have been too simple in overview and response to capture the variance in adoption and implementation by firms.

Furthermore, as with all research, there are contextual limitations based on the sample. In this case, the sample represents only firms whose HR and SC professionals are associated with category associations (ADACI and GIDP) that could be more aware about the theme of sunstainability. Associations in fact

contribute to keep update their associates on many aspects regarding their profession.

Moreover the respondents are managers of only Italian companies, so generalizing beyond this may not be wise. Future research could extend sample going to test implementation of green practices in different cultural contexts. There is so a need for a comparative study between geographical areas, over long period of time, to truly understand what the changes and gaps have been and why they exist. Finally, it would be interesting to see if there are differences between industry sectors (i.e. manufacturing vs. service-based industries) in their environmental activities.

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## Appendix

### Appendix 1: HR constructs found in literature

	ABILITY		MOTIVATION		OPPORTUNITY		
Scientific literature	Attracting/selecting	Training & Development	Performance management/ appraisal	Pay and reward systems	Employee involvement	Empowerment & engagement	Supportive climate/culture and Union role
Green Human Resource Management: A Review and Research Agenda, Douglas W.S. Renwick, Tom Redman1 and Stuart Maguire, International Journal of Management Reviews, Vol. 15, 1–14 (2013)	Green issues specified in job descriptions; Green job candidates, applicants use Green criteria to select organizations; Green employer branding; Firms recruit employees who are 'Green aware'; Green issues in induction /socialization processes;	Employee training in EM to increase awareness, skills and expertise; Training for Green jobs, and integrated training to create an emotional involvement in EM; Trade union reps get information on EM, and union activist EM training; Green knowledge management; Using employees' tacit knowledge in EM; Training workshops for managers; Green MBAs; Green leadership styles	Green performance indicators included in PM system and appraisals; Communication of Green schemes to all levels of staff through PMA scheme, establishing firm-wide dialogue on Green matters; Managers/employees are set Green targets, goals and responsibilities; Managers are set objectives on achieving Green outcomes included in appraisals; Dis-benefits in PM system for non-compliance/not meeting EM goals	Staff suggestions in EM rewarded; Reward schemes linked to staff gaining EM skills via skill-based pay; Green benefits (transport/travel) rather than pay benefits cards to gain Green products; Financial/tax incentives; Monetary-based EM reward system; Monthly managerial bonuses for good EM; Recognition-based rewards in EM for staff; Executive compensation for managers partly based on EM	EI practices in EM including newsletters, suggestion schemes, problem-solving groups, low-carbon champions and Green action teams	Encouraging employees to make suggestions for EM improvements; Increasing employees' psychological empowerment enhances their willingness to make suggestions for EM improvements; Supportive managerial and supervisor behaviours develop employee engagement in EM	Wider EI in EM underpins pro-environment culture; EM education programmes for union members; Joint management/union training programmes in EM; Green union representatives

## Appendix 2: SC constructs found in literature

	PLAN			SOURCE	DELIVER			MAKE		RETURN
Scientific Literature	Internal environmental management	Green information systems	Eco-design	Green purchasing	Cooperation with customers	Green distribution	Green logistic management	Green manufacturing	reduction of material usage	Investment recovery
Kenneth V. Green Jr, Pamela J. Zelbst, Jeremy Meacham, Vikram S. Bhaduria, (2012), "Green supply chain management practices: impact on performance", Supply Chain Management: An International Journal	Commitment of GSCM from senior managers (IEM1) Support for GSCM from mid-level managers (IEM2) Cross-functional cooperation for environmental improvements (IEM3) Total quality environmental management (IEM4)	Reducing transportation costs. Supporting team work and meetings of globally distributed employees to limit their air travel. Tracking environmental information (such as toxicity, energy used, water used, air pollution). Monitoring emissions and waste production. Providing information to encourage green choices by consumers. Improving decision making by executives by highlighting sustainability issues. Reducing energy consumption. Supporting the generation and distribution of renewable energy. Limiting carbon and other emissions. Identifying the role of IS in energy policy.	Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)	Eco labeling of products (GP1) Cooperation with suppliers for environmental objectives (GP2) Environmental audit for suppliers' internal management (GP3) Second-tier supplier environmentally friendly practice evaluation (GP5) Providing design specification to suppliers that include environmental requirements for purchased item (GP6)	Cooperation with customers for eco design (CC1) Cooperation with customers for cleaner production (CC2) Cooperation with customers for green packaging (CC3) Cooperation with customers for using less energy during product transportation					Investment recovery (sale) of excess inventories/materials (IR1) Sale of scrap and used materials (IR2). Sale of excess capital equipment (IR3)
Evaluation of Construction Green Supply Chain Management Theodida Thipparat 2011 International Conference on Innovation, Management and Service IPEDR	Commitment of GSCM from senior managers (IEM1) Support for GSCM from mid-level managers (IEM2) Cross-functional cooperation for environmental improvements (IEM3) Total quality environmental management (IEM4) Environmental compliance and auditing programs (IEM5) ISO 14001 certification (IEM6) Environmental Management Systems exist (IEM7)		Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)	Eco labeling of products (GP1) Cooperation with suppliers for environmental objectives (GP2) Environmental audit for suppliers' internal management (GP3) Suppliers' ISO14000 certification (GP4) Second-tier supplier environmentally friendly practice evaluation (GP5).	Cooperation with customers for eco design (CC1) Cooperation with customers for cleaner production (CC2) Cooperation with customers for green packaging (CC3)					Investment recovery (sale) of excess inventories/materials (IR1) Sale of scrap and used materials (IR2). Sale of excess capital equipment (IR3)
George A. Zsidisin, Thomas E. Hendrick, (1998), "Purchasing's involvement in environmental issues: a multi-country perspective", Industrial Management & Data Systems, Vol. 98 Iss: 7 pp. 313 - 320			Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)	Cooperation with suppliers for environmental objectives (GP2) Environmental audit for suppliers' internal management (GP3) Suppliers' ISO14000 certification (GP4) Second-tier supplier environmentally friendly practice evaluation (GP5).						Investment recovery (sale) of excess inventories/materials (IR1) Sale of scrap and used materials (IR2). Sale of excess capital equipment (IR3)
Qinghua Zhua, Joseph Sarkisb, Kee-hung Lai. "Confirmation of a measurement model for green supply chain management practices implementation." Int. J. Production Economics 111 (2008) 261-273	Commitment of GSCM from senior managers (IEM1) Support for GSCM from mid-level managers (IEM2) Cross-functional cooperation for environmental improvements (IEM3) Total quality environmental management (IEM4) Environmental compliance and auditing programs (IEM5) ISO 14001 certification (IEM6) Environmental Management Systems exist (IEM7)		Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)	Eco labeling of products (GP1) Cooperation with suppliers for environmental objectives (GP2) Environmental audit for suppliers' internal management (GP3) Suppliers' ISO14000 certification (GP4) Second-tier supplier environmentally friendly practice evaluation (GP5).	Cooperation with customers for eco design (CC1) Cooperation with customers for cleaner production (CC2) Cooperation with customers for green packaging (CC3)					Investment recovery (sale) of excess inventories/materials (IR1) Sale of scrap and used materials (IR2). Sale of excess capital equipment (IR3)

	PLAN			SOURCE	DELIVER			MAKE		RETURN
	Internal environmental management	Green information systems	Eco-design	Green purchasing	Cooperation with customers	Green distribution	Green logistic management	Green manufacturing	reduction of material usage	Investment recovery
Scientific Literature										
Victor Guang Shi, S.C. Lenny Koh, James Baldwin, Federica Cucchella, (2012), "Natural resource based green supply chain management". Supply Chain Management: An International Journal, Vol. 17 Iss: 1 pp. 54 - 67			Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3) Accident prevention. Remanufacturing.	Eco labeling of products (GP1) Cooperation with suppliers for environmental objectives (GP2) Suppliers' ISO14000 certification (GP4) Second-tier supplier environmentally friendly practice evaluation (GP5) Holding awareness seminars for suppliers and contractors; Guiding suppliers to set up their own environmental programs; Bringing together suppliers in the same industry to share their know-how and problems; Informing suppliers about the benefits of cleaner production and technologies; Pressuring suppliers to take environmental actions; Choice of suppliers by environmental criteria;		Environment-friendly waste management; Environmental improvement of packaging; Eco-labelling; Taking back packaging; Recovery of company's end of life product; Providing consumers with information on environmental friendly products; Use of environmentally friendly transportation.				
Ninlawan C., Seksan P., Tossapol K., and Pilada W., "The Implementation of Green Supply Chain Management Practices in Electronics Industry"	Commitment of GSCM from senior managers (IEM1) Support for GSCM from mid-level managers (IEM2) Cross-functional cooperation for environmental improvements (IEM3) Total quality environmental management (IEM4) Environmental compliance and auditing programs (IEM5) ISO 14001 certification (IEM6) Environmental Management Systems exist (IEM7)		Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3) Design of product for support regulation. Design the products that weight and the least capacity for decrease taking time, the area stores, and the energy between the transportation loss. Design the products to be easy set up for the users in the most energy saving way. Design usability of part particularly for Extend using products, repair easy and increase efficiency. Make the maintains table for the capacity certainty of products and don't deteriorate which will cause gas glass house abandonment less.	Eco labeling of products (GP1) Cooperation with suppliers for environmental objectives (GP2) Suppliers' ISO14000 certification (GP4) Second-tier supplier environmentally friendly practice evaluation (GP5) Choice of suppliers by environmental criteria;	Cooperation with customers for eco design (CC1) Cooperation with customers for cleaner production (CC2) Cooperation with customers for green packaging (CC3)	Environmental improvement of packaging; Taking back packaging; Use of environmentally friendly transportation.		lead free - replace other substances such as bismuth, silver, tin, gold, copper. Rinse parts with clean water instead of using chemicals and reuse water. Quality control in inputs at vendor site and recheck before processing. Reduce power consumption in products such as ramp load/unload technology in HDD. Increase product life-span resulting in higher efficiency and productivity. Improve machine uptime.		Investment recovery (sale) of excess inventories/materials (IR1) Sale of scrap and used materials (IR2) Sale of excess capital equipment (IR3)
Joseph Sarkis a, Pilar Gonzalez-Torre b, Belarmino Adenso-Diaz "Stakeholder pressure and the adoption of environmental practices: The mediating effect of training"	Environmental Management Systems exist (IEM7) Recycling of solid waste and rubbish. Use of advanced prevention and safety systems at work.		Use of LCA for product design (LCA) Use of easy-to-break joints between components to facilitate disassembly. Clear identification of materials to facilitate disassembly. Use of standardized components to facilitate their reuse.						Reduction in the variety of materials employed in manufacturing the company's products. Reduction in raw material to manufacture products. Avoidance of materials that are considered harmful, but not illegal.	

	PLAN			SOURCE	DELIVER			MAKE		RETURN
	Internal environmental management	Green information systems	Eco-design	Green purchasing	Cooperation with customers	Green distribution	Green logistic management	Green manufacturing	reduction of material usage	Investment recovery
<b>Scientific Literature</b>										
Dagna Simpson, Damien Power, Daniel Samson "Greening the automotive supply chain: a relationship perspective" International Journal of Operations & Production Management	Our firm has a clear policy statement urging environmental awareness in every area of the business. Protecting the environment is a central corporate value in our firm. At our firm, we make a concerted effort to make every employee understand the importance of environmental management.									
Kee-hung Lai a.n, Christina W.Y. Wongb, "Green logistics management and performance: Some empirical evidence from Chinese manufacturing exporters"							GLM procedures are formally documented. Our firm has a formal GLM. We have a department responsible for environmental affairs. GLM procedures are widely available.			
Tzu-Yun Chiou a,b, Hing Kai Chan, Fiona Lettice, Sai Ho Chung "The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan" Transportation Research				Environmental audit for suppliers' internal management (GP3) Second-tier supplier environmentally friendly practice evaluation (GP5) Providing design specification to suppliers that include environmental requirements for purchased item (GP6) Guiding suppliers to set up their own environmental programs; Providing environmental technical advice to suppliers and contractors in order to help suppliers to meet environmental criteria. Pressuring suppliers to take environmental actions; Choice of suppliers by environmental criteria;						
Qinghua Zhu, Joseph Sarkis "Relationships between operational practices and performance among early adopters of green supply chain management practices in Chinese manufacturing enterprises", Journal of Operations Management	Commitment of GSCM from senior managers (IEM1) Support for GSCM from mid-level managers (IEM2) Cross-functional cooperation for environmental improvements (IEM3) Total quality environmental management (IEM4) Environmental compliance and auditing programs (IEM5) ISO 14001 certification (IEM6) Environmental Management Systems exist (IEM7)		Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2). Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)							Investment recovery (sale) of excess inventories/materials (IR1) Sale of scrap and used materials (IR2). Sale of excess capital equipment (IR3)

	PLAN			SOURCE	DELIVER			MAKE		RETURN
Scientific Literature	Internal environmental management	Green information systems	Eco-design	Green purchasing	Cooperation with customers	Green distribution	Green logistic management	Green manufacturing	reduction of material usage	Investment recovery
Qinghua Zhu, Joseph Sarkis, Kee-hung Lai "Green supply chain management: pressures, practices and performance within the Chinese automobile industry", Journal of Cleaner Production	<p>Commitment of GSCM from senior managers (IEM1)</p> <p>Support for GSCM from mid-level managers (IEM2)</p> <p>Cross-functional cooperation for environmental improvements (IEM3)</p> <p>Total quality environmental management (IEM4)</p> <p>Environmental compliance and auditing programs (IEM5)</p> <p>ISO 14001 certification (IEM6)</p> <p>Environmental Management Systems exist (IEM7)</p>		<p>Design of products for reduced consumption of material/energy (ECO1). Design of products for reuse, recycle, recovery of material, component parts (ECO2).</p> <p>Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)</p>	<p>Eco labeling of products (GP1)</p> <p>Cooperation with suppliers for environmental objectives (GP2)</p> <p>Environmental audit for suppliers' internal management (GP3)</p> <p>Suppliers' ISO14000 certification (GP4)</p> <p>Second-tier supplier environmentally friendly practice evaluation (GP5).</p> <p>Providing design specification to suppliers that include environmental requirements for purchased item (GP6)</p>	<p>Cooperation with customers for eco design (CC1)</p> <p>Cooperation with customers for cleaner production (CC2)</p> <p>Cooperation with customers for green packaging (CC3)</p> <p>Cooperation with customers for using less energy during product transportation (CC4)</p>				<p>Investment recovery (sale) of excess inventories/materials (IR1)</p> <p>Sale of scrap and used materials (IR2).</p> <p>Sale of excess capital equipment (IR3)</p>	



### Appendix 3: SC constructs inserted in the survey

	<b>Internal environmental management</b>	<i>Cronbach <math>\alpha</math></i>
<b>PLAN</b>	Commitment of GSCM from senior managers (IEM1)	0,947
	Support for GSCM from mid-level managers (IEM2)	
	Cross-functional cooperation for environmental improvements (IEM3)	
	Total quality environmental management (IEM4)	
	<b>Eco-design</b>	<i>Cronbach <math>\alpha</math></i>
<b>PLAN</b>	Design of products for reduced consumption of material/energy (ECO1)	0,903
	Design of products for reuse, recycle, recovery of material, component parts (ECO2)	
	Design of products to avoid or reduce use of hazardous products and/or their manufacturing process (ECO3)	
	<b>Green purchasing</b>	<i>Cronbach <math>\alpha</math></i>
<b>SOURCE</b>	Eco labeling of products (GP1)	0,953
	Cooperation with suppliers for environmental objectives (GP2)	
	Environmental audit for suppliers' internal management (GP3)	
	Second-tier supplier environmentally friendly practice evaluation (GP5)	
	Providing design specification to suppliers that include environmental requirements for purchased item (GP6)	
	Choice of suppliers by environmental criteria	
	<b>Collaboration with suppliers</b>	<i>Cronbach <math>\alpha</math></i>
<b>SOURCE</b>	Providing design specification to suppliers that include environmental requirements for purchased item	n.a
	Cooperation with suppliers for environmental objectives	
	Cooperation with suppliers for eco design	
	Supplier development programs to meet environmental criteria	
	<b>Reduction of material usage</b>	<i>Cronbach <math>\alpha</math></i>
<b>MAKE</b>	Reduction in the variety of materials employed in manufacturing the company's products	0,887
	Reduction in raw material to manufacture products	
	Avoidance of materials that are considered harmful, but not illegal	
	<b>Green manufacturing</b>	<i>Cronbach <math>\alpha</math></i>
<b>MAKE</b>	quality control in inputs at vendor site and recheck before processing	n.a
	improve machine uptime	
	rinse parts with clean water instead of using chemicals and reuse water	
	<b>Cooperation with customers</b>	<i>Cronbach <math>\alpha</math></i>
<b>DELIVER</b>	Cooperation with customers for eco design (CC1)	0,956
	Cooperation with customers for cleaner production (CC2)	
	Cooperation with customers for green packaging (CC3)	
	<b>Green distribution</b>	<i>Cronbach <math>\alpha</math></i>
<b>DELIVER</b>	environmental improvement of packaging	0,954
	eco-labelling	
	taking back packaging	
	use of environmentally friendly transportation	
	<b>Green logistic management</b>	<i>Cronbach <math>\alpha</math></i>
<b>DELIVER</b>	presence of a formal GLM	0,91
	GLM performance is periodically measured	
	GLM performance is periodically reported	
	<b>Investment recovery</b>	<i>Cronbach <math>\alpha</math></i>
<b>RETURN</b>	Investment recovery (sale) of excess inventories/materials (IR1)	0,816
	Sale of scrap and used materials (IR2)	
	Sale of excess capital equipment (IR3)	

## Appendix 4: HR constructs inserted in the survey

Construct		
Ability	Selection	Green issues in induction /socialization processes Green employer branding (Greenemployer of choice) Green criteria to select job candidates
	Training & Development	Training workshops for managers Employee training in EM to increase awareness, skills and expertise
Motivation	Performance management /appraisal	Managers are set objectives onachieving Green outcomesincluded in appraisals Green performance indicators included in PM system andappraisals Managers/employees are set Greentargets, goals and responsibilities
	Pay and reward systems	Staff suggestions in EM rewarded Green benefits (transport/travel)rather than pay benefits cards togain Green products Executive compensation formanagers partly based on EM stewardship Recognition-based rewards in EM for staff (public recognition,awards, paid vacations, time off,gift certificates) Monetary-based EM reward system
Opportunity	Employee involvement and commitment	Green issues specified in jobdescriptions Encouraging employees to makesuggestions for EM improvements EM education programmes forunion members Joint management/union trainingprogrammes in EM Green union representatives

## Appendix 5: EP mesures found in literature

MEASURE	TYPE	RESPONDENT	FIRM	REFERENCE
<p>Based on the ranking of those eight variables, an overall reputation number is calculated.</p> <ol style="list-style-type: none"> <li>1. quality of management,</li> <li>2. quality of products or services,</li> <li>3. innovativeness,</li> <li>4. long term investment value,</li> <li>5. financial soundness,</li> <li>6. ability to attract,</li> <li>7. develop and keep talented people,</li> <li>8. wise use of corporate assets and responsibility to the community and the environment.</li> </ol>	Qualitative	8000 executives and outside industry experts	<p>The firm is listed in the revised Fortune</p> <p>Corporate Reputation Index presented by Brown and Perry (1995).</p> <p>The CEO is listed in Forbes' annual listing of the 800 top paid CEOs.</p>	<p>"CEO compensation: does it pay to be green?"</p> <p>Peter A. Stanwick and Sarah D. Stanwick. <i>Business Strategy and the Environment</i></p>
<p>we weighted chemicals using the "human toxicity potential factor" (HTP) developed by Hertwich and colleagues (Hertwich, Mateles, Pease, &amp; McKone, 2001), which measures toxicity in terms of benzene equivalence (for carcinogens) or toluene equivalence (for noncarcinogens). we weighted the quantity of each chemical generated over a given year by its correspondent HTP value.</p>	Numeric		<p>firms from industries subject to reporting under the EPA's Toxics Release Inventory</p>	<p>"Environmental performance and executive Compensation: an integrated Agency-institutional perspective." Pascual Berrone-Luis R.Gomez-Mejia</p> <p><i>Academy of Management Journal</i></p>
<p>survey:</p> <p>Seven-point Likert scales were used to measure the following attitudinal variables as perceived by managers: level of managerial environmental training, hourly employee environmental training, managerial environmental empowerment, hourly employee environmental empowerment, hourly employee use of environmental teams, and environmental performance. The scale items ranged from "strongly disagree" to "strongly agree."</p>	Qualitative	<p>Respondents were mostly senior level employees such as environmental or plant managers;</p>	<p>Mexican maquiladora industry</p>	<p>"The role of training and empowerment in environmental performance: A study of the Mexican maquiladora industry"</p> <p>Bonnie F. Daily, John W. Bishop, Jacob A. Massoud.</p> <p><i>International Journal of Operations &amp; Production Management</i> (2012)</p>
<p>We measure environmental performance here by the ratio of total emissions to total sales (TOTAL RELEASES/SALES).</p>	Numeric		<p>relies on firm-level data on EMPs for S&amp;P 500 firms included in the Corporate Environmental Profile Directories compiled from firm surveys by the Investor Research Responsibility Center for 1994–1995</p>	<p>"Incentives for environmental self-regulation and implications for environmental performance"</p> <p>Wilma Rose Q. Anton,<sup>a</sup> George Deltas,<sup>b</sup> and Madhu Khannac</p> <p><i>Journal of Environmental Economics and Management</i></p>
<p>The proposed approach consists of three steps.</p> <ol style="list-style-type: none"> <li>1. identification of criteria for assessing environmental performance (<i>Use of environment friendly technology, Green market share, Use of environment friendly materials</i>)</li> <li>2. fuzzy TOPSIS to generate an overall performance score for each alternative</li> <li>3. sensitivity analysis</li> </ol>	Numeric			<p>A fuzzy multicriteria approach for evaluating environmental performance of suppliers"</p> <p>Anjali Awasthi, Satyaveer S. Chauhan, S.K.Goyal</p> <p><i>Int. J. Production Economics</i> 126 (2010) 370–378</p>

<p>The independent variable environmental performance was determined on the basis of KLD environmental performance ratings. To evaluate environmental performance, KLD evaluated a number of activities that were indicators of environmental strengths or environmental concerns. Environmental performance was developed as a continuous variable by subtracting the pro-rata concern score from the pro-rata strength score for each firm.</p>	Qualitative		<p>Firms were included in the study sample if they were (a) included in the S&amp;P 500 in 2005 and 2006,(b) evaluated for environmental performance in the 2005 KLD performance ratings; and (c) received a request from Ceres to participate in the Ceres 2006 Climate Disclosure Project survey.</p>	<p><i>Beyond Acclamations and Excuses: Environmental Performance, Voluntary Environmental Disclosure and the Role of Visibility"</i> Cedric E. Dawkins John W. Fraas. <i>Journal of Business Ethics (2011) 99:383–397</i></p>
<p>EIRIS surveys.</p> <p>Their indicator of environmental responsiveness.</p> <p>they translated the EIRIS text-grade rating for each measure into a number-grade rating</p>	Qualitative	<p>chairmen, managing directors and selected main board directors of the 10 largest companies in 24 industrial sectors</p>	<p>industrial sectors</p>	<p><i>"Corporate Reputation and Social Performance: The Importance of Fit"</i> Stephen J. Brammer and Stephen Pavelin. <i>Journal of Management Studies 43:3 May 2006</i></p>
<p>Three basic sets of environmental performance measures: emissions, waste, and resource usage. Once the raw data are normalised, we calculate each annual facility environmental impact value as a ratio with its sector average Measures of facility emissions, waste and resource usage must be normalised by some standard unit of production scale, in order to be meaningfully comparable over time and across firms.</p>	Numeric	<p>Dati presi da Using Integrated Pollution Control (IPC) information</p>	<p>Irish Companies in three sectors (Metal fabricating, Paints and inks, Wood sawmilling and preservation)</p>	<p><i>"Environmental performance and practice across sectors: methodology and preliminary results"</i> Don Goldstein, Rachel Hilliard, Valerie Parker. <i>Journal of Cleaner Production</i></p>
<p>A standard questionnaire was used to conduct the structured interviews with 48 multiplechoice questions and six open-ended questions in three sections: environmental knowledge, attitudes, and environmental policy</p>	Qualitative	<p>A stratified random sampling method was used to select the volunteers. Employees interviewed included upper managers, first level managers, customer service employees, inside production and maintenance workers, and outside production and maintenance workers for a total of 62 participants.</p>	<p>Canadian electricity industry</p>	<p><i>Improving environmental awareness training in business"</i> Genevieve M. Perron, Raymond P. Cote', John F. Duffy <i>Journal of Cleaner Production 14 (2006) 551e562</i></p>
<p>We focus on indicators that provide insights on the three main dimensions of environmental performance mentioned above: toxic releases, compliance with environmental regulations and beyond-compliance management practices.</p> <p>The Toxic Release Inventoryà total pounds of toxic releases</p> <p>Risk Screening Environmental Indicators (RSEIs) à considers the following information: the amount of chemical released, the location of this release, the toxicity of the chemical, its fate and transport through the environment, the route and extent of human exposure and the number of people affected.</p> <p>used the following information regarding regulatory compliance: quarters in noncompliance, informal enforcement actions and formal enforcement actions.</p> <p>we chose to use reporting and transparency indicators based on information available on the firm's website and environmental/social responsibility reports. consists of the aggregation of the following seven indicators to represent the quality of companies' corporate environmental disclosure</p>	Numeric		<p>chemical sector</p>	<p><i>"Measuring Corporate Environmental Performance: the Trade-Offs of Sustainability Ratings"</i> Magali Delmas and Vered Doctori Blass <i>Business Strategy and the Environment</i></p>

<p>the environmental performance of firms in China is often examined by evaluating firms' alignment with such international environmental standards as ISO 14001, avoidance of polluting water, soil, and air, reducing energy and resource consumption, adopting environmentally friendly management and operation processes, and complying with relevant environmental regulations.</p> <p>KLD questionnaire</p>	Qualitative	<p>business owner</p> <p>SMEs owner</p>	<p>Chinese small- and medium-sized enterprises (SMEs)</p>	<p>"Stakeholder-firm power difference, stakeholders' CSR orientation, and SMEs' environmental performance in China"</p> <p>Zhi Tang, Jintong Tang</p> <p><i>Journal of Business Venturing</i> 27 (2012) 436-455</p>
<p>In each production unit, indicators are measured; The values of the environmental performance indicators gathered in the production or waste disposal unit need to be adjusted to the production mass defined in the reference flow (eq 1); Because each indicator has a different measurement unit, they must be normalized to a common dimensionless scale (eq2); The simple arithmetic average is used to aggregate normalized performance indicators;</p>	Numeric		<p>agro-industrial companies</p>	<p>"Environmental performance evaluation of agro-industrial innovations e part 1: Ambitec-Life Cycle, a methodological approach for considering life cycle thinking"</p> <p>Maria Cléa Brito de Figueirêdo, Geraldo Stachetti Rodrigues, Armando Caldeira-Pires, Morsyleide de Freitas Rosa, Fernando Antônio Sousa de Aragão, Vicente de Paulo Pereira Barbosa Vieira, Francisco Suetônio Bastos Mota.</p> <p><i>Journal of Cleaner Production</i></p>
<p>The questionnaire was then structured in two parts:</p> <p>Three multiple choice questions: which environmental aspects does the company have a specific commitment for improvement in the EMS? to which does the company devote highest investments to improve its performances? to which would the commitment have been the same even without the EMS?</p> <p>A data collection grid where, for each environmental aspect:</p> <ul style="list-style-type: none"> <li>- Emissions to air</li> <li>- Releases to water</li> <li>- Waste management</li> <li>- Use and contamination of land.</li> <li>- Use of natural resources and raw materials (including energy).</li> <li>- Local issues (noise, vibration, odour, dust, visual appearance, etc.)</li> <li>-Transport issues (goods, services and employees)</li> <li>-Risks of environmental accidents</li> <li>-Effects on biodiversity</li> </ul> <p>The company had to specify the presence of a monitoring system, the indicators that are used and a quantification of the improvement achieved over the last three years through the implementation of the EMS.</p>	Qualitative	<p>The questionnaire was preliminarily tested by submitting it to a panel of ten experts for review, five researchers in the field of environmental engineering and five environmental managers of ISO 14001 certified companies, belonging to other industrial sectors not included in the sample environmental managers.</p>	<p>sample of companies in NW Italy belonging to the same industrial sector (automotive) and with a consolidated EMS (ISO 14001 certified for at least three years)</p>	<p>"The use of indicators and the role of environmental management systems for environmental performances improvement: a survey on ISO 14001 certified companies in the automotive sector"</p> <p>Claudio Comoglio, Serena Botta.</p> <p><i>Journal of Cleaner Production</i></p>
<p>Questionnaire</p> <p>Environmental Performance:</p> <p>Reduction of hazardous waste, emission, etc.</p> <p>Less consumption of e.g. water, electricity, gas</p> <p>Improvement of environmental compliance</p>	Qualitative	<p>Purchasing departmen</p>	<p>124 companies from eight industry sectors in Taiwan</p>	<p>"The influence of greening the suppliers and green innovation on environmental performance and competitive advantage in Taiwan"</p> <p>Tzu-Yun Chiou, Hing Kai Chan, Fiona Lettice, Sai Ho Chung.</p> <p><i>Transportation Research</i></p>

<p>Environmental performance was measured through :</p> <p>managing greenhouse gas emissions, product innovation, lifecycle analysis, environmental management systems, technological development, carbon capture and storage, recovery projects, stakeholder engagement, employee training, conservation and restoration, waste management, recycling, and independent reviews/audits</p>	Qualitative		<p>annual ranking of the Financial Post's top 500 Canadian companies for 2008. With a focus on the natural environment and hypotheses that were specific to visibly polluting industries, they examined the chemical, energy, mining, and forestry industries from the Financial Post 500</p>	<p><i>"The Harm of Symbolic Actions and Green-Washing: Corporate Actions and Communications on Environmental Performance and Their Financial Implications"</i> Kent Walker, Fang Wan <i>Journal Business Ethics (2012) 109:227-242</i></p>
<p>Reduction of air emission</p> <p>Reduction of waste water</p> <p>Reduction of solid wastes</p> <p>Decrease of consumption for hazardous/harmful/toxic materials.</p> <p>Decrease of frequency for environmental accidents</p> <p>Improve a company's environmental situation</p>	Qualitative	Chinese automobile supply chain managers	Chinese automobile	<p><i>"Green supply chain management: pressures, practices and performance within the Chinese automobile industry"</i> Qinghua Zhu, Joseph Sarkis, Kee-hung Lai <i>Journal of Cleaner Production 15 (2007) 1041e1052</i></p>

## Appendix 6: Supply Chain Questionnaire

### Questionario Supply Chain



#### \*1. Qual è il nome dell'organizzazione per cui lavora?

(questo dato verrà utilizzato soltanto per restituire i risultati in forma aggregata)

#### 2. Ci può indicare il suo indirizzo email al quale potremo inviare il report finale?

(domanda facoltativa)

#### Anagrafica

##### 3. Quale delle seguenti alternative meglio descrive l'organizzazione per cui lavora?

Corporate

Azienda

Divisione / Business Unit

Altro (specificare)

##### 4. Qual è la sua posizione all'interno dell'azienda / Business unit?

Direttore Supply Chain

Manager Supply Chain

Responsabile Supply Chain

Direttore Acquisti

Manager Acquisti

Responsabile Acquisti

Altro (specificare)

##### 5. Da quanti anni lavora in ambito Supply Chain / Acquisti?

anni

##### 6. Da quanti anni lavora per questa Azienda / Business unit?

anni

**7. Qual è il settore in cui la sua Azienda / Business unit opera?**

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Agricolo                | <input type="checkbox"/> Energia                | <input type="checkbox"/> Logistico                |
| <input type="checkbox"/> Abbigliamento e tessile | <input type="checkbox"/> Finanziario            | <input type="checkbox"/> Pubblica Amministrazione |
| <input type="checkbox"/> Assicurativo            | <input type="checkbox"/> Gomma Plastica         | <input type="checkbox"/> Retail                   |
| <input type="checkbox"/> Alimentare              | <input type="checkbox"/> Industria chimica      | <input type="checkbox"/> Sanitario                |
| <input type="checkbox"/> Alberghiero             | <input type="checkbox"/> Industria farmaceutica | <input type="checkbox"/> Settore biomedicale      |
| <input type="checkbox"/> Commercio               | <input type="checkbox"/> Industria meccanica    | <input type="checkbox"/> Telecomunicazioni        |
| <input type="checkbox"/> Editoria                | <input type="checkbox"/> Industria elettronica  | <input type="checkbox"/> Turismo                  |
| <input type="checkbox"/> Edilizio                | <input type="checkbox"/> Informatica / software |   |

Altro (specificare)

**8. Chi sono i clienti principali della sua Azienda / Business unit?**

- Aziende
  Consumatori
  Sia aziende che consumatori

**9. Qual è approssimativamente il fatturato della sua Azienda / Business unit?**

Mln di €

**10. Quante persone lavorano approssimativamente nella sua Azienda / Business unit?**

- Fino a 49
  Da 50 a 249
  Da 250 a 499
  Oltre 500

**Collaborazione SCM - HR**

**12. Nel corso degli ultimi due anni, quanto la vostra funzione Supply Chain ha collaborato con la funzione Risorse Umane nelle seguenti attività riguardo temi di sostenibilità ambientale?**

(scala: 1=mai, 2=raramente, 3=occasionalmente, 4=spesso, 5=quasi sempre, 6=sempre)

	1	2	3	4	5	6
Perseguire insieme gli obiettivi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Avere una comprensione reciproca	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lavorare insieme in modo informale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Condividere idee, informazioni e risorse	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Condividere la stessa visione aziendale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Lavorare insieme come in un gruppo	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Questionario Supply Chain**

Si prega di indicare in che misura la vostra azienda ha implementato le seguenti pratiche negli ultimi due anni.

(scala: 1=non considerata, 2=si prevede di considerarla, 3=oggi in considerazione, 4=in fase di progettazione operativa, 5=in piena fase di attuazione, 6=implementata con successo)

**13. Eco-design**

	1	2	3	4	5	6
Progettazione dei prodotti in modo da ridurre il consumo di materiali e/o energia	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Progettazione dei prodotti in modo da riutilizzare, riciclare, recuperare materiali e componenti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Progettazione dei prodotti in modo da evitare o ridurre l'utilizzo di sostanze pericolose e/o la loro produzione	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**14. Gestione ambientale interna**

	1	2	3	4	5	6
Impegno dei manager di alto livello nella gestione eco-sostenibile della filiera	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Impegno dei manager di medio livello nella gestione eco-sostenibile della filiera	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborazione tra funzioni o Business unit per conseguire miglioramenti ambientali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sistemi di gestione della qualità a fini ambientali (ad esempio total quality management)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**15. Acquisti eco-sostenibili**

	1	2	3	4	5	6
Audit ambientale per la gestione dei fornitori	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Selezione dei fornitori (anche) secondo criteri ambientali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Valutazione delle pratiche ambientali dei fornitori di secondo livello	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



**16. Collaborazione con i fornitori per la sostenibilità ambientale**

	1	2	3	4	5	6
Collaborazione con i fornitori per obiettivi ambientali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Comunicazione di specifiche progettuali ai fornitori che includano dei requisiti ambientali per i beni / servizi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programmi di sviluppo dei fornitori per soddisfare criteri ambientali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborazione con i fornitori per la progettazione di prodotti eco-sostenibili (eco-design)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**17. Collaborazione con i clienti per la sostenibilità ambientale**

	1	2	3	4	5	6
Collaborazione con i clienti per la progettazione di prodotti eco-sostenibili (eco-design)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborazione con i clienti finali per processi produttivi più puliti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Collaborazione con i clienti per un packaging eco-sostenibile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**18. Riduzione dell'utilizzo dei materiali**

	1	2	3	4	5	6
Riduzione della varietà dei materiali impiegati in produzione o erogazione del servizio	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riduzione di materie prime per la fabbricazione dei prodotti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Evitare materiali che sono considerati nocivi, anche se non illegali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**19. Produzione eco-sostenibile**

	1	2	3	4	5	6
Controllo qualità in input presso il fornitore e verifica prima dell'utilizzo in produzione	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miglioramento dei tempi di funzionamento delle macchine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risciacquo delle parti con acqua pulita anziché sostanze chimiche, e riutilizzo dell'acqua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**20. Distribuzione eco-sostenibile**

	1	2	3	4	5	6
Miglioramento dell'eco-sostenibilità del packaging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
utilizzo di marchi eco-sostenibili sui prodotti (eco-label)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ritiro del packaging	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Uso di mezzi di trasporto eco-sostenibili	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**21. Logistica eco-sostenibile**

	1	2	3	4	5	6
Presenza di un sistema di gestione logistica eco-sostenibile formalizzato	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Misura periodica delle prestazioni ambientali della logistica	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Reporting periodico delle prestazioni ambientali della logistica	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**22. Recupero investimenti**

	1	2	3	4	5	6
Recupero (vendita) di scorte / materiali in eccesso	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vendita di scarti e materiali già utilizzati	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vendita di beni di investimento in eccesso	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recupero dei prodotti venduti a fine vita	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Supply Chain e Performance

23. Si prega di valutare quanto l'impegno profuso nella sostenibilità ambientale abbia consentito all'azienda, ad oggi, di ottenere i seguenti risultati:  
(scala: 1=per niente, 2=molto poco, 3=poco, 4=abbastanza, 5=molto, 6=totalmente)

	1	2	3	4	5	6
Riduzione degli sprechi in produzione	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miglioramento della qualità del prodotto	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miglioramento della reputazione aziendale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riduzione delle emissioni di agenti chimici tossici in aria e acqua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riciclaggio dei materiali durante il processo di produzione	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento dell'utilizzo di energia rinnovabili e di combustibili sostenibili	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Realizzazione di prodotti eco-sostenibili	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riduzioni del consumo di energia elettrica	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

24. Si prega di valutare la performance economica della vostra Azienda / Business unit, ad oggi, rispetto a quella dei vostri concorrenti.  
(scala: 1=molto peggiore, 2=peggiore, 3=di poco peggiore, 4=di poco migliore, 5=migliore, 6=molto migliore)

	1	2	3	4	5	6
Crescita del fatturato	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crescita dei profitti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento della quota di mercato	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento del valore per gli azionisti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

25. Si prega di valutare in che misura avete percepito pressioni ad implementare pratiche orientate alla sostenibilità ambientale negli ultimi due anni:  
(scala: 1=per niente, 2=molto poco, 3=poco, 4=abbastanza, 5=molto, 6=totalmente)

	1	2	3	4	5	6
Le regolamentazioni ambientali che disciplinano i vostri prodotti sono molto severe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I materiali utilizzati nei vostri prodotti sono controllati da norme che limitano il consumo di sostanze pericolose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri prodotti sono conformi alle normative ambientali di molti paesi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri principali clienti richiedono la certificazione ISO 14000 (o successive)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri principali clienti hanno una chiara politica ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri principali clienti collaborano al ritiro dei prodotti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix 7: Human Resource Questionnaire

### Questionario Risorse Umane

**\*1. Qual è il nome dell'organizzazione per cui lavora?**

(questo dato verrà utilizzato soltanto per restituire i risultati in forma aggregata)

**2. Ci può indicare il suo indirizzo email al quale potremo inviare il report finale?**

(domanda facoltativa)

#### Anagrafica

**3. Quale delle seguenti alternative meglio descrive l'organizzazione per cui lavora?**

Corporate

Azienda

Divisione / Business Unit

Altro (specificare)

**4. Qual è la sua posizione all'interno dell'azienda / Business unit?**

Direttore Risorse Umane

Dirigente in ambito Risorse Umane

Altro (specificare)

**5. Da quanti anni lavora in ambito Risorse Umane?**

anni

**6. Da quanti anni lavora per questa Azienda / Business unit?**

anni

**7. Qual è il settore in cui la sua Azienda / Business unit opera?**

- |  |   |   |
|--|---|---|
| <input type="checkbox"/> Agricolo                | <input type="checkbox"/> Energia                | <input type="checkbox"/> Logistico                |
| <input type="checkbox"/> Abbigliamento e tessile | <input type="checkbox"/> Finanziario            | <input type="checkbox"/> Pubblica Amministrazione |
| <input type="checkbox"/> Assicurativo            | <input type="checkbox"/> Gomma Plastica         | <input type="checkbox"/> Retail                   |
| <input type="checkbox"/> Alimentare              | <input type="checkbox"/> Industria chimica      | <input type="checkbox"/> Sanitario                |
| <input type="checkbox"/> Alberghiero             | <input type="checkbox"/> Industria farmaceutica | <input type="checkbox"/> Settore biomedicale      |
| <input type="checkbox"/> Commercio               | <input type="checkbox"/> Industria meccanica    | <input type="checkbox"/> Telecomunicazioni        |
| <input type="checkbox"/> Editoria                | <input type="checkbox"/> Industria elettronica  | <input type="checkbox"/> Turismo                  |
| <input type="checkbox"/> Edilizio                | <input type="checkbox"/> Informatica / software |   |

Altro (specificare)

**8. Chi sono i clienti principali della sua Azienda / Business unit?**

- Aziende
  Consumatori
  Sia aziende che consumatori

**9. Qual è approssimativamente il fatturato della sua Azienda / Business unit?**

Mln di €

**10. Quante persone lavorano approssimativamente nella sua Azienda / Business unit?**

- Fino a 49
  Da 50 a 249
  Da 250 a 499
  Oltre 500

## Questionario Risorse Umane

Si prega di indicare in che misura la vostra azienda ha implementato le seguenti pratiche negli ultimi due anni. (scala: 1=non considerata, 2=si prevede di considerarla, 3=oggi in considerazione, 4=in fase di progettazione operativa, 5=in piena fase di attuazione, 6=implementata con successo)

**12. Selezione ed Employer Branding**

	1	2	3	4	5	6
Selezione di candidati sulla base di criteri legati anche alla sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attrazione di nuovi lavoratori tramite la pubblicizzazione della sostenibilità ambientale dell'impresa (employer branding)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Percorsi di inserimento che includono anche temi di sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**13. Formazione e sviluppo**

	1	2	3	4	5	6
Formazione su temi ambientali del personale aziendale per aumentarne la conoscenza, le competenze e il commitment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interventi di formazione su temi di sostenibilità ambientale per il management aziendale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**14. Gestione e valutazione delle prestazioni**

	1	2	3	4	5	6
Definizione di target ed obiettivi riguardanti la sostenibilità ambientale per il management aziendale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utilizzo di indicatori legati alle prestazioni ambientali dell'impresa inclusi nel sistema di misurazione e di valutazione delle performance del management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utilizzo di indicatori legati alle prestazioni ambientali dell'impresa inclusi nel sistema di misurazione e di valutazione delle performance del personale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**15. Compensation e Sistema premiante**

	1	2	3	4	5	6
Utilizzo di ricompense per premiare i suggerimenti del personale aziendale riguardanti la sostenibilità ambientale dell'impresa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Utilizzo di benefici a basso impatto ambientale (ad esempio auto aziendali ecologiche, viaggi...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Retribuzione variabile per gli executive dell'azienda legata al raggiungimento di performance ambientali	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riconoscimenti non monetari basati su performance individuali su temi di sostenibilità ambientale (ad esempio premi, vacanze retribuite...)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
La retribuzione variabile del management aziendale è legata alle prestazioni ambientali dell'impresa	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**16. Coinvolgimento e commitment del personale**

	1	2	3	4	5	6
Job description che includono ruoli, compiti, mansioni e responsabilità legate alla sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Supportare all'impegno e al coinvolgimento del personale aziendale in questioni legate alla sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Programmi di formazione per i membri del sindacato aziendale (se presente) su temi di sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gestione congiunta del management aziendale e del sindacato (se presente) per attuare programmi di sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Presenza di rappresentanti sindacali (se presenti) deputati alla gestione di temi legati alla sostenibilità ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Risorse Umane e Performance

17. Si prega di valutare quanto l'impegno profuso nella sostenibilità ambientale abbia consentito all'azienda, ad oggi, di ottenere i seguenti risultati:  
(scala: 1=per niente, 2=molto poco, 3=poco, 4=abbastanza, 5=molto, 6=totalmente)

	1	2	3	4	5	6
Riduzione degli sprechi in produzione	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miglioramento della qualità del prodotto	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Miglioramento della reputazione aziendale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riduzione delle emissioni di agenti chimici tossici in aria e acqua	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riciclaggio dei materiali durante il processo di produzione	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento dell'utilizzo di energia rinnovabili e di combustibili sostenibili	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Realizzazione di prodotti eco-sostenibili	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Riduzioni del consumo di energia elettrica	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

18. Si prega di valutare la performance economica della vostra Azienda / Business unit, ad oggi, rispetto a quella dei vostri concorrenti.  
(scala: 1=molto peggiore, 2=peggiore, 3=di poco peggiore, 4=di poco migliore, 5=migliore, 6=molto migliore)

	1	2	3	4	5	6
Crescita del fatturato	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crescita dei profitti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento della quota di mercato	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Aumento del valore per gli azionisti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

19. Si prega di valutare in che misura avete percepito pressioni ad implementare pratiche orientate alla sostenibilità ambientale negli ultimi due anni:  
(scala: 1=per niente, 2=molto poco, 3=poco, 4=abbastanza, 5=molto, 6=totalmente)

	1	2	3	4	5	6
Le regolamentazioni ambientali che disciplinano i vostri prodotti sono molto severe	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I materiali utilizzati nei vostri prodotti sono controllati da norme che limitano il consumo di sostanze pericolose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri prodotti sono conformi alle normative ambientali di molti paesi	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri principali clienti richiedono la certificazione ISO 14000 (o successive)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri principali clienti hanno una chiara politica ambientale	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I vostri principali clienti collaborano al ritiro dei prodotti	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>