Practices for Environmental Sustainability in the Textile, Clothing and Leather Sectors: The Italian Case

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The fashion supply chain is one of the most polluting industries in the world, being a huge consumer of water, electricity and chemicals, and discharging massive quantities of wastes to land. Stakeholders' and customers' pressure on sustainability has pushed companies to transform general environmental sustainability concepts into business practices. However, a few contributions have offered a comprehensive analysis of the practices employed in the fashion supply chain to reduce its environmental impact. In this paper, a theoretical framework for mapping practices for environmental sustainability implemented in the fashion system is presented. The framework is then used to analyse the Italian scenario.

Keywords: Environmental sustainability, Textile Clothing and Leather (TCL) sectors, Practices, Italy, Content analysis.

1. Introduction

The European Textile, Clothing and Leather (TCL) sectors embody several value chains, essential for the European economy. Companies operating in these sectors are active in the production and trade of textiles and leather, design, development of technical textiles, creation of clothing, footwear and leather-goods, tanning of hides and skins, as well as laundry and dry-cleaning services.

In 2011, the European TCL sectors accounted for over 2.5 million direct jobs in 230,000 businesses, representing 4% of total production, 7% of jobs in European manufacturing, and generating a turnover of more than 210 billion Euros (ESC, 2012). According to the last available disaggregated data from 2010, the largest activity within the sector is the manufacture of textiles, which accounted for 41% of sectorial value added. Just over one third (37%) of value added is generated by the EU-27's manufacture of clothing, with the remainder (22%) being generated by leather manufacturing (Eurostat, 2013a; Eurostat, 2013b; Eurostat 2013c). More

specifically, within the EU-27, Italy is the principal textiles, clothing and leather manufacturing Member State, generating 18.7 billion Euros of value added, which is the equivalent of more than one third (35.2%) of EU-27 value added in these sectors (Eurostat, 2013a; Eurostat, 2013b; Eurostat 2013c).

One of the downsides of this economic success story is represented by the substantial negative environmental "footprint" across the TCL global supply chain (DEFRA, 2011), as analysed by several authors and organisations (Allwood et al., 2006; COTANCE, 2012, DEFRA, 2008; Dickson et al., 2009; Fletcher, 2008; Gardetti and Torres, 2013; Gwilt and Rissanen, 2011; Slater, 2003). Summarizing these contributions, the negative environmental impacts associated with the TCL sectors can be grouped into five main categories: i) energy use in laundry, in the production of primary materials (especially man-made fibers), in yarn manufacturing of natural fibers, in yarn and fabric finishing, and in leather tanning; ii) use of toxic chemicals which may harm human health and the environment; iii) release of chemicals in water – especially in wet pre-treatment, dyeing, finishing, tanning and laundry; iv) solid waste arising from yarn manufacturing of natural fibers, making up, and disposal of products at the end of their life; and v) CO2 emissions, particularly related to transportation processes.

Undoubtedly, the EU has a strategic interest in shaping how the environmental sustainability concept is understood in global policy terms. This is pursed via multilateral agreements to prevent damage to the Union's economic competitiveness (Backer, 2000). To this extent, several European directives related to the environment directly affect the TCL industry, in particular those relating to waste management, industrial emissions and chemicals use, as Integrated Pollution Prevention and Control (IPPC), Emission Trading System (ETS), Regulation on Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) and the Water Framework Directive 2000/60/EC.

In such a context, stakeholders' and customers' pressure, coupled with business drivers as high-price volatility and short term discretionary rationed access to production capacity and resources, have pushed companies to engage with sustainability. However, the management of sustainability is unbalanced: while many companies commit to sustainability, few put their commitment into actions, and even fewer communicate their actions and results (Deloitte, 2013).

In literature, a few contributions have offered a comprehensive and structured analysis of the different practices that have been employed in the TCL sectors to reduce their negative impacts. De Brito et al. (2008) suggested different practices to pursue environmental sustainability objectives, in terms of both a single company and the whole supply chain. Chi (2011) analysed the development, achievements, and challenges of sustainability practices in the Chinese textile and apparel industry. Caniato et al. (2012) presented the results of exploratory case-based research aimed at identifying the drivers that push companies to adopt ''green'' practices, the different practices that can be used to improve environmental sustainability, and the environmental KPIs measured by companies.

Thus, the aim of this paper is twofold: i) to propose a comprehensive classification framework for environmental sustainability practices, and ii) to map the practices implemented by companies operating in the Italian TCL sectors, as the principal European Member State in this industry.

The remainder of the paper is organized as follows. Section 2 presents the methodology adopted, while Section 3 describes the theoretical background of the paper and a systematic analysis of the literature related to practices for environmental sustainability adopted by TCL companies. Section 4 introduces the theoretical framework, and Section 5 presents the application of the theoretical framework to the Italian TCL companies. Finally, conclusions, limits of the study and further development are presented in section 6.

2. Methodology

The purpose of the paper is to gain an understanding of the environmental sustainability practices adopted within the TCL supply chain. Given the relatively new and unexplored nature of the phenomenon, this study adopts an inductive research strategy (Eisenhardt, 1989) based on qualitative research techniques (Miles and Huberman, 1984). In doing so, the research process was divided into three phases.

First of all, a systematic literature review was undertaken to investigate the practices adopted by companies operating in the TCL supply chain. The outcome of this phase was a theoretical framework, in which the practices were summarised and categorised.

In the second phase of this research, the framework was generalised and refined by analysing the performance and practices of the European sustainability leaders, selected according to the Dow Jones Sustainability Europe Index (DJSI Europe). The DJSI Europe tracks the performance of the top 20% of the 600 largest Austrian, Belgian, Dutch, Danish, Finnish, French, German, Greek, Icelandic, Irish, Italian, Luxembourg, Norwegian, Portuguese, Spanish, Swedish, Swiss, and UK companies in the Dow Jones Global Total Stock Market Index that lead the field in terms of sustainability. These 600 companies represent the eligible universe for the DJSI Europe, and are assessed using the Corporate Sustainability Assessment (CSA) on an annual basis (S&P Dow Jones Indices LLC & Robecco SAM AG, 2013). The CSA is designed to capture both general and industry-specific criteria covering the economic, environmental and social dimensions. This way, the research was conducted considering the top ten European companies as resulting at the end of May 2013 (S&P Dow Jones Indices LLC, 2013). Information regarding the environmental practices communicated by the companies on their corporate websites was collected. Content analysis (Bryman, 2004) was the research tool used for analysing the published information. Content analysis is a "technique for making inferences by objectively and systematically identifying specified characteristics of messages" (Holsti, 1969), transforming written text into highly reliable qualitative data. In particular, it is used to analyse if certain words and concepts are present within texts. This kind of analysis was widely adopted in corporate social and environmental responsibility research, such as in Dahlsrud (2008), Jenkins and Yakovleva (2006), Maignan and Ralston (2002), Niskanen and Nieminen (2001), Orlitzky et al. (2003), Wolfe (1991). In this study, we considered the environmental practices communicated to the stakeholders as a proxy of the practices adopted by the companies (Jose and Lee, 2007) as it is more difficult to make false declarations where there is the possibility of verifying public available information (Toms, 2002).

The theoretical framework, resulting from the combination of the results from both the first and the second phase, was then used to guide the third research phase.

During this phase, the list of Italian companies operating in the TCL supply chain was retrieved from the AIDA (Analisi Informatizzata Delle AziendeItaliane) database, held and provided by Bureau van Dijk that covers one million companies in Italy. AIDA provides comprehensive information such as company financials, number of employees, trade description, stock data for listed companies, and so forth. Firms under the NACE Rev. 2 Division 13 (Manufacture of textiles), Division 14 (The manufacture of wearing apparel and the dressing and dyeing of fur), and Division 15 (The manufacture of leather and leather products including footwear), were selected for our purposes. A detail of NACE Divisions considered in this study is presented in Table 1.

Table 1 *NACE Divisions Considered in the Analysis*

NACE	Denomination
13	Manufacture of textiles
13.1	Preparation and spinning of textile fibers
13.2	Weaving of textiles
13.3	Finishing of textiles
13.9	Manufacture of other textiles (e.g. knitted fabrics, carpets, non-wovens, technical textiles
14	Manufacture of wearing apparel
14.1	Manufacture of wearing apparel, except fur apparel
14.2	Manufacture of articles of fur
14.3	Manufacture of knitted and crocheted apparel
15	Manufacture of leather and related products
15.1	Tanning & dressing of leather; manufacture of luggage , handbags , saddlery & harness; dressing & dyeing of fur
15.2	Manufacture of footwear

The number of the Italian companies belonging to the three NACE sectors 13, 14 and 15, at the time of the analysis (April 2013), was 18283. Among this initial sample, 2804 firms belong to Division 13, and were all included in the final sample. Considering Division 14 and 15 (15479 companies in total), a big portion of this sample population (11596) is represented by micro-companies, characterised by a turnover lower than 2 million euros. Because of the high number of such companies, a sample analysis was conducted on the 5% of the population (i.e. 2300 companies). This analysis revealed that only the 7.2% of the sample (i.e. 40 companies) has a public website, whilst the 0.74%, (4) has at least one practice of sustainability adopted. Due to this sample analysis, we deemed the companies with a turnover lower than 2 million euros as negligible for the analysis; therefore, only the companies with a turnover greater than 2 million euros were included in the final sample. Then, firms in liquidation and companies that actually do not belong to the TCL sectors were excluded from the analysis. Consequently, the final sample counted for 5692 companies. Considering this sample, all the companies' websites were content analysed based on the practices for environmental sustainability identified in the theoretical framework, to understand the maturity degree of the

Italian TCL industry with regards to sustainability. In particular, we followed an a priori coding approach, where the categories were established prior to the analysis (Weber, 1990). Such categories correspond to the practices defined in the theoretical framework during the first and the second phase of the research.

3. Systematic Literature Review on Sustainability Practices

The first phase of the research consisted in developing a theoretical framework supporting the analysis of the state of the art of the implementation of environmental sustainability practices within the TCL industry. To this end, a systematic literature review was conducted (Tranfield et al., 2003), aiming to gather and classify the sustainability practices documented in the available body of scientific and practitioner literature. In contrast to a traditional narrative literature review, a systematic literature review reduces researcher bias concerning the inclusion or exclusion of studies, and clearly communicates how the review was performed (Deyner and Neely, 2004), allowing for a high level of transparency (Crowther and Cook, 2007).

The systematic literature search was conducted in relevant literature databases including Emerald, Metapress, Science Direct, Scopus, and Web of Science, using keywords such as "practices", "sustainability", "green", "fashion", "textile", "apparel", "clothing", "footwear", "shoes", "leather".

Afterward, different filters helped identifying and selecting substantively relevant studies constituting the core set of articles for data synthesis and analysis. The filters were defined as follows:

- Filter 1. Ensure substantive relevance, defined as adequacy of the articles in addressing, and capturing the phenomenon under investigation (Brinberg and MacGrath, 1985), by requiring that they contain keywords search in their title, abstract or keywords;
- Filter 2. Consider only English-language articles.
- Filter 3. Remaining abstracts should be read for substantive relevance.
- Filter 4. Remaining full articles should be read for substantive relevance.

No time limit or limit in publication type was employed in these searches.

Through the application of the first two filters to the keyword search phase, 154 papers were identified, of which 43 were defined as relevant (Filter 3 and 4) for this literature review study (as of July 2013).

This phase was followed by a backward search, reviewing the references in the articles yielded from the previous keywords search (Levy and Ellis, 2006). Finally, an Internet search using Google Scholar identified further publications from the industry side, which are out of the scope of academic databases, but can still be classified as relevant. In order to capture this body of knowledge, publications from quarterlies and internal publications of consultancy firms and associations were also taken into consideration. With the backward and the Internet search 31 new publications were added to our review.

In the end, 74 publications formed the basis of this literature review. These publications, in a first evaluation step, were classified according to descriptive dimensions (i.e., distribution of publications across time and main journals). Then, the practices described in the papers were collected and analysed, conceptualised, and categorised into a theoretical framework. The analytical categories were

developed from the analysed papers by generalization. In particular, the classification proposed by Caniato et al. (2012) was used as a starting point. Papers were then classified accordingly, where the dimensions and the categories were revised during the analysis.

3.1 Descriptive Analysis

The body of literature identified comprises 74 papers. The time allocation of the publications is shown in Figure 1. The first published papers found were from the year 1995. Higher numbers of publications are found in the last two years, showing a growing interest towards this topic.

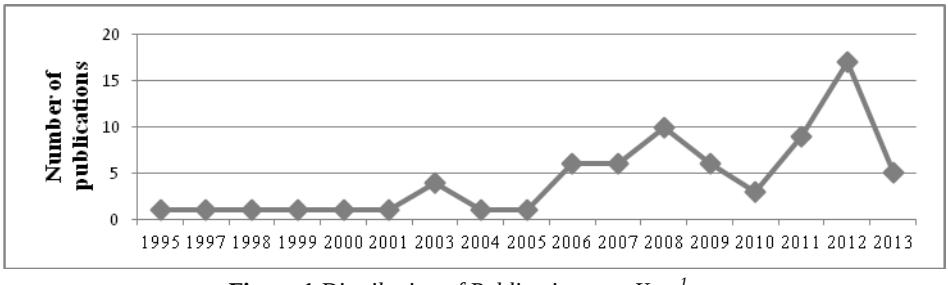


Figure 1 *Distribution of Publications per Year*[1]

Environmental and sustainability related journals (25 papers), and journals associated with the textile, clothing and leather sector (20 papers) capture the highest numbers of papers, while traditional management journals remain in the minority (11 papers). A final group of 10 papers are published in journals of a technical nature. Remaining publications refer to conference proceeding, reports and books. Table 2 reports the journal titles, along with their classification and the number of papers. This analysis shows a very fragmented situation, with 6 articles published on Journal of Cleaner Production and the remaining 68 articles spread over 50 journals, from a vast array of backgrounds.

Table 2 *Journal Distribution of Publications*

Environmental and Sustainability	Management	Textile, Clothing and Leather	Technical
Journal of Cleaner Production (6 papers)	International Journal of Entrepreneurship and Small Business (1 paper)	AATCC Review: the magazine of the textile dyeing, printing, and finishing industry (1 paper)	Construction and Building Materials (1 paper)
Social Responsibility Journal (1 paper)	Supply chain management: An international journal (1 paper)	ATA Journal (1 paper)	Energy Conversion and Management (1 paper)
Ecological Indicators (1 paper)	Journal of Retail & Leisure Property (1 paper)	AUTEX Research Journal (1 paper)	Biomacromolecules (1 paper)

[1]2013 publications refer to the period January-July only.

Industrial Ecology (1 paper)	International Journal of Production Economics (2 papers)	Clothing and Textiles Research Journal (4 papers)	Industrial crops and products (1 paper)
Resources, Conservation and Recycling (4 papers)	International Journal of Retail & Distribution Management (1 paper)	International Journal of Clothing Science and Technology (1 paper)	Polymer composites (1 paper)
Fresenius Environmental Bulletin (1 paper)	Family and Consumer Sciences Research Journal (1 paper)	Journal of Textile and Apparel, Technology and Management (2 papers)	Work: A Journal of Prevention, Assessment and Rehabilitation (1 paper)
Greener Management International (2 papers)	Production Planning & Control (1 paper)	Journal of the Society of Leather Technologists and Chemists (1 paper)	Key Engineering Materials (1 paper)
The International Journal of Environmental, Cultural, Economic and Social Sustainability (1 paper)	Journal of Business and Globalisation (1 paper)	Journal of the Textile Institute (1 paper)	Journal of hazardous materials (1 paper)
Clean Technologies and Environmental Policy (1 paper)	Journal of Organizational Excellence (1 paper)	LBD Interior Textiles (1 paper)	Trends in Biotechnology (1 paper)
Environmental science & technology (2 papers)	Transportation Research Part E: Logistics and Transportation Review (1 paper)	Textile Research Journal (1 paper)	Journal of materials processing technology (1 paper)
Journal of Polymers and the Environment (1 paper)		Textile View Magazine (1 paper)	
The International Journal of Life Cycle Assessment (2 papers)		Textile World (1 paper)	
Energy Efficiency (1 paper)		The Journal of the American Leather Chemists Association (2 papers)	
Business Strategy and the Environment (1 paper)		Colourage (1 paper)	
		Coloration Technology (1 paper)	

3.2 Towards a Theoretical Framework

The general description of the core set of papers is followed by an in-depth analysis and classification of their content. Performing this activity, the following categories were identified:

- Product design: a first set of papers refers to practices implemented to minimise the environmental impact by designing sustainable products (Curwen et al., 2013; Farrer and Finn, 2009). The Cradle to cradle apparel design (C2CAD) developed by Gam et al.(2009) provides practical guidelines for apparel designers and manufacturers to sustainability in addition to functional, expressive, and aesthetic considerations. Fowler and Hope (2007) extend

beyond the use of Life Cycle Analysis to a product-stewardship strategy, based on the integration of key external stakeholders into decisions on product design and development. The use of Human Computer Interaction (HCI) for sustainable design is discussed by Pan et al. (2012), whereas Veitch and Davis (2009) illustrate the use of 3D and 1D anthropometric data for manikin and clothing design as a way to develop the sustainability of the apparel industry. Moreover, the 12 Principles of Green Engineering are proposed as a framework within which to examine existing product and guide their redesign as well as to evaluate new product solutions (Segars et al., 2003). Finally, Borchardt et al. (2011) focus on eco-design and its application in the footwear industry to identify how it can be applied to the redesign of a shoe component in order to minimize the environmental impact and simultaneously reduce costs of production and assembling.

- Product materials: a second set of publications analyse and discuss the utilization of less conventional eco-friendly fibers (Fletcher, 2008), such as hemp (van der Werf and Turunen, 2008), bamboo (Waite, 2009), pineapple, banana, soyabean protein fibers (Dawson, 2012), and organic cotton (Fowler and Hope, 2007; Goldbach et al., 2003), as well as materials made from biopolymers rather than polymers derived from petrochemicals (Bogoeva et al., 2007). Further attempts are being made to use lignocellulose agricultural by-product such as cornhusks, cornstalks, and pineapple leaves as alternative sources of cellulosic fibers (Reddy and Yang, 2005). Additionally, fibers regenerated from waste (Poole et al., 2008) as from recycled polyethylene terephthalate (PET) bottles (Shen et al., 2010b), are presented.
- Process, technology and processing materials: a third group of practices refers to new processes (Phong, 2008; Wiengarten et al., 2012), technologies (Peng et al., 2011; Sivaramakrishnan, 2007), such as nanotechnology (Qian and Hinestroza, 2004; Sawney et al., 2008; Wong et al., 2006), plasma technology (Shishoo, 2007), and processing materials (Saravanabhavan et al., 2008; Zouboulis et al., 2012) which hold the promise of reducing pollution and water use, increasing energy efficiency and minimising waste. In particular, great attention is being paid to dyeing and finishing of yarns and fabrics (Easton, 2007; Rupp, 2008; Visa et al., 2011), and leather tanning (Money, 2010), especially the selection, substitution and reduction of dyes and chemicals (Bechtold et al., 2003; Chen and Burns, 2006; Kumar et al., 2011; Thanikaivelan et al., 2006).
- Waste management: waste management represents the core topic of the fourth subgroup. Waste produced by the TCL supply chain can be classified as either pre-consumer or post-consumer (Council for Textile Recycling, 1998). Pre-consumer waste consists of by-product materials from the textile, fibre, leather and clothing industries. Each year, 750,000 tons of this waste is recycled into new raw materials for the automotive, furniture, mattress, home furnishings, paper, and other industries (Aspiras and Manalo, 1995; Briga-Sà et al., 2013; Chen et al., 2006; Hayes, 2001). In the footwear and leather sector, Ferrer et al. (2012) describe an industrial cluster developed in TresCoroas (Brazil), where a solid waste collection process with the long-term goal of recycling all the collected industrial refuse was implemented. Post-consumer waste consists of any type of garments, shoes, household articles discarded. They are sometimes given to charities but more typically they end up in landfills (Koch and Domina,

1999). Finding alternative methods for the disposal of post-consumer waste has assumed greater importance during the last years (Domina and Koch, 1997; Woolridge et al., 2006). For example, Boujarwah et al. (2009) reports the Dress for Succes (D4S) system, a web-supported vending machine for school uniform reuse.

- Strategic Environmental Assessment (SEA): several SEA tools (Thérivel and Brown, 1999), such as Life Cycle Assessment (LCA) (Rebitzer et al., 2004), have been used to analytically evaluate the environmental burdens of fibers(Muthu et al., 2012; Shen and Patel, 2008; Shen et al., 2010a), products (De Saxce et al., 2012; Jacques and Guimaraes, 2012; Nowack et al., 2012), processes (Garcia-Montano et al., 2006; Kalliala and Talvenmaa, 2000), technologies (Cetinkaya et al., 2012; Gabarrell et al., 2012) and infrastructure (Fieldson and Rai, 2009).
- Supply chain: a major challenge is to ensure that commitment to environmentally responsible practices is not limited to a single company but is echoed throughout the industry's long and highly complex supply chains. Upstream, environmental requirements and improvement programmes for suppliers (Goworek, 2011; Styles et al., 2012), as well as the development of strongly collaborative network (MacCarthy and Jayarathne. 2012; Svensson, 2007), are presented as means to encourage suppliers to improve their sustainability (Fowler and Hope, 2007). Downstream, great efforts are being paid to increase awareness among consumers about the green credentials of the products they buy. To this extent comprehensive labeling including not only raw material sources but also processing information (Power, 2012; Styles et al., 2012) and external communication systems play a great role in providing such information.

A synthesis of the practices found in literature through this systematic review is presented in Table 3. It represents the first version of the classification framework that was then refined in the second phase of the research.

Table 3 *Practices for Environmental Sustainability -Towards a Theoretical Framework*

Category	Practices	References
Product design	Cradle to cradle apparel design (C2CAD)	Gam et al., 2009
	Product-stewardship strategy	Fowler and Hope (2007)
	Human Computer Interaction (HCI) for sustainable design	Pan et al., 2012
	Use of 3D and 1D anthropometric data	Veitch and Davis, 2009
	12 Principles of Green Engineering	Segars et al., 2003
	Ecodesign	Borchardt et al., 2011; Curwen et al., 2013; Farrer and Finn, 2009
Product materials	Eco-friendly fibers (bamboo, hemp, banana, pineapple, soyabean protein fibers)	Dawson, 2012; Fletcher, 2008; van der Werf and Turunen, 2008; Waite, 2009
	Organic cotton	Fowler and Hope, 2007; Goldbach et al., 2003
	Biopolymers	Bogoeva et al., 2007

	Lignocellulose agricultural by-product	Reddy and Yang, 2005
	Fibres regenerated from waste	Poole et al., 2008; Shen et al., 2010b
Process, technology and processing materials	New process	Phong, 2008; Wiengarten et al., 2012
	Low and non-waste technologies (LNWT)	Peng et al., 2011; Sivaramakrishnan, 2007
	Nanotechnology and Plasma technology	Qian and Hinestroza, 2004; Sawney et al., 2008; Shishoo, 2007; Wong et al., 2006
	Processing materials	Saravanabhavan et al., 2008; Zouboulis et al., 2012
	Dyeing, finishing, tanning Selection of dyes and chemicals	Bechtold et al., 2003; Chen and Burns, 2006;Easton, 2007; Kumar et al., 2011; Money, 2010; Rupp, 2008; Thanikaivelan et al., 2006; Visa et al., 2011
Waste management	Pre-consumer waste	Aspiras and Manalo, 1995; Briga-Sà et al., 2013; Chen et al., 2006; Ferrer et al., 2012; Hayes, 2001
	Post-consumer waste	Boujarwah et al., 2009; Domina and Koch, 1997; Koch and Domina, 1999; Woolridge et al., 2006
Strategic Environmental Assessment (SEA)	Footprint Assessment / LCA for: - Fibres - Product - Processes - Technologies - Infrastructure	Cetinkaya et al., 2012; De Saxce et al., 2012; Fieldson and Rai, 2009; Gabarrell et al., 2012; Garcia-Montano et al., 2006;Jacques and Guimaraes, 2012; Kalliala and Talvenmaa, 2000; Muthu et al., 2012; Nowack et al., 2012; Shen and Patel, 2008; Shen et al., 2010a
Supply Chain	Environmental requirements and improvement programmes for suppliers	Goworek, 2011; Styles et al., 2012
	Collaborative network	Fowler and Hope, 2007; MacCarthy and Jayarathne. 2012; Svensson, 2007
	Consumer's awareness	Power, 2012; Styles et al., 2012

The wide varieties of ways to practice sustainability so far presented highlights as one of the challenges of sustainable practices is to provide a common framework that the entire TCL supply chain can embrace.

4. The Proposed Theoretical Framework

In order to further refine and generalise the theoretical framework developed from the systematic literature analysis, a content analysis of the corporate web sites of the top 10 DJSI European companies (as of end of May) was carried out (Table 4). This set of large, visible, European companies that operate worldwide reflects a variety of practices across different sectors and countries. Evidence was then used to elaborate on the practices identified through the systematic literature review and to finalize the theoretical framework. The later were then used to classify and analyse the sustainability practices adopted by Italian TCL companies (third phase of the research).

The resultant framework comprises the following categories: Products and Services, Supply Chain Management, Production Process, Culture, Governance. Moreover, a further dimension, named others, was introduced in order to collect other practices adopted by the companies which could not be classified in the previous ones.

Table 4 *Top 10 DJSI European Companies*

	Company	Country	Industry	Super sector
1	Nestle SA Reg	Switzerland	Consumer Goods	Food & Beverage
2	Novartis AG Reg	Switzerland	Health Care	Health Care
3	Roche Hldgs AG Ptg Genus	Switzerland	Health Care	Health Care
4	TOTAL SA	France	Oil & Gas	Oil & Gas
5	British American Tobacco PLC	U.K.	Consumer Goods	Personal &HouseholdGoods
6	Siemens AG	Germany	Industrials	Industrial Goods& Services
7	Bayer AG	Germany	Basic Materials	Chemicals
8	BASF SE	Germany	Basic Materials	Chemicals
9	Diageo PLC	U.K.	Consumer Goods	Food&Beverage
10	SAP AG	Germany	Technology	Technology

Products and Services

The first dimension includes all the practices related to the consumption of resources required for manufacturing the final product, or to provide a generic service. Practices which can be included in this dimension are the systematic adoption of SEA tools (e.g. LCA, Carbon Footprint) related to the final product, the utilization of methodologies to improve the product design and development process (e.g. Eco Design), products certifications and in general practices for the improvement of the products and/or services sustainability.

Consequently, this first dimension includes also practices related to the consumption of recycled raw materials, produced from renewables, the reduction of toxic components, and the use of raw materials close to the sourcing point (e.g. zero km raw materials suppliers).

In this dimension are also included practices related to the use of packaging produced with recycled materials, the reuse of packaging, and the reduction of packaging weight and dimension.

Supply Chain Management

The second dimension deals with practices related to the supply chain management. Supplier selection methodologies, suppliers training programs on green practices, and certification of suppliers are included within this area. Moreover, the optimization of freight transportation (vehicle routing, adoption of zero-emission vehicles, optimization of utilization rates, warehousing management, etc.) is also included under this category.

Production Process

The third dimension deals with the production processes. In this topic are included the use of SEA tools related to the production process (e.g. LCA), biotechnologies, production performance monitoring and optimization, process and environmental management system certification (e.g. ISO 14000, EMAS). Practices related to the energy saving (plant efficiency optimization, energy utilization reduction, renewable

energy production and consumption, etc.), waste reduction (Carbon Capture and Storage, waste management, waste utilization as energy source, etc.), water (water utilization reduction, water recycling, etc.), process materials (environment pollution by process materials reduction, etc.) are also included under this category.

Culture
This dimension deals with the introduction of training programs involving both internal than external stakeholders, with the goal to spread a green culture.

Governance
This dimension is related to the initiatives whose goal is to manage the green activities and the relationship with all the stakeholders. Sustainability reports, Sustainability Advisory Board, dedicated corporate function or business unit, website dedicated to green activities are all practices which are included in this dimension.

Others
In this dimension all the activities which cannot be categorized in the previous ones have been collected (e.g. biodiversity preservation, environment preservation, forests creation in order compensates the CO2 emission, air pollution reduction, remediation sites, etc.).

The final framework that is depicted in Table 5 was then used to map the Italian TCL sectors and the practices that are currently adopted by the companies operating in this industry.

Table 5 *The Theoretical Framework*

Category	Sub-category	Practices
Products and Services	Products and Services	Methodologies for the environmental impact assessment along the product life cycle (i.e., Life Cycle Assessment (LCA), Carbon Footprint, etc.) Efficient products and services Eco-friendly products and services Products and services to improve customer's sustainability Product certification Eco-design
	RawMaterials	Recyclable, renewable and recycled raw materials Sourcing from sustainable sources Reduction of harmful and toxic raw material use Use of raw materials close to the sourcing place Use of raw materials to decrease resource utilization
	Packaging	Packaging reuse Recyclable and renewable materials Weight and volume reduction
Supply Chain Management	Supply Chain	Selection of suppliers based on their environmental sustainability attitude Pushing suppliers into adopting sustainability practices Procurement certification
	Transportation	Distribution network optimization Route optimization Use of full-load capacity Use of alternative vehicles Promotion and monitoring of a fuel-saving driving

Production Process	Process	Methodologies for the environmental impact assessment along the product life cycle (i.e., Life Cycle Assessment (LCA), Carbon Footprint, etc.) Biotechnologies Risk evaluation and monitoring Development of guidelines Process certification (i.e., UNI ISO 14000, EMAS, etc.)
	EnergyManagement	Efficient processes and buildings Energy production from renewable resources Use of energy from renewable resources Energy demand management
	Waste Management	Carbone Capture and Storage (CCS) Scrap elimination Reduction of waste and air emissions Hazardous waste reduction Waste disposal Waste recovery and reuse Waste use for energy production
	Water Management	Water consumption reduction Water waste treatment Water recycling and reuse
	Processing Materials	Efficient resource utilization Reduction of toxic and harmful processing materials Prevention from environmental contamination
Culture		Internal involvement Promotion of a sustainability culture (internally and externally) Stakeholder involvement and partnership with associations, local communities, etc. Customer involvement
Governance		Documentation and reports Dedicated business unit/function Dedicated website
Others		Biodiversity preservation Climate change preservation Forest creation for compensation Measures taken to reclaim Air quality improvement Renewable Obligation Certificates purchasing

5. Practices for Environmental Sustainability in the Italian TCL Sectors

The final framework presented in Section 4 was used to map the environmental practices implemented by the Italian companies operating in the TCL sectors.

5.1 The Total Sample

Among the 5692 companies belonging to the final sample, 1882 firms (33%) do not have a website. Consequently, the analysis was focused on the remaining 3810 companies. Among the latter, only 526 enterprises (14%) have implemented at least one environmental practice. The following graph (Figure 2) shows the practices

adopted by at least 10% of the companies. It is evident that product certification and process certification are the most adopted environmental practices. Great attention is also paid to the use of eco-friendly raw materials and final products, as well as to the energy efficiency of processes and facilities. Moreover, TCL firms implement actions directed to reduce and treat emissions of pollutants to land, water and air.

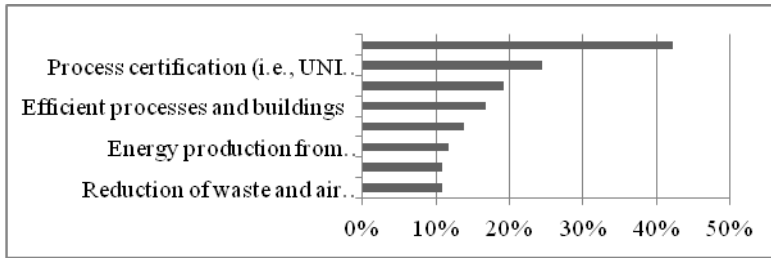


Figure 2 *Most Adopted Practices by TCL Firms*

The percentages of adoption of the different practices in the three sectors are reported in Table 6. For each division considered and for each practice, the percentage in evaluated as the ration between the number of companies implementing the practice and the number of companies in the specific sample (i.e. related to the division). These results are further discussed in the following sections.

Table 6 *Adoption of Environmental Sustainability Practices by TCL Companies*

Category	Sub-category	Practices	% Division 13	% Division 14	% Division 15
Products and Services	Products and Services	Methodologies for the environmental impact assessment along the product life cycle (i.e., Life Cycle Assessment (LCA), Carbon Footprint, etc.)	4%	4%	1%
		Efficient products and services	1%	7%	9%
		Eco-friendly products and services	11%	21%	23%
		Products and services to improve customer's sustainability	3%	1%	0%
		Product certification	48%	33%	46%
		Eco-Design	1%	0%	1%
	RawMaterials	Recyclable, renewable and recycled raw materials	22%	15%	17%
		Sourcing from sustainable sources	9%	5%	7%
		Reduction of harmful and toxic raw material use	3%	7%	16%
		Use of raw materials close to the sourcing place	2%	2%	1%
		Use of raw materials to decrease resource utilization	0%	1%	5%
	Packaging	Packaging reuse	1%	3%	2%
		Recyclable and renewable materials	2%	5%	4%
		Weight and volume reduction	2%	1%	0%

Supply Chain Management	Supply Chain	Selection of suppliers based on their environmental sustainability attitude	2%	5%	2%
		Pushing suppliers into adopting sustainability practices	4%	4%	5%
		Procurement certification	6%	3%	4%
	Transportation	Distribution network optimization	1%	5%	2%
		Route optimization	0%	2%	1%
		Use of full-load capacity	0%	0%	0%
		Use of alternative vehicles	1%	3%	2%
		Promotion and monitoring of a fuel-saving driving	0%	0%	0%
Production Process	Process	Methodologies for the environmental impact assessment along the product life cycle (i.e., Life Cycle Assessment (LCA), Carbon Footprint, etc.)	0%	5%	0%
		Biotechnologies	0%	0%	0%
		Risk evaluation and monitoring	2%	1%	6%
		Development of guidelines	1%	4%	4%
		Process certification (i.e., UNI ISO 14000, EMAS, etc.)	22%	22%	46%
	Energy Management	Efficient processes and buildings	16%	19%	20%
		Energy production from renewable resources	15%	1%	0%
		Use of energy from renewable resources	1%	9%	6%
		Energy demand management	0%	8%	7%
	Waste Management	Carbone Capture and Storage (CCS)	0%	0%	1%
		Scrap elimination	4%	0%	0%
		Reduction of waste and air emissions	13%	4%	2%
		Hazardous waste reduction	1%	9%	9%
		Waste disposal	8%	1%	2%
		Waste recovery and reuse	6%	1%	11%
		Waste use for energy production	0%	6%	8%
	Water Management	Water consumptionreduction	7%	0%	0%
		Water waste treatment	12%	6%	9%
		Water recycling and reuse	4%	2%	14%
	Processing Materials	Efficient resource utilization	2%	5%	7%
		Reduction of toxic and harmful processing materials	11%	7%	7%
		Prevention from environmental contamination	0%	7%	12%
Culture		Internal involvement	3%	1%	1%
		Promotion of a sustainability culture (internally and externally)	9%	4%	12%
		Stakeholder involvement and partnership with associations, local communities, etc.	7%	10%	6%

		Customer involvement	4%	18%	6%
Governance		Documentation and reports	7%	2%	3%
		Dedicated business unit/function	2%	5%	6%
		Dedicated website	0%	1%	0%
Others		Biodiversity preservation	1%	2%	1%
		Climate change preservation	1%	1%	1%
		Forest creation for compensation	1%	1%	0%
		Measures taken to reclaim	0%	2%	0%
		Air quality improvement	0%	0%	0%
		Renewable Obligation Certificates purchasing	2%	0%	1%

5.2 The Textile Sector

This section deals with the manufacture of textiles and includes processes such as spinning, weaving and the finishing of products, as classified within NACE Division 13.

The final sample had 2617 companies, profiled by sub-division (Table 1), is shown in Figure 3.

Figure 3 *Sample Distributions by Sub-Division*

Among the 2617 companies belonging to the sample, 1108 firms (42%) do not have a website. Consequently, the analysis was focused on the remaining 1509 companies. Among the later, only 322 enterprises (12%) have implemented at least one practice, profiled by sub-divisions as shown in Table 7.

Table 7 *Application of at Least One Sustainability Practice – Distribution by Sub-Division*

	13.1	**13.2**	**13.3**	**13.4**
% of companies that have implemented at least one practice	18%	23%	17%	42%

Within each sub-division, the percentage of companies that adopt at least one practice ranges from 9% (sub-division 13.2) to 15% (sub-division 13.9). This analysis shows that there is not a predominant sub-division where companies appear more prone to adopt sustainability practices. On the contrary, the low percentages of application confirm a limited commitment of textile companies towards the

implementation of environmental sustainability concept in the business strategy and activities.

The sample of companies that have adopted at least one practice was then profiled on the basis of the company size. The Small and Medium Enterprise (SME) definition provided by the European Commission (European Commission, 2005) was adopted. In particular, the annual turnover (T) threshold was considered. The percentage of companies that have adopted at least one practice increases moving from micro to large (Figure 4), as also indicated by previous research (Al-Tuwaijri et al., 2004; Hackston and Milne, 1996; Patten, 2002).

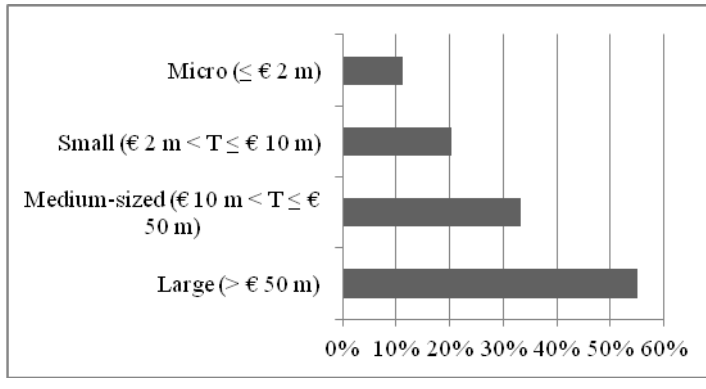
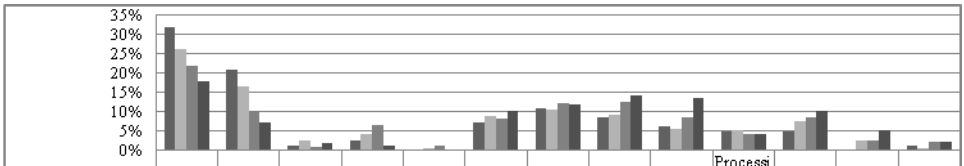


Figure 4 *Percentage of Companies Implementing at least One Sustainability Practice - Distribution by Company Size*

Subsequently, the practices adopted were analysed, as shown in Table 6. The practice most adopted by textile companies is "Product certification" (48%), with particular reference to: i) Oeko-Tex Standard 100 testing for harmful substances; ii) Seri.co that guarantees the absence of substances toxic or harmful in silk fabrics; and iii) Ecolabel that identifies products having a reduced environmental impact throughout their life cycle, from the extraction of raw material through to production, use and disposal. Remaining in the Product and Service category, discrete attention is paid also to the selection of eco-friendly raw materials (22% of the companies) that are recyclable, renewable and/or that come from recycled products, for example for used clothes or PET bottles. Also "Process Certification" is implemented by 22% of the sample, with reference to the ISO 14001:2004 and the EU Eco-Management and Audit Scheme (EMAS). Energy efficiency and production of energy from renewable resources, such as solar and wind power are applied, respectively, by 16% and 15% of the company. The other practices implemented by more than 10% of the textile firms are "Reduction of waste and air emissions" (13%), "Water waste treatment" (12%), "Reduction of toxic and harmful processing materials" (11%) and "Eco-friendly products and services". Packaging, supply chain and transportation practices, as well as the governance of sustainability, are basically neglected by textile companies.

The distribution of the practice adoption per size is shown in Figure 5. It is evident that, moving from micro to large enterprises, the attention towards environmental sustainability shifts from the "Products and Services" to the "Production Process"

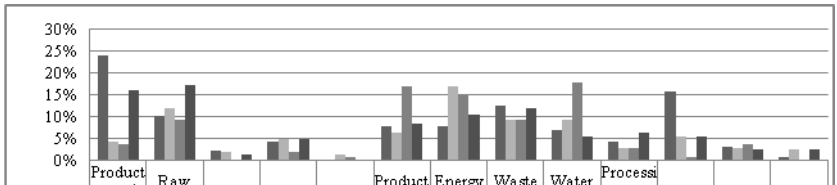
category. Also the implementation of practices related to "Culture" and "Governance" category is larger for larger enterprises.



	Products and Services	Raw Materials	Packaging	Supply Chain	Transportation	Production Process	Energy Management	Waste Management	Water Management	Processing Materials	Culture	Governance	Others
Micro	32%	21%	1%	2%	0%	7%	11%	9%	6%	5%	5%	0%	1%
Small	26%	16%	2%	4%	1%	9%	11%	9%	6%	5%	7%	2%	1%
Medium-Sized	22%	10%	1%	6%	1%	8%	12%	13%	9%	4%	9%	3%	2%
Large	18%	7%	2%	1%	0%	10%	12%	14%	14%	4%	10%	5%	2%

Figure 5 *Adoptions of Environmental Sustainability Practices by Textile Companies – Distribution by Size*

Figure 6 depicts the distribution of practices profiled by sub-division. Spinning companies (sub-division 13.1) are more prone to adopt practices related to product, especially product certification and to spread a culture of sustainability, both internally among the employees and externally towards their stakeholders. Also waste management is a relevant sub-category, with particular reference to the collection of process sub-products (waste fibers) and their re-introduction in the production process. Weaving companies (sub-division 13.2) are characterised by a higher attention towards energy management as they are intensive energy users. Finishing firms (sub-division 13.3) are more committed to use eco-friendly and less harmful chemicals in their processes (as water-based dyes, enzymes, etc.) and to save, purify, collect and reuse water as they are characterised by high water consumption. "Other textile" companies, producing for example technical and non-woven textiles, are more focused on the selection of eco-friendly materials, on the reduction and the recycling of wastes, and on avoiding the use of harmful processing materials.



	Products and Services	Raw Materials	Packaging	Supply Chain	Transportation	Production Process	Energy Management	Waste Management	Water Management	Processing Materials	Culture	Governance	Others
13.1	24%	10%	2%	4%	0%	8%	8%	13%	7%	4%	16%	3%	1%
13.2	4%	12%	2%	5%	1%	6%	17%	9%	9%	3%	5%	3%	2%
13.3	4%	9%	0%	2%	1%	17%	15%	9%	18%	3%	1%	4%	0%
13.9	16%	17%	2%	5%	0%	9%	10%	12%	5%	6%	5%	2%	2%

Figure 6 *Adoptions of Environmental Sustainability Practices by Textile Companies – Distribution by Sub-Division*

5.3 The Clothing Sector

The second sector analysed is classified as NACE Division 14, and it includes all the companies working in the wearing apparel and clothing industry. The final sample counts of 1529 companies, classified as in Figure 7, according to the Table 1.

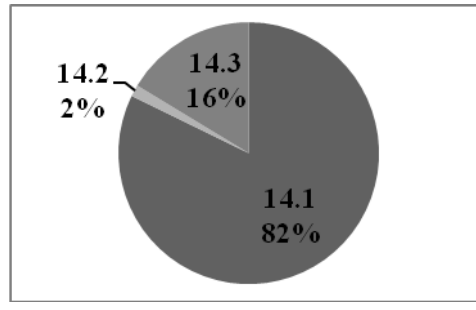


Figure 7 *Sample Distribution by sub-division*

Within these companies, 385 (25%) firms do not have a website. Consequently, the analysis was focused on the remaining 1144. Among the latter, only 96 (9%) has implemented at least one practice, profiled by sub-division as shown in Table 8.

Table 8 *Application of at Least One Sustainability Practice – Distribution by Sub-Division*

	14.1	**14.2**	**14.3**
% of companies that have implemented at least one practice	89%	0%	11%

Focusing the analysis on each sub-division, the percentage of companies adopting at least one practice starts from 0% (sub-division 14.2) to 9% (sub-division 14.1). As previously reported for the textile sector, the low percentages of application confirm a limited commitment of apparel and clothing sectors towards the implementation of environmental sustainability initiatives. On the other hand, a predominance of sub-division 14.1 (manufacturer of wearing apparel except fur apparel) emerge from Table 8.

As for the division 13, the sample of the companies was then profiled according to their dimension. As shown in Figure 8, a trend from small to large companies emerge in the analysis, as indicated by other researches and reported in the previous section.

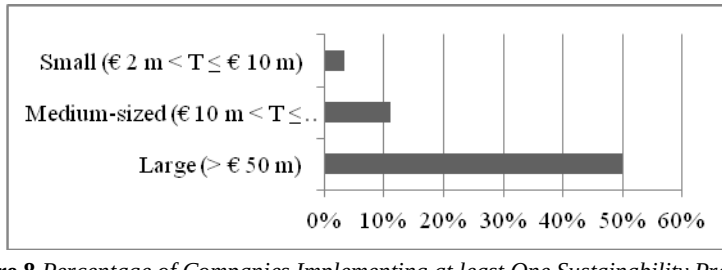
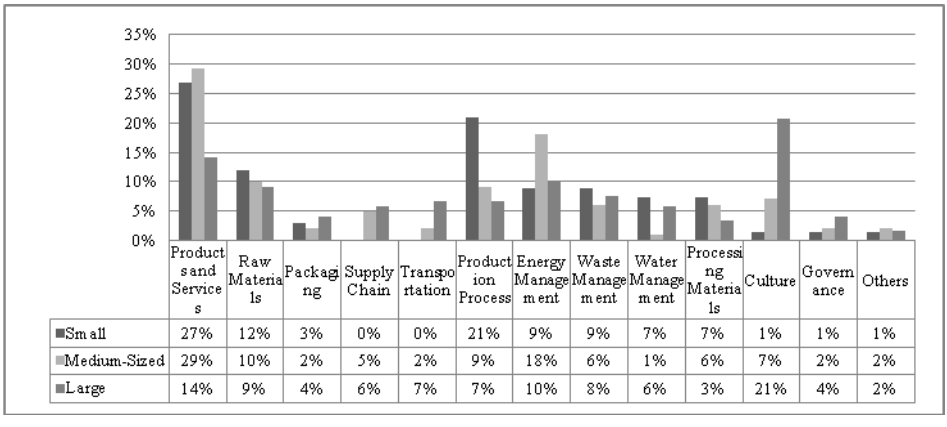


Figure 8 *Percentage of Companies Implementing at least One Sustainability Practice - Distribution by Company Size*

Going deeper into the analysis, the practices adopted were analysed and reported in Table 6. Focusing on the large companies, which represent the 90% of the total sample, the practice most adopted by the apparel and clothing companies is "Stakeholder involvement and partnership with associations, local communities, etc." (38%), followed by "Eco-friendly products and services" (23%) and

"Promotion of a sustainability culture" (21%). Others practices follow these ones starting from "Efficient process and buildings" and "Recyclable, renewable and recycled raw materials" (18%). Analysing the categories proposed in order to classified the sustainable practices, "product and services", "production processes" and "energy management" are the most adopted, whilst the "culture" one is adopted only by the big companies. Practices related to "governance", packaging and transportation are applied by a very low percentage of companies.

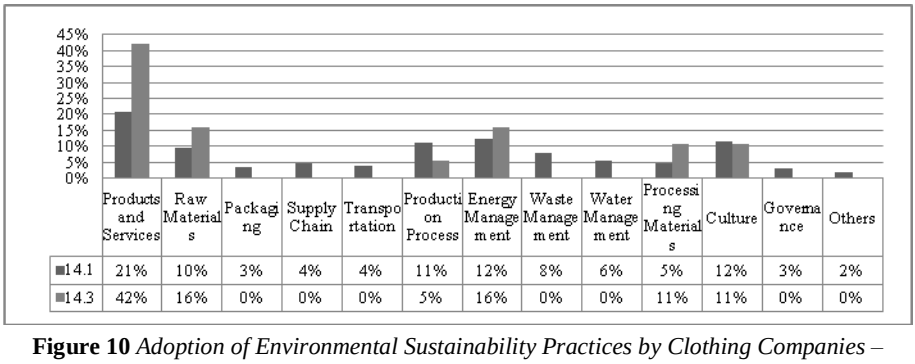
The distribution of the practice adoption per size is reported in Figure 9. As for the textile sector, moving from the small to the big companies, the attention toward environmental sustainability increase, especially for the category "culture".



	Products and Services	Raw Materials	Packaging	Supply Chain	Transportation	Production Process	Energy Management	Waste Management	Water Management	Processing Materials	Culture	Governance	Others
Small	27%	12%	3%	0%	0%	21%	9%	9%	7%	7%	1%	1%	1%
Medium-Sized	29%	10%	2%	5%	2%	9%	18%	6%	1%	6%	7%	2%	2%
Large	14%	9%	4%	6%	7%	7%	10%	8%	6%	3%	21%	4%	2%

Figure 9 *Adoption of Environmental Sustainability Practices by Clothing Companies – Distribution by Size*

Figure 10 reports the distribution of practice classified according to their sub-division. Expect for "Product and Services", where the companies belonging to the 14.3 NACE classifications (Manufacture of knotted and crocheted apparel) results more interested in green initiatives, there is not any significant evidence.



	Products and Services	Raw Materials	Packaging	Supply Chain	Transportation	Production Process	Energy Management	Waste Management	Water Management	Processing Materials	Culture	Governance	Others
14.1	21%	10%	3%	4%	4%	11%	12%	8%	6%	5%	12%	3%	2%
14.3	42%	16%	0%	0%	0%	5%	16%	0%	0%	11%	11%	0%	0%

Figure 10 *Adoption of Environmental Sustainability Practices by Clothing Companies – Distribution by Sub-Division*

5.4 The Leather Sector

This sector deals with the manufacture of leather products and is classified as NACE Division 15. Within this division, companies operate in the tanning and dressing, manufacture of luggage, handbags, footwear and in general any final items mainly

made with leather. The final sample is composed by 1546 companies (small, medium and large), profiled by sub-division according to Figure 11.

Figure 11 *Sample Distributions by Sub-Division*

Among the 1546 companies belonging to the sample, 389 firms (25%) do not have the website. This way, the analysis was carried out on a sample of 1157 firms. Among them, only 108 enterprises (9%) have implemented at least one practice, profiled by sub-divisions as shown in Table 9.

Table 9*Application of at Least One Sustainability Practice – Distribution by Sub-Division*

	15.1	**15.2**
% of companies that have implemented at least one practice	69%	31%

Focusing on the two sub-division, there is a significant difference between the percentage of companies with at least one practice adopted in the "tanning and dressing, manufacture of luggage, handbags, saddler & harness" sub-division (10%) and the "manufacture of footwear" (3%). As a general result, a limited commitment of leather companies towards the implementation of environmental sustainability concept in the business strategy and activities comes out from the analysis.

The sample of the companies that have adopted at least one practice was profiled on the basis of the company size, and the results are reported in Figure 12. Once again, as for the previous sectors, the percentage of companies that have adopted at least one practice increases moving from small to big companies.

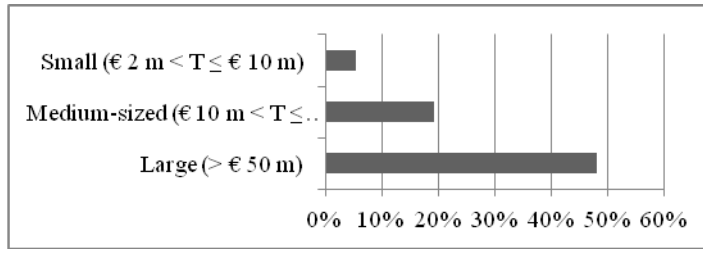
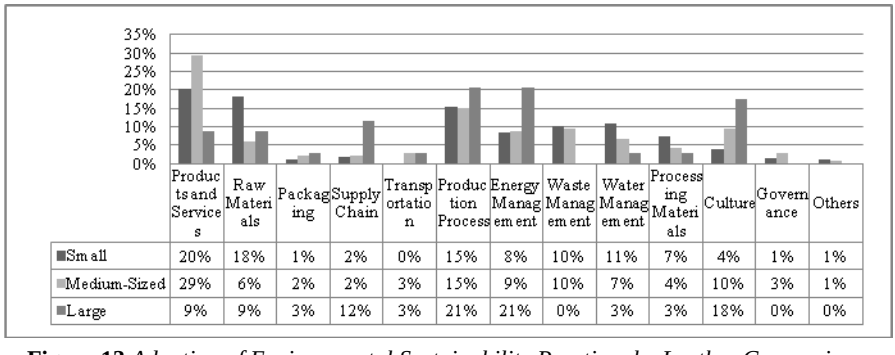


Figure 12 *Percentage of Companies Implementing at least One Sustainability Practice - Distribution by Company Size*

Going forward in the analysis, the practices adopted were analysed (Table 6). "Product certification" and "Process certification" are the most adopted (50%), followed by "Eco-friendly products and services" (25%), "Recyclable, renewable and recycled raw materials" (18%), "Reduction of harmful and toxic raw material

use" (17%), "Water waste treatment" (15%), "Reduction of harmful and toxic processing materials" and "Internal involvement" (13%) and "Waste recovery and reuse" (12). Other practices are adopted by less than or equal to the 10% of the companies.

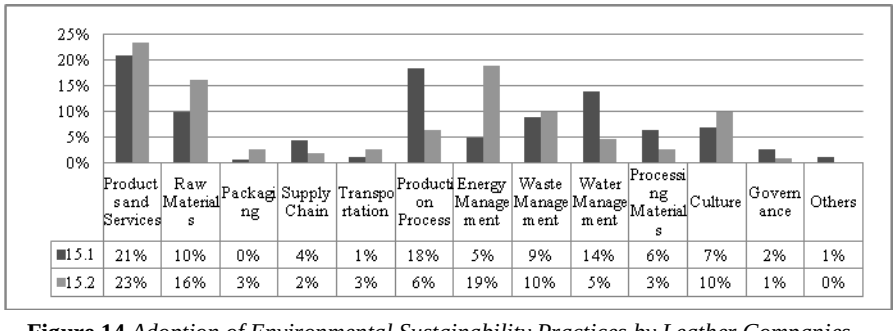
The distribution of the practices adoption per size is shown in Figure 13. Analysing these results, it is evident how, moving from the small to the large companies, the adoption of practices related to "Production process", "Energy management" and "Culture" increases. Whilst for the latter the reason can be attributed to the dimension of the company, the first two categories are strictly related with the energy and water consumption of this industry.



	Products and Services	Raw Materials	Packaging	Supply Chain	Transportation	Production Process	Energy Management	Waste Management	Water Management	Processing Materials	Culture	Governance	Others
Small	20%	18%	1%	2%	0%	15%	8%	10%	11%	7%	4%	1%	1%
Medium-Sized	29%	6%	2%	2%	3%	15%	9%	10%	7%	4%	10%	3%	1%
Large	9%	9%	3%	12%	3%	21%	21%	0%	3%	3%	18%	0%	0%

Figure 13 *Adoption of Environmental Sustainability Practices by Leather Companies – Distribution by Size*

In the end, Figure 14 describes the distribution of practices profiled by sub-division. As previously anticipated, companies belonging to the 15.1 sub-division (which include tanning and wearing) are more interested in "Production process" and "Water management". On the other hand, companies belonging to the 15.2 sub-division (footwear) are more prone to adopt practices related to "Energy management" in comparison with the previous ones.



	Products and Services	Raw Materials	Packaging	Supply Chain	Transportation	Production Process	Energy Management	Waste Management	Water Management	Processing Materials	Culture	Governance	Others
15.1	21%	10%	0%	4%	1%	18%	5%	9%	14%	6%	7%	2%	1%
15.2	23%	16%	3%	2%	3%	6%	19%	10%	5%	3%	10%	1%	0%

Figure 14 *Adoption of Environmental Sustainability Practices by Leather Companies – Distribution by Sub-Division*

5.5 Discussion

Despite the exploratory and descriptive nature of the research, some observations could be proposed. As a general result, the proposed classification framework highlighted the rather scattered approach to the implementation and communication of sustainability practices in the TCL sectors. Analysing the percentage of

implementation both inside each sector and across the sectors, it does not emerge a prevalent consensus on the main practices to be implemented. Therefore, all the three sectors present a limited commitment towards the implementation of sustainability practices, with few exceptions. For example, process certification is implemented in the 46% of Division 15 companies, but only in the 22% of the companies in Division 13 and 14. On the other hand, the production of energy from renewable resources is a practice adopted by the 15% of Division 13 companies, while it lags far behind in the other two divisions. Furthermore, it emerges that the companies belonging to Division 15 are more interested in implementing practices related to the categories "Waste management", "Water Management" and "Processing Materials". This could be due to the presence of toxic substances (e.g. chrome) in the tanning and dressing processes.

Even inside each Division, companies behave differently according to both their size and the sub-division they belong to, as discussed in the previous sections. According to our understanding and knowledge on the TCL sectors, this may be due to technological differences among them. Considering the textile sector, for example, the four sub-divisions display substantially different patterns of practice implementation, probably due to the different requirements of the production processes adopted. Water management is more relevant in sub-division 13.3 (Finishing of textiles) than in sub-division 13.9 (Manufacture of other textile) since they use huge quantities of water. Similarly, analysing the leather industry, the two sub-divisions display different practices implementation probably because of the different production process. Whilst the companies belonging to sub-division 15.1 (Tanning & dressing of leather; manufacture of luggage, handbags, saddlery & harness; dressing & dyeing of fur) have to manage toxic substances and large quantitative of water, companies belonging to 15.2 (Manufacture of footwear) require more energy than the first ones. On the other hand it is important to highlight that companies belonging to 15.2 are usually bigger, in terms of number of employees and turnover, than the ones belonging to 15.1. The dimensional factor could explain the predominance of the practice "culture". Regarding the apparel sector (Division 14), no significant differences emerge between the sub-division.

Notably, the supply chain area appears as one of the most uncovered, especially in SMEs, despite the role globalization has assumed in the last recent years. This increasing globalization has at least two major impacts, from the sustainability standpoint. From the one hand, companies are increasingly held accountable for their own sustainability performance as well as for the sustainability performance of their suppliers and subcontractors. Therefore, the inclusion of sustainability criteria the supplier scouting, evaluation and selection processes are becoming an increasingly mandatory aspect. From the other hand, global supply chains imply transportation, one of the costliest and most environmentally damaging factors in modern supply chain management (Dubey and Bag, 2013). Given the high greenhouse gas impact of transportation, this area requires greater attention from companies operating in the TCL sectors.

The reasons underlying the lack of focus of TCL companies on SCM and transportation practices are not straightforward to discern. Nonetheless, a possible cause is related to the lack of contractual power these companies experience in the supply chain where the focal company detains all the decisions related to transportation. Indeed, the data confirm that SCM and transportation sustainability

practices are usually more implemented in larger companies than in smaller ones (see Figure 5, 9, and 13).

Another substantially neglected area is the area of packaging. Packaging impacts on the sustainability performance in two different stage of its life cycle: when it is produced (consuming resources) and when it is disposed, contributing to the generation of wastes. Despite the relevant impact of this area on sustainability performance, the focus on this aspect still requires a substantial improvement.

Finally, considering the culture sub-category, the framework identifies a rather irregular pattern of practices adoption. In many of the subdivisions, this area is scantily addressed; nonetheless, cultural aspects seem more relevant in large companies. Several explanations could be hypothesised: i) firm size provides useful proxy for the amount of public pressure and, consequently, they are more likely to provide environmental disclosures and to involve their stakeholders (Cormier and Magnan, 2003; Neu et al., 1998); and ii) large firms are associated to a higher employees' average education level, that could result in a deeper sustainability awareness (Waldman et al., 2006).

6. Conclusions

In this paper a theoretical framework for mapping the practices for environmental sustainability implemented in the TCL sectors is presented and used in order to analyse the Italian scenario as the principal European Member State in this industry. The research was carried out taking into consideration only the information reported on the website of the companies. As one of first research devoted to understanding the practices for environmental sustainability in the Italian TCL supply chain, although it is exploratory in nature, some interesting findings can be hypothesized from this study.

First of all, among the approximately 5700 companies belonging to the final sample, the 33% do not have a website. Consequently, the analysis was focused on the remaining approximately 3800 companies. Among the latter, only the 14% have implemented at least one environmental practice, while the practice most adopted by companies is related to the product certification. This means that, as a general result, Italian TCL companies do not seem very interested in sustainability activities, or at least only a few percentages of them has already undertaken some practices on this area. In general, companies behave differently according to both the sub-division they belong to, probably for their differences in their production processes, and their size (in terms of turnover). This result could be interpreted in two different ways. Even if a first analysis could lead to a general indifference of the TCL companies on such topics, on the other hand this correlation could be justified by the difficulty to invest in green activities by small and medium companies.

Because of the nature of the research, several areas could be investigated in order to achieve further results. A future research step could be the extension of this analysis to other countries, in order to compare the results of Italian companies with the others. At the same time, another research methodology approach (e.g. the case based analysis or empirical survey) could be used in order to validate the results obtained with this research. Although companies naturally want to publicize their environmentally-friendly actions, they are often surprisingly hesitant to promote their environmental successes or to issue detailed environmental reports. This way, a direct contact with companies could lead to different results from this study.

7. References

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