# Revision of the European Ecolabel and Green Public Procurement Criteria for Textile Products



## PRELIMINARY REPORT
## (Draft) Working Document

**for**

## 1st AHWG MEETING FOR THE REVISION OF THE ECOLABEL CRITERIA FOR TEXTILE PRODUCTS

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JRC
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# Revision of the European Ecolabel and Green Public Procurement Criteria for Textile Products

**Preliminary report**
**(Draft) Working Document**

***for the 1st AHWG Meeting***

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# INTRODUCTION

This draft preliminary report is intended to provide the background information for the revision of the EU Ecolabel and Green Public Procurement (GPP) criteria for textile products. The study has been carried out by the Joint Research Centre's Institute for Prospective Technological Studies (JRC-IPTS) with technical support from the Danish Standards Foundation (DS) and COWI. The work is being developed for the European Commission's Directorate General for the Environment.

The EU Ecolabel and GPP criteria form key voluntary policy instruments within the European Commission’s Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan and the Roadmap for a Resource-Efficient Europe. The Roadmap seeks to move the economy of Europe onto a more resource efficient path by 2020 in order to become more competitive and to create growth and employment.

The EU Ecolabel promotes the production and consumption of products with a reduced environmental impact along the life cycle and is awarded only to the best (environmental) performing products in the market. Similarly, GPP provides common criteria for public authorities to ’green’ their procurement practices.

An important part of the process for developing or revising Ecolabel criteria is the involvement of stakeholders through public of draft technical reports and criteria proposals and through involvement in working group meetings. This document sets the scene for the discussions planned to take place at the two working group meetings planned to take place in 2012.

This draft preliminary report addresses the requirements of the Ecolabel Regulation No 66/2010 for technical evidence to inform criteria revision. It consists of three main sections:

1. Background information, including a description of the legal framework, preliminary input from stakeholders and an overview on the current number of EU Ecolabel license holders
2. Market information, including a short presentation of other textile labels and an overview of market information regarding textiles and fibres used.
3. A technical analysis pointing out the environmental “hot spots” of textile products based on the information available in different LCA studies.

The information above has been used to determine the focus for the revision process and an initial set of criteria proposals is presented in a supporting technical report.

# 1. BACKGROUND

The first part of the report describes the policy framework for the revision of the EU Ecolabel and GPP criteria for textile products. It presents the scope of the current criteria, identifies the legislative issues relevant to the revision process and presents the findings of preliminary input from stakeholders. The latter includes a review of the statements made by Member States when the current criteria were adopted and an analysis of the responses collected from a questionnaire sent out to Competent Bodies, license holders, public purchasers.

## 1.1 THE EU PRODUCT POLICY FRAMEWORK

The EU Ecolabel and GPP criteria form key voluntary policy instruments within the European Commission's Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan (2008) and the Roadmap for a Resource-Efficient Europe (2020). Both form an important component of the European Commission's broader strategy to support green growth and eco-innovation.

On 16 July 2008 the European Commission presented the Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan. The plan includes a series of proposals on sustainable consumption and production aiming at:

- improving the environmental performance of products;
- increasing the demand for more sustainable goods and technologies;
- stimulating innovation by EU industry.

The EU Integrated Product Policy (IPP) formed a key element of the Action Plan, which proposes a combination of voluntary and mandatory instruments which seek to reduce the environmental impacts arising from products and services along all the phases of their life-cycle.

Two important voluntary policy instruments within the IPP and which are highlighted by the SCP/SIP were the EU Ecolabel and the EU Green Public Procurement (GPP), both of which are intended to promote products and services which demonstrate lower negative environmental impacts when compared with functionally alternative options belonging to the same product/service group. In doing so, these schemes can contribute to the wider objectives of competitiveness and green growth within the EU.

The Roadmap for a Resource-Efficient Europe, which was published in September 2011 and forms part of the Europe 2020 Strategy, further re-inforces the role of the EU Ecolabel and EU Green Public Procurement (GPP). The aim of the Roadmap is to move the economy of Europe onto a more resource efficient path by 2020 in order to become more competitive and to create growth and employment. The role of the Ecolabel and GPP are highlighted as key actions that will contribute towards improving products and changing consumption patterns.

Returning to the SCP/IP, the role of the Ecolabel was highlighted as complementing the information provided to consumers and in acting as a 'label of excellence' that signal to consumers that products perform better in relation to environmental criteria over the whole product life-cycle. It was also intended that the process of setting criteria for the Ecolabel provides useful information for other policy instruments, such the expanded Ecodesign Directive proposed under the Roadmap for a resource-efficient Europe.

GPP was highlighted by both the SCP/IP and the 2020 Roadmap as a route through which the Commission will provide guidance and tools for public authorities to 'green' their procurement practices. This will include the setting of common GPP criteria for products and services together with indicative targets based on the level of the best performing member states.

EU Ecolabel and GPP currently cover a wide list of products and services, with further groups being continuously added. In the 2009-2013 working-plan, the European Union Ecolabelling Board (EUEB) and the European Commission identified "textile products" as a product category for revision during 2011/12.

## 1.2 CURRENT SCOPE OF THE EU ECOLABEL CRITERIA DOCUMENT FOR TEXTILE PRODUCTS

The current scope of the EU Ecolabel criteria document for textile products is defined in article 1 of the Commission Decision of 9 July 2009 "establishing the ecological criteria for the award of the Community Ecolabel for textile products [Decision 567/2009]. Three categories are defined:

- textile clothing and accessories: clothing and accessories (such as handkerchiefs, scarves, bags, shopping bags, rucksacks, belts etc.) consisting of at least 90 % by weight of textile fibres;
- interior textiles: textile products for interior use consisting of at least 90 % by weight of textile fibres. Mats and rugs are included. Wall to wall floor coverings and wall coverings are excluded;

- fibres, yarn and fabric (including durable non-woven) intended for use in textile clothing and accessories or interior textiles.

Feedback on the current scope of the label was invited at the beginning of the revision process in the form of a questionnaire sent to registered stakeholders. The results of the questionnaire and specific comments relating to the scope and definition are presented in section 1.7.

The criteria document itself currently consists of a short framework which sets out the objectives of the criteria and notes on assessment and verification requirements. The aims of the criteria are described as being:

> *'[the promotion of] the reduction of water pollution related to the key processes throughout the textile manufacturing chain, including fibre production, spinning, weaving, knitting, bleaching, dyeing and finishing.'*

The criteria document consists of forty criteria which are intended to meet this specific aim, together with the aims of the EU Ecolabel Regulation. The forty ecological criteria are divided into three main categories:

1. Textile fibre criteria (9 criteria)
2. Processes and chemicals criteria (24 criteria)
3. Fitness for use criteria (7 criteria)

The detailed criteria under each category are listed in table 1.1

Application of the first set of criteria is determined by the form of textile fibre. Application of the second set of criteria vary depending on the fibre, the processing stages that have been used to produce the finished garment or fabric and the type and application of the garment or fabric. Application of the third set of criteria is generic to all products apart from specific stated exclusions.

**Table 1.1: Current textile product Ecolabel criteria according to Decision 2009/567/EC**

| | |
|---|---|
| Textile fibre criteria | 1. Acrylic<br>2. Cotton and other natural cellulosic seed fibres (including kapok)<br>3. Elastane<br>4. Flax and other bast fibres (including hemp, jute and ramie)<br>5. Greasy wool and other keratin fibres (including wool from sheep, camel, alpaca and goat)<br>6. Man-made cellulose fibres (including viscose, lyocell, acetate, cupro and triacetate)<br>7. Polyamide<br>8. Polyester<br>9. Polypropylene |
| Processes and chemicals criteria | 10. Auxiliaries<br>11. Biocidal and biostatic products<br>12. Stripping or depigmentation<br>13. Weighting<br>14. All chemicals and chemical preparations<br>15. Detergents, fabric softeners and complexing agents<br>16. Bleaching agents<br>17. Impurities in dyes: Colour matter with fibre affinity (soluble or insoluble)<br>18. Impurities in pigments: Colour matter with fibre affinity (soluble or insoluble)<br>19. Chrome mordant dyeing<br>20. Metal complex dyes |

| | |
|---|---|
| | 21. Azo dyes<br>22. Dyes that are carcinogenic, mutagenic or toxic to reproduction<br>23. Potentially sensitizing dyes<br>24. Halogenated carriers for polyester<br>25. Printing<br>26. Formaldehyde<br>27. Wastewater discharges from wet processing<br>28. Flame retardants<br>29. Anti felting finishes<br>30. Fabrics finishes<br>31. Fillings<br>32. Coatings, laminates and membranes<br>33. Energy and water use |
| Fitness for use criteria | 34. Dimensional changes during washing and drying<br>35. Colour fastness to washing<br>36. Colour fastness to perspiration (acid, alkaline)<br>37. Colour fastness to wet rubbing<br>38. Colour fastness to dry rubbing<br>39. Colour fastness to light<br>40. Information appearing on the ecolabel |

### 1.3 TECHNICAL TERMS OF REFERENCE FOR THE EU ECOLABEL CRITERIA DOCUMENT FOR TEXTILE PRODUCTS

In seeking to review the Ecolabel criteria for textile products the main term of reference is Regulation No 66/201 on the EU Ecolabel.  Article 6 of the Regulation sets out the 'General requirements for EU Ecolabel criteria'.  Within this Article clause 3(a) highlights the importance of there being a scientific basis for criteria based on a whole life cycle approach.  It highlights the following considerations in determining criteria:

*(a) the most significant environmental impacts, in particular the impact on climate change, the impact on nature and biodiversity, energy and resource consumption, generation of waste, emissions to all environmental media, pollution through physical effects and use and release of hazardous substances;*

*(b) the substitution of hazardous substances by safer substances, as such or via the use of alternative materials or designs, wherever it is technically feasible;*

*(c) the potential to reduce environmental impacts due to durability and reusability of products;*

*(d) the net environmental balance between the environmental benefits and burdens, including health and safety aspects, at the various life stages of the products;*

*(e) where appropriate, social and ethical aspects, e.g. by making reference to related international conventions and agreements such as relevant ILO standards and codes of conduct;*

*(f) criteria established for other environmental labels, particularly officially recognised, nationally or regionally, EN ISO 14024 type I environmental labels, where they exist for that product group so as to enhance synergies;*

*(g) as far as possible the principle of reducing animal testing*

Further to these considerations the provisions of Article 6(4) requires fit for use criteria to also be included and under Articles 6(6) and 6(7) the Ecolabel cannot be awarded to products containing:

- Substances or preparations/mixtures that are classification as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction (CMR), in accordance with Regulation (EC) No 1272/2008
- Substances or preparations/mixtures that are restricted under Article 57 of the REACH Regulation No 1907/2006
- Substances or preparations/mixtures that have been identified according to the procedure described under Article 59 of the REACH Regulation No 1907/2006 and which have been subsequently classified as Substances of Very High Concern.

Article 6(6) creates the scope for the Commission to grant derogations for substances that meet these conditions;

> *'…in the event that it is not technically feasible to substitute them as such, or via the use of alternative materials or designs, or in the case of products which have a significantly higher overall environment performance compared with other goods of the same category* '

such a derogation can only be granted if a product containing substances referred to in Paragraph (6) is present in an article or in any homogenous part of a complex article in concentrations of less than 0.1% (weight by weight).

However, no derogation can be given for substances that meet the criteria of Article 57 of Regulation (EC) No 1907/2006 and that have been identified according to the procedure described in Article 59(1) which establishes the Candidate List for Substances of Very High Concern (SVHC), and that are present in mixtures, in an article or in any homogeneous part of a complex article in concentrations higher than 0,1 % (weight by weight).

## 1.4 THE CRITERIA REVISION PROCESS

The process of revising of the EU Ecolabel and GPP criteria for textiles is planned in order to facilitate as high a stakeholder involvement as possible. The preliminary report and the technical report will form the common basis for the development of criteria for both the EU Ecolabel and GPP criteria.

During the process two open working group meeting are planned. At these meetings the suggested draft will be presented and discussed. In figure 1.1 a view of the revision process is given.

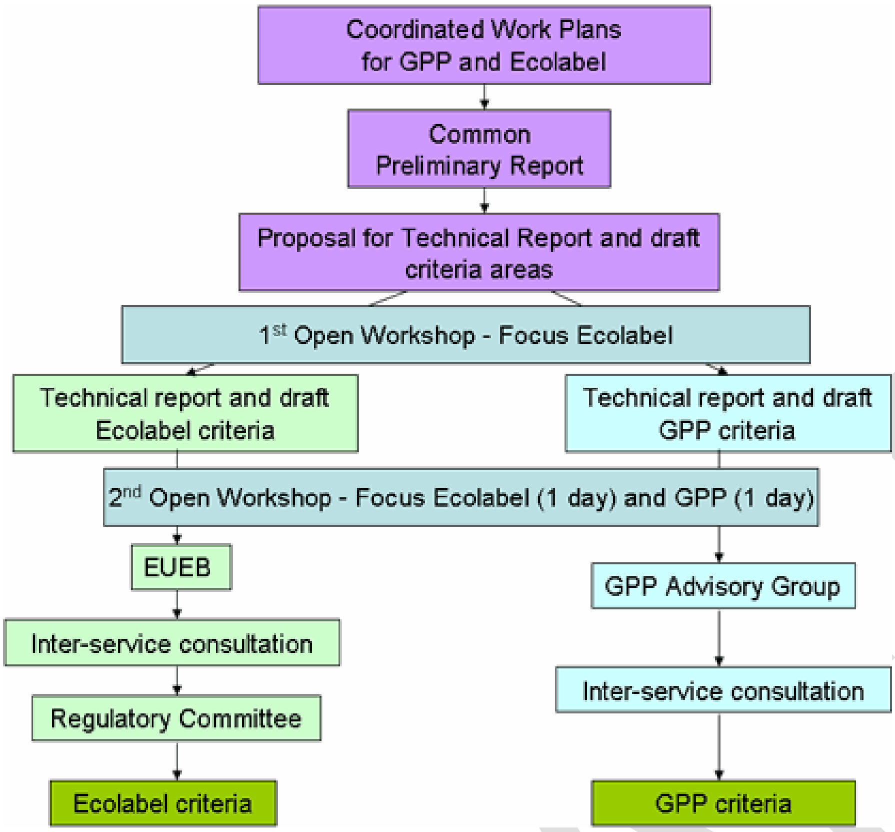


**Figure 1.1: Overview of the revision process for the EU Ecolabel criteria and GPP**

## 1.5 LEGISLATION OF SIGNIFICANCE TO REVISION OF THE ECOLABEL FOR TEXTILE PRODUCTS

In this section we have brought together and described EU legislation which may be of significance to the revision of the EU Ecolabel for textile products. The legislation we have identified can be grouped into three broad areas:

- Resource efficiency
- Product labeling and harmonisation
- Industrial regulation and chemical management

For each area we briefly describe the relevant policy instruments and the nature of their influence on textile products and their environmental performance.

### 1.5.1 RESOURCE EFFICIENCY

Whilst there is no specific legislation under the European Commission's Sixth Environmental Action Plan which directly seeks to regulate the sustainable use of natural resources during the life cycle of textile products, a number of Directives addressing waste may be of significance in considering the focus for the criteria:

- Landfill Directive 1999/39/EC: The Directive requires a 35% reduction in the biodegradable waste being sent to landfill by 2016. This will include textiles manufactured that are readily biodegradable i.e. those manufactured from natural or bio-polymer materials.
- Waste Framework Directive 2008/98/EC: Textiles are a priority waste stream for which end of waste criteria are to be developed for product that is collected for re-use or recycling. Bio-waste is also a thematic issue under the Directive.
- Incineration Directive 2000/76/EC: This Directive sets emissions limits and monitoring requirements for pollutants to air and also seeks to control releases to water resulting from the treatment of waste gases by pollution control equipment. The Directive is significant because textiles may contain substances that could undergo chemical reactions or transformations during the combustion process and become concentrated in waste gases and/or bottom ash.

According to statistics the EU currently discards 5.8 million tonnes of textile waste per annum. The end of life phase for textiles can therefore be considered to be an indirect policy consideration in relation to textile products.

### 1.5.2 PRODUCT LABELING AND HARMONISATION

The labeling of textiles placed on the market in the EU is regulated by three specific Directives. The following Directives ensure the consistent labeling for fibre composition and associated sampling methods. Specific Directives also apply to Personal Protective Equipment (PPE):

- **Directive 2008/121/EC1** on textile names stipulated that all textile products have to be labelled or marked whenever they are put on the market for production or commercial purposes. The directive covered all raw, semi-worked, worked, semi-manufactured, semi-made, made-up products with more than 80% textile weight content. The labelling

[1] *Directive 2008/121/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 14 January 2009 on textile names (recast)*

indicating the fibre composition was mandatory in all stages of the industrial processing and commercial distribution of a product.

- **Directive 73/44/EEC2** and **Directive 96/73/EC3** harmonised the methods for sampling and analysis to be used in Member States for the purpose of determining the fibre composition of binary[4] and ternary[5] textile fibre mixtures. Both Directives have been introduced in order to facilitate the implementation of the provisions on the harmonisation of textiles names (now regulated through Directive 1007/2011, but firstly introduced as early as 1971). In this sense, (a) they identified methods for the quantitative analysis of binary and ternary fibre mixtures, (b) they set up rules in case no uniform method exists and (c) they specified proceedings which take into consideration recent technical progress. As a result of the implementation of these Directives, manufacturers, importers, traders and retailers must carry out fibre tests in accordance to the uniform test methods set out in the Directives.

- **Directives 89/686/EEC and 89/656/EEC** regulate the health and safety performance of Personal Protective Equipment (PPE) ensuring that there is consistent labelling of the performance of garments and the hazards they will protect users against. The second Directive addresses the design and performance of products to be used in workplaces.

The regulation of care and size and country of origin labeling currently takes place at a national level. Voluntary systems currently exist for care labelling (ISO 3758/GINETEX) and garment size (EN 13402).

A European Commission study looking at the options for EU-wide harmonisation of labelling requirements for textile products commenced in 2011. The study has examined the existing EU framework for the labelling of textile products but also has a wider remit to consider voluntary systems and standards. There are a number of areas of possible overlap with the EU Ecolabel within the scope of the labeling being considered by the study:

- country of origin labelling;



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[2] The Annexe II to Directive 96/73/EC has been amended by Directive 2006/2/EC for the purposes of its adaptation to technical progress (Fibres polylactide and elastomultiester have been added to the list of fibres set out in the Annexes I and II)

[3] *Directive 96/73/EC of 16 December 1996 on certain methods for the quantitative analysis of binary textile fibre mixtures*

[4] *Directive 96/73/EC of 16 December 1996 on certain methods for the quantitative analysis of binary textile fibre mixtures*

[5] *Council Directive 73/44/EEC of 26 February 1973 on the approximation of the laws of the Member States relating to the quantitative analysis of ternary fibre mixtures*

- traceability labelling;
- care labelling;
- size labelling;
- flammability labelling
- labelling of allergenic substances;
- environmental labelling; and
- social labelling.

It is intended that it will examine options for harmonisation during 2012 and these may therefore have relevance to the Ecolabel.

Technical harmonization of standards and provisions relating to PPE forms part of the EU Lead Market Initiative (LMI) under which technical textiles are a key area for industrial innovation. Harmonisation technical standards were scheduled to have been brought forward during 2011. This areas is highlighted by the LMI as being particularly relevant to public procurement.

Clothing and textile labels are highly visible point of reference for consumers and employers. The Ecolabel, together with supporting product labels that may influence the life cycle performance of a garment or fabric, are potentially therefore a direct consideration. The existing legislative framework, together with moves towards harmonisation, may therefore be of relevance to the textile product revision.

### 1.5.3 INDUSTRIAL REGULATION AND CHEMICAL MANAGEMENT

#### 1.5.3.1 Integrated Pollution Prevention and Control (IPPC) 1996/61/EC

The Integrated Pollution Prevention and Control (IPPC) Directive[6] aims at minimising pollution from various industrial sources throughout the European Union. Plants for the pre-treatment (operations such as washing, bleaching, mercerisation) or dyeing of fibres or textiles where the treatment capacity exceeds 10 tonnes per day are subject to the IPPC Directive, i.e. are required to obtain an authorisation (environmental permit) to operate. Regulation is also linked to other priority areas of EU policy such as the Water Framework Directive, which maintains a list of priority substances for regulation.

Furthermore, according to the IPPC Directive, permit conditions must be based on Best Available Techniques (BAT). The Reference Document on Best Available Techniques for the Textiles Industry (BREF) was adopted in 2003. This document provides general information on the textile sector and on the industrial processes used within the textile sector (in particular fibre preparation, pre-treatment, dying printing and finishing). It provides data and information concerning emission and consumption levels and describes the emission reduction and other techniques that are considered to be most relevant for determining BAT and BAT-based permit conditions. A revision of the BREF textiles is scheduled for 2009.

The IPPC Directive and the supporting BREF are therefore likely to be a direct consideration in the revision of the Ecolabel, although it is important to recognise that industry best practice may have advanced in the period following the publication of the BREF.

#### 1.5.3.2 VOC Solvents Emissions Directive 1999/13/EC

The VOC (Volatile Organic Compounds) Solvents Emissions Directive is the main policy instrument for the reduction of industrial emissions of volatile organic compounds (VOCs) in the European Union. It covers a wide range of solvent using activities, e.g. printing, surface cleaning, vehicle coating, dry cleaning and manufacture of footwear and pharmaceutical products.

The VOC Solvents Emissions Directive requires installations in which such activities are applied to comply either with the emission limit values set out in the Directive or with the requirements of the so-called reduction scheme. The Directive is therefore a direct consideration in terms of regulatory benchmarks for specific processes used during textile manufacturing.

[6] Directive 96/61/EC

#### 1.5.3.3 REACH Directive EC/2006/1907

The REACH (Registration, Evaluation, Authorisation and Restriction of Chemical substances) Directive came into force in 2007 with the primary aim to; *'ensure a high level of protection of human health and the environment*'. REACH places the burden of proof on industry, which has to collect or generate the data necessary to ensure the safe use of chemicals. REACH is regulated by the European Chemicals Agency (ECHA) which was established under the provisions of the Regulation.

REACH requires the registration of substances used by industry and provides rules for the phasing out and substitution of the most dangerous chemicals based on the latest scientific evidence in relation to the hazards they may pose. Chemicals that are restricted are referred to under Article 57 and listed in Annex XVII of the Regulation whilst Article 59(1) sets out a procedure for the recommendation, registration, testing and authorisation of chemicals considered to pose risks to human health or the environment.

REACH is complemented by the new Regulation for Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation, January 2009). This Regulation incorporates the classification criteria and labelling rules agreed at UN level - the Globally Harmonised System of Classification and Labelling of Chemicals (GHS). The Regulation identifies a series of Risk and Hazard Phrases to be communicated on the Safety Data Sheets for substances.

**Substances that are restricted or require authorisation under REACH Annex XIV and XVII**

REACH has consolidated EU processes for the classification, authorisation and restriction of substances formerly regulated by other pieces of international and EU legislation. These include substances controlled by the Biocide Directive 98/8 EC, the Azo dye Directive 2002/61/EC and Regulation 850/2004 on Persistent Organic Pollutants. In relation to textiles a number of relevant substances are currently authorised or restricted by Annexes XIV and XVII of REACH:

- Flame retardants: Penta- and octabromodiphenol ethers (penta and octa-BDE) Threshold limit is 0,1% (w/w). Impregnants tris (2, 3-dibrompropyl), phosphate cas. Nr. 126-72-7, (TRIS), tris (1-aziridinyl) phosphineoxide (TEPA) cas. Nr. 5455-55-1) and polybrominated biphenyls (PBB) cas. Nr. 59536-65-1 must not be used in textiles which are intended to come into contact with the skin, e.g. articles of clothing or linen.

- Surface repellents: PFOS (perflourooctane sulfonate and its derivatives) are prohibited in textiles. Special notice should be taken of the ban on textiles or other materials with a coating, if the amount of PFOS comprises 1µg/$m^2$ or more of the coated materials.
- Biocides: Textiles must not contain pentachlorophenol (PCP). The import, export, sale or use of products containing 5 ppm, or above of PCP or its salts or esters is prohibited.
- Dyes: Azo dyes is the name of the group of synthetic chemicals based on nitrogen that are often used in the textile industry.

Some Azo dyes may dissociate under certain conditions to produce carcinogenic and allergenic aromatic amines Azo dyes are restricted according to appendixes 8 in REACH, see table 1.2.

**Table 1.2: Azocolourants, Appendix 8, REACH *listed in Criteria 21 L197/79 [Decision 567/2009]**

| Cas nr | Index No | EC No | Substance |
|---|---|---|---|
| 92-67-1 | 612-072-00-6 | 202-177-1 | biphenyl-4-ylamine 4-aminobiphenyl xenylamine* |
| 92-87-5 | 612-042-00-2 | 202-199-1 | Benzidine* |
| 95-69-2 | 202-441-6 | | 4-chloro-o-toluidine* |
| 91-59-8 | 612-022-00-3 | 202-080-4 | 2-naphthylamine* |
| 97-56-3 | 611-006-00-3 | 202-591-2 | o-aminoazotoluene 4-amino-2',3-dimethylazobenzene 4-o-tolylazo-o-toluidine |
| 99-55-8 | 202-765-8 | | 5-nitro-o-toluidine* |
| 106-47-8 | 612-137-00-9 | 203-401-0 | 4-chloroaniline* |
| 615-05-4 | 210-406-1 | | 4-methoxy-m-phenylenediamine |
| 101-77-9 | 612-051-00-1 | 202-974-4 | 4,4'-methylenedianiline 4,4'-diaminodiphenylmethane |
| 91-94-1 | 612-068-00-4 | 202-109-0 | 3,3'-dichlorobenzidine 3,3'-dichlorobiphenyl-4,4'-ylenediamine* |
| 119-90-4 | 612-036-00-X | 204-355-4 | 3,3'-dimethoxybenzidine o-dianisidine* |
| 119-93-7 | 612-041-00-7 | 204-358-0 | 3,3'-dimethylbenzidine 4,4'-bi-o-toluidine |
| 838-88-0 | 612-085-00-7 | 212-658-8 | 4,4'-methylenedi-o-toluidine |
| 120-71-8 | 204-419-1 | | 6-methoxy-m-toluidine p-cresidine* |
| 101-14-4 | 612-078-00-9 | 202-918-9 | 4,4'-methylene-bis-(2-chloro-aniline) 2,2'-dichloro-4,4'-methylene-dianiline* |
| 101-80-4 | 202-977-0 | | 4,4'-oxydianiline* |
| 139-65-1 | 205-370-9 | | 4,4'-thiodianiline* |
| 95-53-4 | 612-091-00-X | 202-429-0 | o-toluidine 2-aminotoluene* |
| 95-80-7 | 612-099-00-3 | 202-453-1 | 4-methyl-m-phenylenediamine |
| 137-17-7 | 205-282-0 | | 2,4,5-trimethylaniline* |
| 90-04-0 | 612-035-00-4 | 201-963-1 | o-anisidine 2-methoxyaniline |
| 60-09-3 | 611-008-00-4 | 200-453-6 | 4-amino azobenzene* |

**Substances that currently appear on the ECHA Candidate list**

As we discussed in section 1.3 substances that form part of the SVHC (Substances of Very High Concern) Candidate List should be excluded from Ecolabelled products.  The list is dynamic and is updated with new substances as candidate substances are identified, testing is carried out and evidence is brought forward.  The Candidate list will therefore have changed since the last revision of the textile product Ecolabel criteria.

A number of the substances that now feature in the list were raised as issues in the Commission's Statement following it's Decision 2009/567/EC on the ecological criteria for textile products. The functional role of these substances is understood to include:

- Auxilliaries
- Dyes and mordants
- Flame retardants
- Plasticizers
- Surfactants

Below we present substances that currently appear on the SVHC candidate list (table 1.3) and consultation list (table 1.4) with possible application in the textile industry.

**Table 1.3: Candidate list Substances of Very High Concern (ECHA as of January 2012)**

| SVHC substance from candidate list | Cas No. | Classification | Possible application in textile industries [SGS 2011a.] | Restricted by existing EU eco-label criteria |
|---|---|---|---|---|
| Alkanes, C10-13, chloro (short chained chlorinated paraffins) | 85535-84-8 | PBT, vPvB | Flame retardant in textile, coating for textiles | Criteria 28 and 30: <0,15 by weight of flame retardant or ≤0,1% by weight of finishing substance |
| Lead chromate | 7758-97-6 | C, cat. 2<br>R, cat. 1 | Manufacture of pigment and dyes, textile printing | Criteria 9:<br>Must not be used in polypropylene<br>Criteria 22.2<br>≤0,1% by weight in dye substances or preparations |
| Lead chromate molybdate sulphate red (C.I.Pigment Red 104) | 12656-85-8 | C, cat. 2<br>R, cat. 1 | Manufacture of pigment and dyes, textile printing | Criteria 9:<br>Must not be used in polypropylene<br>Criteria 22.2<br>≤0,1% by weight in dye substances or preparations |
| Lead sulfochromate yellow (C.I.Pigment yellow 34) | 1344-37-2 | C, cat. 2<br>R, cat. 1 | Manufacture of pigment and dyes, textile printing | Criteria 9:<br>Must not be used in polypropylene<br>Criteria 22.2<br>≤0,1% by weight in dye substances or preparations |

| | | | | |
|---|---|---|---|---|
| Sodium chromate | 7775-11-3 | C, Cat.2<br>M, Cat.2<br>R, Cat.2 | Mordant for dyes and pigments, dying protein fibres, dye fixing agents in wool | Criteria 19: Chrome mordant dyeing is not allowed<br>Criteria 22.2 ≤0,1% by weight in dye substances or preparations |
| Potassium chromate | 7789-00-6 | C, Cat.2<br>M, Cat.2<br>R, Cat.2 | Mordant for dyes and pigments, dying protein fibres, dye fixing agents in wool | Criteria 19: Chrome mordant dyeing is not allowed<br>Criteria 22.2 ≤0,1% by weight in dye substances or preparations |
| Sodium dichromate | 7789-12-0, 10588-01-9 | C, Cat.2<br>M, Cat.2<br>R, Cat.2 | Mordant for dyes and pigments, dying protein fibres, dye fixing agents in wool | Criteria 19: Chrome mordant dyeing is not allowed<br>Criteria 22.2 ≤0,1% by weight in dye substances or preparations |
| Ammonium dichromate | 7789-09-5 | C, Cat.2<br>M, Cat.2<br>R, Cat.2 | Mordant for dyes and pigments, dying protein fibres, dye fixing agents in wool | Criteria 19: Chrome mordant dyeing is not allowed<br>Criteria 22.2 ≤0,1% by weight in dye substances or preparations |
| Potassium dichromate | 7778-50-9 | C, Cat.2<br>M, Cat.2<br>R, Cat.2 | Mordant for dyes and pigments, dying protein fibres, dye fixing agents in wool | Criteria 19: Chrome mordant dyeing is not allowed<br>Criteria 22.2 ≤0,1% by weight in dye substances or preparations |

The consultation list contains substances that are under evaluation which may gradually be added to the candidate list depending on the scientific evaluation of their risk profile. The issue to be discussed with stakeholders in relation to both lists are whether:

- they are used or could be used in any significant quantity
- they are used or could be used for applications other than those already restricted.
- whether arguments exist for considering /not considering their restriction.

**Table 1.4: Consultation list for Substances of Very High Concern (ECHA as of January 2012)**

| SVHC substance from consultation list | Cas No. | Classification | Possible application in textile industries [SGS 2011b.] | Restricted by existing EU eco-label criteria |
|---|---|---|---|---|
| 4-tert-Octylphenol | 140-66-9 | Ev.C *1 | Textile auxiliaries, manufacture of non-ionic surfactants | Criteria 10:<br>Use of substance is not restricted |
| 2-Methoxyaniline | 90-04-0 | Carc. 1B, | Intermediate in the manufacturing of azo dyes, pigments and fragrances | Criteria 22.2<br>≤0,1% by weight in dye substances or preparations |
| Arsenic acid | 7778-39-4 | Carc. 1A | Desiccant for cotton | Criteria 2:<br>Use of substance is not restricted |
| Bis(2-methoxyethyl)ether | 111-96-6 | Repr. 1B | Used in water based dyes | Criteria 22.2<br>≤0,1% by weight in dye substances or preparations |
| N,N-dimethylacetamide (DMAC) | 25214-70-4 | Repr. 1B | Solvent for resins and polymers; paint strippers, ink removers, coatings | Criteria 12:<br>Use of substance is not restricted |

| | | | | |
|---|---|---|---|---|
| Dichromium tris(chromate) | 24613-89-6 | Carc. 1B, | Catalyst in mordanting of yarns | Criteria 19: Chrome mordant dyeing is not allowed<br>Criteria 22.2 ≤0,1% by weight in dye substances or preparations |

*1: Ev.C stands for substances of equivalent level of concern

## 1.6 COMMISSION STATEMENTS

At the adoption of the present criteria document on March 2009, several statements were submitted by Member States on issues for further investigated in the next revision. These statements are listed below, together with a brief discussion of their significance as environmental issues, their relevance to textile products and initial recommendations on how these issues could be addressed by this revision.

### 1: The use and environmental impact of all fluorinated substances

The growing environmental concern relating to perfluorooctane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) derivatives and related substances is due to the fact that these potential harmful compounds now are global environmental pollutants distributed in air, water, soils and biota. In addition, in many countries PFOS, PFOA and other related substances have been observed in human blood samples of the general population [Poulsen et al]. The reasons for this widespread occurrence seem to be that perfluorinated substances are increasingly used and are environmentally persistent and bioaccumulative.

A range of polyfluorinated substances are used in numerous industrial products and consumer products because of their special chemical properties, for instance the ability to repel both water and oils. The most studied and well-known polyfluorinated substances are PFOS and PFOS related substances. These were banned under the Stockholm Convention on Persistent Organic Pollutants and European Commission Regulation 850/2004. They are not produced anymore, and during the past years have been substituted with other fluorinated compounds – either perfluorinated compounds with shorter chain length or polyfluorinated compounds, such as fluorotelomer alcohols [EPA, 2008]. Another example of a widely used fluorinated material is expanded polytetrafluoroethylene (ePTFE) fabric. An analysis of fluorinated substances currently used by the textile industry will be included in the technical analysis.

**2: Use and impact of nanotechnologies**

The use of nanotechnologies has attracted significant interest because of its potential to lend textiles beneficial properties such as water repellency and resistance to bacteria and UV degradation. They have been subject of ongoing scientific research in order to better understand their potential impact on the environment. A recent investigation by the Danish Environmental Protection Agency highlighted seven specific nanomaterials for monitoring in relation to textiles - cerium dioxide, carbon fullerenes, nanoclay, silicon dioxide, silver, titanium dioxide and zero-valent iron.

Nano-particles are currently included in the general criterion on chemicals which excludes hazardous substances. The criterion developed for the product group 'Laundry detergents' in 2011 [REF], together with emerging LCA and toxicological evidence will be used as starting point to inform the review. Also the current scope in the current criteria document [Decision 567/2009] will be used as starting point, e.g. where the use of water repellents is excluded.

**3: New textiles (e.g. textiles with electric or electronic equipment)**

In the market analysis we will investigate to what extent these products are placed on the market. Our initial understanding is that these are a niche product and that they should be explicitly excluded by the scope of the EU Ecolabel. This is a point for discussion with stakeholders.

**4: Look at restricting the use of flame retardants, phthalates, biocides, PFAS**

These substances are, for the most part, covered by the current criteria document but it will be investigated if the present criteria in combination with regulatory restrictions under REACH are sufficient or if precisions are to be made. As we have already discussed in section 1.5 a number of forms of these substances have, since the last criterion revision, been added to the ECHA Candidate list of Substances of Very High Concern.

**5: Tighter link to the best value of emissions in the BAT/BREF documents**

The most recent BREF document (2003) [BREF Textiles, 2003] will be included in the work. It will be investigated if the key performance indicators contained in the BREF can be used in the criteria document. In this case, as the BREF document was published in 2003 and as we noted in section 1.5, it can be expected that these values can be achieved by many companies as industry best practice has advanced and thus stricter requirements could also be considered. Also BREF documents for other products will be referred to eg. Polyester.

**6: Energy requirements**

This will form a part of the technical analysis. The relevance of energy consumption throughout the life cycle of textile products will be investigated and if practicable and relevant criteria for the reduction of energy consumption will be proposed.

**7: Problems in the waste phase of the product**

The EU Ecolabel has no control over how products are effectively disposed. However, apart from the importance of informing the consumers about the best practices to be followed, the responsibility of producers could be increased. Consumer information and issues related to the production stage which can cause difficulties in the waste phase will be considered within the study as part of the life cycle approach. For examples, better attention could be paid to the decomposition products which can be formed from the substances currently used in textiles with the aim of limiting the use of the most problematic ones.

## 1.7 PRELIMINARY STAKEHOLDER QUESTIONNAIRE FINDINGS

At the start of the revision process, a questionnaire was sent out to selected stakeholders in September 2011. The questionnaire is enclosed in Appendix 2. The target groups were license holders, Competent Bodies handling applications for EU Ecolabel and organizations involved in GPP. The purpose was to obtain some initial feedback on where the criteria document could be improved.

Regarding Competent Bodies the main focus was to obtain information on how the criteria document and application pack was conceived. Was the scope and the following criteria clear and how did they feel about the stringency of the criteria? The focus for license holders was basically the same. But also more criteria specific question was raised including request for information in the license holders work in relation to CSR issues. For organizations involved in GPP the focus was the scope and how CSR issues were included in their contracts.

The following organizations answered the questionnaire. In total 15 answers were received: 5 from Competent Bodies, 7 from producers and 3 from other stakeholders. The discussion of the first draft for new criteria will require a broader involvement with stakeholders.

**Table 1.5: List of stakeholders whom responded to the questionnaire**

| Organisation | Country |
|---|---|
| **Competent Bodies** | |
| Danish EPA (Danish CB), MST | Denmark |
| VKI - Austrian Consumer Association, Ecolabel | Austria |
| Umweltbundesamt, UBA | Germany |
| SMK (CB, The Netherlands) | The Netherlands |
| AFNOR | France |
| **Producers/organizations** | |
| Textiles Inducam S.L. | Spain |
| Wooltex | United Kingdom |
| Union Pioneer Public Co., Ltd | Thailand |
| CSIRO Materials Science and Engineering | Australia |
| Rama Textile Industry | Thailand |

| | |
|---|---|
| Inter.Weave LTD | New Zealand |
| The Merino Company | Australia |
| **Others** | |
| FIRA International Ltd | United Kingdom |
| ÖTI - Institut für Ökologie, Technik und Innovation GmbH | Austria |
| EFRA, the European Flame Retardants Association | Belgium |

**Main points and recommendations arising from the questionnaire**

Below is made a summary of the different inputs in order to make some overall recommendations as to subjects that should be addressed during the revision:

**Scope**

*Question asked: do you find the scope adequate or should other products be included?*

There was a general approval and acceptance of the scope. The following point shall be addressed in the revision:

- Point from CB forum should be addressed (single use products, hessian cloth – intermediate product, textiles for outdoor use)
- Define filling materials more clearly (and also take the 90 % calculation into account – what is not included in the calculation)
- Define end product and intermediate products (which is not included in the scope)
- Include B2B products (and spinners, dyers and textiles finishers)
- Define “smart textiles” and textiles containing electronics and how they shall be included

**Applications**

*Question asked: how did you find the application process and the application pack?*

In this part it was mostly recommended to put more effort into the User Manual to ensure that it is clear and directly aimed at the applicants.

**Criteria document**

*Question asked: does the criteria document have the right focus or should other fibre or issues be included?*

The following points were made:

- Include criteria for bamboo fibre
- The criteria and verification process for wool scouring should be reviewed/improved
- Man made fibres: here criteria on energy and water consumption should be introduced
- Criteria on flame retardants shall be reworded
- Resource use shall be in focus – textiles not recyclable shall not be ecolabeled
- Percentage of organic cotton shall be evaluated

**Specific criteria issues**

*A set of specific questions were asked in relation to the current criteria (see appendix)*

The following points were made:

- Regarding fibres it shall be evaluated if aramid should be included.
- 2 out of 6 uses metal complex dyes. Exclusion shall be evaluated.
- Fitness for use criteria are sufficient. Shrinkage should be evaluated though.
- CSR policies are not widely implemented by producers

## 1.8 SUMMARY

Below is a short summary of the main conclusions that can be drawn from section 1.

The EU Ecolabel is a voluntary market instrument and so product criteria should be designed to reflect and to recognise the best performing products in the market. Implementing the most recent EU Ecolabel Regulation flags two key points that relate to the revision process:

1. Focus shall be on the most environmental impacts and the proposed criteria shall be science based and based on a whole life cycle approach.
2. More focus is needed on the possibility to substitute CMR substances and substances that are classified as Substances of Very High Concern.

EU policy frameworks addressing textile waste and textile label harmonisation are potential considerations during the revision process.

Regarding the Commission statements and the concern raised by member states regarding specific chemical substances this has to a great extent been covered by the dynamic process of scientific evaluation for REACH. The current REACH restrictions and candidate list covers a lot of the current textile products chemical criteria. The criteria are to some extent still relevant since the largest part of the production supply chain is situated outside the EU.

The main feedback from the stakeholder questionnaire was that a better link between the criteria and the user manual is necessary in order to ensure a quicker and easier application process. A number of specific points were received in relation to the need to strengthen some criteria definitions, fibre-related issues to address and specific substances for which the approach should be refined, such as flame retardants.

## 2. MARKET ANALYSIS

An overview of the EU textile market is provided by this section. This overview is important in order to focus and shape the scope of the EU Ecolabel criteria on products, fibres and associated eco-innovations which are currently relevant in the marketplace.

An indication of the EU Ecolabel market penetration is also provided by the number of licenses and products currently labelled. A summary of other environmental labels, standards and initiatives of significance or which have achieved high market penetration is also presented.

### 2.1 STRUCTURE OF THE MARKET

After China, the EU is the World's second largest exporter of textile products in terms of value and it continues to dominate global markets for up-market and high quality textiles and clothing. Switzerland is the most significant export market (12.3% of total exports) followed by the USA (10.0%), Russia (9.4%), Turkey (6.8%) and Tunisia (4.9%). With respect to imports, the EU's main suppliers in 2010 in terms of value were China (41.8%), followed by Turkey (13.3%), India (7.8%), Bangladesh (7.2%) and Tunisia (3.1%) [EU 2011a].

The textile industry is one of the industries with the longest and most complicated industrial chains involving actors from agriculture, chemical, fibre, textile and apparel industries as well as from retail and service sectors [IMPRO, 2009]. The market is fragmented and heterogeneous, dominated by small and medium enterprises (SMEs), which overall account for more than 80% of the participants in the supply chain. According to [Euratex 2010], the EU textile industry consists of 127,000 companies employing 1.9 million workers.  Further investigation is required in order to understand and characterise the role of EU producers position in the value chain for textile products.

An entire production chain still exists in the EU, but recent trends indicate that the European textile and clothing sector is focusing increasingly on activities related to research and development, finishing and innovation [EU 2011b]. As stated by [Allwood et al 2006], innovation in order to maintain competitiveness is focusing on niche and high quality products (e.g. wool production in UK). Some finishing operations remain within the EU, while the processing of raw materials, production of yarns and fabrics and their transformation into garments are usually outsourced. This is particularly apparent in the clothing sectors that are more labour and less capital intensive [EU 2011b].

It is worth noting that the EU 27 does not produce cotton and all cotton thus has to be imported either as yarn or semi-manufactured/finished products. The EU27 is, however, a significant producer of the man-made fibres polyester, polypropylene, acrylic as well as cellulosic fibres inclusive of viscose. According to [Cirfs 2011], production of man-made fibres takes place in 110 plants spread over the whole of EU 27 (except Cyprus) and occupies 25,000 employees. The man-made fibre industry is thus the largest combined supplier of raw materials to the European textile industry [Cirfs 2011].

## 2.2 MARKET DATA AND PRODUCT ECO-INNOVATION

Market volumes for textiles in the EU27 have been analysed based on statistics from the Eurostat PRODCOM database. The total indigenous production in the EU27 in 2010 had a value of approximately 75 thousand million Euro, of which textile clothing and accessories, interior textiles and fibres, yarn and fabric accounted for 53%, 8% and 40% respectively. Apparent consumption, including import and export with non-EU countries, was about 124 thousand million Euro. Clothing and accessories dominate the market and their market share is higher for consumption than for production alone. Summary data is provided in table 2.1.

**Table 2.1 - Value of the production and consumption of textiles in the EU27 in 2010 [PRODCOM].**

| Product types | Production in EU27 - Value 2010 figures | | | Apparent consumption in EU27 - Value 2010 figures | | |
|---|---|---|---|---|---|---|
| | 1000 mil. Euro | % | Growth rate/year | 1000 mil. Euro | % | Growth rate/year |
| Textile clothing and accessories | 39.4 | 53% | -10% | 87.5 | 71% | -2% |
| Interior textiles | 5.8 | 8% | -2% | 9.9 | 8% | 0% |
| Fibres, yarn and fabric | 29.8 | 40% | -8% | 26.3 | 21% | -6% |
| Total | **75.0** | **100%** | **-8%** | **123.8** | **100%** | -3% |

The definition of the different product types presented in table 2.1 corresponds to the definition adopted in article 1 of EU Commission Decision of 9 July 2009 regarding the Community Ecolabel for textile products (2009/567/EC).

Due to the global financial crisis, the growth rate registered for textile production and consumption in the EU27 has been generally negative. The growth rate is calculated as an average for the period of 2008 to 2010. The overall picture is a production decline of approximately 8% yearly, while consumption has declined by about 3% per year.

Assuming the ongoing trend to continue constantly, the value of production and apparent consumption in 2012 may be estimated to amount to 60 thousand million Euro and 116 thousand million Euro, respectively. It should be noted that forecasts provided under the actual circumstances are extremely uncertain, as it is difficult to predict when the current market recession and stagnation will be replaced by new investment and expansion.

According to [IMPRO, 2009], the total consumption of textiles in the EU27 in terms of weight was estimated to 9,547,000 tons of textiles of which 6,754,000 tonnes was clothing textiles and 2,793,000 tonnes was interior textiles. The total consumption corresponds to an average of 19.1 kg per citizen and year. A breakdown of the EU27 consumption for clothing textiles and interior textiles is presented and discussed in the following sections.

### 2.2.1 Clothing textile products

Market commentary is pending for this section – input is to be requested from stakeholders

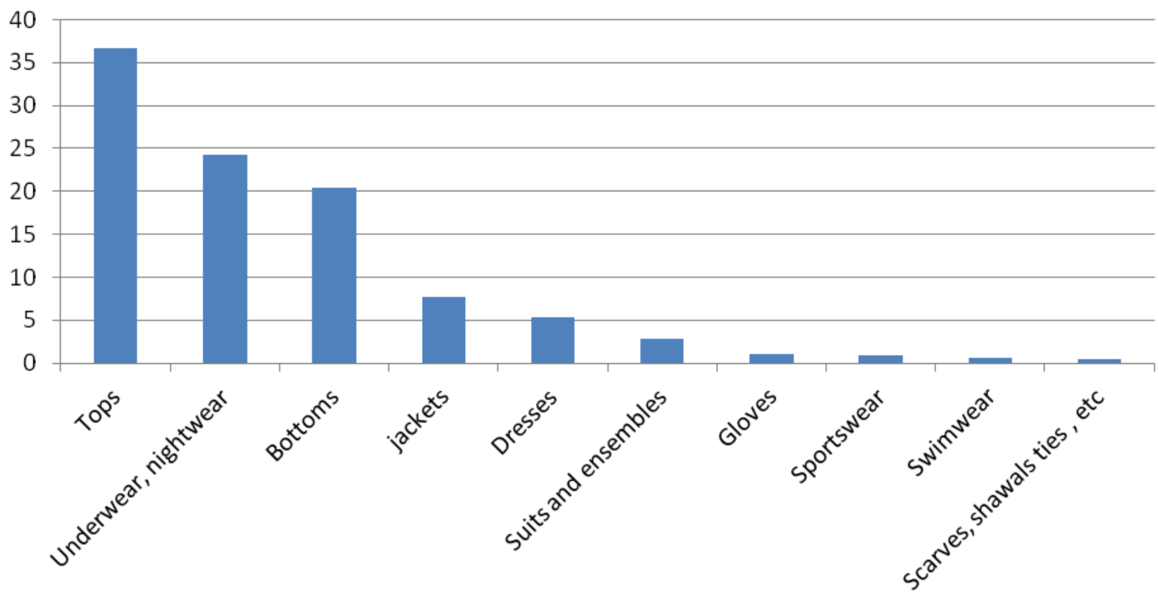


**Figure 2.1: Consumption share for clothing textile products [%], [IMPRO, 2009]**



#### 2.2.1.1 Areas of clothing textile eco-innovation

As a high profile market segment clothing manufacturers and brands have received increasing attention from Government's, NGO's and consumers in relation to their environmental impact. The beginning of consumer awareness in the textiles sector can be traced back to the German Oeko-tex label in 1992. Current initiatives range from the UK's sustainable clothing action plan to the Dutch consumer organization Goerdwaar's annual 'garment checker' ranking of 325 clothing brands. High profile NGO campaigns which have traced supply chains back to countries such as China have also served to raise the importance of Corporate Social Responsibility (CSR) for overseas suppliers.

Partly in response to greater scrutiny and partly in response to pro-active market positioning a number of high profile retailers and brands, alongside a proliferation of small specialist brands, have been active in bringing forward eco-innovations in their clothing product lines. We have selected a number of companies that are highlighted by consumer and ethical rankings, and which are recognised as market leaders in this area, in order to attempt to highlight specific areas of eco-innovation. These are presented in table 2.2. The examples selected reflect a significant competitive focus on environmental issues by outdoor companies.

Whilst it is difficult to obtain meaningful data as to the proportion of their product ranges that carry eco-innovations and the overall market impact of their activities, it is possible to identify common eco-innovations that have been introduced in response to LCA studies, strategic commitments and consumer demand:

- Increasing sustainable cotton use, based on organic, recycled and Better Cotton Initiative cotton and often with garment content at 100%.
- Increasing use of recycled polyester often with a very high % of post-consumer polyester content. Recycled nylon is a new area of innovation.
- Development of specific product lines based on target market segments – for example, environmentally aware fashion, baby clothing, outdoor fleeces and jackets
- Chemical management requirements for suppliers based on the exclusion of specified substances, in some cases reflecting Oeko-tex and/or the REACH SVHC candidate list
- Provision of consumer repair and take-back schemes, some linked to the second hand clothing market, and others linked to close loop recycling of fibres that is also considered at the product design stage
- Auditing and verification against a combination of consumer labeling such as Oeko-tex and industry facing auditing standards such as Bluesign and Eco-Index.
- Auditing and close cooperation with sub suppliers in order to fulfill ethical and environmental CSR criteria

It is anticipated that further investigation of these eco-innovations, and their market relevance, will be carried out with input from industry stakeholders.

**Table 2.2: Selected clothing market eco-innovators**

| Company | Market segment | Specific areas of eco-innovation |
|---|---|---|
| H&M (Sweden) | High street fashion and clothing basics | • Commitment to sustainable cotton use, based on organic, recycled and Better Cotton Initiative cotton. Benchmarking of cotton growing water consumption.<br>• Development of a complete fashion line featuring organic cotton, organic linen, recycled polyester and tencel viscose.<br>• Produces a baby wear line that is EU Ecolabel certified, much of which with 100% organic cotton content.<br>• Exclusion of substances on the REACH SVHC candidate list<br>• Auditing, grading and inspection of suppliers<br>• Retailing of halogen-free waterproof outdoor wear |
| Mark & Spencers (UK) | High street fashion and clothing basics | • Commitment to 25% sustainable cotton use by 2015, based on organic, recycled and Better Cotton Initiative cotton.<br>• A substantial increase in the use of recycled polyester in fleeces, trousers and suites.<br>• Commitment to environmental standards for clothing factories, dye houses and raw materials. These commitments are supported by audits and inspections.<br>• Active promotion of lower temperature washing to customers through a 'wash at 30 degrees' campaign<br>• Provision of take-back routes for its products to customers through it's stores in exchange for credits |

| | | |
|---|---|---|
| C&A (Germany) | High street fashion and clothing basics | • Publication of a restricted substance list which reflects the majority of Oeko-tex 100<br>• Committment to the use of organic cotton evidenced by its market surveys which confirm it is the world's largest purchasers (representing 13% of C&A cotton products in 2010)<br>• Forms part of and audits using the Global Social Compliance Programme codes |
| Patagonia (USA) | Outdoor clothing and performance wear | • Use of certified 100% organic cotton for all product lines<br>• Use of recycled post-consumer polyester in the manufacturing of fleece jackets and waterproof jackets. Pre-consumer recycled nylon has also been introduced.<br>• Use of Tencel (lyocell) viscose manufactured using cellulose derived from FSC certified forests<br>• Use of chlorine free wool for performance layers<br>• The Common Threads initiative has promoted product take-back and the recycling of old polyester jackets into new polyester fibre<br>• Participation in developing and piloting the Eco-Index tool (see section 2.5) |
| Jack Wolfskin (Germany) | Outdoor clothing and performance wear | • Development of a certified organic cotton:polyamide waterproof jacket which reduces polymer content by 50%<br>• Full compliance with Oeko-tex 100 with stricter controls in supplier contracts based on the REACH SVHC list<br>• Contractual obligations for suppliers to comply with chemical restrictions<br>• Implementation of a CSR code of conduct with independent verification<br>• Targeted reduction in the ratio of air shipments to the minimum possible |

| | | |
|---|---|---|
| The North Face (USA) | Outdoor clothing and performance wear | • Use of recycled post-consumer polyester in the manufacturing of fleece jackets and waterproof jackets. Castor oil based jacket water proof membranes have also been introduced.<br>• Introduction of organic cotton into product lines with 12.9% overall content reported for 2011<br>• Provides a life time guarantee for jackets and buyers have access to a repairs service through approved resellers (46,021 units of product repaired in 2010)<br>• Audited against the Bluesign Standard with 27% compliance reported for 2010<br>• Participation in developing and piloting the Eco-Index tool (see section 2.5) |

### 2.2.2 Interior textile products

Market commentary is pending for this section – input is also to be requested from stakeholders

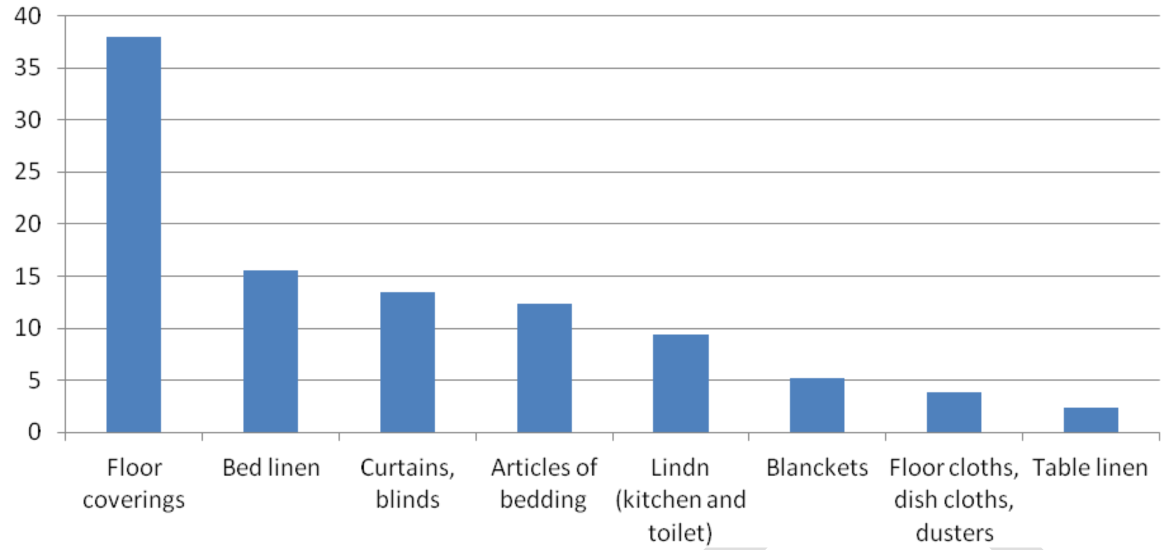


**Figure 2.2: Consumption share for interior textile products [%], [IMPRO, 2009]**

### 2.2.1.2 Areas of clothing textile eco-innovation

Market commentary is pending for this section – input is also to be requested from stakeholders

**Table 2.3: Example market eco-innovators**

| Company | Market segment | Specific areas of eco-innovation |
|---|---|---|
| Lidl/Aldi (Germany) | Bedding, drapery and floor coverings | • Oeko-tex labelling is required for the majority of product lines |
| Carrefour (France) | Bedding, drapery and floor coverings | • Introduction of towel and bed linen product lines with 100% organic cotton content |
| Ikea (Sweden) | Bedding, drapery and floor coverings | • Introduction of a bed linen range using Better Cotton Initiative (BCI) cotton with evidence of 50% reductions in pesticide and water use<br>• Introduction of a bed linen range made from lyocell viscose<br>• Exclusion of substances on the REACH SVHC candidate list with restrictions setout in an internal company specification<br>• Active promotion of lower temperature washing to customers |

### 2.2.3 Fibres, yarns and fabrics

Our analysis shows that cotton is the dominant textile material in the EU27, accounting for approximately 43% of the consumption of clothing textiles and for about 28% of the consumption of household (or interior) textiles. Other important clothing materials include polyester (16% of consumption), acrylic (~10%), polyamide (~9%), wool and other animal hair (~9%), and viscose (~8%). Other important materials for household (or interior) textiles similarly include polyester (28% of consumption), polyamide (~23%), polypropylene (~10%), acrylic  (~4%) and viscose (~3%).

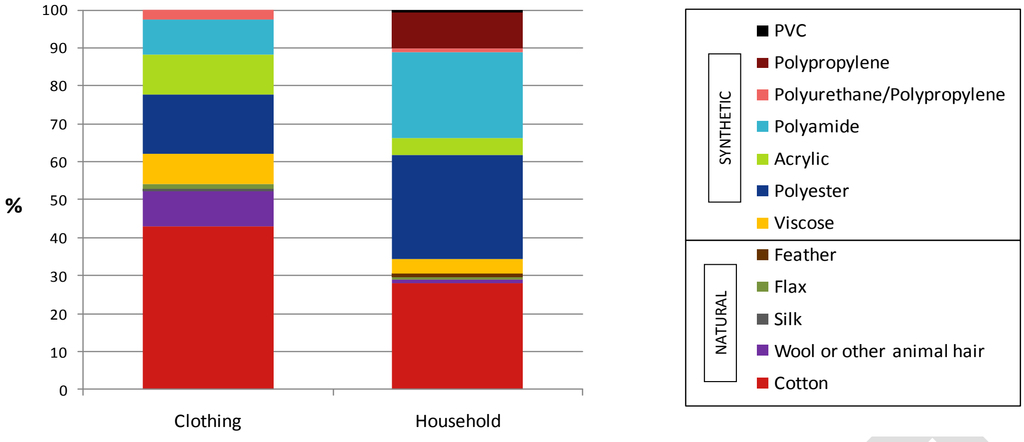


**Figure 2.3: Consumption of textile materials for clothing and household purposes in EU 27 (in thousands of tonnes - 2007/2008 -figures) [IMPRO, 2009]**

### 2.2.1.3 Areas of fibre, yarn and fabric eco-innovation

Market commentary is pending for this section – input is also to requested from stakeholders

**Table 2.4: Example market eco-innovators**

| **Fibre** | **Companies** | **Specific areas of eco-innovation** |
|---|---|---|
| Cotton | GOTS and GRS certified suppliers | • Organic cotton fibre, yarn and fabric<br>• Variable % pre and post consumer recycled waste content |
| Polyester | Camira, Instyle, Wellman, Tejin, Toray | • High % post-consumer recycled waste content<br>• Product take-back for chemical recycling |
| Polyamide | Mipan, Toray, GRS certified suppliers | • >50% pre and post consumer recycled waste content<br>• *GRS certified recycled acrylic fibres/yarns manufacturers to be investigated* |
| Acrylic | GRS certified suppliers | • *GRS certified recycled acrylic fibres/yarns manufacturers to be investigated* |
| Wool | Camira, Instyle, Merino Wool Company, MAPP | • Organic certification (GOTS)<br>• Reduced pesticide and chlorine-free specifications<br>• Pre and post consumer recycled waste content |
| Viscose | Lenzing AG | • Production processes that represent industry best practice in terms of energy use and AOX levels |



## 2.3 THE MARKET FOR EU ECOLABELLED AND GPP TEXTILE PRODUCTS

In this section we review the current market status of the EU Ecolabel and opportunities for Green Public Procurement for further consideration during the review. We also highlight areas of eco-innovation in relation to both areas.

### 2.3.1 EU Ecolabel licenses and products today

The product group Textiles is one on the most successful product groups when it comes to the number of licenses as illustrated by figure 2.6. The status of the EU Ecolabel in 2010 was that a total number of 89 licenses were issued. Given that the criteria did not change radically with in the

2009 revision this information gives a good estimate of the possible market penetration of EU Ecolabel.

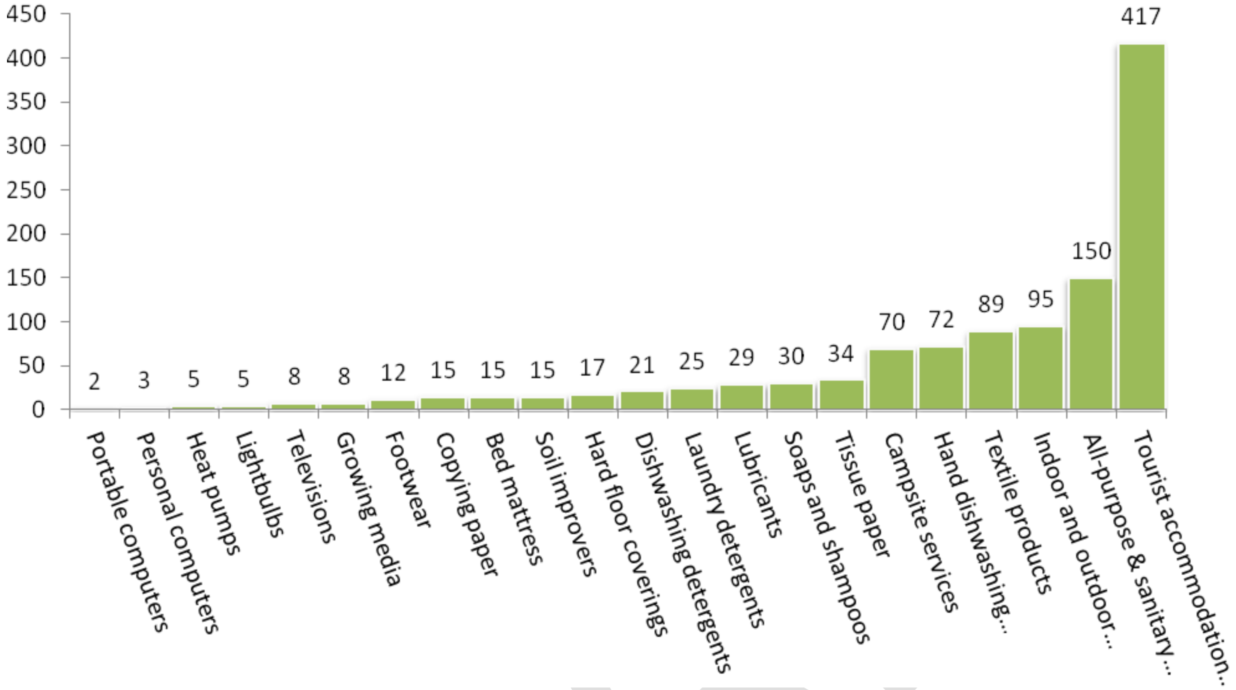


**Figure 2.4: Number of license per product group, status November 2010 [EU Green store]**

As shown in table 2.7, many different member states have issued a license. A possible explanation as to why the Denmark has issues more licenses could be that the Government has supported a lot of initiatives involving key stakeholders in promoting the use of the EU Ecolabel on Textiles. Key stakeholders in this respect cover branch organisations, producers and retailers. Also Ecolabel Denmark has focused on this product group in several marketing campaigns.

The licenses issued include more than 1200 products names covering a broad range of textiles types, eg, fibers/yarns, bed linen, baby wear, work wear and fabric intended to both furniture and clothes. The most used fibres in the licenses are cotton, wool and polyester. Further feedback is to be obtained during the course of the study from a range of license holders on sales volumes relating to these licenses and the opportunities and barriers to expansion of these product ranges.

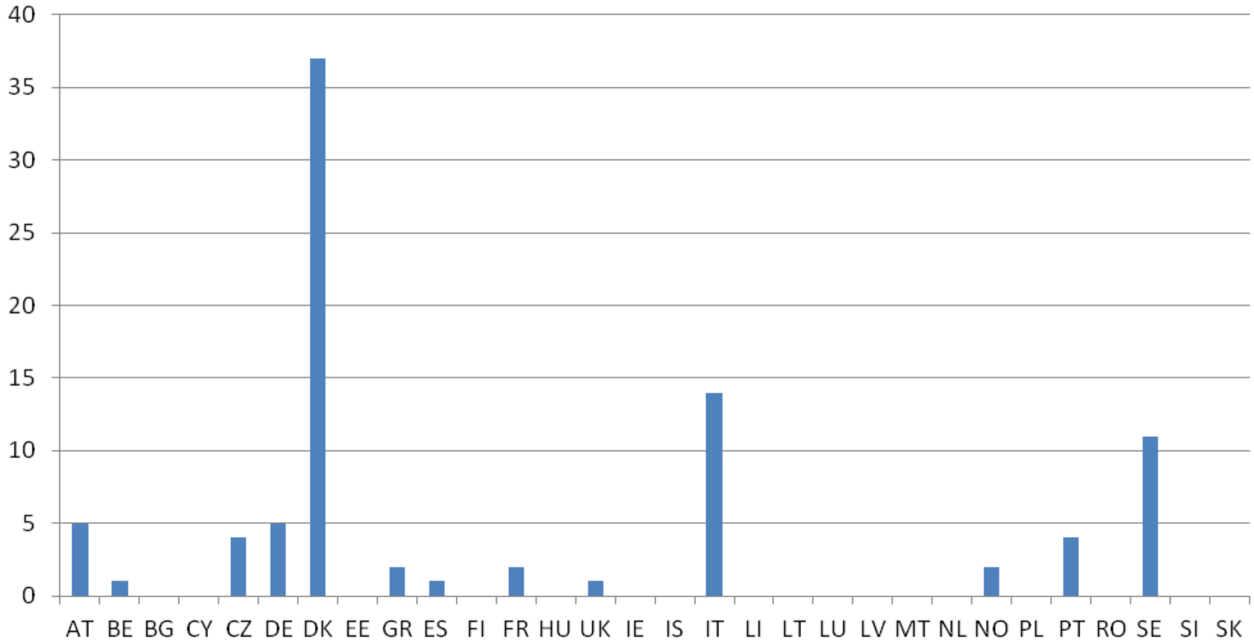


**Figure 2.5: Number of EU textile licenses per EU27 country, status November 2010.**

### 2.3.2 Green Public Procurement opportunities

Green Public Procurement represents a significant opportunity to influence the market for improvements in the environmental performance of textiles. Whilst statistics relating to the scale of the opportunity are limited in their availability, the EU Lead Market Initiative (LMI) recently estimated that public markets for the textile and clothing industry may have a value in the order of 10 billion Euros/annum.

A guide to socially responsible public purchasing published in 2007 by Eurocities and ICLEI highlighted the significant role of the public sector as purchasers of textiles and clothing, particularly workwear. Workwear was considered to include:

- Functional workwear (e.g. for waste collection services),
- Protective clothes (e.g. for firemen)
- Representative workwear (e.g. police uniforms).

In 2007 the total turnover of companies in the EU15 selling workwear was estimated to be €4 billion in 2008, of which approximately half of this was thought to be accounted for by public procurement.

Protective textiles – a subset of workwear - was recently highlighted by the EU Lead Market Initiative (LMI) as a key area for industrial innovation. Public procurement of functional protective clothing for fire-fighters, emergency services, police forces and the military sector as well as for health care professionals in public hospitals was identified as a key market driver for innovation. A good example of a company that is innovating in order to respond to GPP requirements is TDV Industries in France (see below).

The procurement of bed linen by health services is another market segment that may be of significance. Limited data appears to exist relating to this and other potential GPP market segments. This will be explored further during the GPP criteria revision.

**Application of GPP criteria in procurement contracts**

PWC (PriceWaterhouseCoopes) completed a survey in 2009 which evaluated to what extend green criteria had been implemented in public procurement. A questionnaire was send out to 514 organizations and 137 responded according to procurement contracts in 2006 and 2007.

The survey classified the different potential levels of green procurement into three main categories:

- Core Green: addressing the most significant environmental impacts (Ökotex Standard 100)
- Comprehensive green: best environmental products (EU Ecolabel)
- Non green: No green procurement conditions applied.

Whilst the survey did not cover the whole of the EU-27 but the data does highlight a relatively high difference across Europe for textile procurement – both in terms of percentage of value (see figure 2.4) and percentage of contracts (see figure 2.5). In Denmark the majority of the clothing procured must meet ecological criteria of a certain ecological standards or Ecolabel. Within Finland and the UK, only a small part of the products procured meet such criteria.

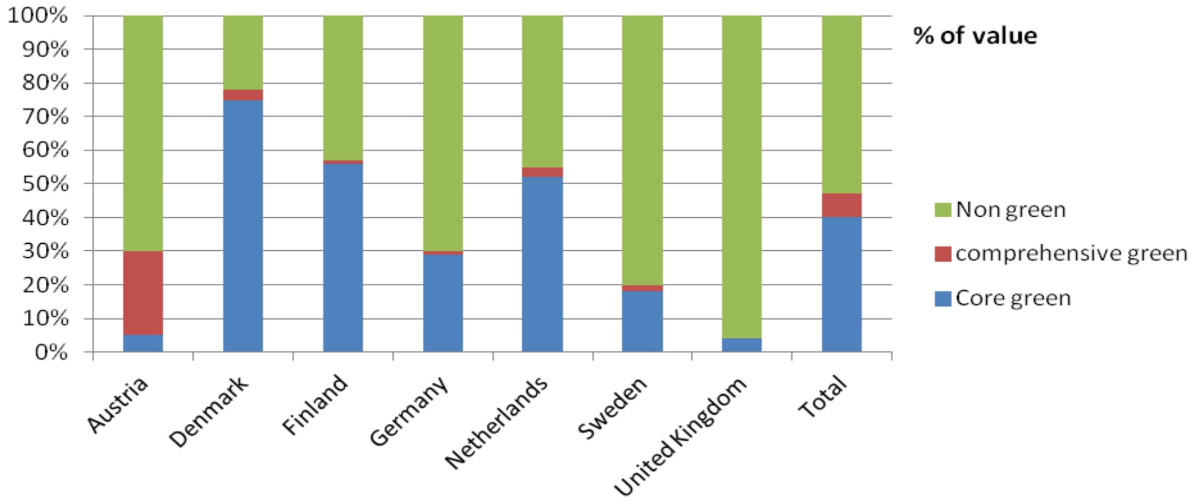


**Figure 2.6: Green criteria in contracts – percent of value [PWC, 2009]**

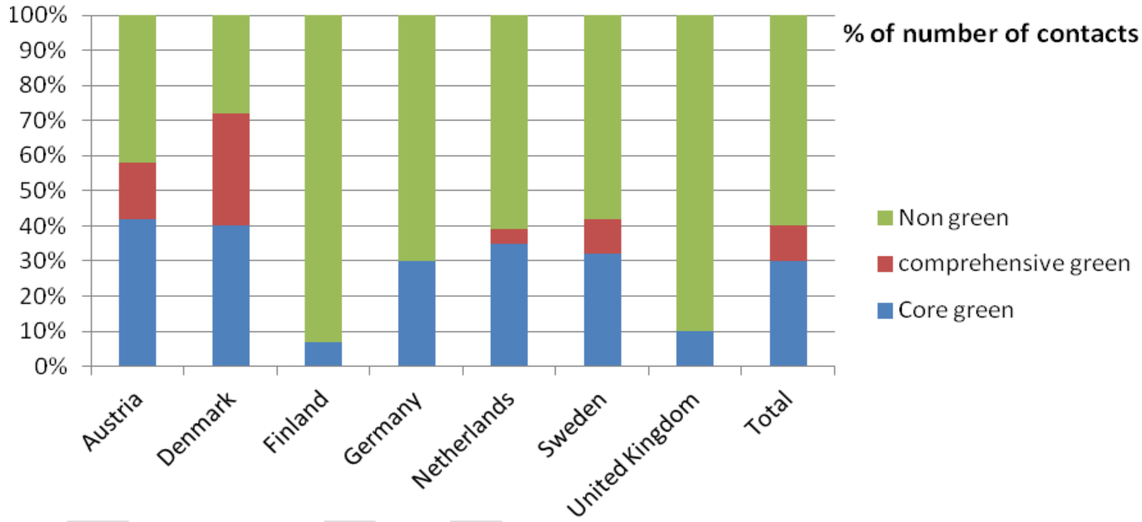


**Figure 2.7: Green criteria in contracts – percent of number of contracts [PWC, 2009]**

Even though the presented data does not cover all of the EU-27 the data is considered to be representative. The data illustrates the big difference in focus on green criteria when issuing public contracts. Comparing this data to the number of EU Ecolabel licenses there is a clear connection. The comprehensive green is included especially in Austria, Denmark and Sweden, which also have the highest number of EU Ecolabel licenses, as shown in figure 2.7.

**Table 2.5: Example GPP eco-innovators**

| Organisation | Market segment | Key areas of eco-innovation |
|---|---|---|
| City of Zürich (Austria) | Police shirts | • 100 % organic cotton (substituting for polyester/non organic cotton) |
| TDV Industries (France) | Technical fabrics, work clothing, military clothing | • Use of unspecified % organic cotton content<br>• Procurement of fair trade cotton<br>• Use of polyester with a high % recycled content<br>• Oeko-tex 100 certification<br>• Product lines made from 'eco-cleaning' fabrics which reduce washing requirements<br>• Product lines made from bacteriostatic fabrics which reduce bacterial build-up<br>• Limited use for some product lines of plant-based dyes that are GOTS certified (but do not meet Ecolabel fitness for use criteria) |



## 2.4 OTHER LABELLING SCHEMES

For textiles, a number of different labelling schemes exist in the market. The labels below are mostly national or multinational labelling schemes. The table gives an overview of where the different labels focus. The labels shown have been selected due to their market penetration, their recognition by retailers and manufacturers (as highlighted in section 2.2) and because they are normally used as benchmarks when developing the EU Ecolabel criteria.

Relevant criteria taken from these labels are discussed in section 3.3 of this report and in the accompanying technical report in order to define the right levels of stringency and also to harmonize among the different schemes where it is possible and relevant.

**Table 2.6: Key EU environmental labels covering textiles products and their scope**

| | EU Ecolabel | Nordic Ecolabel | Blaue Engel | Ökotex 100 | Ökotex 1000 | GOTS |
|---|---|---|---|---|---|---|
| **Fibres** | ✓ | ✓ | ✓ | | | ✓ |
| Sustainable resource use | Cotton, recycled content | Natural fibres, recycled content | | | | Cotton |
| **Production** | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Energy consumption | ✓* | ✓* | | | ✓* | |
| Air and water pollution | ✓ | ✓ | ✓ | | ✓ | ✓ |
| Substance restrictions | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Social and ethical criteria | | ✓ | ✓ | | ✓ | ✓ |
| **Consumer health** | ✓ | ✓ | | ✓ | | |
| **Fitness for use** | ✓ | ✓ | ✓ | ✓ | | ✓ |
| **End of life** | | | | | | |

** No specific benchmarks or limit values*

### 2.4.1 Nordic Ecolabel

The Nordic Ecolabel is the official Ecolabel of the Nordic countries and was established in 1989 by the Nordic Council of Ministers with the purpose of providing an environmental labelling scheme that would contribute to a sustainable consumption. It is a voluntary Ecolabelling of products and services. The Nordic Ecolabel is also initiated as a practical tool for consumers to help them actively choose environmentally-sound products. The Nordic Ecolabel is an ISO 14024 type 1 Ecolabelling system.

The Nordic Ecolabel has about 70 different product groups covering many kind of products for consumers as well as professionals. Within textiles there are 9 licenses (December 2011) covering baby wear, work wear, linen and other home textiles.

The Nordic Ecolabel is to a high extent harmonised with the EU Ecolabel and thus reflects its current scope. The major differences are that 100% organic cotton is mandatory and that CSR criteria are included.



### 2.4.2 Blaue Engel

The Blaue Engel is the first and oldest environment-related label for products and services in the world. It was created in 1978 on the initiative of the German Federal Minister of the Interior and approved by the Ministers of the Environment of the federal government and the federal states. It considers itself as a market instrument of environmental policy designed to distinguish the positive environmental features of products and services on a voluntary basis. The Blaue Engel is an ISO 14024 type 1 Ecolabelling system. Blauer Engel has around 100 product criteria documents.

The Blaue Engel criteria for textiles (RAL-UZ 154) is completing development and covers the whole life cycle including fibre production, use of chemicals, process emissions, working conditions, fitness for use and ethical criteria. Currently there are no license holders (December 2011). [Blaue engel].

### 2.4.3 GOTS

The International Working Group on Global Organic Textile Standard (GOTS) [GOTS] is comprised of four reputed member organisations, namely OTA (USA), IVN (Germany), Soil Association (UK) and JOCA (Japan), which contribute to the GOTS, together with further international stakeholder organizations and experts, their respective expertise in organic farming and environmentally and socially responsible textile processing. The first version of their criteria was decided in 2005 and has so far been revised two times.

Only textile products that contain a minimum of 70% organic fibres can become certified according to GOTS. All chemical inputs must meet certain environmental and toxicological criteria and also the choice of accessories is limited under ecological aspects. The criteria regarding chemicals are formulated in different ways than the EU Ecolabel but the same types of chemicals are approximately excluded.

The criteria also include prescriptions for waste water treatment plant and criteria for any wet-processing unit involved and all processors must comply with social minimum criteria. It is difficult to estimate the market of GOTS but this labelling scheme is widely used, especially in the Far East. The organisations' home page has a public database where to find GOTS labelled products. For example, 20 companies are registered for manufacturing baby wear and 63 are manufacturing interior textiles. Almost 500 companies have been approved as "dyers" which means that there are many more approved suppliers within the GOTS scheme compared to the EU Flower.

In the GOTS scheme chemical suppliers can contact specific Certification Bodies and for a fee have their dyes and chemicals approved. This approval can be used as a marketing tool for license holders when they want to find chemicals that meet the criteria. It also makes the certification process shorter if the chemicals are approved in advance. Furthermore, GOTS has certification Bodies in many countries which make it easy for e.g. Asian companies to apply.

**2.4.4 Ökotex 100**

The Oeko-Tex® Standard 100 is a private and independent globally uniform testing and certification system for textile raw materials, intermediates and end products at all stages of production. The system was established in 1992. Ökotex 100 does not take a whole life cycle approach but instead focuses on harmful substances in the final product and the risks they may pose for end-users.  Ökotex 100plus is also available for products that are also able to demonstrate the production sites are certified with Ökotex 1000 which is described in section 2.4.5.

Tests are foreseen for chemicals which are known to be harmful to health, and parameters which are formulated as a precautionary measure to safeguard health for the user of the final product. The list of chemicals that are tested differs from the present EU criteria and in many areas is currently more stringent and precautionary. Ökotex tests final textiles, which makes it difficult to compare the criteria directly with the EU Ecolabel. In the EU Ecolabel, the test on cotton is carried out on the raw cotton before washing or other wet processing and for Ökotex testing is carried out on the final product.

A tested textile product is allocated to one of the four Oeko-Tex product classes based on its intended use. The more intensively a product comes into contact with the skin, the stricter the requirements it must fulfill:

I = baby products (up to age three - 36 months)

II = products having skin contact (blouses, shirts, underwear)

III = products having no skin contact (coats, lined cloths)

IV = furnishings (table wear, funiture coverings, curtains, textile flooring, mattresses)

More than 9,500 manufacturers in more than 90 countries are approved and 95.000 certificates have been issued [Ökotex-news 2/2011]. This huge success is partly due to the fact that the Ökotex logo is very well known in many European countries and many distributors only want to sell Ökotex labeled textiles. Some supermarket chains such as Lidl also sell almost exclusively Ökotex labeled clothing products. Furthermore Ökotex does not require as much work on the part of the applying company since most of the documentation is obtained following testing of the end products.

### 2.4.5 Ökotex 1000

To complement the product-related Oeko-Tex® Standard 100, the Oeko-Tex® Standard 1000 is a testing, auditing and certification system for environmentally-friendly production sites throughout the textile processing chain.

To qualify for certification according to the Oeko-Tex® Standard 1000, companies must meet stipulated criteria in terms of their environmentally-friendly manufacturing processes and provide evidence that at least 30% of total production output is already certified under Oeko-Tex® Standard 100. The required criteria include:

- Avoidance of environmentally-damaging auxiliaries (chemicals in the production) and dyestuffs
- Compliance with fixed values for waste water and exhaust air treatment
- Optimisation of energy consumption
- Avoidance of noise and dust pollution

- Definition of measures to ensure safety at the workplace
- Prohibition of child labour
- Introduction of basic elements of an environmental management system

Licenses cover spinners, dying houses and finishers. The number of current licenses is approximately 60.

## 2.5 PRIVATE LABELS AND INITIATIVES

In order for the EU Ecolabel for Textiles to focus on the right issues it is of importance to reflect on private or industry-run schemes to better understand what the consumers and the industry are asking for in terms of information and verification. The list is not exhaustive but gives a broad spectrum of examples.  It groups the initiatives under three headings – 1) those that are fibre related, 2) those that focus on a whole life approach and 3) those that focus on CSR.

The list of different labels, both private and independent, indicates that producers, brands and retailers have a need to promote and document the environmental profile of their products. The focus varies a little with some labels placing the emphasis on the fibre origin (e.g. organic) whereas others place more emphasis on ethical aspects (e.g. Global impact, CSR).

Limited information is currently available about the market penetration of these initiatives, although clearly some may be of more significance than others – particularly those with a significant level of industry engagement.

**Table 2.7: List of privately initiated labels and standards among producers/retailers.**

| Name | Description | Is it Certified? |
|---|---|---|
| **1. Fibre related** | | |
| Better Cotton Initiative | The Better Cotton Initiative (BCI) is a non profit, member-based organisation which promotes a comprehensive set of production principles and criteria for growing cotton in a more sustainable manner: socially, environmentally and economically. BCI is made up of players from the entire cotton supply chain, and had its first harvest of "Better Cotton" in 2010. | Yes, by independent third party. |
| Global Recycle Standard | The GRS was developed by US certification body in 2008 and is now managed by Textile Exchange. It is intended to assist in verifying the recycled content of products and it focuses on traceability back to the source. Additional environmental and social criteria are also incorporated into the procedure. A significant number of far eastern manufacturers have product certified by the standard. | Yes, by independent third party. |
| **2. Whole life approach** | | |
| Bluesign. | The bluesign is a private standard initiated in 1997. The standard analyses all input streams – from raw materials to chemical components, to resources – with a sophisticated "Input Stream Management" process. Using "Best Available Technology" (BAT) along the | Yes, by dedicated independent organisation – second party. |

| | | |
|---|---|---|
| | entire textile manufacturing chain ensures that products meet the environmental standards without cutting back on performance requirements. | |
| Coop Naturaline: Switzerland | For textiles and natural cosmetics made from cotton by controlled biological cultivation according to the guidelines of BIO Suisse or the European Union. It covers the entire textile chain and undertakes additional pollution testing by external labs and Coop quality safety.<br><br>Companies who produce the textiles certified COOP Naturaline must meet the basic standards of the International Labour Organization (ILO), be certified at least accoriding to the criteria of the BSCI (Business Social Compliance Initiative), and in the medium term, they must meet the SA 8000 certification. Private label. | Yes, by independent third party |
| Eco-Index | Inspired by Timberland's Green Index the Eco-Index tool has been developed by the Outdoor Industry Association and the European Outdoor Group and claims the involvement of over 100 companies in its development.  It is not intended at this stage to be a consumer facing initiative.<br><br>The Eco-Index consists of a framework of seven areas of environmental impact for which metrics have been developed. A scoring system has also been developed to determine and compare levels of performance. | No, but existing certifications achieve points within the scoring |

| | | |
|---|---|---|
| IMO certified | The Institute for Marketecology (IMO) is an international agency for inspection, certification and quality assurance of eco-friendly products. For more than 20 years, IMO has been active in the field of organic certification but it is also active in the sectors of natural textiles, sustainable forestry, and social accountability monitoring. | Yes, by independent third party |
| NATURTEXTIL Best | Naturtextil BEST" is a holistic standard. It values environmental and social criteria along the whole textile pruduction chain. Main requirements are: 100% certified organic fibers, restricted fiber prosessing methods (bleaching, chlorination, mercerization etc.), limited range of dyes and auxiliaries, no input of hazardous substances (e.g. formaldehyde, PCP, TCP, heavy metals, AOX and many more), Accessories (buttons, pockets etc.) made with natural raw materials, high quality parameters, residue tests in the ready garment, ILO conventions plus living wages. Only used in Germany and Belgium. | Yes, by independent third party |
| MADE-BY | MADE-BY is a European not-for-profit organisation with a mission to improve environmental and social conditions in the fashion industry.<br><br>MADE-BY work with a number of Partner Brands that are committed to improve the sustainability for their products.<br><br>The methods are to help the Partner Brands to choose more sustainable fibers and production methods. | Yes, by own organisation – second party |

| 3. CSR focus | | |
|---|---|---|
| Business Social Compliance Initiative Code of Conduct | The Business Social Compliance Initiative (BSCI) was established in 2002 by private global trade association. The BSCI has developed a ten point code of conduct for working conditions that is based on ILO Conventions, UN Declarations and OECD guidelines. | Yes, by independent third party |
| Global Social Compliance Reference Code | The GSCP Social Reference Code is an auditing tool for manufacturers, brands and retailers. It was developed by and for companies that trade globally. It consists of seven distinct themes which form a code of conduct for working conditions. An Environmental Code has also been developed. | Yes, an independent panel of experts validates self-assessments – second party |

## 2.6 SUMMARY

Below is a short summary of the main conclusions that can be drawn from section 2.

The total production in EU27 in 2010 had a value of approximately 75 thousand million Euro, of which textile clothing and accessories, interior textiles and fibres, yarn and fabric accounting for 53%, 8% and 40% respectively. However, at least 60% of product consumption was imported. The EU's main suppliers in 2010 in terms of value were China (41.8%), followed by Turkey (13.3%), India (7.8%), Bangladesh (7.2%) and Tunisia (3.1%). This highlights the importance of non-EEA suppliers in determining the environmental performance of a significant proportion of textile products in the EU.

Cotton is the dominant textile material, accounting for approximately 43% of the consumption of clothing textiles and for about 28% of the consumption of household textiles. Other important clothing materials include polyester (16% of consumption), acrylic (~10%), polyamide (~9%), wool and other animal hair (~9%), and viscose (~8%).

Improvements in the environmental performance of textile products can be seen to have increased as a priority for a range of EU, USA and Far Eastern fibre, fabric and clothing manufacturers, as well as brands and retailers. Areas of eco-innovation can be identified in the branded and outdoor clothing markets as well as by supermarkets and volume furniture retailers and by manufacturers specifically focused on public procurement contracts. Some key areas of eco-innovation identified include:

- Organic cotton, often at a very high % of content,
- Cotton that is produced using less pesticides (for example, BCI) and less irrigation water
- Polyester fibre with a recycled content, often at a very high % content
- Nylon fibre with a recycled content, although this is a relatively new area
- Product repair and take-back initiatives in conjunction with remanufacturers
- Chemical management, often in the form of lists of restricted substances
- A focus on substitutes for specific high profile chemicals and groups of substances
- A focus on residual chemicals in products and their potential effect of human health
- Fabric treatments designed to reduce the need for washing and extend lifespan
- Supply chain auditing against environmental management standards
- The auditing of sub-suppliers against social and ethical (CSR) codes of conduct

A number of independent, government and industry-led labelling and auditing initiatives have emerged in order drive improve performance, provide market differentiation and enable verification of eco-innovations.  The picture from both the industry and consumer perspective may therefore be confusing.

In 2010 the EU Ecolabel had 89 licenses for textile products covering 1,200 product names, the majority in Denmark, Italy and Sweden. Oeko-tex 100, with its focus on health, was the first significant EU labeling scheme and with over 9,500 licenses is the most successful, having established an international verification infrastructure.  GOTS has also emerged as a significant international scheme for organic cotton.

It may be the case that the Oeko-tex label (in markets such as Germany) together with the other private initiatives we have identified – particularly those driven by large brands and retailers – are currently achieving a more significant level of market impact and environmental improvement than the EU Ecolabel.

## 3. TECHNICAL ANALYSIS

The main requirement of the Regulation No 66/2010 on the EU Ecolabel is that criteria should be based on scientific evidence and should focus on the most significant environmental impacts during the whole life cycle of products. The purpose of this chapter is to respond to this requirement by using the best available scientific evidence to identify the environmental “hot spots” in the life cycle of textiles. The findings will then be used to inform the criterion revision process. The analysis is mainly based on 2 selected LCA-based studies:

1. The Environmental Improvement Potentials of Textiles (IMPRO Textiles), under publication by JRC. This study includes a thorough analysis of the market situation of textiles in the EU and an identification of environmental improvement options.
2. The Danish EDIPTEX – environmental assessment of textiles [REF]. The environmental impacts of different types of textiles are assessed in this report resorting to a LCA approach. The findings are considered representative for the production of textiles today.

These studies were selected on the basis of the scope of their coverage, their scientific rigour and compliance with the requirements of ISO 14040, and their contemporary analysis of improvement options. These two studies are supplemented by findings from other LCA or issue-based studies in order to provide supplementary evidence or to underline or strengthen conclusions. Reference is made in each case. More detailed analyses are made in the Technical report in order to inform the wording for each criterion and in setting cut off limits and requirements.

A MECO (Materials, Energy, Chemicals and Others) matrix has been used to summarise and interpret the results from the EDIPTEX study. The MECO matrix is a screening tool developed as part of the Danish EDIP LCA methodology [Wenzel et al 1997]. The MECO matrix is illustrated in appendix 3. The matrix covers life cycle stages of a product in the columns (resources, production, use and disposal) and macro environmental impact categories under analysis in the rows (Materials, Energy, Chemicals and Other issues - MECO). The columns can be supplemented with other issues if relevant for the specific product or service. In this report the matrix is supplemented with a column for transport.

### 3.1 THE ENVIRONMENTAL IMPROVEMENT POTENTIALS OF TEXTILES (IMPRO-TEXTILES) STUDY

The Environmental Improvement Potentials of Textiles was carried out in 2009. Textile products were identified as a priority group which makes a significant contribution to environmental impacts in Europe by the European Commission Joint Research Centre's EIPRO (Environmental Impacts of Products) study in 2006. The IMPRO Textiles study forms part of the follow-up *Environmental Improvement of Products* (IMPRO) phase of EIPRO. The study uses a life cycle perspective focuses on identifying technically and socio-economically feasible means of improving their environmental performance. The strength of the assessment compared to the other available LCA assessments presented above, is that it is based on the actual consumption of textiles in EU in 2008.

#### 3.1.1 Impact Assessment Method

ReCiPe was chosen as the LCIA methodology for IMPRO Textiles (*Goedkoop et al., 2008*) as it provides characterisation factors at midpoint and endpoint level. In total, 18 midpoint indicators and 3 endpoint indicators have been included in the textile LCA model. The inclusion of 3 endpoints was considered to ease the understanding of LCA results. However the recognised weaknesses of endpoints was balanced by the comprehensive series midpoints. The ReCiPe framework and the relationship between the midpoints and endpoints is illustrated in figure 3.1.

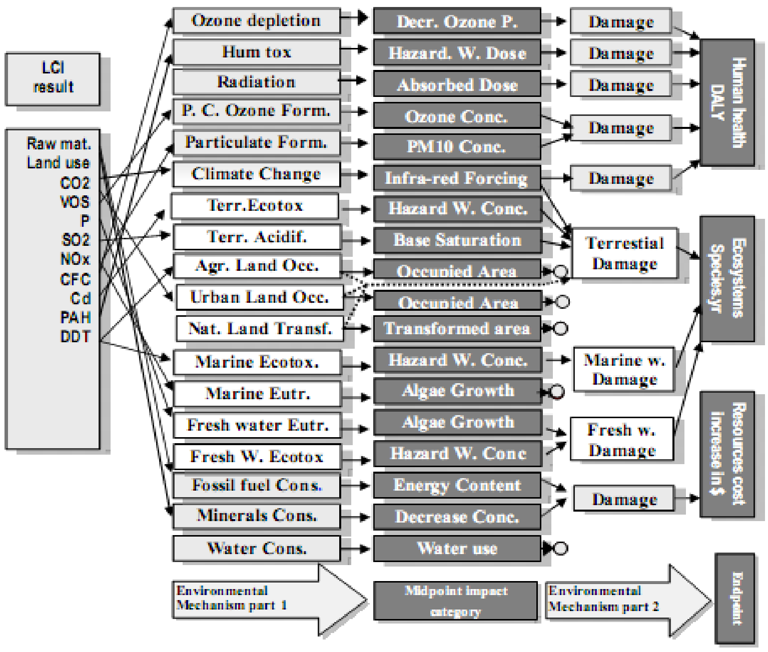


**Figure 3.1: ReCiPe framework: Midpoints and Endpoint categories (*Goedkoop et al, 2008)***

The textile LCA model took into account both first and second hand textiles. Second hand textiles refer to products that are reused after they reach the end-of life phase. All environmental impacts associated with the complete life cycle of textile consumed in one year were taken into account. The system boundaries considered in the textile LCA model are as given in figure 3.2.

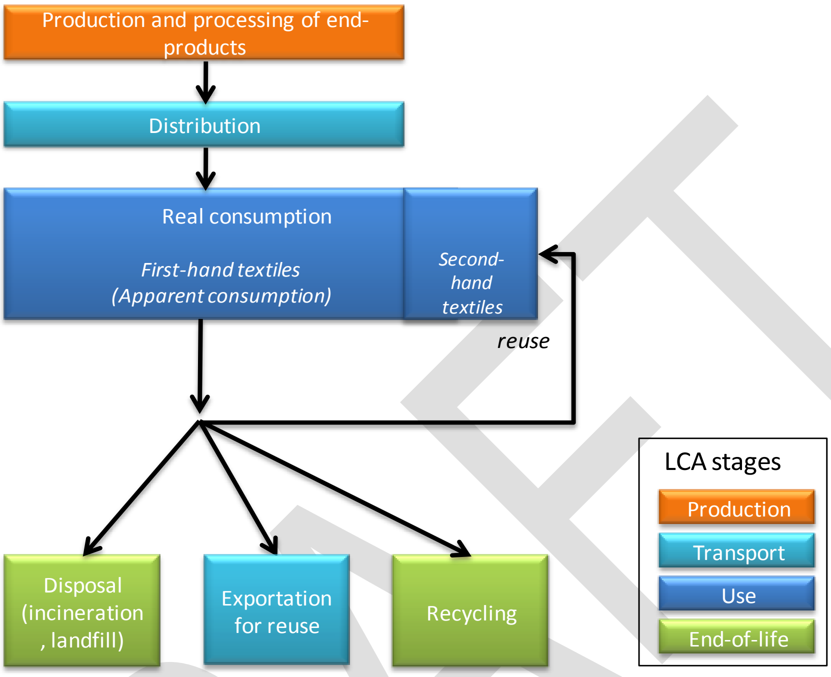


**Figure 3.2: System boundaries of the IMPRO Textile LCA model**

The study split the life cycle of textile products into four main stages as described by the IMPRO methodology:

- **Production and processing** – This phase begins with the production or extraction of raw materials (e.g. cultivation of fibre producing crops), leading to the processing of the fibre, followed by the confection of yarn and fabric, and finally the finishing, cutting and sewing steps needed to make a complete end product.
- **Distribution** – This phase takes into consideration the importation and distribution of textile end products, based on the construction of a distribution scenario for textiles in EU-27. Given the very different types of materials used to package products, and the varying practices carried out by individual companies along the supply chain, the life cycle of packaging was not included in the model. Only importation of final end products was considered and not the import or export of intermediate components (e.g. a fibre produced in one country, then exported to another for further processing).

- **Use –** This phase takes into account consumer behaviour and the use patterns of textile end products. This step incorporated the impacts of washing, tumble drying and ironing. Collected textiles that are reused and are given a lifetime extension assumed to be half the length of their first use.
- **End-of-life –**The end-of-life phase includes the final disposal (incineration, landfilling), reuse and recycling of textiles.

### 3.1.2 Data

The raw data for material and energy inputs, process losses and emissions was derived from previously published LCAs, LCA studies carried out by BIO Intelligence Service, and other relevant studies in the textiles field. This data was combined to environmental life cycle inventory data which was extracted from the ecoinvent 2.0 database (ecoinvent Centre, 2007). Ecoinvent is one of the most exhaustive databases that allow to cope with the high number of materials, chemicals and processes that enter the textile life cycle in a consistent and reliable way.

Other sources of life cycle inventories include WISARD 4.2 (PricewaterhouseCoopers, 2007) for end-of-life models and PlasticsEurope (for plastic compounds. Where data was not readily found in the database, other sources outlined in the report were used (in particular for the production of individual fibre types). Where neither option was available, research institutes and universities were contacted  [IMPRO, 2009].

### 3.1.3 Market analysis and product characterisation

The market analysis within the study was based on the EUROPROMS database which combines data on the production of manufactured products (PRODCOM database) and data on external trade (COMEXT database). In total, 101 clothing product categories and 27 household product categories were identified. The available market data was extracted for each one. For simplification, from the full list of products presented in the database, major end product categories were identified for both sectors. In total, clothing textiles were broken down into 63 different end product categories. As each of the household textile products listed were quite distinct from one another, 27 end products were identified (each its own category).

A breakdown by major materials was ascribed to each end product type (e.g. trousers, shorts, shirts, blouses, etc). In the baseline scenario, the model covered the 9 following fibre types: cotton, wool, viscose, flax, silk, polyester, polyamide, acrylic and polypropylene, as well as the 3 following materials: polyurethane/polypropylene, feathers, and PVC. Two additional fibre types are addressed in the improvement options: hemp and polycotton (polyester/cotton mix).

### 3.1.4 Environmental impact identification

According to [IMPRO, 2009] the consumption of textiles by weight in EU is partitioned between fibres as follows: cotton (43%), polyester (16%), acrylic (~10%), wool (~10%) and viscose (~10%). The remaining share of the market is composed of other fibres (e.g. flax, polyamide, silk and polypropylene, hemp. To the extent it is possible to identify the main environmental impacts related to the consumption of textiles in EU they are presented in the MECO-scheme in table 3.1.

**Table 3.1 MECO matrix screening based on information from the IMPRO study.**

| | **Materials** | **Production** | **Use** | **Disposal** | **Transport** |
|---|---|---|---|---|---|
| **Materials** | Water for irrigation. | | Water consumption | Insignificant | Insignificant |
| **Energy** | Production of cotton and polyester, acrylic, polyamide, viscose and wool | Further manufacturing of cotton, polyester, acrylic, polyamide, viscose and wool.<br><br>For all fibres impacts in the production phase is higher than in the materials phase. | Washing, drying, ironing | Small or insignificant | Small or insignificant |
| **Chemicals** | Pesticides and other chemicals used for cotton growing. | For most fibres impacts in the production phase is higher than in the materials phase.<br><br>Impacts are especially caused by electricity consumption. For wool and cotton the materials phase is just as important as the production phase.<br><br>For viscose finishing is of importance due to the use of soaping agents and softeners | Washing detergents | Small or insignificant | Air transport |

| | | | | | |
|---|---|---|---|---|---|
| **Other issues** | Land occupation related to growing of cotton and raw materials for viscose | | | | |

The environmental impact is described in more detail in figure 3.3, where the environmental impact of textile consumption as whole in the EU-27 is described by midpoint indicators. As shown the production phase and use phase are the most dominant contributors. For the production phase this, as we will go on to illustrate by taking each fibre in turn, is mainly due to the high market share of cotton and the pesticides and fertilizers used in its production. The contribution in the use phase is mainly from the use of energy and laundry detergents. The credit allocations are the result of assumptions relating to recycling and re-use.

The impact from transport is relatively low except for those arising from photochemical oxidant formation (smog) which comes from the use of trucks, ships and planes. It is estimated that 8 percent of textiles imported are by air freight and the rest (92%) are by ship. Natural land transformation does also contribute, mainly due to fossil fuel extraction.

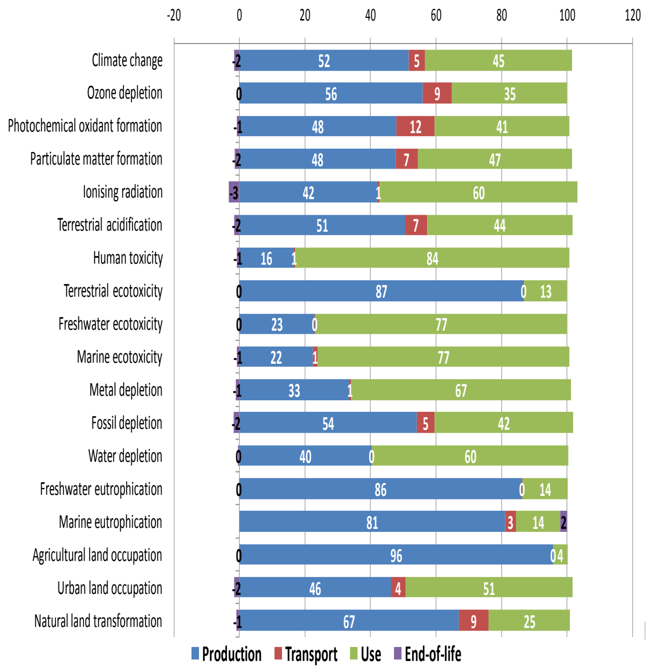


**Figure 3.3 Environmental impact of textile consumption in the EU-27 according to midpoint indicators [IMPRO, 2009].**

The impacts accumulated against each midpoint indicator can then related to the market segmentation of textile products as discussed in section 2 of the report. Figure 3.4 describes the most significant environmental impacts are estimated to be attributed in order of priority – clothing tops, bottoms, underwear, nightwear and hosiery.  Floor coverings, bed linen, jackets, dresses and are the next most significant products.

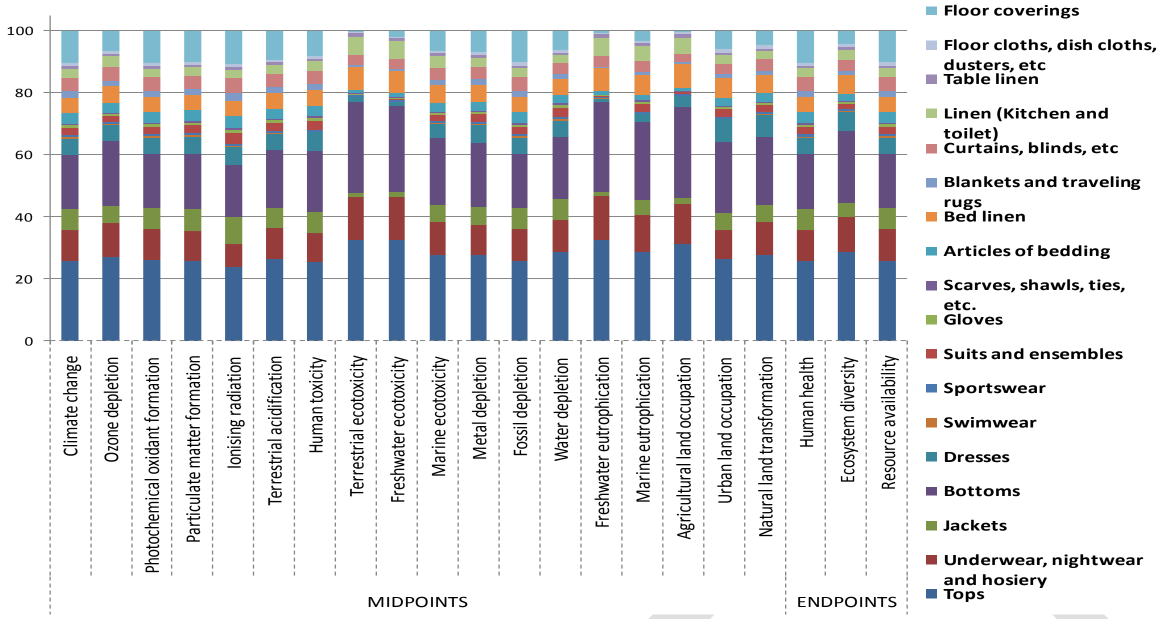


**Figure 3.4: Breakdown of the environmental impacts of the production and processing phase by product types in % [IMPRO, 2009].**

#### 3.1.4.1 Comparison of different fibres for selected environmental impact categories

The IMPRO study was able to make a comparison between different textile fibres using selected midpoint and endpoint indicators for a functional unit of 1 kg of finished woven fabric.  The indicators selected for comparative purposes are as listed in table 3.1.

**Table 3.2  Midpoints and endpoints indicators subject to detailed analysis**

| Midpoints | Endpoints |
|---|---|
| • Climate change | • Human health |
| • Human toxicity | • Ecosystem diversity |
| • Freshwater ecotoxicity | • Resource availability |

The apportionment of environmental impacts for each fibre against each midpoint and endpoint indicator are described in figure 3.5.  The findings highlight the relative importance, in order of priority of cotton, polyester, acrylic, polyamide, viscose and wool.  Cotton dominates in all of the indicator categories reflecting both its market share and environmental impacts.

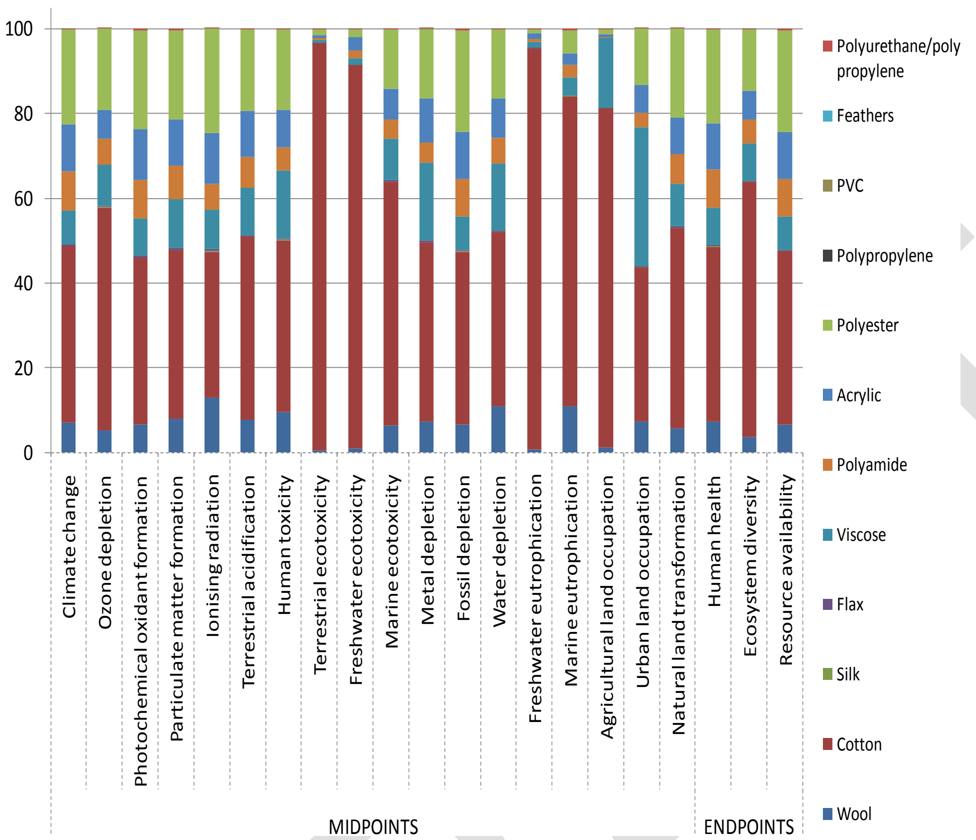


**Figure 3.5: Impacts of textile consumption in the EU 27, midpoint and endpoint indicators, fibre production phase, broken down by fibre**

The overall apportionment of EU27 textile product environmental impacts for each of the three endpoint indicators by life cycle phase is described in figure 3.6.  This highlights the relative importance of the production phase followed by the use phases.  The production phase incorporates raw material sourcing, fibre production, fabric production, formation, dyeing and finishing.

In order to better understand the apportionment of the environmental impacts for each of these stages in the production phase it is necessary to analyse individual fibres and products. The study analyses the main environmental impacts for each for each fibre. A summary of the main environmental impacts identified for the selected midpoint and endpoint indicators are presented in the following section of our analysis. In section 3.2 we complement these findings with those from the EDIPTEX study which analysed example clothing products.  Improvement options for these specific environmental impacts, together with the overall environmental impacts estimated to be attributed to the distribution, use and end-of-life phases, were then identified, analysed and ranked by the study.

The authors of the IMPRO study highlight the need to take into account the quality and functionality of the finished product when making any direct comparison between the fibres – so, for example, many finished products are blends of different fibre types in order to lend the woven fabric beneficial qualities. This is not addressed by the analysis.

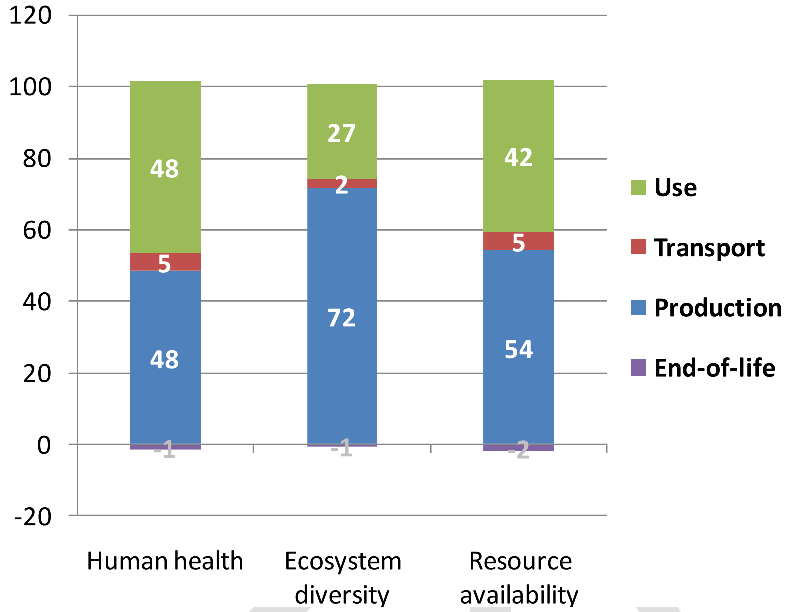


**Figure 3.6: Impacts of textile consumption in the EU 27 estimated by endpoint indicators %**

### 3.1.4.2 Detailed environmental impacts estimated for three selected midpoint indicators

**Climate change midpoint**

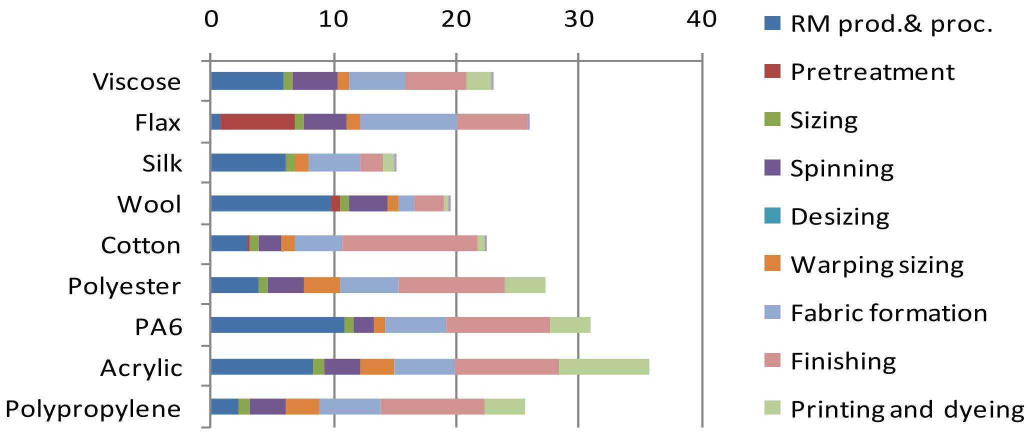


**Figure 3.7: Impacts on climate change of textile production according to fibre type and production phases in kg $CO_2$ eq/kg fabric [IMPRO, 2009]**

**Table 3.3: Summary of the midpoint indicator for climate change**

| | |
|---|---|
| Climate change | • Impacts range from 14.9 (silk) to 35.7 (acrylic) kg $CO_2$ eq/kg fabric.<br>• The synthetic fibres generate the most significant impact per unit<br>• The most significant impact arise from Acrylic (35.7 kg $CO_2$ eq/kg) followed by nylon 6 (30.9 kg $CO_2$ eq/kg) and polyester (27.2 kg $CO_2$ eq/kg)<br>• Raw material production followed by finishing, fabric formation, dyeing and printing are the most significant stages<br>• The finishing process, and therefore the impact, is common for the synthetic fibres<br>• A pre-treatment is required for flax (bleaching) which increases its impact |

**Human toxicity midpoint**

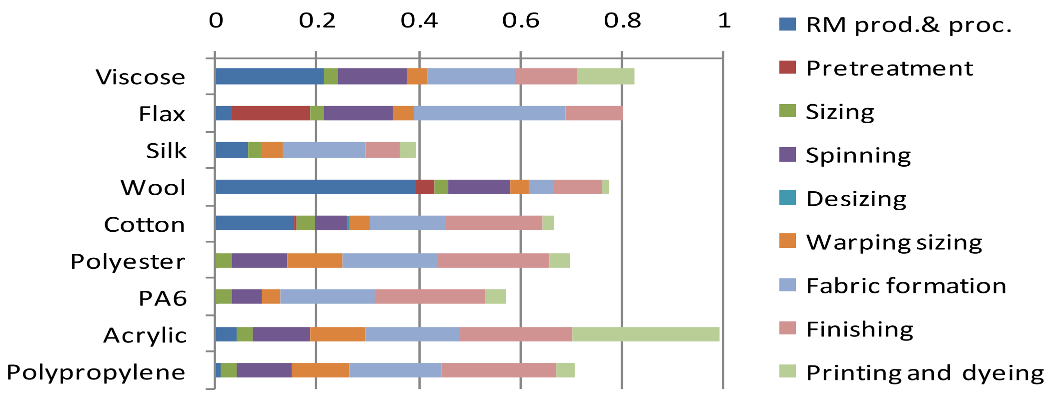


**Figure 3.8: Impacts of textile production, broken down by fibre type and production phases, human toxicity, in kg 1,4-DB eq/kg fabric [IMPRO, 2009]**

**Table 3.4: Summary of the midpoint indicator for human toxicity**

| | |
|---|---|
| Human toxicity | • Impacts range from 0.39 (silk) to 0.99 (acrylic) kg 1,4 DB eq/kg of fabric.<br>• The most significant impacts arise from acrylic (0.99 kg 1,4 DB) eq/kg followed by viscose (0.82 kg 1,4 DB eq/kg) and flax (0.80 kg DB eq/kg).<br>• The most significant impacts relate to downstream production and processing – particularly for the synthetic fibres<br>• Wool raw material production and scouring processes are especially significant for that fibre type<br>• For synthetic fibres the most significant impacts relate to electricity use for production and processing, although this will be influenced by the fuel mix and the extent of on-site electricity generation |

**Freshwater ecotoxicity midpoint**

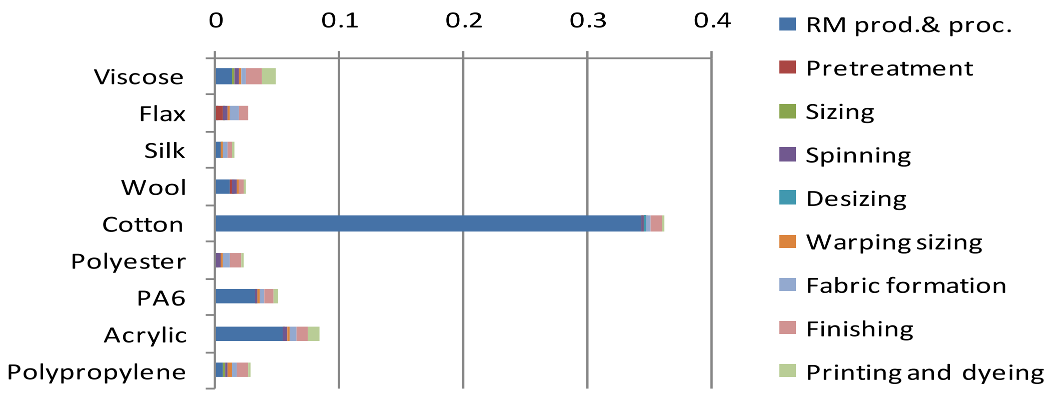


**Figure 3.9: Impacts of textile production, broken down by fibre type and production phases, freshwater ecotoxicity, in kg 1,4-DB eq/kg fabric, [IMPRO, 2009]**

**Table 3.5: Summary of the midpoint indicator for freshwater ecotoxicity**

| | |
|---|---|
| Freshwater ecotoxicity | • Impacts range from 15.7 (silk) to 360 (cotton) g 1,4 DB eq/kg.<br>• The most significant impacts arise from cotton (0.36 g 1,4 DB eq/kg) followed by acrylic (85 g 1,4 DB eq/kg), polyamide (50 g 1,4 DB eq/kg) and nylon 6 (45 g 1,4 DB eq/kg)<br>• The impacts arising from cotton are related to the use of fertilisers and agrochemicals<br>• The overall impacts of acrylic and nylon 6 are largely related to the raw material production phase, where phosporus is released.<br>• Finishing and dyeing processes also register significant impacts – particularly in relation to anthraquinone dyes |

### 3.1.4.3 Detailed environmental impacts estimated for the three selected endpoint indicators

**Human health endpoint**

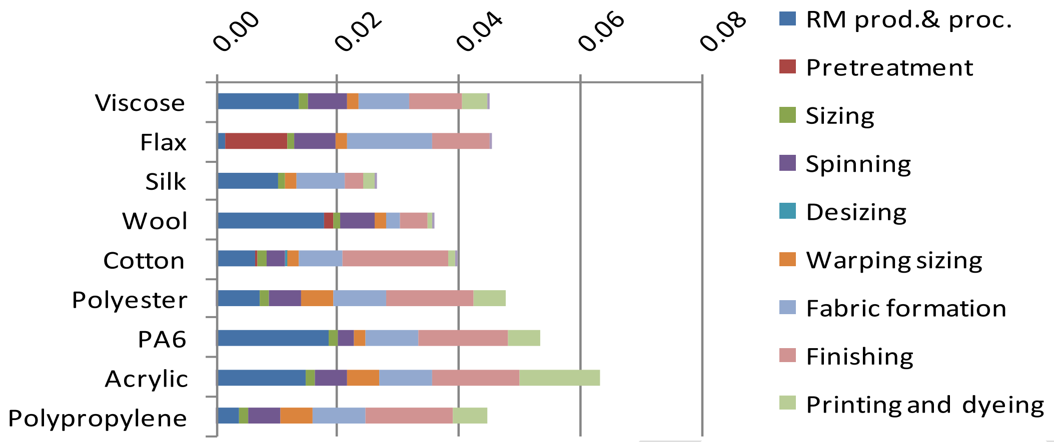


**Figure 3.10 : Impacts of textile production, broken down by fibre type and production phases, human health, in DALY/t fabric, [IMPRO, 2009]**

**Table 3.6: Summary of the Endpoint indicator for human health**

| | |
|---|---|
| Human health | • Impacts range from 2.6 × $10^{-2}$ (silk) to 6.3 × $10^{-2}$ (acrylic) DALY/t.<br>• The most significant impacts arise from acrylic (6.3 × $10^{-2}$ DALY/t) followed by polyamide (5.3 × $10^{-2}$ DALY/t) and flax (4.5 × $10^{-2}$ DALY/t).<br>• Raw material production, fabric formation, finishing, dyeing and printing are the most significant impact areas, particularly for synthetic fibres<br>• The impacts arise largely due to process energy use |

**Ecosystem diversity endpoint**

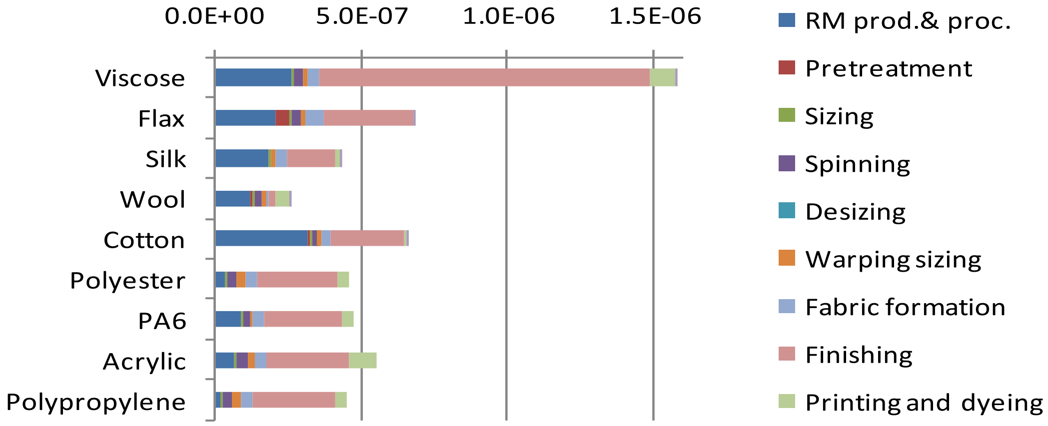


**Figure 3.11: Impacts of textile production, broken down by fibre type and production phases, ecosystem diversity, in species.yr/kg fabric, [IMPRO, 2009]**

**Table 3.7: Summary of the Endpoint indicator for ecosystem diversity**

| | |
|---|---|
| Ecosystem diversity | • Impacts range from 2.5 × $10^{-7}$ (wool) to 1.56 × $10^{-6}$ (viscose) species.yr/kg.<br>• The most significant impacts arise from viscose (1.6 × $10^{-6}$ species.yr/kg) followed by flax (6.8 × $10^{-7}$ species.yr/kg) and cotton (6.6 × $10^{-7}$ species.yr/kg)<br>• The finishing stage generates the most significant impacts due to the use of various forms of fabric softeners. The impact is particularly significant for viscose.<br>• Some finishing processes also use soaping agents and softeners.<br>• The impacts arising from soaping agents and softeners arise from the sourcing of raw materials such as palm oil<br>• Raw material sourcing for viscose, flax, silk, cotton and wool also generate impacts relating to land use and transformation |

**Resource availability endpoint**

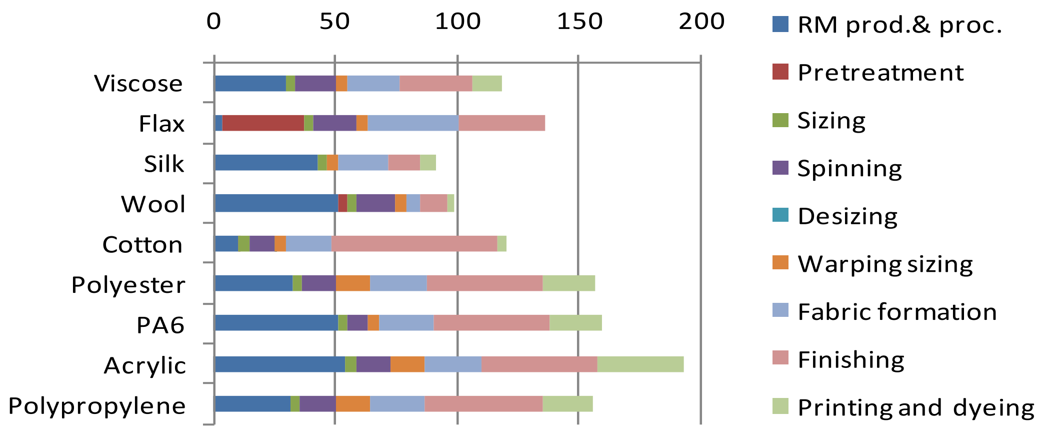


**Figure 3.12: Impacts of textile production, broken down by fibre type and production phases, resource availability, in $/kg fabric, [IMPRO, 2009]**

**Table 3.8: Summary of the Endpoint indicator for resource availability**

| | |
|---|---|
| Resource availability | • Impacts range from 92 (silk) to 193 (acrylic) per $ of external costs per kg.<br>• The most significant impacts arise from acrylic (193$) followed by nylon 6 (160$/kg), polyester (156$/kg) and polypropylene (156$/kg)<br>• The most significant impacts arise from the raw material production, fabric formation, finishing, dyeing and printing stages<br>• The raw material production and finishing stages are the most significant for the synthetic fibres – with energy use being the main contributor |

### 3.1.2 Improvement options analysis

In the study [IMPRO, 2009] several improvements options were evaluated. These options, which were derived from the LCA analysis, are summarised and discussed in table 3.9. The improvement options focus on some, but not all, of the areas of environmental impact estimated by the fibre midpoints and endpoints. This is because the analysis by fibre identifies fibre-specific issues whereas the improvement options address the combined overall impacts for EU27 textile production, which are dominated by cotton. The combined improvement options must therefore be considered alongside fibre-specific improvement options in order to create a balanced view of where to focus EU Ecolabel criteria revisions.

**Table 3.9: Environmental improvements options identified by IMPRO Textiles**

| Option | Environmental benefit | Discussion and commentary |
|---|---|---|
| Reducing agrochemical use in cotton production by replacement with GM cotton | Less impact on aquatic systems | When comparing organic, GM and conventional cotton 3 main parameters must be taken into account: yield, pesticide used and fertilizers used. Comparing midpoint indicators organic and GM cotton have less or the same impact – except for agricultural land occupation where organic cotton has greater impact due to lower yield.<br>*This conclusion is however uncertain since the impact is very dependent on crop yield and the yield for GM cotton is estimated differently by different sources.* |
| Replace cotton with eg flax and hemp | Less use of chemicals and less impact on aquatic systems | Growing of flax and hemp has environmental advantages compared to cotton.<br>*However it is deemed unlikely that use of flax and hemp can be required or favoured by the EU Ecolabel.* |
| Reduce use of sizing chemicals | Less consumption of raw materials - less discharges and waste water treatment | The benefit of reducing consumption of sizing chemicals or replacing such chemicals by enzymes has been assessed by [IMPRO, |

| | | |
|---|---|---|
| Replace chemicals with enzymes | Overall slight reduction of impacts | 2009]. In the assessment sizing chemicals has been assumed to be white oil and starch from potatoes. The assessment shows that reduced sizing has some small environmental advantages, but on the other hand requires higher quality of yarn. Regarding replacing chemicals with enzymes the benefit to be obtained is marginal. However, calculations have been undertaken for cotton only. Potential related to other fibres has not been assessed.<br><br>*It seems difficult to utilise the assessment for strengthening Ecolabel criteria for textiles* |
| Use other knitting technologies | Les energy consumption and less production of fabric waste | Substitute flat knitting by integral or fully fashioned knitting partly or fully Alternative knitting technologies can provide custom shaped products and thus have loss of material in the knitting process. The disadvantage of these technologies is considerably higher energy consumption. The overall benefit seems to be questionable.<br><br>*The Eco-label will normally not recommend specific technologies but instead establish limits for consumption of specific substances and raw materials. The study provides waste arisings estimates which could inform waste minimisation performance indicators.* |

| | | |
|---|---|---|
| Dye controller and low liquor ratio dying machines | Reduced energy, steam and water consumption and prevent excessive chemicals use | Dye machine controllers and low liquor ration dying machines can successfully reduce consumption of chemicals of up to 60% and water by 28 - 70%. References for calculations is, however, uncertain.<br>*Regarding chemicals more knowledge is needed in order to establish criteria on the consumption or emissions of chemicals in general.*<br>*The Eco-label will normally not recommend specific technologies but instead establish limits for consumption of specific substances and raw materials.* |
| Recycle/ re-use water during production - ion exchange technology | Reduce water consumption | There are both advances and disadvantages with membrane or ion exchange. There are high initial capital investment and slow filtrations rates compared to other water treatment. Also the risk of clogging the filter and the use of chemicals are a disadvance.<br>*The Eco-label will normally not recommend specific technologies but instead establish limits for consumption of specific substances and raw materials.* |
| Less air freight | Reduce energy consumption | 8 percent of of imports are estimated to be by air freight and 92 percent by ship.<br>*The contribution from the air freight is relative large. Because of this even a little reduction in the percentage will have a high influence on the overall impact.* |

| | | |
|---|---|---|
| Promotion of recycling and reuse | Reduction of textile waste generated | In the study it is estimated that 20% of the textiles waste are collected with 10% being recycled. An increase in the collection rate to 40 and recycling percentage increased to 20 will not have a significant impact on the overall impact of the textile.<br>*This assumption requires revisiting as the study did not analyse a scenario in which textile waste is remanufactured in a closed loop system into new fibre e.g. cotton , polyester* |
| Fibre blends | Reduce detergent, energy and water consumption | Some composite materials as polycotton (polyester/cotton) have considerable advantages during the use phase and could be promoted.<br>*The intention of the EU Ecolabel is not to promote specific materials or fibres. Composites may also create problems in operating closed loop recycling systems.* |

The above suggestions for improvement are further quantified and weighted according to their potential in table 3.9. Here it is shown that the greatest improvement potential would be the recycling of effluent water and an increase in the recycling and reuse of textiles. In this table the use phase is included to illustrate the potential improvements potential of the whole life cycle.

**Table 3.10 Environmental improvement potentials of the improvement options for the endpoint indicators compared to the baseline scenario in %. For comparative reason also improvements in the use phase is included [IMPRO, 2009]**

| | | Endpoint indicators | | |
|---|---|---|---|---|
| **Phase** | **Option** | **Human health** | **Ecosystem diversity** | **Resource availability** |
| Production | Replacement of traditional cotton by GM cotton | 0.7 | 3.7 | 0.4 |
| | Substitution of cotton by hemp | 0.3 | 5.8 | 0.7 |
| | Reducing consumption of sizing chemicals | 0.2 | 0.3 | 0.2 |
| | Replacement of chemicals with enzymes | 0.03 | 0.11 | 0.03 |
| | Use of fully fashioned knitting | 1.2 | 2.0 | 4.0 |
| | Use low liquor ratio dyeing machines and dye machine controllers | 0.1 | 0.8 | 0.1 |
| | Recycling of effluent water by ion exchange technology | 0.6 | 11.3 | 0.6 |
| Distribution | Avoidance of air transportation | 3.9 | 1.9 | 4.5 |
| Use | Reduction of the washing temperature | 4.7 | 2.1 | 4.3 |
| | Increase of the load capacity of washing and drying appliances | 3.9 | 2.4 | 3.3 |
| | Reduction of the use of tumble drying | 1.6 | 0.7 | 1.5 |

| | | | | |
|---|---|---|---|---|
| | Improvement of washing machines and dryers efficiencies | 3.8 | 1.7 | 3.6 |
| End-of-life | Increase of the collection of used clothing for reuse and recycling | 8.1 | 5.7 | 7.7 |



## 3.2 THE DANISH PROJECT EDIPTEX - ENVIRONMENTAL ASSESSMENT OF TEXTILES

The Danish project EDIPTEX - Environmental assessment of textiles from 2006 [Laursen, et al 2006] is a thorough assessment of selected textile products from a life cycle perspective. It was commissioned by the Danish Environment Protection Agency. The assessment provides a detailed LCA study for the following textile products which are of relevance to the Ecolabel revision:

- A T-shirt made by 100% of cotton
- A jogging suit made of nylon micro fibres with cotton lining
- A work jacket made of polyester (65%) and cotton (35%)
- A blouse of viscose, nylon and elastane

In this way we can consider the environmental impacts of whole products which may typically comprise blends of fibres, fixtures and fastenings as well as specific surface treatments and finishings.

The findings of this study can be considered representative for the production of different textiles although not all fibre types are represented in the examples. The listed examples represent some of the most common types of fibres blending and they will be used to illustrate the main environmental impacts areas and their sources. It does not, however, address all of the significant fibres or blends used by contemporary retailers. Results from other studies will also therefore need to be taken into account in order to provide supplementary evidence in relation to acrylic and wool blends.

### 3.2.1 Impact Assessment Method

The EDIPTEX project is a LCA study based on the Danish EDIP life cycle impact assessment method. EDIP is an internationally recognised LCA methodology and the study was carried out in accordance with the requirements of the ISO standards 14040/14044. The methodology used considers the following impact categories (midpoint indicators):

- global warming
- stratospheric ozone depletion
- acidification
- eutrophication
- photochemical ozone formation
- toxicity to humans
- toxicity to the environment
- consumption of natural resources
- generation of waste for landfilling.

A more comprehensive description of the assessment method is given in Appendix 4. Further information on the EDIP methodology is provided in [Wenzel et al 1997].

### 3.2.2 Data

Most of the data used in the LCA work was gathered and developed within the project. Almost 500 textile unit processes (e.g. dying of polyester) were modelled, which required the collection of data on inputs and outputs from the processes, including data on emissions. In order to evaluate the environmental impact of the chemicals used in textiles, equivalency factors were found for a number of chemicals (using data from chemicals already evaluated for chemicals with no data). All process data and equivalency factors are currently integrated in the GaBi LCA software.

### 3.2.3 Findings from the study

The outcomes of the study are briefly summarized in the following. The results demonstrates how the environmental impacts depend strongly on the type of product, the fibers utilised and the way in which the product is treated by washing and drying during the use phase.

**Example 1: T-shirt**

A T-shirt was assessed assumed to be made of pure cotton. The assessment did not include multicoloured patterns or prints on the product. The following life cycle assumptions were made in order to carry out the assessment:

- For the cotton cultivation, conventional farming and harvesting was considered, which included the use of pesticides and defoliating agents.
- The use of hydrogen peroxide was considered in the bleaching process while reactive dyes are assumed to be used in the dyeing process which avoid the emission of heavy metals and arylamine. Regarding finishing, a non-problematic softener is considered.

- The life time of the T-shirt was set to 50 washes and drying is assumed to be carried out in a tumble dryer.
- Water consumption was not assessed, but it was noted that cotton irrigation may have a significant impact on water resources.

The results of the LCA are presented according to three end-point indicators in figure 3.11. These end-points estimates are aggregated from the midpoints indicators presented in section 3.2.1.

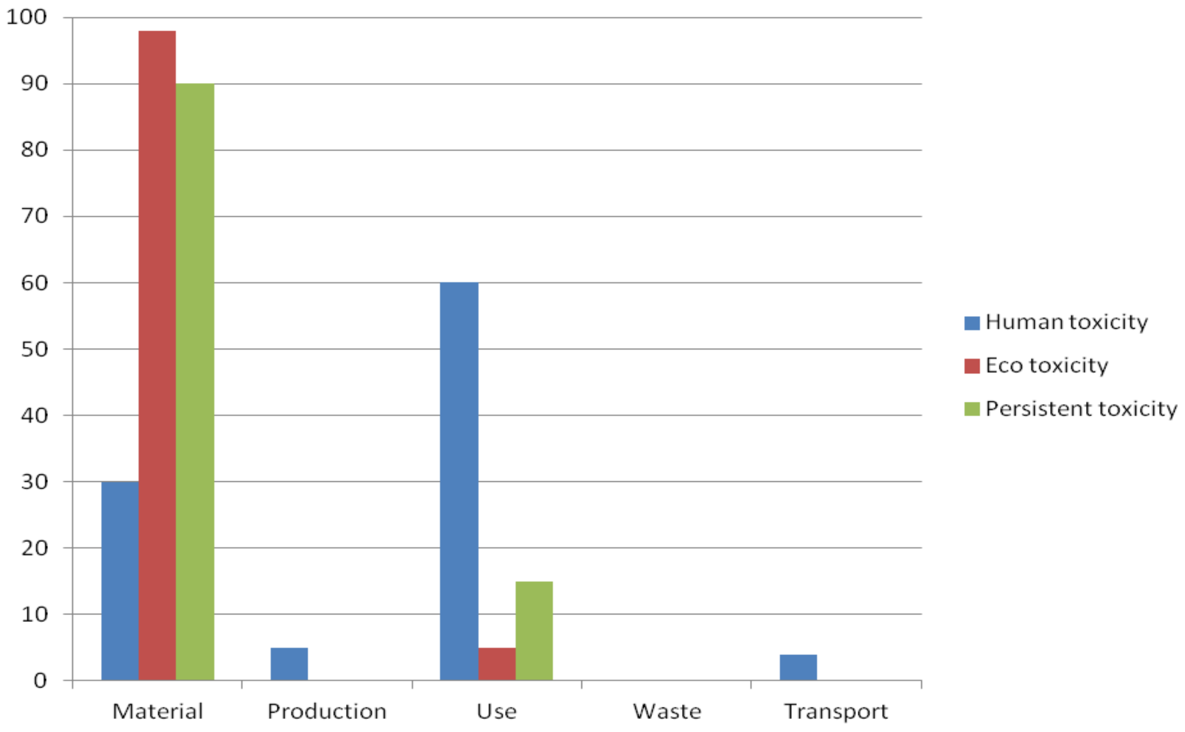


**Figure 3.13: T-Shirt LCA results interpreted as toxicology end-points**

The main contribution to ecotoxicity and persistent toxicity in the material phase is the use of pesticides in the cotton production. Regarding the human toxicity whilst 30% of the impact is related to the cotton production but here the use phase is the main contributor (60%) mainly from the detergents and the use of electricity in the drying process. The significance of the material phase is highlighted by the findings for the environmental toxicity midpoint in figure 3.14. These findings are supported by another study “Well dressed?” [Biffaward, 2006]. This study is also for a 100% cotton T-shirt but under UK conditions.

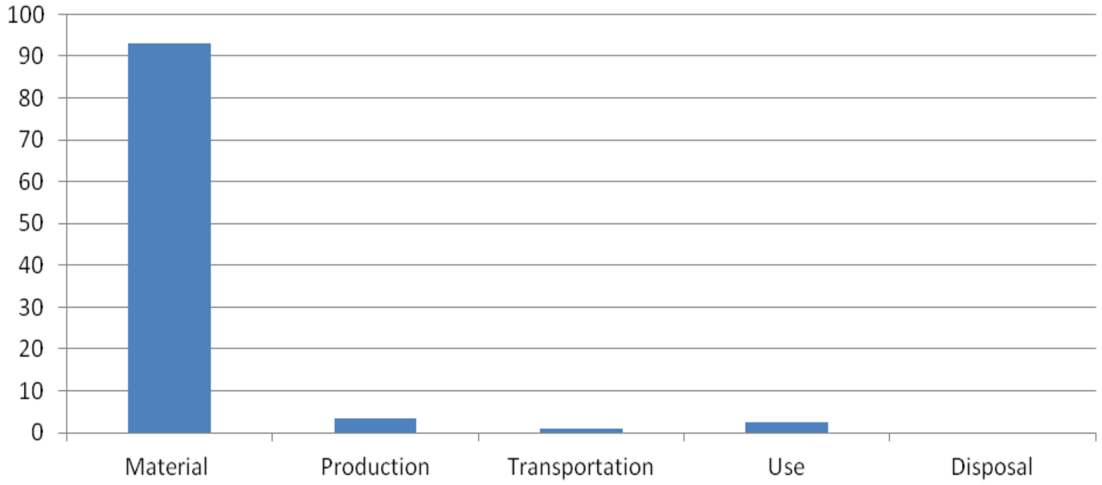


**Figure 3.14 T-Shirt non organic cotton - LCA results for environmental toxicology mid-point [% contribution of life cycle phase]**

The overall results of the t-shirt LCA analysis have been screened into a MECO matrix which is presented in table 3.10. The main findings in the matrix are that the highest impact related to chemicals is from the use of pesticides, the highest impact related to energy is from the use phase mainly from washing and drying the T-shirt. It also notable that the direct contribution from disposal and transport is very little.

**Table 3.11: MECO matrix for the T-shirt example**

| | Materials | Production | Use | Disposal | Transport |
|---|---|---|---|---|---|
| **Materials** | Water for irrigation. | | | | |
| **Energy** | 10% of total energy consumption. Mainly related to agricultural activities (70%). | 12% of total energy consumption. The use is related to manufacturing of yarn (55 %), knitting (10%), pre-treatment (12%), dyeing (12%) and finishing (11%) | 78% of total energy consumption. The use is related to drying (68%), washing (24%) and ironing (8%) | - 2% is gained by incineration | 2% is related to operations with vehicles |
| **Chemicals** | Very dominating regarding eco-toxicity and persistent toxicity, Caused mainly by use of pesticides | Effects are very small. Caused by use of chemicals for pre-treatment (washing agents), dyeing, finishing and emissions from energy generation. | Dominating regarding human toxic effects. Caused mainly by use of washing powder secondly emissions from energy generation. | Little negative contribution due to the avoided emissions associated with the energy credit from incineration | Effects are very small. Caused by emissions from fuels for transport |
| **Other issues:** **-** Waste generation | Second most important stage. Mainly residues from energy generation | Relatively small. Residues from energy generation | Most important stage. Residues from energy generation | Insignificant | Insignificant |

The indicator results for primary energy are illustrated in figure 3.13. Primary energy use is mainly related to the use phase (washing and drying). In the material phase 70 % of the energy is related to the transportation of the fibres and the production of fertilizers and pesticides contributes with 13%. Primary energy used in the production phase (12 % of the total energy consumption) is mainly from the use of electricity and natural gas. In the confection 1 % is credited for the reuse of cutted textiles. These findings are supported by another study "Well dressed?" [Biffaward, 2006] This study is also for a 100% cotton T-shirt but under UK conditions.

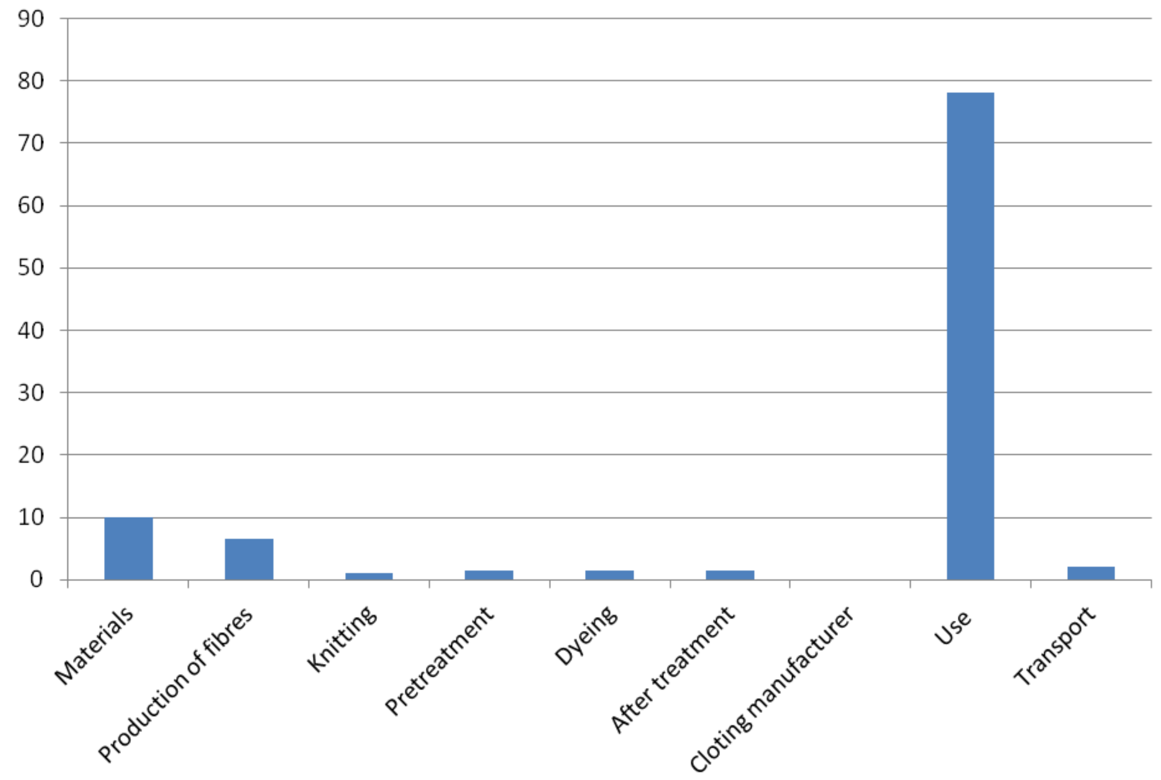


**Figure 3.15: T-Shirt LCA results for primary energy use [% consumption]**



**Conventional cotton and organic cotton scenario comparison.**

A major contribution to energy consumption and toxicity in the material phase comes from the production and use of pesticides and fertilizers in the cultivation of cotton. The consequence of using organic cotton in place of conventional cotton is illustrated below.

Comparison between conventional and organic cotton shows that there is only a small difference with respect to the use of primary energy and only a small difference in the energy related effects – organic cotton shows a reduction of 5-10% because of the contribution from production of fertilisers and pesticides becomes zero. The contribution from the waste phase is also very much the same.

The major difference is in the reduction of the toxicology effects as illustrated in the comparison in figure 3.16 – in which persistent toxicity is reduced by 85% and eco toxicity is reduced with 95%.

This conclusion is supported by another study “Well dressed?” [Biffaward, 2006]. In this study the impact from the material phase is reduced from 93% to 7.5%. This indicates that there is a significant improvement potential when using organic cotton as an alternative to conventional cotton. The impact on the production becomes significant as this phase accounts for 48% of the whole life cycle impacts.

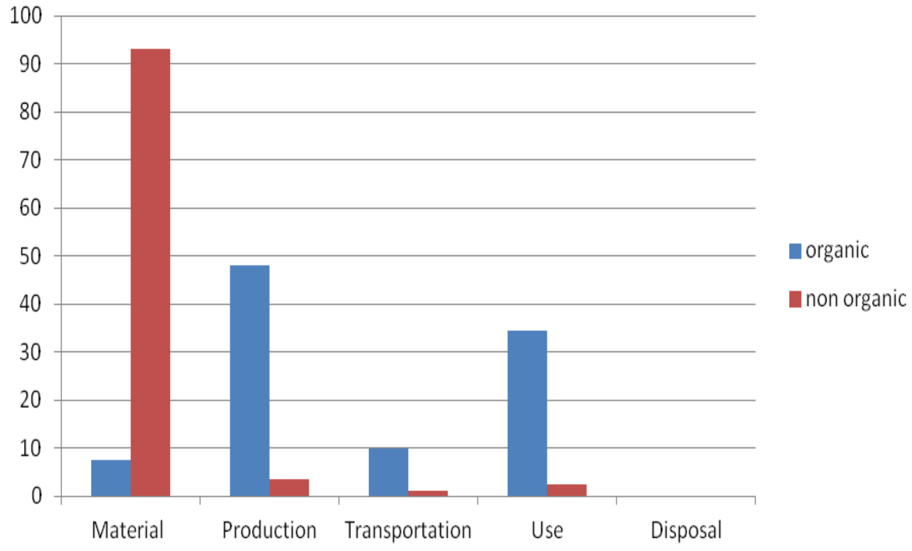


**Figure 3.16: LCA environmental toxicity indicator profile (in %) for conventional and organic cotton T-shirts.** *Note that the production phase have more weight for organic cotton – due to a lower total impact.*

**Example 2: Jogging suit**

A jogging suit assessed was assumed to consist of a top and trousers. The suit is assumed to consist of and outer fabric (nylon) and a lining (cotton). The top incorporates a polyester zipper (consisting of both tape and chain). The suit is made up of 350 g nylon, 350 g cotton and 6 g polyester for the zipper. The following life cycle assumptions were made in order to carry out the assessment:

- The cotton was assumed to be conventional cotton farmed and harvested using pesticides and defoliating agents,
- The nylon was assumed to have been manufactured from virgin feedstock
- Bleaching is assumed using hydrogen peroxide. The cotton is not dyed while dyeing of the nylon is assumed to have been carried out using acid dyes with no emission of heavy metals and arylamines.
- Regarding finishing, the nylon is treated to be wind-proof as well as water- and dirt-repellent. Furthermore, the whole suit is softened. 24 washes during the useful life of the suit are assumed. Drying is carried out in a tumble dryer.
- Water consumption is not assessed, but it is noted that cotton irrigation may have a significant impact on water resources.

- Thus, consumption of materials focuses on resources used for nylon and polyester manufacturing and energy generation (based on a mineral oil, natural gas and coal fuel mix).

The results of the LCA are presented according to three end-point indicators in figure 3.17. These end-points estimates are aggregated from the midpoints indicators presented in section 3.2.1.

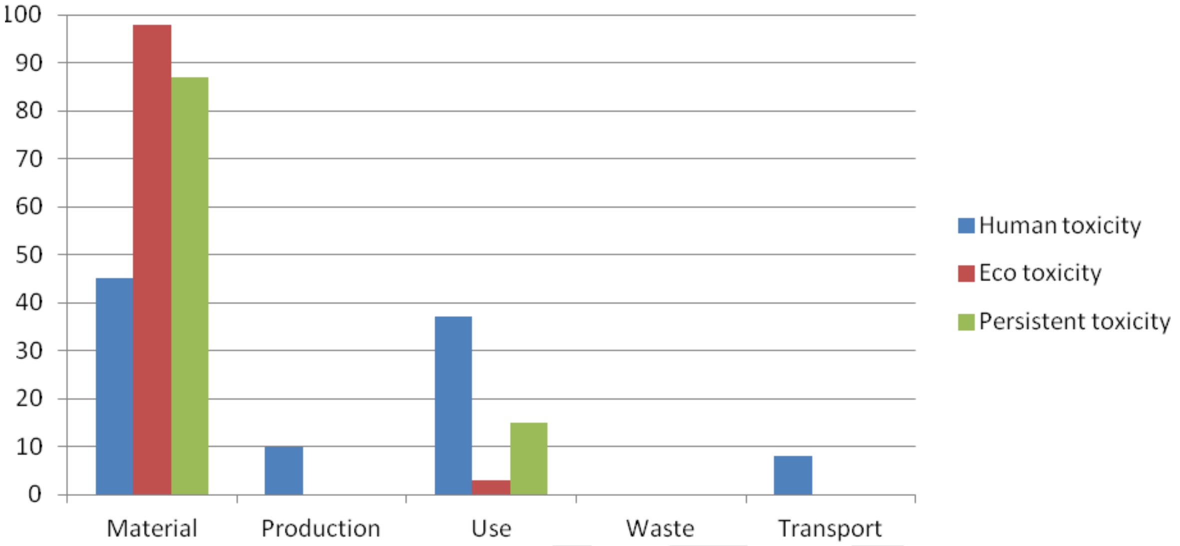


**Figure 3.17: Jogging suit LCA results interpreted as toxicity endpoints.**

The main contributions to environmental impacts associated with the three endpoints are during the production of cotton and nylon. The contribution in the material phase is mainly due to the use of pesticides in the production of cotton. However, the introduction of nylon into the blend increases the contribution to human toxicity of the material production stage.  The study notes that the contribution of the toxicity effects was not complete. This was because the nylon data used in the EDIPTEX database was relatively dated and lacked data equivalency.  It also did not contain data on chemicals used in the surface treatment of the nylon. As a result the contribution in the production phase is likely to be underestimated [EDIPTEX].

The overall results of the jogging suit LCA analysis have been screened into a MECO matrix which is presented in table 3.12. The main findings in the matrix are that the highest impact related to chemical use is from the use of pesticides, the highest impact related to energy is from the use phase mainly from washing and drying the jogging suit but with nylon production making a significant additional contribution. It also notable that the direct contribution from disposal and transport is very little.

**Table 3.12 MECO matrix for a jogging suit**

| | Materials | Production | Use | Disposal | Transport |
|---|---|---|---|---|---|
| **Materials** | Dominant stage regarding oil and natural gas (production of fertilizers).<br><br>Water for irrigation.<br><br>The production of the zipper contributes 1% | Significant use of both oil, gas and coal for electricity and heating | Dominant stage regarding use of coal, which is used for generation of electricity. Also significant use of oil and gas. | | Significant consumption of oil for operation of vehicles |
| **Energy** | 32% of total energy consumption. Related to manufacturing of nylon fibres (70%) and agricultural activities (30%). | 17% of total energy consumption. The use is related to manufacturing of cotton yarn (35 %), weaving of nylon (20%), knitting of cotton (8%), pre-treatment (14%), dyeing (8%) and finishing and packaging (15%) | 50% of total energy consumption. The use is related to drying (82%) and washing (18%) | - 2% is gained by incineration | 3% is related to operations with vehicles |
| **Chemicals** | Very dominating regarding ecotoxicity and persistent toxicity, Caused mainly by use of pesticides | Effects are relatively small. Caused by pretreatment (washing agents), dyeing, finishing and emissions from energy generation. | Dominating regarding human toxic effects. Caused mainly by use of washing powder secondly emissions from energy generation. Effects are small compared to effects from the material stage | Little negative contribution | Effects are very small. Caused by emissions from fuels for transport |
| **Other issues** | No further significant issues are identified | | | | |

The indicator results for primary energy are illustrated in figure 3.18. Even though the same amount of cotton and nylon is used, the results indicate that the energy use associated with the production of nylon is more significant. There is no substantial contribution from the materials (polyester) used to manufacture the zipper.

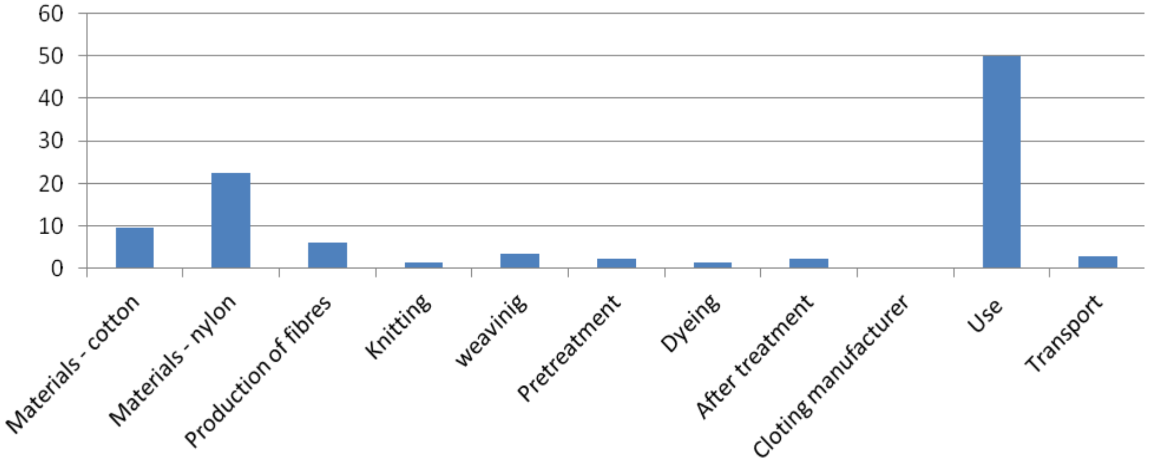


**Figure 3.18: Jogging suit LCA results for primary energy use [% consumption]**

**Example 3: Work jacket**

A work jacket was assessed which was assumed to consist of 65% polyester and 35% cotton. It includes 10 brass buttons, a brass zipper and a polyester zipper in a pocket. The following life cycle assumptions were made in order to carry out the assessment:

- The cotton is assumed to be conventional cotton farmed and harvested using pesticides and defoliating agents.
- The polyester was assumed to have been manufactured from virgin feedstock
- Bleaching is assumed to have been carried out using hydrogen peroxide.
- Reactive dyes are used for cotton fibres, and dispersion dyes together with dichlorobenzene are used for polyester. None of the dyes contain heavy metals or can cause the emission of arylamines. Regarding finishing, the jacket is softened. 40 washes during the useful life of the jacket are assumed.
- The washes are industrial washes with a reduced consumption of detergents compared to household washing.
- Drying is carried out in a tumble dryer. Water consumption is not assessed, but it is noted that cotton irrigation may have a significant impact on water resources.

- Thus consumption of materials focuses on resources used for polyester manufacturing and energy generation (based on a mineral oil, natural gas and coal fuel mix).

The study notes that the contribution of the toxicity effects was not complete. This was because the polyester data used in the EDIPTEX database was relatively dated and lacked data equivalency. It also did not contain data on chemicals used in the surface treatment of the polyester. As a result the contribution in the production phase is likely to be underestimated [EDIPTEX].

The overall results of the work jacket LCA analysis have been screened into a MECO matrix which is presented in table 3.13. The midpoint results for the environmental toxicity indicator are presented for comparative purposes in figure 3.19.

The main findings as presented in the MECO matrix are that the highest impact related to chemical use is from the use of pesticides, the highest impact related to energy is from the use phase mainly from washing and drying the jogging suit but with polyester production making a significant additional contribution. It also notable that the direct contribution from disposal and transport is very little.

**Table 3.13 MECO matrix for a work jacket**

| | Materials | Production | Use | Disposal | Transport |
|---|---|---|---|---|---|
| **Materials** | Second most important phase regarding use of fossil fuels. Water for irrigation. | Consumption of fossil fuels is relatively small. Used for electricity and heating. | Dominant stage regarding use of fossil fuels, which is used for generation of electricity. | | Small consumption of oil for operation of vehicles |
| **Energy** | 15% of total energy consumption. Related to manufacturing of polyester fibres and agricultural activities. | 9% of total energy consumption. The use is related to manufacturing of yarn (35 %), weaving (15%), pre-treatment (11%), dyeing (22%) and finishing and packaging (17%) | 73% of total energy consumption. The use is related to washing and drying | - 1% is gained by incineration | 4% is related to operations with vehicles |
| **Chemicals** | Very dominating regarding ecotoxicity and persistent toxicity, Caused mainly by use of pesticides | Effects are relatively small. Caused by pre -treatment (washing agents), dyeing, finishing and emissions from energy generation. | Dominating regarding human toxic effects. Caused mainly by use of washing powder secondly emissions from energy generation. Total effects are small compared to effects from the material stage | Little negative contribution | Effects are very small. Caused by emissions from fuels for transport |
| **Other issues** | No further significant issues are identified | | | | |

Figure 3.19 illustrates how approximately 80 percent of the total environmental toxicity midpoint contribution is attiributed to the fibre production phase, relating mainly to the use of pesticides in cotton production. The remaining proportion (approximately 10 % of the total contribution) mainly relateds to production processes. This contribution arises from use of carriers, dyestuff and softeners.

Data source for figure to be checked

**Figure 3.19: LCA results for environmental toxicity midpoint for a work jacket [% contribution]**

The indicator results for primary energy are illustrated in figure 3.20. This illustrates that the main use of primary energy is in the use phase – mainly from the washing and drying of the jacket. Even though a higher proportion of synthetic fibre is used compared to the jogging suit, the results indicate that the energy use associated with the production of polyester is substantially less than for nylon, hence the lower overall proportional contribution of the materials phase. No substantial contribution was highlighted from the materials (polyester) used to manufacture the zipper.

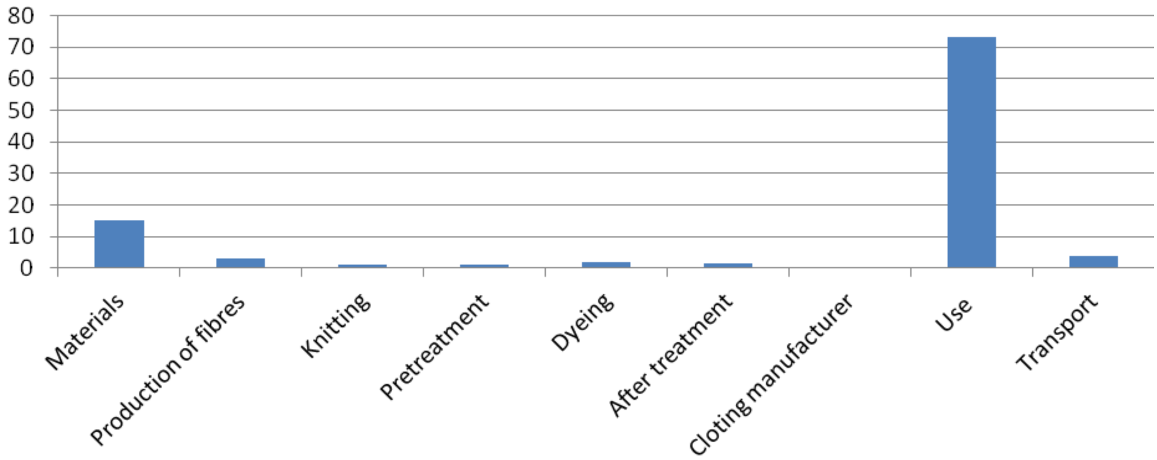


**Figure 3.20: Work jacket LCA results for primary energy use [% consumption]**

**Polyester production - choice of carriers**

Carriers (solvents) are used in the dying of polyester and substitutes emerge as an improvement option from this case study. In the results presented here the reference carrier is 1,2 dichlorobenzene. Improvement options are discussed further in section 3.3.

**Example 4: A Blouse**

A work blouse was assessed which was assumed to consist of 70% viscose, 25% nylon and 5% elasthane. The following life cycle assumptions were made in order to carry out the assessment:

- Reactive dyes were used for viscose fibers, and acid dyes for nylon and elasthane.
- 25 washes during the useful life of the blouse are assumed. The blouse is assumed dryed in open air (drip drying).
- Data for elasthane is not complete but modelled based on the assumption that elasthane is comparable to polyurethane.

The study notes that the contribution of the toxicity effects was not complete. This was because the nylon and viscose data used in the EDIPTEX database was relatively dated and lacked data equivalency. The inputs were missing data on chemicals used in the surface treatment of the nylon and an equivalency factor for carbon disulphide used in viscose production. As a result the contribution in the production phase is likely to be underestimated [EDIPTEX]. Data was also not available for elastane. The inputs were therefore based on polyurethane, which makes up 85% of the content of elastane.

The overall results of the work jacket LCA analysis have been screened into a MECO matrix which is presented in table 3.14. The midpoint results for the environmental toxicity indicator are presented for comparative purposes in figure 3.21.

**Table 3.14 MECO matrix for a blouse**

| | Materials | Production | Use | Disposal | Transport |
|---|---|---|---|---|---|
| **Materials** | Oil and gas for manufacturing of nylon and elasthane. | Oil, gas and coal for electricity and heating | Coal for generation of electricity. | | Consumption of oil for operation of vehicles |
| **Energy** | 65% of total energy consumption. Related to manufacturing of fibres. | 23% of total energy consumption. The use is related to weaving (27%), pre-treatment (13%), dyeing (33%) and finishing and packaging (27%) | 12% of total energy consumption. The use is related to washing. | - 2% is gained by incineration | 2% is related to operation with vehicles |
| **Chemicals** | Second most important phase. Related to manufacturing of fibres. | Effects are relatively small. Caused by pre-treatment. | Dominating phase. Caused by use of washing powder (detergents). | Effects are insignificant | Effects are insignificant |
| **Other issues** | No further significant issues are identified | | | | |

The main findings as presented in the MECO matrix are that the highest impact related to chemical use is from the use of detergents during the use phase, followed by chemical processes for the production and washing of viscose fibres. The highest impact related to energy is from the fibre production phase, with viscose requiring twice the amount of energy per unit of production as nylon. It is notable that the direct contribution from disposal and transport is very little.

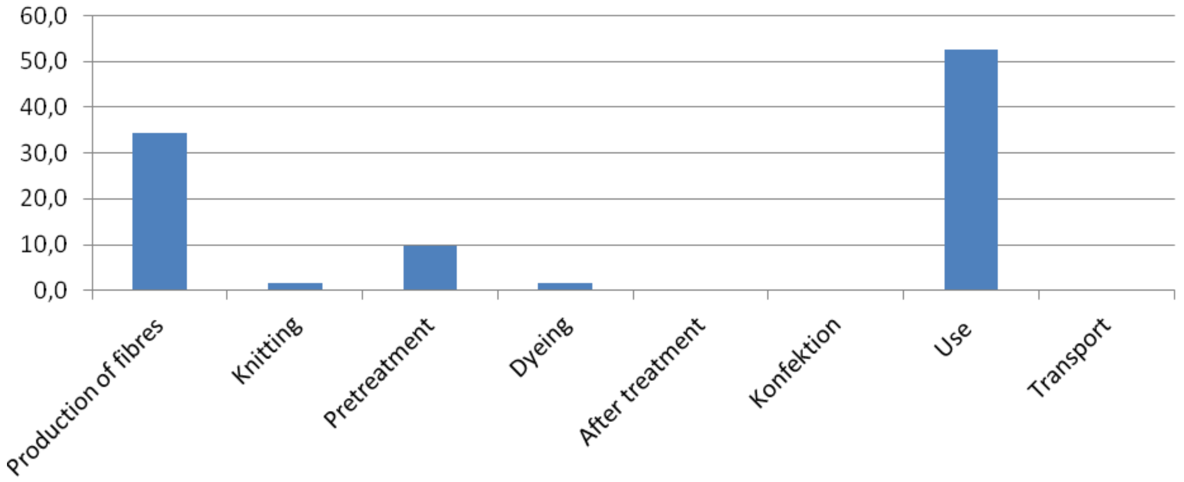


**Figure 3.21: LCA results for environmental toxicity midpoint for a blouse [% contribution]**

Figure 3.21 illustrates how over 30% of the total environmental toxicity midpoint contribution is attiributed to the fibre production phase, relating mainly to the production and washing of viscose. Emissions of sulphides and the use of bleaches are understood to be associated with the production indicator result. Pre-treatment also registers as a significant impact which is related to the use of softeners for viscose.

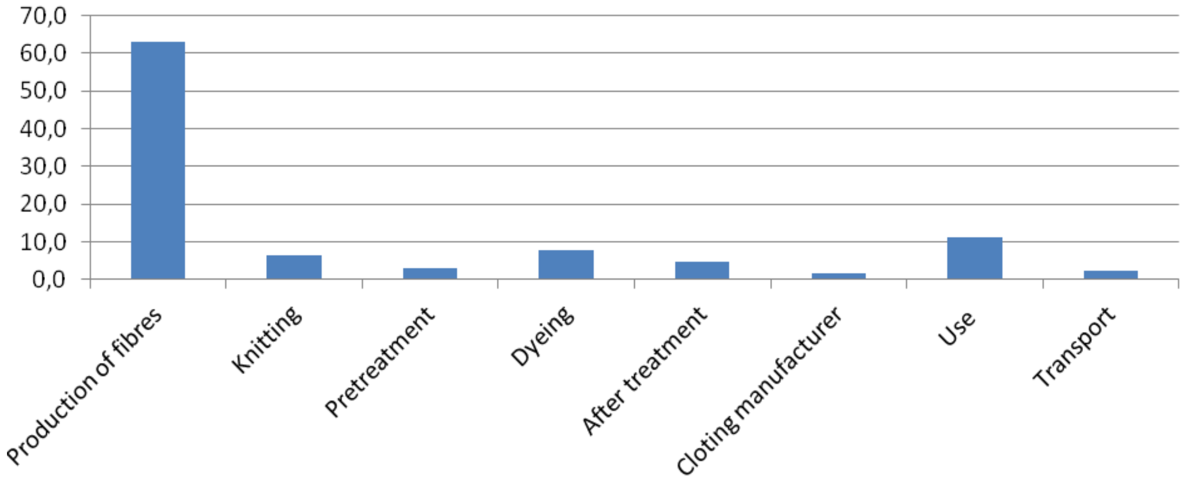


**Figure 3.22: Blouse LCA results for primary energy use [% consumption]**

The indicator results for primary energy are illustrated in figure 3.22. This illustrates that the main use of primary energy is in the fibre production phase – mainly related to the production of viscose but also related to the production of nylon. As we have already noted nylon is the most energy intensive synthetic fibre to manufacture.  Viscose production data from industry suggest that it requires twice the amount of energy per kg unit of nylon production. The production of the blouse contributes approximately 23% of the total energy consumption.

### 3.3 KEY ENVIRONMENTAL ISSUES IDENTIFIED BY THE LCA STUDIES

In this section we explore in greater detail a number of the environmental issues identified by the IMPRO and EDIPTEX LCA studies, and with reference to the Commission Statements and initial stakeholder feedback. We have grouped the analysis according to issues raised by the technical analysis carried out by both studies. The issues identified as being of significance were as follows:

- Cotton: The ecotoxicity associated with the use of agrochemicals and the resource impact of water use for irrigation;
- Synthetic fibres (acrylic, nylon, polyamide, polypropylene): The climate change and ecotoxicity impact of energy use to manufacture fibres;
- Cellulose fibres (viscose): The climate change and ecotoxicity impact of energy use to manufacture fibres;
- Raw material and feedstocks required to manufacture cellulose, synthetic fibres, soaping agents and softeners;
- Process energy and ecotoxicity associated with the fabric formation, finishing and printing and dyeing stages of production;
- Fuel use and climate change impacts associated with air freight and shipping to distribute products;
- Energy and ecotoxicity associated with the use phase of textile products;
- The potential benefits of more sustainable systems of resource use associated with the disposal phase.

For each issue additional supporting evidence is introduced in order to inform discussion as to the possible direction of the criterion revision, including improvement options which could be used to establish requirements of limit values, and where relevant the potential for harmonisation with other labelling or certification schemes that address specific environmental issues.

A number of further environmental issues have also been raised for discussion that are not specifically addressed or highlighted by the LCA studies reviewed.  In some cases this is because the data available was limited or incomplete – for example in the case of fabric surface treatments in the EDIPTEX study – whilst for others it is because there are new 'horizontal' regulatory requirements or because the environmental impacts are currently poorly understood – for example in the case of nanomaterials. The implications for the criteria revision in the following areas are discussed further in sections 3.4:

- Hazardous substances: Under Article 6 (Paragraphs 6 and 7) of the Ecolabel Regulation (EC) No 66/2010 no textile product awarded the Ecolabel should contain:
    - Substances or preparations/mixtures that are restricted under Article 57 of the REACH Regulation (EC) No 1907/2006
    - Substances or preparations/mixtures that have been identified according to the procedure described under Article 59 of the REACH Regulation (EC) No 1907/2006 and which have been subsequently classified as Substances of Very High Concern.
    - Substances or preparations/mixtures that are classification as toxic, hazardous to the environment, carcinogenic, mutagenic or toxic for reproduction (CMR), in accordance with Regulation (EC) No 1272/2008.
- Polyester dye carriers: EDIPTEX highlighted the potential to reduce the eco-toxicity of wastewater effluent by substituting solvent carriers used to facilitate the dyeing of polyester fibres and fabrics.
- Nitrilotriacetic acid: There is emerging evidence that NTA surfactant may be carcinogenic and can disrupt the functioning of wastewater treatment plants.
- Flame retardants: The various substances that confer fabrics flame retardants properties are currently addressed by the Ecolabel criteria. Feedback from stakeholders and updates of the REACH candidate list suggest that this criteria requires a revision.
- Phthalates: Updates to the REACH candidate list mean that the use of plasticisers which can act as endocrine disrupters requires further consideration.
- Nano-materials: Concerns have been raised about the possible environmental impacts of surface coatings and treatments that have been developed at an atomic, molecular or macro molecular scale.

These issues must either be addressed under the requirements of the Regulation on the EU Ecolabel or they should form areas for further investigation in order to determine whether there is sufficient evidence to adopt a pre-cautionary approach.

### 3.3.1 Cotton production

Cotton is the most used natural fiber in textile production. Values for the global cotton production vary depending on the source and on how the figure is calculated but most sources estimate the production to be around 22 million tons in 2009/10 [Organiccotton.org]. This value has not changed much since 1990 when the production also was just above 20 million tons [Allwood, J.M et al et al]. Cotton is produced in many countries but the biggest producers are China, USA, India and Pakistan. As shown in table 3.15, cotton prices have increased dramatically since 2009, [Indexmundi].

**Table 3.15: Average spot price in US cents/Pound Upland cotton.** **As per November 2011*

| Year | Price [US cents / Pounds] |
|---|---|
| 2009 | 58 |
| 2010 | 77 |
| 2011 | 178 |
| 2012* | 110 |

#### 3.3.1.1 Controlling pesticide use

Cotton is a crop that normally requires large quantities of pesticides. It covers 2.5% of the world's cultivated land yet uses 16% of the world's insecticides, more than any other single major crop[EJF, 2007]. A study in USA has concluded that the application of pesticides to cotton crops is 3 to 5 times greater per hectare than the application of pesticides to corn in the humid areas of USA [U.S. Geological Survey ].

The current list of excluded pesticides has been unchanged since the criteria version from 2002. The list was adopted from the PIC Procedure which is derived from the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade [PIC]. This procedure has been accepted by more than 120 member nations of UNEP and FAO.

The existing criterion for cotton includes 19 of the 32 pesticides listed on the current PIC-list. Hexachlorocyclohexane (total isomers) in the criterion covers both HCH (mixed isomers) and Lindane (gamma-HCH) on the PIC list. The remaining 13 pesticides from the PIC-list that are not covered by the current criteria document are: Alachlor, Aldicarb, Binapacryl, Dinitro-ortho-cresol

(DNOC) and its salts, EDB (1,2-dibromoethane), Endosulfan, Ethylene dichloride, Ethylene oxide, Fluoroacetamide, Mercury compounds, Tributyl tin compounds, combination of benomyl, carbofuran and thiram. The applicability of these substances to the criteria revision are discussed further in the technical report.

Market interest has been developed in cotton which significantly reduce pesticide use but do not achieve a 100% elimination. The Better Cotton Initiative is a good example, with a focus on Intregated Pesticide Management techniques as well as the management of water use for irrigation (see the discussion point below). Inditex is an example of a retailer and manufacturer that has recently signed up to support BCI through its product lines.

#### 3.3.1.2 Increasing the use of organic cotton

Consumption of cotton is highly dominated by traditional cotton as the production and consumption of organic cotton globally is still very small compared to traditional cotton. According to [Textile Exchange 2010a], 1.1 % of the global cotton production in 2010 was organic. The global production of organic cotton increased by 15 % from 2009 to 2010 [Textile Exchange 2010a]. In a longer perspective it is worth noting that the global organic cotton market has grown from US$ 240 million in 2001 to US$ 5100 million in 2009 [Textile Exchange 2010a; Textile Exchange 2010b].

While International Trade and Commerce asserts that demand of organic cotton is already outstripping supply and this is likely to continue in the near future, Organic Exchange asserts that supply shortage will occur only if the annual growth rate of organic cotton production falls below 40%, well below the growth rates recorded over the past few years [Textile Exchange 2010b].

Important European users of organic cotton (among top 10, globally) include companies as H&M (Sweden), C&A (Belgium), Inditex / Zara (Spain), Adidas (Germany) and the Otto Group (Germany) [Textile Exchange 2010b]. It is estimated that the retail market of organic cotton products may grow by about 20% yearly or more depending on the commitment of brands and retailers to support the production of organic cotton [Textile Exchange 2010b].

Many of these companies are manufacturing and retailing products which, although forming a very small part of their product range, contain a very high proportion of organic cotton – in many cases between 70% and 100%. Some significant companies in the outdoor clothing sector have also adopted a policy of 100% organic cotton for all product ranges. Although organic certification routes vary GOTS (which was discussed in section 2.4.3) has emerged as a popular global certification route. GOTS requires a minimum organic content of 70%

#### 3.3.1.2 Water consumption

The quantity of water consumption associated with cotton production is the subject of discussion because of variations in the source of water for irrigation. According to FAO cotton requires between 700 to 1300 mm annually to meet its requirements and the highest water demand is during the flowering period when the leaf area is at its maximum.

Water is a renewable but limited resource and shortage of water can be a local problem strongly depending also on consumption for alternative purposes. It is thus difficult to define a global acceptable consumption level for irrigation. However, H&M claims to have obtained savings of 32% in production of cotton as compared to traditional cotton based on surveys of growers in its supply chain.

Water is added to the crops by both natural sources (rainfall) and artificially (irrigation). The proportion between the two types of sources depends on the time of year and on where the cotton grows. In Egypt the crop water requirement is 1009 mm and almost all is add by irrigation whereas in USA the requirement is 516 mm of which 311 mm is rainfall and irrigation only contributes with 205 mm [Value of Water Research, 2005].

Setting requirements to the amount or method of irrigation could possible reduce the water used but this would require co-operation with the farmers. For conventional cotton it is normally impossible to trace the cotton back to the individual farmers since the visibility is lost through cotton merchants, ginners and spinners. Although the example of H&M clearly illustrates that large buyers can achieve traceability.

Examples of schemes that tries to reduce the amount of water used to irrigation is BCI (Better Cotton Initiative) which works closely with the farmers in order to help them use less pesticide and water and Helvetas Swiss Intercooperation who have made a guideline called Irrigation and soil conservation Innovations that describe how irrigation systems can be innovated.

Even if there exist a potential for reducing water consumption in the growing of cotton the steerability of the EU Ecolabel also have to be taken into consideration. It has to be discussed if and how transparent and comparable criteria can be set also taken into consideration that these criteria must be checked by the Competent Bodies when issuing the license.

### 3.3.2 Synthetic fibre production

Consumption of energy for synthetic fibre production was identified as one of the key environmental issues. There are not criteria on energy consumption in the current criteria. Hence this section gives a more in-depth description in order to evaluate if it is feasible to set criteria in this area.

Average figures from manufacturers in Europe are available from Plastics Europe. Figures are available for polyamide, polyester and polypropylene and they cover the manufacturing of the resin and not the final fibres. The data is updated every 6 year, are developed with the aim '*to encourage environmental improvements in production processes through benchmarking against a European industry average*' [PlasticsEurope 2011a].

**Table 3.16: Process energy data benchmarks for synthetic polymer production**

| **Material** | **Total average energy (MJ) consumed to produce 1 kg material** | **Reference/comments** |
|---|---|---|
| Polyamide 6 (nylon 6) | 66.12 MJ | PlasticsEurope 2005a, |
| Polyamide 6.6 (nylon 6.6) | 64.51 MJ | PlasticsEurope 2005a, |
| PET (amorphous) -polyester | 44.4 MJ | PlasticsEurope 2011b, data are also available from 1999 and 2005. |
| Acrylonitrile | 31.13 MJ | PlasticsEurope 2005d, data are available for 1995 and 2005. Acrylonitrile constitutes min. 85% of acrylic. |
| Polypropylene (resin) | 14.74 MJ | PlasticsEurope 2005c, data are also available for 1999 |

These figures can be used as a starting point for setting energy criteria for energy use in the production of man-made fibres. However, their limitation is that they only address polymer production and therefore not the process energy consumption for fibre production. The 2007 BREF for polymers provides data for fibre production in 2007 but it does not address all synthetic fibres.

It is suggested as being important that the registration of energy consumption and production data is the same as the reporting to Plastic Europe or BREF in order to ensure a correct comparison.

Some figures are already 4 years old and the time frame of updating these figures has to be taken into consideration.

By taking a whole life cycle perspective it is also possible to identify how process energy can be saved by feedstock substitution.  For example, by using polyester feedstock consisting of post-consumer waste plastic.  The environmental benefits are discussed further in section 3.3.3.

### 3.3.3 Raw materials and feedstocks

#### 3.3.3.1 Man-made cellulose fibres

Viscose fibres are made from regenerated cellulose. This cellulose may be derived from a range of different sources, including timber and bamboo pulp, but essentially the production process is the same. In the last decade production of viscose fibres has stabilised at approximately 2.6 million tonnes world-wide (Europe : 600 thousand tons). [EU Ecolabel, 2007].

Pulp is a commodity product and may be produced and blended from a range of sources. Benchmarking of global pulp mills suggests that pulp production technology varies considerably in the amount of energy used and the quantity and nature of the emissions to air and water. The EDIPTEX study highlighted the energy intensive nature of viscose production, with consumed primary energy data suggesting a benchmark of 196 MJ/kg of fibre. This figure requires further corroboration as it is significantly higher than the data for synthetic fibres (see table 3.16) and the BREF for polymers suggests a range of 26.1 – 33.2 MJ/kg of fibre. It is to be verified which process stages are included in the EDIPTEX dataset and whether the figure includes the energy value of the finished product itself.

Pulp feedstock, pulp liquors and detergents have also been associated with deforestation and water pollution in developing countries – as highlighted by both IMPRO Textiles and EDIPTEX. COD and AOX levels are of concern with regards to wastewater effluent treatment. Both energy use and AOX levels in wastewater effluent are benchmarked for global pulp production by EKONO who publish an annual industry report.

With the shift of viscose production to countries such as China concerns have risen about the possible extent of deforestation in order to supply cellulose pulp feedstock. Alternative material sources have also emerged such as bamboo which are also more rapidly renewable than trees. In other sectors such as construction the responsible sourcing of timber has been successfully regulated by certification schemes established by organizations such as the Forestry Stewardship Council (FSC) which set requirements for the sustainable management of forestry and plantations, requiring third party verification of the chain of custody for timber products. Evidence suggests that the level of assurance provided by such schemes varies. It is also to investigated as to whether new sources of feedstock such as bamboo can be certified.

#### 3.3.3.2 Synthetic fibre feedstock recycling

Acrylic and nylon fibre have been identified as having the most significant impacts as a result of the energy used during the fibre manufacturing stage. It was already highlighted in section 3.3.2 the potential to benchmark process energy use for fibre manufacturing. Another alternative which is being implemented by industry is feedstock recycling.

Acrylic plastic is not easily recycled. It is considered a group 7 plastic among recycled plastics and is not collected for recycling in most communities. Large pieces can be reformed into other useful objects if they have not suffered too much stress, crazing, or cracking, but this accounts for only a very small portion of acrylic plastic waste. Limited information is currently available comparing the life cycle performance of feedstock recycling for these fibres [BSR, 2009].

Industry is making progress towards nylon 6 recycling. This began in the 1990's with a focus by manufacturers such as BASF on the recovery and recycling of nylon 6 carpet fibres. Nylon fibres for use in clothing and fabrics have taken longer to become available, and almost exclusively with a focus on nylon 6 because of technical difficulties associated with recycling nylon 6.6. Collaborations between leading fibre manufacturers such as Toray and brands such as Patagonia have driven research & development in nylon 6 chemical recycling. Korean company Hyosung manufacture a nylon fibre with a 50% recycled (post-consumer) content certified by the Global Recycle Standard (GRS). The whole life benefits of this manufacturing route are unconfirmed by independent LCA results.

Polyester is the synthetic fibre with the greatest market share and is the most widely recycled polymer. A comparative LCA study between virgin polyester and polyester made of recycled materials (polyethylene terephthalate) has been performed independently by Utrecht University on behalf of fibre manufacturer Wellman. Wellman produces polyester fibre from virgin and post-consumer polyester. The clothing brand Patagonia [Patagonia] has also carried out its own environmental analysis. Patagonia sources polyester fleece in order to manufacture jackets as well as base layers for insulation layers.

In both analyses production is based on the use of DMT (dimethyl terephthalate) as an intermediate chemical of PET. The Patagonia study compared three alternatives:

1. Production of virgin fibre (production in Japan)
2. Production of fibres with local open recycling systems (production in Japan)
3. Production of fibres with recycled materials (recovered fleece textile) from the US (production in Japan)

The Utrecht University study compared options 1 and 2.

In figures 3.23 it is shown that the production of the ingredients (terephthalatic acid and ethylene glycol) of the polyester is the major contributor to the $CO_2$ emission from the production of polyester [ISR, 2009].

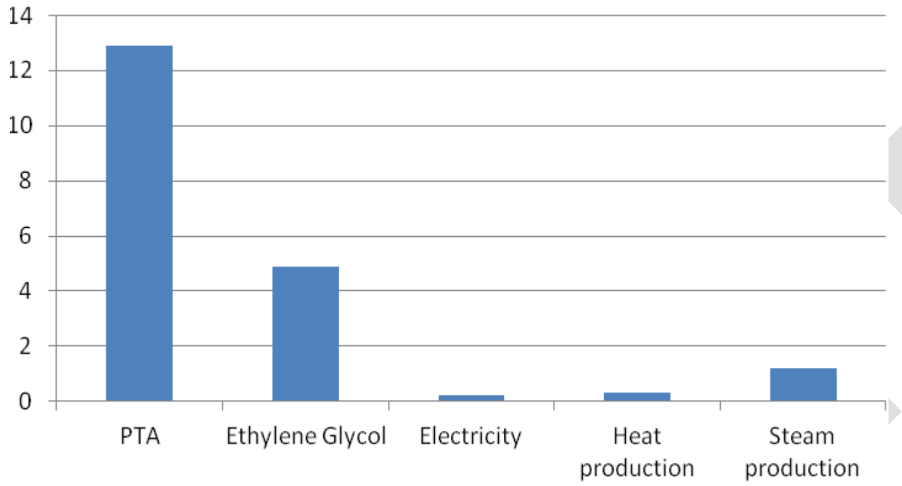


**Figure 3.23 $CO_2$ emission in different stages of production of polyester (PTA: production of purified terephthalatic acid).**

The result from the Patagonia study are presented in figure 3.24. They indicate that great savings may be achieved by using recycled post consumer waste plastic from packaging in the production of fibres. These findings are, to an extent, corroborated by the Utrecht University study for options 1 and 2, which estimated a reduction in Global Warming Potential of between 25 and 75%.

This suggests that a possible mandatory use of recycled materials the availability of recycled materials in the right quality should be considered when deciding on future criteria on man-made fibres. The third option of using post-consumer waste textiles saves energy but the benefits are influenced in this case by transport distances.  This option is discussed further in section 3.3.6.

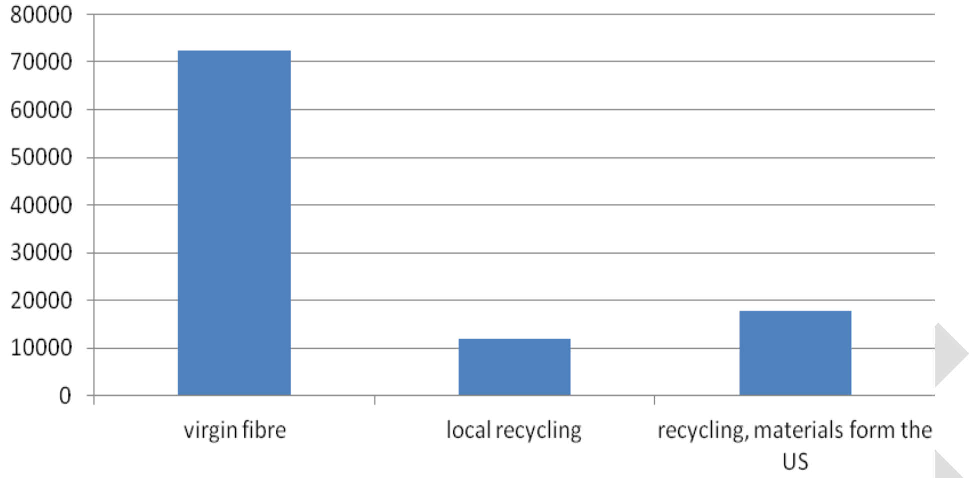


**Figure 3.24: Comparison of primary energy use for three feedstock options [Patagonia]**

According to the current criteria document (article 2) [Decission 567/2009] it is possible to achieve the EU Ecolabel if the fibre used is post consumer recycled. No licenses are, to the knowledge of the authors of this report, given for recycled fibers. This could indicate either that there is no market for the EU Ecolabel for these products or that 'recycled' of '2$^{nd}$ hand' is sufficient. Or that this option is not clear or not known to producers or retailers.

### 3.3.3.2 Soaping agents and fabric softeners

The pre-treatment and finishing stages for viscose werehighlighted as a main contributor to the midpoint indicator environmental toxicity and the endpoint indicator ecosystem diversity. The finishing process for viscose embodies many sub processes which are not necessarily energy demanding but require washing agents and softeners. For instance, fatty alcohol sulfonate, which is used as a soaping agent for the fabric washing sub process is an oil based product used as well and the raw material from which it is derived (palm oil) is contributing a lot to tropical land transformation.

In the current criteria there are no criteria for soaping agents in the production of viscose. Palm oil was identified by IMPRO Textiles as a specific raw material which influenced the ecosystem diversity endpoint indicator. The responsible sourcing could therefore be a consideration for viscose. The Roundtable on Palm Oil is understood to be the main reliable global certification route for sustainable palm oil. This option, as well as potential substitutes, require further investigation and discussion during the revision process.

### 3.3.4 Process energy use and ecotoxicity

#### 3.3.4.1 Energy consumption in printing and dyeing

According to BREF (2003) the lowest energy consumption for cotton dyeing using reactive dyestuff and conventional jets was 3.6-4.8 kg steam/kg and 0.24-0.35 kWh electricity/kg. According to [BSR, 2009] no studies were found that distinguish the energy use and GHG emissions from different dyes for various fabric types. The IMPRO study highlighted dye machine controllers and low liquor ratio dying machines as improvement options which can successfully reduce consumption of chemicals of up to 60% and water by 28 - 70%. However, the energy saving potential of these options is unclear.

There appears to be contradictory evidence about the significant of this process stage. In contrast to the findings of IMPRO both EDIPTEX and the BSR study [BSR, 2009] suggest that the dyeing stage has little impact on the overall energy and carbon footprint. However, a forthcoming LCA

study of a viscose dress [BSR, 2009] suggests dyeing may cause as much as 19% of the life cycle GHG emissions for that garment. For all clothing types the GHG emission from the dyeing stage suggest approximately 3% whole life contribution, supporting the conclusion of EDIPTEX.

In the current criteria document it is mandatory to monitor the energy consumption for the whole production, wet processing. No format or reference to specify production is given which makes it impossibility to benchmark the different productions sites.

It could be discussed if it is relevant to set criteria to the energy consumption in the wet processing and if so how to determine a common benchmark.

#### 3.3.4.2 Ecotoxicity of dyes and pigments

Dyes and pigments are to a large extend regulated by REACH and the criteria for Hazardous substances and mixtures as noted in section 1.5.3. The IMPRO study highlighted dye control and low liquor ratio dying machines as further potential areas of improvement.

Dye machine controllers and low liquor ration dying machines can successfully reduce consumption of chemicals of up to 60% and water by 28 - 70%. Reference for calculations is, however, uncertain. Regarding chemicals the existing knowledge is hardly sufficient to establish criteria on consumption or emissions of chemicals in general.

The Eco-label will normally not recommend specific technologies but would instead seek to establish limits for consumption of specific substances and raw materials but it can be discussed if it is possible to set specific criteria in order to ensure a better handling of the dying process.

#### 3.3.4.3 Polyester dye carriers

The reference carrier (solvent) used by the EDIPTEX LCA study for polyester was 1,2 dichlorobenzene. The study suggested that if this carrier was to be substituted with a carrier based on sodium benzoate, methanol and LAS the estimated reduction would, for the reference case study of a work jacket, be 5% for the eco-toxicity end-point indicator and approximately 1%. for the persistent toxicity end-point indicator. The improvement is lower for persistent toxicity because the contribution from pesticides in the reference case study was relatively high. Looking only at the dying process the reduction in toxicology effects was estimated to be up to 95% - with the most significant improvement for eco toxicity. This form of carrier is currently excluded by Criteria 24 of the Ecolabel.

#### 3.3.4.4 Energy consumption in fabric formation and finishing

The IMPRO study point out the choice of knitting technology to be a way of reducing energy consumption. Substitute flat knitting by integral or fully fashioned knitting partly or fully Alternative knitting technologies can provide custom shaped products and thus have loss of material in the knitting process. The disadvantage of these technologies is considerably higher energy consumption. The overall benefit seems to be questionable.

The Eco-label will normally not recommend specific technologies but instead establish limits for consumption of specific substances and raw materials.

#### 3.3.4.5 Wool scouring

Waste water emission is one on the most significant environmental impacts from the production of wool. The criterion for scouring effluent was discussed intensely at the last revision and there was specific feedback from the stakeholder questionnaire regarding the difficulty of producers to meet the criteria. As a result of this the values for COD in the waste water are quite different depending on if the effluent is treated on-site or off-site:

- For effluent treated on-site the criterion is: the COD discharged to surface waters shall not exceed 45 g/kg greasy wool
- For effluent treated off-site the criterion is: the COD discharged to sewer shall not exceed 60 g/kg greasy wool, and the effluent shall be treated off-site so as to achieve at least a further 75 % reduction of COD content

This mean that the final COD in effluent treated off-site must not exceed 15 g/kg. This fact means that the final COD level in effluent treated on-site can be three times larger than COD in effluent treated on-site which may seem unfair. In areas on New Zealand very few scouring plants have their own waste water treatment plants and the effluent is therefore treated off-site and only very efficient waste water treatment plants can achieve greater than a 75% COD reduction.

A single COD value of 20 g/kg treated wool no matter where and how the effluent is treated has been suggested by stakeholders. If this value is decided it will be the same criterion as in criterion 27 so for practical reasons there could just be a reference to this criterion. Regional differences must however be investigated before a final value can be proposed.

As we highlighted in the preliminary report some leading outdoor companies claim to sell 'chlorine-free' and AOX free wool. This implies the use of substitute ectoparasiticides to treat wool. The nature of wool treatments used for these garments and their availability in the market is therefore to be investigated further.



### 3.3.5 Air freight distribution

In the IMPRO study the distribution phase is responsible for about 10% of the overall impacts. It was assumed that long distance shipment is dominated by shipping (92%). Air transportation was assumed to be 8%. According to the ecoinvent 2.0 inventories, per tonne-kilometre, air transportation has an approximately 100 times greater climate change impact than ship transportation[IMPRO, 2009].

The study showed a reduction in the environmental impact of approximately 40% if the air freight was lowered to a 4% modal share of distribution. Whilst care would need to be taken to ensure that a new environmental burden is created if clothes that are shipped require additional biocide treatments, the evidence still appears to point to there being a significant benefit.

Whilst the modal split may vary between product lines and retailers, and the Ecolabel should not be used to restrict trade, it is possible that an approach could be adopted similar to food labeling initiatives in the UK. Products that have been air freighted are identified on product labels. In this way consumer choice and transparency are promoted.

### 3.3.5 Influencing the use phase

#### 3.3.5.1 Energy saving advice

Both the EDIPTEX study and the IMPRO study identify the use phase as the most dominant phase for textiles. Although user behavior is not within the remit of the EU Ecolabel to regulate or producers of textiles to control the whole life significance of the use phase does suggest that opportunities to influence consumer choices should be explored.

One way of influencing user behavior is to provide consumers with information on how to save energy or use less detergent. This approach has been adopted by Marks & Spencers as part of their Plan A programme. Consumers have been encouraged to wash clothing at 30$^{o}$C or less. This approach could be taken further by using or amending the GINETEX labelling on products to give energy and/or washing advice.

#### 3.3.5.2 Aftercare and design for durability

Clothing for greater product durability was highlighted by the EDIPTEX case studies as a a significant possible area of improvement. There could be the potential to encourage design innovation in line with areas of product innovation and differentiation by front runner brands such as Timberland who, for example, promote additional durable features of their jean products. These could include double or triple stitching and the re-enforcement of areas of wear.

Whilst fixtures such as buttons and zips were not highlighted by EDIPTEX as having significant environmental impacts from a production perspective, their loss of failure could result in an earlier disposal of the garment. A criteria could therefore be created that promotes greater longevity of garments by promoting the availability of spares – e.g. branded buttons, fasteners, zips – and aftercare repair services. The latter may be particularly applicable for higher value products e.g. outdoor clothing manufacturers such as the North Face offer this service via licensed retailers.

### 3.3.6 Supporting design for recycling

This specific area was highlighted by the IMPRO and University of Cambridge LCA studies and would represent a response to the high/rising level of EU textile waste arisings. In Europe the textile waste occupies nearly five percent of all landfill space and one million tons of textiles will end up in landfills every year [Textile Exchange 2010b].

The waste phase contributes positively according to the EDIPTEX study because textiles are assumed to be collected and burned with energy recovery. This represents the typical end-of-life scenario in Denmark. The benefits are, however, much greater if textiles are recycled and therefore substitute virgin fibres. The IMPRO study identified an increase of reuse and recycling of textile waste as one of the most promising improvement options.

The EU Ecolabel can promote the recycling of textiles by ensuring that EU Ecolabeled textiles can technically be recycled and/or by promoting the recovery and recycling of textiles, potentially through a combination of consideration at the design and material selection stage and through the promotion of retailer take-back schemes.  Consideration at an early stage can contribute to the design of closed loop recycling systems – so, for example, nylon 6 is currently preferable to nylon 6.6.  The ability to recycle fibre blends may also be an area for consideration – although often blends are chosen because they confer a fabric benefits during the use phase.

Patagonia is an example of a brand that has been active in product takeback for closed loop recycling.  They have established their 'Common Threads' programme to recover old product displaying their brand.  They have worked with a manufacturer to ensure that specific product lines manufactured from polyester fibres can be recycled.  As discussed in section 3.3.3 this programme has been supported by an LCA study to verify the environmental benefits.

Marks & Spencers have been active in product take-back for open loop recycling.  Consumers who bring back old clothing displaying their brand receive in-store credits in exchange. This area of activity is supported by a wider awareness raising programme.

In France textile producers that place products on the French market must contribute towards a producer responsibility scheme that pays for recycling infrastructure.

### 3.4 HAZARDOUS SUBSTANCES AND ASSOCIATED RISK PHRASES

The Commission (DG ENV) have made a proposal for a legal text regarding the chemical criteria listed in the new regulation. The proposal basically consist of two parts, one a list of risk phrases not allowed in the final product and second exclusion of Substances of Very High Concern. The list of risk phrases is fixed but is has to be discussed who this should be implemented for textiles and arguments for derogations have to be developed.

The suggested wording is taken from last proposal that went into Inter services consultation, Laundry detergents for professional use.

***Proposed criteria for Hazardous substances and mixtures***

According to the Article 6(6) of Regulation (EC) No 66/2010 on the EU Ecolabel, the product or any component of it shall not contain substances meeting criteria for classification with the hazard statements or risk phrases specified below in accordance with Regulation (EC) No 1272/2008 or Directive 67/548/EC nor shall it contain substances referred to in Article 57 of Regulation (EC) No 1907/2006. The risk phrases below generally refer to substances. However, where information on substances cannot be obtained, the classification rules for mixtures shall be applied.

**Table 3.17: List of CLP hazard statements and risk phrases**

| **Hazard Statement**[1] | **Risk Phrase**[2] |
|---|---|
| H300 Fatal if swallowed | R28 |
| H301 Toxic if swallowed | R25 |
| H304 May be fatal if swallowed and enters airways | R65 |
| H310 Fatal in contact with skin | R27 |
| H311 Toxic in contact with skin | R24 |
| H330 Fatal if inhaled | R23/26 |
| H331 Toxic if inhaled | R23 |
| H340 May cause genetic defects | R46 |
| H341 Suspected of causing genetic defects | R68 |
| H350 May cause cancer | R45 |
| H350i May cause cancer by inhalation | R49 |

| | |
|---|---|
| H351 Suspected of causing cancer | R40 |
| H360F May damage fertility | R60 |
| H360D May damage the unborn child | R61 |
| H360FD May damage fertility. May damage the unborn child | R60/61/60-61 |
| H360Fd May damage fertility. Suspected of damaging the unborn child | R60/63 |
| H360Df May damage the unborn child. Suspected of damaging fertility | R61/62 |
| H361f Suspected of damaging fertility | R62 |
| H361d Suspected of damaging the unborn child | R63 |
| H361fd Suspected of damaging fertility. Suspected of damaging the unborn child. | R62-63 |
| H362 May cause harm to breast fed children | R64 |
| H370 Causes damage to organs | R39/23/24/25/26/27/28 |
| H371 May cause damage to organs | R68/20/21/22 |
| H372 Causes damage to organs | R48/25/24/23 |
| H373 May cause damage to organs | R48/20/21/22 |
| H400 Very toxic to aquatic life | R50 |
| H410 Very toxic to aquatic life with long-lasting effects | R50-53 |
| H411 Toxic to aquatic life with long-lasting effects | R51-53 |
| H412 Harmful to aquatic life with long-lasting effects | R52-53 |
| H413 May cause long-lasting effects to aquatic life | R53 |
| EUH059 Hazardous to the ozone layer | R59 |
| EUH029 Contact with water liberates toxic gas | R29 |
| EUH031 Contact with acids liberates toxic gas | R31 |
| EUH032 Contact with acids liberates very toxic | R32 |

| | |
|---|---|
| gas | |
| EUH070 Toxic by eye contact | R39-41 |
| Sensitising substances | |
| H334: May cause allergy or asthma symptoms or breathing difficulties if inhaled | R42 |
| H317: May cause allergic skin reaction | R43 |

*[1] Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006*

*[2] Directive 67/548/EEC with adjustment to REACH according to Directive 2006/121/EC and Directive 1999/45/EC as amended*

Note that this criterion also applies to known degradation products such as formaldehyde from formaldehyde releasers.

The use of substances or mixtures which change their properties upon processing (e.g., become no longer bioavailable, undergo chemical modification) so that the identified hazard no longer applies are exempted from the above requirement.

Sensitising substances have been added to the list in other product groups and it has to be discussed whether allergen skin contact risk phrases should also be included: R42/H334 and R43/H317.

***Proposed criteria for Substances listed in accordance with article 59(1) of Regulation (EC) No 1907/2006***

No derogation from the exclusion in Article 6(6) of the Regulation (EC) No66/2010 shall be given concerning substances identified as substances of very high concern and included in the list foreseen in Article 59 of Regulation (EC) No 1907/2006 present in the final product in concentrations > 0.1%.

## 3.5 ADDITIONAL ENVIRONMENTAL ISSUES FOR CONSIDERATION

A number of environmental issues currently addressed by the EU Ecolabel criteria were not specifically highlighted as being significant within the overall LCA findings. This was either due to their significance upon normalisation of the indicators or, in some cases, a lack of data. These issues include dyes and pigments, flame retardants and plasticisers. Nanotechnology and the substance nitrilotriacetic acid have also been identified as precautionary issues to be discussed.

### 3.5.1 Flame retardants

Feedback from the stakeholder questionnaire argued that flame retardants are necessary in some textile applications and should be regulated like other chemicals because there is no clear definition of a “flame retardant”. Flame retardants have been discussed extensively in other product groups and no solution satisfying all stakeholders has been found yet.

The current criteria have been criticised by producers stating that it is too arbitary in how it deals with flame retardants in textiles. For example, an additive flame retardant with no risk phrases would not currently fulfil the criteria. On the other hand, it is also the case that some products that currently qualify for Ökotex, which excludes a wider range of flame retardants than currently feature in the ECHA candidate list, may also not qualify because their precursors are covered by excluded risk phrases. Very few flame retardants exist that are fully reactive, as the industry interprets the current criteria.

Furthermore, a significant number of flame retardants currently used are understood to be incorporated in an additive form and therefore excluded by the Ecolabel unless the alternative clause in the current Regulation is used which is with reference to Regulation (EC) No 1272/2008. It is understood that without clarification this effectively excludes certain product ranges which require specific flame retardants in order to meet Member State fire regulations. Fire retardants currently restricted by REACH and forming part of the SVHC Candidate List are as follows:

**REACH Annex XVII**

- PeBDE – Pentabromodiphenyl oxide (0,1% wt)
- OcBDE – Octabromidiphenyl oxide (0,1% wt)
- TEPA – Tris(aziridinul)phosphinoxide (skin contact)
- TRIS – Tris (2,3 dibromopropyl) phosphate (skin contact)
- PBBs – Polybrominated biphenyls (0,1% wt)

**REACH  SVHC Candidate List**

- HBCD – Hexabromocyclododecane
- TCEP – Tris (2,chloroethyl)phosphate

With the exception of decBDE this combined list is reflected by the flame retardants currently restricted by the Ökotex 100 label as of January 2011.

Brominated flame retardants were highlighted as an area of focus by the Commission Statements and stakeholder feedback. As we have highlighted a range of brominated retardants are now either restricted by REACH or appear on the SVHC Candidate List.  The European Flame Retardants Association (EFRA) has highlighted the continued need for the use of the brominated flame retardants Decabromodiphenyl ether (Deca-BDE) and Hexabromocyclododecane (HBCD) in furniture and upholstery in order to meet EU Member State fire safety regulations.

Cross checking the Risk Phrases for these flame retardants shows that Deca-BDE does not currently carry any Risk Phrases whilst HBCD appears on the Candidate List and carries R63 and R64.  Deca-BDE is the subject of ongoing monitoring at an EU and International level with regard to its classification under REACH.  It is also understood that Deca-BDE may be of limited application in relation to the Ecolabel but further investigation is required in order to confirm this.

It is to be discussed during the revision process whether derogations of other specific flame retardants which may be classified as hazardous substances should be made from the new criteria – particularly for the following specific applications:

- Furnishings and drapery that fulfil the textile product definition,
- Nightwear (poly-cotton blends and health service and care facility nightwear),
- Bed linen (particularly for health services and care facilities)
- Personal Protective Equipment (PPE).

It is understood that DecaBDE may used in PPE applications alongside other alternatives, including inherently flame retardant materials. For the other listed applications organophosphorous and inorganic retardants would tend to be used, a number of which are already restricted and appear on the SVHC Candidate List.  It is also understood that the suitability of specific retardants will depend on whether the fibre is natural or synthetic, and that this in turn will also influence the potential for residual skin contact.

Derogations can only be made if no technically or economically feasible alternatives can be identified.  The following questions are therefore proposed for further investigation:

- How could the definition of reactive and additive flame retardants be improved to better reflect product chemistry?
- Do additive or partially reactive flame retardants exist which would provide adequete fire safety for the specific applications whilst not carrying Risk Phrases?
- Are there inherently flame retardant materials in the market which would enable PPE to meet the Ecolabel requirements?

It is proposed that fabrics and materials registered with Oekotex, research by SWEREA (Swedish Research) and a 2010 technical study of substitute technologies commissioned by the UK Government's Department for the Environment, Food and Rural Affairs (DEFRA), are used as a reference point in order to evaluate current industry best practice.

**Table 3.18: Ökotex licensed products - Fibre materials with flame retardant properties**

| Name of the product | Country | Manufacturer |
|---|---|---|
| Dacron® T483 | Germany | DuPont Sabanci Polyester GmbH, Hamm |
| ESFRON | Korea | Woongjin Chemical Co. Ltd., Seoul |
| FR-Adhesive (Type N) | Germany | W.L. Gore & Associates GmbH, Putzbrunn |
| FR-Adhesive Type X | Germany | W.L. Gore & Associates GmbH, Putzbrunn |
| FR-Membrane (Type 11) | Germany | W.L. Gore & Associates GmbH, Putzbrunn |
| FR-Membrane Type 23 | Germany | W.L. Gore & Associates GmbH, Putzbrunn |
| Lenzing FR® | Austria | Lenzing AG, Lenzing |
| Trevira CS | Germany | Trevira GmbH, Bobingen |
| Trevira CS bioactive | Germany | Trevira GmbH, Bobingen |
| Trevira CS/FR Polyesterrohstoff A2 | Germany | Trevira GmbH, Bobingen |
| Visil AP | Finland | Kuitu Finland Oy, Valkeakoski |

**Table 3.19: Ökotex licensed products - Precursors for the production of flame retardant polymers**

| Name of the product | Country | Manufacturer |
|---|---|---|
| UKANOL ® FR50/1 | Germany | Schill + Seilacher Aktiengesellschaft, Böblingen |
| UKANOL® ES | Germany | Schill + Seilacher Aktiengesellschaft, Böblingen |

**Table 3.20: Ökotex licensed products - Auxiliaries for a flame retardant finish**

| Name of the product | Country | Manufacturer |
|---|---|---|
| AFLAMMIT® KWB | Germany | Thor GmbH, Speyer |
| AFLAMMIT® SAP | Germany | Thor GmbH, Speyer |
| APYROL CEP-ECO | Germany | CHT R. Beitlich GmbH, Tübingen |
| Avora® Polymer 2370 | Germany | Invista Resins & Fibers GmbH & Co. KG |
| Avora® Polymer 2630 | Germany | Invista Resins & Fibers GmbH & Co. KG |
| Avora® Polymer 2750 | Germany | Invista Resins & Fibers GmbH & Co. KG |
| DanAi-H | China | Jiangsu Sheng Dan Ai Chemical Co., Ltd., Yangzhong |
| ECO-FLAM PU | Belgium | NV DEVAN Chemicals, Ronse |
| ECO-FLAM SU | Belgium | NV DEVAN Chemicals, Ronse |
| Finifire Pro | Netherlands | Finifire BV, El Haarlem |
| Flacavon ARP | Germany | Schill + Seilacher, Böblingen |
| Flacavon WP | Germany | Schill + Seilacher, Böblingen |
| FLAMMENTIN® MSG | Germany | Thor GmbH, Speyer |
| FLOVAN® CGN | Switzerland | Huntsman Textile Effects, Basel |
| Fyrol PCF | Netherlands | ICL-IP Europe BV, Amsterdam |
| PEKOFLAM® MSP liquid | Switzerland | Clariant Produkte (Schweiz) AG, Muttenz |
| PROBAN® POLYMER | United Kingdon | Rhodia UK Limited, West Midlands |
| PYROVATEX® CP new | Switzerland | Huntsman Textile Effects, Basel |
| PYROVATEX® CP-LF | Switzerland | Huntsman Textile Effects, Basel |
| RUCO-FLAM PCE | Germany | Rudolf GmbH, Geretsried |
| X-Guard 3-HPP-N | Korea | Chempia Co., Ltd, Ansan City |

### 3.5.2 Phthalates

Phthalate esters are plastising agents used in the manufacturing of plastics. They have been the subject of extensive scientific investigation and testing in relation to human health and environmental concerns about their potential to act as endocrine disrupters. Their main recorded effect is to mimic the action of hormones resulting in the induction or inhibition of estrogenic or androgenic processes.

The 2009 GPP criteria for textiles introduced a criteria which focussed on the phthalate content of products that come into direct contact with the skin.. At the time the phthalate plasticizers listed below were identified on a precautionary basis and a restriction on their content of 0.1% by weight of the final product was included. As new additions to the ECHA SVHC listing these substances could be specifically highlighted within an Ecolabel criteria. This would complement the broader R Phrases exclusions required under the Ecolabel Regulation.

**SVHC Candidate List**

- DEHP (Di-(2-ethylhexyl)-phthalate) CAS no. 117-81-7
- BBP (Butylbenzylphthalate) CAS no. 85-68-7
- DBP (Dibutylphthalate) CAS no. 84-74-2
- Bis(2-methoxyethyl) phthalate
- DIBP (Diisobutylphthalat)
- TCEP (Tris(2-chlorethyl)phosphate)

**No current R/H Phrases**

- DINP (Di-isononylphthalate)

**Not currently registered under REACH**

- DNOP (Di-n-octylphthalate)
- DIDP (Di-isodecylphthalate)

The extent to which these, and other phthalates registered under REACH, are used in synthetic fibres, coatings, laminates and membranes, their relative importance and the existence of substitution options is to be further investigated with input from stakeholders.

### 3.5.3 Nitrilotriacetic acid (NTA)

At earlier revisions a ban on the use of the surfactant NTA was discussed. Toxicology evidence suggests that the strong complexing capacity of NTA can result in adverse effects upon heavy metal removal during sewage treatment and upon mobilisation of metals from sediments in receiving waters. Several investigations have shown that the presence of NTA in water/sediment systems increases the concentration of heavy metals in the water phase.

The toxicity of NTA towards algae, crustaceans and fish is low with $EC/LC_{50}$ values well above 100 mg/l. The acute toxicity of NTA and its salts in animals is also relatively low. However, the International Agency for Research on Cancer (IARC) has evaluated that there is sufficient evidence for the carcinogenicity of NTA and its sodium salts in experimental animals, and the overall evaluation is that nitriloacetic acid and its salt are possibly carcinogenic to humans. IARC has placed NTA in Group 2B [Madsen *et al.* (2001)].

### 3.5.4 Nanomaterials

Nanosilver in textiles was cited by stakeholders as a specific example of nanotechnology for analysis by this study. It is used in all kinds of clothes from socks and shirts to caps, gloves and underwear. Sports wear etc. labelled as "antibacterial", "free of odour" etc. has been registered to contain nanosilver or triclosan [Poulsen et al 2011]. These substances stop or reduce bacterial activity and thereby "reduces" the need for washing.

There is some limited evidence of the whole life benefits of nano-silver coatings. An LCA study carried out by scientists from the UK, Germany and Switzerland has highlighted a beneficial reduction in energy and detergent use during the use phase of garments. However, the study noted that the environmental burdens from the mining of silver may outweigh these benefits if consumer behaviour does not lead to reduced clothes washing.

The environmental impacts of nanosilver have been investigated in some theoretical studies and a few laboratory based ones. In the study by Luoma (2008) it was estimated that mass release from silver containing socks in the USA would be in the range of 6-930 kg or 180-2790 kg assuming that 10% and 30%, respectively, of the population would use these kinds of socks. The release of nanosilver from socks upon contact with water showed that for some socks almost all silver leached to water whereas for others no leaching was detected [Benn & Westerhoff, 2008].

Silver is known to be an ecotoxic metal and tests with silver nanoparticles (AgNP) do also reveal very low effect concentrations. Thus, for algae EC50-values as low as 4 µg/l have been found and also for crustaceans values far below 1 mg/l has been reported. This ranks AgNP as very toxic towards aquatic organisms. It is also important to note that at concentrations below 1 mg/l inhibition of nitrifying bacteria can occur and thus the function of wastewater treatment plants may be affected by the presence of AgNP.  Possible adverse effects arising from interactions with symbiotic bacteria present in organisms and in soil have also been documented.

A number of studies, mainly in vitro, have shown that the main mechanism of silver nanoparticle toxicity seems to be mediated by an increase in ROS (reactive oxygen species ) production, stimulating inflammation and genotoxic events and apoptosis or necrosis.  The concentration of the administered nanoparticles is able to influence the toxicity, specifically, and at low levels of oxidative stress a protective response is initiated which progresses to a damaging response with increasing particle concentration, and therefore oxidant levels.  It is thus relevant to consider the toxicity threshold of silver nanoparticles.

Quantification of the extent of nanosilver application in clothing and home furnishings was not possible. A manufacturer of nanosilver yarn presents the fields of application as active/casual/sports/outdoor wear, under wear and home furnishing and bedding [Everest 2010].  A request for information has been made to dominant international suppliers of sports equipment. While some companies Nike [Nike 2010; Intersport 2010 ] have informed us that nanosilver is not used in sports equipment, other companies (e.g. Adidas) have not responded.

## 3.6 CORPORATE SOCIAL RESPONSIBILITY (CSR)

Corporate Social Responsibility (CSR) is a general term that relates to public reporting on the adherence of companies suppliers and manufacturing sites to national and internationally recognised social and environmental standards. CSR has been identified as a separate overarching issue from our market analysis and labelling initiatives, but as well as dealing with social and ethical issues it also often addresses the environmental management practices of production plants.

Setting CSR criteria are relative new to the EU Ecolabel. But for the production of textiles CSR related issues are of great importance when it comes to customers expectations – which have become increasingly sensitised in recent years to social and environmental issues - and in order to avoid situations where EU Ecolabeled products may be produced by companies who have not addressed these issues. This could lead to bad publicity and, based on the recent experiences of a number of high profile brands and retailers, would reflect badly on the reputation of the EU Ecolabel.

CSR issues also form an important part of the promotion of the Ecolabel to manufacturers in countries which supply the EU. In some countries where social and environmental standards may not be as high organisations such as the United Nations Environment Programme (UNEP) are actively engaged in promoting the market opportunities created by the ecolabel. Leading clothing retailers are also active in auditing their sub-suppliers performance due to the high consumer profile of these issues. CSR criteria would re-inforce and reward this work.

This is an area where it will be particularly difficult for the Competent bodies to evaluate documentation or evaluate situations on audits onsite.

### 3.6.1 Social compliance

Emerging compliance schemes such as the Business Social Compliance Initiative (BSCI) and the Global Social Compliance Programme (GSCP) specifically address human rights, labour rights, working agreements and salaries and occupational health and safety issues. Elements of environmental schemes such as GOTS and Oeko-tex 1000 also address CSR issues and, provided that third party verification has been carried out, could be used as a compliance route in order to reduce the burden on Competent Bodies.

For example, the BSCI Code of Conduct and the GSCP Social Reference Code have both emerged as an auditing tool for manufacturers, brands and retailers. To take one as an example, the GSCP Code  consists of seven distinct themes which incorporate the a series of ILO (International Labour Organisation) conventions:

- Forced, bonded, indentured and prison labour
- Child labour
- Freedom of association and the effective recognition of the right to collective
- bargaining
- Discrimination, harassment and abuse
- Health and safety
- Wages, benefits and terms of employment
- Working hours

The Code does not include a grading of performance and so compliance would be required with specified themes or all seven themes.  However, as we noted in section 2.5 the GSCP Code is only subject to second party verification following self-assessment whereas the BSCI is third party verified.

**3.6.2  Environmental management**

Clothing brands and retailers may source fibres and textiles from a range of sub-suppliers and manufacturing sites in many different parts of the world.  In some countries environmental management practices may be less stringent than in the European Economic Area.

Compliance programmes such as Oeko-tex 1000 and the Global Social Compliance Programme (GSCP) address environmental management issues and, provided that third party verification has been carried out, could be used as a compliance route in order to reduce the burden on Competent Bodies.  The GSCP Environmental Reference Requirements is one possible compliance route.  The Reference Requirements proposes three levels of 'generic' compliance:

1. Awareness and compliance
2. Pro-active management and performance improvement
3. Leading practice

In a similar fashion to H&M and Timberland who audit, inspect and rank suppliers' performance it would be possible for brands and retailers with multiple sub-suppliers to verify their compliance against a selected compliance level.  Level 2 would represent a pro-active approach to environmental management that would place a supplier in the upper quartile of practices and is therefore proposed as a possible compliance level for this criteria.

Detailed reference requirements are then provided for eleven separate areas of environmental performance under each of which performance is graded according to three levels of compliance:

1. Environmental Management System
2. Energy Use, Transport and Greenhouse Gases (GHGs)
3. Water use
4. Wastewater effluent
5. Emissions to air
6. General
7. Ozone Depleting Substances (ODS)
8. Waste management
9. Pollution Prevention / Hazardous and Potentially Hazardous Substances
10. Major incident prevention and management
11. Contaminated land/ Soil and groundwater pollution prevention
12. Land use and biodiversity
13. Nuisances

The criteria could focus on specific areas of compliance – for example, 1, 3, 4, 5, 6 and 7 – or could require compliance with all areas of performance. However, as we previously noted for the GSCP Social Code verification is only at best second party following self-assessment.

Waste management in order to minimise textile waste during manufacturing was identified by the EDIPTEX, IMPRO and University of Cambridge LCA-based studies. Estimates are illustrated by table 3.21. This could be addressed as a specific and distinct issue for which a waste management plan could be required to have been put in place by manufacturers.

**Table 3.21: Fabric losses from cutting process [IMPRO Textiles]**

| Textile product groups | Losses (%) |
|---|---|
| ***Clothing products*** | |
| T-shirts, vests, singlets, etc. | 13 |
| Shirts or blouses | 13 |
| Jerseys, jumpers, pullovers, etc. | 10 |
| Briefs, panties, underpants, etc. | 16 |
| Slips, petticoats and girdles | 18 |
| Nightwear | 13 |
| Negligees, bathrobes, dressing gowns, etc. | 15 |
| Other underwear, nightwear and hosiery | 18 |
| Anoraks, ski-jackets, etc. | 12 |
| Jackets and blazers | 16 |
| Raincoats | 14 |
| Overcoats, car coats, capes | 14 |
| Trousers, breeches, overalls, etc. | 14 |
| Shorts | 15 |
| Skirts | 14 |
| Dresses | 18 |
| Swimwear | 18 |
| Tracksuits | 15 |
| Suits and ensembles | 14 |
| Gloves | 18 |
| Scarves, shawls, etc. | 4 |
| ***Household (interior) products*** | |
| Table linens | 9 |
| Kitchen and toilet linens | 5 |
| Floor cloths, dishcloths, dusters, etc. | 4.5 |
| Bedding | 4 |
| Bed linens | 3 |
| Blankets and travelling rugs | 3 |
| Curtains, blinds, etc. | 3 |

# 4. RECOMMENDATIONS AND CONCLUSIONS

In this section we bring together the findings from this preliminary report in order to draw conclusions and to make recommendations on the scope and emphasis of the textile products criteria revision.

In order to do this we briefly sum up the conclusions that can be drawn from each of the three distinct sections of this report before using these findings to formulate our proposed framework and approach to the criteria revision.

## 4.1 POLICY FRAMEWORK

The EU Ecolabel is an important policy instrument within European Commission's Sustainable Consumption and Production and Sustainable Industrial Policy (SCP/SIP) Action Plan. It is a voluntary market instrument and so product criteria should be designed to reflect and to recognise the best performing products in the market. Regulation No 66/201 on the EU Ecolabel highlights the importance of there being a scientific basis for criteria based on a whole life cycle approach.

The current scope of the textile products Ecolabel as defined by Commission Decision 2009/567/EC is as follows:

- textile clothing and accessories: clothing and accessories (such as handkerchiefs, scarves, bags, shopping bags, rucksacks, belts etc.) consisting of at least 90 % by weight of textile fibres;
- interior textiles: textile products for interior use consisting of at least 90 % by weight of textile fibres. Mats and rugs are included. Wall to wall floor coverings and wall coverings are excluded;
- fibres, yarn and fabric (including durable non-woven) intended for use in textile clothing and accessories or interior textiles.

Three main areas of European policy influence on textile products were identified as being significant to the revision:

- Resource efficiency: the EU currently discards 5.8 million tonnes of textile waste per annum and under the Waste Framework Directive (2008/98/EC) textiles are a priority waste stream.

- Textile product labeling and harmonisation: The consumer labeling of textile products, as well as specialist labeling of Personal Protective Equipment (PPE), are currently the subject of harmonisation considerations.
- Industrial regulation and chemical management: The IPPC and REACH Directives have a significant influence on the regulation of European textile manufacturing sites and the substances used to manufacture textiles that are made and sold in the EU.

Since the last revision REACH and the CLP Regulation have become a mandatory and dynamic reference point for Ecolabel product criteria. The SVHC Candidate List and Risk Phrases must be used to exclude substances. In relation to textiles a number of relevant substances are currently restricted, appear on the Candidate List or carry hazardous risk phrases. These include:

- Dyes and mordants
- Flame retardants
- Sizing agents
- Plasticizers
- Surfactants

**4.2 STAKE HOLDER FEEDBACK**

At the start of the revision process a questionnaire was sent out to selected stakeholders. The target groups were license holders, Competent Bodies handling applications for EU Ecolabel and organisations involved in GPP. The main suggestions from stakeholders about the criteria were:

- Clarification of which products are included and which are not included within the scope of the product group.
- Resource use should be in focus – for example, textiles not recyclable shall not be ecolabeled
- The criterion for cotton has to be evaluated, especially with respect to the appropriate percentage of organic cotton
- Inclusion of criteria for emissions and energy consumption from the production of synthetic fibres
- Clarification of the criteria for wool, particular emphasis on the verification element
- The fitness for use criteria are adequate but it is suggested to look at the limits for shrinkage

- More harmonisation with other labeling schemes
- Inclusion of criteria for CSR and other ethical issues.

Further detailed feedback is expected from the Working Groups that will take place as part of the criteria revision process.

### 4.3 MARKET ANALYSIS

The consumptions of textiles in the EU-27 is slightly decreasing and stagnating due to economic conditions. Overall the production is decreasing more than the consumption indicating that imports of textile products from outside the EU is increasing. The total production in EU27 in 2010 had a value of approximately 75 thousand million Euro, of which textile clothing and accessories, interior textiles and fibres, yarn and fabric accounted for 53%, 8% and 40% respectively.

At least 60% of product consumption was imported. The EU's main suppliers in 2010 in terms of value were China (41.8%), followed by Turkey (13.3%), India (7.8%), Bangladesh (7.2%) and Tunisia (3.1%). This highlights the importance of non-EEA suppliers in determining the environmental performance of a significant proportion of textile products in the EU.

Cotton is the dominant textile material, accounting for approximately 43% of the consumption of clothing textiles and for about 28% of the consumption of household textiles. Other important clothing materials include polyester (16% of consumption), acrylic (~10%), polyamide (~9%), wool and other animal hair (~9%), and viscose (~8%). Other important materials for household textiles similarly include polyester ( 28% of consumption), polyamide (~23%), polypropylene (~10%), acrylic (~4%) and viscose (~3%).

Improvements in the environmental performance of textile products can be seen to have increased as a priority for a range of number of EU, USA and Far Eastern fibre, fabric and clothing manufacturers, as well as brands and retailers. Areas of eco-innovation can be identified in the branded and outdoor clothing markets as well as by supermarkets and volume furniture retailers and by manufacturers specifically focused on public procurement contracts. Some key areas of eco-innovation identified by this study include:

- Organic cotton, often at a very high % of content, although mismatches between supply and demand have been claimed to restrict growth.
- Cotton that is produced using less pesticides ( for example, using Integrated Pesticide Management techniques) and less irrigation water
- Polyester fibre with a recycled content, often at a very high % content

- Nylon fibre with a recycled content, although this is a relatively new area
- Product repair and take-back initiatives in conjunction with remanufacturers
- Chemical management, often in the form of lists of restricted substances
- A focus on substitutes for specific high profile chemicals and groups of substances
- A focus on residual chemicals in products and their effect of human health
- Supply chain auditing against environmental management standards
- Fabric treatments designed to reduce the need for washing and extend lifespan

The auditing of sub-suppliers against social and ethical codes of conduct has also emerged in response to NGO and consumer campaigns. The Global Social Compliance Programme's Reference Code and the Business Social Compliance Initiative's Code of Conduct are a good examples in this area.

A number of industry-led labelling and auditing initiatives have emerged in order provide performance monitoring and market differentiation for these eco-innovations. These include labels addressing whole life criteria - Bluesign, Eco-Index, Made-by – and labels addressing specific fibres – GOTS, BCI, Global Recycled Standard.

Oeko-tex 100, with its focus on human health, pre-dates many of these initiatives and with over 10,000 licenses remains as the most successful independent labelling scheme, having established an international verification infrastructure. The EU Ecolabel, the Nordic Ecolabel and the Blue Angel are the other most notable independent labels.

The current market penetration of the EU Ecolabel is an important consideration in relation to these market trends and the size of the textile market. For this, limited data is currently available. There were 89 licenses for textile products in 2010 covering 1,200 product names, the majority in Denmark, Italy and Sweden. For EU Ecolabeled products as a whole the share is estimated to be relatively small (estimated to be less than 1% of the total market).

It may be the case that the Oekotex label (in markets such as Germany) and the initiatives of eco-innovators we have identified – particularly and large brands and retailers – are currently achieving a more significant level of market impact and environmental improvement than the EU Ecolabel. Organic cotton and recycled polyester being good examples. Greater harmonisation with other labels and initiatives could therefore be an option to increase market penetration whilst simultaneously increasing the ambition of the label. .

## 4.4 LCA STUDY FINDINGS

Two major LCA-studies formed the basis for the analysis – IMPRO Textiles (European Commission JRC) and EDIPTEX (Danish Environmental Protection Agency). IMPRO Textiles provided top-down assessment of the EU market whilst EDIPTEX provided an assessment of selected clothing products. The findings were supplemented by more specific LCA studies and technical evidence where necessary.

The overall findings indicate that the fibre production phase, followed by the use phase, are associated with the most significant environmental impacts during the life cycle of textile products . The specific environmental 'hot spots' identified as being of significance were as follows:

- **Cotton production:** The ecotoxicity associated with the production and use of fertilizers and pesticides is the main contributor to both energy consumption and ecotoxicity. The resource impact of water use for irrigation was also highlighted as being significant. A shift to organic cotton should significantly reduce the toxicity profile of products made of cotton, although this would not address water use.
- **Synthetic fibre production** (acrylic, nylon, polyamide, polypropylene): The climate change and ecotoxicity impact of energy and raw material use to manufacture fibres. Nylon and acrylic are the most energy intensive to produce and are technically the most difficult to recycle. The EDIPTEX case studies highlight how is the energy required to produce garments is, to some extent, influenced by fibre blends.
- **Man-made cellulose fibres:** The climate change and ecotoxicity impact of energy use to manufacture fibres. The EDIPTEX case studies highlighted viscose as being the most energy intensive fibre to produce.
- **Raw material and feedstocks required to manufacture cellulose fibre, soaping agents and softeners.** Timber and bamboo are the predominant sources of raw material for cellulose fibre manufacturing. Palm oil was identified as especially significant as a feedstock for the manufacturing of soaping agents and softeners. Viscose has significantly higher impacts associated with soaping agent and softener use;
- **Process energy and ecotoxicity associated with the fabric formation, finishing and printing and dyeing stages of production.** However, there was conflicting evidence in this area, with EDIPTEX reaching the conclusion that the effect on ecotoxicity from the production phase for traditional cotton is less significant overall. The scouring stage was highlighted in relation to wool. Dye carriers were highlighted in relation to polyester.

- **Fuel use and climate change impacts associated with shipping and air freight** to distribute products. Although air freight only accounts for a small share of distribution its impacts are proportionally much higher.
- **Energy and ecotoxicity associated with the use phase** of textile products. This primarily relates to washing energy and detergents, and can be influenced by fibre choice and blends.

The findings also highlighted the potential benefits of more sustainable systems of resource use associated with the disposal phase. The allocation of benefits from re-use, recycling and energy recovery was an area specifically highlighted.

A number of environmental issues currently addressed by the EU Ecolabel criteria were not specifically highlighted by the LCA findings as being significant overall. To some extent this may have been due to the exclusion and substitution of the most hazardous substances from the LCA analysis. These included flame retardants, dyes and plasticizers. Nanotechnology was also identified as a new area of focus for which limited data and evidence currently exists for the potential environmental impacts. However, evidence suggests that a precautionary approach may be justified.

## 4.5 WHAT SHOULD BE THE FOCUS FOR THE REVISION?

Based on the discussion in section 3.3 and the findings listed above a framework has been proposed for the criteria revision. This framework, which is presented in table 4.1, proposes five key focus areas for the revision. It is currently suggested to keep the overall structure and approach of the existing criteria document and not to split the criteria by market segment.

The suggestion is to improve in the documentation the weight of the proposed criteria by ensuring that the issues highlighted as environmental 'hot spots' have the strictest criteria based on industry best practice. In seeking to do this a number of criteria revisions and new criteria proposals are proposed. For other relevant issues not listed as 'hot spots' relevant criteria would be set but based more on an industry average. It is also to be considered whether all the criteria should be retained.

It is also recommended to discuss harmonisation with other labels or schemes in order to reposition the EU ecolabel within the market and to lower the administrative burden for both applicants and Competent Bodies. Keeping in mind that harmonisation will have both pro and cons which are to be discussed.

The readability of the document as well options to streamline and focus the assessment and verification element are also recommended to be in focus – again in order to streamline and lighten the application process.

The focus and the most selective criteria shall be the textile fibre criteria. Here an in-depth revision is necessary especially for the criteria for cotton and energy related criteria have to be implemented in the production of man-made fibres.

With regards to the process and chemical criteria the focus shall be on updating the criteria in relation to present legislation and BAT and to analyse the possibility to harmonise with other labels or schemes.

Several new areas for developing criteria have been proposed. They are all relevant either from an environmental point of view or because of market expectations. It has to be discussed whether it is possible to develop criteria in these areas and if it is feasible taken into account the improvement potential and the added administrative burden for both the applicant and the Competent bodies.

**Table 4.1 Proposed approach to the Textile Products Ecolabel criteria revision**

| **Revision theme** | **Areas to be addressed by existing criteria revisions and new criteria proposals** | **Questions for stakeholders** |
|---|---|---|
| 1. Focussed technical updates: *based on BREF and technical evidence review* | • Updates of existing substance restrictions in line with REACH and the Ecolabel Regulation (EC/66/2010)<br>• Technical updates to the existing criteria based on the latest evidence,<br>• Alignment of existing criteria limit values with BREF/industry best practice,<br>• Explore process energy benchmarks for all synthetic fibres | • *Do the proposed areas of improvement represent current industry best practice?*<br>• *Are any specific derogations required for hazardous substances?*<br>• *Given the need for a stronger whole life focus (see 2 below) and to reduce barriers to licensing is there scope to delete any criteria?* |
| 2. Improved whole life scope: *based on a fibre and product LCA review* | • Introduce a specific focus on process energy use and recycled content for regenerated and synthetic fibres,<br>• Require a higher proportion of cotton production to be organic, transition or IPM content,<br>• Consider how water use for cotton irrigation can be addressed,<br>• Address process energy use associated with the dyeing, finishing, formation and | • *Do the proposed areas of improvement fully reflect state-of-the-art LCA findings?*<br>• *Are there other environmental impacts for which sufficient evidence exists to support criteria proposals?* |

| | | |
|---|---|---|
| | printing stages,<br>• Address the responsible sourcing of feedstocks for viscose fibre and associated softeners/soaping agents,<br>• Identify measures to influence energy and detergent use during the use phase,<br>• Identify measures that consider the maintenance and recyclability of garments, fabrics and fibres. | |
| 3. Reflect product best practice: *based on eco-innovation by manufacturers, retailers and brands* | • Increase the required proportion of organic cotton significantly,<br>• Require a significant minimum recycled content for polyester and nylon,<br>• Design for durability and recycling,<br>• Consumer labelling and advice in relation to the use phase,<br>• Encourage/provide consumers repair and take-back routes. | • *Do the proposed areas of improvement represent current market best practice?*<br>• *Are the proposals for to influence the use and end-of-life phases implementable within the frame of the Ecolabel?* |
| 4. Explore options for label and initiative harmonisation: *based on a review of state, NGO and private label scheme criteria* | • Oeko-tex 100 – Explore options that would facilitate use of verification and certification infrastructure<br>• BCI/GOTS cotton – Explore options that would address the scope of these labels and improve raw materials | • *Should harmonisation be a priority for the Ecolabel?*<br>• *To what extent should these labels/initiatives be considered for harmonisation?*<br>• *Are there other labels and initiatives that should be* |

| | | |
|---|---|---|
| | availability/price,<br>• GSCP, BSCI and Oekotex 1000 – Explore options for harmonisation in support of supply chain/CSR verification,<br>• Industry labels and initiatives – Explore overlaps with fashion brand, supermarket and outdoor industry priorities, | *considered?* |
| 5. Improve focus on opportunities in target market segments: *based on textile label, public procurement consumer and industry priorities* | • Workwear/PPE – In relation to public procurement/GPP<br>• Bed linen and nightwear – In relation to public procurement/GPP<br>• Baby/childrens clothing – As highlighted by the health focus of Oeko-tex.<br>• Outdoor clothing – Target segment in which consumers may display higher consumer environmental awareness.<br>• Fashion/high street clothing basics – An emerging area of focus for company CSR and consumer environmental awareness. | • *Is it appropriate to consider targeting and/or tailoring its the Ecolabel criteria to these market segments?*<br>• *Are there other market segments which the Ecolabel could focus on or which have special considerations?*<br>• *Are there specific derogations that should be applied to these market segments?*<br>• *Are there arguments for strengthening criteria in any of these market segments?* |

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**APPENDIX 1 TERMS AND DEFINITIONS**

| | |
|---|---|
| BAT | Best Available Technique |
| BREF | Reference Document on Best Available Technique |
| CB forum | EU Ecolabel Competent Body forum |
| CMR | Carcinogenic, mutagenic and toxic for reproduction |
| COD | Chemical Oxygen Demand |
| CSR | Corporate Social Resonsibility |
| ECHA | European Chemical Agency |
| Endpoint indicator | The endpoint method (or damage approach) tries to model the effects of emissions directly for the protection targets (natural environment's ecosystems, human health, resource availability). Endpoint methods typically follow the midpoint modelling considering the severity and reversibility of effects and the models' uncertainties. |
| EUEB | EU Ecolabelling Board |
| GHG | Greenhouse gases |
| GOTS | Global Organic Textile Standard |
| GPP | Green Public Procurement |
| IPP | Integrated Product Policy |
| JRC | Joint Research Centre |
| MEKA matrix | Material, Energy, Chemicals and other issues |
| Midpoint indicator | A term that specifies the results of traditional LCIA characterization and normalization methods as indicators located between emission and endpoint damages in the impact pathway at the point where it is judged that further modelling involves too much uncertainty. |
| ODS | Ozone Depleting Substances |
| SvHC | Substances of Very High Concern |

| | |
|---|---|
| VOC | Volatile organic compounds |

## APPENDIX 2. QUESTIONNAIRE

### 1: QUESTIONNAIRE FOR COMPETENT BODIES

This first part is to be filled out by Competent Bodies.

#### 1. Scope of the EU Ecolabel criteria document

| |
|---|
| **a**. Do you think the present scope of the criteria document (Article 1) is adequate and precise? |
| **Answer**: |
| **b**. Have you been contacted by producers or others who have had difficulty in understanding the scope? |
| **Answer:** |
| **c**. Have you as a CB had to deny any textile products the EU Ecolabel, because they in your opinion did not fit the scope? If yes please indicate which ones. |
| **Answer**: |
| **d**. Do you have any suggestions to broaden the scope? |
| **Answer**: |

**2. Handling applications**

| |
|---|
| **a**. How many applications for Textiles have you dealt, or are you dealing with? (If none please proceed to question 3). |
| **Answer**: |
| **b**. Do you have any suggestions to improve the User manual or the criteria document? |
| **Answer**: |
| **c**. Have you produced other types of aid (e.g. documents, home page) to help your applicants? If yes please give a short description. |
| **Answer**: |
| **d**. Which marked segments are covered by your licenses? (e.g. children’s clothes, work clothes or furniture fabric). |
| **Answer**: |

**3. Stringency of the criteria**

| |
|---|
| **a**. Have you denied any applications because the applicant did not fulfil all criteria? If yes please indicate criteria (number). |
| **Answer**: |
| **b.** Is the current verification procedure/test sufficient? |
| **Answer**: |

**2: QUESTIONNAIRE FOR LICENCE HOLDERS**

This part is aimed at the licence holders and their product chain.

**1. Scope of the EU Ecolabel criteria document**

| |
|---|
| **a**. Do you think the present scope of the criteria document (Article 1) is adequate and precise? |
| **Answer**: |
| **b**. Have you been contacted by sub supplier, or others who have had difficulty in understanding the scope? |
| **Answer:** |
| **d**. Do you have any suggestions to broaden the scope? |
| **Answer**: |

| |
|---|
| |

**2. Experience from making an application**

| |
|---|
| **A** How did you find the application process? |
| **Answer**: |
| **b**. Do you have any suggestions to improve the User manual or the criteria document? |
| **Answer**: |
| **c**. Have your Competent Body produced other types of aid (e.g. documents, home page) to help your make the application? If yes please give a short description. |
| **Answer**: |
| **d**. Which marked segments are covered by your licence? (e.g. children's clothes, work wear or furniture fabric). |
| **Answer**: |
| **e:** How do you find the administrative work in relation to documenting the criteria? |
| **Answer**: |

**3. How does your organization work with CSR (corporate social responsibility?)**

| |
|---|
| **a**. Do you have a policy for CSR? If yes please submit it. |
| **Answer**: |
| **b.** Have your organization signed national/international declarations, e.g. “Global Compact”? |
| **Answer**: |
| **C:** Does your organization work accordingly, or do you have a certification according to an international scheme or standard, e.g. SA8000 or ISO26001? |
| **Answer**: |

## 3: QUESTIONNAIRE FOR GREEN PUBLIC PROCUREMENT (GPP)

This part is aimed at the people engaged in making or evaluating public tenders.

### 1. Scope of the EU Ecolabel criteria document

| |
|---|
| **a**. Do you use environmental parameters in your tenders? If yes do you use the EU Ecolabel Criteria? |
| **Answer**: |
| **b**. Do you think the present scope of the criteria document (Article 1) is adequate and precise? Please specify  for which products you use environmental parameters. |
| **Answer:** |
| c: Do you have any suggestions to broaden the scope? |
| **Answer**: |
| **d**. Do you use the complete EU Criteria document or just part of it? If only parts are used please specify which ones. |
| **Answer**: |
| e:  Do you use other environmental parameters that the ones specified in the EU Ecolabel? |

| |
|---|
| **Answer**: |

**2. Do you include criteria for CSR (corporate social responsibility) in your tenders?**

| |
|---|
| **a**. If yes, do you ask for a policy for CSR? |
| **Answer**: |
| **b.** If yes, do you ask the bidder to have signed national/international declarations, e.g. “Global Compact”? |
| **Answer**: |
| **c:** If yes, do you ask the bidder to a certification according to an international scheme or standard, e.g. SA8000 or ISO26001? Please specify which one. |
| **Answer**: |

## APPENDIX 3: SUMMARY OF RESPONDENTS TO THE QUESTIONNAIRE

The following organizations replied to the questionnaire.

| | Organization | Country |
|---|---|---|
| 1 | Danish EPA (Danish CB) | Denmark |
| 2 | CSIRO Materials Science and Engineering | Australia |
| 3 | FIRA International Ltd | United Kingdom |
| 4 | EFRA, the European Flame Retardants Association | Belgium |
| 5 | VKI - Austrian Consumer Association, Ecolabel | Austria |
| 6 | SMK (CB, The Netherlands) | The Netherlands |
| 7 | Rama Textile Industry | Thailand |
| 8 | Inter.Weave LTD | New Zealand |
| 9 | The Merino Company | Australia |
| 10 | Union Pioneer Public Co., Ltd | Thailand |
| 11 | wooltexuk | United Kingdom |
| 12 | ÖTI - Institut für Ökologie, Technik und Innovation GmbH | Austria |
| 13 | Textiles Inducam S.L. | Spain |
| 14 | Umweltbundesamt | Germany |
| 15 | AFNOR | France |

## APPENDIX 3: MECO MATRIX

The MECO matrix is a screening tool developed as part of the Danish EDIP methodology in order to summarize and interpret the results of a LCA study [Wenzel et al 1997]. The MECO matrix is illustrated in the table below.  The matrix covers life cycle stages of a product in the columns (resources, production, use and disposal) and macro environmental impact categories under analysis in the rows (Materials, Energy, Chemicals and Other issues - MECO).

| | **Resources** | **Production** | **Use** | **Disposal** |
|---|---|---|---|---|
| **Materials** | | | | |
| **Energy** | | | | |
| **Chemicals** | | | | |
| **Other issues** | | | | |

Transport are included in the final stage of relevance, that is to say, for instance, that transport of a product is allocated to the use phase and that procurement of resources allocated to the production stage. As an alternative to this transport can be illustrated in a separate Column if it is considered relevant for the specific product or service. .

The MECO categories are assumed to be self-explanatory, but may be described as follows:

**Materials** cover use of natural resources, renewable as well as non-renewable. If quantified, the consumption of natural resources may be calculated as person equivalents (PE) based on the yearly global consumption of resources. The resources employed in the different phases of the products life cycle are named and potentially quantified while an assessment of the resources which can be saved by reuse, recycling and energy recover is shown in the disposal phase.

**Energy** covers use of energy resources, renewable as well as non-renewable. If quantified, the consumption may be calculated as MJ of primary energy. The energy employed in the different phases of the products life cycle are named and potentially quantified while an assessment of the resources which can be saved by reuse, recycling and energy recover is shown in the disposal phase.

**Chemicals** cover all emissions of substances, including emissions due to the intentional use of chemicals in the production process as well as emissions associated with the product life cycle (e.g. waste disposal processes).

**Other issues** cover all other issues that may be considered relevant, e.g. working environment, land uses.

The MECO methodology may be used as semi-quantitative screening tool, useful for identifying the environmental "hotspots" of a product. The strength of the MECO methodology is that it requires to consider typical key issues throughout the life cycle of the product, allowing the identification of those issues where products changes and improvement options should be considered. The MECO methodology can thus be utilised in product development, as well as in the preparation of Ecolabels and guidelines for green procurement.

## APPENDIX 4: DESCRIPTION OF THE LCA STUDIES USED

### 1: EDIP assessment method

A specific procedure is followed when a product is environmentally assessed. Internationally1, it has been agreed that an environmental assessment must follow the steps briefly described below.

Objective In this step, the purpose of the environmental assessment is described, as well as the recipient(s) and the decisions it is intended to support.

**Delimitation**

In this step, the product to be assessed is described, the product's performance is stated, and it the amount included in the assessment is defined. In order to ensure that the same performance is assessed every time, the performance is defined in relation to the volume and quality of the performance. This is called the functional unit. Crucial for the results of the environmental assessment is that the functional unit is defined correctly and precisely. This step also includes parameters like time, geography and technology. For example, it should be determined whether modern or older production methods are used, where the product is sold, etc.

Statement In this step, data from all the processes of the product's lifecycle are collected and processed, i.e. from cradle to grave. These data will be used to calculate consumption and discharges from all processes of the product's lifecycle. The EDIP method applies a bill of materials as the structure for the product, and materials content and production processes are specified in detail.

**Data**

Data is processed and stored for the unit processes. The data format in the EDIP database for unit processes contains three categories of information:

- description of the process
- statement of the interchange with the environment (input and output), and
- a description of the data information.

The EDIP unit process database contains a possibility for correcting or establishing new data descriptions when necessary. Collecting and processing data can be a very time-consuming task.

**The assessment**

When the statement is complete, it must be assessed. The first step of the assessment is a translation of data to the environmental impacts expected from the individual discharges and emissions. This translation is called characterisation, and environmental impact potentials are worked out.

Environmental impacts, resource consumption and impacts on occupational health and safety are assessed in the EDIP method. What is the resource consumption? How big are the environmental impacts? In order to be able to interpret resource consumption and expected environmental impacts, it is necessary to bring them on to a common scale and use the same comparison reference. This is called normalisation.

**2: IMPRO – textiles**

The key characteristics of the textile LCA model are as follows:

- The model is a bottom-up life cycle analysis of the consumption of household textiles and clothes in the EU27. The model takes into account all impacts of the production, distribution, use and end-of-life of textiles that are produced in a given year to satisfy the European apparent consumption.
- Market data for 2007 was retrieved from the EUROPROMS database. 101 end products were linked to specific information regarding their composition (fibre type breakdown), their weight, their production processes (knitted, woven, laminated), their lifetime and the care practices they were associated with (e.g. ironing or not).
- The baseline scenario of the model covers the following fibre types: cotton, wool, viscose, flax, silk, polyester, polyamide, acrylic, and polypropylene. In addition to these fibre types, additional data have been gathered to assess the improvement potential due to organic and GM cotton and hemp. Polyurethane, PVC and feathers have also been included.
- Environmental data is based on an exhaustive literature review. WISARD 4.2 was used as a life cycle database for end-of-life treatment, for all other processes and products, ecoinvent 2.0 was used, for plastic compounds, PlasticsEurope data was used.
- The life cycle impact assessment methodology used is ReCiPe. This methodology allows the quantification of potential impacts at both midpoints and endpoints.

Due to lacking data the following assumptions were necessary:

- Importation for EU consumption could not be distinguished from importation for transit. Importation impacts were therefore allocated to all end-products consumed in the EU.
- Reused textiles in Europe were included in the model and given a lifetime extension of 50%. Reused clothes are also assumed to avoid the production of new items with a 1:1 ratio. In addition, only the impacts of exportation were considered for items that are reused abroad.
- Blended fibres are included in the model as the breakdown per fibre of each item has been considered. However, blended fibres cannot be distinguished from “pure” fibres.
- Recycling has been modelled as recycling into wipers considering that textile wipers can replace paper wipers. Only energy benefits have been included in the model.
- Concerning production of fibres, some processes were extrapolated from other fibre types as no fibre specific data were available.
- Processes are tightly linked to product quality, implicitly meaning that for a given fibre type, end-products will not necessarily follow the same processes. However, as this information could not be obtained, it was assumed that all fabrics undergo a complete process chain which might lead to an overestimation of environmental impacts.
- No specific data were found to model different production practices. Thus, it is assumed that European (or more generally western) practices are representative.

**Data**

Raw data for material and energy inputs, process losses and emissions was derived from previously published LCAs, LCA studies carried out by BIO Intelligence Service, and other relevant studies in the textiles field. The list of publications consulted is presented in the references (section xxxxx). This data was combined to environmental life cycle inventory data which was extracted from the ecoinvent 2.0 database (*ecoinvent Centre, 2007*). Ecoinvent is one of the most exhaustive databases that allow to cope with the high number of materials, chemicals and processes that enter the textile life cycle in a consistent and reliable way. Other sources of life cycle inventories include WISARD 4.2 (*PricewaterhouseCoopers, 2007*) for end-of-life models and PlasticsEurope (for plastic compounds. Where data was not readily found in the database, other sources outlined in the report were used (in particular for the production of individual fibre types). Where neither option was available, research institutes and universities were contacted. Section 3.2 will outline how the model has been organised, including its limitations and the major assumptions made throughout its construction.

**Method**

ReCiPe is a recommended LCIA method in the ILCD-ELCD handbook for endpoints indicators. As for midpoints indicators, ReCiPe proposes a harmonised set of characterization factors, hence limiting interpretation incoherence that would have been obtained by using multiple methodologies.

Using endpoints usually ease the understanding of LCA results as they are less numerous than midpoints indicators and are easier to apprehend (**figure**). However, one should keep in mind that by modelling environmental impacts further in the environmental chain, endpoints indicators are less robust than midpoints.