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Labelling of chemicals in textiles

Nordic Textile Initiative

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Nordic Textile Initiative – Report on labelling of chemicals in textiles

Abstract

This report contains an analysis of the needs and barriers for a legal requirement on declaration and/or labelling of chemicals in textiles. The project is a part of the Nordic action plan for textiles *"Well dressed in a clean environment. Nordic action plan for sustainable fashion and textiles"*.

Nordic consumers clearly expressed in the surveys, a need for a declaration of hazardous chemicals in textiles. The consumers' primary concern was whether a textile contains substances that may impact the own health. Concerns for textile workers' exposure to hazardous chemicals came second, while environmental damage and increased recycling possibilities had less importance to the consumers. However, in addition to protecting the consumers, the ambition of the Nordic action plan encompass protecting the environment and support a non-toxic circular economy. There are further socio-economical benefits with a legal requirement on declaration and/or labelling of chemicals in textiles, as this will likely reduce the occurrence of hazardous chemicals in textiles. Reduced exposure to hazardous chemicals in textiles can be related to aspects like sick-leave, health/hospital care which have effects both on individual, company and society level. In addition, environmental concerns and remediation actions can be related to societal cost. In comparison with increased restriction of chemicals in textiles, a legal requirement on declaration of chemicals would have the advantage that it can inform stakeholders with specific needs (allergenic customers, recyclers etc.), while restrictions are limited to the cases where occurrence of a chemical poses an unacceptable risk. A legal requirement on declaration and/or labelling of chemicals in textiles is expected to improve the information flow in the supply chain and support the companies' efforts in phasing out unwanted chemicals upstream.

The report presents possible legal frameworks for a declaration and/or labelling requirement, including both making additions to current legislations (Fibre labelling regulation, Ecodesign directive, REACH etc.) and developing a new legislation. Two major barriers were identified for a legal requirement on declaration and/or labelling of chemicals in textiles:

- The work load of introducing new legislation or making additions to current legislations
- The work load in converting the textile supply chain (where the major part is not subject to EU law since it takes place outside the EU borders) into a non-toxic supply chain

Both these obstacles are described in the report and have to be taken into consideration to make the legislation support a non-toxic environment in reality and not just in theory.

Among the described multitude of on-going initiatives for reducing the occurrence of hazardous chemicals in textiles should be highlighted the proposed restriction under REACH article 68.2 of substances with a harmonized CLP classification as carcinogenic, mutagenic or reproduction toxic properties category 1A or 1B in consumer textiles. Further, in the respective Nordic countries there are several on-going initiatives linked to a non-toxic environment and textiles, such as restrictions of allergenic substances, increased use of ecolabels, and dialogues with the industry.

Based on the findings from the analysis in this report, a way forward towards a legal requirement on a declaration and/or labelling of chemicals in textiles is proposed via two main options. One option is to work for an extension of the REACH legislation: to make it applicable for labelling and declaration. This option is supported by the industry. Another option is to create a new legislation framework; a product safety regulation for textiles. This option may have a more holistic approach and can include CE-marking. Both options have the potential to make the study's purpose feasible, however, work load and timing are aspects that may be challenging. A proposal is also given for which substances that would be relevant to include in a legal declaration and/or labelling requirement. It is regardless of final selection recommended that an assessment of substances' relevance to textiles is made.

Table of Contents

Preface	6
Executive summary	7
Reading instructions	15
1. Introduction	17
1.1 Background: Chemicals management in the textile value chain	18
1.2 Project aim and setup	32
2. International labelling and declaration activities	34
2.1 Existing legal acts related to textile labelling and declaration of chemicals in textiles	35
2.2 Voluntary textile labels	37
2.3 On-going regulatory and voluntary activities	40
2.4 Conclusion on international labelling and declaration activities	48
3. Consumer needs	49
3.1 Consumer surveys	49
3.2 Questionnaire/interviews with key actors	51
3.3 Literature on consumer demand for information on chemicals in textiles	53
3.4 Conclusion on consumer needs	54
4. Relevant substances	56
4.1 Aspects of substance selection	56
4.2 Aim with declaration/label requirement	57
4.3 Substance coverage in existing schemes	60
4.4 Grouping of chemicals in communication based on properties vs. based on chemical structure	61
4.5 Meaning of “textile relevance” of a substance	65
4.6 Suggested substances	67
4.7 Conclusion for relevant substances	71
5. Practical and legal possibilities	72
5.1 Practical possibilities	72
5.2 Legal possibilities	75
5.3 Conclusion on practical and legal possibilities	86
6. Impact assessment	88
6.1 Socio-economic impact assessment	88
6.2 Questionnaire to Nordic textile companies	89
6.3 Discussions with the Swedish Chemicals Group at Swerea IVF	92
6.4 Conclusion on impact assessment	93
7. Conclusions and recommendations	95
7.1 Alternative approaches based on aiming at declarations and/or labelling	96
7.2 Type of communication wheels in use	99
7.3 Concentration limits and substance nomenclature	99

7.4	Responsibility for awareness of legislation and follow-up activities (market surveillance)	101
7.5	First proposal for a joint Nordic strategy on declaration of chemicals in textiles	102
7.6	Concluding remarks	106
References.....		108
Appendix 1 Overview of textile-relevant substances coverage in different legal and voluntary schemes		112
Appendix 2 Questionnaires on consumer needs		119
Appendix 3 Background to uncertainty in hazard classification.....		123
Appendix 4 The CE-mark		125
Appendix 5 Functional and process related chemicals.....		128
Appendix 6 Consultation on a possible legal requirement to declare and / or tagging content of harmful chemicals in textile products.....		131

Preface

In April 2015, the Nordic countries adopted an action plan for textiles, *"Well dressed in a clean environment. Nordic action plan for sustainable fashion and textiles"*(Nordic Council of Ministers, 2015). Reducing the use of harmful chemicals is one of the aims in this action plan and the Nordic Council of Ministers, through the Ministry of Environment and Food in Denmark, commissioned Swerea IVF to analyse the needs and barriers for a legal requirement on declaration and/or labelling of chemicals in textiles as one possible Nordic input to the European Union (EU) work on chemicals in textiles.

Both declaration and label possibilities are included in the scope. A label is defined as always present on the product. A declaration does not have to be present on the product and can be for example a report to authorities or a mandatory document to be kept at the company's web-site etc. These two systems may be used in combination.

The commission involved the following steps:

- Mapping of the international activities in the area of declaration and labelling of chemicals in textiles.
- Survey of consumer demand/need for declaration and/or labelling of chemical content of textiles in the EU, through contact with relevant consumer and environmental labelling actors.
- Mapping substances to include in labelling/declaration.
- Impact assessment of both positive and negative effects of introducing a declaration and / or labelling for different actors in the value chain including exporters and materials recyclers.
- Analysis of legal and practical possibilities to import goods with a declaration and/or labelling requirement in place.
- Development of a first proposal for a joint Nordic strategy for the introduction of a system for declaration and/or labelling within the EU if the analysis shows that it is feasible.

Executive summary

In the manufacturing of textiles, a variety of chemicals are used, and often in large amounts. Some of the chemicals stay in the textile product, while other chemicals are consumed in the textile production or washed out and cannot always be traced in the ready-made textile product. In both cases, textile-related substances can cause harm to people's health and/or the environment in different phases of the life cycle.

This report analyses the needs and barriers for a legal requirement on declaration and/or labelling as a risk management measure for chemicals in textiles. Both declaration and label possibilities are included in the scope. A label is defined as always present on the product. A declaration does not have to be present on the product and can be for example a report to authorities or a mandatory document to be kept at the company's website etc.

The global textile supply chain vs. European legal schemes

Today, the textile consumer products that are consumed and used within the European Union (EU) and the European Economic Area (EEA) (Norway, Iceland and Liechtenstein), are produced outside European borders to a large extent. It is challenging and not easy for European importers of textile goods to know exactly which substances are present in a ready-made textile product, due to the global nature of the long and complex textile supply chain.

There is no textile product legislation on EU level that specifically addresses the issue of hazardous substances in textiles. Today, a number of legal schemes cover occurrence of chemicals in textile products in the EU/EEA such as: REACH, the POP Regulation, the Biocidal Products Regulation (BPR), the General Product Safety Directive (GPSD) and the Toy Safety Directive. However, chemicals in textiles are currently not regulated in a comprehensive way.

Since a significant proportion of textile production occurs outside the EU/EEA, i.e. in regions and countries where the EU legislation does not apply, there is a requirement for business agreements or equivalent to make sure imported products comply with EU legislation.

Large variations in the design of existing legal and voluntary schemes

An overview of legal acts and voluntary schemes related to labelling and declaration of chemicals in products is provided in this report. The overview shows that different solutions have been worked out in different contexts and for different product groups. The solutions vary both in terms of requirements and in terms of schemes for implementation and follow-up.

A broad range of voluntary textile schemes exists globally. In a database called the Ecolabel Index, is currently listed 108 textile ecolabels (Ecolabel Index, 2016). The most common textile label globally is the Oeko-Tex® 100 certification, followed by BlueSign, Global Organic Textile Standard (GOTS), the Nordic Swan and the EU Ecolabel. These labels are all third party reviewed Type I environmental labels standardized by ISO 14024 (ISO, 1999).

Currently, the most common way to communicate around chemicals content in products in the textile supply chain (for both legal and voluntary purposes) is to use a Restricted Substance List (RSL). Several RSLs are applied by companies and associations worldwide; for example:

- Joint Roadmap (ZDHC) a joint initiative among some major textile brands (ZDHC, 2014).
- Afirm (Apparel and Footwear International RSL Management group)(AFIRM, 2011)
- The American Apparel and Footwear Association (AAFA) (AAFA, 2015)
- The Chemicals Guide from the Chemicals Group at Swerea IVF (Swerea IVF, 2016a)

Different actors have different needs

In this report, two actors' needs have been discussed: consumers and end-of-life actors (recyclers and reprocessors). Compared with the situation today, many consumers would benefit from having additional information regarding chemicals in textile products, e.g. people suffering from allergy and parents of young children. The investigation of the consumer needs shows that consumer communication must be made as simple as possible, since the consumer already has to cope with a high amount of information in daily life. The information must at the same time not be misleading and make the consumer think that the chemicals content-focused label implies claims of an "environmentally friendly" garment in general, or that "free from"-claims means that there are no hazardous chemicals in the product.

When comparing the results for consumer needs with other stakeholders' needs (including the needs of recyclers), it is clear that the needs differ between stakeholders, and further that the possibilities for meeting the needs of all stakeholders are not always easily feasible within existing legislation. Consequently, the needs of **all** stakeholders may not be met by amending existing legislation; new legislation may be needed.

Substances to include in a labelling/declaration

Large quantities of a wide variety of chemicals with various functionalities and applications are used in textile manufacturing. Some of these thousands of individual substances are harmful to human health and/or the environment; for example substances can cause allergic reactions or bioaccumulate in the environment.

It is challenging and not obvious to make general statements about which substances that could be relevant to include in declarations/label requirements. Textiles make up a very diverse category of products with long, complex and global supply chains. The substance scope depends on the textile product in question, where children's clothing and protective clothing for fire fighters exemplifies two different product categories. Those exemplified extremes cannot have the same design and performance requirements due to their different expected uses. However, they clearly illustrate the major variations in design and performance within the textile sector which in consequence reflects various chemicals content in products.

Firstly, when defining which substances to include in a labelling/declaration, a nomenclature needs to be decided on. Without an accepted and common language there is no possibility to communicate in a comprehensive way. There are several possibilities to define a list of specific textile-relevant substances. All have their advantages and disadvantages, and which the most useful nomenclature for substance selection is depends thus on the aim and purpose of that particular labelling scheme. In general, the nomenclature for communicating chemical content on a product label can be based on:

- chemical structure (e.g. orto-phthalates that are all based on the orto-phthalic acid);
- functional properties (e.g. flame retardants that aims to retard fires in materials whatever chemistry is involved); or

- hazard classification according to the CLP Regulation¹ (e.g. substances that are carcinogenic, mutagenic or toxic to reproduction (CMR), persistent, bioaccumulative and toxic substances (PBT), endocrine disruptors(ED) or sensitizers).

These could each be common denominators when deciding a common nomenclature for substances that are to be included in a declaration/labelling scheme. Currently, all three nomenclatures, in combination or alone, are in use in different existing schemes.

Secondly, whichever substances are selected, it is of vital importance that these chemicals are of high relevance for the textile products that will fall under the scope of the declaration/label requirement. In order to succeed in eliminating hazardous substances from textile products it will facilitate to have lists that only consist of hazardous and highly relevant substances, as companies are expected to monitor and manage the substance list. A clear description on the routines for adding or removing a substance to or from the list will facilitate to keep the list updated. This is of key importance for a successful value chain implementation and elimination of the hazardous substances from the market.

This report presents a list of substances and substance groups that might be relevant for a declaration/label requirement. In addition, a comprehensive but not complete list of hazardous substances relevant to textiles is provided to illustrate the magnitude and challenge of this topic since there is no current knowledge available of all existing textile chemicals on the global market. Relevance is related to the different needs. For consumers, the relevance of substances depends on the perspective:

- individuals' (consumers and workers) health; relevant substances are substances hazardous to health, for example CMR/ED (i.e. non-regulated substances with these properties, i.e. carcinogenic dyestuffs) and sensitizers (organic solvents, nano-sized silver;
- the production sites' local environment; relevant substances are for example substances toxic to the environment, such as nonylphenol ethoxylates and nonylphenols (NPEO/NP), per- and polyfluorinated alkyl substances(PFAS), nano-silver;

¹Regulation (EU) No 1272/2008, CLP, concerns the classification, labelling and packaging of chemical substances and mixtures.

- the consumer's local environment; relevant substances are for example NPEO/NP, nano-sized silver;
- the global environment; relevant substances are for example PFAS, halogenated flame retardants, short chain chloroparaffins (SCCP).

For end-of-life actors, the requirements are related to:

- chemicals compromising the possibility for supplying high value secondary raw materials; relevant substances are for example PFAS
- workers' health; relevant substances are for example CMR/ED (i.e. non-regulated substances with these properties, i.e. carcinogenic dyestuffs), sensitizers (organic solvents, nano-sized silver)
- chemicals affecting the process; relevant substances are for example metal complexes, pigments, and materials such as elastane and polyurethane (PU)

Positive and negative effects on the actors in the textile value chain

There are several different ways of introducing a declaration and/or labelling requirement. Such a regulation will give both positive and negative effects for the actors throughout the textile value chain, from supply chain to waste treatment.

A legal requirement on declaration and/or labelling of chemicals in textiles will likely reduce the occurrence of hazardous chemicals in textiles. The socio-economic saving from health perspective can be related to aspects like sick-leave, health/hospital care which have effects both on individual, company and society level. The exact saving is difficult to anticipate and is strongly correlated to each chemical in question since chemicals have different health characteristics and concerns. Further, how much a label/declaration will reduce the occurrence of hazardous chemicals depends on the consumers' choice.

There are also cost-benefits from an industry perspective to work proactively, to protect the brand name and reduce costs for remediation of natural environments. The impact assessment shows that most textile companies perceive that even though it is difficult to retrieve information on chemical content, a legal requirement does increase information flow in the supply chain and supports the companies' efforts in phasing out unwanted chemicals upstream.

A regulation is perceived as positive by both businesses and society, if it includes highly relevant hazardous textile chemicals that would have

a major impact on the phase-out of toxic chemicals early in the textile value chain. The challenge, however, is to get a comprehensive list of these chemicals when there are a number of barriers in the value chain, for example the poor transparency demonstrated by the chemical industry.

A declaration/labelling requirement would imply that textile companies have to derive information that today is not naturally disclosed in their current value chain. This is not unique for the textile sector, but the diversity of the chemicals challenges and the fact that a major part of textile production is not subject to EU law since it takes place outside the EU borders is unique for textile production. The value provided by a declaration/labelling requirement in relation to the added administrative burden on this specific industry sector should be clearly communicated if the initiative is decided to be realized.

The terms of claim (conformity to requirements, positive content, negative content or other), the nomenclature for communication, as well as the communication wheel (QR-code, electronic chip, etc.) will have different impact on different actors (size, role and position in the value chain etc.). The common denominator is that a legal requirement will be a support to request information regarding chemicals from upstream actors, though this comes with the need for allocating more resources for information management.

Legal and practical possibilities and challenges for a declaration and/or labelling requirement, including market surveillance

The report presents various possibilities and challenges for a declaration and/or labelling requirement, including both making additions to current legislations (Fibre labelling regulation, Ecodesign directive, REACH) and developing a new legislation. The existing legislations that include a label and/or declaration requirement vary in aim, type of communication wheel and scope, thus clear communication of these aspects are envisaged. The main conclusions regarding legal possibilities are:

- Fibre labelling regulation; not applicable for the study's purpose
- Ecodesign directive; not applicable for the study's purpose
- REACH; an extension of the information duty in REACH would require the legal text to be amended accordingly (e.g. Article 33). However, REACH is a good option to cover restrictions of textile-relevant hazardous chemicals in legislation

- New legislation; very attractive solution for the study's purpose, especially to cover additional requirements for a specific product group. However long term development is foreseen.
- CE-mark; very appropriate for labelling and declaration requirements. However, has to be related to a legal framework where GPD is not seen as an option. A new legislation is seen as the most feasible way.

As described above, many textile companies regard strong regulation as beneficial in their phase-out actions and chemicals management; there is thus a strong incentive for reaching consensus between the textile industry and policy-makers in this matter. The challenges consist mainly in the work load of introducing new legislations and in converting the textile supply chain. In neither case, the challenges of a journey towards a non-toxic supply chain should not be underestimated.

Experience shows that many EU/EEA based companies are still unaware of the current regulations. The implementation of a new legal requirement is thus identified as key to achieve a non-toxic environment in practice. Visible evidence of this is that chemical risk-based notifications are continuously reported in the RAPEX registry for textile products.

Summarizing, the possible benefits of a successful implementation of a legal labelling and/or declaration standard are:

- Continuing to improve the working and social conditions of workers outside the EU, while offering textiles at an affordable price for EU consumers;
- Improving the overall environmental footprint of textiles over their entire life-cycle;
- Changing consumer attitudes of buying as cheap as possible and as much as possible;
- Providing consumers with relevant information concerning the environmental footprint of the textile products as well as the associated health risk, based on harmonized systems - at least at European level;
- consumer organisations generally favour harmonised, mandatory systems in order to ensure that consumers meet the same information across the EU.

The possible drawbacks of a non-successful implementation of a legal labelling and/or declaration standard are:

- Increasing the bureaucratic burden on businesses while not achieving the expected desired effect;

Proposal for how to work towards an EU requirement on declaration and/or labelling of chemicals in textiles

Based on the findings from the analysis in this report, a way forward towards a legal requirement on a declaration and/or labelling of chemicals in textiles is proposed via two main options. One option is to work for an extension of the information duty in the REACH legislation: to make it applicable for labelling and declaration. This option is supported by the industry. Another option is to create a new legislation framework; a product safety regulation for textiles. This option may have a more holistic approach and can include CE-marking. Both options have the potential to make the study's purpose feasible; however, work load and timing are aspects that may be challenging. A proposal is also given for which substances that would be relevant to include in a legal declaration and/or labelling requirement. It is regardless of final selection recommended that an assessment of substances' relevance to textiles is made.

Further, in order to work towards a non-toxic environment in relation to textile production and use a number of parallel activities to labelling and/or declaration legislation would be beneficial.

Encourage non-toxic (frontrunner) initiatives: Policy makers need to encourage initiatives, project innovation etc. and provide incentives for the development and take-up of environmentally friendlier textiles, initially on a voluntary basis through e.g. labelling schemes and or declaration standards and thereafter consider legislation.

Connect green procurement into labelling/declaration standards: This should lead to incentives for purchasing environmentally friendlier textiles following the Green Product Procurement (GPP) criteria developed at European level.

Efficient and clear societal communication: In order to develop successful labelling schemes and/or declaration standards, they should be efficiently communicated in parallel to legislative measures for businesses in the textile sector to get the expected outcome. This means continuous support, and to implement and/or fund consumer awareness and behaviour change campaigns.

Support to develop the Environmental Product Declarations (EPD) system (voluntary-based): In parallel there will be a societal need to support the textile industry in making Environmental Product Declarations (EPD), especially SMEs, and EU Member States. This would imply to provide support in the development of Product Category Rules (PCR) for

textiles based on a harmonized methodology possibly addressed as a labelling scheme and/or declaration standard.

Effective policy approach: Governments should revisit the approach and effectiveness of policies related to chemical use in the fashion and textile industry, including chemicals used in the fibre or garment production processes, regardless if they take place in the European Union or not.

New technologies impact: New technologies that seem to reduce or eliminate hazardous chemistry, such as nanotechnology and GMOs, should be thoroughly assessed regarding to what extent they may pose a risk to human health and the environment.

Reading instructions

The report is structured as follows:

Chapter 1 gives an introduction to the structure of the textile supply chain, the chemicals used in each of the production steps and the different challenges related to tracing the use and emissions of hazardous chemicals. Chapter 1 also provides a description of the project aim and setup.

Chapter 2 provides an overview of legal acts relevant to textile labelling and declaration of chemicals in textiles today, followed by an overview of voluntary textile labelling and declaration schemes.

Chapter 3 reports the results from an investigation of consumer needs for labelling and declaration of chemicals in textiles, partly based on a literature search and partly based on an email questionnaire and/or interviews with key actors in the Nordic countries.

Chapter 4 investigates which substances could be relevant to include in a requirement for declaration and/or labelling of chemicals in textiles. A range of different aspects to consider before selecting which substances to include are discussed (substance grouping, nomenclature, analytic testing etc).

Chapter 5 identifies positive and negative effects of introducing a declaration and/or labelling requirement.

Chapter 6 describes legal and practical possibilities for a declaration and/or labelling requirement, including legal supervision.

Finally, Chapter 7 contains conclusions and recommendations around possible approaches, communication wheels, substance nomenclatures as well as a list of suggested substances to include in a legal requirement on declaration and/or labelling of chemicals in textiles. Chap-

ter 7 ends with a first proposal for how to work towards an EU requirement on declaration and/or labelling of chemicals in textiles.

Further, when describing the alternative legal frameworks, the authors themselves have contributed with conclusions based on their expertise in the field, rather than pointing towards a single reference. This is stated here to avoid misunderstanding of non-referenced conclusions.

1. Introduction

This report presents the benefits, possibilities and challenges with a legal scheme for textile labelling and/or declaration. This introductory chapter puts a large emphasis on describing challenges for the textile industry sector. Thus, the chapter describes drawbacks of a potential legal scheme related to challenges in the implementation part. However, the authors recognize that the societal AND industrial benefits are most likely greater than the drawbacks.

Chemical content in textiles has traditionally been an issue for the whole textile supply chain. The interest is linked to working environment considerations but also compliance with current legislation. Chemical content information is therefore transferred from chemical supplier through textile manufacturers to retailers and textile brands. One of the specific drivers for the communication is the European chemical legislation (REACH). This legislation includes among other things requirements regarding providing information to consumers for specific hazardous chemicals. This information is however not provided to the reprocessing industry handling the consumer waste.

In this study, the hypothesis is made that the above described information would be beneficial for recyclers in order to develop high value secondary raw material out of textile pre- and post-consumer waste. Furthermore, if information was provided instantly at the point of purchase, consumers would have the opportunity to make a better choice in terms of their own health (for instance regarding sensitizers) and for the environment (locally or globally).

In general, actors in the value chain (from raw material producers all the way to end-of-life actors for textile materials) can be considered to have their specific needs fulfilled via the information duty in REACH or just by the fact that the textile product comply with current legislation and therefore regulated/restricted substances are absent. However, consumers may have the need for information at the point of purchase. Likewise, reprocessors need relevant information on chemical content for successful reprocessing. Further, in addition to the chemicals covered by legislation, it may be beneficial to cover other hazardous chemicals, to meet consumer demands (for instance chemicals of environmental or health concern) and facilitate for recyclers (for instance chemicals

that affect the value of the secondary raw material or chemicals affecting the processes as such).

For these purposes a labelling and/or declaration of relevant hazardous chemicals on textiles would hypothetically fulfil the needs of consumers and the reprocessing industry. This assumption is based on that consumers think they would benefit from immediate information about hazardous chemicals, and that reproducers would like to have access to information for decision support.

In this study extra focus has been put on clarifying consumer's needs. The needs for the reprocessing industry are more related to details regarding specific materials and the intended process to be used.

1.1 Background: Chemicals management in the textile value chain

Consumer products are traded today in a globalised market. This is also true for textile consumer products that are traded and used in the European Union (EU) and the European Economic Area (EEA) (Norway, Iceland and Liechtenstein). In fact, such textile products are produced to a large extent outside European borders.

Some of the hazardous chemicals that are used and emitted in textile production and/or occur in the textile products are of concern for the local and global environment, workers in the textile supply chain, end consumers but also for reuse and recycling of the textile products. Therefore it is essential to develop ways of consistent chemicals communication along the whole textile life cycle.

This is a presumption for effective and knowledgeable information exchange along the global value chain, concerning hazardous chemicals that may occur in textile products is essential in order to comply with current European legislation. This consistent information exchange shall include all actors (from supply chain to waste treatment). Therefore, there is a need for a consistent scheme that cannot be misunderstood or ignored in order to communicate substances of concern both on a national level as well as international level in a non-legal context, that may progress to a textile specific and effective legislation.

However, there are some challenges for brands and importers to be able to identify consumer products that contain certain hazardous chemicals used in the entire value chain - from production to the end consumer. This section therefore intends to provide an overview of the chal-

lenges with information exchange concerning hazardous chemicals in the context of the textile value chain.

1.1.1 The textile supply chain

In the manufacturing of textiles, a variety of chemicals are used, and often in large amounts (Olsson et al., 2009). Some of the substances are harmful to health and/or the environment, with properties such as sensitising, human toxic, eco-toxic, persistent or bio-accumulative (Swedish Chemicals Agency, 2014). It is difficult to know exactly which substances are present in a ready-made textile product since the supply chain is long, complex and global (Munn, 2011; Roos, 2015).

Figure 1 presents different chemicals used in different process steps along the textile value chain. The raw material can be sourced according to the specification of the final customer. When the raw material is synthetic the production takes place in a chemical industry environment whereas the bio-based material is sourced from farming industries. The fibre is then produced, usually using low amounts of additives in the process for bio-based but for synthetic materials it may be mixed together in a chemical reaction (for example polymer production).

During spinning, knitting, warping and weaving low amounts of chemicals are introduced in the process. In the wet treatment, scouring and dyeing takes place prior to the finishing. Garment making does not require any addition of large amounts of chemicals, unless the garment is finished after its manufacturing.

Chemical issues

Raw materials:	Fibre production:	Yarn spinning:	Fabric manufacturing:	Wet treatment:	Drying /finishing:	Garment making:	Transport:
Pesticides	Solvents	Spinning oils	Needle oils	Detergents	Air emissions	Stain removal	Biocides
Fertilisers	Carbon disulfide		Sizing agents	Lubricants	Prints	Spray bleaching	Container gas
Crude oil	Surfactants			Stabilizers	Finishing agents		Fuel combustion
Fracking agents	Monomers			Bleach			
	Catalysts			Dyestuff			
				Salts			
				Softeners			
				Finishing agents*			
				Water emissions			
				COD			

*Finishing agents are e.g. biocides, flame retardants, water/oil repellents etc.

Figure 1. Chemicals use and possible issues in the textile supply chain

During the chemical intensive process steps (raw material production, fibre production, wet treatment and finishing), a large variety of chemicals are being used. The chemicals may be sourced from a formula-tor at a local market or via global suppliers.

Figure 2 shows the amounts of chemicals used to produce a garment, which is dependent both on garment type and supply chain perfor-mance. The production of 1 kg garment uses roughly between 1 and 4 kg chemicals per kg garment (Olsson et al., 2009). Chemicals in this context include for instance detergents, salts, emulsifiers, pigments/colourants, finishing agents. In Figure 2, only the total quantity of chemicals that have been used is included, and neither the specific functionality nor the hazard characteristics are considered.

Figure 2. Total quantity of chemicals used in the production of four different garments, in a best case (Min), an average case (Average) and a worst case (Max) scenario. (Olsson et al., 2009)

1.1.2 The meaning of hazard and risk of chemicals

The terms “risk” and “hazard” may seem to have very similar meaning to most of us, but to a scientist they are actually very different, see Figure 3. With respect to chemistry, the terms have very specific meanings:

- **Hazard** refers to the inherent properties of a chemical substance that make it capable of causing harm to a person or the environment.
- **Exposure** describes both the amount of, and the frequency with which, a chemical substance comes into contact with a person, group of people or the environment.
- **Risk** is the possibility of a harm arising from a particular exposure to a chemical substance, under specific conditions.

Figure 3. Hazard versus risk. Risk is based on hazard and exposure.

With respect to protecting the environment, the term hazard should include already identified PBT (Persistent, Bioaccumulative and Toxic)

and vPvB (very Persistent and very Bioaccumulative) substances according to established criteria in the REACH regulation.

1.1.3 *Regulatory schemes and restrictions of hazardous chemicals in textiles – globally and within the EU*

Any national (or federal) regulation of chemicals is restricted to actions inside their area of jurisdiction, in contrast to the global textile supply chain. It should in the present context first be noted that any legal obligations on EU/EEA actors must be transferred to business agreements, since it is not possible to enforce EU regulation in third country production countries, such as China, the only way to uphold rules of compliance is through trans-boundary business agreements since most of goods are imported from textile producing countries outside the EU/EEA.

At global level, the International Strategy for Chemicals Management from 2006 (SAICM) (UNEP, 2006) is an arena for collaboration around the legislative work concerning use and emission of hazardous chemicals, administered by the UNEP (United Nations Environmental Programme). Chemicals that may have textile relevance are addressed in the globally applicable Stockholm Convention (UNEP, 2016). The Stockholm Convention work includes two parts: definition and identification of Persistent Organic Pollutants (POP) according to the so called annex D criteria in the Stockholm Convention. There are programmes organized by UNEP and especially help developing countries with implementation in practice via phase-out measures. Therefore, in the textile sector, UNEP coordinates information projects (e.g. chemicals in products (CiP) focusing on textiles in a global context where POPs may occur and have negative impact on health and environment), see section 2.3.8. These projects are often coordinated in cooperation with regional centres through national implementation programs (NIP).

In the European Union, there is currently no specific EU legislation that comprehensively and specifically regulates hazardous substances in textiles. The five legal schemes that do cover occurrence of chemicals in textile products are briefly described below:

- REACH
 - The European chemicals legislation REACH (EC No 1907/2006) (European Commission, 2006) is a substance regulation that came into force in June 2007. REACH regulates chemical substances and mixtures produced in and im-

ported to the EU market. Within REACH it is possible to regulate the use of hazardous substances by including substances in Annex XIV (list of substances subject to authorisation) or in Annex XVII (restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.)

- Annex XIV – authorization of Substances of Very High Concern (SVHC) – primarily a hazard based approach that assures that listed SVHC are properly controlled and progressively replaced with suitable alternatives on the EU internal market. Use within the EU/EEA of substances that are included in Annex XIV is thus subject to authorisation according to Article 56. However the placing on the market or the use of an imported article which contains an Annex XIV substance is not subject to the authorisation requirement. But if not specifically exempted otherwise, the incorporation of an Annex XIV substance into an article is a use which is subject to the authorisation requirement. Moreover, the Chemical Safety Report of an application for authorisation for a given substance should cover the whole substance service-life for the "use(s) applied for", including the service life of articles and the waste stage according to Article 62(4)(d) and Annex I of REACH)².
- Annex XVII – restriction – a risk based approach that limit or ban the manufacture, placing on the market or use of certain substances as such that pose unacceptable risks to human health and the environment under normal foreseeable uses, in chemical mixtures and in articles and materials. Inclusion in Annex XVII is the only way to regulate the occurrence of SVHC or other hazardous substances in imported articles. Some of the present restrictions in Annex XVII include textile uses and applications.
- The textile-relevant substances on the candidate list and in the Annexes XIV and XVII are listed in Appendix 1.

²https://echa.europa.eu/view-article/-/journal_content/title/guidance-on-inclusion-of-substances-in-annex-xiv

- POP Regulation
 - The POP Regulation (EU) No 850/2004 (European Commission, 2004) regulates and restricts production and use of PBT/vPvB substances that have been assessed and consolidated as POPs. The POP Regulation is endorsed by the legally binding commitment from the Stockholm Convention (UNEP). So far, focus has been on a few chemicals of concern, where use in textiles is mainly represented by: PFOS and PFOA and their related chemicals; certain brominated flame retardants; and short chain chloroparaffins (SCCP).
- Biocidal Products Regulation
 - Regulation (EU) No 528/2013 concerning the making available on the market and use of biocidal products (BPR) was finally published on 27 June 2012 in the Official Journal of the European Union (EU). This regulation is in force since 1 September 2013 and has replaced the old biocidal products directive (BPD) in EU/EEA.
 - The key principle is that treated articles should not be placed on the EU market unless all bioactive substances contained in the biocidal products with which they were treated or which they incorporate are approved for use in BPR. In addition to this, biocide treated articles require additional labelling under BPR.
 - Companies who are placing articles (such as textile products, furniture etc) on the EU market must receive information from their suppliers regarding whether their articles have been treated by biocides. If yes, companies need to know which biocides have been used for treatment and then make a decision regarding whether to stop selling treated article or re-label treated articles appropriately according to BPR.
 - BPR provides a positive list of approved biocides for different product types (PT) of products, where textile-relevant chemicals mainly fall under Product type 9 (PT9). Currently two substances have been approved for PT9: Propiconazole and Folpet. Triclosan and Cu-HDO have been subject to non-inclusion decision, and 38 substances are still under review.
- General Product Safety Directive
 - The General Product Safety Directive (GPSD) 2001/95/EC applies in the absence of specific European regulations on

safety of certain product categories and complements the provisions of sector legislation, which do not cover certain matters, for instance in relation to producers' obligations and the authorities' powers and tasks.

- The Directive provides a generic definition of a safe product. A product is deemed safe once it conforms to the safety provisions provided in European legislation or national legislation of Member States adopted in accordance with EU law. In the absence of such regulations, the product's compliance is determined according to other reference documents such as national standards, Commission recommendations, codes of practices.
 - In addition to the basic requirement to place only safe products on the market, producers must inform consumers of the risks associated with the products they supply. They must take appropriate measures to prevent such risks and be able to trace dangerous products.
 - The Directive provides for an alert system (Rapid Alert System for non-food dangerous products - RAPEX) between the EU Member States, Norway, Iceland and Liechtenstein, and the Commission. RAPEX ensures that the relevant authorities are rapidly informed of dangerous products.
 - Under certain conditions, the Commission may adopt a formal temporary Decision requiring the Member States to ban the marketing of a product posing a serious risk, to recall it from consumers or to withdraw it from the market. Such Decisions at Community level can be taken:
 - where the Member States have different approaches to dealing with the risks posed by such a product;
 - where urgency is required, and where no other Community law exists to deal with that serious risk;
 - where the serious risk can effectively be eliminated only by a Community measure.
 - A Decision in GPSD of this kind is temporary, normally only valid for up to one year. But it may be renewed and can result in a permanent legislation. Such emergency measures have already been taken for dimethylfumarate (DMF) and phthalates (substances used in plastics) which is now regulated in REACH.
- Toy Safety Directive

- The Toy Safety Directive (TSD, Directive 2009/48/EC) restricts occurrence in toys of chemical substances classified as carcinogenic, mutagenic or toxic to reproduction (CMR) of category 1A, 1B or 2 according to the CLP Regulation.

1.1.4 Cases of legal alert of product safety for articles that contained certain hazardous chemicals

The RAPEX system under the General Product Safety Directive was introduced above. Chemicals risks are one of the most often signalled risks every year in RAPEX. In 2015, chemical risks attained a maximum of 25% of all notifications in the system where textiles and toys are common examples of such notified products. The substances with high occurrence in textile materials are listed below:

- **Dimethylfumarate (DMF)**

- The biocide dimethylfumarate (DMF) is a powerful anti-mould chemical used in consumer products by placing it into desiccant sachets accompanying the products to keep them dry. DMF evaporates from the sachets into or onto the products, and from there penetrates through consumers' clothes onto their skin. It was widely used in everyday consumer products such as sofas and shoes. DMF can provoke allergic reactions causing skin itching, irritation, redness, burns and rheumatic pain.
- In 2009, the Commission adopted Decision 2009/251/EC, requiring Member States to ensure that, as of 1 May 2009, all consumer products containing DMF were banned (maximum limit: 0.1 mg DMF per kg of product or part of the product). Today there is a permanent ban of DMF included in 2012 in Annex XVII of REACH.

- **Phthalates**

- Phthalates are chemical substances used to soften plastics like PVC (Polyvinyl Chloride) used in many consumer products including toys and childcare articles. In 1999, a number of Member States expressed concern about the potential adverse effects that phthalates could have on the health of children. This led to a Decision under the General Product Safety Directive which temporarily banned the use of six phthalates in toys and childcare articles.
- In 2005, the restriction under the General Product Safety Directive was made permanent (Directive 2005/84/EC) and banned the use of phthalates in toys after a series of risk assessments confirmed the safety concerns making a difference between the three classified phthalates (bis (2-ethylhexyl)phthalate (DEHP), dibutyl phthalate (DBP) and butyl benzyl phthalate (BBP) and the three non-classified phthalates (diisononyl phthalate (DINP), diisodecyl

phthalate (DIDP) and di-n-octyl phthalate (DNOP). The ban is now included in Annex XVII of REACH (entries No 51 and 52). Conclusively this directive does not list certain chemicals but rather chemicals with specific hazard properties that may jeopardize article safety³.

1.1.5 Hazard classification – the tool to decide whether a substance has hazardous properties or not

Hazard classification is the general tool in legislative frameworks to decide whether a specific substance has hazardous properties or not, and is harmonized via the Global Harmonization System (GHS) (United Nations, 2011).

However, hazard classification on specific substance level varies both within and between jurisdictional areas. The lists with hazard classified substances may differ between different legal areas whether these hazardous substances are of legal concern or not (EU, US federal, California, China, Japan etc.).

In the EU only substances that have a harmonized hazard classification can be further regulated. In total, there are currently 4,522 substances that have an EU harmonized classification in the ECHA inventory out of in total 123,260 entries⁴.

If a labelling or declaration scheme is based on hazard classification, then the EU harmonized classifications should be the only kind of classification, where a list of these substances could be specified with CAS RN or EC No.?, where the chemicals producers and suppliers have a responsibility to provide solid scientific data for hazard classification and the competent authority to ensure clarity of hazard harmonized textile-relevant chemicals to provide legal certainty. Appendix 3 elaborates more on the procedures for hazard classifications within the EU.

³Though the GPSD does not address chemical substances in particular, Article 13 provides for the opportunity to adopt temporary “emergency” measures which may include limit values for chemical substances in consumer products. Such an emergency measure was used for dimethylfumarate (DMF) in textiles and leather goods, until a restriction could later be incorporated into REACH. The generality of the GPSD is complemented by e.g. specific product legislation. For example the Cosmetic Products Regulation (Regulation (EC) No 1223/2009) (European Commission, 2009) includes specific restrictions for hazardous chemicals in cosmetic products, and requires a full list of ingredients, and in addition that content of allergenic substances and nano-sized materials are highlighted.

⁴<http://echa.europa.eu/information-on-chemicals/cl-inventory-database>

1.1.6 Challenges in chemical information exchange along the value chain

The textile industry is one of the longest and most complicated industrial chains in manufacturing industry and has an extensive and diverse use of chemicals. In practice, the industry's task to obtain specific chemical information about hazardous chemicals used and emitted, is challenging. The challenges lie both in the inherent complexity of the identification of hazard classified textile-relevant chemicals and in the numbers of actors involved in the supply chain. More specifically, there are several challenges and obstacles such as organizational issues, linguistic issues and lack of knowledge.

Especially lack of knowledge in the value chain is problematic since upstream actors handling chemicals (textile manufacturers and their suppliers) are not necessarily trained in chemistry and chemical management. Cultural differences and organisational differences may also contribute to the challenge of information exchange. However, where EU law has become clear on textile-relevant hazardous chemicals there is a trend that suppliers from production countries outside EU/EEA have improved in identifying and communicating these hazards with their European textile retailer customers. Current examples are the banned arylamines that derive from certain azo dyes and are seldom observed nowadays in imported textiles. This can also rely on implemented legislation in production countries that have applied EU law in order to facilitate trade with EU.

The information exchange in the textile value chain is illustrated in a simplified manner in Figure 4, starting from chemical suppliers, raw material producers down to the retailer. Information along this chain has to be transferred between actors along the routes indicated by red arrows. However, with the obstacles stated above, important chemical information is easily lost, disabling comprehensive information exchange. However, hazardous textile-relevant chemicals of trans-boundary concern could be specified in labelling and/or declaration schemes. Such schemes would then support the industry to enhance and improve this critical communication and possibly result in the phase-out of these hazardous chemicals and introduction of much less hazardous but technically feasible alternatives.

It shall however be emphasised that the chain is divided upstream into two streams; one that may have direct contact with the textile company, namely the raw material producer, and one stream that own the chemical information but does not usually have contact with the final business to business customer (as can be seen in the illustration in Fig-

ure 4). Furthermore, European downstream actors (i.e. brands and retailers) should have the knowledge about restricted or unwanted chemicals, but they often lack sufficient information on which chemicals are actually being used in the production countries. These chemicals may include restricted substances in the EU, which may be allowed in these countries.

Figure 4. Simplified illustration of the textile value chain and the information exchange routes between actors.

In order to comply with existing legislation and to fulfil customer demands, some kind of chemical management is utilised by all actors on the market. Current chemical management systems are designed and intended to handle the obstacles. For textile brands many companies use so called Restricted Substance List (RSL) as their core tool in the chemical management system. The RSL normally consists of chemical names as well as CAS numbers of the specific substances. In some cases the lists also give guidance to where the chemicals may be found in the production or with information of the function provided. Substances included in such lists mainly consist of restricted substances often but not always related to the textile materials, see Appendix 1. Some front runners occasionally and additionally include substances that may be, but not yet are, regulated in their RSLs together with already regulated and often textile-relevant substances such as SVHC and skin sensitizers (allergenic).

Managing the RSL compliance in the value chain is normally accompanied with contracts, audits, chemical testing and dialogue including

educational activities. Some brands also add some of the voluntary systems, described in 2.2, to follow-up on chemicals issues in the supply chain. All of the above mentioned activities are part of a textile company's and brand's possibility to reduce risks related to hazardous substances (for workers, consumers and the environment). To our knowledge, no companies use RSLs including requirements solely based on hazard properties, which is logical since the companies need requirements that are possible to follow up⁵. More specifically, it is challenging in audit and dialogue situations upstream when the requirements are only based on classification and hazard properties and the context of risk of exposure and harm to all recipients in the value chain including the final consumer. There are likely several reasons why there are challenges in effective dialogues: there is no knowledge available regarding who to communicate with; there is a lack of knowledge between communicators; there is bad precision in textile relevance of RSL listed chemicals; or there is simply no willingness to exchange critical chemicals information since most often presence of hazardous regulated and/or non wanted chemicals may be seen as bad publicity by the producer.

Appendix 1 contains the requirements of the AAFA guide (AAFA, 2015), which guides the members of the American Apparel and Footwear Association (AAFA) and the Chemicals Guide (Swerea IVF, 2016a). Hence, the Chemicals Guide is a commonly used guide in the Nordic countries. This support guidance document originates from a Nordic knowledge platform called the Chemicals Group at Swerea IVF that consists of more than 100 major Nordic textile retailers.

Since the textile relevance of chemicals listed in any RSL or similar tool irrespectively of its origin, it is crucial that not only hazard is a selection criteria in any steering document. If hazard is the sole parameter for listing chemicals in an RSL or similar, it will impair the precision in the up/down stream communication to identify hazards and eventually achieve substitution in a successful way.

There are examples of published RSLs that are based on requirements based solely on hazard classification. We have such examples in public procurement (see Appendix 1).

⁵ For example "all allergenic substances are banned" would be meaningless, to tell a supplier since the classification of substances as allergenic is not harmonized, see section 1.1.3.

1.2 Project aim and setup

The overall project aim is to perform an analysis, which provides an overview of the needs, possibilities and consequences to policymakers and authorities, where society can benefit from a successful phase out of hazardous chemicals in textiles for years to come.

This aims to be the introductory material supporting the analysis of possibilities and limitations of an EU requirement to declare and/or label content of selected chemicals or groups of substances in textiles. Groups of substances that could be relevant for inclusion in a possible declaration and/or labelling restriction are, for example, allergenic substances or endocrine disruptors. Furthermore, the analysis includes the ability to declare and/or label the chemical content in textiles, for example by a physical marking of clothes or electronic solutions.

There are a number of possible positive consequences from legal labelling and/or declaration standards of chemicals in textiles. Such schemes enable the protection of consumers and workers health and also the protection of the environment locally and globally. In addition, it enables a circular economy based on high value secondary raw materials.

The work includes the following activities:

- 1A. Mapping of the on-going international activities in the area of declaration and labelling of chemicals in textiles. **(Chapter 2)**
- 1B. Survey of consumer demand/need for declaration and/or labelling of chemical content of textiles in the EU, through contact with relevant consumer and environmental labelling actors. **(Chapter 3)**
- 1C. Mapping substances to include in labelling/declaration:
 - substances that are harmful to consumers
 - substances that have harmful effects on the environment in the country of manufacture and on the health of textile workers
 - substances that pose risks during recycling. **(Chapter 4)**
- 1D. Impact assessment of both positive and negative effects of introducing a declaration and/or labelling requirement, including the implications for different actors in the value chain including exporters and materials recyclers. **(Chapter 6)**
- 1E. Analysis of legal and practical possibilities to import goods with a declaration and/or labelling requirement in place, including who should be responsible for declaration and/or labelling (e.g. manufacturers, importers or other actors). **(Chapter 5)**

- 1F. Development of a first proposal for a joint Nordic strategy for the introduction of a system for declaration and/or labelling within the EU, if the analysis shows that it is feasible. **(Chapter 7)**

2. International labelling and declaration activities

Today, there are many on-going international activities of legal character but also the development of voluntary schemes and implementation projects in the area of labelling and declaration of chemicals in textiles. This chapter begins with an overview of legal acts related to textile labelling and declaration of chemicals in textiles today, followed by an overview of voluntary labelling and declaration schemes and ends with a description of on-going activities both in the industry and by authorities.

The chapter partly includes information about labelling and declaration activities (legal acts and voluntary) for other product groups. The knowledge of which substances that have been regulated, and in which ways, for other product groups, together with experiences of benefits and drawbacks with different legislation designs from implementation and market surveillance is useful information when suggesting new legislation.

In this context, it is important to recognize the difference between a label and a declaration. A label consists mainly of a symbol including limited amount of information. Examples of such labels are the Nordic Swan, the CE-mark, but also the companies' own labelling of their products, such as "PFC-free". In Appendix 1, Table A1.1, different labels are shown. These represent labels which have the intention to point out absence of certain chemicals, a whole list as in the first example, or one at a time as in the second example. The label itself will most likely be physically present on the product. Further details related to the label may be presented in a tag or in other places, e.g. a website. Declarations on the other hand, are usually a list with either a positive list (all chemicals in the product, selected declarable hazardous chemicals) or a negative list (a list of chemicals not present in the product). Further, a declaration can be a report to authorities or a mandatory document to be kept at the company's website etc. Label and declaration systems may be used in combination.

2.1 Existing legal acts related to textile labelling and declaration of chemicals in textiles

Current legal requirements on textile labelling and declaration of chemicals in textiles are presented in Table 1. In addition, the table includes other relevant labelling schemes for consumer products of interest for labelling of textile consumer products. Either they are selected because they contribute with *experience on which communication wheels⁶ that work and in which contexts*, or they state examples on *information requirements on regulated products*. The table is not complete in terms of international legislation but covers mainly countries where information is available in English and the legislation is at the forefront.

Table 1. Selected legal acts related to labelling and declaration of chemicals in consumer products including their jurisdictional areas.

Legal act	Related scope for current report	Jurisdictional area
Regulation (EU) No 1007/2011 on textile fibre names and related labelling and marking of the fibre composition of textile products	Labelling requirements for fibre names and fibre composition of textile products and textile components of products	EU
Regulation (EU) No 528/2012 concerning the making available on the market and use of biocidal products	Labelling requirements for content of biocides (active substances). Information duty to consumers.	EU
Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	Information duty to consumers on SVHC substances on the candidate list ⁷ upon request for private citizens and immediate information duty for EU professional actors.	EU
Regulation (EC) No 1223/2009 on cosmetic products	Full content declaration, and in addition, labelling requirements for allergenic and nano sized content.	EU
Directive 2011/65/EU on electronic equipment.	CE-marking	EU
Directive 93/42/EEC for medical devices	CE-marking	EU
GHS/CLP, European Regulation (EC) No 1272/2008 on classification, labelling and packaging (CLP) of chemical substances	Harmonized system for classification and labelling of chemical hazards of substances and mixtures.	Global/EU

⁶ Communication wheel can mean any interface for communicating information between two actors.

⁷ Substances on the candidate list are selected high priority substances among all the substances that are carcinogenic, mutagenic and toxic for reproduction (CMRs), persistent, bio-accumulating and toxic/very persistent and very bio-accumulating (PBTs/vPvBs), and chemical substances identified as causing serious and irreversible effects to humans or the environment equivalent to the effects.

Legal act	Related scope for current report	Jurisdictional area
National legislations on formaldehyde	Labelling requirements for textile products containing formaldehyde	Austria ⁸ , Germany ⁹ Japan ¹⁰ etc.
Regulation (EU) No 1169/2011 on the provision of food information to consumers	Labelling requirements for allergenic content	EU
Directive 94/62/EC on packaging and packaging waste	Voluntary marking symbols on the product	EU
The General Product Safety Directive (GPSD, Directive 2001/95/EC)	Requirement of general consumer safety and that non-compliance shall be reported in the RAPEX system.	EU
Regulation (EC) No 765/2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products	CE-marking	EU
Regulation (EC) No 648/2004 on detergents	Declaration of all ingredients in groups and also labelling requirements for allergenic content	EU
Directive 2009/48/EC on the safety of toys	Chemical restrictions, compliance is declared by the CE-mark	EU
Directive 89/686/EEC on personal protective equipment	Chemical restrictions, compliance is declared by the CE-mark	EU

The selected legal acts shown in Table 1 implies already labelling and/or declaration of chemical content for some categories of products, due to their normal foreseeable use e.g. medical devices or full content declaration for cosmetics, that may otherwise pose an unacceptable risk if not safe enough and consequently ensures safety as far as possible to the user. Some of the articles have general requirements to state a list of ingredients on the packaging (food, drugs, cosmetic) whereas others only have the claim of the inclusion or exclusion of a certain substance. Finally, CE-marking has an own solution in that the chemical requirements is not linked to any statement on the product but have requirements about chemical content that in turn enables an approval of the article, see Appendix 4 for more info about the CE-mark.

Whether any of the existing legislative frameworks is suitable to follow, or if a new communication wheel should be developed for textiles, is discussed further in Chapter 5.

⁸ Formaldehydverordnung, BGBl Nr. 194/1990

⁹ Bedarfsgegenständeverordnung, Annex III, No 9

¹⁰ Japanese Law 112

2.2 Voluntary textile labels

In this section a number of voluntary schemes relating to chemical labelling and /or declaration are presented. Either they are selected *because they are commonly used communication wheels in the textile value chain* or they *state examples of information requirements on regulated products* that are important as benchmarks in this study. Table 2 is not complete in terms of international voluntary actions but provides an overview of the most relevant schemes.

Chemicals included in the voluntary schemes are usually related to both regulated chemicals, and to chemicals that pose risk to environment or health but are not regulated (see Appendix 1). Some schemes offer a consumer oriented label that enables article suppliers to show customers that they are frontrunners.

In addition, the scheme itself often provides a chemical management “solution” that is supportive for companies in their chemical management work and, in particular, their chemical compliance work towards authorities and also towards customer demands. The EU-based companies need to be compliant with the EU laws, but their non-EU based suppliers do not. Voluntary textile labels are hence a way for EU-based textile importers to verify that non-EU-based suppliers follow EU laws.

Since the voluntary schemes today work much more with visualisation in different ways of the chemical management work and result of this work, in comparison to legal schemes, they are often used in marketing.

Information about hazardous chemicals in textiles targeting consumers is today given generally by eco-labels. However, such information is usually not stated on the product itself but rather information sourced at the related homepage. Even then, detailed information on substance level is not always provided.

A broad range of voluntary textile labels exist^{11,12}, the Ecolabel Index currently has a list of 108 textile ecolabels¹³. Table 2 lists and compares a selection of well-known labelling schemes that address content of chemicals in the textile product. The most common environmental textile label globally is the Oeko-Tex® 100 certification, followed by

¹¹ <https://center.sustainability.duke.edu/sites/default/files/documents/ecolabelsreport.pdf>

¹²

<http://www.mistrafuturefashion.com/en/publications/Documents/reviewofecolabellingapproachesinfoodandfashion.pdf>

¹³ <http://www.ecolabelindex.com/ecolabels/?st=category,textiles>

BlueSign and GOTS. The Nordic Swan and the EU Ecolabel are included since they are the official ecolabelling schemes in the Nordic countries and in the EU. A comparison of the substance coverage of the labels is found in Appendix 1.

Table 2. Textile labels addressing chemicals content in textile products.

Organization/ label	No of labelled textile products	Related scope	Life cycled based	Method
Oeko-Tex 100 ¹⁴	>100,000	Content of chemicals harmful to health and environment ¹⁵	No. Only analysis of chemicals in final product	Lab analysis and information about input chemicals.
BlueSign ¹⁶	>10,000	Use of chemicals harmful to health and environment	Yes. Covers all relevant parts concerning chemicals in textile production.	Input RSL ¹⁷ including on-site inspection at the manufacturer. Includes test for some chemicals.
GOTS ¹⁸	~3,000 (manufacturers)	Content of chemicals harmful to health and environment	Yes. Covers all relevant parts in textile production.	As above
Nordic Swan ¹⁹	827 ²⁰	Use of chemicals harmful to health and environment	Yes. Covers all relevant parts in textile production.	Declaration from chemical supplier of non-use, including on-site inspection at the manufacturer. Includes test for some chemicals.
EU ecolabel ²¹	647	Use of chemicals	Yes. Covers all	

¹⁴OEKO-TEX® Association, 2013. OEKO-TEX® Standard 100. <https://www.oeko-tex.com>

¹⁵OEKO-TEX® 100 state that they guarantees REACH compliance and covers today more than the original scope of only health related hazards .. Scope quote: "To level out global differences regarding the assessment of possible harmful substances in textiles and identify and eliminate potential sources of problematic substances at each processing stage."

¹⁶BLUESIGN®, 2013. BLUESIGN®. <http://www.bluesign.com/>

¹⁷ RSL = Restricted Substance list

¹⁸www.global-standard.org

¹⁹<http://www.svanen.se/en/>

²⁰ Ecolabelling Denmark, pers. comm. Data extraction from the Nordic Ecolabelling organisations, May 2016

Organization/ label	No of labelled textile products	Related scope	Life cycled based	Method
		harmful to health and environment	relevant parts in textile production	Declaration from chemical supplier of non-use, including on- site inspection at the manufacturer. Includes test for sev- eral chemicals. Read the criteria document, 2014/350/EU, espe- cially Annex 1.

2.2.1 Official certified eco-labels for textile products in the Nordic area

The Nordic Ecolabel

The Nordic Ecolabel, also called the Nordic Swan, was established in 1989 by the Nordic Council of Ministers and has today criteria for 63 product groups²². It is a Type I environmental label according to the ISO 14020 standard. ISO 14024 provides the following principles for operating an ecolabelling scheme(ISO, 1999):

- Environmental labelling programmes should be voluntary
- Compliance with environmental and other relevant legislation is required
- The whole product life cycle must be taken into consideration when setting product environmental criteria, e.g. extraction of resource, manufacturing, distribution, use and disposal relating to relevant cross-media environmental indicators. Any departure from this comprehensive approach or selective use of restricted environmental issues has to be justified
- Product environmental criteria need to be established to differentiate environmentally preferable products from others in the product category when these differences are significant.

²¹<http://ec.europa.eu/environment/ecolabel/>

²²<http://www.svanen.se/en/>

The criteria are under continuous development under a pan-Nordic team (Nordic Ecolabelling, 2014). There are today 827 labelled textile products certified according to the textile criteria document (Nordic Ecolabelling, 2016) which is far less compared to the other textile schemes mentioned in Table 2, if only the quantitative aspect is considered.

The EU Ecolabel

The EU Commission decided in 1992 to launch a common Ecolabel for the European market (European Commission, 2010). The criteria are commonly developed by the commission's research centre in Seville, Spain. The EU Ecolabel is very similar to the Nordic Ecolabel, it is also a Type I environmental life cycle based label and the criteria are gradually made more stringent. There are today 647 labelled textile products, certified according to the EU Ecolabel textile criteria document. The EU Ecolabel is managed by the same organisations as the Nordic Ecolabel in the Nordic Countries.

2.3 On-going regulatory and voluntary activities

Below is described the on-going activities in terms of voluntary chemicals management schemes in the industry, activities in the EU, Nordic countries and US (i.e. California), that can be considered advanced in terms of legal development, and finally the UNEP activities in the area of chemicals in textiles.

2.3.1 Voluntary chemicals management

Other voluntary tools for reducing the content of hazardous chemicals in textiles are for instance:

- the AAFA guide²³, providing an RSL for the apparel and footwear industry, see Appendix 1.
- the Chemicals Management Module (CMM)²⁴, providing a scheme for evaluating management measures to improve the chemicals

²³ AAFA, 2015. AAFA Restricted Substance List. <https://www.wewear.org/rsl/>

management. CMM is the chemicals management part of the Higg Index by the Sustainable Apparel Coalition (SAC).

- the AFIRM Supplier Toolkit²⁵, provides an RSL and chemicals management tool for the apparel and footwear industry.
- the Zero Discharge of Hazardous Chemicals (ZDHC) Programme (ZDHC, 2014). ZDHC is directed towards RSLs for production sites (Manufacturing RSL) but has bearing on the content of chemicals in textile products and chemicals registry portal²⁶.
- the Chemicals Guide from the Chemicals Group at Swerea IVF (Swerea IVF, 2016a), provides a guide to avoid unwanted chemicals in textile products which is used by over 100 textile companies in Sweden, Denmark and Norway²⁷.
- The SIN list from ChemSec (ChemSec, 2016), which identifies all substances with SVHC properties, also those that have not been included in the candidate list and their Textile guide that provides chemicals management in textile value chains²⁸
- Chemical footprint project run by Clean Production Action in Massachusetts, United States²⁹

Neither of the above mentioned voluntary acts can be used to certify products, i.e. claim or guarantee inclusion or exclusion of certain hazardous substances in the final product, since they are guidelines in the chemical management work and no certification schemes. Further, the OECD has recently made an overview of chemicals substitution tools (OECD, 2015) providing a good overview of commonly used tools.

As can be seen already from the selected list above there are many different tools and initiatives developed for different purposes. Most of the voluntary chemicals management schemes have a large amount of cross-talk between them, and the criteria for selecting substances, as well as the resulting RSLs are quite similar. In Appendix 1, the substance selection for the AAFA guide and the Chemicals Guide from the Chemicals Group at Swerea IVF are shown to correspond well both to each

²⁴ Part of the Higg Index from Sustainable Apparel Coalition and Outdoor Industry Association, 2014. Chemicals Management Working Group (CMWG).
<http://outdoorindustry.org/responsibility/chemicals/index.html>

²⁵ <http://www.afirm-group.com/>

²⁶ <http://www.roadmaptozero.com/news/post/zdhc-chemical-registry/>

²⁷ <http://www.kemikaligruppen.se/>

²⁸ <http://chemsec.org/business-tool/>

²⁹ <http://cleanproduction.org/chemical-footprint/cfp>

other but also to different eco-labels. The SIN list includes more chemicals, however, not all of them are of relevance for textile products.

2.3.2 Regulatory and voluntary activities in the EU

The European Commission has prepared a suggestion to restrict substances with a harmonized CLP classification as carcinogenic, mutagenic or reproduction toxic properties category 1A or 1B (CMR-substances) in consumer textiles, such as clothes, home textiles, towels, etc. within the REACH regulation, Article 68:2 (European Commission, 2015). Restriction under REACH article 68.2 means that a group of substances can be proposed for restriction based on their CMR-properties (harmonised classification as CMR1A/1B according to CLP). This allows for faster handling by the European Commission and also for regulation of whole groups of substances within REACH. This possibility has only been used once before so this has been considered as one of the test pilots for paragraph 68:2 in REACH. The suggestion includes three lists of CMR-substances which are likely to be found in textiles (Fransson et al., 2015).

The European Commission performed a study on labelling of textile products in 2010 (Kidmose Rytz et al., 2010) in connection to the development of the regulation on textile names and related labelling of textile products (currently Regulation (EU) No 1007/2011 (European Commission, 2011)). The study investigated whether other textile labelling requirements could be brought up in EU legislation, including care instructions, chemical substances in textiles, electronic labelling (RFID), country of origin, organic, and size labelling etc. The study also investigated different actors' needs, concluding that consumer organisations generally favour harmonised, mandatory systems. Industry organisations are generally in favour of voluntary systems, and for the member states, any mandatory labelling system would increase requirements for market surveillance, the report concludes.

In a more recent study by the European Commission on labelling (European Commission 2013)³⁰ it was indicated that the development of new initiatives, to establish new labelling requirements for textile products, is of interest to consumers. However, on the basis of the evaluations carried out, the Commission concludes that labelling requirements do not need to be addressed in the Textile Regulation, given they are

³⁰<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0656:FIN:EN:PDF>

currently in place or being developed under other regulatory or non-regulatory frameworks.

The European Commission concludes that further efforts in research and deployment of alternative and non-allergenic substances are deemed important particularly concerning labelling requirements for allergenic substances used in textile manufacturing. Although some voluntary labelling schemes do already exist to inform consumers about the presence of hazardous substances (including allergenic substances) in textile products, labelling schemes and other tools to convey information on allergenic substances should be further investigated according to the European Commission. Also, the need for further measures to control the presence of substances (in particular sensitizers) which are found in finished textile products, and may be released from products, should be assessed and, if appropriate, addressed under the relevant instruments available in EU chemicals legislation, and in particular under the REACH Regulation. Additionally, according to the European Commission, the outcome of parallel processes, such as the on-going revision of the EU Ecolabel criteria for textile products, will be taken into account.

Green Public Procurement within the EU

Since 2008, the European Commission has more than 20 common EU Green Public Procurement (GPP) criteria for a range of different products and services³¹. Green Public Procurement is a voluntary instrument that outlines the rationale for the core and comprehensive environmental purchasing criteria that are being proposed. The EU GPP criteria (also for chemicals in textiles) are developed to facilitate the inclusion of green requirements in public tender documents. While the adopted EU GPP criteria aim to reach a good balance between environmental performance, cost considerations, market availability and ease of verification, procuring authorities may choose, according to their needs and ambition level, to include all or only certain requirements in their tender documents.

For each product group such as textile, two sets of criteria are presented (see also Appendix 1):

- The core criteria are those suitable for use by any contracting authority across the Member States and address the key environmental impacts. They are designed to be used with minimum additional verification effort or cost increases.

³¹http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

- The comprehensive criteria are for those who wish to purchase the best environmental products available on the market. These may require additional verification effort or a slight increase in cost compared to other products with the same functionality.

The basic concept of GPP relies on having clear, verifiable, justifiable and ambitious environmental criteria for products and services, based on a life-cycle approach and scientific evidence base. In the Communication “Public procurement for a better environment” (COM, 2008) the Commission recommended the creation of a process for setting common GPP criteria.

2.3.3 Activities in Norway

In Norway, the Nordic Ecolabel and the EU Ecolabel are used on textile products, as well as Oeko-Tex® 100 and other voluntary textile labels. The Norwegian Environment Agency is not working with labelling of chemicals in textiles but follows the on-going international activities³².

2.3.4 Activities in Denmark

The Danish EPA is driving the action plan for textiles (Nordic Council of Ministers, 2015), which this report is an activity in, as described in the preface. The goal is to make Nordic fashion the most sustainable in the world. In Denmark, the Danish EPA has worked with different measures, such as an industry dialogue, “Partnerskabet for Kemi i Tekstiler”³³, and studies on recycling of textiles, for example the “Kemiske stoffer i forbrugerprodukter, der kan hinder genanvendelse” and the “Life Cycle Assessment (LCA) of different treatments for discarded textiles”. In 2015, the Danish EPA provided funding to textile companies making it possible for them to get consultancy support in ecolabelled textile production, with the aim of increasing the number of Danish companies with either an EU Ecolabel or a Swan ecolabel.

³² Personal communication with Trine Torgersen Sjøfingeniør, Produktseksjonen Miljødirektoratet

³³<http://mst.dk/service/publikationer/publikationsarkiv/2016/jan/partnerskab-for-kemi-i-tekstiler/>

2.3.5 Activities in Finland

In 2011, the Finnish Environmental Institute made a case study regarding content of hazardous chemicals in textile products (Assmuth et al., 2011). This report deals with policy and practical issues, and presents both possibilities for regulatory measures (e.g. improved implementation of existing regulations, development of additional legislation and public procurement) and measures by firms and other organisations (e.g. active compliance work, better information exchange between business partners, eco-labelling). There is currently no on-going activity addressing chemicals in textiles at the Finnish Safety and Chemicals Agency (TUKES) other than the Nordic collaboration³⁴.

2.3.6 Activities in Sweden

The Swedish government have overall environmental goals linked to the Swedish Environmental Objectives³⁵, which include an improved knowledge on hazardous chemicals in articles. The Swedish Environmental Protection Agency and the Swedish Chemicals Agency are working towards these goals that also include textiles, for instance within the national target for resource efficient and toxic-free material cycles (Östlund et al., 2015) and an action plan for toxic-free everyday life. Specifically the goal states: by 2020, the material cycles for textiles are as far as possible free from hazardous substances. Recently Sweden issued an RMOA (Risk Management Option Analysis) that covers skin sensitising substances with a harmonised classification as Skin Sensitising category 1/1A/1B according to the entry in table 3.1 in Annex VI of CLP Regulation (Regulation (EC) 1272/2008) in textile articles³⁶.

The work includes both dialogues with national actors in the textile sector, in order to increase knowledge and promote substitution, as well as initiatives at EU level regarding legislation on hazardous substances in textiles. Based on the polluter pays principle (PPP), Sweden is currently discussing a tax on consumer products containing hazardous substances³⁷. The objective is to create awareness and incentives to phase out not yet regulated hazardous chemicals. The information gained would also be beneficial in the light of resource efficient and toxic-free

³⁴ Personal communication with Annette Ekman, Finnish Safety and Chemicals Agency (TUKES)

³⁵ <http://www.miljomal.se/Environmental-Objectives-Portal/>

³⁶ <https://www.echa.europa.eu/web/guest/addressing-chemicals-of-concern/substances-of-potential-concern/pact/-/substance-rev/13911/term>

³⁷ <http://www.regeringen.se/rattsdokument/statens-offentliga-utredningar/2015/03/sou-201530/>

material cycles. Clothing and shoes are not included at this point, but there is a description on how such a tax could be designed also for this product group, including a preliminary impact assessment of the excise duty.

2.3.7 Activities in the US

The Californian Office of Environmental Health Hazard Assessment (OEHHA) has on-going work in updating the Proposition 65 act, concerning the requirements for labelling (Article 6) of consumer products containing carcinogenic and reproduction toxic substances, over the Safe Harbor levels³⁸. On 27 November 2015, they published a proposal for a modified procedure, which is open for comments until 6 June 2016.

The current proposal makes mandatory a warning symbol, the word “WARNING”, and a statement:

“This product can expose you to chemicals such as [name of one or more chemical], which is [are] known to the State of California to cause [cancer and birth defects or other reproductive harm]. For more information go to www.P65Warnings.ca.gov/product.”

The Proposition 65 act has received severe criticism for making such abundance of warnings that it has lost its clarity (Borrell, 2009) and is now under revision for readability and clarity (OEHHA, 2015).

2.3.8 UN activities

In the UN there are also ongoing activities e.g. within the United Nations Environment Program (UNEP), which includes the project Chemicals in Products (CiP) initiated 2008. The goal is to protect the environment and human health from hazardous chemicals in textile consumer products. In this ongoing study it was early recognized that “information on chemicals, including chemicals contained in products, is essential if proper management of those chemicals is to be possible” (Munn, 2011).

³⁸ Safe harbor levels, which include No Significant Risk Levels (NSRLs) for cancer-causing chemicals and Maximum Allowable Dose Levels (MADLs) for chemicals causing reproductive toxicity, have been established for many, but not all, of the chemicals listed under Proposition 65. Exposure levels and discharges to drinking water sources that are below the safe harbor levels are exempt from the requirements of Proposition 65. For substances without safe harbor levels, enforcement actions result in negotiations of acceptable exposure levels in specific settlement agreements.

A survey of feasible product labelling for possible POP-containing products, not only textiles, was a first step (UNEP, 2012). Further, a major upstream information project within the CiP programme, along some real textile value chains, coordinated by UNEP, is planned in cooperation with major textile brands, the international chemicals industry, academia and six Asian Governments (China, Vietnam, Philippines, Singapore, Bangladesh and Pakistan). The aim of this project is to support implementation in practice of the chemicals restrictions agreed on in the Stockholm Convention and to phase out certain identified chemicals of concern at source with the local authorities acting as the driver. The project start is foreseen to be in 2017³⁹.

In short, this project starts with an identification of POPs and other chemicals of concern (CoC) in the textile sector. This is followed by a transition to less hazardous and technically feasible alternatives to POPs and other priority CoCs. Those countries empowered to meet Stockholm Convention reporting needs for substitution as a result of their inventories through data collection and effective tools for identification and substitution of CoCs. Currently, a labelling requirement is in place only for PCBs, designed to keep track of appliances (equipment) containing PCBs so that important information is not lost during the use or disposal phase. Parties to the Stockholm Convention (regulating POPs) are required to identify and remove from use equipment containing PCBs, as well as to attach labels indicating the presence of PCBs in appliances. UNEP also highlighted the labelling approach to identify certain flame retardants in plastics (ISO 1043-4) (ISO, 1998) as a good example.

³⁹<http://www.unep.org/chemicalsandwaste/SAICM/ChemicalsInProductsCiP/tabid/56141/Default.aspx>

2.4 Conclusion on international labelling and declaration activities

This chapter has provided an overview of legal acts and voluntary schemes related to labelling and declaration of chemicals in products. The existing schemes have different solutions for declaration of chemicals in products, both in terms of requirements and in terms of schemes for implementation and following-up. For example some schemes address a single substance (national legislations on formaldehyde) while others address multiple substances (California Proposition 65); some schemes specify the communication wheel (Directive 2009/48/EC on the safety of toys) while others require labelling of contents of active substances in biocide treated articles such as the BPR (EU Regulation No 528/2012). The variation is a natural consequence of that the schemes have been worked out in different contexts and for different product groups.

A broad range of voluntary textile labels exists; the Ecolabel Index currently has a list of 108 textile ecolabels. The most common textile environmental label globally is the Oeko-Tex® 100 certification⁴⁰, followed by BlueSign and GOTS, the Nordic Swan and the EU Ecolabel, which are all third party reviewed Type I environmental labels standardized by ISO 14024.

The textile industry works mainly with RSLs, for which there are several applied by companies and associations worldwide. Some are mentioned below:

- Joint Roadmap (ZDHC) a joint initiative among some major textile brands⁴¹.
- Afirm (Apparel and Footwear International RSL Management group)⁴²
- The American Apparel and Footwear Association (AAFA)⁴³
- The Chemicals Group of Swerea IVF⁴⁴

In the Nordic countries, over 100 textile companies use the Chemicals Guide from the Chemicals Group at Swerea IVF to build up their own RSLs.

⁴⁰ <https://center.sustainability.duke.edu/sites/default/files/documents/ecolabelsreport.pdf>

⁴¹ <http://www.roadmaptozero.com/>

⁴² <http://afirm-group.com/>

⁴³ <https://www.wewear.org/>

⁴⁴ <http://www.kemikaliegruppen.se/>

3. Consumer needs

Information about the consumer needs was collected using three different methods:

- consumer surveys;
- a questionnaire and/or interviews with key actors in the Nordic countries; and
- a literature study.

It is quite well known that what consumers say they do is not always what consumers actually do (Gwozdz et al., 2013). In this perspective it is wise to not only use information from consumers' self-reported behaviour.

3.1 Consumer surveys

Two independent consumer surveys were carried out, both during October 2016 using the same questionnaire. The first one was carried out by the Swedish Consumers' Association⁴⁵ as a web-survey. The request for participation was sent out to a panel of Swedish consumers that had signed up for participation in web-surveys on consumer-related issues in general. There were 236 respondents to the survey, with a small preponderance for women of age 58 or over. The second consumer survey was carried out by the Danish market research company Epinion⁴⁶. Also this survey was web-based and the request for participation was in this case sent out to the existing Epinion panels of consumers in three Nordic countries: Denmark, Norway and Sweden. In total there were 915 respondents in the three countries, with the same small preponderance for women of age 58 or over. See Appendix 2 for more information on the surveys and respondents.

⁴⁵<http://www.sverigeskonsumenter.se/in-english/>

⁴⁶<http://www.epinionglobal.com/>

The two consumer surveys confirmed each other regarding all questions, and gave clear answers:

- A majority of respondents (87-94%) answer that they think that textiles may contain hazardous chemicals.
- A majority of respondents (66-81%) answer that they have previously felt the need for a label that tells which chemicals are present in textiles.
- A majority of respondents (70-88%) answer that they would like a label that tells which chemicals are present in clothing and home textiles to exist.
- A majority of respondents answer that they would be most interested in knowing the presence of chemicals with health hazards, firstly if the product itself contains something hazardous (55-66% in all groups) and secondly if it has been produced using chemicals that have been hazardous for the textile workers (19-32% in all groups). A minority of consumers thinks that it would be most important to know if the product contains chemicals with environmental hazards (12-26% in all groups). A few respondents answer that they would be most interested in knowing if the chemical content makes the textile suitable for recycling (1-5%).
- A majority of respondents (76-83%) answer that they would use such a label to choose between different textile products.
- When considering their own total consumption, for example of travel, consumer electronics and food, the respondents answer that they often (63-70%) do actively choose products that carry environmental labels familiar to them.
- There are some specific chemicals that the respondents have heard may occur in textiles and that they would like to know if they do in a product that they buy, mainly phthalates, dye-stuff and flame retardants. This open question gave also an insight into the diversity of the nomenclature that consumers use regarding hazardous chemicals (see Appendix 2 for full list).

The results from the consumer surveys were thus very positive towards a label or declaration of some kind that tells which chemicals are present or that indicate absence of hazardous chemicals in clothing and home textiles. It was also clear that health hazards were most relevant to the consumers. It can be noted that only two of the respondents an-

swered that they were interested in knowing if the textiles contained any allergenic substances.

3.2 Questionnaire/interviews with key actors

The key actors were identified as organisations representing stakeholders that could contribute with valuable knowledge, e.g. consumer organisations, eco-labelling organisations and business associations. See Appendix 2 for more information on the questionnaire and respondents (8 out of 22 answered).

The eight respondents all stated that the possibility for the consumers to perceive and comprehend information regarding chemicals in textiles was very limited. Some consumer groups are more receptive, e.g. young persons or parents of young children. When specific substances are an issue in media etc., consumers are normally concerned with avoiding those in general and do not make connections to specific types of products.

Regarding what information is useful for and possible to act upon for the consumers, the answers were also that the information needed to be simple to be useful. Customers suffering from allergies are seen as a group that would have specific advantage if chemicals classified as sensitizers would be declared at product level. The consumer needs to handle lots of information about all types of products, and one of the respondents expressed strongly that the purpose with a consumer label must not be mixed-up with other purposes, e.g. bother the consumer with a consumer label that has another purpose than to protect or inform the consumer (e.g. a label with the goal to facilitate recycling). If the purpose is chemical safety, then it should not be used to “camouflage” other purposes.

The reflections regarding consumer perspective on how to design a system for declaration and/or labelling of chemicals in textiles dealt with transparent background for the label, relevant substances, and type of label/declaration. It should be very clear to the consumer that the label is not an eco-label, i.e. covering more aspects than chemicals (if not integrated with eco-label). Regarding what substances to include, if a label covers just one or a few substances the consumer might be misled (compare with product claims such as “BPA-free” or “paraben-free”). Fluorinated compounds may be relevant as a single group since they are still legal and there has been a lot of attention in media and may also be of high importance for recyclers to be aware of. Regarding type of label,

graphic symbols and electronic labelling were favoured by the respondents in comparison with information given as text. A marking could be placed on the care label, but to have too much information printed on or added via a physical label in the garment is difficult. People remove labels, it might therefore be better to have a symbol printed on the textile (if possible). Several people mentioned the use of the label for facilitating recycling, and that a label which could be handled by automated process equipment would be preferable. Other important aspects may be that the format should be harmonised between different articles and done by trustworthy organisations.

Three out of eight respondents answered that consumers are in general very positive to environmental labels. The other five respondents said that they have not experienced a demand for declaration and/or labelling of chemicals in textiles from consumers. The customers ask for organic clothes and sometimes for PFC (per- and polyfluorinated compounds) content after it has been highlighted in media.

The substances consumers usually ask about in textiles were (number of times explicitly mentioned): phthalates (5), fluorinated compounds (6), biocides (3), nickel (2), chromium (2), dyestuffs (5), substances on the REACH candidate list/CMR substances (2), hormone disrupting substances (2), brominated flame retardants (1), formaldehyde (1), PAHs (1), dimethylfumarate (1), NPEO (1) and hazardous substances in general (1). A relevant comment in this context is that most consumers expect the companies to control all social and environmental consequences connected to their products and believe that products on the market are “safe”. Another relevant comment is that voluntary labelling sometimes is seen as a market trick to sell more products.

3.3 Literature on consumer demand for information on chemicals in textiles

A literature search was made, including also the advice on literature from the key actors. In general, the needs for information about chemicals content in products are not very well explored. Recently, ECHA initiated a consumer dialogue asking for such input⁴⁷.

In the study on labelling of textile products from the DG IPOL (described in 2.3), prepared in relation to the upcoming fibre labelling directive (EU No 1007/2011), it was concluded that, generally, the consumer organisations do not follow the area of textile labelling very closely, with the exception of the labelling requirements for chemicals content (Kidmose Rytz et al., 2010). This was supposedly because improper textile labelling does, in most cases, not present a risk to consumers' health. However, consumer organisations generally favour harmonised, mandatory systems in order to ensure that consumers meet the same information across the EU. The consumer demands contrasted with the industry organisations' demands, which were generally in favour of voluntary systems, primarily due to the costs associated with mandatory system(s). Furthermore, the European Commission made a study regarding possibilities and barriers for a labelling scheme on allergenic substances in textiles (European Commission, 2013). The conclusions in this report were that the presence of allergenic substances in finished textile products and the risks they pose is an issue of importance to many consumers. The obstacles for including allergenic substances in the fibre labelling directive were e.g. that concentration levels that may generate allergic reactions in exposed groups of individuals were however not established for every substance that may be found in textile products, and uncertainties about the causal link between textile products and allergies in the population. In addition, existing horizontal legislation such as REACH and CLP could provide a solution to address the risks from certain substances in textile products, and no further measure was therefore necessary, the study concluded. Here the focus of the DG IPOL study was clearly on protecting the European customer rather than promoting a non-toxic supply chain for textiles.

⁴⁷<https://www.webropolsurveys.com/Answer/SurveyParticipation.aspx?SDID=Fin1162353&SID=0e89d416-5dc7-43db-bb46-bbd23563196e&dy=4592362>

In a more recent study by the European Commission on labelling (European Commission 2013)⁴⁸ it was indicated that the development of new initiatives, to establish new labelling requirements for textile products, is of interest to consumers. However, on the basis of the evaluations carried out, the Commission concludes that labelling requirements do not need to be addressed in the textile fibre regulation, given they are currently in place or being developed under other regulatory or non-regulatory frameworks. A recent consumer survey performed within the Mistra Future Fashion research programme concluded that many consumers would like to buy environmentally friendly garments but that they have difficulties distinguishing the clothes that are environmentally friendly (Gwozdz et al., 2013).

Companies can also gain from consumer label requirements. For products regulated by the European Cosmetics Regulation (EC No 1223/2009), it has recently been suggested a restriction against making claims that products are free from a certain chemicals, e.g. “paraben-free”, while it is still allowed to state “does not contain preservatives” etc. addressing a functional group of substances. This change is made in order to reduce the risk that consumers are misled by such a claim to think that the product does not contain any hazardous substances. The on-going discussion in the cosmetics industry is relevant also for the possible development of a label and/or declaration for chemicals in textiles since it highlights both the demand from companies to market consumer products based on chemicals content control and the demand for fair marketing.

3.4 Conclusion on consumer needs

Consumers showed to be very positive towards a label or declaration of some kind that tells which chemicals are present in clothing and home textiles. The two consumer surveys had in total 1151 respondents and had both a small preponderance for women of age 58 or over. A majority of the respondents answer that they would be most interested in knowing the presence of chemicals with health hazards, firstly if the product itself contains something hazardous (55-66% in all groups) and secondly if it has been produced using chemicals that have been hazardous for

⁴⁸<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0656:FIN:EN:PDF>

the textile workers (19-32% in all groups), and that they would use such a label to choose between different textile products.

It is clear from all the sources that the communication to the consumer must be made as simple as possible since the consumer has to cope with a large amount of information in daily life. The information must at the same time not be misleading and make the consumer think that the label implies an environmentally friendly garment in general, or that “free from”-claims means that there are no hazardous chemicals in the product. Thus, the consumers are e.g. not always served by retrieving information about chemical names. Instead, in the case when there is need for substance name information (for example for people suffering from allergy), the consumer can check which allergens that are covered once and then just look for a single label.

4. Relevant substances

When legal regulations and voluntary chemicals requirements for products describe which substances that are addressed in the regulation, this is done in various ways. Usually specific functions and/or properties are presented. Examples of specific functional property-lending chemicals may be flame retardants that provide flame retarded materials, fluorochemicals that provide water and soil repellent properties and pigments that provide colour to a material.

Another way to describe the addressed chemicals of concern is to relate to groups of chemicals with similar structures, for example phthalates, alkylphenolethoxylates (APEO) and short chain chloroparaffins (SCCP). These terminologies, of grouping of substances with similar chemical properties and/or within the same family of substances, are used in communication between companies and authorities and even customers.

4.1 Aspects of substance selection

This section describes aspects to consider before selecting which substances are to be included in a requirement for declaration and/or labelling of chemicals in textiles. The criteria for selection of substances to declare the presence of, or, absence of, in a textile product, should include documentation of a clear aim. Section 4.2 introduces a couple of examples of such aims that would be reasonable to select. It should be noted, that for reaching the aim, substances are selected based on their unwanted properties. However, it may still be important to communicate the rationale around selected substances in textile supply chains. Section 4.4 describes grouping of chemicals in alternative ways, and either way it is recommendable to list substances with their identity, i.e. CAS numbers. Additionally, aspects of relevant substances for various textile processes and expected properties of textiles should be taken into account (see section 4.5), and eventually an iterative process where the possibilities for legal enforcement, development of validated analytical methods and legal certainty, as described in chapter 5.2, are also considered. When critical chemical information is not obtained via the commu-

nication in the value chain, laboratory analysis is utilised as a risk management tool.

4.2 Aim with declaration/label requirement

Which substances that are relevant for a declaration/label requirement, depends on the aim with establishing the requirement. In practice, several of the aims listed below are envisaged as possible. There might be also additional aims with establishing a declaration/label requirement.

Aim 1: Protect the consumer

The aim can be to protect the consumer's own health, by minimising exposure during use, and consequently keep the consumer as safe as possible during the use of the textile product. This aim addresses textile consumer products containing substances that have the potential to be released from textile consumer products and are hazardous, for example:

- allergenic chemicals, (e.g. dyestuffs, biocides);
- carcinogenic, mutagenic or reproductive toxic chemicals, (e.g. dyestuffs, phthalates); and
- endocrine-disrupting chemicals (e.g. surfactants such as NP/NPEO).

Declarations and/or labelling schemes that should meet this aim need to be expressed in such a way that they are understandable for consumers with no chemistry background. The declarations would then be informative in a way that simultaneously lets the consumer see benefits in such declarations and/or labelling schemes to do a better choice from a non-toxic perspective.

Aim 2: Phase out harmful chemicals in the textile supply chain

The aim can be to protect not only people and the environment in the European countries, but also workers and the environment in the producing countries. All harmonised classified and textile-related substances are relevant here:

- allergenic chemicals;
- carcinogenic, mutagenic or reproductive toxic chemicals;
- substances with other hazardous properties, e.g. neurotoxicity or immunotoxicity, (e.g. perfluorinated surfactants);

- persistent and bio-accumulating chemicals, (e.g. silicon-based finishings)
- environmental toxic chemicals, (e.g. silver, NP/NPEO); and
- endocrine-disrupting chemicals.

Declarations and/or labelling schemes that meet this aim needs trans-boundary chemicals legislation beyond the EU borders. This means along the global value chain which is comprehensible to all actors both non –EU and EU actors down stream that prevents the introduction of known hazards listed above. A legal system of this kind is not feasible in the near future. However in a longer perspective a successful approach would mean that the production of textile articles entering the EU will have a sound chemicals management that do not include substances that are harmful to human health or the environment. This aim can be achieved by enabling the consumers to choose better products, which is more realistic than trans-boundary global legislation.

Aim 3: Protect the local environment in Europe

The aim can be to protect the local environment in the European countries. The import of products that contain unknown substances is a potential threat to the environment in the European countries if the substances are washed out in the waters or emitted to the environment. Diffuse emissions of chemicals from textiles can be a source of contamination and lead to exposure of the environment and also humans via intake routes such as drinking water and food supply. Textile-related substances that may be harmful in the European local environment are for example:

- persistent and bio-accumulating chemicals,
- environmental toxic chemicals, and
- endocrine-disrupting chemicals.

If the aim is to protect the local environment in the European countries, the exposure to only process related chemicals (see section 4.4), is irrelevant, unless traces of them can be found in imported textiles. Also relevant quantity and concentration of the chemicals differs in the situation for workers, with exposure during their entire working hours in comparison to for example consumers, exposed mostly occasionally. Likewise, there is a difference between local environmental exposures at production sites (where unwanted chemicals are not seldom washed out of the textile product before shipping to Europe) versus diffuse emis-

sions in the use phase or end-of-life phase causing emissions to the local environment in the European countries (of textile product content).

Aim 4: Facilitate reuse and recycling

The aim can be to provide information on the content of the product to actors in the end-of-life phase of the textile products, for example reuse and recycling facilities. Recycling processes can be facilitated if the content of chemicals is known. In addition, the RSL that are being used in the textile industry today for fulfilling the legal and customer demands may not always match the demand of the recycling industry or a high value recycled material. Textile-related substances that are relevant for recycling are for example persistent chemicals and heavy metals, since they will remain in the recycled material regardless of recycling technology, see Figure 5 below.

Figure 5. Schematic picture of transfer of chemicals in three different recycling processes (mechanical treatment, chemical treatment and incineration).

Groups of chemicals that should be declared in order to specifically facilitate recycling are all chemicals that pose risk for the user. However, substances of legal concern are today more related to chemicals with environmental impact such as:

- persistent and bio-accumulating chemicals,
- environmental toxic chemicals.

The European Commission is establishing end-of-waste criteria for a number of specific recyclable materials including metal scrap of copper, aluminium and iron, waste paper, waste glass, compost, and plastics that encompasses:

- Product quality requirements
- Requirements on input materials
- Requirements on treatment processes and techniques
- Requirements on the provision of information (e.g. documentation of end use, traceability systems, labelling).
- Requirements on quality assurance procedures

The European End-of Waste Directive (EoW) is intended to bring awareness of the need to comply with REACH/CLP/POPs obligations for EoW materials, and of the need to trace potentially problematic substances in textile cycles with improved functioning of the internal and external market to the EU, legal certainty, harmonized rules, etc⁴⁹.

In the context of EoW, feasible labelling that addresses the factual content of hazardous chemicals in textiles along the whole textile value chain is essential for the reuse and recycling of textile products in a circular economy.

Conclusively it is therefore recommended that the Nordic countries encourages the development of EoW criteria for textiles and are a strong force in the implementation of this in society. In this context the aim would be to support and enforce both a non-toxic environment and consumer products possible for sustainable reuse and recycling of textiles. If non compliant with EoW the textile material is considered as waste from a regulatory perspective.

4.3 Substance coverage in existing schemes

In Appendix 1 is shown an overview of substance coverage in different legal and voluntary schemes, and in addition which nomenclature is used. The legal schemes include the following regulations; REACH, the Stockholm convention (POPs legislation). Also the voluntary schemes include both labels on the market and examples of RSLs, i.e. OEKO-TEX

⁴⁹<http://susproc.jrc.ec.europa.eu/activities/waste/index.html>

100, Blue Sign, GOTS, Nordic Ecolabelling of Textiles, EU Ecolabel, EU GPP of textiles, AAFA RSL and The Chemicals Guide. If there is a label related to the scheme it is presented in the “product label” line. In Appendix 1 the chemicals are listed as generic groups of substances vertically such as toxic metals, ortho-phthalate plasticizers, or by functionality (such as flame retardants), where CAS no are used for identification of specific substances within respective group of substances. In Appendix 1, no specific substances are mentioned due to the fact that any comprehensive list of substances within each group listed may consist of hundreds of chemicals. If the group is represented in a scheme, an “X” is placed in the Appendix 1 table or the specific entry in REACH annex XVII is mentioned in parenthesis. In the case of the general restriction in REACH annex XVII on CMR classified substances, and their restricted use in the EU/EEA, these CMR classified substances are referred to the CLP database hosted at the ECHA home page⁵⁰. In Appendix 1 this can be found further down in the table, where the “X” represents such legal requirements. Additionally, some specific requirements are mentioned concerning pH on material level related to consumer safety, and also whether it is specified in the scheme how the requirements should be verified.

The authors’ conclusion is that since many requirements are similar to all schemes on group and substance level they all aim to fulfil legal requirements. For the voluntary schemes, developed by NGOs or authorities, they often include requirements based on classifications with the aim to manage chemicals in a proactive manner and to protect humans and the environment in the best way possible. However, the RSLs, developed by the companies to fulfil current legal requirements, are as mentioned before usually based on groups relating to specific CAS nr; sometimes also including non-regulated substances, indicating the necessity to be able to follow-up on the requirements.

4.4 Grouping of chemicals in communication based on properties vs. based on chemical structure

Chemical substances can be grouped in several different ways: based on their chemical structure (phthalates, polychlorinated bisphenyls etc.), based on their functional properties (plasticizers, flame retardants etc.)

⁵⁰<https://echa.europa.eu/>

or based on their toxicological properties (endocrine disrupters, carcinogens, etc.). While the chemical structure is a singular property, both the functional and toxicological properties are not; one substance may have one or many functional properties (e.g. both be a plasticizer and a flame retardant) and also one of many toxicological properties (e.g. both be endocrine disruptive and carcinogenic).

4.4.1 Grouping based on functional properties

The functional properties of chemicals can be further divided into use in the processing of textiles in the production (antifoaming agents, catalysts etc., functions selected by the process engineer), and use which provides function to the final textile product (softeners, plasticizers etc., functions selected by the product designer). Thus, a grouping of the chemicals in two sets (process chemicals vs. functional chemicals) in order to facilitate for companies to organize and target their chemical management in different ways, that may include daily routines, contract formats, communication upstream with suppliers etc. This way to organize the daily chemicals work is of great value since the communication up and downstream targets highly relevant and hazardous chemicals that eventually and efficiently results in their phase out from the market place. For the purpose of this report, Appendix 5 gives an introduction to functional chemicals and process chemicals.

4.4.2 Grouping based on toxicological properties

In the case of a restriction, addressing groups of chemicals based on their toxic properties, to secure the legal certainty, only hazardous chemicals with certain harmonized hazard classification according to the EU CLP Regulation, should be considered for labelling of textile consumer articles, as explained in section 1.1.5. The Swedish Chemicals Agency has previously identified the following hazard classifications as relevant for regulation in textile articles (Swedish Chemicals Agency, 2016a, 2013):

- Substances contained in the final textile product with harmonised classification as Carcinogenic, Mutagenic and toxic to Reproduction (CMR), Category 1A/1B (Risk phrases H340, H350 and H360).
- Environmentally hazardous substances that exhibit PBT or vPvB properties according to Regulation (EC) 1907/2006 (REACH) which are currently known to be used in the production of textiles.

- Substances contained in the final textile product with harmonised classification as respiratory and/or skin sensitising (H334 and H317).
- Substances which are defined as endocrine disrupting substances (EDC), when legal criteria for those substances have been set.
- Substances of Very High Concern (SVHC) included in the REACH Candidate List according to article 57d (PBT), 57e (vPvB) and 57 f (substances of equivalent level of concern, e.g. endocrine disruptors).
- Harmonised classified CMR Category 2 substances.

4.4.3 Benchmark to the cosmetic legislation in the EU

An alternative track to harmonized hazard classification as a component in textile labelling, a benchmark to cosmetics legislation in the EU would be beneficial to consider as an alternative approach. Cosmetic products placed on the EU market must be safe regardless of the manufacturing processes or the channels of distribution according to the cosmetics legislation in the EU. The manufacturer is responsible for the safety of their products, and must ensure that they undergo an expert scientific safety assessment before they are sold. A special database with information on cosmetic substances and ingredients, called CosIng⁵¹, enables easy access to data on these substances, including legal requirements and restrictions⁵². It would be of interest to have a similar approach for safe textile consumer products as for cosmetics. This requires that suppliers outside the EU provide their first recipient in the EU with substance information of relevance for scientific evaluation to be approved for the EU/EEA market. In this context the CE-mark would possibly be considered as a legal warranty for those safe textile consumer products.

4.4.4 Risk approach vs. hazard approach

Furthermore, the Swedish Chemicals Agency concludes that regulation for labelling of certain hazardous chemicals in textile consumer products should be constructed to ensure minimized risk for all con-

⁵¹ <https://datahub.io/dataset/cosing>

⁵² https://ec.europa.eu/growth/sectors/cosmetics_en

sumers but with a certain concern for sensitive groups such as small children, pregnant women and consumers suffering from allergy (Swedish Chemicals Agency, 2016a, 2013).

There are different target groups of consumers in society that are sensitive to exposure than others e.g. small children and pregnant women. These groups may be subjected to an elevated risk for products than other consumer groups. In the case of small children the user pattern is different than for adults. For pregnant women there may in certain cases elevated risks for the development of the foetus. Therefore, it is of great importance and concern that the normal foreseeable uses of textile consumer articles are well defined so that proper precautions regarding hazardous chemical contents are described, for example, in a labelling system. Thus, the identification of hazardous substances of certain concern to textile consumer products should reflect the relevant risk approach (in contrast to the hazard approach) to be the most relevant for labelling and/or declaration.

There are examples of substances that in a certain state are toxic, but included in a material have very low or even no toxic properties. For instance, alloying elements in metal based materials (nickel in stainless steel) are not released from low sulphur containing steel qualities⁵³ and therefore do not pose any risk to the consumer if used in buttons, zippers etc. Hence only levels of these substances, that may present risks if present in textile consumer products, are considered.

The main argument from the Swedish Chemicals Agency (KEMI) for a hazard based regulation of CMR substances and allergy-causing substances in articles, is that the type of substances have very serious effects, especially CMR, since it has been difficult to establish a threshold dose. It is therefore impossible to determine a level of safe exposure. Control of the CMR and allergenic substances are essential to protect human health, protection of the environment is not relevant for these substances.

Endocrine toxic (ED) should be regulated through a hazard based legislation, because it is not possible to determine the threshold dose where the effects of ED in many cases are severe, permanent and can affect entire populations. Regulating these kind of hazardous substances is important both to protect human health and the environment.

⁵³<https://www.ncbi.nlm.nih.gov/pubmed/9330816>

For PBT / vPvB substances, KEMI believes in a hazardous based legislation because these substances remain in the environment and bioaccumulate where regulation is important both to protect human health and the environment.

Overall KEMI believes that the precautionary principle should be applied widely, and therefore advocate for a hazardous based legislation. Additionally, a hazardous based legislation is easier from a regulatory perspective where no comprehensive exposure and risk assessments have to be performed and more clear to understand why these substances are banned.

The Toy Safety Directive (TSD, Directive 2009/48/EC) is an example of a legislation that contains chemical requirements based on hazard classification since small children are sensitive users due to their user pattern to put everything possible in their mouth. Chemical substances classified as carcinogenic, mutagenic or toxic to reproduction (CMR) of category 1A, 1B or 2 according to the CLP Regulation are only allowed in toys if certain conditions are met. The products themselves do, however, not contain any certain chemical information; it is only indirectly communicated via the CE-mark.

4.5 Meaning of “textile relevance” of a substance

The selection of substances should consider the textile relevance of substances, to avoid that irrelevant substances increase the length of the lists of restricted substances, and put an unnecessary high burden on companies to check compliance.

Many substances have multiple uses and might be both functional and process chemicals. They are often related to specific materials and/or functions and not to the product groups in e.g. textiles. Typical examples are dyestuffs that can be directly linked to certain textile materials, e.g. reactive dyes used for cotton and disperse dyes used in polyester. In those cases where only materials or only primary uses of these chemicals are identified in literature sources e.g. adhesives and fragrances we may assume that textiles may contain these substances but these assumptions are far from certain since there are no reliable sources to refer to in these cases.

Therefore, a model was developed at Swerea IVF and applied in one of the reports from the Swedish Chemicals Agency (2015) to categorize the meaning of high to low and no relevance to textiles that is illustrated in Table 3 below.

Table 3. Assessment scheme of relevance level to textiles (Swedish Chemicals Agency, 2013)

Level of textile relevance	Probability assessment	Comments	Main findings - CMR	Concentration range ⁵⁴ in textile product (estimated) [mg/kg]
High (H)	Known use in textiles	Major use in textile materials	Organic dyestuffs, stabilizers	>100 – 5000<
Medium (M)	May be used in textiles	One of many uses in textile materials.	Inorganic pigments, oxidants	10 – 1000
Low (L)	Indirect or less likely use in textiles	Raw material, intermediate, impurity, degradation product	PAH, raw minerals and salts, petrochemical fractions, arylamines, solvents, biocides (preservatives)	< 100
No	No known use in textiles			< LOD (Limit of detection)

This approach, based on probability of relevance concerning use in textiles, may be applicable to labelling as long as the kind of material and functionality of each component of the composite textile products are known. If the exact history of the application of chemical is not known, then at least a worst case scenario of highly relevant but hazardous chemicals for each specific textile product may be identified. Indeed, a worst case scenario is not optimal for a labelling system but it enables risk management of chemicals and it may result in upstream/downstream dialogue with producers with the aim to describe the real critical chemical content of a textile product. This requires transparency and legal trans-boundary incentives to disclose critical (illegal or unacceptable) content of chemicals products used early in the textile value chains.

The assessment scheme in Table 3, or a similar approach, can be used in the work with developing new regulations, to secure that the list of substances that companies are asked to control is kept relevant and consequently as short as possible; to avoid non relevant chemicals in these lists to emphasise the dialogue with upstream suppliers as much

⁵⁴ The concentration is linked to the function. If a plasticizer occur, it may be in concentrations up to 30%. If a potent biocide occur, it may be in concentrations up to 0.001%.

as possible. Longer and less relevant lists of chemicals may result in futile discussions on likely uses at remotely located production sites, where such lists of non relevance and length makes it easier for suppliers to deny and/or demonstrate ignorance towards their possible use of such chemicals which is probably true for non relevant chemicals. Consequently, a highly textile relevant and consistent list of substances that companies are asked to control is kept, the easier the implementation will become in the whole textile value chain.

4.6 Suggested substances

In this chapter, the relevance of substances has been described in relation to different needs. Many of the above discussed substances that pose risks may be regulated in REACH or other current legislation. However, there are some needs that will not be entirely fulfilled by these schemes. This section attempts to point out chemicals of concern, regulated or non-regulated, for two categories of information receiver: consumers and recyclers. Some of the chemicals may be important for both categories, however only addressed once.

4.6.1 Consumers

Consumers express concern for hazardous chemical content in textiles (Chapter 3). These substances may pose risks to human health but also to the environment. The concern is mostly related to own health but also workers in production countries. Such chemicals are:

Skin sensitizers

For *certain individuals (consumers or workers)*, allergenic substances may pose a risk and would therefore be of interest to regulate. Some sensitizing substances mentioned below are already banned. However, it may not necessarily mean that they do not pose any risk at concentration levels below the restriction levels in REACH or adjacent chemicals legislation. Thus, informing consumers about the presence of sensitizers may be of great value.

These chemical sensitizers may include: ⁵⁵:

- Allergenic dyes that are classified as sensitizers as such.
- Alkylphenolethoxylates (APEO)⁵⁶
- Chromium VI⁵⁷
- Nickel (Ni)⁵⁸, labelling for nickel content below the current restriction limits and limitations.
- Hydrazine⁵⁹
- PAH - Polycyclic aromatic hydrocarbons⁶⁰, labelling for PAH content below the current restriction limits and limitations.
- Aromatic organic solvents
- Aliphatic organic solvents
- Chlorinated organic solvents⁶¹
- Other Organic solvents
 - DMAC (N,N-dimethylacetamide)⁶²
 - NMP (N-methyl-2-pyrrolidone)⁶³
- Chloroparaffins (SCCP)⁶⁴, labelling for SCCP content below the current restriction limits and limitations.
- Formaldehyde
- Dimethylfumarate (DMFu)⁶⁵ that could cause allergic reactions below the restriction limit.
- Silver complexes in nano size (Ag +)

CMR/ED

Substances with CMR and/or ED properties should be phased out in all applications where there in a life cycle perspective is a risks that they

⁵⁵ This list of sensitizers is not fully comprehensive but only illustrates some examples of known sensitizers. There are about 4,000 substances known to science that may cause allergy (Prof Carola Liden" Conference - Chemicals and public health" arranged by AstmaochAllergiförbundet (2013)

⁵⁶ REACH annex XVII entry 46a

⁵⁷ REACH annex XVII entry 47

⁵⁸ REACH annex XVII entry 27

⁵⁹ REACH SVHC

⁶⁰ REACH annex XVII entry 50. There are thousands of PAH and only 8 are banned in REACH annex XVII, Some more PAH are under development for possible regulation (RMOA) and currently not banned.

⁶¹ Some chlorinated solvents are restricted in REACH annex XVII entry 32

⁶² REACH SVHC

⁶³ REACH SVHC

⁶⁴ EU POP Regulation

⁶⁵ REACH annex XVII entry 61

will cause harm to human health. The labelling and/or declaration criteria may however cover substances not yet regulated. Labelling and declaration criteria can act in a faster pace than regulation, and thus in a proactive manner enforce phase-out of textile-relevant hazardous chemicals.

This group includes for instance arylamine salts, arylamines (e.g. aniline) azo-compounds and dyes/colorants with carcinogenic potential. Some arylamines are breakdown products of a number of still not regulated azo dyestuffs and pigments. Reproductive/endocrine toxic substances may include for instance orto-phthalates still not regulated in REACH. Further, it may include aryl phosphates that are precursors to phosphor organic plasticizers.

4.6.2 Reprocessors/recyclers

In the Nordic countries, there are to date few actors textile reprocessing post-consumer fractions in their plants. However, in Europe there are end-of-life actors which have requirements on chemical content and/or origin of the textile material and would benefit a relevant labelling/declaration system (Schmidt et al., 2016; Östlund et al., 2015). The highest priority to mark for identification and sorting possibilities in relation to recycling is chemicals that may occur under restriction limits such as:

- Brominated flame retardants, such as , decaBDE and trischloroethyl phosphate (TCEP)
- Per- and polyfluorinated oil and water repellents , (PFAS)
- Biocides, i.e., Triclosan, Cu-HDO (Bis-(N-cyclohexyldiazoniumdioxycopper) where no explicit biocidal functionality of the textile product is expressed by the supplier.
- CMR classified colourants (i.e. azo dyes that are CMR as such)

In addition chemicals such as:

- Tin organic compounds other than those groups restricted in REACH annex XVII,
- Benzotriazols (such as UV-320, UV-327, UV-328 and UV-350),
- Cadmium (Cd) and cadmium salts below current restriction limits in REACH annex XVII Lead (Pb) and lead salts below current restriction limits in REACH annex XVII Mercury, (e.g. used as defoliants and pesticides for cotton),

should be avoided and/or marked to achieve the goal on non-toxic resource efficient circularity.

In addition, there might be chemicals affecting the process, for instance metal complexes, pigments, elastane, and some coatings such as polyurethane (PU). This is however depending on which process that will be used (mechanical, melting, depolymerisation) for a certain material, why this will not be further analysed in this report.

Identification and sorting based on chemical substances content in materials may include the following aspects:

- Polyester-based materials (PES): In mechanical recycling all the chemicals remain after the recycling process. A chemical treatment of polyester material may result in some decomposition products such as PAHs (polycyclic aromatic compounds). Through thermal treatment evaporation of for instance chlorinated organic compounds, silicones and alkylphenols may occur. In the thermal treated material remains of azo-based dyes, optical brighteners, per- and fluorinated substances, toxic metals, non-halogenated flame retardants, biocides and degradation products may be present in the recycled material.
- Polyamide-based material (PA): In mechanical recycling all the chemicals contained in the incoming material remain in the recycled material. A chemical treatment means that all toxic metals, azo-based dyes, metal complexes, degradation products and biocides can be found in the recycled material.
- Cellulose-based materials: In mechanical recycling all the chemicals contained in the incoming material remain in the recycled material. A chemical treatment means that all toxic metals and inorganic phosphorus in various compounds can be found in the recycled material, e.g. azo-based dyes.
- Wool-based materials: In mechanical recycling all the chemicals contained in the incoming material stream remain in recycled materials, e.g. azo-based dyes.

4.7 Conclusion for relevant substances

Which substances that should be included in a declaration/label requirement also depend on the aim of the requirement. To be able to talk about which substances that are included or not, a nomenclature first need to be decided on. There are several possibilities here that all have advantages and disadvantages, and the most useful nomenclature does, just as the substance selection, depend on the aim. The nomenclature for communicating on groups of substances can be based on chemical structure (e.g. phthalates), functional properties (e.g. flame retardants) or hazardous properties (e.g. allergens); all three nomenclatures are in use today in different schemes.

Longer and less relevant lists of chemicals may result in futile discussions on likely uses at remotely located production sites, where such lists of non relevance and length makes it easier for suppliers to deny and/or demonstrate ignorance towards their possible use of such chemicals which is probably true for non relevant chemicals. Consequently, the shorter the list of substances that companies are asked to control is kept, the easier the implementation will become.

There are different chemicals that are relevant for the different needs. For consumers it depends on perspective:

- Human health(consumers and workers); CMR/ED (i.e. non-regulated substances with these properties, i.e. carcinogenic dye stuff), sensitizers (organic solvents, nano-silver, DMFu)
- the productions sites local environment; for example NPEO/NP, PFAS, nano-silver
- the consumer local environment; for example NPEO/NP, nano-silver
- the global environment; for example PFAS, halogenated flame retardants, SCCP

For end-of-life actors, the requirements are related to:

- chemicals compromising the possibility for high value secondary raw materials; for example PFAS
- workers health; CMR/ED (i.e. non-regulated substances with these properties, i.e. carcinogenic dye stuff), sensitizers (organic solvents, nano-silver, DMFu)
- chemicals affecting the process – metal complexes, pigments, and materials such as elastane and poly urethane (PU)

5. Practical and legal possibilities

This chapter describes legal and practical possibilities for a declaration and/or labelling requirement, including market surveillance.

5.1 Practical possibilities

As previously mentioned, the practical possibilities are largely dependent on the possibilities for textile companies to retrieve the information needed from their suppliers to make a correct label and/or declaration of chemical content of a product.

For textile companies importing goods from outside EU/EEA, some chemicals are easier to manage and retrieve information about than others. This may be explained by the fact that the design phase is owned by the brand and therefore easier to manage compared to chemicals associated with, for instance, the production processes of textiles.

5.1.1 *Practical possibilities for communication wheels*

The DG IPOL study on labelling of textile products in 2010 (Kidmose Rytz et al., 2010)(described in 2.3) also investigated practical possibilities for so called “communication wheels”. Table 4 describes communication wheels used today in different regulations and potential new ways to communicate, together with foreseen advantages and disadvantages.

Table 4. Communication wheels

Communication wheel	Current use	Advantages	Disadvantages
Information on the care label	Fibre Labelling Regulation (regulation (EU) No 1007/2011)	Consumers and producers are used to handle information on the care label	Can be removed. The label is already large for products sold in many countries.
Physical marking of product	Packaging Directive (94/62/EC)(voluntary),	Visible.	Cannot be applied to all products.

Communication wheel	Current use	Advantages	Disadvantages
Information on the packaging	CE-marking Regulation (EC No 765/2008)	Visible.	Visibility can be a disadvantage for fashion items. Can be removed.
Information requirement with flexibility concerning communication wheel	Cosmetics Regulation (EC No 1223/2009) and Food Packaging Regulation (EU No 1169/2011)	Flexible to the type of product. ⁶⁶	Can be used inconsequently and be confusing.
QR code or similar printable codes (EAN etc.)	Biocidal Products Regulation (EU No 528/2012), Regulation (EC) No 648/2004 on detergents, and SVHC substances (Art. 33 under REACH Regulation) (EC No 1907/2006)	-	Initially work intensive to provide the expected information.
Electronic chip or similar (e.g. i-buttons)		Can connect with any type of information on a website.	Items dependent on electric currents or electromagnetic fields in order to work properly, fall under the RoHS Directive (2011/65/EU). This means that textile products with electronic devices incorporated will be subject to CE-marking under current conditions. Work intensive to provide the expected information.

⁶⁶ The information duty in Article 58(3) of the Biocidal Products Regulation reads as follows: The label referred to in the first subparagraph shall provide the following information:

- (a) a statement that the treated article incorporates biocidal products;
- (b) where substantiated, the biocidal property attributed to the treated article;
- (c) without prejudice to Article 24 of Regulation (EC) No 1272/2008, the name of all active substances contained in the biocidal products;
- (d) the name of all nanomaterials contained in the biocidal products, followed by the word 'nano' in brackets;
- (e) any relevant instructions for use, including any precautions to be taken because of the biocidal products with which a treated article was treated or which it incorporates.

And Article 58(5): Notwithstanding the labelling requirements set out in paragraph 3, the supplier of a treated article shall, where a consumer so requests, provide that consumer, within 45 days, free of charge, with information on the biocidal treatment of the treated article.

5.2 Legal possibilities

The sections below discuss the legal possibilities and challenges for an extension of the current scope of a number of legal frameworks with a requirement for declaration and/or labelling of chemicals in textiles. Legislations that are considered close in scope on textile labelling/declaration are included in the analysis together with the possibility of the development of a new textile legislation.

The following legal frameworks are considered and analysed:

- REACH
- Fibre labelling regulation
- Ecodesign directive
- CE-mark in connection to legal framework
- New textile regulation

The above current and suggested legal frameworks have been selected based on earlier studies and evaluations of possible relevant frameworks for textiles, and based on discussions within this study (i.e. the authors' experiences and input from the Nordic authorities). Whatever legal approach that is finally decided, the general and overall approach is to eliminate any risk of inconsistencies and duplications in any of these legal frameworks in order to maintain clarity of such a legal framework.

In 2013, the Swedish Chemicals Agency reported on several legislative options for textiles (Swedish Chemicals Agency, 2013). These legal options have been further assessed by the Swedish Chemical Agency in a governmental commission 2016 and during the stakeholder dialogue addressed as "The textile dialogue". Herein, a possibility has also been raised that a separate legislation can be developed for the purpose to have clear textile-relevant chemicals legislation. The current and possible legal frameworks suggested above are all relevant for this study. In addition, the authors have during the course of this work, included additional options based on experience "in the field". In the end of each section, the authors have provided their conclusions and point of view.

5.2.1 REACH

The scope of the European legislation REACH is chemicals in general and it includes requirements on substances and chemical mixtures, and in some cases on articles. Due to this scope, the available means of REACH to avoid the use of hazardous chemicals in imported articles

(from non-EU/EEA countries) are restrictions of the occurrence of substances in articles (art. 67). In addition there is the information duty on SVHC⁶⁷ in articles (art. 33).

Within the scope of declaration and labelling it is important to include CMR-classified substances related to textiles, in order protect customers and the environment. This is already under consideration by the European Commission through the CMR fast-track (art 68.2). In the proposal, suggested by Sweden through the Swedish Chemical Agency, approximately 120 CMR-classified substances with textile relevance are proposed for restriction.

Furthermore, it would be of high relevance to include sensitizers as well as endocrine disrupting (ED) substances within the scope of hazardous chemicals of equal concern (art, 57f), to fulfil needs of consumers (including allergic individuals). A challenge for including the latter group is that there is still no hazard statement according to CLP for ED substances.

One possible approach within REACH would be to extend the current information duty to a responsibility to immediately inform the consumer regarding SVHC substances. Such a duty could include not only professional actors but also private consumers and end-of-life actors (reprocessors and recyclers), which can then be considered as end consumers. The information would in this case meet requirements and needs from both consumers and end-of-life actors. Such information provided in these value chains can have similarity to the information system linked to food, cosmetics or even chemical products, i.e. SDS and labelling of packaging according to CLP.

Summary of analysis of legal possibilities

For chemicals of concern (art. 57) according to REACH, they are best to phase out by restrictions within REACH regardless of labelling/declaration possibilities. During assessment of possibilities to adapt REACH, the scope is excluding waste according to article 2.2 which in turn excludes waste management from the information duty according to article 33. This will then make it difficult to within the scope of REACH fulfil requirements of recyclers (reprocessors). Consequently, since waste has been identified as out of scope even for information duty the authors view is that chemicals that are troublesome for recycling should be managed in other legal frameworks.

⁶⁷ Substances of Very High Concern

Further, within REACH, e.g. labelling of skin sensitizers in consumer products, are normally out of scope. There may though be possible with precautionary assessments if risks are anticipated for certain groups of textile-relevant substances. In the assessment from the report from 2016 it was however stated that, “few Member States are giving priority to developing proposals for an EU-harmonised classification of allergenic substances” within the CLP regulation (Swedish Chemicals Agency, 2016a).

REACH handles identified unacceptable risks for specific hazardous substances and their identified normal foreseeable uses, which requires substantial weight-of-evidence (WoE). Sensitizers may therefore be difficult to argue unacceptable risk in the sense used within REACH, and an example of this is that no sensitizers have yet been included in the Candidate list.

5.2.2 Fibre labelling regulation

The scope and aim of this legislation is to label origin and fibre content of the specific textile product. Since this regulation is specific for textile raw material, there have been previous discussions on this regulation concerning hazardous chemical content in textiles that would include more than just the textile raw material. Hazardous chemical content in textiles are not considered as a viable extended scope for the Fibre labelling regulation. Accordingly, during assessment in the work from the Swedish Chemical Agency there was no support to extend this regulation, and neither to perform necessary adaptations in REACH to avoid overlaps in the legal frameworks.

Summary of analysis of legal possibilities

5.2.3 The reduction of risk for consumer exposure to hazardous chemicals is not within the scope of the fibre labelling regulation. Ecodesign directive

The Ecodesign directive has the scope of including all environmental aspects for a number of product categories related to the definition of eco-design.⁶⁸ In addition, the regulation itself includes labelling as part of

⁶⁸ Definitions according to Ecodesign Directive:

- Ecodesign’ means the integration of environmental aspects into product design with the aim of improving the environmental performance of the product throughout its whole life cycle.

the scope in order to push the market towards better products due to consumer behaviour. In 2005 the EUP (Energy Using Products) Directive (2005/32 / EC) was developed with the main focus on energy consuming products and their energy consumption. This directive evolved in 2009 to the (Energy Related Products (2009/125 / EC)) covering energy related products. The scope was then extended to consider related climate impact. Further scope development has been discussed with resource efficiency on the agenda.

The directive has been planned to be revised in 2012 but have currently been postponed.⁶⁹ Considering the extensive scope, toxic substances may be included. However, to date only energy-consuming products are addressed and the directive regulates mainly energy consumption in these products. One exemption is however the mercury in flat screens, pointed towards easy dismantling of relevant parts to avoid exposure during recycling.

Summary of analysis of legal possibilities

The authors' view is that it is not feasible in the near future to include hazardous chemical labelling/declaration of textiles within the current scope of the Ecodesign directive. An extension of the scope or a sister directive could be possible.

• 'Ecodesign requirement' means any requirement in relation to a product, or the design of a product, intended to improve its environmental performance, or any requirement for the supply of information with regard to the environmental aspects of a product.

⁶⁹ Unclear when the revision will take place.

5.2.4 New textile legislation

A new European textile legislation provides the possibility and freedom to meet a number of needs. The intended scope may well include consumer safety requirements as well as end-of-life chemicals requirements on textiles to facilitate reprocessing as a catalyst for a “non-toxic” textile circular economy. The conditions for product specific regulation are:

- The product complies with the essential requirements such as health, safety, function and environment, with all EU harmonized legislation that includes REACH, POP etc.
- Additional requirements related to the specific product group. In this part allergenic substances may be included to protect consumers or relevant chemicals to enable resource efficient recycling.
- Prescribed inspection procedure has been followed and may well be extended for “non-toxic” textile consumer articles.

Summary of analysis of legal possibilities

Development of new legislation on product level is a long term process. The Swedish Chemicals Agency has actively worked with such an option, though they identified other disadvantages, for example the lack of support from industry stakeholders. Conclusions from the Swedish Chemicals Agency report on new textile product legislation are that the European Commission is restrictive to additional sector specific chemical legislations.⁷⁰

The authors recognize though that a legal framework specific for textile products may be one way forward to meet the needs identified for various stakeholders in a more complete way. In addition, if a CE-mark would be suitable, this framework can relate to this “new” legislation.

5.2.5 CE-mark

The scope of CE-mark is much depending on the related legal framework on product safety. However, CE-mark can be developed to match a number of needs. In other words it is a relatively flexible in the intended scope where a number of products in current product safety regulations, have both chemical requirements and labelling/declaration requirements.

⁷⁰<http://www.kemi.se/global/rapporter/2016/report-8-16-hazardous-chemical-substances-in-textiles.pdf>

In order to affix the CE-mark on finished consumer products that requires a special product safety standard for these products. One possibility is thus to create a new textile specific product safety legislation based on CE-mark criteria on the restriction of chemical contents in textiles that also corresponds to several objectives.

The conditions to obtain the CE-mark for products are:

- Additional requirements related to the specific product group. In this part allergenic substances may be included to protect consumers or relevant chemicals to enable resource efficient recycling.
- The product complies with the essential requirements such as health, safety, function and environment, with all EU harmonized legislation, that in the case of textiles would include REACH, BPR etc.
- Prescribed inspection procedure has been followed

Summary of analysis of legal possibilities

For many textile retailers and manufacturers, CE-marking is a well-known legal tool, as it is used for protective clothing and for toys. Within the latter product group several textile materials are used and the requirements include chemicals requirements to ensure that these categories of textile-related products are safe to users. In addition, the CE-mark is well known on the international market and bans products that require but lack the CE-mark to be placed on the EU/EEA market.

However, in order to establish a CE-mark in general for textile consumer products, a legal framework have to be addressed. It is not probable that product safety legislation (GPD) can be addressed in this case. Therefore a new legislation may have to be developed in order for CE-mark to be eligible.

In the table below a summary of legal possibilities are presented.

Table 5. Legal options

Legal act	Possible scope extension	Timing
Regulation (EU) No 1007/2011 on textile fibre names and related labelling and marking of the fibre composition of textile products	Define certain hazards chemicals to be considered for labelling.	The KemI proposal to include chemicals with certain hazards (KemI, 2013) and was recently denied (European Commission, 2014a).
Regulation (EC) No 66/2010 of the European Parliament and of the Council of 25 November 2009 on the EU Ecolabel.	Convert an existing voluntary label scheme into a legal requirement.	Unknown
Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)	Immediate Information duty of SVHC to consumers instead of upon request within 45 days.	Last REACH review was 2012 ⁷¹ . Recent "Call for action" ⁷² and CMR regulation proposal ⁷³ sent by KemI.
Regulation (EC) No 765/2008 setting out the requirements for accreditation and market surveillance relating to the marketing of products	CE-marking which entails required internal process to ensure compliance	Already required for protective wear (Directive 89/686/EEC) and chemicals in textile toy components (Directive 2009/48/EC).
New textile legislation	Based on CE-mark criteria on the restriction of chemical contents in textile consumer products	there is no specific textile consumer product chemicals legislation today.

⁷¹ http://ec.europa.eu/environment/chemicals/reach/review_2012_en.htm

⁷² <http://www.regeringen.se/contentassets/80170a7a8f23444cb9407850ba73d2ff/swedish-letter-to-the-commission-on-call-for-action-to-promote-measures-on-hazardous-substances-in-textiles.pdf>

⁷³ http://ec.europa.eu/growth/tools-databases/newsroom/cf/itemdetail.cfm?item_id=8299

5.2.6 *Implementation of legislation in practice*

The impact assessment as well as previous experiences show that most textile companies perceive that even though it is difficult to retrieve information on chemical content, a legal requirement does increase information in the supply chain and supports their efforts in phasing out unwanted chemicals upstream.^{74,75}

Another aspect relates to the challenges with insufficient laboratory analysis technology, and legal certainty. As has been mentioned before, the laboratory analysis technology is constantly developing, leading to the lowering of detection limits of certain substances. It is important that the legislation specifies the EN or EN/ISO test methods issued by CEN (European Committee for Standardization)⁷⁶ that are mandated by the European Commission for demonstrating compliance. The risk that a company's own product control programme uses a test method, e.g. an in house method, with higher detection limit than the CEN mandated test method used during market surveillance, leads otherwise to legal uncertainty concerning compliance.

UNEP has long been aware of the need to support implementation in practice of the chemicals restrictions agreed on in the Stockholm Convention, and create specific guidance, especially for developing countries, e.g. for PFOS (UNIDO, 2012). As described earlier in section 2.3.8, an information project is planned in textile production countries with the aim to help local governments to phase out chemicals of concern at source. In short the project operates through the global dialogue under the Strategic Approach to International Chemicals Management (SAICM), a Chemicals in Products (CiP) Project was initiated in 2009 to examine the information requirements for proper management of chemicals contained in products. SAICM has as its goal "that by 2020 chemicals are used and produced in ways that minimize significant adverse effects on human health and the environment". In Paragraph 15(b) of the SAICM text it is recognized that information on chemicals, including chemicals contained in products, is essential if proper management of those chemicals is to be possible. In this context, the CiP Project is reviewing existing information systems pertaining to chemicals in products, assessing that information in relation to the needs of all relevant stakeholders and

⁷⁴ Work under the Stockholm Convention, risk assessment of brominated flame retardant DecaBDE.

⁷⁵ Survey and dialogue with the companies within the Formas-funded project SUPFES, coordinated by Swerea IVF.

⁷⁶<https://www.cen.eu/Pages/default.aspx>

identifying gaps, and developing specific recommendations for actions to promote implementation of the SAICM goal. Currently textiles will be in-depth studied in CiP in a vast upstream project that includes several important Asian production countries such as China and Vietnam.

The awareness of applicable legislation on chemicals in products is sometimes missing among companies that do not consider themselves as working with chemicals. “We work only with textiles, not with chemicals” is a misunderstanding that was sometimes experienced in a series of EU funded projects (ELEEN 1 and 2) aiming to increase the awareness of European environmental legislation in small and medium sized enterprises (SME) (Swerea IVF, 2016b). The ELEEN projects also showed that in many companies, non-compliance is only detected in case of market surveillance, i.e. when the authorities make an audit or a product has been tested positive for a forbidden substance. Adding a knowledge demand, such as e.g. with the restrictions is given when the EU harmonized legislation must be complied with if one complies with the any relevant and specific Product Safety Directive connected to a CE-marking (e.g. the RoHS Directive), has the potential of making a legislation more efficiently implemented in addition to specific chemicals requirements for certain Product Safety Directives such as for toys and protective clothing. This would decrease the work load especially for SMEs and improve the chemicals management work internally and externally when communicating up-streams.

5.2.7 Limit values

When critical chemical information is not obtained via the communication in the value chain tests are utilised as a risk management tool, when the occurrence and content of certain hazardous chemicals is verified through CEN mandated analytical methods and ask these demonstrated levels of risk exposure etc. The aim with the test is to control that unwanted chemicals are not being used at all in the value chain. However, the knowledge of the occurrence of a chemical in a textile product depends on, apart from information communicated between actors, the detection limit of the relevant analytical method. The development of mandated validated analytical methods is though sometimes not in phase with legal acts to ensure effective control mechanisms along the textile value chains. In addition, some chemicals occur in the environment as background contaminants, and are unrelated to textile products – they occur everywhere where restrictions on occurrence in articles may be challenging and ineffective since reasons for occurrence

has nothing to do with any intended uses along the whole value chains. Therefore, when setting the acceptable and well assessed concentration levels of a chemical in a textile product, mandated validated analytical methods as well as any background contamination levels must therefore be considered. For example, in the case of finishing of textiles with non-fluorine containing agents, the incoming process water may be contaminated with fluorinated compounds. With a sufficiently low restriction limit, the finished material will get fail in the test for fluorine, although the source of the fluorinated content was the background contamination of the incoming process water. In order to be effective to prevent pollution the regulation must have a relevant scope, in the case of contaminants that has nothing to do with impurities of non use chemicals in a textile production, only local environmental legislation is effective and possibly also local chemicals legislation that prevents the local productions sites in e.g. Asia to use these chemicals that eventually end up in final articles that may be restricted on false grounds.

Guidance on well-functioning limit values can be drawn from other regulations and voluntary labelling schemes, and a harmonised approach is also useful for clarity both to the industry and consumers. For example, the CEN guide for addressing chemicals in standards for consumer-relevant articles (BSI, 2015). The guide recommends that, when setting requirements for chemicals in consumer-relevant articles and their components, a requirement should be considered to ensure that substances included in Annex XIV of REACH do not exceed 0.01% in a consumer-relevant article or its components after the sunset date given for that substance unless an authorisation is granted for the production process relevant for the article. Also, a limitation for SVHC substances of 0.01% is recommended in the CEN guide (BSI, 2015).

There are different approaches when deciding which concentration limit that is reasonable and relevant to set. These approaches are:

- **Analytical reliability approach:** Each regulated substance or group of substances needs to be analysed with international standardized and validated EU mandated methods with LOQ (Limit of Quantification) at least a factor 3 to 5 times lower than the restriction limit in the regulation. Otherwise, there will be conflicts concerning the interpretation of compliance where analytical tests are applied.
- **Legal approach:** Restricted chemicals with content in the article above the legal restriction cannot be labelled. Therefore labelling for restricted chemicals with content below the legal restriction limit may well be labelled if these levels are ensured by validated

methods e.g. analytical methods and/or consistent and trustful information from suppliers.

- **Hazard approach:** Substances that are CMR, ED and/or skin sensitizers shall be labelled if they irrespectively of the concentration level occur in consumer products due to these properties. This precautionary hazard approach essentially means that there is no room for distribution of CMR, ED and/or skin sensitizers in society among the public through such articles. Therefore substances with these toxic properties should be given a fixed and low restriction limit with a *hazard orientated* restriction limit, see section 4.4.
- **Risk approach** However for a *risk oriented* approach, restriction limit depends on exposure in combination with hazards where the exposure is related to various normal foreseeable uses and physical/chemical properties and consequently various exposure scenarios, where adverse dose-effects need to taken into consideration when limits are set.

The aim of the declaration/label requirement must be known to select the most relevant approach, further explained in the next section.

5.2.8 Further legal and voluntary possibilities

There are several further possibilities with legal and voluntary labelling and/or declaration standards of chemicals in textiles.

Encourage non-toxic (frontrunner) initiatives: Labelling and/or declaration requirements may encourage initiatives, project innovation etc. and provide incentives for the development and take-up of environmentally friendlier textiles, initially on a voluntary basis through e.g. labelling schemes and/or declaration standards and thereafter consider legislation.

Connect green procurement into labelling/declaration standards: This should lead to incentives for purchasing environmentally friendlier textiles following the GPP criteria developed at European level.

Efficient and clear societal communication: In order to develop successful labelling schemes and/or declaration standards, they should be efficiently communicated in parallel to legislative measures for businesses in the textile sector to get the expected effected effects of a non-toxic environment and textile consumer products that decision makers have expected. This means continuous support, implement and/or fund consumer awareness and behaviour change campaigns;

Support to develop PCR: In parallel there will be a societal need to support the textile industry, especially SMEs, and EU Member States in the development of Product Category Rules (PCR) on textiles based on a harmonized methodology possibly addressed as a labelling scheme and/or declaration standard.

Effective policy approach: Governments should revisit the approach and effectiveness of policy related to chemical use in the fashion and textile industry, including chemicals used in the fibre or garment production processes, no matter if they take place in the European Union or not.

New technologies impact: In addition, new technologies that seem to reduce or eliminate hazardous chemistry, such as nanotechnology and GMOs, should be thoroughly assessed regarding to what extent they may pose a risk to human health and the environment.

5.3 Conclusion on practical and legal possibilities

In conclusion, due to the complexity of textile supply chains, the work load of introducing new legislations and the work load in converting the textile supply chain (where the major part is not subject to EU law since it takes place outside the EU borders) into a non-toxic supply chain, have to be taken into consideration or at least understood by policymakers and authorities to make legislation so effective that they move towards a non-toxic environment in reality and not just in theory.

To create/amend and enforce an EU legislation with a declaration/labelling requirement for textiles concerning their possible critical content of hazardous chemicals socio-economic considerations such as free movement of known “non-toxic” products and maintained sound competition in the EU/EEA society, must be kept in mind. The CE-mark is suggested to communicate safe and non-toxic textile consumer products, if specific product safety directive is developed that clearly specifies and defines what a non-toxic textile consumer products actually are in terms of eliminated textile-relevant chemicals listed in such a product safety directive supported by mandated EN standards as effective control instruments, will be effective in the legal sense and is already well known for a number of products. This will only become reality if there is any political willingness and consensus to deploy this package of regulatory work of course with possibly conflicting current EU regulation in mind.

There is also possibly a way forward. to change the REACH information duty in Article 33 so that also consumers should receive the information regarding any SVHC content in an article immediately rather than within 45 days on request as is currently the case. Even though

there may be some formal challenges for changes such as article 33, at least those Nordic countries that are EU members can always suggest this revision as one way forward to reach the goals of a non-toxic environment formulated in EAP 2020.

The main conclusions from the authors regarding legal possibilities are:

- Fibre labelling regulation; not applicable for the study's purpose
- Ecodesign directive; not applicable for the study's purpose
- REACH; not applicable for labelling and declaration. However, REACH is a good option to cover textile-relevant hazardous chemicals in legislation.
- New legislation; very attractive solution for the study's purpose, especially to cover additional requirements for a specific product group. However long term development is foreseen.
- CE-mark; very appropriate for labelling and declaration requirements. However, has to be related to a legal framework where GPD is not seen as an option. A new legislation is seen as the most feasible way.

Finally, a voluntary scheme close in scope may be considered to be converted into a legal scheme since for instance the EU Eco labels are actually EU directives and could be implemented as mandatory accordingly if the socio economic analysis demonstrates that the EU Eco label does not pose a trade barrier and jeopardize the free movement of consumer articles within and to the EU/EEA. If the socio economics is feasible then the EU Ecolabel may be interesting to investigate further as regulatory schemes.⁷⁷

Looking forward, whatever labelling system suggested by the Nordic countries, it needs to be enforceable in EU legislation.

⁷⁷ http://ec.europa.eu/environment/ecolabel/documents/User_manual_textile.pdf

6. Impact assessment

The impact assessment identifies positive and negative effects of introducing a declaration and/or labelling requirement. This includes the implications for different actors in the value chain—including exporters and materials recyclers.

6.1 Socio-economic impact assessment

Substitution of hazardous chemicals to chemicals with improved health and environmental impact has potentially positive socio-economic consequences. The foreseen socio-economical benefits with a legal requirement on declaration and/or labelling of chemicals in textiles, will likely reduce the occurrence of hazardous chemicals in textiles. The economic saving from health perspective can be related to aspects like sick-leave, health/hospital care which have effects both on individual, company and society level. The exact saving is difficult to anticipate and is strongly correlated to the chemicals in question since these have different health characteristics and concerns. Further, how much a label/declaration will reduce the occurrence of hazardous chemicals depends on the consumers' choice. Studies explaining as far as possible the correlation between savings and phase-out actions can be found in scientific publications and reports (Swedish Chemicals Agency, 2016b). More specifically, exposure and related weight-of-evidence results for health effects are addressed. In addition, environmental concerns and remediation actions can be related to societal cost.

Overall, there are strong arguments from a societal perspective to prevent elevated costs, for health care and sick leave for chemicals being phased-out. For legal schemes like labelling and declaration the link may not be as strong as for restriction proposals. If so, this relates to the fact that the reduction of hazardous chemicals is dependent on that the consumers make the "right" choice. From an industry perspective, there are cost-benefits to work proactively, to protect the brand name and also in case authorities would endorse the polluter pays principle for remediation activities in the environment (Swedish Chemicals Agency, 2016b). Lack of control in chemicals management and poor working conditions

can result in exposure of workers, which in turn can cause costs for health care and sick leave in all places in the supply chain. Safety measure like waste water treatment and toxic waste management generates additional costs.

The concluding options discussed in this study are 1) extension of information duty in REACH and to further regulate textile relevant hazardous chemicals and 2) new legislation that may be accompanied with CE-mark. These two will have a bit different impact in the authors' view. For both options, the societal benefits are similar but may have different time frames due to the fact that new legislation takes time to enforce. However, in new legislation other sustainability aspects may be possible to handle which give larger improvement potential for the environment but also for workers in the textile industry. From an industrial point of view REACH is commonly known in the textile supply chain giving advantages in implementation of additional requirements. Therefore this may be more cost-efficient in the near future. The second option will initially require additional workload and thorough understanding for textile companies. However, in an ideal situation a new legislation will work as the contact point for legal schemes which contains all necessary information about legal requirements which in turn makes it easier to manage textile regulation.

6.2 Questionnaire to Nordic textile companies

During April and May 2016, a questionnaire was sent out to Nordic textile companies; via direct contact and also via the Textile Importers' Association in Sweden⁷⁸(see Appendix 6). The companies were of various sizes, from SMEs to large multi-national corporations; they also had different positions in the value chain, from textile producers to textile recyclers. 28 answers were received, either in text or via transcript interviews, whereof the main part were textile importing companies. For all questions multiple answers were allowed.

⁷⁸ <http://textileimporters.se/>

6.2.1 *Communication system*

The questionnaire asked how a good legal communication system regarding substances in articles would look like, and four alternatives were suggested:

- A) CE-marking, (12)
- B) positive content (“the article contains substance X”), (3)
- C) negative content (“the article is free from substance X”), (15)
- D) “Other”, with room for explanation.(4)

The answers were distributed as 12 A’s, 3 B’s, 15 C’s and 4 D’s. The foreseen consequences to alternative A (CE-marking) were that it is a well-recognised label for consumers, and that it is useful for all parties (industry, authorities and consumers). It would be the simplest option for the companies that already market CE-marked products. Alternative B (inform about content) was not so popular and it was pointed out that this could “lead to paranoia” among consumers. Alternative C (“free from” claims) was seen as good information but a real challenge to be able to guarantee such a claim.

The respondents who answered alternative D either wanted process chemicals (see section 4.4) to be included too (2 respondents), eco-labelling to be used, or did not at all think that there should be a declaration demand.

6.2.2 *Grouping of chemicals in communication*

Furthermore, the questionnaire asked what the best alternative for grouping of chemicals would be, with the alternatives:

- A) harmonized classification, (13)
- B) chemical structure, (12)
- C) functional properties, (chemicals that provide function to the textile material and /or product, i.e. flame retardants)(14)
- D) no group, just a list of CAS RN, (1)
- E) “Other”, with room for explanation.(4)

The answers were distributed as 13 A’s, 12 B’s, 14 C’s, 1 D and 4 E’s. Regarding Alternative A, the knowledge about how the classification system (harmonised and self-classification, see section 1.1.5) varied between respondents. It was again pointed out for both alternative A and B that information about specific substances could frighten the consumer. Regardless of grouping approach, listing the CAS numbers would be needed in order for the legislation to be possible to realize. The compa-

nies need to know when they are in compliance with the regulations or not, otherwise there will be room for different interpretations. Alternative C was found to be the easiest approach for communication in the supply chain according to respondents that chose alternative C. The respondents who answered alternative E did either want eco-labelling, did not at all think that there should be a declaration demand based on such general groups (2 respondents), or did not state any reason.

6.2.3 Communication wheel

Regarding communication wheel, it is a term for different systems for communication, used within the Product Environmental Footprint (PEF) development work by the European Commission (2014b), for communication of for instance chemical content of textile products, but also care instructions, country of origin, size labelling (S, M, L) etc. Communication wheels can mean any interface and format for communicating the above information between two actors, and is independent of the selected scheme. The questionnaire gave the following alternatives:

- A) information on the care label, (6)
- B) QR-code or similar (connecting to a website), (18)
- C) information on packaging (or on a hang tag), (13)
- D) electronic chip or similar, (2)
- E) "Other", with room for explanation. (5)

The answers were distributed as 6 A's, 18 B's, 13 C's, 2 D's and 5 E's. Alternative A was seen as less practical since many people remove the care label. For Alternative B specific guidance on what information to communicate on the connected website was asked for as this could otherwise vary too much. The experiences from the PPE directive development show that solutions that build on that all consumers have access to a smart phone or similar are considered to be politically impossible. It was also concluded that all products and all packaging are not possible to put any label on which would make Alternatives B and C difficult. For alternative D, there might be a negative additional environmental impact from the production and waste treatment of an electronic device. The people who answered alternative E were either against the declaration/labelling idea (3 respondents), wanted a pictogram or had answered multiple choices without comment.

6.2.4 *Other aspects*

For the more qualitative questions, the general picture given was that some companies work with established communication systems such as GOTS, Oeko-Tex or BlueSign, while most companies did not have a specific system in place. The companies that sold textile consumer articles did not experience that they got questions from their customers to a high extent. The B2B companies experiences more questions from their business customers. From the recycler's perspective, a requirement for declaration and/or labelling would be very welcomed; however, the ideal source would be labelled production waste. A label on a post-consumer article would not have the same credibility since the consumer could have added substances to the garment both intentionally (impregnation, dyes etc.) or unintentionally (one recycler gave the example of oil stains from car fixing).

6.3 Discussions with the Swedish Chemicals Group at Swerea IVF

The Swedish Chemicals Group at Swerea IVF⁷⁹ mainly consists of companies that sell textile products in the Nordic countries, which have been manufactured in Asia. The companies are of various sizes, from SMEs to large multi-national corporations. Several of them also market other products than textiles, and could complement the discussion with how demands on other product groups affect their business. There are also several companies that sell products globally and some companies have their own manufacturing in Sweden. The discussions took place during four occasions:

- the 5th of April in Borås, Sweden,
- the 7th of April in Göteborg, Sweden,
- the 13th of April in Billingstad, Norway,
- the 14th of April in Stockholm, Sweden.

There were between 16 and 41 people attending the meeting, from companies in Denmark, Norway and Sweden. The participants at these dialogue meetings represent different parts of the textile sectors, such

⁷⁹ <http://www.kemikaliegruppen.se/membersExample.asp>

as: fashion brands, work wear, toys, swim wear and underwear. The background to the Nordic Council of Ministers' commission to Swerea IVF was explained, and all participants had the chance to ask questions, suggest proposals, share experience, and discuss positive and negative effects of introducing a declaration and/or labelling requirement.

The initial discussions were later followed-up at a meeting on 26 May in Gothenburg to catch the thoughts that had matured in the interval. The discussions gave the following conclusions:

- In general, the need for a declaration and/or labelling duty was questioned.
 - The value provided by the label/declaration requirement in comparison with the pressure on an industry sector should be clearly communicated if the initiative is decided to be realized.
- A new legal requirement directed towards the textile industry will increase the administrative burden for this specific sector.
 - The Nordic companies in the Swedish Chemicals Group at Swerea IVF are in the forefront regarding management of chemicals in textiles and do not see that they will have to change anything in their products. For companies in the forefront it will “only” be an administrative change but also benefit improved consumer information on chemicals content in their products.
- REACH is the preferred scheme for further regulation of chemicals in textiles.
 - One possibility that could be considered is to change the REACH information duty in Article 33 so that also consumers should receive the information regarding any SVHC content in an article immediately, instead of the current obligation where information is only passed to the consumer upon request.

6.4 Conclusion on impact assessment

There are several different ways of introducing a declaration and/or labelling requirement which gives both positive and negative effects for the actors in the textile value chain (from supply chain to waste treatment). Overall, there are strong arguments from a society perspective to prevent elevated costs. Also, there are cost-benefits from an industry perspective to work proactively, to protect the brand name and also in case authorities would endorse the polluter pays principle for remediation activities in the environment.

The most negative effect seems to be that a regulation would increase the work load on companies in one specific sector which is perceived as unfair by the textile industry, selling articles rather than chemical products. There are other sectors with certain legal requirements such as toys, electronics, cosmetics etc. These sectors can serve as benchmarks for gaining experiences on how a similar certain legal system would be for textile consumer products. However, it should be emphasised that there is a major difference in complexity of managing the chemicals content in textiles compared to these other product groups (textile toys exempted). The intent of chapter 1 has been to clearly explain the diversity of processes (agricultural, mechanical, chemical), the number of actors in the supply chains, and the additional challenging dimension in that most of the processes with impact on chemicals content are performed outside the EU/EES (thus not affected by EU legislation). Therefore, textile companies hence have to derive information that is not naturally disclosed in their current value chain. The value provided by the label/declaration requirement in comparison with the pressure on an industry sector should be clearly communicated if the initiative is decided to be realized.

The terms of claim (CE-marking, positive content, negative content or other), the nomenclature for communication, as well as the communication wheel (QR-code, electronic chip, etc.) will have different impact on different actors (size, role and position in the supply chain etc.). The common denominator is that a legal requirement will be a support to request information regarding chemicals from upstream actors, though this comes with the need for allocating more resources for information management.

7. Conclusions and recommendations

A lot of possibilities appear in the development of a label and/or declaration requirement via legal regulation. The existing legislations that include a label and/or declaration requirement vary in both aim, type of communication wheel, scope and follow-up (enforcement and market surveillance). There are main differences between legal alternatives and voluntary alternatives worth to point out. EU harmonised regulations such as REACH (Regulation (EC) No 1907/2006), EU POP (Regulation (EU) No 850/2004) and the Biocidal Products Regulation (BPR, Regulation (EU) No 528/2012) are based on peer-reviewed scientific assessments of certain hazardous chemicals (EU harmonized hazard classification) of concern, often listed by CAS numbers.

Voluntary schemes also include the approach to list chemicals related to certain chemical (hazardous) properties, see Appendix 1, though not limited to EU harmonized hazard classification. There are other legal frameworks in the EU that are not based on hazard classification. This is the case for the Cosmetics Regulation (1223/2009 / EEC) which includes substances for the opinion of the SCCS⁸⁰. However, it should be emphasised that there is a major difference in complexity of managing the chemicals content in textiles compared to other product groups. The textile supply chain is unique in its diversity of processes (agricultural, mechanical, chemical), the number of actors involved, and the additional challenging dimension in that most of the processes with impact on chemicals content are performed outside the EU/EES (thus not affected by EU legislation).

The option to design a new legislation is an attractive solution for the study's purpose. New legislation would enable comprehensive requirements including textile-relevant chemicals, and ensure legal certainty.

⁸⁰Cosmetic Ingredients and their Safety Evaluation committee on behalf of the European Commission.

The implementation of legal regulation in the EU includes identification of uses and market volumes, but only in the EU since this is EU Regulation. For that reason uses outside the EU, e.g. in textile production, is not covered, which makes the dossiers and suggested restrictions limited only to consider the part of the value chain that is covered in the EU. This is a weakness since most production and high volume uses occur outside the EU and this is also where the largest damages to health and environment occur.

The authors have brought up the UNEP implementation of the Stockholm Convention as a good example on how to work with developing legislation and implementation in parallel. Here UNEP of course has the obvious advantage to work on a global basis. The previous experiences of Swedish companies being unaware that there is a REACH regulation reported in section 5.2.1, together with the reports from the RAPEX registry show that legal compliance is sometimes lacking. It is therefore recommended to develop a scheme for label and/or declaration of chemicals in textiles that has a strong implementation plan such as user friendly websites, smart phone apps, authority information in media, effective use of social media etc to reach out also to SMEs.

7.1 Alternative approaches based on aiming at declarations and/or labelling

The analysis shows that there are several possible pathways and as explained in 4.2, the aim of the declaration/labelling decides what will be the best approach.

Below in Table 6 are some suggestions of approaches for the purpose of illustrating the differences. The table links the approaches to aims and the target group of the label, further described in 7.1.1-7.1.4.

Table 6. Aims, target groups and applicable approaches to fulfil the aims.

Aim	Target group	Applicable approach
Aim 1: Protect the consumer	Consumer	<ul style="list-style-type: none"> • Consumer-driven approach • Best performance producer-driven approach
Aim 2: Phase out harmful chemicals in	Consumer	<ul style="list-style-type: none"> • Sustainability-driven approach

the textile supply chain		<ul style="list-style-type: none"> • Best performance producer-driven approach
Aim 3: Protect the local environment in Europe	Consumer	<ul style="list-style-type: none"> • Sustainability-driven approach • Best performance producer-driven approach
Aim 4: Facilitate reuse and recycling	Recyclers	<ul style="list-style-type: none"> • Sustainability-driven approach • Best performance producer-driven approach

7.1.1 Consumer-driven approach

The approach can be a consumer-driven approach, supporting “the consumer’s right to know” and helping the consumer to choose “toxic-free” products (applicable in specific to Aim 1 in 4.2). This is seen as important to support people suffering from allergy, and consumers that are concerned about their or their children’s health, but also for consumers that care in general about environmental issues (see below). This approach puts a high demand for market surveillance as the trustworthiness is crucial, as failure to live up to claims such as “allergen free” can cause acute allergic reactions. This approach if realized would help many allergic individuals. Since the issue of allergy is very complex and individual there are many challenges to implement any sort of legal labelling that “ensures allergen free”. Most likely only a limited number of known sensitizers will be covered that are also represented in so called clinical patch tests used by dermatologists to cross check any kind of incorrect labelling. Though the patch test series have developed and exist for specific article groups such as textiles, they still don’t cover all possible combinations of sensitizers that individuals may react on.

7.1.2 Sustainability-driven approach

A label developed with this aim would include both chemicals detrimental for the consumer’s health, but also chemicals that are harmful for the workers’ health in the manufacturing processes and for the environment, both in the production countries and in the consumption coun-

tries (applicable to Aim 2, 3 and 4 in 4.2). This is important for consumers that care for the environment and health and want to be able to differentiate between products with high and low environmental performance. Also the need for information on chemical content in textiles for future recycling can be included in this approach. In these cases current EU ECO labels schemes are feasible since they cover the whole value chain. Due the complexity of the textile value chains in context to considerations of free movement of products in the EU/EEA and additionally sound competition there may be resource challenges to implement these requirements from a legal perspective when going from voluntary with a few hundred articles to assess to millions and simultaneously keep up the same high standard of assessment and requirement compliance. If there is any political willingness to provide these resources and funding to the assessing bodies then it may be possible to apply this approach by law. Alternatively, the third party review could be replaced by a self-verification system. However, the trustworthiness of self-verification systems is much lower.

7.1.3 Best performance producer-driven approach

A declaration requirement that includes a requirement that the companies should have a certain pre-specified technical documentation of the internal process that clearly describes the control procedures how to obtain the upstream information about unwanted chemicals in a robust and feasible way, to make sure compliance is fulfilled. This may give the companies that put effort in their chemicals management work an advantage, and be a potential “show-stopper” for products from companies that lack good internal systems for ensuring compliance with legislation. This approach is applicable to all Aims in section 4.2. that additionally facilitates and enhances the monitoring of the authorities' enforcement during inspections at enterprises.

7.1.4 Market driven approach

In addition to the approaches in Table 6, it is also possible to follow a market driven approach. Increased demands on knowledge about chemical content of products may lead to that some actors lack the resources needed to comply with legislation (e.g. micro-sized companies). A market driven approach would aim at reducing as much as possible any forces towards regulating which companies are present on the market. A relevant, clear and visible textile labelling

the identified undesirable but not yet banned textile-relevant chemicals would enhance the implementation of the fundamental principles on which the EU already formulated in the EU Treaty⁸¹. This would mean that the likelihood of obstructive measures to a free development of the market due to the legislation will not occur. With such an approach on labelling, it is crucial to follow up that current EU regulations shall not hinder SME's to establish themselves on the market.

7.2 Type of communication wheels in use

The communication wheels used today in different regulations are:

- Information on the care label (Fibre labelling Regulation (EU) No 1007/2011)
- Physical marking of product (CE-marking Regulation (EC No 765/2008))
- Information on the packaging (Cosmetics Regulation (EC No 1223/2009) and Food Packaging Regulation (EU No 1169/2011))
- Information requirement with flexibility concerning communication wheel (Biocidal Products Regulation (EU No 528/2012), and SVHC substances under REACH Regulation (EC No 1907/2006))

Other communication wheels are also discussed as possibilities:

- QR codes or similar printable codes
- Electronic chip or similar (will under current systems make the textile product regulated by the RoHS (2011/65/EU) and WEEE (2012/19/EU) directives as it will become dependent on electric currents or electromagnetic fields in order to work properly).

7.3 Concentration limits and substance nomenclature

The concentration limit for when the restriction or declaration requirement applies varies between legal acts. The variety of concentra-

⁸¹One of the fundamental principles of the Treaty (Article 28 TFEU), the right to free movement of goods originating in the Member States and products coming from third countries which are in free circulation in Member States

tion limits and also substance nomenclature is a great challenge in the textile industry today. The concentration limits are crucial for the authorities' market surveillance and legal certainty as for example detection limits of analytical methods are constantly lowered. Concentration limits are for example:

- List of all ingredients of products over a certain concentration limit (Food Packaging Regulation (EU No 1169/2011), Cosmetics Regulation (EC No 1223/2009), SVHC substances under REACH Regulation (EC No 1907/2006))
- The extractable amount (Toys Directive (2009/48/EC), nickel under REACH Regulation (EC No 1907/2006))
- There are no concentrations levels in BPR (Biocidal Products Regulation (EU No 528/2012)) so concentration limits may not be applicable with reference to this legal framework. However a qualitative approach meaning found or not which is actually above or below some sort of best laboratory practice detection limit would be useful since BPR is designed this way due to requirements on bioactive agents regulated in BPR.
- The detection limit (Toys Directive (2009/48/EC))
- The safe harbour levels (Proposition 65)

As mentioned in section 5.2, it is important that the legislation specifies the test method that will be used to show legal compliance. This is the case for nickel and arylamines in REACH annex XVII, but could be included for other restricted substances as well. The lack of test methods for certain substances should however not affect the selection of substances to regulate, instead development of new test methods should be encouraged.

The nomenclature with which the substance shall be declared also varies:

- E numbers (Food Packaging Regulation (EU No 1169/2011))
- IUPAC names, Non-proprietary Names (INN) for pharmaceutical products, Chemical Abstracts Service numbers (CAS), The EC number which correspond to either the European Inventory of Existing Commercial chemical Substances (EINECS) numbers or the European List of Notified Chemical Substances (ELINCS) numbers, the registration number given under Regulation (EC) No 1907/2006, or the International Nomenclature of Cosmetic Ingredients (INCI) etc. (Cosmetics Regulation (EC No 1223/2009))
- Substance name (Biocidal Products Regulation (EU No 528/2012)).

7.4 Responsibility for awareness of legislation and follow-up activities (market surveillance)

Basically, all actors on the EU/EEA market should be aware of the community legislation in force. However, the awareness and knowledge of restrictions of chemicals varies among actors on the market. Likewise, the follow-up activities from the authorities' side also differs between current legal acts. Table 7 shows what current legislations and their requirements on chemicals.

Table 7. Requirements regarding chemical content of products in selected legislations.

	Toys Directive (2009/48/EC)	REACH Regulation (EC No 1907/2006)	RoHS Directive (2011/65/EU)	Biocidal Products Regulation (EU No 528/2012)	CLP regulation (EC No 1272/2008)	Food Packaging Regulation (EU No 1169/2011)	Proposition 65 (California)	Cosmetics Regulation (EC No 1223/2009)
Requirement in legislation								
Documented internal processes to make sure compliance is fulfilled	X		X					
Absence of a specified list of chemicals	X	X	X	*82		X		83
Absence of chemicals with specific properties	X							
Information duty to consumers upon re-		X		X				

⁸² BPR mechanisms is based on approval of bioactive agents and not on direct restrictions

⁸³ Cosmetics legislation mechanisms is based on approval of cosmetic constituents and not on direct restrictions

quest								
Information duty to professional customers		X			X			
Label with list of ingredients on consumer products						X		X
Label products with content of chemicals with specific properties				X	X		X	X

Authority inspections (market surveillance) of the restrictions currently in force show that there are deviations. The RAPEX statistics for 2014 (European Commission, 2016) shows that “Clothing, textiles and fashion items” was the second most notified product category in the RAPEX system in 2014 (32%) after the product category “Toys” (39%). However, it should be noted that the product category “Clothing, textiles and fashion items” also includes shoes and fashion products made of other materials than textiles, such as plastic and leather. A large part of the notifications are also related to suffocation or strangulation risk in children’s clothing and not related to the use of restricted chemicals. On average chemical risks stood for 25% of the notifications in RAPEX 2014.

7.5 First proposal for a joint Nordic strategy on declaration of chemicals in textiles

A first proposal for how to work towards an EU requirement on declaration and/or labelling of chemicals in textiles has been elaborated based on three major insights:

1. The aim of the legislation must be specified in detail. From the general aim of moving towards a non-toxic environment, the aim can be broken down into sub-aims such as protecting the consumers, or secure a non-toxic circular economy (see chapter 4).
2. Implementation of the legislation is essential. Many companies in the EU/EEA are still not aware of existing legislation (see section 5.2.1). How to inform and perform market surveillance must be planned at an early stage in the development of new regulations.

3. How to communicate around chemicals in articles is a complicated issue where the many stakeholders of the textile value chain have different capabilities and needs (see section 4.4)

During the course of the work three main options were discussed:

1. Extended information duty in REACH
2. CE-mark
3. Convert voluntary schemes to legislation.

These options are further discussed in 7.5.1-7.5.3.

7.5.1 Strengthen the information demand concerning products and goods within the framework of REACH

As stated in the introduction, there is currently no specific EU legislation that comprehensively regulates hazardous substances in textiles. If the aim is to achieve feasible legal labelling requirements for textile consumer products, in order to reach a non-toxic environment as was implied in the current commission by the Nordic Council of Ministers, it is crucial to achieve broad understanding and increased knowledge among all actors in society. In addition, the information about certain chemicals or absence of the same should be communicated via label and/or declaration. This may be performed by extending the information demand for chemical content to products and goods. This demand already exists for chemical products through safety data sheets and labelling and packaging via CLP. In addition there are today business to business information requirements that relates to SVHC. This information currently only reach the customer if specially demanded by the customer.

There are three main benefits extended information demand EU harmonized regulations bring to businesses and consumers within the EU/EEA namely:

- Businesses and upstream actors outside EU already know that products have to comply with EU harmonized regulations when traded in the EU/EEA.
- Clear and well communicated requirements and their rational reason to prevent certain hazardous chemicals into the private consumer chain encourage strong implementation throughout the entire EU/EEA.

- Well communicated relation between EU harmonized legal and normative (CEN) requirements to protection of human health and the environment

Some drawbacks:

- May meet consumer needs but not applicable for post-consumer waste and end-of-life actors.
- Lack of public understanding and knowledge of labelling concrete meaning may lead to overestimation of the SVHC scope into safe textile consumer products free from of any possible content of certain hazardous chemicals according to defined schemes
- Confusion among the public that all SVHC have health hazards, if the suggested communication/labelling systems do not clearly relate to safe textile consumer products in terms of any possible content of certain hazardous chemicals according to defined schemes

7.5.2 *Extend the CE-marking obligation*

The legible and indelible CE-mark is a label for consumer products, linked to product level legislation. The CE-mark assures product safety through legal compliance according to third part schemes, and governments can take action if the label is awarded improperly. The CE-mark is also today in use for similar product groups: work-wear and toys made of textiles. In addition, electronics are included in the scope of CE-labelling due to particular issues related to the sectors, as mentioned previously. By affixing the CE-marking to a product, a manufacturer declares that the article meets all the legal requirements for CE-marking and can be sold throughout the EU/EEA. This also applies to products made in other countries that are sold in the EU/EEA.

A CE-mark on consumer products, signify that they have been assessed to meet high safety, health, and environmental protection requirements, thus may include customers and recyclers demands. The specific requirements can gradually be made stricter if there is a demand for this. CE-marking also supports fair competition by making it easier for both consumers and authorities to spot actors not following the rules.

There are three main benefits CE-marking brings to businesses and consumers within the EU/EEA namely:

- Businesses already know that products bearing the CE-marking can be traded in the EU/EEA without restrictions.
- The requirement on technical documentation encourages strong implementation throughout the entire EU/EEA.
- Requirements can be step-wise improved.

Drawbacks:

- No consistent application possible if the suggested communication/labelling systems do not clearly what is included in relation to safe textile consumer products in terms of any possible content of certain hazardous chemicals according to defined CEN-standardized schemes and EU harmonized legislation.
- Development of extended regulation and normative standards may be time consuming so the political willingness is essential to prioritize this process.

7.5.3 *Convert voluntary schemes into legislation, such as EU ECO label*

The EU Eco label is also today in use for some textile product groups and adaptable via specific requirements for a whole range of textile products, from interior, outdoor, fashion etc.

There are three main benefits converting an existing voluntary scheme into legislation for textile products:

- European based businesses already know that products bearing the EU Eco label can be traded in the EU/EEA without restrictions.
- The implementation of legal requirements on consumer product level provides evenness and uncompetitive conditions throughout the entire EU/EEA market that encourage free movement of safe textile consumer products from a chemicals perspective.
- Requirements can be step-wise improved.

Drawbacks:

- Development of extended regulation and normative standards may be time consuming so the political willingness is essential to prioritize this process (same as above).
- Lack of market understanding and knowledge may impose regulatory actions that may strain the administrative actions of the judiciary that result in non effective application of the law.

- The third party review is costly. If the same requirements are kept and the third party review will continue, this will demand huge resources. If the third party review is omitted, the trustworthiness will no longer be accompanying the label.

7.5.4 Authors proposal for legal frameworks

However, the above mentioned options have been further analysed by the authors with in consultation with the Nordic authorities, where some have been rejected and some together with additional suggestions have been pointed out as possibilities for labelling and declaration of hazardous chemicals in textiles. Thus it is suggested to investigate the possibilities to address the following legal possibilities:

- Fibre labelling regulation; not applicable for the study's purpose
- Ecodesign directive; not applicable for the study's purpose
- REACH; an extension of the information duty in REACH would require the legal text to be amended accordingly (e.g. Article 33). However, REACH is a good option to cover restrictions of textile-relevant hazardous chemicals in legislation.
- New legislation; very attractive solution for the study's purpose, especially to cover additional requirements for a specific product group. However long term development is foreseen.
- CE-mark; very appropriate for labelling and declaration requirements. However, has to be related to a legal framework.

The concluding options discussed in this study are 1) extension of information duty in REACH and to further regulate textile relevant hazardous chemicals and 2) new legislation that may be accompanied with CE-mark. It is also proposed that the assessment scheme in Table 3 (or a similar approach) is used in the work with developing the EU requirement on declaration and/or labelling of chemicals in textiles, to secure that the list of substances are of highest textile relevance to enable companies to effective and targeted chemicals management in dialogue with their suppliers

7.6 Concluding remarks

Conclusively it would be strongly recommended and advantageous to focus even more than before on a strong implementation already in the construction of a new legal act. One way to achieve this is to apply a

new legislation perhaps in combination with a CE-mark for a holistic approach on textile consumer products. From a textile company perspective, increasing legal requirements via the REACH legislation is a second suitable option to legal demands on labelling and/or declaration. The consumer may be fully protected via such approach **if** for instance allergenic substances are to be included. However, from a circular economy and sorting possibilities based on toxic free resources in a material looped system, some kind of relevant information to recyclers are valuable (i.e. labelling and/or declaration).

It would be an important and significant advantage to apply an established legislation and label in the EU/EEA, which stands for chemical safety of product and, at the same time, does not denote any commercial labelling exclusivity. The latter following that legislative compliance should not generate costs in such a way that competition is negatively influenced. The suggested alternatives have various opportunities as well as challenges in terms of legal and industrial aspects. Thus, it is of great importance neither to underestimate the work load in introducing new legislations, nor the work load to “de-tox” the current global textile supply chains. However, several studies have pointed out the cost benefits for both companies and society for phase out actions of hazardous chemicals. It is therefore recommended investigating these options further in the Nordic cooperation.

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Appendix 1 Overview of textile-relevant substances coverage in different legal and voluntary schemes

In the requirements put on chemicals use and/or chemicals left in the textile product, the textile sector need to follow legal schemes. Such examples of relevant legal schemes are presented in this Appendix. The requirements are normally communicated up-stream in the supply chain through RSLs. Furthermore, in order to be more proactive or to meet specific customer demands, voluntary schemes such as different labels are used. These schemes usually include regulated chemicals as well as requirements based on classification of a specific chemical.

The table below presents relevant legal regulations and voluntary chemicals requirements for textile products. The regulations and requirements are specified on the x-axis. In the table it is shown how the different schemes describe which substances that are restricted (marked with an X) in various ways: either by their specific functions (flame retardants, colorants etc.), chemical grouping (toxic metals, phthalates etc.) and/or properties (CMR, allergenic etc.). These are specified in the y-axis of the table. For the substances covered by the REACH regulation, it is specified which substances are listed on the candidate list, in Annex XIV and XVII and the entry in Annex XVII in parenthesis if applicable.

In the table is clear that the voluntary chemicals requirements have a similar substance scope, and that they all cover the legally regulated substances. There are only a few substance groups for which the requirements differ: not all schemes addresses explicitly UV stabilizers, pesticides, PAH, VOC, NP and NPEO. For the schemes, mainly voluntary schemes, that have requirements

based on hazard classification, the scope is very similar, though all schemes do not restrict substances classified as H317, H334, H413, H412, H301 , H311, H331 or H373.

Table A1.1. Overview of textile-relevant substances coverage in different legal and voluntary schemes. X = substance group included in the scheme, - = substance group not included in the scheme.

	REACH SVHC (candidate list & annex XIV)	REACH restriction annex XVII (entry No in parenthesis)	Stockholm Convention POPs legislation	OEKO-TEX® 100 (product class 1)	Blue Sign	GOTS	Nordic Ecolabelling of Textile, hides/ skins and leather	EU Ecolabel	EU GPP of textiles ⁸⁴	AAFA RSL ⁸⁵	The Chemicals Guide ⁸⁶
Version	-	-	-	-	5.1	4.0	4.0	2014/350/EU	2012	17	January 2016
Product Label	-	-	-						-	-	-

⁸⁴ <http://ec.europa.eu/environment/gpp/pdf/criteria/textiles.pdf>

⁸⁵ <https://www.wewear.org/industry-resources/restricted-substances-list/>

⁸⁶ The Swedish Chemicals Group at Swerea IVF provides a Chemicals Guide which is used by over 100 textile companies in Sweden, Denmark and Norway.

	REACH SVHC (candidate list & annex XIV)	REACH restriction annex XVII (entry No in parenthesis)	Stockholm Convention POPs legislation	OEKO-TEX® 100 (product class 1)	Blue Sign	GOTS	Nordic Ecolabelling of Textile, hides/ skins and leather	EU Ecolabel	EU GPP of textiles ⁸⁴	AAFA RSL ⁸⁵	The Chemicals Guide ⁸⁶
Substance groups with specified CAS RN											
Toxic metals and metal compounds	Lead, tin ⁸⁷ , boron ⁴⁴ , cadmium ⁴⁴ , chromium	Nickel (27), lead (16,17,63), chromium(47), cadmium (23), tin (20)	-	X	X	X	X	X	X	X	X
Phthalate plasticizers	various	DEHP, DBP, BBP, DINP, DIDP and DNOP (51,52)	-	X	X	X	X	X	X	X	X
Halogenated flame retardants	HBCDD, TCEP, Deca-BDE ⁴⁵	PBB (o8), OctaBDE (62)	X	X	X	X	X	X	X	X	X
Short chain chloroparaffins	SCCP ⁸⁸	-		X	X	X	X	X	X	X	X
Poly and perfluorinated substances	various ⁴⁵	On-going	X	X	X	X	X	X	X	X	X
CMR colorants	C.I. Direct Black 38 ⁸⁹ , C.I. Direct Red 28, C.I. Solvent Blue 4, C.I.	all carcinogens regulated by entry 28	-	X	X	X	X	X	X	X	X

⁸⁷Only candidate list.

⁸⁸Only candidate list.

⁸⁹All the listed dyestuff are only candidate list substances, not in Annex XIV.

	REACH SVHC (candidate list & annex XIV)	REACH restriction annex XVII (entry No in parenthesis)	Stockholm Convention POPs legislation	OEKO-TEX® 100 (product class 1)	Blue Sign	GOTS	Nordic Ecolabelling of Textile, hides/ skins and leather	EU Ecolabel	EU GPP of textiles ⁸⁴	AAFA RSL ⁸⁵	The Chemicals Guide ⁸⁶
	Basic Blue 26, C.I. Basic Violet 3, Michler's base, 4,4'-bis(dimethylamino)-4''-(methylamino)trityl alcohol										
Arylamines (precursors to azo colorants)	p-Cresidine ⁹⁰ , 4-Aminoazobenzene, 4,4-Methylenedi-o-toluidine, o-Anisidine, Biphenyl-4-ylamine, o-Toluidine, 4-methyl-m-phenylenediamine, o-Aminoazotoluene	various arylamines + Navy Blue (43)	-	X	X	X	X	X	X	X	X
Benzotriazols (UV stabilizers)	UV-320, UV-327, UV-328, UV-350 ⁹¹	-	-	X	-	-	-	-	-	X	X
PAH	-	Benzo(a)anthracene, Ben-	-	X	X	X	X	-	-	X	X

⁹⁰All the listed arylamines are only candidate list substances, not in Annex XIV.

⁹¹All the listed arylamines are only candidate list substances, not in Annex XIV.

	REACH SVHC (candidate list & annex XIV)	REACH restriction annex XVII (entry No in parenthesis)	Stockholm Convention POPs legislation	OEKO-TEX® 100 (product class 1)	Blue Sign	GOTS	Nordic Ecolabelling of Textile, hides/ skins and leather	EU Ecolabel	EU GPP of textiles ⁸⁴	AAFA RSL ⁸⁵	The Chemicals Guide ⁸⁶
		zo(a)phenanthrene(chrysene), Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(j)fluoranthene, Benzo(k)fluoranthene, Dibenzo(a,h)anthracene, Benzo(e)pyrene (50)									
Volatile organic compounds (VOC)	Trichloroethylene, 1,2,3-trichloropropane ⁹²	various (32)	-	X	-	-	X	X	-	X	X
Nonylphenols (NP) and nonylphenoethoxylates (NPE)	all 4-NP and 4-NPEO	various (46, 46a)	-	X	X	X	X	X	-	X	X
Allergenic dyestuff	-	-	-	X	X	X	X	X	X	X	X
Pesticides	-	-	-	X	X	X	X	X	X	X	-
Formaldehyde	-	-	-	X	X	X	X	X	X	X	X
Biocides during transport	-	PCP (22)	-	X	X	X	X	X	X	X	X
Restrictions based on clas-											

⁹²Only candidate list.

	REACH SVHC (candidate list & annex XIV)	REACH restriction annex XVII (entry No in parenthesis)	Stockholm Convention POPs legislation	OEKO-TEX® 100 (product class 1)	Blue Sign	GOTS	Nordic Ecolabelling of Textile, hides/ skins and leather	EU Ecolabel	EU GPP of textiles ⁸⁴	AAFA RSL ⁸⁵	The Chemicals Guide ⁸⁶
sifications											
Harmonized classification as CMR within the EU	-	<i>Must not be used within EU</i>	-	-	-	X	X	X	-	-	-
Classification as H400, H410, H411, EUH059, H330, H310, H300, H340, H341, H350, H351, H360, H361, H370, H371, H372	-	-	-	-	-	X	X	X	-	-	-
Classification as H317	-	-	-	-	X	-	X	X	-	-	-
Classification as H334	-	-	-	-	-	-	X	-	-	-	-
Classification as H413 or H412	-	-	-	-	-	X	-	X	-	-	-
Classification as H301 , H311 or H331	-	-	-	-	-	-	X	X	-	-	-
Classification as H373	-	-	-	-	-	-	-	X	-	-	-
pH	-	-	-	X	X	-	-	-	-	-	X

	REACH SVHC (candidate list & annex XIV)	REACH restriction annex XVII (entry No in parenthesis)	Stockholm Convention POPs legislation	OEKO-TEX® 100 (product class 1)	Blue Sign	GOTS	Nordic Ecolabelling of Textile, hides/ skins and leather	EU Ecolabel	EU GPP of textiles ⁸⁴	AAFA RSL ⁸⁵	The Chemicals Guide ⁸⁶
Verification by lab analysis⁹³	X	X	X	X	X	X	X	X	X	X	X
Verification by self report⁹⁴	-	-	-	-	X	-	X	X	X	-	-

⁹³The scheme requires verification by laboratory testing.

⁹⁴The scheme requires verification by self-report where the supplier sends a signed guarantee that the substance is not used.

Appendix 2 Questionnaires on consumer needs

This appendix reports what the questionnaires for collecting information about the consumer needs looked like. The questionnaire for the consumer surveys is shown in 2A and the questionnaire for interviews with key actors in the Nordic countries is shown in 2B.

2A. Questionnaire on consumer needs to consumers

The questionnaire was available to Danish, Norwegian and Swedish respondents in their respective language. Below is a translation to English.

Questionnaire:

1. Do you think that there may be harmful chemicals in clothing and home textiles you buy in the store?
2. Have you ever felt the need for a label that tells which chemicals are present in clothing and home textiles?
3. Would you like a label that tells which chemicals are present in clothing and home textiles to exist?
4. If there would be a label for chemicals in clothes, what would you be most interested in knowing? Select the option you think is most important:
 - a. If the product contains hazardous chemicals, e.g. carcinogens, or chemicals that are allergenic or damaging to our genes.
 - b. If the product contains hazardous chemicals, e.g. chemicals harmful to wildlife or substances that take long time to break down in the environment.
 - c. If the product is manufactured with dangerous chemicals that can harm people or the environment in the country of production.
 - d. If the fabric is suitable for recycling.
5. Would you use such a label to choose between different products?

6. Are there any specific chemicals that you have heard may occur in textiles and that you would like to know if they do in a product that you buy?
7. If you consider your total consumption, for example of travel, consumer electronics and food. How often do you actively choose products that carry environmental labels familiar to you?

Responses on specific chemicals (question 6):

Answers are sorted after occurrence.

• Do not know/no specific chemicals mentioned/blanks (30)	• Plastics (3)
• Phthalates (23)	• PVC (3)
• Dyestuff (21)	• Heavy metals (3)
• Flame retardants (19)	• Microplastics (3)
• Formaldehyde/formalin (17)	• Mercury (2)
• PFAS/perfluorinated substances (14)	• Arsenic (2)
• Antibacterial/anti-mould agents (14)	• Environmentally hazardous substances (2)
• Silver (13)	• Bleaching agents (2)
• Chromium (13)	• Pesticides (2)
• Hormone disrupting substances (6)	• Plasticizers (2)
• Chlorinated substances (5)	• Chemicals with a bad smell (2)
• Brominated substances (5)	• Allergens (2)
• Nano sized particles (4)	• BPA/bisphenol (2)
• Carcinogenic substances (4)	• Jeans (1)
• Persistent substances (3)	• Anti-wrinkle agents (1)
• Nickel (3)	• Synthetic fibres (1)
• Nonylphenoethoxylates/nonylphenol (3)	• P-phenylenediamine (1)
• Plastic prints (3)	• Dioxin (1)
• Water repellents/impregnation agents (3)	• Fleece (1)
	• Lead (1)
	• Acrylamide (1)
	• Benzene (1)
	• Acids (1)
	• Mordants (1)

- Triclosan (1)
- Dimethylfumarate (1)
- Latex (1)
- PCB (1)
- Nylon (1)
- All substances on the grey and black list of REACH (1)
- Coatings/laminates (1)

2B. Questionnaire on consumer needs to key actors in the Nordic countries

Questionnaire:

1. What information is possible for the consumers to perceive and comprehend?
2. What information is useful to the consumers? What information is possible to act upon for the consumers?
3. How would a system for declaration and/or labelling of chemicals in textiles be designed ideally?
4. Have you experienced a demand from consumers on declaration and/or labelling of chemicals in textiles?
5. Are you aware of any previous studies and publications that have been made regarding the demand from consumers on declaration and/or labelling of chemicals in textiles?
6. What substances do you usually get questions on when consumers ask about chemicals in textiles?

Respondents:

Affiliation	Country	Response
Naturskyddsföreningen (Env. Prot. Assoc.)	Sweden	No
TEKO, Sveriges Textil- och Modeföretag	Sweden	Yes
Svensk Handel	Sweden	No
Swedish Fashion Council/Nordic Fashion Association	Sweden/Nordic	Yes
Regeringskansliet	Sweden	Responded they were not relevant
Kemikalieinspektionen	Sweden	Yes
Naturvårdsverket	Sweden	No
Safety and Chemicals Agency (Tukes)	Finland	Yes
Miljødirektoratet	Norway	Will be late with response
MST	Denmark	Yes
Dansk Mode & Textil	Denmark	Yes

Affiliation	Country	Response
Teko Bransjeforening	Norway	No
Astma- och Allergiförbundet	Sweden	No
Copenhagen Business School	Denmark	No
Konsumentverket	Sweden	Responded they were not relevant
VTT	Finland	No
Forbrugerrådet	Denmark	No
Astma Allergi Danmark	Denmark	Responded they were not relevant
Miljømærkning Danmark	Denmark	Yes
Closed loop/Danish Fashion Institute	Denmark	No
Coop	Denmark	Yes
The Finnish Association for Nature Conservation (FANC)	Finland	No

Appendix 3 Background to uncertainty in hazard classification

The definition of what is a hazardous substance and what is not a hazardous substance is dependent on the legal framework as well as the substance properties. The CLP Regulation (EC No 1272/2008) (European Commission, 2008) provides the EU/EEA definition: “A substance or a mixture fulfilling the criteria relating to physical hazards, health hazards or environmental hazards, laid down in Parts 2 to 5 of Annex I is hazardous and shall be classified in relation to the respective hazard classes provided for in that Annex.”

In order to acquire knowledge about whether a certain substance fulfils the criteria of annex I to the CLP Regulation, a thorough assessment has to be performed. Such assessment includes studies on physico-chemical properties, human toxicity properties as well as eco-toxicity properties, according to standardised test methods. These assessments, if performed, are not always publicly available, and new information about substances' properties is also produced continuously.

The CLP regulation follows the UN Globally Harmonized System of Classification and Labelling of Chemicals (GHS) (United Nations, 2011). GHS provides a common guidance for what properties a chemical shall exhibit in above mentioned assessments to render a certain classification, and has replaced the previous national systems in most countries. The decision to classify a specific substance is however still within the countries' own jurisdictional areas. This means that a substance might have a harmonized classification within the EU CLP regulation (as e.g. skin sensitising (H317)), while being unclassified in other countries. In addition, the CLP Regulation allows for different classifications of the same substance as long as there has not been a decision on harmonised classification for that substance. Harmonised classification is required for substances that have carcinogenic, mutagenic or reproduction toxic properties (category 1A, 1B or 2) or are respiratory sensitizers (category 1). However, there is also a time aspect in the definition of a sub-

stance as hazardous, as there is administrative work with classification also in the cases where the properties of a substance are known.

The two types of harmonisation – of nomenclature (H-phrases) and requirements (global harmonization through the GHS) on the one hand, and classification of a specific substance in CLP (harmonization within the EU) on the other hand are illustrated in Figure A3.1.

Figure A3.1. The GHS system provides a harmonised nomenclature for chemical risk classification and common requirements for classification. The actual classification of a specific substance is not harmonised by the GHS system.

Appendix 4 The CE-mark

For many textile resellers and manufacturers, CE-marking is a well-known legal tool, as it is used for protective clothing and for toys, the latter product group including several textile product types.

Figure A4.1. The European CE-mark.

For electronic products there are restricted substances that the product have to comply with that are particularly related to this sector. The substances belong to classes that give fire resistance and to heavy metals used in for instance soldering and electronic components. The substances that are regulated are described in RoHS-directive. In addition, the CE-marking of electronics include quality aspects such as life length of certain components. Toys have CE-mark that relates to physical hazards (for instance parts that have to be checked for possibilities for children to swallow) but also substances of concern. A chemical risk assessment has to be performed based on a technical report and description of the material composition in the toy. There may be substances pointed out that are regulated elsewhere but with higher restriction limits. Also, CMR-classified substances are regulated. The regulated substances are described in the Toys-directive. In both cases (toys and electronics and electrical equipment) the products have to comply with the regulated substances in the legal framework in order for them to “earn” the CE-mark.

Protective clothing belongs to the group of personal protective equipment, abbreviated PPE. PPE have to fulfill the European Directive 89/686/EC to be placed on the European market. This directive determines the health and safety requirements with which products have to

comply and the procedures that have to be completed before placing a PPE on the EU/EEA market.

The aim of this directive is to facilitate the free movement of PPE in the EU/EEA market with due respect of the basic requirements regarding the consumer's health and safety that are based on harmonized European standards to comply with EU harmonized legislation. As a visible indication of conformity with the fundamental requirements, the producer is obliged to affix the CE-marking on his equipment:

- **Category I - PPE protecting against minor risks:** In this instance, it suffices to draw up a technical file. The manufacturer may then affix the CE-mark as a sign of conformity, without intervention of a third party.
- **Category II - PPE protecting against moderate risks:** As always, you have to draw up a technical file. In addition, a CE type examination has to be carried out by a notified body. The notification number of the notified body has to be mentioned in the information to the user. Only when the notified body has issued a type examination certificate, you are allowed to affix the CE-mark.
- **Category III - PPE protecting against mortal injuries or irreversible harm:** As always, you have to draw up a technical file, and a CE type examination has to be carried out by a notified body.

In addition, a notified body has to carry out an annual quality monitoring. You may choose between two possibilities: either, the notified body takes samples from your production, which are then submitted to tests, or the notified body audits your quality system.

Only when you are in possession of a CE type examination certificate and a positive report of the monitoring, you may affix the CE-mark. This mark has to mention the notification number of the notified body performing the monitoring.

An example of CE-marking is protective gloves, for which there are certain requirements that have to be fulfilled to achieve the CE-mark according to EN420. This standard defines the general or the general requirements applicable to all protective gloves that include some chemical requirements.

- The gloves themselves should not constitute a risk or cause damage.
- The glove material shall have a neutral pH, where leather gloves should be in the pH range of 3.5-9.5.

- The maximum allowed content for the chromium (VI) content is 3 mg / kg
- The manufacturer must inform if there are any known substances in the gloves that can cause allergies.

Appendix 5 Functional and process related chemicals

Conceptual model

Figure A4.1 below describes a conceptual model of functional and process related chemicals, and how it is based on the knowledge at different levels in a textile supply chain. The supply chain actors: retailers, suppliers and sub-suppliers, all have knowledge related to the chemicals content in textiles, but on different level.

Figure A4.1. Conceptual model of functional and process related chemicals.

At the first level can be found companies that are producers or importers of articles which is the level where many legal requirements are in fact set for textile products. At level two are the quality and technical properties. These properties are sometimes specified by the companies (for example type of DWR treatment), but quite often the full specification is made in a step further down in the supply chain (for example the dyestuff needed to achieve a specific nuance), by suppliers. The supplier will deliver an article that comply with all customer demands but otherwise is as cost effective as possible. The third level in the model describes the chemicals applied to achieve the quality and technical properties (product function related chemicals). This information is seldom

communicated downstream the supply chain due to business secrets. At the level of application of chemicals into a material, these processes are often executed in large scale processes, where one batch of material is produced to fit several customers and the selection of process function related chemicals is made. The fourth level represents the raw material processing where the quality management of both chemicals and raw material will make decisions that ultimately determine the content of impurities later on in the ready-made article.

Functional chemicals

Functional or effect chemicals are added to give an article a specific function. Functional chemicals contribute to design or any feasible technical function in the final product, e.g. colorants. For functional chemicals there is a need for certain concentration in the final product in order to achieve the desirable function (Swedish Chemicals Agency, 2014).

Some examples of functional (or effect) chemicals are:

- Colorants (dyestuffs and pigments)
- Oil, soil and water repellents
- Plasticizers
- Flame retardants
- Fragrances
- Alloys
- Biocides for defined functionalities in the article e.g. disinfectants
- Stabilizers e.g. antioxidants, UV/light stabilizers and anti-degradants.

The functional chemicals that are used should have good compatibility, such as good solubility in the materials. Some effect chemicals require good affinity to the fibres, for example as dyes in cellulose. In order to sustain the desired function in the final textile product during the usage phase the functional should have the most favourable ageing characteristics possible. The functional chemicals are not only relevant to high degree in the use phase and the possible exposure, but also to the end-of-life scenario for a textile product.

Process chemicals

The other category are called processing chemicals, also called auxiliary chemicals, that are necessary to make processes work, but they do

not provide any desired properties to the final product and are therefore not meant to remain in the finished product.

Some examples of process chemicals are:

- Organic solvents
- Surfactants e.g. wetting and dispersing agents
- Softeners
- Curative agents
- Accelerators
- Chain extenders
- Lubricants
- Defoaming agent
- Catalysts
- Hardening agents
- Vulcanizing agent (rubber)
- Retarder (rubber)
- Complexing agent
- Salts
- Acids and bases
- Reactive resins (e.g. binders and adhesives) for various finishing treatments
- Biocides as preservatives in the process or during storage and transport e.g. fungicides and preservatives.
- Tanning agents (leather)
- Drying agents
- Intermediates, precursors and monomers

Remains of the process chemicals may however be found in the finished product and cause health and/or environmental problems. A process chemical which remains as impurities in the final product often has a relatively low concentration, compared with the concentration of an effect/functional chemical in the final product.

Appendix 6 Consultation on a possible legal requirement to declare and / or tagging content of harmful chemicals in textile products

In April 2015, the Nordic countries adopted a joint action plan for textile goods, "*Well dressed in a clean environment. Nordic action plan for sustainable fashion and textiles*"⁹⁵. One of the goals of this action plan is to reduce the use of harmful chemicals in textile products. The Nordic Council of Ministers commissioned Swerea IVF to analyze the opportunities with and obstacles to a legal requirements at EU level to declare and / or label content of harmful chemicals in textile products.

Questions to interested parties regarding the possible introduction of an EU legal requirement concerning communication of substances in articles. (Multiple choices are possible)

1. PROFESSIONALISM

1.1 What is a good legal communication system regarding substances in articles, if you could choose freely.

- A. CE-marking (required today for protectional wear and electronics, contains a "knowledge demand" in that it requires an internal process to ensure compliance with the requirements)
- B. Information on the content of substances (eg PFAS, BFR, allergens, etc.)
- C. Information on that item is "free" (ie below a specific threshold value) from substances

⁹⁵ Nordic Council of Ministers, 2015. Well dressed in a clean environment. Nordic action plan for sustainable fashion and textiles. Copenhagen, Denmark. <http://norden.diva-portal.org/smash/get/diva2:819423/FULLTEXT01.pdf>

D. Other, please explain!

1.2 Which substances / groups of substances do you think should be included in a communication system.

A. Groups of harmonized classified substances, such as

- a. carcinogenic,
- b. mutagenic,
- c. reproductive toxic,
- d. persistent, bioaccumulative and toxic,
- e. endocrine disruptors,
- f. allergens
- g. environmental toxic
- h. other

B. Groups of substances with a similar chemical structure

- a. PFAS
- b. Phthalates
- c. Nickel
- d. Brominated flame retardants (BFR)
- e. Heavy metals
- f. Halogenated substances
- g. Dimethylformamide (DMFA)
- h. NPEO
- i. Other

C. Groups of substances with a similar function

- a. Flame retardants
- b. Biocides
- c. Water / dirt-repellents
- d. Surfactants
- e. Other

D. Grouping is not needed, better to just have a list of restricted CAS RN.

E. Other grouping, please explain!

1.3 Which "tool" for communication would you choose, if you could choose freely.

- A. Information that can be read on the care label (for textiles)
- B. QR code or equivalent of the article that links to information on a website
- C. Information on the packaging or hang-tags
- D. Electronic chip or similar device

E. Other

2. STATE-OF-THE-ART

2.1 Do you use any communication system to customers / consumers about hazardous substances in your products today? If yes, please tell us more about the communication systems you use to customers.

.....

2.2 Do you receive requests from your customers to use any specific communication system to declare hazardous substances in your products today? If yes, which?

.....

3. RATIONALE (if you answered that you use a communication system above)

3.1 Please specify the reasons for why you are using this communication system.

.....

3.2 Do you have an integrated communication on substances in articles in your business model? For example, that you report what system you use in your annual report together with any business / market share that come with it.

.....

3.3 Describe the potential advantages and disadvantages from the use of the communication system, compared with that you have not used such a system.

.....

4. KNOWLEDGE

4.1 Describe what you know about the systems you use in relation to your needs ditto communication example on background, criteria, evaluation mechanisms, etc.

.....

5. CREDIBILITY AND COOPERATION

5.1 Do you recon that you receive the details that you ask for via the communication systems you use today? If not, what do you miss in the information that you consider essential in your use of ditto communication.

.....

5.2 In what way is the communication system you use today beneficial for your customers and other stakeholders to your business, including the public, investors, the public, the media, etc.?

.....