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Technical Sector Report on Smart Textiles

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Executive Summary

This Technical Sector Report outlines the methodological concept of an LCA-based design decision support tool for SMEs in the smart textiles sector. The methodology concept builds the framework for the specification of the LCA to go tool for this sector, being part of D3.1 (Table 1). The main challenges are overcoming the prevailing barriers for LCA application at the early stage of technology development. For this purpose, a simplified LCA to go approach is proposed to fill the sector-specific knowledge gap on environmental impacts as well as the lack of viable eco-design principles for smart textiles. The tool is designed upon an iterative approach, comprising two steps. Both steps can be used alone or in combination:

Step one features generic eco-profiles of typical smart textiles. The conceptual design of the first step follows a strictly reductionist attitude so as to limit the efforts of its users to a minimum. It allows for a quick check of typical smart textile applications without requiring the user to insert extensive raw-data. The eco-profiles are based on ready-made LCA data, which give a rough overview of typical environmental aspects at one glance. The user can customise them to some extend and try out roughly how a change in variables influences the eco-performance of the product. That aims at stimulating the formation of common sense environmental awareness rather than in-deep LCA expertise. The generic eco-profiles are associated with LCA-based eco-design heuristics. They that offer rule-of-thumb eco-design guidance at the very early stage of the product design process. That helps to spur the product development process into a sustainable direction.

The second step allows for more detailed, yet simplified, environmental analysis of individual products by which the user can refine the results of step one. It implements a fast-track LCA approach and calculates the environmental performance of materials, energy and life cycle stages. The output indicator is Eco-costs and the Ecocost/Value Ratio (EVR). Eco-costs refer to a product's virtual costs of preventing the life cycle wide environmental burden of that product (Annex 4.1) (Vogtlander et al, 2001; Vogtlander, JG, et al. 2009). The tool allows for comparison of design alternatives (scenarios) of the same product as a basis for informed decision-making in eco-design. The tool is supported by the Idemat database of eco-costs that can be amended with LCI data on smart textiles materials and subassemblies.

Table 1: Software Requirement Specification for the Smart Textiles Module

USER	Technology developers at SME, design agencies and unaffiliated design artists, design engineering students,
INPUT	Step 1: product type and few adjustment variables, target price of the product, Step 2: limited set of technical parameters (materials, subassemblies, energy-use, end-of-life scenario)
OUTPUT	Step 1: Eco-profiles of typical smart textile products (expressed as eco-costs), Eco-cost – value ratio (EVR). Step 2: Refined environmental impact per life cycle stage & product component expressed by single indicators Eco-costs, EVR, PCF (product carbon footprint), CED (cumulated energy demand).
DATABASE	Excel look-up tables of eco-profiles; Idemat 2012, ELCD database (if needed)