Ecodesign in the Textile Sector

UNIT 06: Life Cycle Assessment in textile sector

Funded by the Erasmus+ Programme of the European Union

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LCA & PEF

WHY IS LCA SO IMPORTANT?

1. To prove the respect of requirements and legislation
2. To adapt processes and products to specifications and legislation
3. To generate detailed information and to provide a scientific basis for environmental comparisons between products (comparative LCA)
4. To identify areas of interest in order to reduce the related impacts
5. To support actions of eco-labeling Marketing and eco-declarations (EPD, PEF)

PEF – PRODUCT ENVIRONMENTAL FOOTPRINT

Recommendation 2013/179/EC

on the use of common methods to measure and communicate the life cycle environmental performance of products and organisations.

Is a multi-criteria measure of the environmental performance of product, throughout its life cycle from raw material acquisition to final disposal.

SCOPE:

1. optimization of processes
2. identification of significant environmental impacts
3. communication of life cycle environmental performance
4. increase the comparability of the studies

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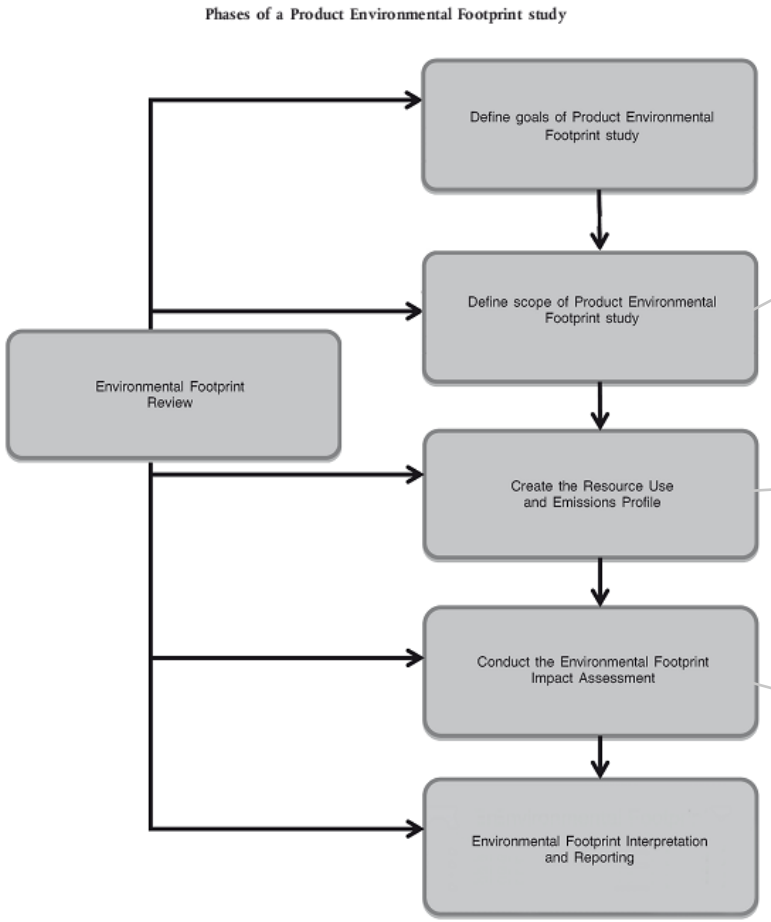
Annex II: Product Environmental Footprint (PEF) Guide



The scope shall be in line with the defined goals and shall include:

1. unit of analysis and reference flow
2. system boundaries
3. environmental footprint impact categories
4. assumptions/limitations

RESOURCE USE AND EMISSIONS PROFILE

An inventory of all material/energy resourse inputs/outputs and emissions into air, water and soil for the product supply chain.

Classification material/energy inputs and outputs inventoried in the Resourse Use and Emissions Profile to the relevant EF impact category.
Characterization : calculation of the magnitude of the contribution of each classified input/output to their respective

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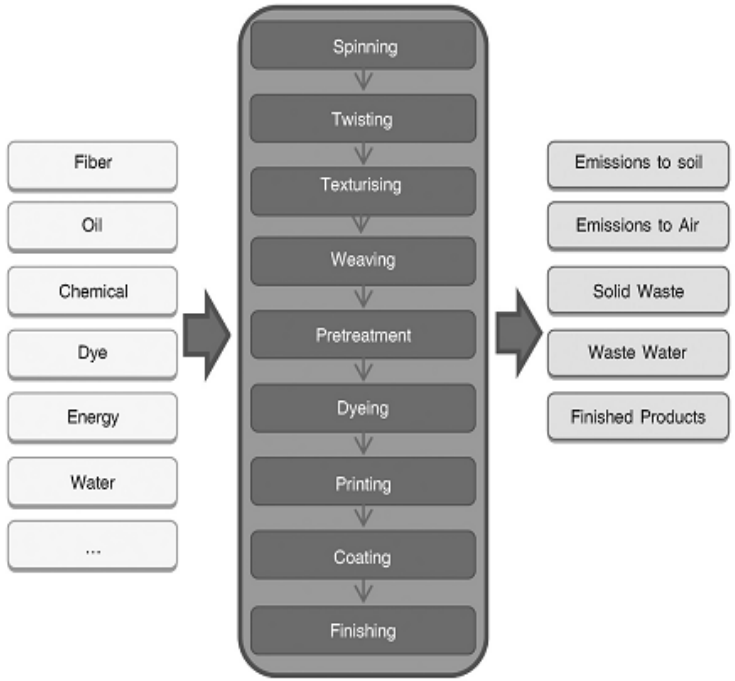
PEF
Step 2: Define scope of Product Environmental Footprint

1) Unit of Analysis and reference Flow

Unit of analysis	
What	T-shirt (averange for size S,M,L), made from polyester
How much	1 T-shirt
What well	Wear one time per week and use washing machine at 30°C for cleaning
How long	For 5 years

2) System Boundaries



3) Environmental Footprint Impact Categories

EF Impact Category	EF Impact Assessment Model	EF Impact Category indicators
Climate Change	Bern model - Global Warming Potentials (GWP) over a 100 year time horizon.	kg CO_2 equivalent
Ozone Depletion	EDIP model based on the ODPs of the World Meteorological Organ-ization (WMO) over an infinite time horizon.	kg CFC-11 (*) equivalent
Ecotoxicity for aquatic fresh water	USEtox model	CTUe (Comparative Toxic Unit for ecosystems)
Human Toxicity - cancer effects	USEtox model	CTUh (Comparative Toxic Unit for humans)
Human Toxicity – non-cancer effects	USEtox model	CTUh (Comparative Toxic Unit for humans)

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PEF
Step 3: Create the Resource Use and Emissions Profile

An inventory of all material/energy resourse inputs/outputs and emissions into air, water and soil for the product supply chain.

— **Elementary flows**, which are (ISO 14040:2006, 3.12) "*material or energy entering the system being studied that has been drawn from the environment without previous human transformation, or material or energy leaving the system being studied that is released into the environment without subsequent human transformation.*" Elementary flows are, for example, resources extracted from nature or emissions into air, water, soil that are directly linked to the characterisation factors of the EF impact categories;

— **Non-elementary (or complex) flows**, which are all the remaining inputs (e.g. electricity, materials, transport processes) and outputs (e.g. waste, by-products) in a system that require further modelling efforts to be transformed into elementary flows.

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PEF
Step 4: Conduct the Environmental Footprint Impact Assessment

Classification: assigning the material/energy inputs and outputs inventoried in the Resourse Use and Emissions Profile to the relevant EF impact category.
The data are expressed in terms of constituent substances for which characterization factors are available.

EXAMPLE: CLASSIFICATION OF DATA FOR A T-SHIRT STUDY		
	CLIMATE CHANGE	ACIDIFICATION
CO_2	YES	NO
CH_4	YES	NO
SO_2	NO	YES
NO_x	NO	YES

Characterization: calculation of the magnitude of the contribution of each classified input/output to their respective EF impact categories and aggregation of the contributions within each category.
The characterization factors are specific to each substance or resource.

Climate Change:

	Amount (kg)		CF		CO_2-equivalents (metric tonnes)
CO_2	5 132	×	1	=	5,132 t CO_2-eq.
CH_4	8,2	×	25	=	0,205 t CO_2-eq.
SO_2	3,9	×	0	=	0 t CO_2-eq.
NO_2	26,8	×	0	=	0 t CO_2-eq.
			Total	=	5,337 t CO_2-eq.

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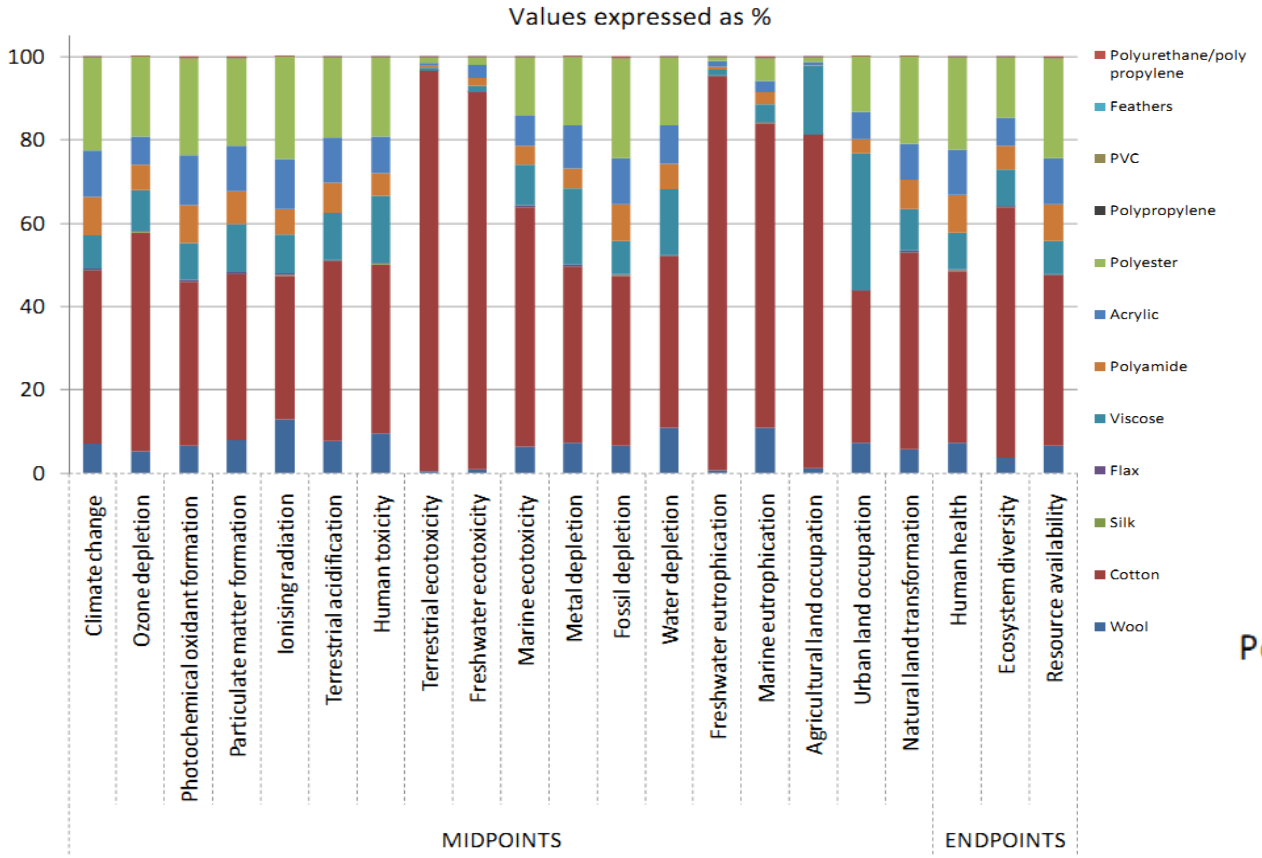
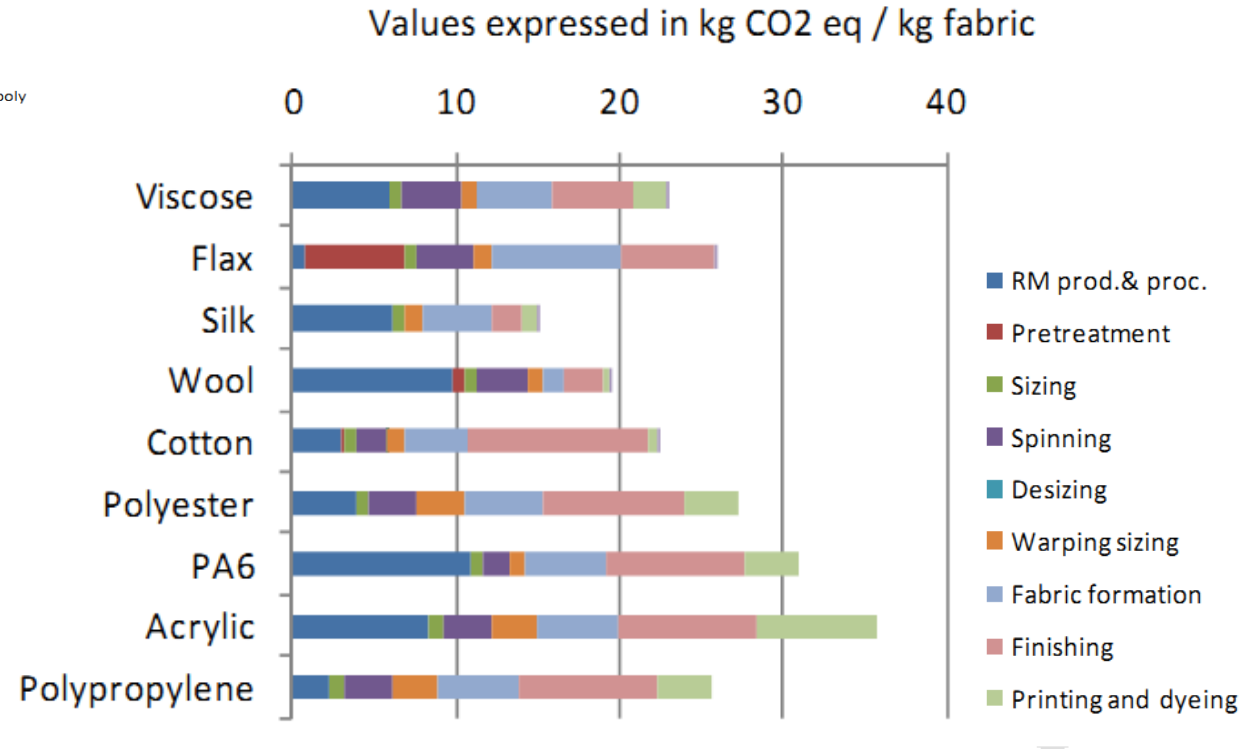
PEF
Step 4: Comparison of fibers – the environmental impacts





European Commission's Joint Research Centre - Environmental Improvement Potential of Textiles

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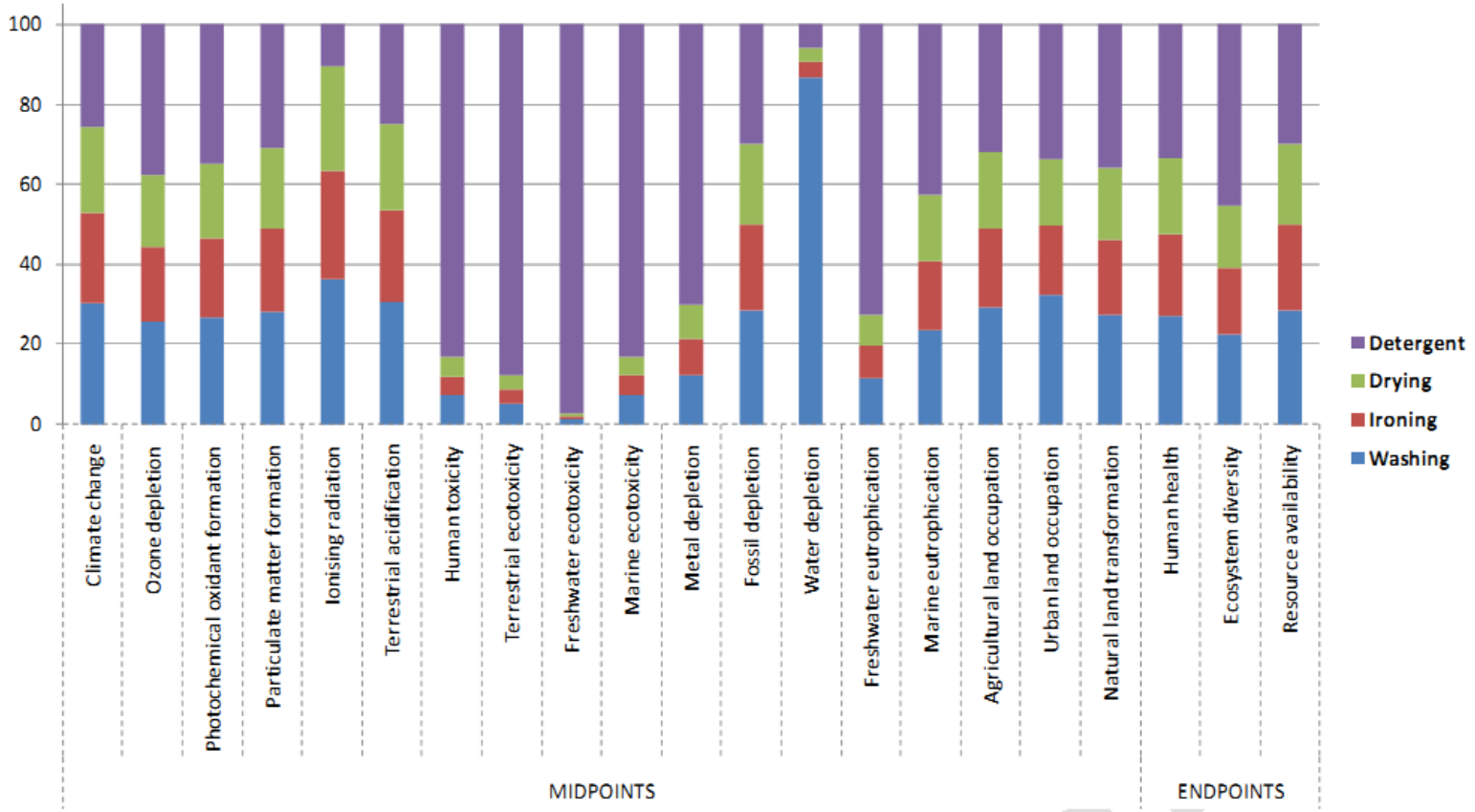
PEF
Step 4: Use stage of textile products – the environmental impacts



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