USED, BUT NOT USED UP: Using textile waste to inform textile rating schemes

A suggestion for empirically based policy measures to reduce the environmental impacts of clothing and footwear

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Introduction

In this paper we argue that lifespan or Duration of Service (DoS) of clothing and other textiles can be measured using analyses of waste, thus contributing to greater accuracy in the effort to reduce their environmental impacts. We argue that this opportunity will make it possible to put fast fashion out of fashion and enable Green Claims to be based on credible assessments of product lifespan. Targeted Producer Responsibility (TPR) analyses, a waste audit or waste composition/characterization study method we have called picking analysis (from Norwegian "plukkanalyse"), aimed at gathering knowledge about the use-phase, was originally developed to enable eco-modulation in an extended producer responsibility (EPR) scheme. In this paper, we show the potential for using waste audits, in other rating schemes, policies or voluntary industry agreements as an alternative to a government-imposed regulation. The new regulations or industry schemes will require methods for surveillance, data collection and control, and methods to identify the most polluting products in order to avoid false green claims. The products that pollute the most are those that are never used – and therefore never should have been produced. When products end up being discarded after a short lifespan, this is dominantly a result of fast fashion and irresponsible production volumes, contributing to vast volumes of waste which must be reduced, in accordance with the waste hierarchy, incorporated in the European Waste Framework Directive.

In the EU's important work to identify and decrease the number of products with a high environmental impact, it is crucial that all important parameters are considered. This paper discusses one such parameter, the product's "lifespan" or DoS. Including DoS in a correct manner is crucial for several of the EU Textile Strategy's important tools and policy areas such as

- Product environmental footprint (PEF), especially category rules for apparel and footwear (PEFCR)
- Ecodesign for Sustainable Products Regulation (ESPR)
- Labelling and Digital Product Passport (DPP)
- Green claims directive
- Extended Producer Responsibility (EPR)
- Waste Framework Directive (WFD)

Making fast fashion out of fashion

The global trend towards increased production of apparel decreases the sustainability of the clothing industry. The utilisation is reduced, resulting in more garments per person and fewer wears per garment lifespan[1-3], as well as more fibre produced per capita (see Figure 1) [4].
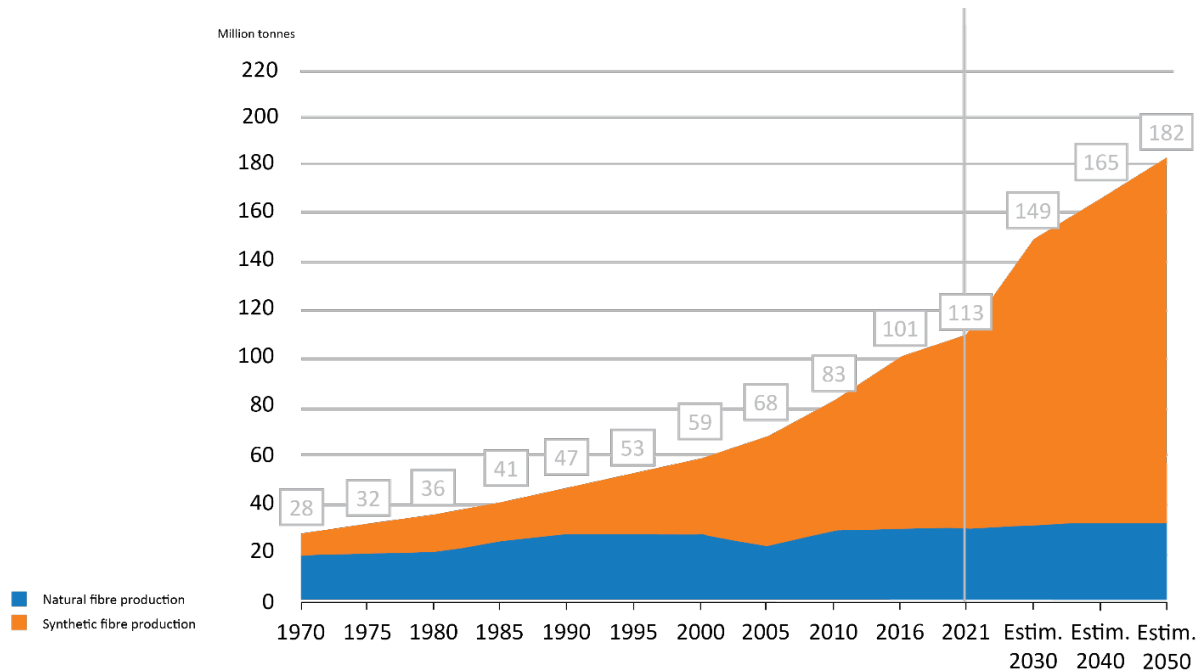
Million tonnes

Figure 1 Global fibre production [2-9]

To lower the environmental impact, the production quantity - not only quality - must be taken into account. To make fast fashion out of fashion is an important statement in the EU textile strategy. The problem is that the political tools so far do not contribute to this, e.g., the proposed eco-modulation for an EPR system is vague, and PEFCR and as a consequence most likely also ESPR favours plastics and thus fast fashion. On the contrary, they support plastic materials. These synthetic fibres, such as polyester, are an important raw material for fast fashion because of their low price, abundant availability and ease of manufacture. To make fast fashion out of fashion, it is necessary to identify short-lived fashion products and their producers. Even though fast fashion products often are made of synthetics, this is not a sufficient indicator alone, because the same material is also used in high-quality and performance clothing. Fast fashion is *a business model* based on high speed both in production and consumption, resulting in a low degree of utilisation of the products, alongside the accumulation of unsold, unused, and little-used goods of low value in the production chain, households, in the waste as well as in the second-hand trade. We believe that the TPR method explained below can be used to identify fast fashion and consequently contribute to the development of measures and policy that makes it possible to make fast fashion more costly and thus "unfashionable". This will therefore contribute to the important environmental goal in the form of political action.

How lifespan is currently discussed

There is an increased interest in product lifespan in political strategies [10]. For clothing, there is no agreement on how to measure or predict this. Both in the work with PEFCR and ESPR, there seems to be an understanding that product characteristics can be used to predict a longer life. These characteristics are focused on physical strength (durability as in technical durability) and established test methods. At the same time, we know that 2/3 of clothing goes out of use for other reasons than wear and tear: textiles are thrown away with much of their use potential unused [11], and we know

that there is no simple connection between strength and a long DoS or many uses [12]. To use product characteristics to determine product sustainability is not based on evidence and empirical research but on lofty theories, namely that stronger items are used longer, and that products used longer prevent other products from being both bought and produced. The problems with using product characteristics are also evident in the discussion on how to eco-modulate[1] in an EPR system [13].

Several problems occur when trying to predict DoS based on product characteristics:

- Promoting plastic: The different test methods for strength (including dimensional stability, tensile strength, tear-resistance and colour fastness) in most cases give better results for synthetic than natural fibres [14].
- The support for synthetics promotes the fast fashion business model because they are the cheapest and therefore increases the environmental burden (see Figure 1)[1].
- The most important factors for long/intense use are not taken into consideration, namely the value of the garment *to* the user.
- Only single items are taken into account, not their number/volume nor the business model and marketing strategy they are part of, although we know these are important for the DoS [15-18].

There is also confusion in terminology mixing characteristics of products, e.g., the durability, with the product lifespans, as in how long or much they are used. Figure 2 gives an overview of the concepts in use, explaining the fundamental difference in looking ahead in time, guessing and predicting, as opposed to looking back in time analysing what actually ends up as waste, and why products are disposed of.
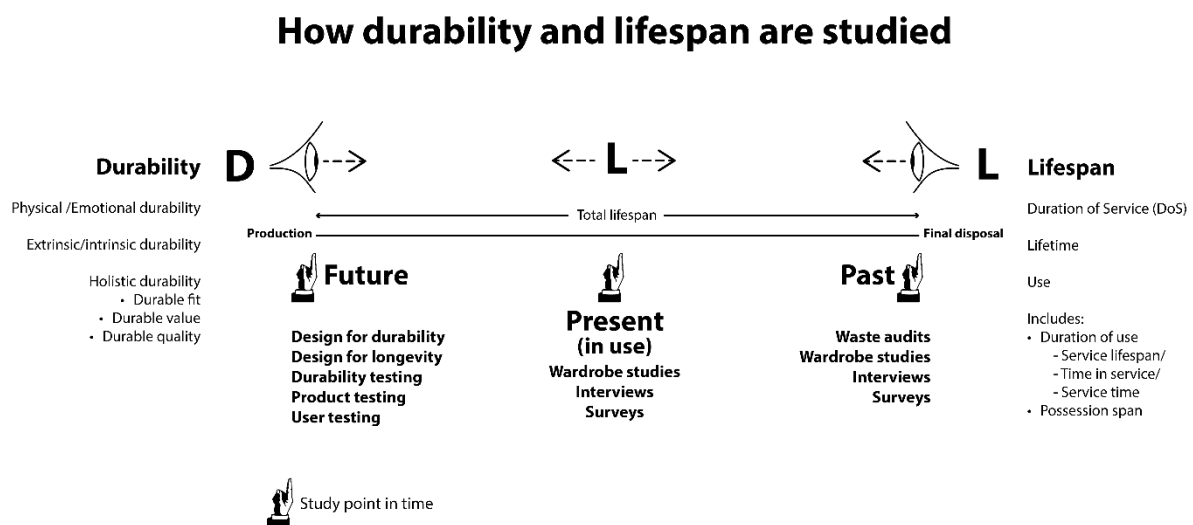

Figure 2 Understanding DoS and lifespan

Predicting future DoS

Since the concept of emotional durability was described [19], there has been an understanding that DoS is dependent on more than intrinsic qualities such as strength. However, no good methods exist for measuring this, and so far there is no empirical work supporting the idea that it is possible to design for "emotional durability". On the contrary, emotional durability appears through use and in

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[1] the concept of penalizing the use of materials that are perceived to be environmentally harmful, while rewarding the use of those that are perceived as being "better" for the environment

ways that the designer has little influence over [20-22]. It follows that DoS is strongly influenced by the perceived value, and this is influenced by (1) business model and economic factors, like price, marketing and availability, (2) emotions, including love and personal history and (3) physical and sensory factors such as fit, colours and touch.

Assessing past DoS makes it possible to take an opposite approach to finding indicators for all these factors: identifying garments that are used, loved, and kept for a long time and the opposite; never worn.

Methods for measuring the use of clothes

Wardrobe studies

The life of clothes can be measured in time (e.g., years), and the number of uses or users, among other parameters [23]. Both time and uses can be important because they point to different aspects of clothing consumption. Years are most important for garments linked to special occasions and weather conditions, while number of uses is more important for garments used in daily life. In a wardrobe both categories are necessary. Wardrobe studies as a method can be used for studying both [24], and can include questions of how long/much different items have been used, and how long/much the owner thinks they will use it in the future. It is also possible to measure the average age of the garments in a wardrobe, the age of items with different characteristics, or the age/and frequency of use when clothing is going out of use. The advantage of this method is its accuracy, while the disadvantage is the cost. The price is high because of the method's dependence on physical interaction with each consumer or the willingness of the informants to do more than what a normal survey requires. The method is used both in qualitative fieldwork-based research [23, 24] and in quantitative survey-based research [17, 18, 25], and among other themes used for discussing DoS and other use, or lifespan-related questions.

Waste audits

Waste audits involve digging into waste, and picking out specific items from waste streams to analyse in more detail. It's a proven method that has been used for retrospectively examining the use phase and obtaining insights into both product performance and consumer behaviour for goods and food (edible or non-edible, assessing level of food waste), packaging (plastic) and electronics. The interest in waste audits of textiles is growing fast, but so far only for gathering downstream information to enable utilisation of the waste through reuse and recycling of the waste [26, 27].

The TPR method is a modification of waste audits developed to improve the way eco-modulation might be done in EPR. TPR is looking back into the use phase. The method analyses garments and textiles in the waste and second-hand streams identifying brands and brand-owners. Using samples of discarded clothes and textile products makes the method less costly than wardrobe studies, as described above, and it is easier to design the sampling in line with wishes to make it more representative. The method uses the date of production and the condition of the garment to estimate its DoS. Labelling a production date in all items will make the method more precise, which therefore should be mandated immediately. Otherwise, it is possible for a trained picker to assess the production year with 2-3 years deviation, and it is even possible to develop imaging technology combined with machine learning and AI to reduce the deviation.

TPR picking analyses can say more about duration of use, than number of uses. This is a disadvantage because both aspects are important. It is possible to work with the methods to develop ways of improving the estimation of the number of uses. It is already possible to say if a product has not been used at all. These unsold and sold but not used items are recognized by the attached price tag, but

also other easily recognizable elements, such as stickers, packaging and remaining starch on the textile. Using TPR to improve EPR can make a ban on unsold goods unnecessary by making the EPR fee on unsold goods high.

To operationalise information from product level to an EPR scheme, DoS is linked to producer (brand), making it possible to modulate the fee based on the differences in how long (and partly also how much) products from different producers on average have been in use, along with other factors such as the value capture potential according to the waste hierarchy, e.g., the potential for reuse (i.e., longer use as the original product) and recycling (i.e., longer use as material). The same information can be used for other political tools, such as PEF and ESPR because it is also possible to link the information on products DoS to brand or intrinsic qualities, such as colour, fibre content, as well as the above-mentioned strength of the material, or attempts to make the products "repairable" or emotionally durable.

Scaling waste audits for delivery of EU textile strategies

EU strategies are seeking to significantly reduce the textile industry's environmental footprint through sourcing sustainable raw materials and designing long-lived clothing that's easily repaired and recycled. In combination, the Ecodesign for Sustainable Products Regulation together with Extended Producer Responsibility and the Waste Directive 2025 target these outcomes.

The advent of the Digital Product Passport as well as updated technology at waste collection and sorting facilities provide an opportunity for low-cost, automated and ongoing picking analysis (assuming the DPP includes details such as date of manufacture, brand, sub-category type and material type).

Amalgamating this real-life data to show the average DoS of each garment sub-category made from each raw material or related to other design parameters, could then greatly improve DoS predictions of the same product sub-categories in PEF and ESPR. Minimal testing of new products would be required to verify adequate durability to deliver a long life. This reduced cost burden would also remove a significant barrier to SMEs for the adoption of PEF and ESPR. ESPR, PEF and also LCAs as a tool for clothing, could be based on real data on DoS. Currently, few LCA studies include the use phase or are based on empirical data for these [28]. By using the method, further research could be done on different business models, design parameters and brands to find out what actually makes products last and remain in use and how to design and organise circular business models in an economically viable way.

Using DoS based on real data in ESPR and in an eco-modulated EPR fee that significantly rewards the producers of long-lived, high reuse value or readily recycled/recyclable clothing would provide clear market signals on product design, business models and marketing practices. The recent proposal for a revised WFD that is currently out for consultations also points in the direction of more real data waste analyses, mandatory for every member state to implement [29].

Defining fast fashion

The method can be used for defining fast fashion, e.g., as products used less than 2 years before being discarded, and perhaps "ultra-fast fashion" as those used less than 1 year. It is also possible to use the same methods for empirically verifying theories about the link between design parameters and DoS, e.g., examine whether shirts sold with spare buttons are used longer than those without. Because different types of garments are used differently, it is possible to measure the garment in groups, e.g., using different expected DoS for underwear, outerwear and daily wear.

Conclusions and recommendations

Lifespans of textiles can and should be measured empirically and waste audits are probably the most cost-effective method in existence   [11].

Implementing mandatory labelling of the brand (already done by most brands) and date of production (only done by some brands) on all textile products will make it easier for researchers, policymakers and consumers to gain knowledge of the Duration of Service (DoS). This is an important first step in making fast fashion recognisable and therefore also easier to make it obsolete. In the ongoing work with the EU's Textile Strategy (and certainly in all policy development) there is a wish for alignment.

It is therefore urgent to obtain good empirical knowledge about DoS, alongside other important environmental parameters. This is needed to make LCAs better, and PEF reliable and valid for any green claims, but also for DPP and EPR. We encourage the further development of waste audit methods to not only look at waste compositions and what happens after clothing has been discarded, but rather at the same time collect information about what has been used for a long time or a lot. This means turning the gaze from the waste to the production of waste, and therefore creating opportunities for developing policy measures that are efficient in preventing waste and with larger potential environmental benefits, in line with the waste hierarchy.

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