Supplementary Material

Car vs Packaging – a first, simple (environmental) sustainability assessment of our changing shopping behaviour

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Assumptions and Life Cycle Inventory Data for the Basic Scenarios

Key assumptions used in the calculation of the basic scenarios for "shopping in the city" and "online shopping" in relation to the functional unit – i.e. "purchase of new clothes of one person over a period of one year" (summarized in table 1 of the manuscript):

- **Purchased articles of clothing**. Although the actual production of all these clothes is not part of the examined system, their weight is of relevance for a variety of the here examined transport steps. For this study, the in Table S1 listed mix of clothes items is assumed to be purchased over the year – resulting in an average weight of 254 grams per clothes item.

Table S1. Mix of purchased articles of clothing over one year. The mixes (i.e. the various kinds of clothing and the share between men, women and children) are based on the assumption of the author of this study, while the average weight is taken from the weight information given at https://www.parcl.com/education/forwarders/docs/parcl-approximate-weight-of-goods.pdf

			Average weight (in g/piece)		
			Men	**Women**	**Children**
Undergarments	8	pieces	80	40	20
T-Shirt / Shirt	5	pieces	200	130	80
Pullover / Sweater	3	pieces	350	400	250
Shorts / Pants	1	piece	300	200	120
Trousers	4	pieces	700	550	300
Suits & Dresses/Skirts	1	piece	1600	600	300
Jackets	2	pieces	1200	1000	650
			Weight of all pieces in kg		
TOTAL	24	pieces	9.79	7.17	4.23
		Share (in%)	*15*	*35*	*50*

- **Transport Production – Distribution**. Based on the production chain of the fashion label Mango (reported in a factsheet of the Clean Clothes Campaign[1]), a simplified supply mix for clothing items of 80% coming from Asia (using China as representative country), 10% coming from the North of Africa (with Morocco being used in this study) and the remaining 10% originating from the South of Europe (using Turkey as representative country) is assumed in this study here. The distribution centre is assumed to be in the northern part of Germany, and all the items are transported in a first step by a mix of lorry and ship to this distribution centre. In details, the following transports are modelled:

  - From China to the distribution centre:
    250 km lorry (to harbor in China) using the dataset "market for transport, freight, lorry >32 metric ton, EURO3 [GLO]", **20'000 km by ship** (from China to Europe) using the dataset "market for transport, freight, sea, transoceanic ship [GLO]", and **250 km lorry** (from harbor to distribution centre) using the dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]".

  - From Morocco to the distribution centre:
    50 km lorry (to harbor in Morocco) using the dataset "market for transport, freight, lorry >32 metric ton, EURO4 [GLO]", **2'600 km by ship** (from Morocco to Europe) using the dataset "market for transport, freight, sea, transoceanic ship [GLO]", and **250 km lorry** (from harbor to distribution centre) using the dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]".

  - From Turkey to the distribution centre:
    2'750 km lorry (from production site to distribution centre) using the dataset "market for transport, freight, lorry >32 metric ton, EURO4 [GLO]".

- **Transport Distribution – Point of Sales (POS)**. For the transport from this distribution centre to the point of sales (i.e. shop in the city and the logistical centre of the online company, respectively) **600 km lorry** (using dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]") and **100 km delivery van** (using dataset "market for transport, freight, light commercial vehicle [LGO]") are assumed here (based on default distances reported in [1]).

- **Travelling to the City centre**. As default value the following situation is assumed here: a family (two adults and two children) is driving in their **own car** (represent by the dataset "market for transport, passenger car, EURO [RER]"), three times per year, from home to the next city centre for a shopping day. The family is assumed to live in Wildhaus (Switzerland) and the next city centre then is Zürich. According to www.google.ch/maps the shortest road trip from Wildhaus to Zürich is **85 km**.

- **Shopping bags**. The study assumes that one shopping bag is received per two clothes items (i.e. a total of **12 shopping bag per functional unit**). For these shopping bags, a 50:50 mix of plastic and

[1] See https://cleanclothes.org/resources/publications/factsheets/general-factsheet-garment-industry-february-2015.pdf

paper bags is assumed. Key data for the production of these shopping bags are taken from [2] and combined with data from ecoinvent version 3.4 [3].

- **Active use of ICT device**. The study assumes **30 minutes of internet and laptop use** for each article of clothing that is ordered. The laptop is modelled based on the data for a typical 14- to 15-inch devices given in [4] and the internet infrastructure and energy consumption is modelled with the data reported in [5].

- **Transport of "delivery to me"**. According to https://de.wikipedia.org/wiki/Zalando, Zalando has 4 own logistical centres from where the parcels are send out. In this study, it is assumed that 60% of the parcels are sent from Lahr to Switzerland, 20% from Mönchengladbach and the remaining 20% from Erfurt. All these parcels are transported first to a central platform in Bülach (using dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]") and the respective transport distances according to www.google.ch/maps are 200km, 620km and 550km respective.
  From Bülach to the customer, the Swiss Post is handling the further delivery. A total distance to the customer of 150km is assumed here; split into 40% lorry (using dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]"), 40% train (using dataset "market for transport, freight train [CH]") and 20% delivery van (using dataset "market for transport, freight, light commercial vehicle [GLO]").

- **Carton boxes**. weight and dimension of "Postpac No.4" from Swiss Post (i.e. 48x26x16 cm, weight of 815g, as reported at https://www.postshop.ch/de/Produkte/Verpacken-Versenden/PostPac/Post-Pac-OEko-4-10er-Einheit-KE_730840??S=0&P=1) are used in combination with the dataset "market for carton board box production, with offset printing [GLO]".

- **Number of clothes items that are send back**. According to the statistical information from VSV ASVAD (the Swiss association of e-commerce companies), published in February 2017 [6], 46.5% of the values of ordered textile products have been sent back in Switzerland in 2016. Hence, it for this study here it assumed that **3 out of 7 articles** (or about 43%) are sent back.

- **Transport of "sending back"**. It is assumed that the parcel is picked-up at home and then follows the same way as in case of "delivery to me" (see above), with the exception that 100% of the parcels are assumed to go back to Zalando's logistics centre in Lahr. This transport is modelled first as 150km transport to Bülach, split into 40% lorry (using dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]"), 40% train (using dataset "market for transport, freight train [CH]") and 20% delivery van (using dataset "market for transport, freight, light commercial vehicle [GLO]") – followed by a transport in a lorry from Bülach to Lahr (200km, using dataset "market for transport, freight, lorry >32 metric ton, EURO6 [GLO]").

References

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