Supplementary Material for :

The global apparel industry: a significant, yet overlooked source of plastic leakage

This PDF file includes:

Additional description of the methods

Supplementary Figures and Tables:

Methods

ESTIMATION OF CONSUMPTION PER MARKET

There is no peer-reviewed publication that contains estimates for end-use apparel consumption by fiber type and region. This research introduces figures for apparel consumption in the US, the EU-28, China, India, Japan, Brazil, and the aggregated Rest of the World. Data are for the 2019 calendar year or the 2018/19 crop year, which is the latest calendar or crop year before the distortive effects of the COVID pandemic.

<u>Cotton apparel</u>

For cotton apparel, estimates were generated using an apparent consumption approach. The starting point for these calculations was the quantity of cotton fiber consumed by spinning mills (e.g., yarn production) for each primary market or country c [1]. To these volumes, imports were added and exports were subtracted at each downstream stage of the value chain (fabric manufacturing and cut and sew assembly into finished consumer products) [2]. Trade volumes were adjusted to account for blending and loss throughout the value chain using the trade category specific conversion factors (i) established by the United States Department of Agriculture (USDA) [3].

$$
\begin{aligned}
CottonFiberCons_c \\
&= DomesticCottonMillUse_c + (Yarn\ Imports_i * Conversion\ Factor_i) \\
&- (Yarn\ Exports * Conversion\ Factor_i) \\
&+ \ (Fabric\ Imports_i * Conversion\ Factor_i) \\
&- (Fabric\ Exports_i * Conversion\ Factor_i) \\
&+ \ (Finished\ Textile\ Imports_i * Conversion\ Factor_i) \\
&- (Finished\ Textile\ Exports_i * Conversion\ Factor_i)
\end{aligned}
$$

A result of these calculations was a total volume of cotton available for consumers. These figures needed to be scaled down to isolate apparel (i.e., exclude fibers meant for other uses such as non-wovens or home furnishings). Several markets (US, EU-28, and Japan) are dominated by imports. Imports are classified according to end-use (e.g., apparel and home furnishings), and the proportion of apparel relative to other end-uses was derived for each import-dominant market. These proportions were applied against the result from the apparent consumption process to establish estimates for cotton consumed in apparel in import-dominant markets.

$$CottonApparelCons_{c\ imp} = CottonFiberCons_{c\ imp} * CottonApparelProportion_{c\ imp}$$

[†] *c imp denotes import-dominant apparel markets*

For China, India, and Brazil, domestic apparel manufacturing represents a larger share of apparel available for consumers, and trade data could not be leveraged in the same way to deflate total cotton end-use to apparel end-use. However, the proportion of apparel relative to other end-uses was consistent across import-dominant regions (between 75% and 78%). Given the international consistency, this average was applied to deflate apparent consumption results for total cotton end-use for China, India, and Brazil to estimates for the volume of cotton devoted to apparel in those markets.

$$CottonApparelCons_{c\,mfg} = CottonFiberCons_{c\,mfg} * ApparelProportion_{c\,mfg}$$

† *c mfg denotes markets with significant domestic apparel manufacturing*

For the Rest of the World, cotton world production numbers from the USDA are taken and multiplied by 75% to isolate apparel, using apparel's estimated share of end-use consumption from the markets of focus. The quantity of cotton apparel in the specific markets studied is then subtracted, to obtain the quantity for the Rest of the World.

$$CottonApparelCons_{Global} = CottonMillUse_{Global} * 75\%$$

$$CottonApparelCons_{RoW} = CottonApparelCons_{Global} - \sum_{c} CottonApparelCons_{c}$$

Man-made apparel

The apparent consumption approach could not be applied for man-made apparel. There are two reasons. One is because the geographies for published man-made fiber production and consumption data are often by region rather than by country. This prevents the alignment of trade data with yarn production data. Another obstacle for apparent consumption methods and apparel derived from man-made fibers is that there is a greater diversity of end-uses for man-made fibers (e.g., automobile upholstery), and there is no known way to comprehensively estimate the volumes devoted to these alternate end-uses. For the import-dominant markets (US, EU-28, and Japan), imports were assumed to represent apparel constructed with man-made fibers (i.e., petroleum-derived synthetic fibers and cellulosic-derived fibers) consumption. Imported apparel weight volumes were multiplied by USDA conversions factors [4] to incorporate fiber loss and blending along the value chain. In a robustness check, apparel import figures for cotton were compared against those derived under the apparent consumption approach. The values closely resembled each other, suggesting that the use of purely import-based estimates is a valid alternative to apparent consumption for apparel composed of man-made fibers for these markets.

$$ManmadeApparelCons_{c\,imp} = ManmadeApparelImports_{c\,imp}$$

There is more domestic apparel manufacturing in Brazil, China, and India, and apparel import data cannot be considered representative of consumers' use. A solution was to use cotton's share of apparel. Cotton's share of apparel was relatively consistent across import markets (EU, US and Japan), ranging between 45.5% and 56.7%. It was assumed that cotton's share of apparel could be similar in Brazil, China, and India. Specifically, it is assumed to be 50% for Brazil and India. For China, where man-made fiber production is high, we considered a range for cotton's share of apparel between 40% and 50%.

$$ManmadeApparelCons_{Brazil} = CottonApparelCons_{Brazil}$$

$$ManmadeApparelCons_{India} = CottonApparelCons_{India}$$

$$ManmadeApparelCons_{China-Min} = CottonApparelCons_{China}$$

$$ManmadeApparelCons_{China-Max} = \frac{60\%}{40\%} * CottonApparelCons_{China}$$

For the Rest of the World, the assumption that 75% of global cotton use is devoted to apparel was leveraged. It was then assumed that cotton had a 50% market share of apparel. The result is that the estimated volume of synthetic and cellulosic fibers derived fibers flowing into apparel is the same as cotton .

$$ManmadeApparelCons_{RoW} = CottonApparelCons_{RoW}$$

Due to differences in the implications for plastic leakage for synthetic (e.g., polyester) and cellulosic-derived (i.e., viscose) man-made fibers, estimates for man-made fibers were separated according to source material. Published figures for the share of petroleum-derived and cellulosic-derived fiber in apparel are not available. To approximate these volumes, figures for global textile fiber production [5] were assumed consistent across markets. Specifically, 91% of man-made fibers were considered synthetic and 9% considered cellulosic-derived.

$$SyntheticApparelCons_c = ShareofSyntheticInManmade_c * ManmadeApparelCons_c$$

Non-cotton natural fiber apparel

Estimates for yarn production for non-cotton natural fibers (wool, linen, silk) are not available. This prevents the use of apparent consumption for describing apparel consumption using net apparel consumption methods. At the most granular internationally shared level (HS6), import classifications prevent representative estimates from being derived for apparel made from non-cotton natural fibers. However, the most detailed US import categories (HS10) enable further delineation by fiber content. These data show non-cotton natural fibers represent 4% of US apparel imports, and a 4% share for non-cotton natural fibers is assumed for all other markets.

The consumption numbers are summarized in Table S1.

Table S1. Consumption numbers by market and fiber type, in Mt per year

	EU-28	US	Japan	China	India	Brazil	Rest of the World	Total
Cotton	2.5	2.5	0.45	2.3	2.0	0.56	4.4	**15**
Synthetic - mean	2.1	2.2	0.55	2.5	1.9	0.51	4.2	**14**
Synthetic - low	-	-	-	2.06	-	-	4.0	**13**
Synthetic - high	-	-	-	3.0	-	-	4.4	**15**
Other fibers	0.39	0.41	0.094	0.44	0.34	0.093	0.75	**2.5**
Total - mean	**5.0**	**5.1**	**1.1**	**5.2**	**4.2**	**1.2**	**9.3**	**31**
Total - low	-	-	-	4.3	-	-	9.1	**30**
Total - high	-	-	-	5.2	-	-	9.5	**32**

A double check is performed to make sure that these numbers are consistent with the economic reality, and in particular the quantity of apparel consumed in the Rest of the World compared to the 6 regions singled out. For this, data from the IMF [6] on purchasing price parity (PPP) per capita and economic activity are compared. Table S2 shows that the PPP per capita of the 164 countries in the set “Emerging and Developing Economies” is about a quarter of that from the EU.

Moreover, Ward and Neumann[7] shows that lower income brackets spend as much as 40% of their income on food alone. And even when incomes increase to $10k per capita, the volume spent on clothes is about one third of the amount in markets with average income. This indicates that clothing spending is exponential with income, and while there may be many more consumers at the lower income levels, it takes many of them to equal spending in developed markets. In addition, lower income markets will be recipients of used apparel from developed markets, which will also weigh on their consumption of new apparel. This suggests that significant proportion of their limited spending could go to used items rather than new ones.

Table S2. Gross domestic product per capita, in purchasing power parity, international dollars

	2015	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**
European Union	41'225	41'994	43'185	44'058	44'845	42'224	44'514	45'857
Emerging market and developing economies	10'164	10'460	10'809	11'166	11'423	11'058	11'705	12'016
Ratio EU/Developing - per capita	4.1	4.0	4.0	3.9	3.9	3.8	3.8	3.8

PLASTIC FLOWS ALONG THE APPAREL VALUE CHAIN

The assessment follows a lifecycle thinking by considering all identifiable activities on the value chain and upstream (i.e., the full range of activities needed to create, use and dispose of the apparel), in order to provide as comprehensive a view as possible of the product's cradle-to-grave life cycle. Figures S1, S2 and S3 show the plastic flows taken into account at each stage of the apparel value chain, for cotton, synthetic and other fibers apparel respectively.

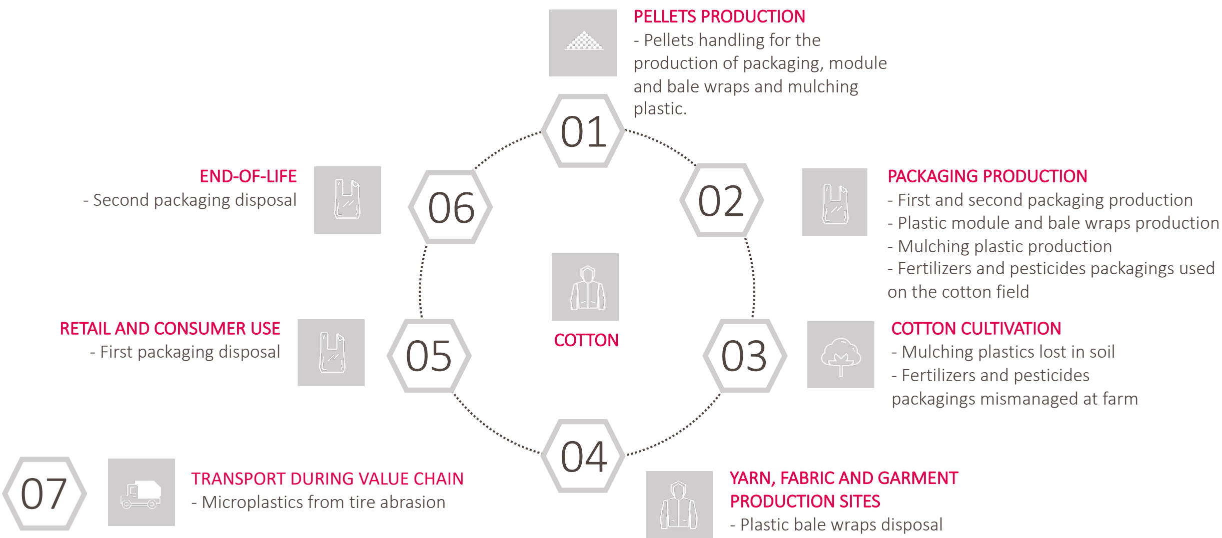

Fig. S1: Plastic leakage across the life cycle of cotton apparel

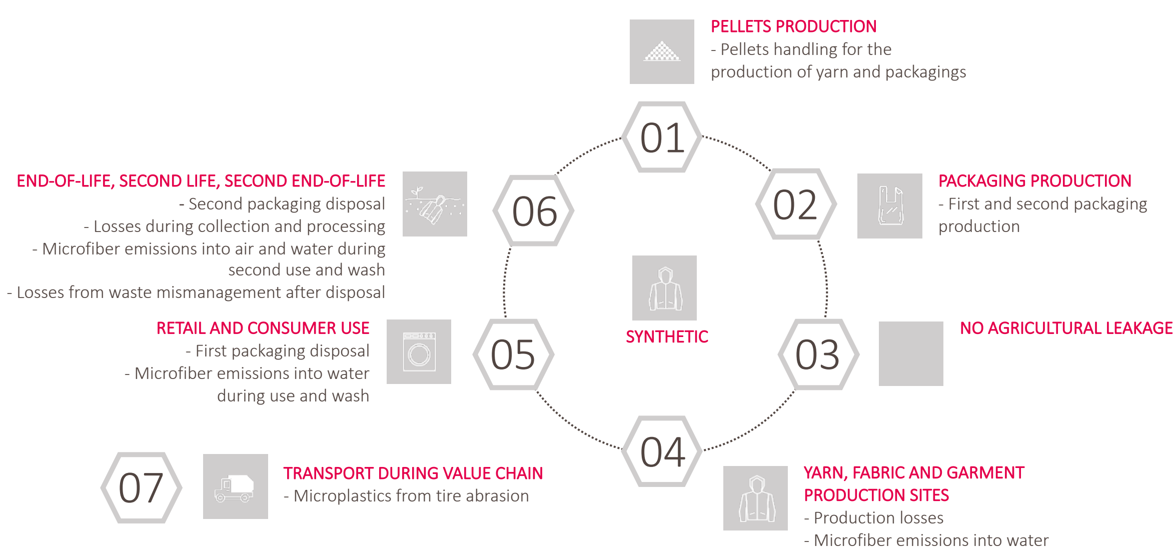

Fig. S2: Plastic leakage across the life cycle of synthetic apparel

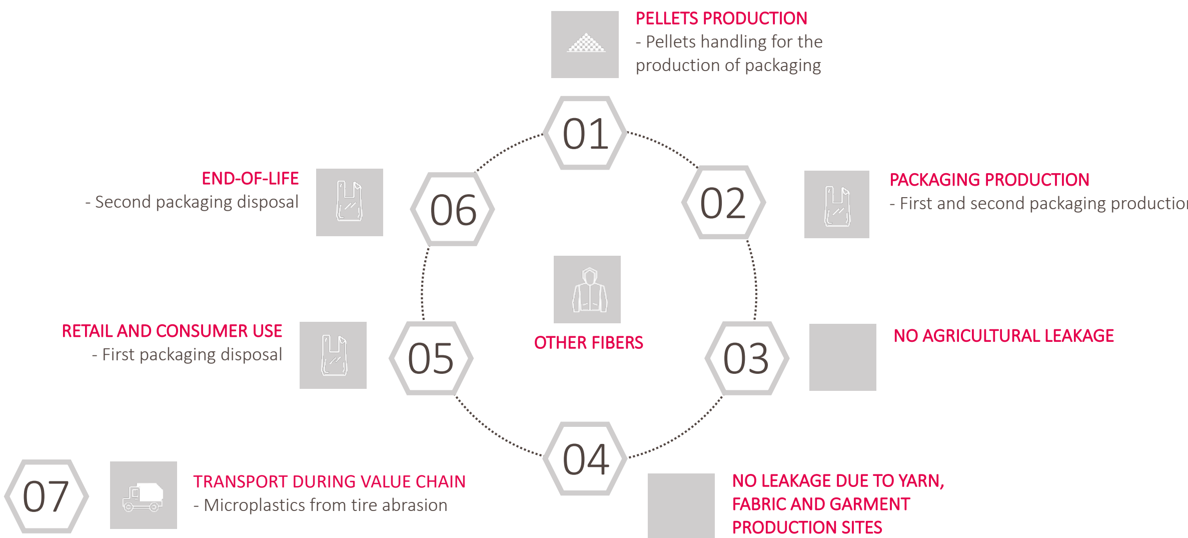

Fig. S3: Plastic leakage across the life cycle of apparel from other fibers

Details on the plastic flows presented in Figures S1, S2 and S3 for each life cycle stage are given below:

1. Pellet production: This includes the pellet production stage to produce plastic materials such as polyester yarn and plastic packaging.
2. Plastic formation: This includes production of the plastic material such as polyester fibers, packaging, and module wraps from plastic pellets.
3. Agricultural plastics: This includes losses from plastic applied to agricultural soil, such as mulching plastic, and items which may be mismanaged at the farm level such as module wraps or crop input packaging.
4. Yarn, fabric and apparel production sites: This includes any losses during the apparel manufacturing stage including producing yarn or fabric, wet processing, and apparel assembly.
5. Retail and consumer use: This stage covers plastic leakage from disposal of the primary packaging, and microfiber emissions to water and soil from the apparel during washing.
6. End-of-life in the first market, recover for reuse and end-of-life in the second market: This life cycle stage represents the appropriate end-of-life pathway for apparel in each country of consumption. The shares of items landfilled, incinerated, recycled, exported for second life and the use pattern in second life are incorporated.
7. Transport throughout the value chain: This covers microplastic losses from truck tire abrasion that occurs across the value chain.

GEOGRAPHIES ALONG THE APPAREL VALUE CHAIN

Some processes within the system boundaries might take place anywhere or within multiple life cycle stages, such as the pellet and packaging production, respectively. In contrast, some have definite geographies, with specific variations in plastic flows associated with said geographies. The different geographies considered at each stage are summarized in Figure S4.

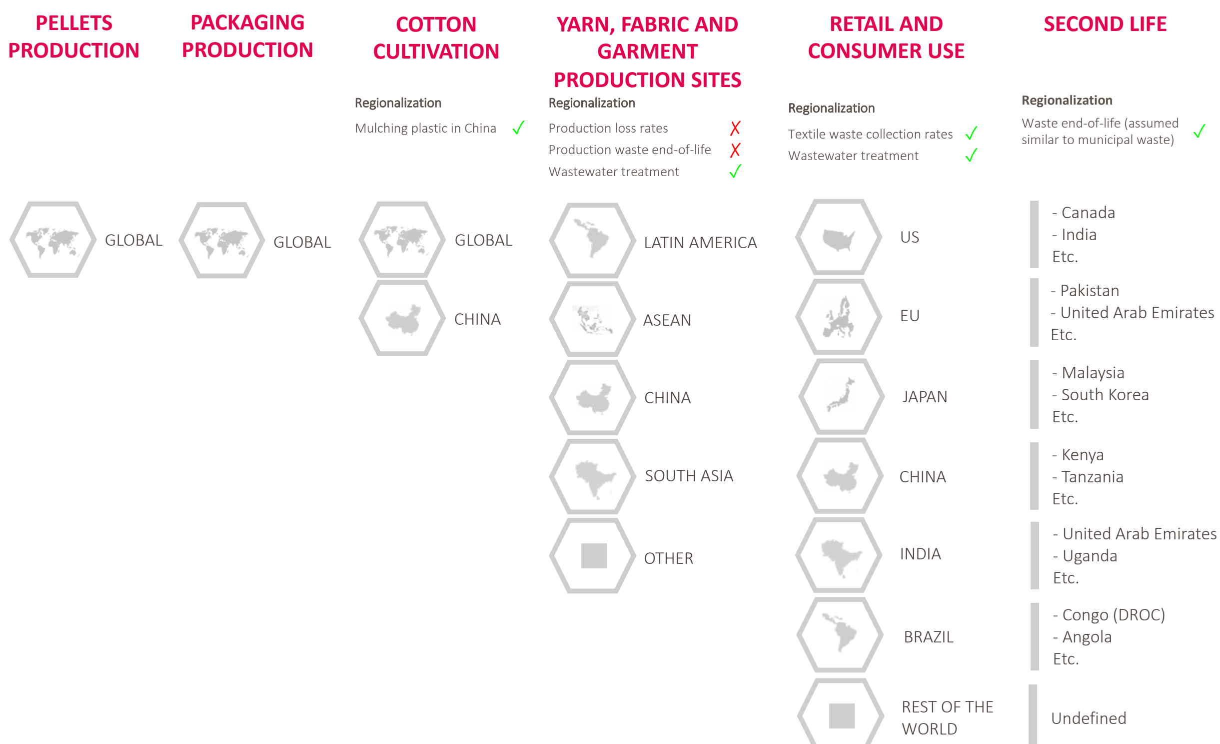

Fig. S4: Geographies along the value chain

For apparel second life, only the main export countries are given in Figure S4, and the complete lists of export markets are given in Tables S4 to S9.

For cotton cultivation, China was treated differently as the plastic flows associated with the cultivation processes differ between China and elsewhere in the world.

The location specific textile production shares related to different sales markets were extracted from Trade Data Monitor *(2)* and are summed in Tables S2 and S3.

Table S2: Apparel manufacturing by country - Synthetic apparel

		Primary sales markets considered					
		EU-28	US	Japan	China	India	Brazil
Manufacturing countries (2)	Latin America	1%	28%	0%	0%	0%	0%
	ASEAN (Association of Southeast Asian Nations)	19%	25%	29%	0%	0%	0%

	South Asia	26%	6%	6%	0%	0%	0%
	China	39%	33%	63%	100%	0%	0%
	India	0%	0%	0%	0%	100%	0%
	Brazil	0%	0%	0%	0%	0%	100%
	Undefined	16%	9%	1%	0%	0%	0%

Table S3: Apparel manufacturing by country - Cotton apparel

		Primary sales markets considered					
		EU-28	US	Japan	China	India	Brazil
Manufacturing countries	Latin America	1%	28%	1%	0%	0%	0%
	ASEAN	8%	19%	35%	0%	0%	0%
	South Asia	59%	25%	15%	0%	0%	0%
	China	13%	21%	46%	100%	0%	0%
	India	0%	0%	0%	0%	100%	0%
	Brazil	0%	0%	0%	0%	0%	100%
	Undefined	20%	7%	2%	0%	0%	0%

For the EU-28, the US and Japan, we based the production mix on trade data (Trade data monitor, 2020).

For China, India and Brazil, since they are major production countries, it is not possible to rely on trade data, and we assumed that the total apparel consumption comes from domestic production.

At the end-of-life of apparel, some is recycled, landfilled or incinerated within the same country, whereas some is exported to other countries to be reused and eventually disposed. We extracted the share of textiles exported at the end-of-life (trade code HS 6309) over total textile consumption in the market from trade data [2]. We assume that the same percentage of used exports applies to apparel as to other textiles. The quantities are reported in Tables S4 to S9.

Table S4: Used apparel exported by the EU-28

Export country	Mass exported (in Mt)
Pakistan	16%
United Arab Emirates	9.4%
Tunisia	7.1%
Turkey	4.8%
Ukraine	6.6%
Cameroon	4.4%

Togo	4.1%
India	4.1%
Russia	2.5%
Ghana	6.5%
Belarus	2.2%
Benin	2.8%
Guinea	1.7%
Kenya	2.0%
Nigeria	3.1%
Niger	1.2%
Senegal	1.2%
Oman	0.9%
Mali	0.9%
Angola	0.8%
Congo (ROC)	0.8%
Morocco	0.8%
Chile	0.7%
Uganda	0.7%
Congo (DROC)	0.7%
Tanzania	0.8%
Madagascar	0.7%
Mozambique	0.6%
Cote d'Ivoire	0.9%
Jordan	0.2%
Djibouti	0.6%
Burkina Faso	0.6%
South Africa	0.6%
Iraq	0.5%

Table S5: Used apparel exported by the US

Export country	Mass exported (in Mt)
Canada	16%
India	13%
Guatemala	12%
Chile	8%
Honduras	7%
Dominican Republic	6%
Pakistan	5%
United Arab Emirates	4%
Nicaragua	4%
Mexico	3%
El Salvador	3%
Congo (DROC)	2%
Philippines	2%
Malaysia	2%
Liberia	1%
Kenya	1%
Angola	1%
Tunisia	1%
Tanzania	1%
Senegal	1%
Costa Rica	1%
Guinea	1%
Ukraine	1%

Table S6: Used apparel exported by Japan

Export country	Mass exported (in Mt)
Malaysia	52%
South Korea	17%
Philippines	15%
Cambodia	4%
Pakistan	3%
India	3%
Hong Kong	3%
Thailand	2%

Table S7: Used apparel exported by China

Export country	Mass exported (in Mt)
Kenya	20%
Tanzania	8%
Angola	8%
Pakistan	7%
Philippines	7%
Nigeria	6%
Mozambique	5%
Ghana	4%
Madagascar	3%
Haiti	2%
Uganda	2%
India	2%
Cambodia	2%
Cameroon	2%
Turkey	2%
Guinea	2%
Thailand	2%
Cote d'Ivoire	2%
Benin	1%
Malawi	1%
United Arab Emirates	1%
Congo (DROC)	1%
Iraq	1%
Togo	1%
Rwanda	1%
Singapore	1%

Table S8: Used apparel exported by India

Export country	Mass exported (in Mt)
United Arab Emirates	25%
Uganda	11%
Kenya	11%
Congo (DROC)	8%
Tanzania	5%
Thailand	5%
Philippines	4%
Malaysia	3%
Malawi	3%
Angola	3%
Mozambique	3%
Ghana	2%
Zambia	2%
Chile	1%
Rwanda	1%
Madagascar	1%
Congo (ROC)	1%
Jordan	1%
Guinea	1%
Burundi	1%
Sudan	1%
Japan	1%

Table S9: Used apparel exported by Brazil

Export country	Mass exported (in Mt)
Congo (DROC)	52%
Angola	29%

PLASTIC LEAKAGE ALONG THE APPAREL THE VALUE CHAIN

Plastic leakage is defined as the mass of plastic leaving the human environment and terminating in the natural environment. Leakage is a result of both loss and release through transfer and redistribution pathways. Losses according to Peano et al. [8] are the mass of plastic that leaves a managed product or waste management system. All losses do not necessarily end up in the natural environment. For example, part of the microfiber losses through apparel washing are recaptured in wastewater treatment plants. The fraction that then leaves the human environment for the natural environment is said to be released. The sum of the plastic released into different environmental compartments corresponds to the total leakage. The key stages of plastic leakage modelling for the different environmental compartments are illustrated in Figure S5.

Fig. S5: Key stages of the plastic leakage modelling, aligned on the fate of toxic substances covered in the USEtox model [9]

At each step of the apparel value chain, we assessed the macro- and micro-plastics leakage by combining the plastic flows with the loss and release rates provided by Peano et al. [8]. These include pellet losses during manufacturing, microplastic fibers losses through laundering, microplastic release through wastewater, macroplastic losses during waste disposal, and microplastic losses and release through transport. Table S10 shows the different plastic leakage routes for each stage of the life cycle of a textile product, and summarizes the related background data that are further detailed in Peano et al. [8], as well as the estimated data quality.

Mismanagement waste indexes (MWI) in particular are a key factor influencing the results of this study. The MWI used in this study were compiled by Peano et al. [8], and account for both uncollected and poorly managed waste. This follows the definition of mismanaged waste from Jambeck et al. [10] as “material that is either littered or inadequately disposed. Inadequately disposed waste is not formally managed and includes disposal in dumps or open, uncontrolled landfills, where it is not fully contained”. Poorly managed waste according to Peano et al. [8] includes:

- Dumping: In low-income countries, collected waste can end up in an open dump, which is prone to pollute nearby aquifers, water bodies and settlements.
- Non-sanitary landfills: In transition countries, landfills planned as controlled engineered sites can end up being mismanaged (e.g., light plastic waste may be blown away by wind, or carried away by runoff) (Velis et al. 2017).

Table S10: Summary and data quality assessment for background data provided in the plastic leakage methodology (*4*)

Life cycle stages	Nature of plastic leakage	Key background data	Data quality
Suppliers	Microplastics from pellet production	Pellet loss rates: Lassen et al. (2015) [11], Sundt et al. (2014) [12], Cole and Sherrington (2016) [13]	Low
Production (company-owned)	Macroplastics from product and packaging production	Mismanaged waste rates per country: Kaza et al. (2018) [14]	Low
Product use	Microfiber from textile washing and wearing	Release rate after wastewater treatment: Country data compiled based on various sources (Van Drecht et al. 2009 [15]; Williams et al. 2012 [16]; Baum et al. 2013 [17])	Average
Product end-of-life	Macroplastics from textile products end-of-life (incineration, landfilling, recycling, reuse) in hotspot countries	Mismanaged waste indexes (MWI) for textile, for hotspot countries country*: Amaral et al., (2018) *(16)*; Garvert, (2017) *(17)*; Spuijbroek (2019) *(18);* Eurostat *(19);* EPA *(20)*; Reverse Resources *(21)*; Korai et al. (2020) *(22)*; Abrelpe (2020) *(23)*	Average
	Macroplastics from textile products end-of-life in other countries, and from packaging end-of-life in all countries	Mismanaged waste indexes (MWI) per country: Kaza et al. (2018) [14]	Low
Transport	Microplastics from tire abrasion	Unice et al. (2018) [18] Hann et al. (2018) [19]	High

*For the countries identified as key leakage hotspots, individually refined MWI for textiles specifically were compiled (see the next section) rather than using the data from Kaza et al (2018).

MISMANAGED WASTE INDEXES (MWI) FOR TEXTILE WASTE IN HOTSPOT COUNTRIES

For the countries identified as apparel leakage hotspots (the US, the EU, China, India, Pakistan and Brazil), we refined the MWI to represent textile waste specifically.

The methodology we adopted to obtain a textile-specific MWI value in these countries can be divided into three steps:

1. Defining a recovery rate through recycling or reuse practices that is specific to the textile waste.
2. Establishing the shares of different waste management practices for municipal waste that will be applied by default to the textile waste not recovered through recycling or reuse.
3. Combining information from the previous steps to derive the value of MWI for textile waste in the country.

The first step, aiming at determining a textile-specific waste recovery rate, is based on a thorough literature review. Knowledge on this topic being scarce, data is often limited and does not necessarily reflect recovery practices for the entire pool of textile waste. Indeed, studies were usually covering recycling practices either for industrial textile waste or post-consumer textile waste, but seldom both at the same time. For countries where quantitative data was available, we used the values provided directly *(Brazil:* [20,21]; *China:* [22]*; EU-28:* [23]*; USA:* [24]*)* . When only qualitative statements were available, we derived values based on expert judgment. For instance, several sources confirmed the existence of recycling capacities both in India and Pakistan [25]. However, based on qualitative statements from a major recycling actor in India, it was inferred that the quality of textile waste from local sourcing was too low for recycling companies to turn a profit, thus compelling them to focus exclusively on textile waste imports from abroad. We thus assume that none of the textile waste generated within the country was eventually recycled in both India and Pakistan. To date, reporting practices on the recovery of textile waste are not yet harmonized and we expect that more accurate data will be available in the future.

The second step relies on a review of the most recent literature on municipal waste management in each country. It covers the collection rate, as well as the shares of management of collected municipal waste between incineration, sanitary landfill, non-sanitary landfill and dumpsite. Non-sanitary landfills are assumed to have some monitoring and isolation in place but not sufficiently, whereas open dumps are completely unsupervised. We found quantitative data for all countries with the reference year ranging from 2016 for Pakistan [26] to 2019 for Brazil [27].

The last step consists of combining data from textile-specific waste recovery rates and municipal waste management shares. First, we used the waste collection rate to establish the share of uncollected textile waste. Then we applied the recovery rate to the collected textile waste (when no specific mass of textile was already available) to single out the textile waste that is subject to other waste management options. Finally, we applied the shares of municipal waste management (other than recycling or reuse) to the textile waste that is collected but not recycled nor reused. We eventually computed MWI for textile waste as follows:

$$MWI\_textile\ (\%) = Uncollected\ textile\ waste\ (\%) + textile\ waste\ in\ non\ sanitary\ landfills\ (\%) + textile\ waste\ in\ dumpsites\ (\%)$$

In the case of the European Union (28 countries), we estimated the share of non-sanitary landfills by looking at the number of landfills that were considered illegal by the European Court [28] out of the total number landfills for non-inert waste [29]. For China, Spuijbroek [22] considered that 47% of landfills had an inappropriate leachate treatment. In Brazil, the report by Abrelpe [27] mentioned that 23% of collected waste ended up in unsanitary landfills. Eventually, Kumar et al. [30] considered that only 3% of waste disposal sites in India were sanitary landfills, while Korai et al. [26] mentioned that no engineered landfills nor waste-to-energy facilities were found in Pakistan. The textile MWI obtained from this are given in table S11.

Table S11: MWI refined for textiles

Market	MWI for textiles (%)	Reference year
EU-28	29%	2018
US	2.7%	2018
China	45%	2018
India	98%	2018
Brazil	45%	2019
Pakistan	100%	2016

UNCERTAINTY ANALYSIS

The MWI are one of the key parameters influencing the results, while exhibiting a high uncertainty due to the general lack of primary data. Therefore, we performed an uncertainty analysis on this parameter.

For the US, EU, China, India, Brazil and Pakistan, which have a refined MWI specific to textile, we calculated a different uncertainty range for the textile MWI and for the packaging MWI. The textile MWI uncertainty analysis is given in Table S12.

Table S12: MWI uncertainty intervals for textile

Market	MWI for textile – low end (%)	MWI for textile – high end (%)
EU-28	20%	37%
US	1.1%	4.3%
China	25%	65%
India	92%	100%
Brazil	4.3%	17%
Pakistan	95%	100%

The approach chosen to calculate this uncertainty is based on the evaluation of the standard deviation in MWI values for general waste obtained through different methodologies for the same country. The MWI values for general waste obtained through 6 different methodologies as well as the associated standard deviation for each country are provided in Table S13.

Table S13: MWI values for textile from different methodologies

Market	Methodologies						Standard deviation across sources
	EA – based on What a Waste 2.0 data [31]	EA – based on World Waste Status [31]	WWF ReSource 2020 [32]	Jambeck et al.2015 [10]	Lebreton & Andrady 2019 [33]	PLP 2020 [34]	
EU-28	7%	15%	5%	4%	6%	11%	8%
US	0%	0%	2%	2%	1%	2%	2%
China	28%	85%	76%	76%	70%	71%	20%
India	87%	100%	88%	88%	95%	95%	5%
Brazil	35%	84%	11%	11%	42%	31%	27%
Pakistan	98%	96%	87%	87%	85%	88%	5%

We took the uncertainty range of the packaging MWI as the interval between the 1st and the 3rd quartile of the MWI of the economic group they belong to: High income countries (HIC), Upper middle income countries (UMC), Lower middle income countries (LMC), Low income countries (LIC). The quartiles of the MWI by economic grouping of countries is summed up in Table S14 (classification taken from Kaza et al. [14]).

Table S14: MWI by groups of countries

Groups of countries	1st quartile	Median	3rd quartile
HIC	0%	4.3%	23%
UMC	39%	68%	88%
LMC	79%	88%	95%
LIC	95%	95%	98%
HIC+UMC	2.7%	23%	69%
LIC+LMC	88%	95%	95%
LIC+LMC+UMC	69%	88%	95%

For Japan, the MWI for textile is not differentiated from other wastes, so for both the apparel and its packaging the uncertainty range we took corresponds to the 1st and 3rd quartiles of the MWI of HIC.

For the export countries, we take the uncertainty interval the 1st and 3rd quartiles of their income category. For exports for which the geography is not defined, the aggregation of the LIC, LMC and UMC is taken.

Table S15. Key results of apparel consumption, plastic waste and leakage per life cycle stage and primary market for cotton and synthetic fibers, in Mt per year. Data for Fig. 1 and Fig. 2 are expressed here. The numbers into brackets show the uncertainty intervals.

		Cotton		Synthetic		Other fibers		Total	
	Apparel consumption	**15**	-	**14**	[13 - 14]	**2.5**	-	**31**	[30 - 32]
Plastic waste	Packaging	**1.7**	-	**1.6**	[1.6 - 1.7]	**0.30**	-	**3.7**	[3.6 - 3.8]
	cultivation	**0.21**	-	**16**	[15 - 17]	**0**	-	**16**	[15 - 17]
Plastic waste related to primary market	EU	**0.33**	-	**2.6**	-	**0.046**	-	**3.0**	-
	US	**0.33**	-	**2.8**	-	**0.048**	-	**3.2**	-
	Japan	**0.063**	-	**0.69**	-	**0.011**	-	**0.77**	-
	China	**0.34**	-	**3.2**	[2.6 - 3.7]	**0.052**	-	**3.6**	[3.0 - 4.1]
	India	**0.26**	-	**2.3**	-	**0.040**	-	**2.6**	-
	Brazil	**0.071**	-	**0.64**	-	**0.011**	-	**0.72**	-
	Rest of the world	**0.56**	-	**5.3**	[5.0 - 5.5]	**0.089**	-	**5.9**	[5.7 - 6.2]
Plastic leakage per life cycle stage	First end-of-life (in primary market)	**0.72**	[0.44 - 1.3]	**6.8**	[3.7 - 9.7]	**0.12**	[0.08 - 0.22]	**7.6**	[4.2 - 11.2]
	Second end-of-life (in secondary markets)	**0**	-	**1.4**	[1.2 - 1.6]	**0**	-	**1.4**	[1.2 - 1.6]
	Others	**0.055**	[0.060 - 0.060]	**0.12**	[0.12 - 0.13]	**0.0013**	[0.0013 - 0.0013]	**0.18**	[0.18 - 0.19]
Plastic leakage related to primary market	EU	**0.030**	[0.025 - 0.21]	**1.0**	[0.82 - 1.3]	**0.0035**	[0.0023 - 0.030]	**1.1**	[0.85 - 1.6]
	US	**0.0091**	[0.0091 - 0.084]	**0.28**	[0.21 - 0.41]	**< 0.001**	-	**0.29**	[0.23 - 0.51]
	Japan	**0.0023**	[0.0023 - 0.016]	**0.055**	[0.055 - 0.23]	**< 0.001**	-	**0.058**	[0.071 - 0.24]
	China	**0.094**	[0.094 - 0.25]	**1.3**	[0.73 - 2.3]	**0.015**	[0.021 - 0.045]	**1.4**	[0.87 - 2.6]
	India	**0.24**	[0.21 - 0.24]	**2.0**	[1.9 - 2.1]	**0.039**	[0.034 - 0.039]	**2.3**	[2.1 - 2.3]
	Brazil	**0.025**	[0.0044 - 0.044]	**0.25**	[0.10 - 0.41]	**0.0039**	< 0.001 - 0.0072	**0.28**	[0.10 - 0.46]
	Rest of the world	**0.37**	[0.12 - 0.51]	**3.3**	[1.2 - 4.7]	**0.062**	[0.019 - 0.085]	**3.8**	[1.3 - 5.3]

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