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# FAST FASHION VERSUS CIRCULAR ECONOMY: AN EXCITING MATCH?

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**ABSTRACT**

Fast Fashion is an extremely successful business model that brings apparel and home textiles to the market in ever shorter lead times at ever lower prices. On the one hand, this can be seen as extremely consumer-friendly, as customers can afford top-styled clothing that is always in line with the latest trends, even on a small budget. The opportunity to dress fashionably therefore does not remain a privilege of high earners. On the other hand, the production of fast fashion takes place without compliance with social and environmental standards. It's all about producing as cheaply and quickly as possible. In the EU, the linear economic model is currently being transformed into a circular one. This development does not stop at the textile sector. The textile industry is obliged to bring more durable products onto the market, to comply with social and environmental standards, and to recycle a high proportion of the textiles at the end of their life cycle. In this communication it is shown that fast fashion leads to an uncontrolled growth of textile production and that recycling alone cannot be the solution. The only way is to tackle the problem at its roots and not to regard waste prevention as just an empty phrase. It is obvious that fast fashion and the circular economy are not compatible and that there can only be one winner.

## 1. INTRODUCTION

### 1.1 The textile production chain

The manufacture of apparel or other textiles requires a multi-step process that is globally dislocated. In contrast to packaging, the textile processing chain is much longer and thus the consumption of resources and energy is very high. Table 1 summarizes the energy demand for the production of apparel broken down according to the individual process steps.

Therefore, according to literature the energy consumption over the entire textile processing chain can add up to 960 GJ/t (Steinberger et al., 2009). The broad range is due to the fact that the (secondary) spinning and weaving or knitting steps, in particular, are strongly dependent on the type of yarn (especially yarn titer) or fabric (especially grammage).

Due to the length of the textile processing chain numerous opportunities to close loops are possible. In addition to reuse (i.e., second-hand clothing), recycling can occur at the fabric, fiber, polymer, or monomer level. Naturally, the less one has to go back in the textile processing chain, the greater the savings potential. However, it must be taken into account that there are certain limitations that prevent short cycles, such as blends of different polymers or the presence of impurities. For recycling, it will be necessary to

**TABLE 1:** Cumulative energy demand for the production of textiles (Roithner et al., 2021).

| Process step | Cumulative energy demand / GJ/t | Remark |
|---|---|---|
| Raw material production | PET: 69 – 81<br>PA: 119 - 129 | Only man-made fibers |
| Fiber production | Cotton: 55 - 69<br>PET: 89 - 110 | Cotton: high water consumption (up to 24,000 m³/t), energy (fossil-based), agrochemicals |
| Yarn formation | 95 - 190 | Strongly dependent on titer |
| Fabric formation | 100 - 310 | Strongly dependent on grammage |
| Wet processing | 104 - 398 | Large quantities of waste water |
| Cutting / sewing | 105 - 420 | |

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use all available processes, even down to the monomer level, and to choose the combination that offers the greatest ecological and economic advantage.

### 1.2 The fast fashion business model

In the apparel industry, the term "fast fashion" has become increasingly important in recent years. "Fast fashion" refers to a business model in which textiles are put on the market in short cycles, offered cheaply and without a long shelf life. Garments are designed, produced and put into stores as quickly as possible to match the latest fashion style. The main characteristic is the shortening of the time to market. This leads to a rapid change of collections and ultimately to an unsustainable and increased consumption of resources. At the same time, sales are boosted.

Figure 1 shows the sales of the leading fast fashion brands in 2021 and 2022. Inditex, which comprises brands such as Zara, Bershka, Massimo Dutti, Oysho, Pull&Bear, Stradivarius, Uterqüe and Lefties is the largest player and is accounting for just over a quarter of sales (32.6 bn€ in 2022). However, Shein has almost doubled its sales from 2021 (14.7 bn€) to 2022 (28.1 bn€) and is close on the heels of Zara (Statista, 2023c). Shein is a Chinese company that has once again accelerated the fast fashion business model, completely ignoring environmental protection and ethical principles (Bottini, 2022).

A close look at the company Inditex reveals that the sales have increased almost sixfold from 2004 (5.6 bn€) to 2022 (32.6 bn€). Even though there was a 28% drop in 2020 due to the pandemic, the average CAGR in this period was 11%, which corresponds to a doubling time of only 6.6 years (see Figure 2).

An end to the rapid growth does not seem to be in sight. As shown in Figure 3, the sales of companies in the fast fashion sector are expected to double again in just six

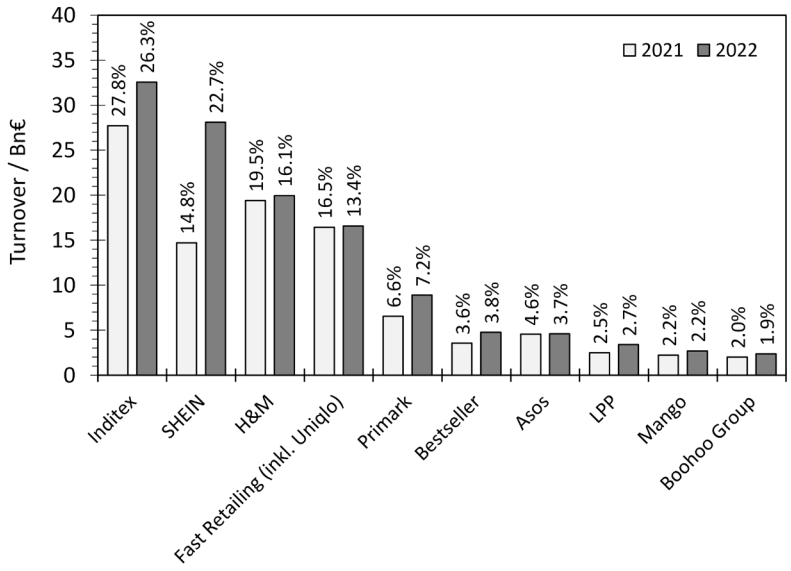


**FIGURE 1:** Sales of leading fast fashion groups worldwide in 2021 and 2022. The percentages refer to the market share of the respective fashion groups (Statista, 2023c).

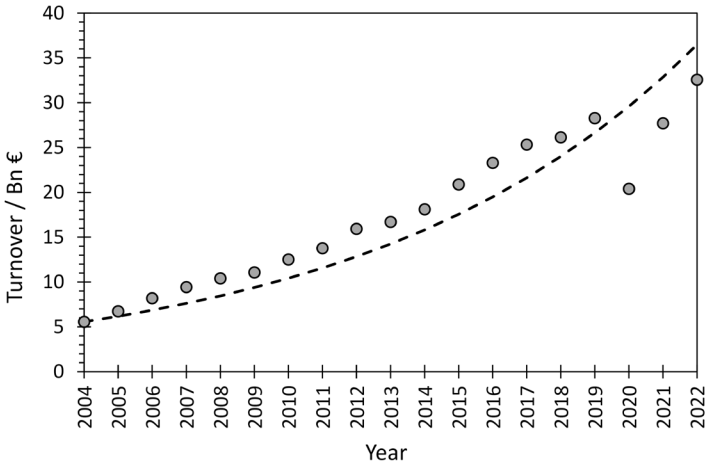


**FIGURE 2:** Inditex Group's sales worldwide from 2004 to 2022 (Statista, 2023b). The dashed line indicates an annual growth rate of 11% based on 2004.

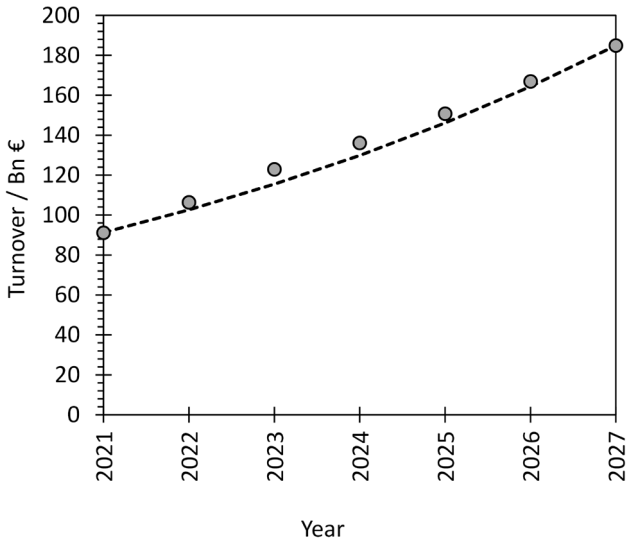


**FIGURE 3:** Outlook on sales of leading fast fashion groups from 2021 to 2027 (Statista, 2023a). The dashed line indicates an annual growth rate of 12.5% from 2021.

years (from 2021 to 2027) which corresponds to an annual growth rate of 12.5% (Statista, 2023a).

### 1.3 Circular economy in the EU

In recent years, the European Union has set a goal to transform our current linear economic model into a circular one. Circular economy is understood as a regenerative system in which resource consumption and waste production are minimized by closing energy and material cycles (Commission, 2015). Typically, sustainable design, maintenance, repair, reuse, re-manufacturing, refurbishing and recycling are proven means to achieve this goal. Due to the amendment of the waste framework directive (WFD) in 2018 (Commission, 2018), textiles are also included in the circular economy concept. The EU Commission expects the transition to a circular economy not only to reduce environmental impacts, but also to improve the security of supply of raw materials and have a positive impact on employment in the EU.

The Commission's focus on textiles is reflected not least in the fact that, in addition to the implementation of textiles in the WFD, other documents that are wholly or at least partly related to textiles have been published, such as the Circular Economy Action Plan in 2020 (Commission, 2020), the EU Strategy for Textiles in 2021 (Commission, 2021) and the EU Strategy for Sustainable and Circular Textiles in 2022 (Commission, 2022). Only recently, on 5 July 2023, the commission has made a proposal for an amendment of the WFD (Commission, 2023a). This document also includes Annex IVc, which defines which textile, textile-related and footwear products will fall within the scope of the foreseen extended producer responsibility. The Commission has clearly stated that it is committed to moving the textile industry towards a circular economy.

**TABLE 2:** Global (recycled) fiber market in 2021 by fiber type (Exchange, 2022).

| Fiber type | Production volume | Market share of recycled fibers | |
|---|---|---|---|
| | $10^6$ t | wt% | $10^6$ t |
| PET | 72.2 | 15* | 10.8* |
| WO | 1.0 | 6 | 0.06 |
| EL | 1.2 | 3 | 0.04 |
| PA | 5.9 | 2 | 0.12 |
| CO | 24.7 | 1 | 0.25 |
| MMCF | 7.2 | 0.5 | 0.04 |
| PP | 3.0 | 0.2 | 0.01 |

** derived practically exclusively from PET bottles*

## 2. GROWTH VERSUS RECYCLING

In a superficial view, it could be concluded that fast fashion in combination with circular economy can form an excellent symbiosis. Through the business model of fast fashion, people can be supplied with affordable fashion. Parallel to this, recycling (of textiles) is included in the EU Circular Economy Package and could help reduce the textile industry's need for primary raw materials (polymers). In addition, textile recycling could create new "green jobs".

Already, Inditex, for example, is making efforts to meet energy consumption from renewable sources, to use sustainably produced cotton, and to use polyester made from recycled materials. The company claims in its 2022 annual report (Inditex, 2023) that the following goals, among others, have been achieved or will soon be achieved:

- use of 100% renewable electricity at its own facilities;
- use of preferred fibres in its products (100% cotton and cellulosic fibers in 2023 and 100% polyester and linen in 2025;
- 25% reduction in water consumption in the supply chain by 2025.

Only recently it has been shown that companies following the fast fashion business model have launched activities to achieve SDG's. However, in fact, brands tend to do "business as usual" and increase greenwashing activities instead (Garcia-Ortega et al., 2023). Finally, large players in the fast fashion sector still rely on driving sales numbers up. Many customers do not understand the negative impact of excessive (textile) consumption on the environment (Hugo et al., 2021). It is therefore still a long way to move fast fashion in the direction of Circular Economy.

Currently, fiber-to-fiber recycling is virtually non-existent. As demonstrated in Table 2, at first glance, it appears that PET fibers have a relatively high recycling rate, as they are made from 15% recycled material (Exchange, 2022). However, recycled PET is derived almost exclusively from PET bottles and fiber-to-fiber recycling is essentially zero. Of the other fiber types, wool has the highest recycling rate at 6%, although with an annual production of around 1 million t, only 60,000 t of fibers are recycled. From this perspective, although the recycling rate is only about 1%,

cotton is in the lead in recycling with a quarter of a million tons. In total, well under 1 million t of fibers are thus actually sourced from textile waste.

It is undisputed that recycling is an effective means of reducing the need for native raw materials. Even though recycling in the textile sector will gain importance based on the new legal framework, the massive growth driven by the fast fashion business model must also be taken into account. The production volume of synthetic polymer fibers has grown by an average of 5.6% annually from 1970 (4.8 million t) to 2022 (72.2 million t) (CIRFS, 2020; Exchange, 2022). This corresponds to a doubling time of 12.7 years. While such growth may be a benefit to the economy, it will not be sustainable for the environment in the long run (Bartl, 2020). If this growth continues in the next few years, the production volume will reach 140 million t by as early as 2032, about twice the volume of 2020. In 2038, the production volume of synthetic polymer fibers would even reach 200 million t, which is about twice the total fiber market in 2020.

Assuming optimistically for the year 2032, that 50% of synthetic polymer fibers are sourced from textile recycling (i.e., direct fiber recycling or produced from the recycled fiber polymer, that would be 71 million t), the demand for virgin polymers would be more or less equal to today's high demand (69 and 71 million t, respectively) as sketched in Figure 4. If we further assume an even more ambitious increase of recycled material content, due to technological progress and stringent legislation, from 50% in 2032 to 66% by 2038, this would reflect deriving an ambitious 129 million t of synthetic fibers from end-of-life textiles (see Figure 4). However, the demand for native raw materials for fiber production would still only decrease insignificantly (from 69 to 67 million t).

Hence, while recycling is indeed a necessary must in the textile sector, it is not sufficient at all. Even if textile recycling is a suitable measure to reduce the consumption of primary resources, growth will compensate all technological progress.

## 3. CONCLUSIONS

Even if a high percentage of end-of-use textiles should be recycled due to the current stringent EU regulations, the business model of fast fashion always leads to a high consumption of resources along the textile processing chain. The above-mentioned limitations (Figure 4) only consider the demand for native material for polymer production. However, textile recycling requires going several steps back in the textile production chain and, to a certain extent, going through it again. Depending on the condition of the end-of-use textiles, they can be fed back into the process chain at different re-entry points (i.e. as fibers, polymers or monomers), which means that at least part of the process chain has to be run through again. This means that despite recycling, significant energy consumption and emissions, especially wastewater, have to be accepted (Ipsmiller & Bartl, 2022; Roithner et al., 2021). However, for this to be feasible, it should always be attempted to plan and implement necessary recycling technologies of the future in line with minimum design requirements. Decisions should be made in close coordination of legislation and technology owners and there needs to be a binding consensus on what is a minimum requirement to provide the necessary function of the textile (brands), what really needs to be avoided from a technological perspective (recyclers) and what the best compromise for that in terms of legal limitations could be.

Ultimately, recycling can only address the symptoms and not, as would be appropriate, the causes. To achieve a massive reduction in resource consumption, it is essential to reduce the amount of textiles sold. Probate means for this are for example an extension of the useful life ("design for durability"), reuse or alternative business models (e.g., leasing). The volume of second-hand clothing sold within the EU must be massively increased by accompanying measures such as repairing, re-manufacturing, re-purposing as well as consumer awareness.

All of these valuable strategies may not be implemented voluntarily, and if a consensus as mentioned above is

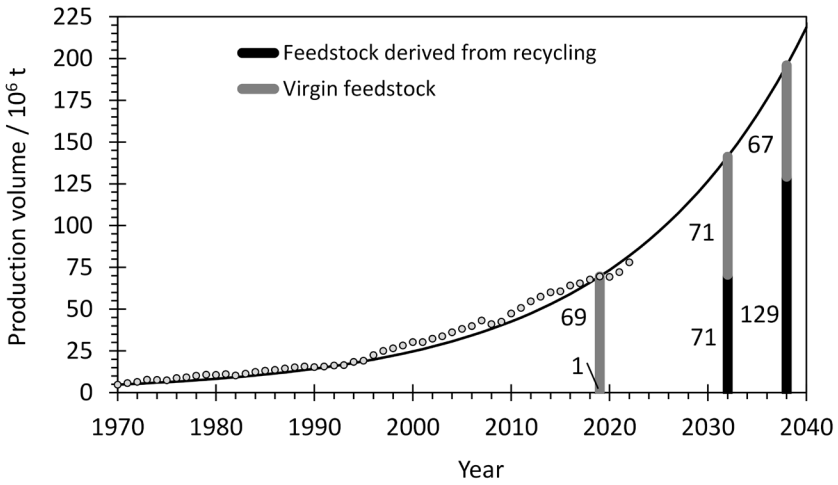


**FIGURE 4:** Production volume of synthetic fibers (circles) from 1970 to 2022 (CIRFS, 2020; Exchange, 2022). The curve indicates an annual growth rate of 5.6% from 1970. The black columns show the amount of fibers sourced from recycled material (fiber-to-fiber) and the gray columns show the amount of fibers derived from native resources (assumption: recycling rate in 2032 is 50%, in 2038 66%).

not found, this will then require massive legal regimes. Some of the Commission's proposals on textiles are actually correct, but there is no clear indication of how they are to be achieved. An EPR system, as proposed by the Commission, may shift costs from general waste charges to polluters (i.e. textile distributors), as shown for packaging waste, but it will not necessarily reduce the amount of waste (textiles) or make it easier to recycle. The collection rates that can be achieved by means of EPR are often too low, so the Commission is currently considering an EU-wide deposit system on single use plastic beverage bottles (Commission 2023b) and like it would also be a way for textiles to achieve an almost complete return rate. An exclusive treatment of textile waste in the EU could prevent negative impacts on the local textile processing chain in the recipient markets and also stop the disorderly dumping in these countries. Finally, (legally prescribed) higher prices for textiles would be a proven way to reduce the consumption of virgin apparel, thus to increase the attractiveness of second-hand clothes and to alleviate the pressure to export end-of-life clothes to developing countries. It is clear that these measures will be fiercely opposed by a large number of stakeholders such as industry, trade or consumers. It is therefore clear that the business model of fast fashion is not compatible with a circular economy. From this point of view, an exciting match between industry and legislation can be expected in the near future. In any case, keep your fingers crossed for the environment.

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## REFERENCES

Bartl, A. (2020). The circular economy package of the European Union: Are new paths being taken or is it an old story? Detritus, 12, 12-17. https://doi.org/10.31025/2611-4135/2020.13991.

Bottini, V. (2022). Fast fashion and corporate social responsibility: the baffling case of Shein. (Bachelor). Luiss Guido Carli, Rome/IT. Retrieved from https://tesi.luiss.it/id/eprint/33451; accessed 17 July 2023.

Chen, S., Rotaru, A.-E., Shrestha, P.M., Malvankar, N.S., Liu, F., Fan, W., Nevin, K.P., Lovley, D.R., 2014. Promoting interspecies electron transfer with biochar. Sci. Rep. 4, 5019. https://doi.org/10.1038/srep05019.

CIRFS. (2020). Information on Man-made Fibres (Vol. 55th). European Man-Made Fibres Association, Brussels/BE.

Commission (2015). Closing the loop: Commission adopts ambitious new Circular Economy Package to boost competitiveness, create jobs and generate sustainable growth [Press release], Brussels/BE.

Commission (2018). Directive (EU) 2018/851 of the European Parliament and of the Council of 30 May 2018 amending Directive 2008/98/EC on waste. Official Journal of the European Union, 61(L150), 109-140.

Commission (2020). COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS A new Circular Economy Action Plan For a cleaner and more competitive Europe COM/2020/98 final. Brussels/BE.

Commission (2021). EU strategy for textiles, Document Ares(2021)67453, Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/DOC/?uri=PI_COM:Ares(2021)67453; accessed 17 July 2023.

Commission (2022). EU Strategy for Sustainable and Circular Textiles. COM(2022) 141 final, Brussels/BE, Retrieved from https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52022DC0141; accessed 17 July 2023.

Commission (2023a). Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2008/98/EC on waste COM/2023/420 final.

Commission (2023b). Commission Revision of the Packaging and Packaging Waste Directive. Retrieved from https://www.europarl.europa.eu/RegData/etudes/BRIE/2023/745707/EPRS_BRI(2023)745707_EN.pdf; accessed 5 Sept 2023.

Exchange (2022). Preferred Fiber & Materials Market Report. Retrieved from Lamesa, Textile Exchange, Texas/USA: textileexchange.org/app/uploads/2022/10/Textile-Exchange_PFMR_2022.pdf; accessed 17 July 2023.

Garcia-Ortega, B., Galan-Cubillo, J., Llorens-Montes, F. J., & de-Miguel-Molina, B. (2023). Sufficient consumption as a missing link toward sustainability: The case of fast fashion. Journal of Cleaner Production, 399. https://doi.org/10.1016/j.jclepro.2023.136678.

Hugo, A. A., de Nadae, J., & Lima, R. D. S. (2021). Can fashion be circular? A literature review on circular economy barriers, drivers, and practices in the fashion industry's productive chain. Sustainability (Switzerland), 13(21). https://doi.org/10.3390/su132112246.

Inditex. (2023). Inditex Group Annual Report 2022. Retrieved from Arteixo/ES: https://static.inditex.com/annual_report_2022/pdf/Inditex-group-annual-report-2022.pdf; accessed 17 July 2023.

Ipsmiller, W., & Bartl, A. (2022). Sourcing and re-sourcing end-of-use textiles. In Polluting Textiles: The Problem with Microfibres (pp. 214-244). https://doi.org/10.4324/9781003165385-11.

Roithner, C., Weber, A. S., Rechberger, H., Bartl, A., & Ipsmiller, W. (2021). Beschreibung des Stands des Wissens zu Textilrecyclingtechnologien (SWiTex). Retrieved from Vienna: Available at: https://publik.tuwien.ac.at/files/publik_299479.pdf; accessed 18 July 2023.

Statista (2023a). Fast fashion market value forecast worldwide from 2022 to 2027 Retrieved from https://www.statista.com/statistics/1008241/fast-fashion-market-value-forecast-worldwide/; accessed 17 July 2023.

Statista (2023b). Inditex Group's sales worldwide from 2004 to 2022 (in billion euros). Retrieved from https://www.statista.com/statistics/268817/sales-of-the-inditex-group-worldwide/; accessed 17 July 2023.

Statista (2023c). Umsatz führender Fast Fashion-Konzerne weltweit in den Jahren 2021 und 2022 (in Milliarden Euro) Retrieved from https://de.statista.com/statistik/daten/studie/814197/umfrage/umsatz-fuehrender-fast-fashion-konzerne-weltweit/; accessed 17 July 2023.

Steinberger, J. K., Friot, D., Jolliet, O., & Erkman, S. (2009). A spatially explicit life cycle inventory of the global textile chain. The International Journal of Life Cycle Assessment, 14(5), 443-455. doi:10.1007/s11367-009-0078-4.