

**TRUE
COST
LABEL**

+
FULL CIRCLE



**LIFE CYCLE ANALYSIS:
FULL CIRCLE T-SHIRTS**

ABOUT THIS REPORT

This Life Cycle Analysis report has been constructed in consultation to the Full Circle brand to reveal the invisible costs of their sustainable garments. A True Cost Label impact profile has been generated to show consumers the impact their t-shirts have on the planet and its people. To help consumers make more informed decisions, Full Circle's t-shirts are benchmarked with t-shirts of the same material composition according to conventional industrial practices. As a frontrunner, Full Circle understands the need for radical transparency which is why they partnered with True Cost Label to generate this Life Cycle Analysis.

OUR STORY

We are True Cost Label, a digital platform that makes it simple to buy and sell sustainable and ethical fashion. Let's face it. Our clothing has a huge impact on the environment, and the people who make it. We reveal these invisible costs. Piece by piece, we break down how each garment affects our planet and its people. By translating complicated data into simple facts, we bring clarity. That's how we encourage more informed decisions that involve less pollution and fairer work conditions across the industry.

Finding a new favorite is already a challenge. Let sustainability be the easy part. We bring together conscious fashion brands with like-minded consumers. All in one spot. United force. Love the planet. Love your fashion.



LIFE CYCLE ANALYSIS

A Life Cycle Analysis, also known as LCA study, is a deep analysis of the supply chain. Whereas LCAs can be performed for any industry, True Cost Label specializes in those specifically for the fashion sector. An essential step in this, is the mapping of Full Circle’s supply chain.

The product is broken down at fiber level, looking at every single kilogram of material and type of fiber within. Consequently, the environmental and social impacts of the production of raw materials and the manufacturing of those materials into fabric is collected and computed into total figures. From the spinning of yarns from fiber, to the weaving of yarns into fabric, the dyeing, the cutting, sewing, packaging, and shipping and anything else imaginable within the typical supply chain of fashion products.

Another important aspect of LCA is transport. For every product True Cost Label investigates, the transportation route from the very first fiber to the brand’s store is tracked down and included in the impact calculation. This way, the total amount of kilometers a brand’s product has traveled is displayed in its True Costs.

For Full Circle, True Cost Label conducted an LCA for four of their t-shirt designs: Full Circle *Grey (low-impact Spin-dyed)* T-shirts and Full Circle *Black, Blue & White (Roll-dyed)* T-shirts. The supply chain for these two products is similar except for a different dyeing process. Where Spin-dyeing is a best practice low-impact dyeing technique, Roll-dyeing, also known as Piece dyeing, is a more conventional, typical practice.

Material Composition

Material composition of the T-shirt:

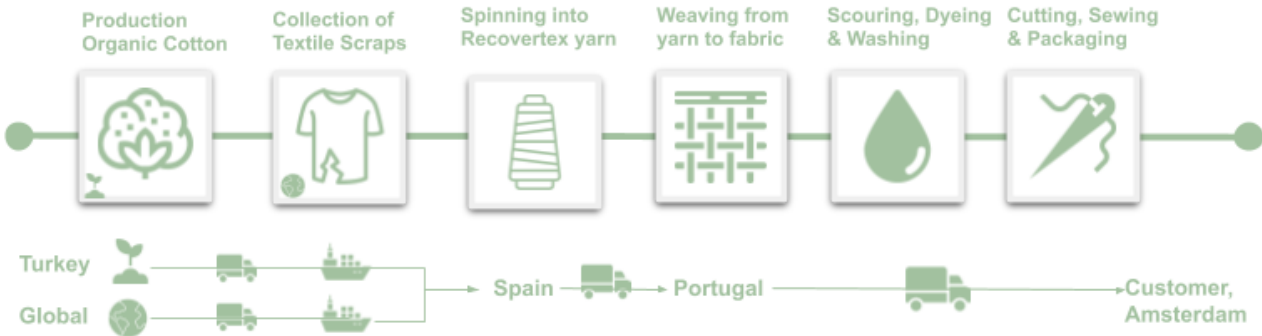
- 51%* Recycled Cotton GRS certified;
- 49% Organic Cotton GOTS certified;
- (* 1% due to label weight)

The supply chain

Recycled cotton is produced in Spain from cotton scraps collected globally then processed to fiber and mixed with certified organic cotton fibers from Turkey to form Reconvertex Yarns, a product by Hilaturras Ferre (Spain). From the factory of Hilaturras Ferre in Spain, the yarns are transported to Portuguese manufacturer SCOOP near Porto. There the yarns are woven into cloth, dyed according to the design, cut, and sewn into t-shirts. From Portugal the shirts are packed and transported to consumers.

Figure 1: Full Circle Supply chain:

FULL CIRCLE T-SHIRTS



FULL CIRCLE T-SHIRTS

Size L, 278 grams including label

Spin-dyed Shirt
Grey



Roll-dyed Shirt
Blue, Black & White



3,16



Kilogram CO₂

78



Liter water

0,54x



Around the world

yes



Recycled Material

no



Product-as-Service

Next cycle



Refurbished/Reuse

yes



Biobased

LCA RESULTS

The results of this LCA are presented in the following table and in the figure above:

Indicator	Spin-dyed	Roll-dyed	Industry average	Benchmarking (spin-/roll-dyed)	Unit
Climate change	3,05	5,78	7,29	58%/21% Better than average	kg CO ₂ -eq / product
Water use	70	94	615	89%/85% Better than average	Liter H ₂ O/ product
Total distance	15,700	15,700	±35,000	±45% Better than average	Km distance / product
Recycled material	Yes	Yes	No		
Biobased material	Yes	Yes	Yes		
Reused material	At 2 nd life (takeback)	At 2 nd life (takeback)	No		

SOCIAL IMPACT

Regarding social impact, all T-shirts sold by Full Circle are produced in Europe according to European labor standards and legislation. In the near future Full Circle will start auditing their supply chain using the ETI framework.

Additionally, consumers can return their T-shirts at end-of-life to receive a nice discount on a 2nd generation T-shirt line, fully recycled and made possible by their own returned products.

TRANSPARENCY SCORE

Full Circle obtains a transparency score of **85%**. Full Circle is able to disclose rich information on the players & processes of their supply chain. Still, the actual impact factory data could be obtained. This data is admittedly hard to collect considering that cotton is a commodity product, cotton scraps are sourced globally, and factory data is not always documented. Identifying these origins in combination with primary data of the manufacturers will give Full Circle a **100%** transparency score.

REFLECTION & IMPROVEMENT

Breakdown of indicators

True Cost Label's LCAs are broken down in the following indicators:

- Climate change expressed in kilograms of CO₂-equivalents¹;
- Water use expressed in liters of water.
- Distance traveled in amount of kilometers.

In addition, various qualitative indicators, a social impact reflection and transparency score is taken into account as shown in the previous page. By putting all these indicators together, True Cost Label aims to provide shoppers with the most complete picture of their product before purchasing it.

Impact visualization & compensation

Full Circle T-shirts have a climate change impact of 3,05 (spin-dyed) and 5,78 (roll-dyed) kg CO₂-eq per item. The 2020 production target of Full Circle is set at 1500 items, equal to a total of 7,65 tons of CO₂. This total is equally accounted for by the four color options (25% spin-dyed for Grey, 75% roll-dyed for Black, Blue & White). To visualize this impact, Full Circle would need a small forest of 284 full grown trees capturing CO₂ for a year to compensate these emissions. The total water use of the 1500 shirts has been calculated in the same way as the total impact on climate change, using 70 liters for 25% and 95 liters for 75% of the total product. The total water impact equals 133125 liters or 135 m³ of water. Enough water to support the full water demand of a family of 4 people for 9 months.

Strategies for Improvement

Full Circle uses recycled and organic cotton fibers resulting in great sustainability scores. Using their circular economy strategy, they manage to beat industry average by 56% (spin-dyed) and 21% (roll-dyed) on climate impact and an astonishing 90% on water use due to the prevention of impact intensive cotton production. Still, the fibers travel a great distance, enough to circle the earth's equator halfway despite manufacturing happening in Europe. In addition to the achieved sustainability of Full Circle, True Cost Label suggests several strategies for improvement.

Strategy	Description
Transparency	Identifying the origins of cotton producers and cotton scrap collection in combination with obtaining primary data of the manufacturer's factory energy usage and tertiary materials allows Full Circle to score 100% transparency.
Climate Change	As can be seen with the Spin-dyed t-shirt, a significant amount of impact is generated from the conventional roll-dyeing process. It might be worth investigating with the manufacturers what can be done to create more low-impact dye designs for their t-shirts.
Total Distance	Manufactures can be questioned whether organic cotton production from Egypt or even closer is a viable sourcing option. Additionally, further research into their textile scrap collection can be conducted followed by a request whether a specific local textile collection can be used on consistent basis for the recycled cotton.
Compensation	Full Circle and their supply chain can apply impact compensation strategies. From renewable energy investment to certified CO ₂ compensation standards.

¹ A CO₂ equivalent, abbreviated as CO₂-eq is a measure used to compare emissions from various greenhouse gases based on their global-warming potential (GWP).

IMPACT VISUALISATION



284 trees are needed to compensate the climate impact of 1500 Full Circle shirts

1500 Full Circle shirts need the same water as **one family of 4 for 9 months**



LIFE CYCLE INVENTORY

The following processes were included in the LCA for Full Circle T-shirts

Production

- Production of recycled cotton (GRS)
- Production of organic cotton (GOTS)

Manufacturing

- Pretreatment of cotton fibers for spinning
- Spinning of cotton fibers at 200 decitex (35ECC)
- Weaving cotton yarns at 200 decitex (35ECC)
- Scouring of cotton yarns
- Spin-dyeing
- Roll dyeing
- Softening, Washing, Centrifugation & Drying
- Cutting, Sewing & Standard Packaging
- Wastewater treatment
- Medium voltage Grid electricity, Spain
- Medium voltage Grid electricity, Portugal
- Grid electricity, General Industry average
- Conventional Cotton from India/China mix

Transport

- Truck + trailer 24 tons net capacity
- Container ship (> 0,41 ton/m³) w/v ratio

LCA ASSUMPTIONS

The following assumptions were made to conduct the full Life Cycle Analysis for Full Circle:

- Market data from LCA databases has been used to generate the final true cost impact score, see 'our methods' and fill data gaps in the supply chain (see transparency score)
- Common transportation routes and shipping routes are assumed between the production, manufacturing and retail locations.
- Transport harbors for Full Circle Supply chain set at Izmir (Tr) <-> Alicante (Es)
- A decitex of 200 dernier has been assumed for the spinning and weaving process based on average English Cotton Count of 20-40 ECC
- Full circle applies sustainable packaging, which is not yet included due to lack of data, average packing is included.
- For industry average all fibers are simulated as conventional cotton fibers, including conventional and typical production countries, shipping routes and processes

OUR METHODOLOGY

Life Cycle Scope

The scope of our LCAs are set at Cradle-to-Gate (C2G) representing the impact of raw materials turned into a product to the point at which the product is sold to a consumer.

Standardization & Certification

True Cost Label LCAs are conducted using ISO 14040/44 certified LCA data in combination with True Cost Label's inhouse developed True Cost Generator. The databases and methods we use follow EU guidelines (i.e. Eco invent 3.5, ILCD Midpoint+). True Cost Label is unique in applying HIGG datapoints and frequently cited life cycle entries for textile production and manufacturing processes. Sources and references are displayed on the last page of this report.

Transparency Score

Transparency score is a semi-qualitative scoring method showing the degree of information brands can obtain & provide on their supply-chain. Fashion products have a complex supply chain often including commodity products. Therefore, it is hard to trace the origins and data of every single fiber. To fill this data gap TCL applies market average data from the above mentioned verified and standardized sources. To score 100% transparency, the brand must obtain raw data on every fiber including data from energy, fuel and water use of all production, manufacturing, and logistic processes. Our mission at TCL is to pursue a 100% transparency score. Only together will we be able to accomplish this and much more.

HOW WE GENERATE THE TRUE COSTS OF YOUR PRODUCT

All LCAs made by True Cost Label B.V. including the data and methods contained within are calculated using our own developed tool, the 'True Cost Generator'. A custom LCA tool built by True Cost Label, specifically for Fashion LCAs and the detailed supply chains of the fashion industry.

1

Software, Databases and Methodology applied.

We apply OpenLCA[1] software to access input data for the True Cost Generator, with data mainly but not exclusively deriving from the following databases:

Ecoinvent 3.6 [2];

Idemat 2021 by TU Delft [3];

2

We apply the following Impact Assessment Methods for data retrieved and used in our LCAs

A) Carbon footprint: IPCC 2013 GWP 100a [4] as recommended by the European Platform on Life Cycle Assessment: ILCD [5] (International Reference Life Cycle Data System);

B) Water Depletion: ILCD 2011; Resource depletion - water; midpoint; freshwater scarcity; Swiss Ecoscarcity 2006.

C) Total distance in kilometer and mode of transport: Supply chain data provided by the customer in combination with Google maps and Sea Distances.

In addition, LCA data is included from carefully selected LCAs from peer reviewed scientific papers.

This is mostly done for innovative textile production processes or processes poorly modelled in existing databases. Assumptions made for these additions are stated in detail in each report

3

Goal and scope

We calculate our LCAs with a functional unit of total impact per kg of product from the raw materials to the manufacturing of the product with all transport processes included. (Cradle-to-Gate).

4

Standardization

True Cost Label Applies the ILCD method for its impact numbers, which is standardized according to EU-PEF method: European Product Environmental Footprint (EC, 2018. Product environmental footprint category rules, version 6.3). Our LCAs, LCA Reports and advise given based on LCA results follow the general principles of the ISO14044 quality standard for Life Cycle Assessment

5

References:

1. <https://www.openlca.org/>

2. <https://www.ecoinvent.org/database/older-versions/ecoinvent-36/ecoinvent-36.html>

3. <https://www.ecocostsvalue.com/EVR/model/theory/5-Idemat.html>

4. <https://www.ipcc.ch/>

5. <https://eplca.jrc.ec.europa.eu/uploads/ILCD-Recommendation-of-methods-for-LCIA-def.pdf>

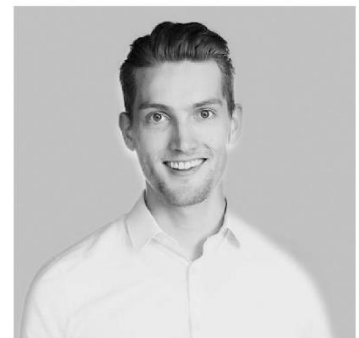
6. <https://www.iso.org/standard/38498.html>

ANY QUESTIONS ABOUT THIS?

For questions related to our methods, calculations and numbers provided on the website, please take up contact with our LCA expert.

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FINAL NOTE

The LCAs conducted by True Cost Label B.V. are continuously updated and improved in line with changing regulations, standardizations and new publications of data sources providing increasingly higher data quality. Therefore, it may be the case that these numbers will be updated in the future at the product display on the True Cost Label platform.

True Cost Label aims for 100% transparency 100% of the time. That said, the ultimate goal is to use actual factory data from the very supply chain parties involved in the Cradle2Gate lifecycle of every product that runs on the platform. This way all brands connected to True Cost Label will be at a 100% transparency score with real-time impact data of the product's supply chain. To ensure this goal True Cost Label will keep innovating and streamlining its processes.

Only together will we be able to change the fashion industry to a new sustainable paradigm. United force. Love the planet, love your fashion.



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Let's break it down