THE GREAT GREEN WASHING MACHINE PART 2:

The Use And Misuse of Sustainability Metrics In Fashion

GENEVA CENTER FOR BUSINESS & HUMAN RIGHTS

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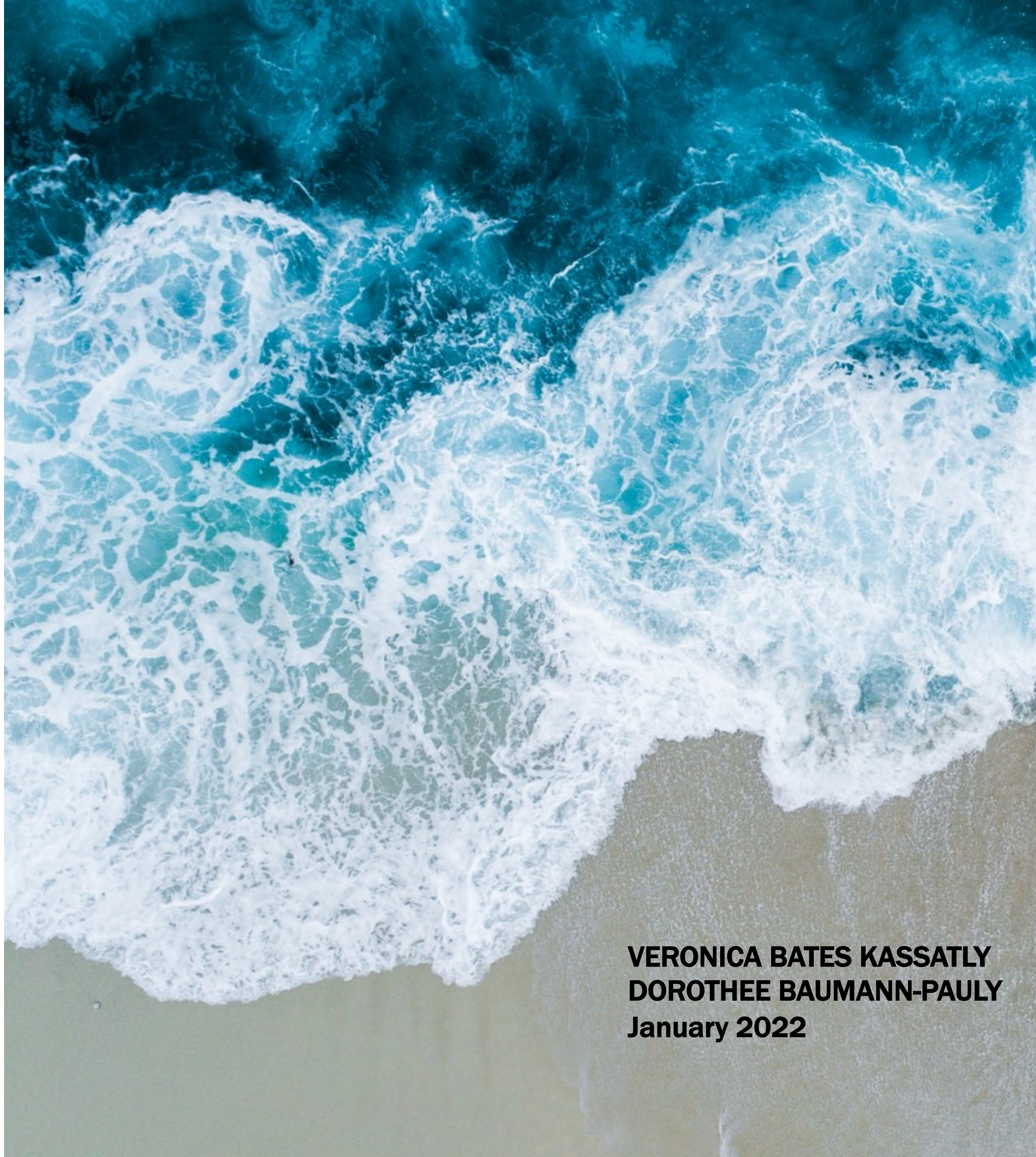

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NB. This is the second part of the Great Green Washing Machine series. Concerns 1-3 are included in the previous white paper: The Great Green Washing Machine Part 1: Back To The Roots of Sustainability.

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UNSPLASH: SUSTAINABLE GATE

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ACRONYMS
LIST OF FIGURES AND BOXES

BCI	Better Cotton Initiative
CC	Cotton Connect
CEO	Chief Executive Officer
CIO	Chief Information Officer
CSR	Corporate Social Responsibility
EP&L	Environmental Profit and Loss
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FTC	Federal Trade Commission of the United States
FYM	Farm Yard Manure
GOTS	Global Organic Textile Standard
GNI	Gross National Income
GRI	Global Reporting Initiative
GWP	Global Warming Potential
Ha	Hectare
HIGG MSI	Higg Materials Sustainability Index (referred to as the MSI or Higg)
ICAC	International Cotton Advisory Committee
INEI	The Peruvian Institute for Statistics
ISC	International Sericulture Commission
ISEAL	ISEAL Alliance
IPCC	Intergovernmental Panel on Climate Change
Kg	Kilogram
KPIs	Key Performance Indicators
MT	Metric Tonne
OCS	Organic Cotton Standard
PEF	Product Environmental Footprint
PETA	People for the Ethical Treatment of Animals
RCT	Randomized Control Trial
REEL	Responsible Environment Enhanced Livelihoods
SAC	Sustainable Apparel Coalition
SDGs	SDGs Sustainable Development Goals
SEIA	Social and Economic Impact Assessment
SPO	Second-party Opinion
TE	Textile Exchange
TOMC	Texas Organic Marketing Cooperative
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
US	United States

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UNSPLASH: MUKUKU STUDIO

PREFACE

“Africa contributed just 3% of global emissions, yet we are the continent which ... is already paying the biggest price.”

COP 26 closed, a day late, just as we were finalising the present report. To the disappointment of many, this last-ditch effort still failed to reach a commitment from all participants to “the phase-out of unabated coal power and of inefficient subsidies for fossil fuels”, with India and China insisting that the language be revised to “phase down” coal use.[1] What the COP26 did establish, however, is the need to understand just transitions, and not only green transitions. Going forward, we need to develop strategies that ensure climate justice, with human rights at the core.

In this context, the reluctance of manufacturing hubs in the global south to commit to eliminating coal power is understandable. The prevailing view in much of the global south is that climate change is a problem caused by the global north, and that it is something that the north should pay to rectify. To quote Ali Bongo Ondimba, President of Gabon: “Africa contributed just 3% of global emissions, yet we are the continent which ... is already paying the biggest price,”[2]

It is the privileged world’s consumption that must be curtailed, not the opportunities open to those - with far smaller per capita carbon footprints - in the global south. A sentiment eloquently expressed by Indian Prime Minister Shri Narendra Modi at COP26 itself: “One-Word, in the context of climate, can become the basic foundation of One World. This word is- LIFE...L, I, F, E, which means Lifestyle For Environment.”[3]

As for fashion, the sector’s contribution to COP26 was twofold:

1. More than 50 fashion and textile companies backed Textile Exchange’s policy request that the use of “environmentally preferred” materials be incentivized.[4]

2. The roughly 125 brand members of the UN Fashion Industry Charter for Climate Action[5]
committed to:
“Support the ambition of the Paris Agreement in limiting global temperature rise to 1.5 degrees Celsius above pre-industrial levels by selecting one of the two options (a or b):

a. Setting Science Based Target Initiative (SBTi) approved science-based emissions reduction targets on scope 1, 2 and 3 within 24 months, in line with the latest criteria and recommendations of the SBTi; and commit to achieving net zero emissions no later than 2050.[6]
OR

b. Setting at least 50% absolute aggregate GHG emission reductions in scope 1, 2 and 3 of the Greenhouse Gas Protocol Corporate Standard, by 2030 against a baseline of no earlier than 2019 and commit to achieving net zero emissions no later than 2050.”


UNSPLASH: MATT PALMER

BOX 1 :
Textile Exchange and Sustainable Apparel Coalition

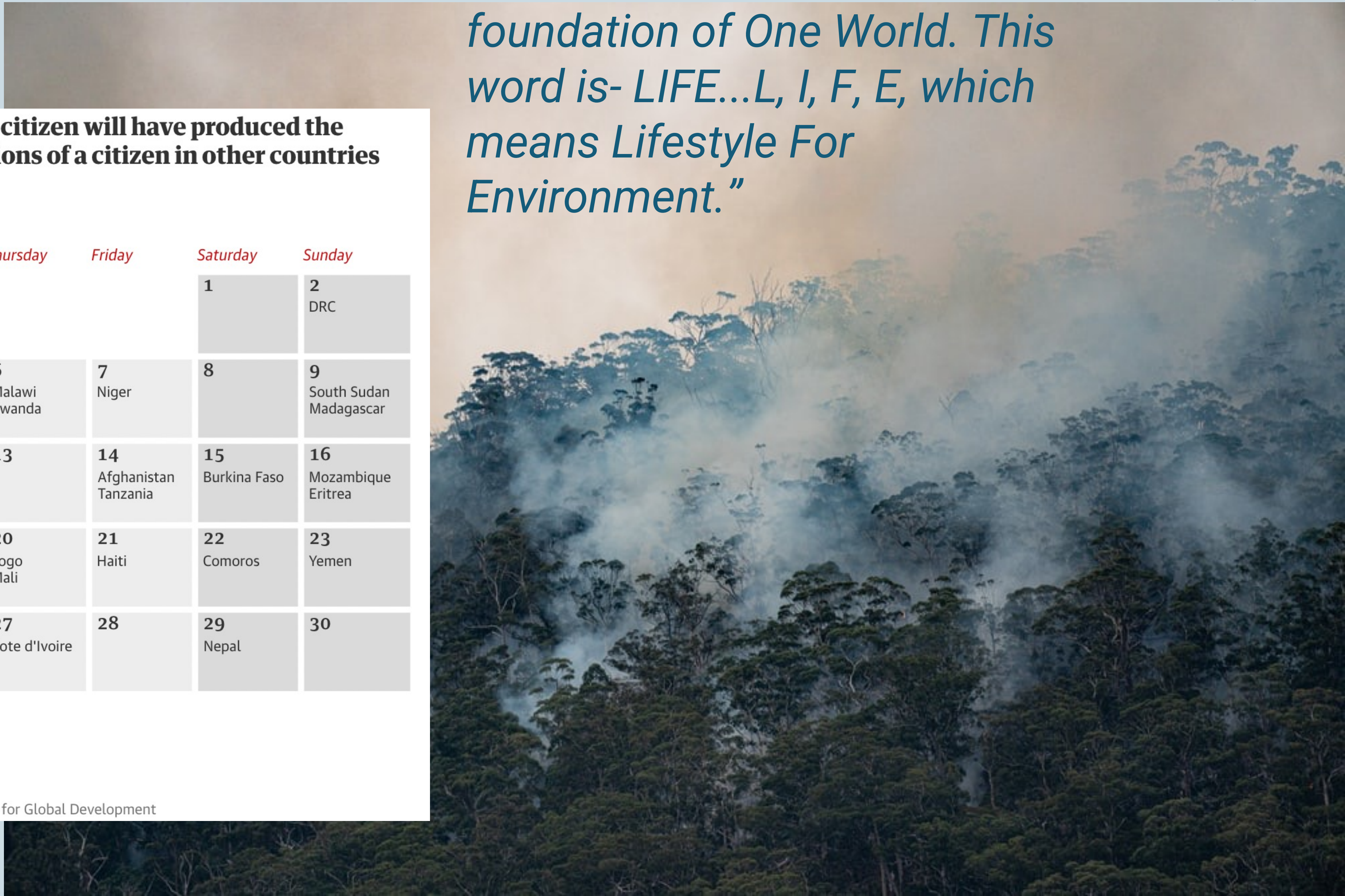
The sister industry initiatives Textile Exchange (TE)[7] and the Sustainable Apparel Coalition (SAC)[8] - both founded by Patagonia, along with other major fast fashion and athleisure brands - dominate, even dictate, current fashion sustainability analysis. For both, analysis is centered on the proprietary ‘Higg Index’[9] and particularly, the Higg Material Sustainability Index or MSI. [10]

Which actually now belongs to a VC backed for profit, registered in Delaware, Higg Co. Further details and background on all these organizations is provided in The Great Green Washing Machine Part 1: Back to The Roots of Sustainability [11]

It is commendable that the fashion industry commits to science-based targets. The problem of course is that both of fashion’s COP26 contributions - as well as the ‘science-based’ targets themselves - are based upon the industry’s own evaluation of what does and does not constitute a preferred fiber, as well as their own calculations of the emissions and impacts of different fibers and fabrics. And they are not scientists. [12]

As already pointed out in the Great Green Washing Machine Part 1[13] , none of the fashion industry’s sustainability claims have been informed by any leading academics, nor have they been subject to any independent oversight. Neither the methodology nor the underlying data is transparently provided, and none of it is open source. The outcome, not surprisingly, is that, as we shall demonstrate in this paper, many of the claims are false.

“One-Word, in the context of climate, can become the basic foundation of One World. This word is- LIFE...L, I, F, E, which means Lifestyle For Environment.”



UNSPLASH: MATT PALMER

Days by which an average UK citizen will have produced the annual carbon dioxide emissions of a citizen in other countries

January

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
					1	2 DRC
3	4 Somalia Burundi	5 Chad CAR	6 Malawi Rwanda	7 Niger	8	9 South Sudan Madagascar
10 Sierra Leone Uganda	11 Ethiopia	12 Guinea-Bissau	13	14 Afghanistan Tanzania	15 Burkina Faso	16 Mozambique Eritrea
17 The Gambia Guinea	18	19 Liberia	20 Togo Mali	21 Haiti	22 Comoros	23 Yemen
24 Cameroon	25 Kenya	26	27 Cote d'Ivoire	28	29 Nepal	30
31 Zambia						

Guardian graphic. Sources: World Bank data. Center for Global Development

GUARDIAN GRAPHIC. SOURCES: WORLD BANK DATA. CENTER FOR GLOBAL

Figure 1

EXECUTIVE SUMMARY

Concerns 1-3, outlined in our previous white paper: The Great Green Washing Machine Part 1: Back to The Roots Of Sustainability[14] demonstrate that in fashion at the present time, sustainability is not properly defined, and the vital metric - impact on the multidimensionally poor[15] - is not considered. Those who have the least freedom and opportunity to live the lives they value - farmers, primarily, but not exclusively in the global south[16] - are not consulted, and their complaints are ignored. All sustainability assertions in fashion are based solely upon purported environmental impact,[17] whilst the impact on farmers of the major agricultural (cotton) sustainability programs is not accurately captured, if at all.
In Concerns 4 through 7, in this second white paper, we further demonstrate that even the environmental impact of fashion is not being correctly assessed, neither broadly, nor narrowly.

Current assessments are broadly incorrect for two reasons. Firstly, because measurement is cradle to gate rather than cradle to grave so the harmful outcomes in some garments' use and disposal are ignored. And secondly, because impacts are calculated per kilo, when what really matters - what is key - is impact per wear. Clothes are not Kleenex. We are supposed to wear them multiple times, and if garments of some fabrics are worn many times more than others - and that does appear to be the case - then that should be included in sustainability calculations. If a dress "costs" 12, whether that is US Dollars or an environmental measure, and it is worn once, the cost is 12 per wear. If another dress "costs" 1,200, and is worn 100 times, the cost/impact is also 12 per wear. The difference is that at the end of those '100 times', in the first case there are 100 dresses to dispose of, and in the second, only one.

Sustainable fashion's repeated references to Life Cycle Assessments (LCAs) - or scores derived from LCAs - is highly problematic from a scientific perspective, as LCAs can only be compared if they were produced using exactly the same methodology and boundaries etc.[18]
No such suite of global LCAs for the various fibers used in the apparel sector exists. In fact, for all the major fibers, with the partial exception of wool and cotton, no global generic LCA exists.

This means that any comparative database available at the present time should not be used to inform consumer-facing indices, knowing that these will both do economic harm to allegedly 'less sustainable' fibers and their producers[19] and do harm to consumers, in the sense that they will be seriously misinformed, when they have a right to expect the truth. [20]

Notwithstanding, the EU is planning to establish consumer-facing labelling based on a product's purported environmental footprint (PEF), one component of the European Union initiative on substantiating green claims. The EU states that the Product Environmental Footprint (PEF)[21] method is intended to measure the life cycle environmental performance of products and to advise consumers on more sustainable purchases. The EU does not, however, appear to intend to commission the LCAs needed to make such claims,[22] so the data underlying the EU PEF will, presumably, most likely be derived from one or more existing databases.[23] Nor it seems, does the EU plan to commission the kind of wardrobe studies required to accurately identify the number of times different garments are worn, and how this is tied to fabric choice. And finally, it would appear that the EU does not currently intend to commission the studies needed to accurately assess the micro-fiber or end of life impacts of different fabrics.

"Moreover, even the narrow definition of environmental impact alone, is not currently correctly assessed as the data needed to make accurate comparative impact assertions simply does not exist."

GETTY IMAGES: ANDREW H. WALKER

"Nearly 60 percent of India's 1.3 billion people make a living from agriculture, though the sector accounts for only about 11 percent of economic output. For many, getting another job isn't an option....
"I'm not scared of hard work," said Rajwinder Kaur, 28. "I will do any job, but there are none."


NEW YORK TIMES: REBECCA


THE ECONOMIC TIMES: AGENCIES

EXECUTIVE SUMMARY

Concerns 4 -7 below, illustrate some of the wholly misleading comparative assertions that are the outcome of the present system. As we will demonstrate, sustainable fashion currently overestimates or even wrongly assesses the benefits of switching to 'preferred' fibres by a considerable margin. For example, the **widespread belief that switching from conventional to organic cotton production saves water and c02 does not hold true** when assessed scientifically (Concern 5). There is also no robust evidence that pursuing organic rather than conventional practices in cotton cultivation brings socio-economic benefit to the farmers (see the Great Green Washing Machine Part 1, Concern 3 as well as Concern 5 below). By the same token, the c02 impact of polyester is seriously underestimated (Concern 7). Whilst for the PEF, the most important variable, impact per wear, will either not be calculated at all, or based on the SAC's most recent submission, will be estimated based on *"expert judgement"*, without any distinction by fiber or fabric (Concern 4)[24]

It is also counterintuitive that brands should ask to receive incentives, in the form of *" tax credits and/or suspension or duty reductions of an imported component or finished, certified product"*[25] for the use of PET - the recycled polyethylene terephthalate material produced from soda or water bottles - when, as we show in this white paper, rPET does not mitigate global pollution with plastic nano and microfibers (Concern 7). Like virgin plastic, rPET does not biodegrade. It cannot be recycled fiber to fiber. And in some countries, it cannot be easily disposed of without additional expense.

There is, moreover, a fundamental failing in all sustainable fashion fiber claims at present. Farmed fibers provide a cash crop that is only one component of a much larger system. Given that many farmers must farm, if we want to halt global warming and promote income equality, fiber sustainability needs to be viewed, not as a stand-alone, but as part of a broader picture.

To quote the New York Times[26]: *" Nearly 60 percent of India's 1.3 billion people make a living from agriculture, though the sector accounts for only about 11 percent of economic output. For many, getting another job isn't an option…."I'm not scared of hard work," said Rajwinder Kaur, 28. "I will do any job, but there are none."*

Clearly, if we refuse to buy a crop on environmental grounds, those farmers will have to produce another. By definition, we will have reduced those farmers' incomes - if there were another more profitable food or fiber that they could have cultivated, they would have chosen that in the first place. Whilst if the substitute crop is also more environmentally harmful than the cotton/wool/silk/etc. that it has replaced - for example rice cultivation seems almost invariably to require more water per hectare than cotton[27] - we shall have increased global warming as well. That would be a double failure for 'sustainability'. At the present time, however, this fundamental consideration is not even mentioned, let alone evaluated.

As this, and our previous paper have repeatedly pointed out, comparative sustainability indices are currently causing economic harm to purportedly less 'sustainable' fibers and fabrics. Their sole object and purpose is to engender a reduction in demand for less sustainable choices, and an increase in demand for more sustainable fiber and fabric options. By definition, producers of 'less sustainable' fibers will see their market dwindle. Allowing private companies to decide upon the methods and values to be used in impact allocation for different fibers, and permitting them to switch these at will, is clearly ethically incompatible with the aims and objectives of comparative sustainability indices and labelling.

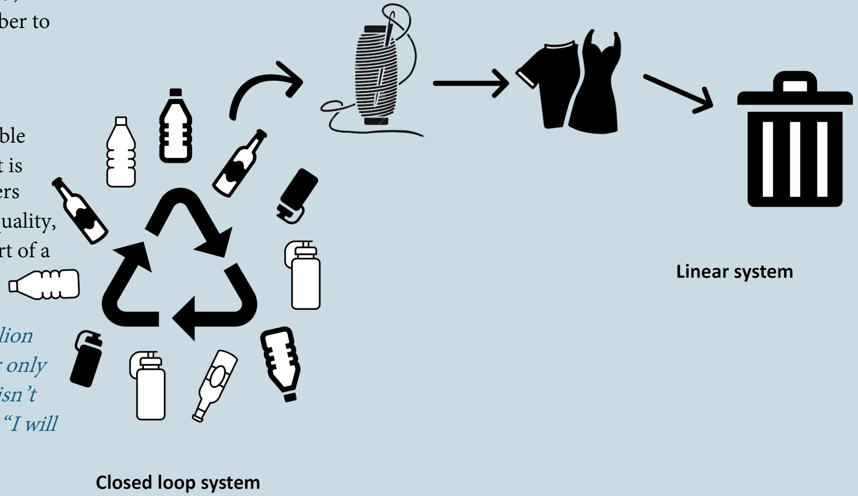


Figure 2

TENCATE PROTECTIVE FABRICS

As in our first white paper, we conclude our analysis in this second paper, with proposed measures and recommendations for both companies and legislators who wish to address fashion sustainability. We add three additional recommendations to the original two:

Recommendation 3:
Governments must require fashion brands to provide comprehensive, accurate and verified sustainability information. Private corporations cannot be allowed to unilaterally decide upon the impact of different fibers.

Recommendation 4:
Global resources must be better managed to promote the use of farmed fibers and coproducts.

Recommendation 5:
Reduce the use of plastic fibres.

As before, for each, we provide associated action points for policymakers and corporations, to ensure that in meeting the needs of the present without compromising the ability of future generations to meet their own needs, overriding priority is given to meeting the essential needs of the world's poor, with climate justice at the core.

1. MEASUREMENT CONCERNS IN CURRENT FASHION SUSTAINABILITY

CONCERN 4: The Limited Scope of Sustainability Assessments

To date, sustainability measurements have had a very narrow scope. They don't assess sustainability impacts along the entire value chain - by which we mean everything involved in creating that garment or piece of apparel from infrastructure, HR, and design, to after sales service. [28]

Instead, venture capital funded Higg.Co's Higg MSI (Please see The Great Green Washing Machine: Part 1, for further insights and clarification of the role and structure of Higg Co.[29]) as well as virtually all the major brands' sustainability reporting, is focused on impact **only up to the factory gate**. This means that sustainability measurement focuses solely on impacts that occur in fiber, fabric, and garment production. It excludes any impacts after the ready-made garment leaves for shipment and sale. In so doing, all sustainability assessments fail to assess **a garment's true environmental impact from fibre cultivation to grave,** leaving out important parts of the life cycle, namely the longevity of a garment's use, its impact in use, and its ability to be recycled.

CRADLE TO GATE

- Measures enviromental footprint of material extraction and production phases
- Does not consider impact beyond manufcturing
- Active use and end of use / disposal phases are not considered

CRADLE TO CRADLE

- A specific type of cradle to cradle assessment that reconnects the end of use phase with material extraction and production by recovering and recycling post-consumer materials

CRADLE TO GRAVE

- Measures enviromental footprint from production to end of use
- Measures enviromental footprint of complete lifecycle and considers all inputs and outputs of all phases

Types of Lifecycle Assessments (LCAs)

Figure 3

This narrow scope can lead to absurd results. If we would for example compare plastic with metal cutlery, and assess them based purely on production values, we might declare the former more sustainable, while ignoring the most important metric of an item's impact: the number of times it is worn/used.

JUNGLE FOLK

JUNGLE FOLK

CONCERN 4: The Limited Scope of Sustainability Assessments

BOX 2:
Why Longevity of a Product is the Most Relevant Sustainability Metric

If a dress "costs" 12, whether that is US Dollars or some environmental measure, and it is worn once, the cost is 12 per wear. If another dress "costs" 1,200, and is worn 100 times, the cost/impact is also 12 per wear. The difference is that at the end of those '100 times', in the first case there are 100 dresses to dispose of, and in the second, only one.

The crucial factor to note here is that it is not how long a garment is kept that matters. It is how many times it is worn. If someone wears the same pair of shoes every day for one year and then throws them out, the impact per wear is far lower than that of another individual who buys the same pair of shoes and keeps them for 20 years, but only wears them 10 times each year. It is self-evident that this also requires that items last long enough to be worn multiple times, even if they are used infrequently - as may be the case for many swimsuits in cooler climates, and heavy sweaters in warmer regions.[30]

SIFO - Consumption Research Norway - and Ingun Klepp and Kirsi Laitala in particular have devoted considerable effort to investigating how many times most people wear the average garment, how care patterns affect impact in use, and whether the number of wears is affected by such aspects as fiber and price. [31 32 33]

It is perhaps indicative of the level of scholarship in sustainable fashion, that the sector does not appear to refer to these studies at all. Instead, the entire focus appears to be on how long a garment is kept rather than on how many times it is worn. And neither relative price nor fiber composition appear to be considered.

Kering, for example, released a study in January 2021[34]: "Capturing the Impacts of Consumer Use and Product End of Life in Luxury."[35] Only a summary paper is available, so we do not know how randomly the "three thousand luxury fashion consumers across six countries (France, United Kingdom, Italy, China, USA, and Japan)" were selected, what questions they were asked, or how the data were collected, analyzed, and statistically validated. We also do not know how many times they used the items before they were thrown away, sold, or donated. All we know is that only the first life was measured (apparel gets a second life if resold or gifted), and that on average, no item of clothing was kept for more than 6 years.

GREENGROUND.AT

It appears that studies undertaken in both Norway and the UK found that 20% of garments were either never used, or only used a couple of times.[36] If on average 50% of garments made with an impact of 12 are worn once, and the other 50% disposed of without ever being worn (whether they are disposed of immediately or kept for 6 years and then disposed of makes no difference) then 2 garments are being produced for each wear, and so the average impact per wear doubles. Whilst if garments made with an impact of 1200 are normally worn 400 times instead of 100 times, as suggested in the box-out, then their impact per wear falls from 12 to 3. And if they are worn 1000 times - surely a relatively easily achievable goal for a long-lasting garment - then the impact per wear falls to 1.2.

When considering the 'sustainability' impact of resale, it is vital to remember this. At present, pre-worn or pre-loved purchases are automatically labelled 'sustainable', and the resale industry is hugely hyped by everyone from influencers to the Business of Fashion.[37 38]

It is self-evident that if consumers continue to cycle through different outfits as rapidly as before, merely substituting some pre-worn items for new, this will not solve fashion's problems. A sweater that is resold three times, with each of the 4 owners wearing it 20 times, is far less sustainable than the same sweater, purchased new, and worn 1000 times by a single owner.

CONCERN 4: The Limited Scope of Sustainability Assessments


JUNGLE FOLK

A 2018 Danish study did attempt[39] to measure the impact per use of different types of shopping bags. They found that, as the New York Times put it *"An organic cotton tote needs to be used 20,000 times to offset its overall impact of production, according to a 2018 study by the Ministry of Environment and Food of Denmark. That equates to daily use for 54 years — for just one bag."*[40]
The problem with that, is that any modelling, no matter how sophisticated, is no better than its base data - garbage in, garbage out (GIGO) - and the Danish study used Ecoinvent data. This is a privately owned database that is behind a paywall, so we are unable to offer much insight into its validity, albeit the failings of the LCA that Ecoinvent uses for PET are detailed in Concern 5 below. For organic cotton, the Danish LCA states *"For organic cotton, we modified the Ecoinvent dataset for conventional cotton production by subtracting environmental impacts connected to fertilizers and by lowering the production yield by 30%".* That is a sweeping and unsubstantiated assumption on yield and the researchers have forgotten to include the impact of manure (see Concern 5). As a result, it is far from clear that this study's conclusions are accurate.

The question, of course, is whether rates of use/disposal of clothing are fiber related? We suspect yes, simply because disposal of a cheap polyester dress or shirt feels relatively guilt-free. Throwing out a brand new and extremely expensive cashmere sweater after a couple, or even no wears at all, would normally give most owners pause for thought.

A November 2020 study by Laitala and Klepp [41], examining the wardrobe practices of participants aged 18-64, in Germany, Japan, the UK, and the USA, as well as 10 major cities in China, substantiates this intuition. Based on a regression where all the other reported variables were included and controlled for, that study did indeed find that garments that cost over 100 USD (the most expensive category) were worn 31 times more than those that cost under 10 USD (the cheapest category). They were also kept the longest. Items in the most expensive garment group were used 2 years longer than the cheapest.

In this context it is important to note that these figures are not average descriptive statistics but part of a regression where all the other reported variables are included and controlled for. Like all studies, the answers obtained will depend in part on the questions asked, and hence the variables included. For example, asking whether the item was a favorite garment would likely have altered the results - without, however, being much use in guiding sustainable consumer fabric and garment choices.

As to fiber, the largest number of garments studied were made of cotton, and they had the shortest average lifespan. Silk garments were both kept the longest and worn the greatest number of times, followed by wool.

Interestingly, based on the number of times respondents had worn a garment, and how many times they assumed they would continue wearing it, this study estimated the average total number of wears per item of clothing at 80. This is radically different from the numbers trotted out by the sustainable fashion sector which routinely refers to clothes being worn 7, or less than ten times. [42 43]

Another important factor revealed by Laitala and Klepp, that is less intuitive and certainly food for thought, is the role played in garments' rates of use and longevity, of different washing/cleaning requirements. The second most important predictor of the total number of wears for any given item was the number of wears before laundering. Indeed, the estimated lifespan, in number of wears, increased by 16 for each higher bracket reported, and garments that were washed after more than 30 wears, were worn 94 times more than those that were washed after each wear.

Moreover, a joint Australian/Norwegian study found that extended wear combined with best practice care, could reduce the environmental impacts of a wool sweater by around 75% when compared with what are believed to be current practices.[44] Whilst a 2020 analysis based on the same quantitative wardrobe survey and qualitative laundry diary data from China, Germany, Japan, the UK and the USA as was used in the aforementioned Laitala and Klepp report: *"found that the largest potential for environmental improvement exists in reducing laundering frequency and in the selection of washing and drying processes, and through a transition to fibres that are washed less frequently, such as wool."*[45]

CONCERN 4: The Limited Scope of Sustainability Assessments

It is important to note that the Laitala study,[46] whilst large in itself - covering 1111 respondents and 53,461 garments - is small relative both to the total population of those five nations, and to the volume of garments in circulation. Further work is required, particularly in replication, but the direction is already clear. Pending more comprehensive analysis, the simplest, most effective, and most easily understood piece of sustainability information that could be given to consumers would be a warning label:

> "If you wear this garment fewer than X times, your purchase is unsustainable and may increase global warming."

OR

> "Consumers are advised to avoid purchasing any garment that they expect to wear less than Y times."

The exact terminology would ideally be based upon further robust studies. In their absence however, the specific number is less important than the message: wear it longer/use it more.

This should be supplemented by a cleaning logo, guiding consumers to items that can be washed infrequently, at lower temperatures, and without tumble drying, and would presumably need to be combined with public service messaging to highlight the environmental benefits of garments with minimal washing requirements in terms of both frequency and method (low temperature, air dry). Something of which sustainable fashion, let alone consumers, seems to be largely unaware.

All these studies show that some data are already available, and there is, moreover, considerable knowledge in use and methods needed to expand that data further. In other words, there is no objective reason not to include the use phase in any evaluation of the environmental impact of clothing. Given the importance of the use characteristics of different fibers, not only in and of themselves - in terms of number and type of washing cycles etc. - but also in terms of their impact on the total number of times any given garment is worn, it would be inexcusable for the German Green Button, or the EU PEF, to establish a consumer facing labelling system that ignores these considerations.


APARTMENT CLOTHING


UNSPLASH: KATE SKUMEN

CONCERN 5: Fantasy and Fiction in Organic Fiber Claims –

Water Use in Cotton Farming, the Impact of Lower Yields on Farmer Income and Biodiversity, and the Overlooked Impact of Manure

UGAOO

UGAOO

Conventional wisdom suggests that organic farming is better for both people and the planet than conventional farming. Here we provide two examples that show that sustainability assessments are in fact considerably more complex. In particular, we will discuss organic cotton cultivation in the context of the use of both animal manure and irrigation in the cultivation system.

BOX 3:
Organic Vs Conventional Farming

Unlike conventional agriculture, organic farming does not use synthetic fertilizers or synthetic pesticides, except as a last resort.[47] A reaction to the excessive use of both in early twentieth century agriculture, many organic practices are a reversion to more traditional methods - manure as fertilizer, crop rotation, the use of beneficial pests etc. The reintroduction of traditional methods that appears to have started with the organic movement, is, however, now common in conventional farming as well.[48]

Australia is the leading global producer of organic crops - accounting for almost 50% by hectare, in 2018, according to TE itself.[49] Rain permitting, Australia is also a major global producer of cotton, and employs arguably the world's most environmentally friendly and efficient production methods.[50] [51]

Yet as TE themselves substantiate; Australia produces no organic cotton.[52] It is perhaps surprising that this telling inconsistency is ignored by 'sustainable fashion'.

Moreover, as a perennial which is cultivated as an annual crop, and so is only in the ground for 6 months of each year, **virtually all cotton** is rotated - primarily with soy in Brazil[53], winter wheat in the Aral Sea basin[54], and wheat or vetch/soy/fava bean in Australia.[55]

In short, nowadays, the differences between conventional and organic practices are often somewhat blurred. This is not reflected in comparative analysis in sustainable fashion, which continues to demonise conventional cotton.[56]

5.1 WATER USE IN ORGANIC COTTON CULTIVATION

A general claim, frequently bandied around the sustainable apparel sector, is that cotton is automatically unsustainable due to its high irrigation requirements. The destruction of the Aral Sea because of poor Soviet planning, including the wholesale construction of substandard and inefficient irrigation systems[57] is blamed on a plant rather than on people. And cotton's 'thirst' for water is a regular justification for the use of polyester and plastics by the Higg MSI and others. Indeed, it would appear that many of the artificially inflated numbers for cotton's water and pesticide use originated with the polyester sector, in 2009.[58]

In fact, with a tap root considerably longer than the plant is tall[59] cotton is a xerophyte.[60]
Moreover, it is important to remember that only 45% of global cotton is actually irrigated[61] and according to the ICAC Cotton Data Book, in 2018/19 the global average water use for all cotton was 1,214 lt/kg (the number fluctuates annually, above and below this point, as a function of global rainfall). Moreover, cotton's critics neglect to note that tens of millions of cotton farmers have personal water consumption patterns that are a mere fraction of those of their detractors in the global north. The average daily per capita consumption of water in Benin is estimated at only 20 liters per person. In the cotton growing areas of the north of the country, this drops to an average of 17 liters per person (only 5 liters per person per day in the dry season).[62]
Daily personal water consumption in the UK, on the other hand, is estimated to average 142 liters per day[63], whilst in the USA, the average is even higher, at 82 US gallons or 310 liters per person, per day.[64]

Indeed, the typical private home swimming pool in the USA, according to one 2016 evaluation[65], requires an average of 13,500 US gallons of water, or 51,098 liters to fill. Whilst a typical community-owned neighborhood pool will need around one million liters.

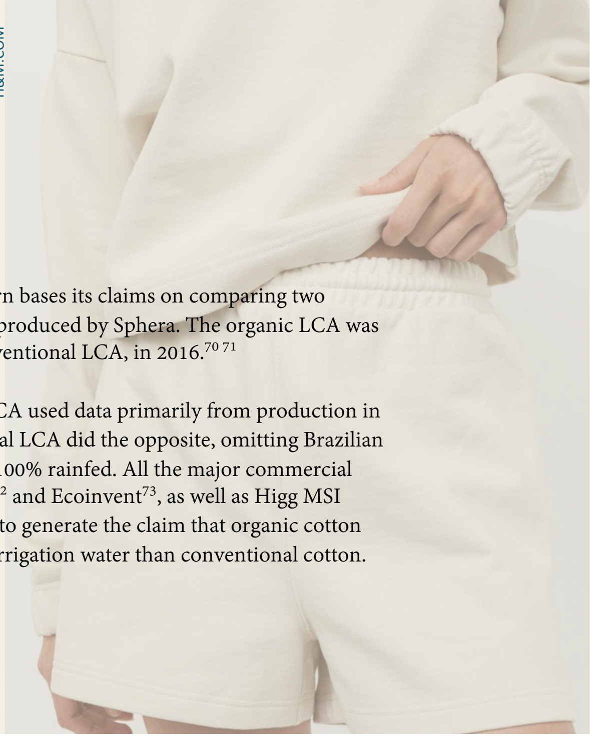
This means that global average water consumption per kilo of fiber in cotton production represents only 4 days of water usage by the average US citizen. Whilst the average US private home pool uses as much water as the cultivation of 42 kilos of cotton lint. The difference is that home swimming pools are not a necessity, whilst for millions of the neediest on the planet - whose own personal water consumption may be only 6% of that of most US citizens - cotton is their principal cash crop, perhaps their sole source of income and opportunity.

In the context of cotton, fashion brands are increasingly advertising garments that are made of organic cotton and claiming that organic cotton farming needs less water. However, the sole LCA that compares cotton fiber produced under different cultivation systems in the same place at the same time, was prepared by Sphera (formerly known as Thinkstep, a leading commercial provider of LCAs and impact data)[66] for the Laudes Foundation in 2018*: "Life Cycle Assessment of Cotton Cultivation Systems: Better Cotton, Conventional Cotton and Organic Cotton."* This report states that the LCIA results for 1 metric ton of seed cotton were as follows: Blue (irrigation) Water Consumption per tonne of seed cotton production: conventional cotton 1.71E+06 kg; organic cotton; 1.88E+06 kg; Better Cotton 1.75E+06 kg.[67]
(For additional information on the various identity cotton schemes, please see The Great Green Washing Machine: Part 1)
In other words, organic cotton consumed 10% more water per tonne of seed cotton than conventional production (indeed of the three: BCI, organic and conventional, as we can see, the lowest blue water consumption was found in the conventional system).

Despite this, both the Norwegian clothing brand Norrona[68] and H&M UK[69], have recently both posted claims on their respective websites that clothes made of organic cotton use 87-88% less water than those made of conventional cotton - based on the Higg MSI.

The Higg in turn bases its claims on comparing two purportedly global LCAs, both produced by Sphera. The organic LCA was published in 2014, and the conventional LCA, in 2016.[70 71]

The organic LCA used data primarily from production in rainfed regions, the conventional LCA did the opposite, omitting Brazilian and African cottons which are 100% rainfed. All the major commercial databases such as Sphera Gabi [72] and Ecoinvent[73], as well as Higg MSI appear to use these two studies to generate the claim that organic cotton consumes 87/88% less blue or irrigation water than conventional cotton.



H&M.COM

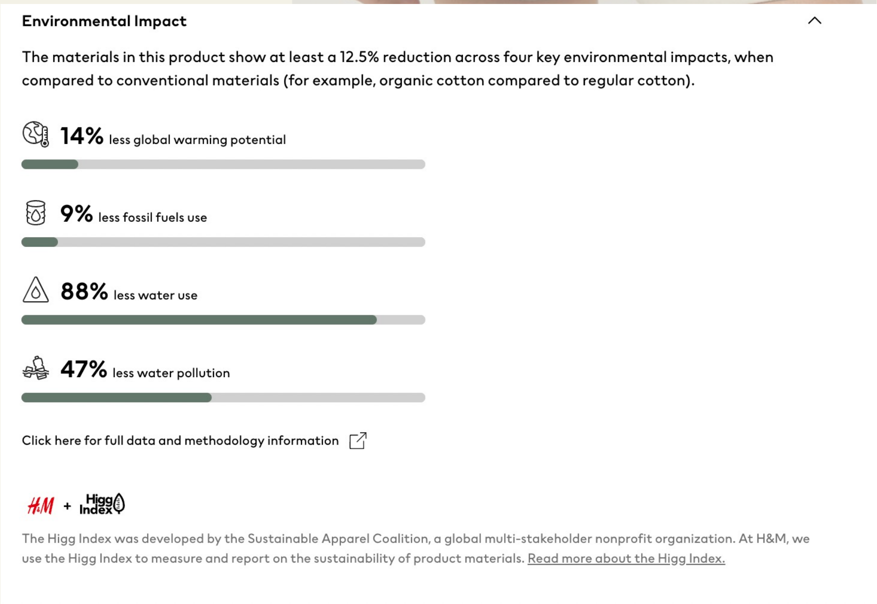


Figure 4

5.1 WATER USE IN ORGANIC COTTON CULTIVATION

This claim is misleading because it asserts that it is the organic production system that accounts for the difference in water consumption, when, it is just rainfall. The first piece of analysis to point this out - in 2019 - was written by one of the authors of the present report.[74]
The observation was received by TE with considerable hostility:

"The overall intent of the articles written by this author (in the upcoming publication and previously in the May 2019 issue) appear to be with an agenda of creating doubt around the benefits of organic and other sustainable cotton initiatives. **This is done by attempting to discredit the water-saving data that is reported in the LCA of Organic Cotton."**[75]

The crucial point to note here is that **there is NO water saving whatsoever reported in the 2014 LCA of organic cotton.** [76]

UNSPLASH: LEILA MELHADO

The 83 page, 2014 LCA states unambiguously:

"5.2.4 Water use in the regions under study: organically cultivated cotton receives relatively little irrigation in addition to naturally occurring rainfall. The irrigation water requirement of a crop is obviously mainly determined by climatic conditions although the actual usage is also influenced by irrigation techniques. This is why **low irrigation rates cannot be attributed exclusively** to the **organic cultivation** scheme" (page 54).

But when TE produced their own 18-page summary of the Sphera LCA, their "CONCLUDING REMARKS" stated something completely different:

"**Results indicate** that organically grown cotton has the following potential impact savings (per 1,000kg Cotton Fiber) over conventional:....**91 percent reduced blue water consumption"**[77]

The Sphera organic LCA has been in the public domain since 2014. But seven years later, it seems that nobody in the sustainable apparel sector has read it. Almost without exception, all commentators refer to the TE summary as the LCA, and so insist that the LCA itself made that water saving claim when it clearly did not.

A case in point is a recent "myth busting" document produced by The Transformers Foundation, an initiative funded by major players in the denim industry, which stated, "Multiple experts we spoke to contested the organic cotton LCA's findings." and continues "...As **the LCA Summary of Findings** states...". But no link to the LCA itself is provided. The sole source given by this 'myth busting' report is: "55 **TE**. (2014, November). The life cycle assessment of organic cotton fiber: **Summary of findings** - a global average." [78]

It is concerning that a mere summary of the Sphera LCA, written by a third party - TE - a summary that is moreover, substantially, and critically inaccurate, underpins not only all discussion of the relative sustainability of organic cotton within the sustainable fashion industry, but also the recent demand by Kering, Patagonia, Stella McCartney, Gap, and Chloé, along with almost 50 other fashion and textile companies for preferential tariff treatment for organic cotton.[79]

This, incidentally, highlights the concern that automatically arises in any area when major corporations are allowed to control the narrative. The leading cotton producer organisations must be aware of the failings in the organic cotton claims made by the Higg MSI, but they say nothing. Indeed, some are major supporters of both TE and the SAC, despite the fact that these sister organisations both base all their 'sustainability' calculations on that very index.

5.1 WATER USE IN ORGANIC COTTON CULTIVATION

Producers and manufacturers wish to sell. They will automatically be unwilling to contradict and so offend their most important customers. Indeed, many suppliers, both small and large, apparently feel obliged to join TE and its various ‘responsible’ standards, despite considerable misgivings as to their validity and effectiveness, precisely because they fear that they will lose market share if they do not. It is self-evident that if this dynamic continues, ‘sustainable’ fashion will continue to be plagued by false data and misleading assertions.

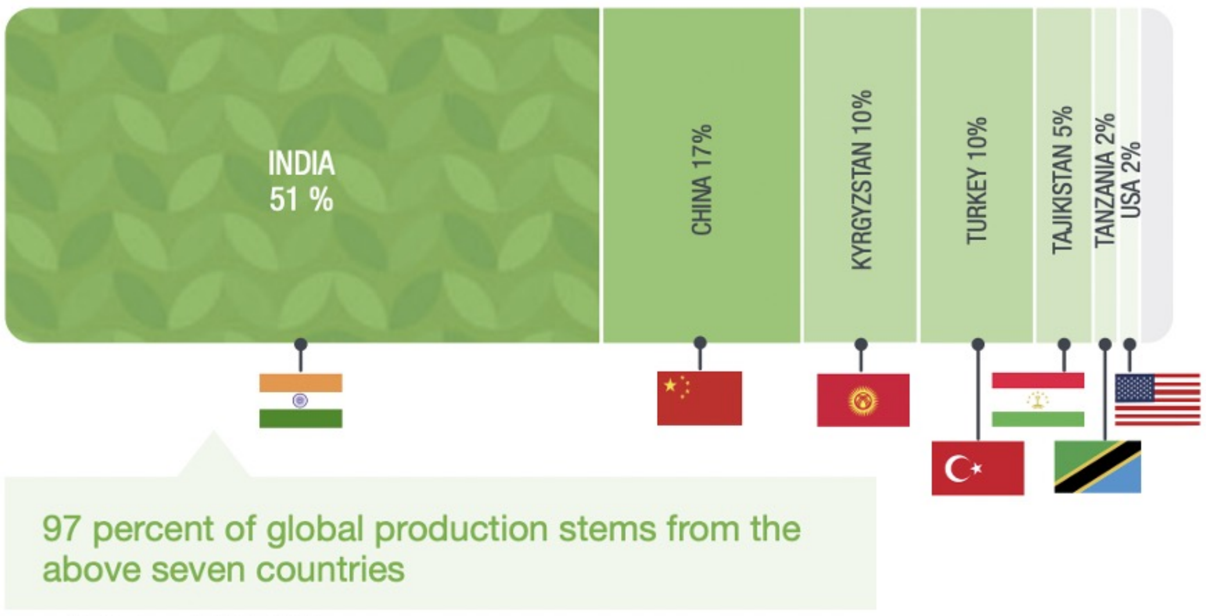
For example, one defence some use to continue to justify the organic water saving claims, whatever the 2014 LCA might conclude, is that whilst organic cotton production may not use less water than conventional cotton grown in the same place at the same time, most organic cotton is rainfed, whilst most conventional cotton is irrigated, so the claim still stands.

But that assertion is not substantiated by the data either.

The TE 2020 Organic Cotton Market Report, states that in 2018/19, 10% of global organic cotton was produced in Kyrgyzstan.

As of 2019/20 Kyrgyz cotton had increased to 12% of the global organic total.[81] The ICAC 2020 Cotton Data book states that Kyrgyzstan had an average blue or irrigation water use, per kilo of lint, of 5,340 lt/kg. It also states that all Kyrgyz cotton is organic.[82]

If 10% of global organic cotton came from the Kyrgyz Republic in 2018/19, and 12% in 2019/20, then, ceteris paribus, global average water use for organic cotton cannot be lower than 534 lt/kg for 2018/19, and 641 lt/kg for 2019/20.



80 Screenshot taken 19/08/2021

5.1 WATER USE IN ORGANIC COTTON CULTIVATION

The ICAC Cotton Data Book also states that in 2018/19 the global average water use for all cotton was 1,214 lt/kg. This means that the generic average for global organic cotton is not 87/88% less as Norrona and H&M claim. In 2018/19, it was categorically no more than 1- (534/1214) or 56% less. Ceteris paribus, in 2019/20, it was 47% less. Indeed, since, of the countries listed by TE, only Tanzania produces 100% rainfed cotton, the difference is considerably smaller than that. Calculations made for this report by Dr Terry Townsend, using ICAC data, show that based on estimates of average rates of irrigation water use in regions accounting for 97% of world organic cotton production, the world average use of irrigation water in organic production in 2018/19 was about 1,600 liters per kg of lint.

Obviously, any estimate of average water use in cotton production is imprecise and will vary from year to year depending on rainfall, heat units and wind. Nevertheless, the available data shows that irrigation water use in organic cotton production systems around the world is about one-third higher than irrigation water use per kilogram of lint of conventional cotton production.

This makes sense because organic cotton is most viable in semi-arid and arid regions where insect and weed pressures are low and growing anything in a dry area requires more irrigation. The available data also reinforces the conclusion that there is no objective data showing that organic cotton production requires less water than conventional cotton production per kilogram of lint.

All of this also raises another vital concern with using generic LCA data to make comparative sustainability assertions. LCAs are not set in stone. Technology changes, climate changes, the location of production changes, and as it does so, LCA impacts change. The organic LCA that most of these unsubstantiated claims are based on was published in 2014. The production data for India was from 2011/2012, and for the other countries, from 2012/2013.[83] In 2022 that LCA is clearly outdated and no longer valid. Indeed, the Higg Co. MSI website states under "modelling notes": "data from Sphera. Gabi documentation 2020". Clicking on the link provided reveals that the data set ceased to be valid after 2017 - that is almost 5 years ago.

What this means, of course, is that the consumer-facing organic cotton claims currently being made by Norrona, H&M and Higg Co., are false, misleading, and represent unfair competition. Unfair competition towards other brands that do not make such false claims, and so in consumers' eyes, appear less sustainable, and unfair competition towards conventional cotton farmers in Benin, Zambia, Zimbabwe, and many other desperately poor countries, whose 100% rainfed cotton in fact consumes far less water than the global organic average, not more.

UNSPLASH: PIXELFUSHION3D

UNSPLASH: INES FRAILE

5.2. THE NEGATIVE IMPACTS OF LOWER YIELDS

Fashion avidly promotes organic farming as a solution to many of the industry's impact problems. As recent experience in Sri Lanka has shown, however,[84] switching to organic production means lower yields and so higher prices.[85] More land will have to be put under cultivation for crops, as well as for the livestock needed to produce organic fertilizer. More land under cultivation will, in turn, reduce biodiversity. As one recent study of existing global literature on organic food farming put it:

> "In *terms of environmental and climate change effects, organic farming is less polluting than conventional farming when measured per unit of land but not when measured per unit of output…Widespread upscaling of organic agriculture would cause additional loss of natural habitats and also entail output price increases… Organic farming is not the paradigm for sustainable agriculture.*"[86]

CHINA DAILU: XINHUA

CHINA DAILU: XINHUA

5.3. FAILURE TO PRIORITIZE THE NEEDS OF THE MOST DISADVANTAGED

Organic fiber cultivation is also increasingly charged with failing to prioritise the needs and interests of the global poor, and like sustainability in fashion in general[87], could be described as an elitist, even imperialistic system in which the interests of the global north define the conversation. To quote Luna et al. (2021)."Some Burkinabè producers see organic as prioritizing purity for an imagined White consumer. Organic's call to "get back to the dirt" also clashes with a cultural context where aspiration for development is often expressed as "getting out of the dirt."[88]

Moreover, as pointed out in that 2021 report, many regulations covering organic cotton focus more on ensuring that there is no danger of pesticides getting anywhere near the relatively affluent and predominantly white end users, rather than on reducing toxicity for the farmers and the land. Indeed, the authors suggest that such measures as the three-year rule, and the 50m buffer zone, result in less sustainable production, by both encouraging farmers to clear forest to obtain readily certifiable fields, and by forcing farmers to leave valuable land unplanted.[89]

Whilst as Part 1 of this series pointed out (Concern 3) the little independent evidence that is available suggests that switching from conventional to organic cotton production leaves farmers worse off.

UNSPLASH: EUGENESERGEEV

5.4. THE ROLE OF ANIMAL MANURE

Another overlooked issue with organic farming is the animal manure that is widely used as fertilizer. Indeed manure - animal dung used to fertilize land - is a key overlooked aspect in most calculations of what makes different fibers sustainable or otherwise:

a) The importance of manure in organic production is generally overlooked.
b) In many databases, allocation to manure is excluded for some fibers - specifically organic cotton - and included for others, such as silk.
c) The importance of livestock in maintaining soil health is not included in any farmed fiber impact evaluation.

In the sustainable apparel sector, vegan, organic, and sustainable are all frequently conflated. This represents a fundamental misunderstanding of both sustainability and agriculture.

The use of synthetic fertilisers is prohibited in organic farming, and organic cultivation relies largely on farmyard manure (FYM) to provide essential soil nutrients. This means much organic produce is not vegan.

FYM is also commonly used in conventional agriculture, partly due to availability, partly because manure improves soil health in a way that synthetic fertilisers do not.[90] FYM is, therefore, a vital input in regenerative farming[91] and so as a result, are livestock. This means vegan and sustainable are not synonymous.

A host of vegan initiatives have sprung up recently, trying to suggest that wool and leather are 'unsustainable'. This screenshot from the Material Innovation Institute gives a flavour of the conversation. [92]

Without a thriving market for wool/hides and meat/dairy, there will be no FYM. Unless, of course, consumers are willing to pay a sufficient premium for organic vegetables and fibers to cover the cost of rearing livestock, uniquely for their manure production. Were meat/dairy/wool to be eliminated as these 'sustainability' initiatives so ardently recommend, the environmental impact of organic fibers would then rise in proportion, as livestock impacts could no longer be divided across multiple co-products, and would all have to be assigned to manure, and hence to the cotton, hemp, linen, that manure was used to produce. In addition to which, all said livestock's meat, wool, and hides would have to be landfilled - a complete waste of resources in an already resource strapped world.

As both symptom and consequence of this muddled thinking, the impact of manure production is generally excluded from LCAs of organic cotton, including the 2014 Organic LCA used by the Higg Co. to calculate the MSI, and by Kering to calculate its EP&L.[93]

That this significantly underestimates the environmental impact of organic cotton was pointed out in that 2014 organic LCA itself, which notes (page 44) that using The Intergovernmental Panel on Climate Change, 2006 IPCC Guidelines for National Greenhouse Gas Inventories for the manure employed in cultivation [94] would increase organic cotton's GWP by a factor of 4, Eutrophication by 18x, and Acidification by 37x.

It is self-evident that fashion industry funded claims that a 45% reduction in GWP in the pre spinning phase of textile production, will be achieved by 2030[95] - in good part by substituting organic for conventional cotton - is not scientifically substantiated.[96]

It should be noted that the authors of the present report are not the only ones to have observed that to fail to include the upstream impacts of manure is to seriously underestimate the impact of organic cotton cultivation. A recent report: *"Identifying Low Carbon Sources of Cotton and Polyester Fibers"*, published by the United Nations Fashion Industry Charter for Climate Action, also condemned the aberration in the 2014 LCA's failure to include the upstream impact of manure. Unfortunately, that report then furthers the confusion by intimating that if farmers use manure from their own cows, rather than buying it in from other farmers, the environmental impact magically disappears. We quote: *"Fertilizers vs compost and type of compost are key drivers in GHG release on farms. On farm fertilizer (manure) derived as a waste product* ***(passive fertilizer application from owned cattle) is the best solution to bringing down impact."***[97]

Attribution by ownership is not an accepted method of LCA allocation and makes no sense. The fact that Bowles Farm owns its own cotton gin does not mean that their cotton bales come impact free.[98]

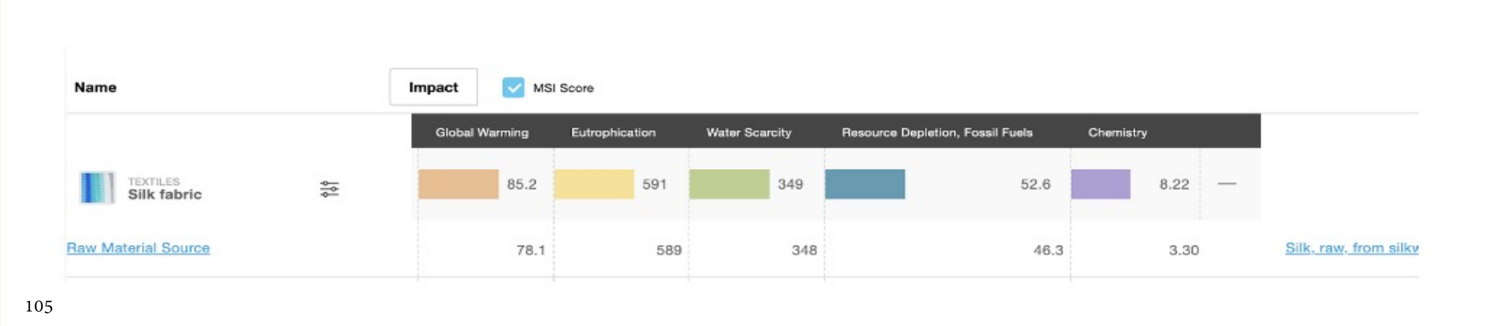
MII screenshot 21/07/21

5.4. THE ROLE OF ANIMAL MANURE

If a co-product has value and so influences farmer decisions to cultivate cotton or raise cattle and indeed how much or how many, it is self-evident that the co-product must share part of the burden of that cotton or cow's emissions. A 2013 study[99] found that for farmers in Maharashtra, India, manure ranked second after milk to sell in a list of reasons to keep livestock. Whilst, for 7% of the farmers surveyed, **manure was** ranked as **the main reason** to keep animals. Indeed, in India, manure is used to generate biogas. One study calculated that using dung as fuel is more efficient than using it as manure.[100] Dung is currently being promoted as an excellent source of renewable power for that cattle rich nation,[101] and the state of Chhattisgarh has recently launched a program to purchase cow dung at Rupees 2,000/tonne as part of a statewide initiative to generate green electricity.[102]

Clearly, pretending that if the farmer owns the cows, the manure has no environmental impact, will increase climate change, not reduce it. It should, however, be pointed out, that it is only for organic fibers that the impact of manure is excluded. For silk for instance, impacts associated with manure production are included in the Higg MSI. These negative impacts are primarily Global Warming Potential (GWP) and eutrophication - i.e., the excessive nutrients released by manure, such as nitrogen which can cause algal blooms in water[103], as well as soil imbalances on land that affect both plants and the insects that feed on them.[104]

Indeed, as the screenshot from the Higg MSI below shows, the most important element of silk's purported impact according to the MSI is not water scarcity, it is eutrophication - at 589/kilo.
That is 16 times the total average impact for generic polyester fabric - and it derives almost entirely from the use of manure as a fertiliser in silk cultivation.



Impact | MSI Score

Name	Global Warming	Eutrophication	Water Scarcity	Resource Depletion, Fossil Fuels	Chemistry	
TEXTILES Silk fabric	85.2	591	349	52.6	8.22	—
Raw Material Source	78.1	589	348	46.3	3.30	Silk, raw, from silkw

[105]

Figure 5

BOX 4:
Higgies - or what unit are Higg MSI scores measured in?

Higgies - or what unit are Higg MSI scores measured in? The sharper eyed may be wondering 589 eutrophication 'what' per kilo? The same question will apply to every Higg score referred to in this paper, and the answer is: we don't know. The MSI is based on LCAs but it apparently takes the impact values of water, emissions etc, normalises them by process, on a base of 10, weights by water scarcity and possibly other factors, and then comes up with a final 'number' of what we shall call 'Higgies' per kilo, in each of five impact areas - Global Warming, Eutrophication, Water Scarcity, Resource Depletion Fossil Fuels, and Chemistry. Since the MSI is privately owned and not open source, it is effectively a black box. What exactly is being measured, how these different impacts can be summed, let alone how consistent or reliable any of this is, is unknown.

UNSPLASH: LEON EPHRAIM

It is inconsistent and misleading to insist that silk is the world's least sustainable fiber, due in no small part to the use of manure recommended in Indian sericulture, whilst simultaneously claiming that organic cotton is the world's most sustainable farmed fiber by simply excluding the upstream impact of manure, despite the fact that recommended manure application per hectare of organic cotton in India (18 tonnes) does not appear radically different from recommended application per hectare of mulberry trees for silk (20 tonnes).[106] [107]

Finally, despite frequent assertions that organic cultivation has no grey water (polluted runoff) and is not toxic[108], this is not borne out by the facts. Manure, if it enters the water supply, can be both a major source of eutrophication, and toxic to both humans and animals.

Water pollution is one of the biggest problems resulting from ineffective disposal of animal waste," says Oene Oenema, a professor at Wageningen University, who has spent many years researching agricultural pollution across Asia. "When waste is being disposed of in rivers, and then transported to lakes and coastal zones, fish disappear, the water becomes dark and black, and there's a high risk of infections being transmitted to humans. In parts of China, there are still discharges directly into service water."[109]

The World Health Organisation states that Diarrhoeal disease is the second leading cause of death in children under five years old and a major cause of child malnutrition.[110] [111]
To quote the New York Times, speaking of India, the world's leading cotton producer [112] *"The country's water problem speaks to the mismatch between its global economic ambitions and the dire conditions of much of its 1.4 billion population, two-thirds of whom still live in rural areas. Nearly 40 million Indians are affected by waterborne diseases every year, leading to about $600 million annually in medical costs and labor loss. About 100,000 children under 5 years old die of diarrhea every year. The growth of millions more is stunted"*[113]

Given the risks of seepage, run-off, and generally poor hygiene associated with the use of manure in organic cotton production, combined with the lack of access to treated water in many producing nations, the toxicity associated with manure should be a major concern.

"While many sanitation initiatives across sub-Saharan Africa have focused solely on human waste, scientists fear they have overlooked a much greater problem. "There have been a number of studies in low-income countries, where human sanitation for people was improved, but outcomes like diarrhoea didn't change," says Jan-Willem Rosenboom, senior programme officer for sanitation and hygiene at the Gates Foundation. "This could be because there's already so much animal waste in the environment, that merely improving human sanitation doesn't have enough of an impact on health."[114]

It is unacceptable that sustainable fashion simply whitewashes the negative impacts of the use of manure in organic cotton production from the picture (for example, the denim sector's cotton myth report mentioned earlier, skips this myth completely)[115] and presses farmers to convert to organic systems without ever having undertaken any studies whatsoever of the potential for such cultivation to impact negatively on SDGs 3 and 6 - not to mention SDGs 13, 14, and 15. [116]

BOX 5:
Sustainable Development Goals

Source: 117

CONCERN 6:

DIGGING DEEPER INTO EXISTING SUSTAINABILITY STUDIES – Time Frames, Locations, Allocation Methods, and Values that Radically Change Impacts

In this section we discuss several methodological concerns with existing comparative sustainability indices. The impact assessments of LCAs can change radically, depending on when and where these studies were conducted, over what time-period, and what method and values were assigned to co-products - both those used as inputs, and those that are outputs.

If indices are based on unrepresentative LCAs, they will not be useful reference points. If such indices are followed by consumers, brands, and manufacturers, it is equally obvious that this may well have the opposite effect of that intended. Namely to contribute to an increase in both climate change and global inequality, rather than a reduction. We have already discussed these concerns in the context of manure and rainfall in organic cotton cultivation. Here, we offer further insights in the context of water use in silk, and the allocation of impacts to co-products in leather, silk, and wool.

It should also be noted that all current claims are based on comparing attributional LCAs - LCAs that measure the average impact of the production concerned. However, for a realistic comparative sustainability assessment, an evaluation of the impact of substituting one fabric for another should be conducted. So-called consequential LCAs measure the impact of marginal producers - those who would cease to produce, because of falling demand, and those who would respond to an increase in demand for the alternative fabric.[118]

This obviously gives you a much clearer picture of what the net impacts of fiber swapping are likely to be, but we can find no evidence of the existence of any consequential LCAs in sustainable fashion.

Given the number of official schemes planned or in implementation - including Germany's Green Button and the EU's PEF - whose intent is to advise consumers to switch to certain fabrics over others, with the aim of reducing climate change, this would appear a major failure and flaw in the system. For instance, encouraging consumers not to buy conventional cotton, reducing demand and so price, would likely discourage inefficient producers first - possibly those in sub-Saharan Africa, whose cotton is rainfed and cultivated with minimal use of synthetic fertilizers and pesticides. [119]

Whilst, if consumers are encouraged to purchase say, viscose instead, the increased demand and so price could result in an expansion in the least sustainable branches of that sector. Sateri, for instance, a major supplier to *"a host of major brands, including Adidas, Abercrombie & Fitch and H&M"*[120] has recently been tied to deforestation in Kalimantan (Borneo). The monoculture involved in viscose plantations, particularly eucalyptus, has been tied to reductions in biodiversity from Indonesia to the Iberian Peninsula[121] [122] , and viscose itself does not appear currently to be recycled - viscose fiber to viscose fiber - whereas cotton is recycled into cotton fabric[123], cotton shoddy[124], and soon, viscose itself.[125]

Similarly, if the demand for polyester increased, the marginal producer might be a coal-based plant in China, with a very different environmental footprint to that of existing oil and gas-based PET plants[126] , and as we shall see (Concern 7), polyester is not currently recycled fiber to fiber, either.

UNSPLASH: THOMAS SEREDA

6.1. SILK – AN EXAMPLE OF OUTDATED AND UNREPRESENTATIVE REFERENCE STUDIES

A good example of how much the choice of timeframe and location matters in evaluating sustainability, is provided by the case of silk.

As we shall demonstrate, fashion's sustainability assessments of silk, just like their sustainability assessments of cotton, suffer from a failure to differentiate between rainfed and non-rainfed cultivation methods. As already mentioned, the favourable water impact score for organic cotton that is promoted by most indices, initiatives, and brands, including the MSI, is obtained by looking at organic cotton production in rainfed conditions, and then attributing the lower irrigation/blue water consumption to the production system.

Exactly the opposite applies to the Higg MSI, and indeed Kering as well as countless blogs, when it comes to the evaluation of the purported impact of silk [127] [128] [129], All claim that silk has a significant water impact by looking at 100% irrigated production, and then asserting that all raw silk production requires huge amounts of water (of silk fabric's MSI score of 1086/kilo, 348/kilo is derived from water scarcity in cultivation).

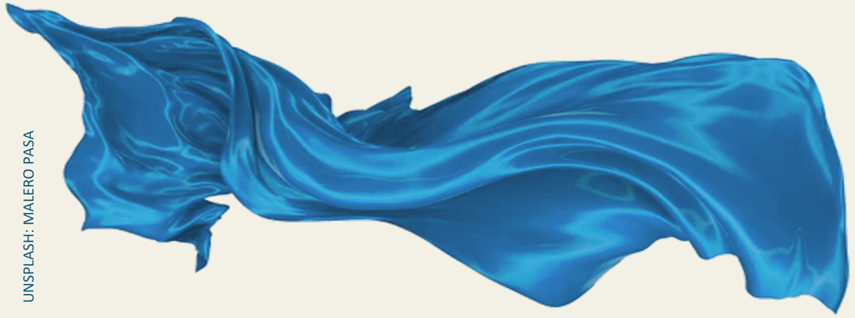
In the global apparel market, the principal silk type that is traded is mulberry silk, produced by Bombyx Mori, the common silk moth. Other varieties are wild or vanya silks - primarily tasar, muga, and eri. [130]

Bombyx Mori prefers temperate conditions and so almost all mulberry silk comes from China.[131] Indeed *"The market share of Indian silk exports in the global silk trade is [only] 4% to 5%."*[132] The International Sericulture Commission maintains that 100% of Chinese mulberry silk is entirely rainfed. It also maintains that 30% of Indian silk is entirely rainfed.

Currently, however, the most cited LCA assessing the sustainability of mulberry silk is one produced by the Oxford University Silk Group[133] in 2014 - *"Life Cycle Assessment of Indian Silk"* by Miguel F. Astudillo, Gunnar Thalwitz, and Fritz Vollrath.[134] As the title shows, we already have a major assessment failing as this study only covers production in **India, not China**, and India represents less than 5% of the global supply.

More precisely, the 2014 LCA evaluates the practices of just 100 bivoltine silk farmers in Dharmapuri, Tamil Nadu, India, **in 2006.** The study actually computes two different sets of impact values - one obtained from farmer records, the other, by using the same farmers' 2006 methods, but applying fertilizer, manure etc. according to Recommended Practices, as obtained from a 2013 publication by the Government of Andhra Pradesh.

Irrigation had to be estimated for both cases, as it was not measured in 2006. Moreover, whilst most mulberry silk in the global supply chain is rainfed, since the 100 Indian farmers concerned lived in a dry area, the Oxford LCA estimated that the mulberry trees needed to be almost fully irrigated. Since the farmers were using (wasteful) furrow irrigation at the time, this meant that 8,590 m3/ha of irrigation water was estimated to be required, per annum.



UNSPLASH: MALERO PASA

When questioned about the MSI's high water impact score for silk, the SAC replied (email dated March 11, 2020): *"According to our data sources, the amount of water used to produce mulberry trees is huge. Common practices require more than 8,500 cubic meters of water per hectare per year and more than 9,000 cubic meters during dry seasons (Astudillo et al. [2014] and Huo [2017])."*

Huo [2017], incidentally, does not appear to exist and the SAC has refused all requests for a copy, but we can in any case see from the SAC's assertion that *"8,500-9,000 cubic meters of water per hectare per year"* are required, that they are just quoting Astudillo et al. (2014), and sustainable fashion is basing all of its claims for silk's purported water impact on the assumption that far from being primarily rainfed, **all silk is 100% irrigated, in the most inefficient manner.**

An accurate assessment of silk's sustainability would need to carefully distinguish between rainfed silk and non-rainfed silk. Whilst for the latter, the irrigation method is highly relevant.
As Astudillo et al. (2014) point out: *"A significant amount of energy and water can be saved using drip irrigation. Siddalingaswamy et al. (2007) conducted a study of furrow vs. drip irrigation, confirming possible water savings of 66% without compromising mulberry yields."* Across the agricultural sector, drip irrigation is considerably more common in 2021, than it was in 2006.

6.1. SILK – AN EXAMPLE OF OUTDATED AND UNREPRESENTATIVE REFERENCE STUDIES

So too is the use of off-grid, solar power in India. As the 2014 silk LCA also points out: *"Burdens associated with drying can be reduced using solar energy. Solar dryers for silkworm cocoons have been developed, reducing electricity requirements ten-fold compared with electric dryers."*

When considering the transparency and validity of these purported scores, it should also be noted that in May 2021, when the SAC transferred ownership of the MSI to VC backed Higg Co[135], the MSI impact per kilo of silk increased overnight from 680/kilo to 1086/kilo. That of polyester dropped from 45/kilo to 36.2/kilo, and the purported impact of the other farmed fibers also increased. The stated sources for all these scores, however, remained unchanged.

The International Sericulture Commission informs us that despite repeated requests, the SAC has been unable to provide any explanation for either the increase in silk's purported impact, or the reduction in polyester's.

Such inexplicable overnight changes in the sustainability values of key fibres suggest a non-scientific adjustment of the impact scores. It is self-evident that one possible reason for the SAC's inability to explain these adjustments is that the changes were something that the MSI's new owners - Higg Co - decided upon unilaterally.

In short then, fashion is looking at the outdated and unrepresentative practices of a tiny global sample and using this to claim that all mulberry silk production imposes a heavy environmental burden. It should be noted that in the MSI silk, raw, from silkworm Data Quality notes, Higg Co. maintains that the 'Time Representativeness' of this data is*: "Excellent Data are not older than 4 years with respect to the release date or latest review date"* and both the Geographical and technological Representativeness are designated as: 'good'.[136]

As we have seen, however, the data actually covers 2006 practices combined with 2013 recommendations. Both sets of data are unequivocally older than 4 years. And 100% irrigated Indian mulberry silk is categorically not geographically representative of globally traded mulberry silk production, some 80% of which comes from China. It is not even representative of the mulberry silk that comes from India, most of which is at least partially rainfed.

As a for profit, registered in Delaware, Higg Co is only accountable to its shareholders, yet their fibre assessments have far-reaching consequences. Under the circumstances, this should be a matter of serious concern. As it is, brands currently using the Higg MSI for silk are setting incentives for unfair competitive practice. They are deliberately portraying the impact of silk fiber to be considerably higher than it is.

I quote the 2014 silk LCA's author, Professor Vollrath: *"For the Higgs MSI that study was taken out of context by - apparently - being used as a generic pattern of sericulture. As such* ***it is totally misunderstanding, and thus misrepresenting, the point of the study which was to demonstrate a bad (or indeed worst) case scenario to guard against."*** [137]

In using this worst-case scenario to depict the average impact of global silk production, these brands are giving an unwarranted advantage to cheaper silk substitutes - such as viscose and polyester - and they are damaging the market for Mulberry silk and so the prospects for the 12 million underprivileged who are employed, both full and part time, in its cultivation.[138]

ECO LOOKBOOK: STEVE JAGER

6.2. SILK – THE FAILURE TO IDENTIFY AND INCLUDE VALUABLE CO-PRODUCTS OF FIBRE PRODUCTION

One important thing to note here is that in calculating economic allocation, if no co-products are identified, this will significantly increase the impact attributed to any given fiber. We quote the 2014 Astudillo and Vollrath[139] study:

"Animal fibres and animal husbandry generally require higher inputs than plant production and generate a larger amount of co- products. Silk is the only long natural filament fibre, and off-farm processing is complex compared to other animal fibres such as wool. If these co-products are insufficiently valorised, the result is almost complete attribution of total impact to reeled silk. With the possible exception of firewood and unreelable silk, ***co-products from sericulture in India are of low value. Pupae*** *[the life stage in which silk moths exhibit complete metamorphosis][140] and sericin [the gum coating the fibres and allowing them to stick to each other][141]* ***constitute over 50% of dry weight of final output; we are not aware of these currently being utilised in the study area."***

In other words, the Astudillo et al. LCA assumes that silk has little by way of valuable co-products, and so the entire environmental impact of silk rearing has to be assigned to the fiber alone.

In reality, Pupae, which are about 50% of dry cocoon weight, are eaten in China[142] , Vietnam, Cambodia, and South Korea[143], and used for cattle feed in Brazil. Sericin is 12.5% of dry cocoon weight or 25% of raw silk weight and it is used in medicine and cosmetics.[144 145]

These and other co-products can have significant economic value, and so reduce the amount of environmental impact that must be assigned to silk fiber. In ignoring this, it is self-evident that the Higg MSI et al. are all grossly overestimating the average environmental impact of silk.

By the same token, it is inconsistent that the MSI identifies manure as a co-product of cattle rearing, and so attributes a share of the bovine's emissions to the impact of silk. But then fails to deduct the share of emissions attributable to manure in calculating the impact that must be attributed to rawhides.

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6.3. LEATHER – AN EXAMPLE OF THE IMPACT OF USING DIFFERENT ECONOMIC ALLOCATIONS

Please note: the detailed analysis underpinning this section can be found in "Appendix 1: Leather - an Example of the Impact of Using Different Economic Allocations" at the end of this paper.

As we have already seen in the case of manure in both silk and organic cotton cultivation, whether and how production burdens are assigned across inputs, and so included in the final impact of the commodity, makes a huge difference to the purported impact of the fiber under consideration. Similarly, as already mentioned in the context of silk, many fibres, and this is true of virtually all farmed fibers, have co-products. Sheep produce wool, lanolin, skins, and meat (and sometimes dairy products); cattle produce hides for leather, meat and/or dairy products, manure, and sometimes saleable methane;[146] [147] farming silkworms produces silk, pupae/pupal oil, and sericin, as well as mulberry fruit and other minor goods; cotton plants produce cottonseed, cotton fiber, and linters, and so on. When undertaking an LCA, one thing that must be decided is how the environmental impact of raising that sheep, silkworm, cotton, or cow is going to be allocated between the different co-products.

The ISO, International Organization for Standardization, accepts a number of different LCA methodologies. One common method of co-product impact allocation is economic allocation, and this is the approach that appears to be used by the Higg MSI for all farmed fibers, except wool.

What this means, using leather as an example, is that the total lifetime environmental impact of a cow or steer, is apportioned to the rawhide, in proportion to the hide's share of that cow's total lifetime economic value. So, if for example, the lifetime impact of the average steer in GWP was 1000, and the hide's share in the average steer's lifetime value was 3%, an LCA would allocate 3%, or 30 of that 1000 in GWP, to the rawhide.

For generic, global leather, the MSI uses an economic allocation to the hide of 3.6%. The global leather industry protested this 3.6% allocation at the end of 2020, because it overstated the average market value of hides, based on slaughter value. We should, however, remember that cows also produce milk and calves (as do breeding bulls), and that the lifetime production of manure/methane by all bovines may also have significant economic value, so slaughter values do not in fact, automatically reflect lifetime contributions. And it is lifetime contributions that are required for an accurate LCA.

As it is, the Leather and Hide Council of America estimate that 5.5 million hides, allegedly enough to make 99 million pairs of shoes, went into landfill in the USA alone, in 2019.[148] If hides are being sent to landfill, because nobody will buy them, they clearly do not contribute 3.6% to the lifetime value of the cow or steer concerned. They are an additional cost. To encourage brands and consumers not to use such hides is obviously both a significant waste of global resources, and harmful to the income of global cattle farmers. It is the opposite of sustainable on both counts by which sustainability should be measured.

The leather sector's repeated protests have, however, been to no avail, and Higg Co. refuse to change the economic allocation for generic global leather, which remains at 3.6%.

It is concerning that the economic allocation for generic cow leather is decided by a private company that does not need to be transparent to global stakeholders over their business decisions. This is particularly the case given the recent appearance of rawhide MSI scores, that are specific to two brands PrimeAsia[149], a large US and Taiwan-based producer, with operations in China and Vietnam, and the world's biggest meat packer[150] Brazil's JBS.[151] JBS also has operations in the USA.[152] Indeed, JBS is the largest meatpacker in the USA controlling 25% of US slaughter capacity[153]. Along with Tyson Foods and Cargill (as well as Marfrig owned National Beef[154]), JBS currently stands accused of manipulating feedlot contract prices to the considerable disadvantage of both US cattle ranchers, and the public, and to the advantage of the processors themselves.[155]

PrimeAsia portrays the new MSI scores as a triumph for science, covering*: "11 supply chain configurations in three different continents...more than 266 process phases, 3,000 data points collected and operations in five different countries."*[156]

6.3. LEATHER – AN EXAMPLE OF THE IMPACT OF USING DIFFERENT ECONOMIC ALLOCATIONS

However, as Appendix 1 shows, the impact reductions for both PrimeAsia and JBS rawhides appear attributable **solely** to a reduction in the economic allocation that is applied, by the MSI, to PrimeAsia and JBS hides, and to their hides alone. This, without any explanation as to why such a significantly lower economic allocation is valid. It is true that like other meat companies, JBS can sell the hide fleshings and trimmings to collagen manufacturers, as these must be treated as food grade, but this most likely does not apply to PrimeAsia. In any case, sales of trimmings would not account for 75-76% of the hide value.

All the talk of data collection notwithstanding, a quick look at the MSI (the screenshots in appendix 1 were taken between July and December 2021) shows that the source for the rawhide values in both the PrimeAsia and the JBS scores in fact, remains the same as the source for the generic values: Sphera GaBi.

The only data that the MSI claims to have collected from the manufacturer is that required to 'customize' the allocation. The reader will recall that for generic leather, the MSI uses an economic allocation to the rawhide of 3.6%. For PrimeAsia South America hides, the MSI allocation has been reduced to 1%, and for PrimeAsia US and Australia rawhides, to 0.892%.

Inevitably, this means that the purported GWP, eutrophication etc. for PrimeAsia hides are only 28% and 25% of their generic equivalents. Whilst JBS hides, with an even more favorable economic allocation of 0.87% are, as the screenshot below shows, the world's most sustainable choice according to the MSI.

Select | Process | Impact | MSI Score

Select	Process	Global Warming	Eutrophication	Water Scarcity	Resource Depletion, Fossil Fuels	Chemistry	
☐	Cow hide, Brazil	4.32	5.68	0.250	0.884	1.90	This dataset describes salted bovine hide produ includes the cattle raising (mainly fodder produ emissions) as well as the slaughtering. The data
☐	Cow hides, global average	4.32	11.5	1.54	1.08	2.84	This process is based on an average of equally from Brazil and the US. Animal husbandry, inclu manure management, and enteric fermentation ...
☐	Cow hide, US	4.32	17.3	2.83	1.27	2.84	This dataset describes salted bovine hide produ includes the cattle raising (mainly fodder produ emissions) as well as the slaughtering. The data ...
☑	Cow hide {JBS and Asiatan}, Brazil	1.04	1.37	0.060	0.214	1.90	This dataset describes bovine hide production. the cattle raising (mainly fodder production and emissions) as well as the slaughtering. The data ...
☐	Cow hide {PrimeAsia}, from Steers (US and Australia)	1.07	4.28	0.700	0.315	1.90	This dataset describes bovine hide production. the cattle raising (mainly fodder production and emissions) as well as the slaughtering. The data ...
☐	Cow hide {PrimeAsia}, from South American raw hides	1.20	1.58	0.070	0.245	1.90	This dataset describes bovine hide production. the cattle raising (mainly fodder production and emissions) as well as the slaughtering. The data ...

157

Screenshot taken 22/12/21

6.3. LEATHER – AN EXAMPLE OF THE IMPACT OF USING DIFFERENT ECONOMIC ALLOCATIONS

This is an interesting turn of events for the JBS group whose owners were only recently released from jail on corruption charges - or as Bloomberg put it on July 15, 2021 *"Brazil's Batista Brothers Are Out of Jail And Worth $6 Billion"* [158] - and whose cattle sourcing has been repeatedly tied to Amazon deforestation. [159 160 161]

Indeed, in Mighty Earth's Soy and Cattle tracker, JBS is the lowest ranked Brazilian producer[162] with their cattle sourcing tied to over 100,000 ha of deforested land in the Amazon and the Cerrado, some 74% of which may have been cleared illegally. Indeed, a November 17, 2021, investigative piece by the New York Times uncovered further details: *"An analysis showed that, among the JBS suppliers, ranches covering an estimated 2,500 square miles significantly overlapped Indigenous land, a conservation zone or an area that was deforested after 2008, when laws regulating deforestation were put in place in Brazil"* [163]

and:

"According to the numbers, between January 2018 and June 2021 ranches operating in Jaci-Paraná on illegally deforested land sold at least 17,700 cattle to intermediate ranches. The buyers were suppliers to the three big meatpackers, JBS, Marfrig and Minerva."

The November 17, 2021, article by the NYT was followed by the November 29, 2021, release of a study by Slow Factory[164] connecting Amazon deforestation, much illegal, to JBS cowhides. And connecting JBS's supply chain to 100 brands and corporations, including MSI promoters and supporters: Nike, Walmart, Gap, PVH, and H&M.[165]

The MII, referred to in 5.4 above, whose sales deck, as noted in that section, is based upon the Higg MSI, promptly took advantage of the Slow Factory report to launch a 30 November email campaign, seeking donations to: *"Create a cleaner, kinder world with us,"* through investment in next-gen materials.

The MII are, apparently oblivious to the fact that the index that they have built their vilification of silk, wool, cotton, leather, and alpaca upon, finds JBS hides the most sustainable in the world, which surely calls into question the validity of the rest of the MSI's scoring and so the justification for the MII business model?

Whether and how brands should source Brazilian cowhides is beyond the scope of this paper. We are interested in the use and misuse of sustainability metrics and specifically in how changing the economic allocation for JBS hides has made their hides appear the world's most sustainable without any changes to the underlying data for Brazil, and in direct contradiction to the sector's commitments. TE leads the Responsible Leather Round Table (RLRT)[166], an initiative that *"evolved from Textile Exchange's vision for a global textile industry that protects and restores the environment, reduces the climate impact of our industry and enhances lives".* But TE sustainability metrics are based on the Higg MSI, and indeed, Higg sponsored the 2021 RLRT Summit. [167 168]

The absurdity of this situation can be lost on no one, and it is a sign of the inconsistency, even incompetence, that marks most current sustainability measurement, that both H&M and VF Corp have policies in place prohibiting leather sourced from Brazil, precisely due to traceability concerns.[169] Yet both corporations are also avid supporters of both the Higg MSI, and TE, and, as we have just pointed out, both Higg Co and TE claim that JBS hides are the world's most sustainable.

SUSTAINABLE CHIC: ABLE

JBS COUROS: LECTRA.COM

6.4. WOOL – THE EXAMPLE FOR PHYSICAL Vs ECONOMIC ALLOCATION

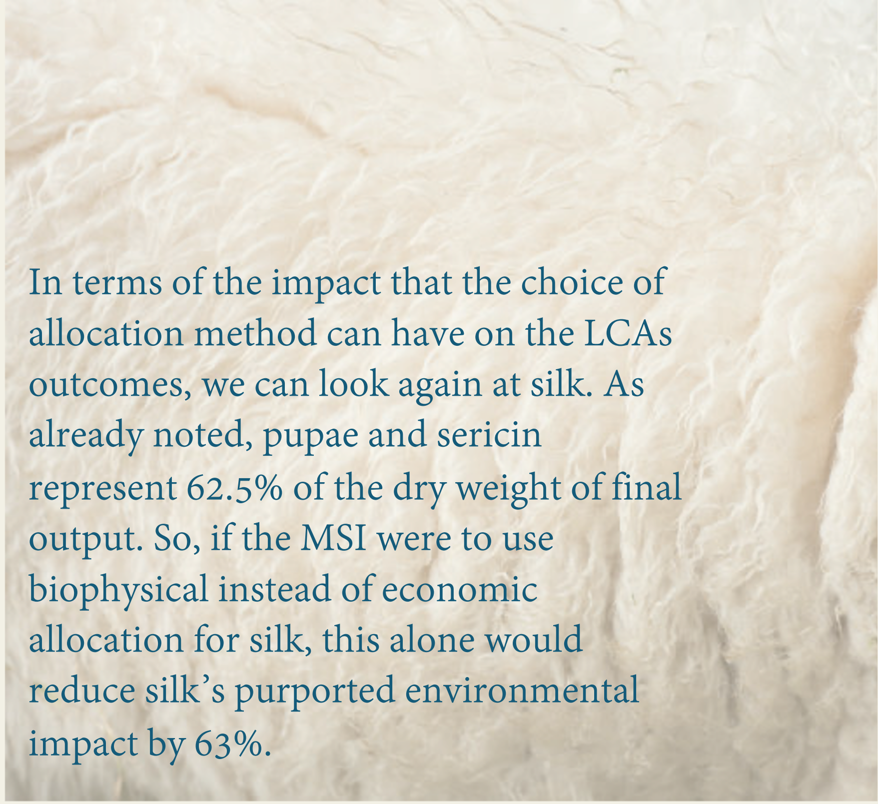
As stated at the beginning of this section, and as we have just seen for leather, economic allocation is the method used by the Higg MSI for all farmed fibers except wool. For wool, the MSI uses a different method*: "Biophysical allocation using protein content is applied to divide the outputs of the system between meat and wool."* [170]

Using economic allocation has **two** advantages:

1. It is the only method that can be used for a comparative fiber index, as it is the only method that can be applied uniformly across all fibers, as required by ISO standards for public facing comparative assertions. Allocation by protein cannot be used for cotton or polyester for example, as neither fiber contains any protein.

2. If a fiber is being wasted - landfilled rather than employed to produce products - then using it has zero environmental impact. On the contrary, using it to produce a good has the double benefit of both reducing the cost of waste disposal, and of preventing the impact of producing an alternative. Economic allocation accurately captures this, as that fiber will also have zero economic value. Biophysical methodology does not capture this at all. Since the fiber protein content is independent of its market price, biophysical allocation will always tell manufacturers and consumers that using the fiber will result in additional impact, when in fact, the opposite is the case. Some of the problems that have arisen for European wool because of the use of biophysical allocation in virtually all wool LCAs, are outlined in a forthcoming book edited by Klepp and Tobaisson. [171]

UNSPLASH: AHAVELAAR



In terms of the impact that the choice of allocation method can have on the LCAs outcomes, we can look again at silk. As already noted, pupae and sericin represent 62.5% of the dry weight of final output. So, if the MSI were to use biophysical instead of economic allocation for silk, this alone would reduce silk's purported environmental impact by 63%.

Figure 6

6.5. THE MISCONCEPTION THAT TRACKING RESOLVES SUSTAINABILITY CONCERNS

Supply chain transparency is a necessary but insufficient condition for sustainability claims. Mapping production locations needs to be coupled with independent third-party information about working conditions at these production sites.[172]

In fashion, most brands in fact manage at best to map their first-tier suppliers (those suppliers brands buy from directly), while deeper layers of the supply chain (the suppliers that the first-tier suppliers buy from) remain unidentified. For comprehensive sustainability assessments this is insufficient. Moreover, simply tracking how much water a fabric consumed or how much GWP was emitted in its production, only covers one part of the sustainability picture.

In September 2021, Higg Co. announced that it was Launching a *"Traceability Partner Program for Supply Chain Sustainability"*[173]:

"Higg, a technology platform that enables consumer goods companies to measure, manage, and share the social and environmental impacts of their full value chain, today announced a new program enabling comprehensive traceability across the global supply chain. The Higg traceability program, a global collaboration beginning with technology partners atma.io by Avery Dennison, FibreTrace, and TrusTrace".

The first thing to note is that the MSI does not contain a metric to assess the socio-economic impact of fibers on their producers so none of the brands that use/will use TrusTrace or FiberTrace will have any idea whether their fabric choices contributed to meeting the needs of the worlds' poorest, or rather denied them a market, or reduced their incomes.

TrusTrace describes itself as *"a state-of-the-art digital platform for product traceability and supply chain transparency".*[174]

A strategy TrusTrace recommends to brands because *"Products marketed as sustainable grow 5.6 times faster than those that are not."*

FiberTrace on the other hand claims *"we aim to ultimately provide the consumer the opportunity to choose a transparent and sustainable supply chain to follow and purchase from."*[175]

The notion that apparel manufactured by workers who were not paid a living wage becomes sustainable because the fiber used to produce the fabric can be traced back to a responsible farm in Australia or California is a gross distortion of reality. And to suggest that buying cotton from large US or Australian farms is more sustainable than purchasing cotton from poor subsistence farmers in Burkina Faso or Zambia, simply because the latter do not have the funds to track their production from field to gin, is misleading.

In conclusion, as this, and our previous paper have repeatedly pointed out, comparative sustainability indices are currently causing economic harm to purportedly less 'sustainable' fibers and fabrics. Their sole object and purpose are to engender a reduction in demand for less sustainable choices, and an increase in demand for more sustainable fiber and fabric options. By definition, producers of 'less sustainable' fibers will see their market dwindle.

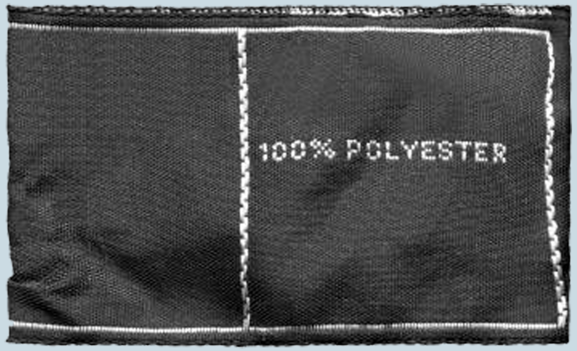
As Concerns 5 and 6 have amply demonstrated, allowing private corporations to decide upon the methods and values to be used in impact allocation for different fibers, and permitting them to switch these at will, is clearly ethically incompatible with the aims and objectives of comparative sustainability indices and labelling. We would submit that urgent action is required by the EU and other governments to correct this. In particular, we are unclear how the EU could sanction the use of the MSI to generate scores for the EU PEF, when it is clear that for leather for example, EU producers are being penalised through the use of a much higher economic allocation for their hides, than for those coming from JBS or PrimeAsia, without any rational explanation for this difference. And it goes without saying that if this proliferation of pay for play scores within the MSI - from JBS and PrimeAsia, to FiberTrace and Avery Dennison - is allowed to continue, SMEs and subsistence farmers will eventually be the only producers rated 'unsustainable'. This would not only be unjust and unscientific, it would also be a non-fiscal barrier to trade, and patently inconsistent with EU development policies and commitments.

CONCERN 7:
OVERLOOKED IMPACTS OF POLYESTER AND MICROFIBRES

The explosive growth in global per capita and total fiber consumption since the late 1990s - from roughly 42 million tonnes or 7.3 kilos per capita in 1996, to 101 million tonnes or 13 kg/capita in 2019[176] - is due almost entirely to the increasing use of plastic fibers.

Even the major brands' own initiative, TE, has pointed out that in 2019, global production of plastic fibers reached 70 million metric tonnes.[177] Whilst Wood-Mackenzie Chemicals calculate that polyester fiber alone totalled 58 million metric tonnes in 2018/19 - or 57% of the global total. [178]

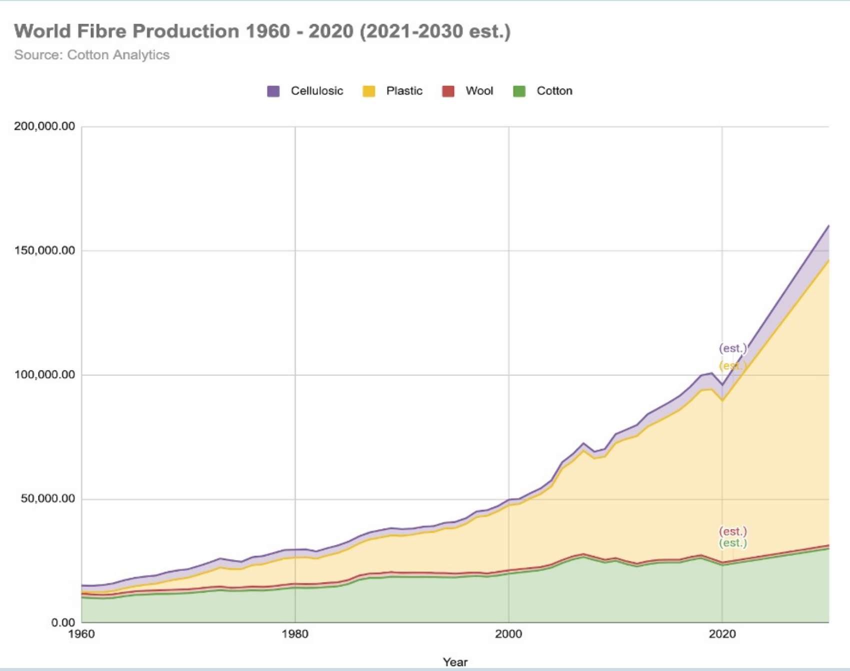
Not all of this is attributable to fashion (apparel production reportedly accounts for 43% of global fiber demand[179]) but it is clear that plastics, particularly polyester, have been the engine behind this explosion. Without cheap polyester, rising prices, as manufacturers tried to encourage an increased supply of farmed fibers, would - without the need for any expensive initiatives, costly campaigns, or global conferences - have stifled demand through market forces. Cheap fast fashion and athleisure would have died before they took off.



UNSPLASH: TARZHANOVA

To illustrate the orders of magnitude involved here, over the past 12 months, polyester staple has fluctuated between 42 and 51 cents US per pound. A similar grade of cotton on the other hand (Cotlook A Index) has averaged US$0.87 - $1.03 per pound. Whilst silk currently averages US$31 per pound. [180] (All prices mill gate E. China).

In other words, even at existing levels of demand, cotton is double the price of polyester, whilst silk costs 67 times more. Not surprisingly, a Spring/Summer 2021, online sweep by Changing Markets found that for the 12 major brands surveyed, 67% of their offerings contained some type of fossil synthetic, and that on average, these fibres accounted for 53% of the garments' composition. Moreover, at the lower end of the market - Walmart and Boohoo - fossil synthetics were present in 80% or more of the garments listed. [181]



GUARDIAN: MICHAEL KEMP / ALAMY

The fact that the fast fashion/athleisure business model is so dependent on cheap polyester is highly problematic. The industry is not surprisingly, unwilling to acknowledge let alone address potential problems with polyester production and consumption, whilst polyester brings with it, several serious concerns for both environmental and human health:

1. The lack of a global LCA for polyester, along with the absence of fiber-to-fiber polyester recycling, along with the omission of polyester fabric's failure to degrade, all combine to result in an artificially favourable view of polyester's environmental impact

2. A high carbon footprint – for both virgin plastic production and recycling

3. The toxicity of antimony, which is used as a catalyst in 80–90% of global polyester production, and

4. The potential pervasiveness and toxicity of microfibers that are released when wearing and washing plastic fibre garments.

7.1. NO RECYCLING OF POLYESTER AND NO GLOBAL LCA

One root cause of confusion is the lack of a comprehensive and global LCA for polyester. As we have already mentioned, the MSI rates polyester and other plastics the world's most sustainable fibers. However, as we have also pointed out, LCAs - or scores derived from LCAs - can only be compared if the LCAs concerned were produced using exactly the same methodology and boundaries, and no such suite of global LCAs for the various fibers used in the apparel sector exists. In fact, for all fibers, with the partial exception of wool and cotton, no global generic LCA exists.

For polyester, as the recent United Nations Fashion Industry Charter for Climate Action (UNFCCC) report points out, Plastics Europe's Eco-profile of PET is the LCA most widely used by commercial databases such as Ecoinvent and Sphera GaBi - and hence, by the Higg MSI. But as that report also points out: *"Greenhouse gas impacts of crude oil extraction and refinery* ***can vary by a factor of seven*** *depending on the location".*

As the UNFCCC report also observes, and as is the case for the 2014 organic cotton LCA mentioned earlier, the Plastics Europe PET study is out of date. The Plastics Europe data is for 2009, and so *"The mix of crude oil import modeled in Plastics Europe, is not representative of the current scenario in Europe".*

On top of which, *"background data from Europe is often used to represent Asian PET production, which is not truly reflective of the crude oil mix of refineries operating in Asia"* (pg. 111). [182]

As already noted, 93% of global polyester production comes from Asia. Clearly existing databases in the apparel sector, including the Higg MSI, are grossly understating the environmental impact of polyester production. If the impact of 2021 Asian PET is indeed seven times higher than that of 2009 European PET, brands and consumers are being thoroughly misled.

In addition, there must be serious concern that even using representative data for the feedstock fails to adequately capture direct emissions (let alone externalities), particularly of fracked natural gas, in the light of increasing evidence of methane leaks[183] (We can also note that in Asia we now see PET production ramping up using coal[184]).

These undesirable outcomes are compounded by the almost complete absence of fibre-to-fibre recycling and polyester fabric's failure to degrade, whilst the fashion industry's focus on r-PET as a more sustainable solution does not in fact, account for sustainability comprehensively.

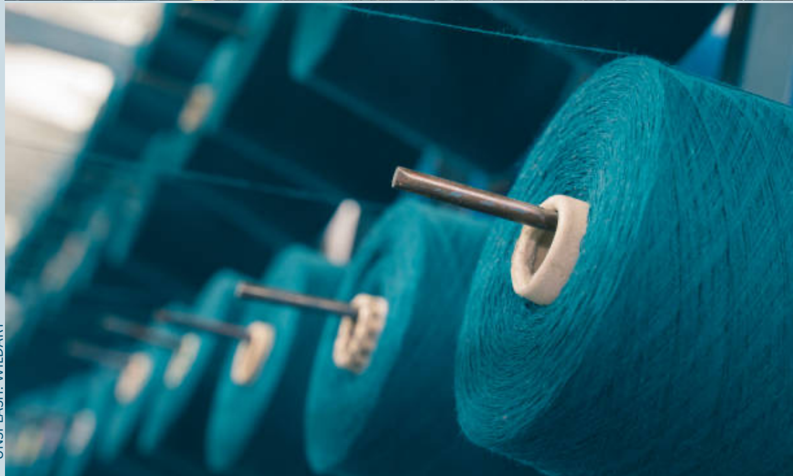
At the present time, commercially available recycled polyester - fabric-to-fabric - does not exist and seems almost impossible to achieve because business is dictated by economics, and virgin polyester is too cheap for recycled alternatives to compete. Indeed, Patagonia and Teijin launched a program to achieve fabric-to-fabric recycling with Patagonia's Capilene performance garments, all the way back in 2005[185], when they also announced a five-year goal to make all Patagonia products recyclable through the Common Threads Garment Recycling Program. [186]

Capilene incidentally, is a polyester base layer, with performance wicking properties.[187]

As of the end of 2021, Patagonia's Capilene performance garments are still alive and well, but we were unable to find any evidence of fiber-to-fiber recycling on the Patagonia website. On the contrary, it seems Patagonia has forgotten that they once claimed to recycle polyester, fiber-to-fiber.[188] And Patagonia's website currently states that they are only now looking into chemical-recycling technologies to reuse garments. We quote:

"For the Fall 2021 season, 89% of our polyester fabrics are made with recycled polyester. As a result of not using virgin polyester, we avoided more than 3.3 million pounds of CO_2."

UNSPLASH: CHRIS LABOUTILLIER



UNSPLASH: WILDART

WHAT'S NEXT

We're looking beyond plastic bottles from commodity recyclers to the next generation of potential recycled materials. One option could be recycled ocean plastics. Long-term, we're also looking into chemical- recycling technologies that might allow us to reuse recycled garments and get us closer to a "circular" manufacturing process." [189]

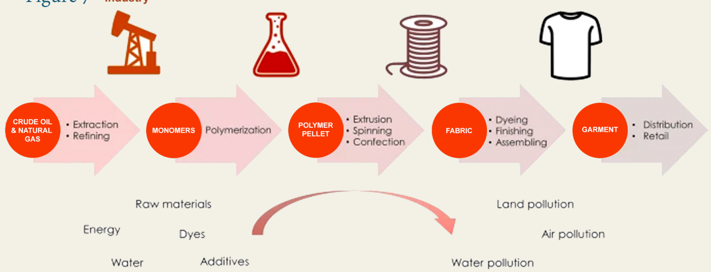
The major stumbling block, of course, is the cheapness of virgin polyester. Noting the unit economics issues and carbon footprint problems for chemical recycling, we can see that, for the foreseeable future, r-PET is going to be sourced from plastic bottles. To quote Rob Stier, lead petrochemical analyst at S&P Global Platts*: "Longer term the solution for plastics recycling and specifically polyester clothing is going to be chemical recycling." However, "[these] are years away from large commercial operations, they're probably going to have a pretty bad carbon footprint and be expensive."* [190]

As bottles, with some addition of new material, PET can be recycled indefinitely, bottle to bottle – albeit with degradation, unit economic, and carbon footprint constraints. Once diverted into the apparel sector however, it's a one-way street: bottle - fabric - landfill/incineration/escape into the wild. The fabric cannot economically be recycled into new fabric.

As a result, mountains of waste are being generated in the global south by second-hand polyester clothing exported from the global north in the guise of 'recycling'. – Chile [191] and Ghana [192] are prime examples.

It is apparently also the case that polyester molecules lose strength each time they are recycled, resulting in weaker yarn and fabric with a shorter lifespan. If the low quality 'recycled' garment cannot be worn as many times, the possibly lower GWP at the factory gate may be completely offset by the lower number of wears resulting in higher impact per wear (see Concern 4).

Figure 7



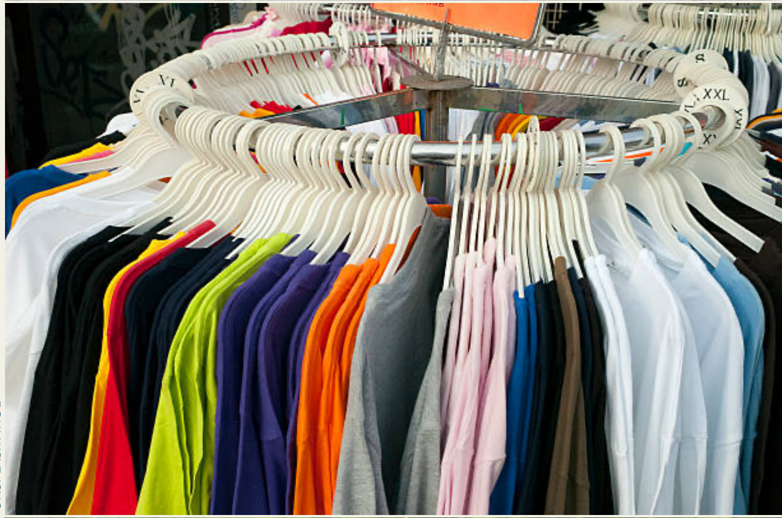
Additionally, some studies [193] have shown that recycled polyester fabric sheds more fibers than virgin - at least initially. It is important to point out here that it is not just for polyester that the concerns associated with the possibly inferior properties of recycled fibers apply. The word shoddy in the English language is now synonymous with something poor quality, inferior[194], badly and carelessly made, using poor quality materials[195], and generally substandard.[196] Originally however, shoddy was the name of recycled fabric, especially wool, but also cotton[197]. It is clearly vital that before recommending recycled fiber as the solution to every problem, fashion actually studies and evaluates the 'quality' and durability of such fabrics.

As it is, for brands to suggest that r-PET is any kind of circular/sustainable solution, is patently misleading. In line with the precautionary principle, fashion should be attempting to reduce the use of all plastics to only those fabrics for which there is no technical substitute. Currently, however, because precautionary adaptations to the business model are not rewarded by the market (alternatives are more expensive) and are not even recognized by any existing sustainability measures or initiatives, there are no incentives for companies to adapt.

Reducing the use of plastic fibers should be the aim in any sustainability measurement.
Astonishingly, however, even the Ellen MacArthur Foundation[198] which began life focused on marine pollution, and whose November 2017 report*: "A New Textiles Economy: Redesigning Fashion's Future"* is much quoted, simply ignores the precautionary principle and makes no attempt to recommend that brands mitigate their use of plastic fibers.[199]

Against the background of lacking awareness and willingness to address the nano and microplastics conundrum, brands are allowed to continue to market plastic products as more sustainable. For example, Changing Markets found that H&M's Conscious Collection contained a higher percentage of fossil synthetics than its main collection - 72% versus 65%. Zalando was nearly the same, with a 'sustainable' collection containing 69% fossil fibre synthetics, compared to 72% overall. [200]


UNSPLASH: RECYCLE MAN



UNSPLASH: IHOE


UNSPLASH: IZZY71

7.2 CARBON FOOTPRINT OF PLASTIC FIBRES


UNSPLASH: NORDRODEN


UNSPLASH: SLOBODAN MILJEVIC

The plastics industry has long avoided the scrutiny of relative carbon emissions. It is remarkable that a global plastics emissions LCA was not even attempted until 2019.
“This is, to our best knowledge, the first global assessment of the life cycle of greenhouse gas emissions from all plastics," said author Sangwon Suh, a professor at University of California Santa Barbara's Bren School of Environmental Science & Management. "It's also the first evaluation of various strategies to reduce the emissions of plastics."[201]

The results of this first LCA for global plastics lead to quite a dire conclusion – there is no such thing as ‘low carbon’ plastic:
“Ultimately, Suh and Zheng found that replacing fossil-based energy with renewable sources had the greatest impact on plastic's greenhouse gas emissions overall. Transitioning to 100% renewable energy -- a purely theoretical scenario, Suh concedes -- would reduce emissions by 51%.”[202]

Unfortunately, the growing demand for plastic means this situation still ends up producing more carbon in the future than we currently produce right now. In fact, Suh was surprised by just how difficult it was to reduce emissions given this trend.
"We thought that any one of these strategies should have curbed the greenhouse gas emissions of plastics significantly," Suh said. But they didn't. "We tried one and it didn't really make much impact. We combined two, still the emissions were there. And then we combined all of them. Only then could we see a reduction in future greenhouse gas emissions from the current level.”

UNSPLASH: SHARPLY_DONE

One must wonder: what industry does not get substantially better when powered by renewable energy? Moreover, as Suh observes *"The question is, what is the biggest bang for the kilowatt hour of renewable energy?"* Total global power demand is not currently supplied by renewables and will not be in the immediate future. So, as every industry - from Bitcoin to denim - tries to justify continuing to ramp up production by switching to renewables, we need to ask: does 1 kWh of renewable energy offset more emissions when it's directed toward domestic use, transportation, plastics, Bitcoin, or some other application? And given that some uses of power are more vital than others should we consider some sort of ranking that prioritizes basics such as light and heat?

That said, it is clear that plastics production **and** recycling are both extremely energy intensive. In fact, the true carbon footprint of plastics production is now shown to have been greatly underestimated based on satellite [203] and drone data [204] [205] that show significant methane emissions – previously unreported - associated with gas and oil extraction.

7.3. TOXICITY OF ANTIMONY

Antimony is a chemical element used as a catalyst in the production of PET (polyethylene terephthalate), commonly known as polyester. However, neither the use of antimony in PET polyester production, nor the toxicity of antimony are mentioned in any reports or impact studies by the sustainable apparel sector that we have been able to identify.

The role of the European Environment Agency (EEA) is *"to provide sound, independent information on the environment. We are a major information source for those involved in developing, adopting, implementing, and evaluating environmental policy, and also the general public."* [206]

Yet, the EEA produced a report in January 2021, titled: *"Plastic in textiles: towards a circular economy for synthetic textiles in Europe"* in which the toxicity of antimony is not discussed. While the report is ostensibly about "plastic in textiles", one of the 5 "key messages" proffered by this report is that: *"In contrast to cotton, the production of synthetic fibres does not use agricultural resources, toxic pesticides or fertilisers."* [207]

The report does not mention antimony at all, which is surprising given that antimony trioxide is a suspected carcinogen for humans[208], and that the EU's Directorate-General for Environment Sustainable Chemicals has already flagged concerns around the use of this chemical element. We quote:

"Another organometallic whose persistence and consequent impact on public health has been debated is antimony trioxide, which is used in the manufacture of polyethylene terephthalate (PET plastic) and can also be found in some flame retardants applied to clothing, carpets, upholstery and plastics. About 130,000 tonnes of antimony trioxide was produced globally in 2012. Like many metals, antimony is suspected to be carcinogenic and can severely affect the lungs, heart and stomach. The compound can travel through ground and surface waters and can also be biomagnified through some plant species." [209]

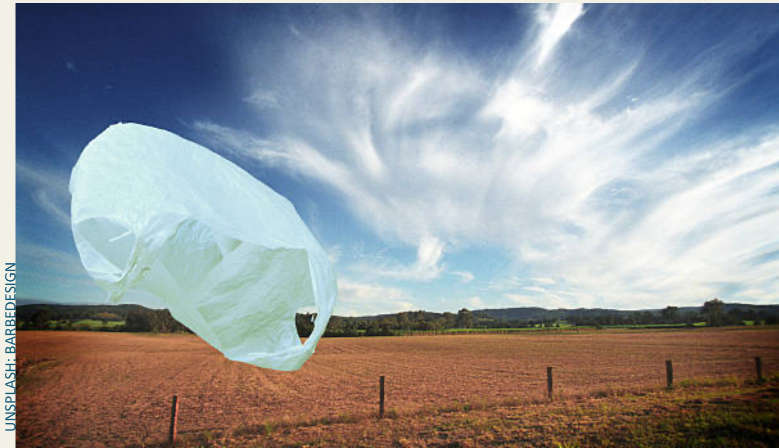
Moreover, unlike pesticides, which have biodegraded long before a cotton garment reaches the consumer, antimony is used as a catalyst to produce PET Polyester. This means that the toxicity is integral to the product itself and remains embedded throughout the garment's life. As a result, most polyester apparel may affect human health, both directly in wear - through sweating - and through the dissolution of antimony during laundering and the release of microplastic fibres. [210]

It is confounding that none of this makes its way into any sustainability narrative. Rather, the oversimplified construct that "cotton, wool, silk, leather and other farmed fibres are bad" dominates the sustainable fashion debate. Since polyester production went mainstream for apparel about 15 years ago, the fashion industry has engaged in an advertising campaign to make polyester appear sustainable, often based on unsubstantiated water and pesticide fictions surrounding cotton.[211] Even reputable agencies such as the EEA, the World Economic Forum, and the UN Environment Program [212] are repeating these baseless claims as a justification for avoiding cotton and other farmed fibers, whilst the impact of antimony on not just humans but also the environment is simply ignored.

CAREXCANADA.CA: ANTIMONY TRIOXIDE

UNSPLASH: COLTON SURGEON

UNSPLASH: KARINA TESSC



UNSPLASH: BARBEDESIGN

7.4. PERVASIVENESS AND TOXICITY OF MICROFIBRES


UNSPLASH: JEREMY SALLEE

Polyester, nylon, acrylic and other non-cellulosic synthetic fibers are made from petroleum or natural gas and they do not substantially decompose like natural polymers (e.g., cellulose).[213] None of the mass-produced plastics biodegrade, and unless they have been incinerated virtually every plastic ever made is still with us. As sunlight (ultraviolet light) weakens the materials however, they fragment into smaller particles. Frequently too small to be seen by the naked eye, these are known as nano and microplastics (NMPs).

Moreover, all fibers/fabrics shed in wash and wear. Apart from silk, all natural fibers are staple fibers, and must be twisted together or spun to make a long strand of yarn that can then be woven/knitted. As a result, to make blended fiber yarns such as poly/cotton, the polyester must be cut into staple. For 100% polyester items (or woven blends), filament is often used. The shorter the staple, the more likely shedding is to occur, but even filament yarns and fabrics shed when abraded, for example when fabrics rub against each other in wear or wash, drag against walls, furniture or the washing machine drum, or are otherwise exposed to sunlight and the elements.

These synthetic microfibers are dissipated in the air as the garment is worn and in the water supply when it is washed. Since they do not decompose, merely break up, these fibers always remain present, but in ever smaller dimensions, until finally, as nanofibers, they are invisible to the human eye.

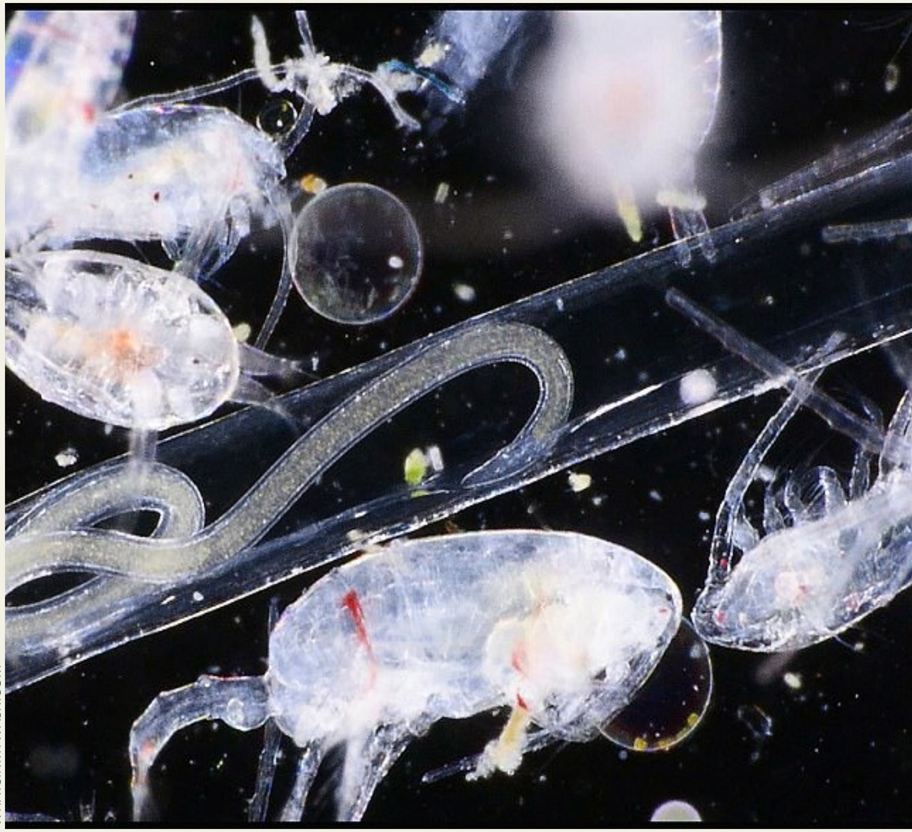
The question then is whether these micro and nano fibers are harmful? And how prevalent are they?

Sustainability indices to date, do not account for the effects of microplastics. And this despite a growing body of academic literature on the subject. Already a decade ago, ecologist M.A. Browne *"released an alarming study showing that tiny clothing fibers could be the biggest source of plastic in our oceans."* [214]

Yet the first fully comprehensive studies are only now being undertaken. Not surprisingly, this is a hotly contested topic, and one that we cannot evaluate in any detail here.[215] But in 2018, EURATEX, the European Apparel and Textile Confederation,[216] sought a scientific perspective on microplastics from the European Commission's Scientific Advice Mechanism, SAPEA.[217]
In January 2019, this group of academics concluded that whilst much is unclear, and there is a need to standardise and internationally harmonise NMPs measurement methods, so that they can be applied on a comparable and routine basis, and even though 'high quality' risk assessment is not yet feasible, the recommended course of action is to reduce, prevent and mitigate pollution with NMPs. [218]

The EU recently launched an initiative on microplastics, including a consultation[219] which reportedly, referred specifically to microfibres released by fashion: "Launching the consultation, the Commission said the problem is "significant," pointing out that between 200 000 and 500 000 tonnes of synthetic fibres from textiles are released into the marine environment each year globally."[220]

Yet, the EU PEF does not consider microplastics, nor has any major apparel company committed to an annual reduction in polyester use. Neither do the Higg MSI or any other comparative fibre index currently evaluate the impact of micro and nano plastics. The excuse proffered is that no agreed system for evaluating/measuring such impact exists. However, given that it is the major brands who are responsible for microfiber pollution, one could argue that it is their responsibility to fund such a study in the first place.[221]


WHATSINMYWASH.COM

7.4. PERVASIVENESS AND TOXICITY OF MICROFIBRES

The EEA's January 2021, publication does refer to the possibility *"that between 200 000 and 500 000 tonnes of microplastic fibres from textiles enter the marine environment each year."* But despite the EEA being an EU institution, their report makes no reference to SAPEA's 2019 recommendation that use of plastics be mitigated. Instead, the report insists that: *"The guiding principle is that the choice of fibre should match the textile product's application, the properties required, and the expected lifespan and end-of-life processes",* apparently suggesting that this renders attempts to reduce plastic fiber consumption difficult, if not impossible. Simply put, it is admitted that industries are overdependent on PET. Further, it is even admitted that nano and microplastics are likely not 'good' and yet there are no serious initiatives to try to remedy the situation, and brands are given free rein to produce garments from polyester when there is absolutely no justification in terms of lifespan, required properties, application or end of life - quite the contrary.

For example, Changing Markets made a sweep of several online shops' Spring/Summer 2021 collections and found 85% of Boohoo's offering, and 80% of Walmart's contained plastic fibers.[222] On August 5, 2021, the Pretty Little Thing website listed 4,879 dresses[223] and only 109 of these appeared to have been made of cotton, or even cotton blends. And whilst a search for 'silk dress' returned 421 matches, not one was actually made of silk. All appeared to be made of polyester. Searching the ASOS website produced similar results - "silk dress" yielded "698 styles found", not one of which was silk, almost all were listed as 100% polyester.

Clearly no properties are required of a 'silk-look' dress that could not be satisfied by silk itself; whilst based on the findings of Laitala and Klepp (Concern 4) the expected lifespan of a silk dress would certainly be longer, and end-of-life processes, for silk are definitely more environmentally friendly. On top of which, purchasing a silk dress would almost certainly contribute to SDGs 1,2,3,4,8,10,12, and 15 (see SDG box-out on page 23). The same cannot be said for purchasing a polyester dress.

Moreover, despite referring to the release of microfibers to the air, the EEA report seems to pin all hope on better filters in washing machines, without any serious attention to unit economics nor the fact that approximately one billion washing machines would require retrofits. Indeed, we are talking about fibers frequently invisible to the human eye, that no household washing machine could possibly effectively and economically filter. On top of which, filtering microfibers or catching them in a guppy bag does not eliminate them. The fibers still must be disposed of and will almost certainly infiltrate both air and water - not to mention the lungs of the individual in charge of disposal - in the process. And obviously under this system, microfibers released to the air in wear and use will not be captured at all.

No major brand, publication, or blog has felt the need to call out and address antimony and methane concerns in polyester production, and no one has called for a global LCA for polyester. This, even though according to Wood Mackenzie Chemicals, 2019 polyester production totalled 58 million tonnes, and polyester currently represents roughly 56% of global fiber production.

These omissions expose the shoddy analytics and the self-interest that underlie not just the Higg MSI but also most discussions of sustainability in the fashion value chain (see Concern 4), and they highlight some of the shortcomings of a system run for and by large corporations. It seems self-evident that, as we propose in our recommendations, the simplest and quickest solution to many of these concerns would be legislation imposing a reduction in the use of plastic fibres.

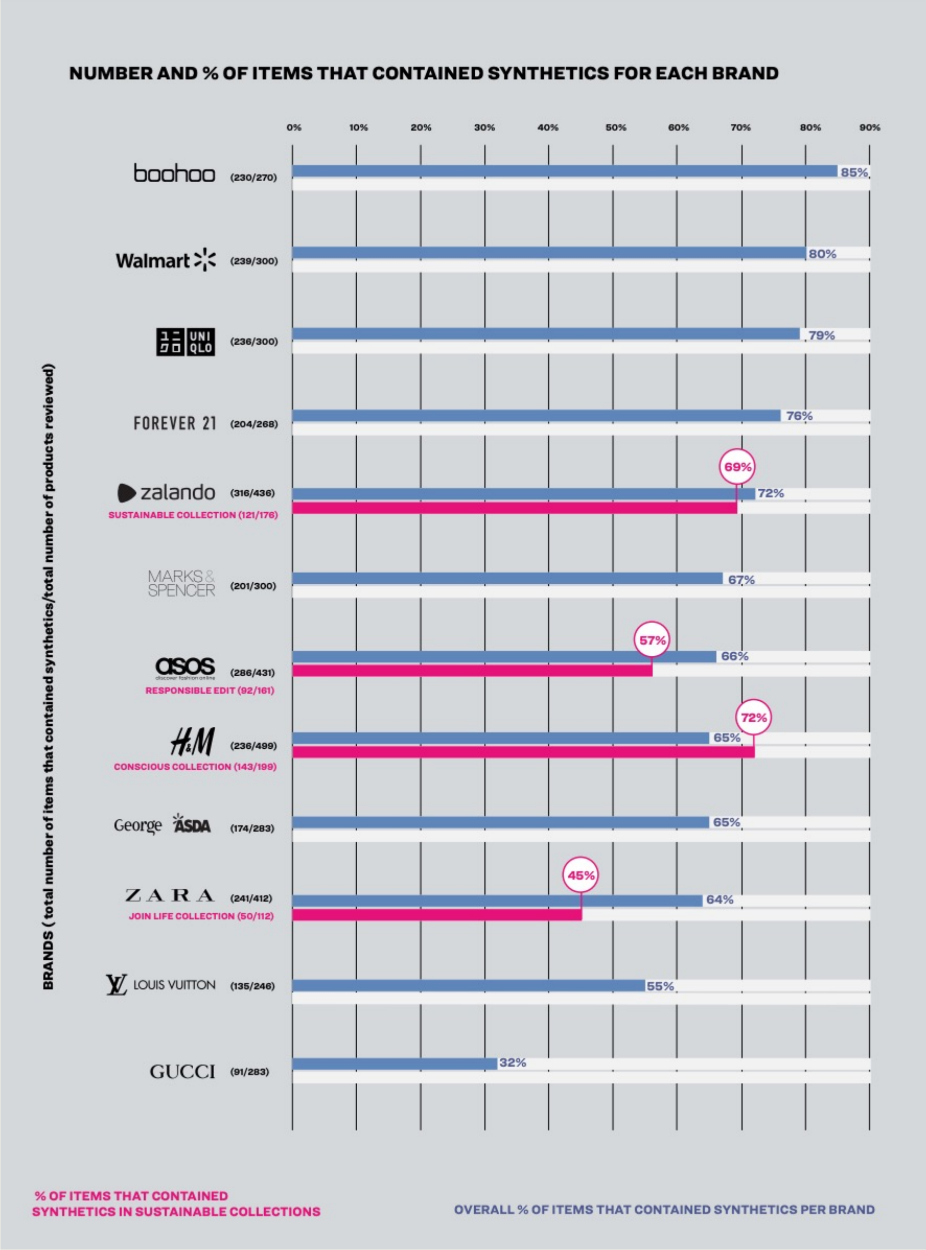


Figure 9

TOWARDS MEANINGFUL CRITERIA FOR SUSTAINABLE METRICS – Conclusions and Recommendations

As we hope we have demonstrated, first in The Great Green Washing Machine Part 1: Back to the Roots of Sustainability[224] and now in the present white paper, sustainability is complex and multi-faceted. In fashion, sustainability is not currently being measured comprehensively or scientifically. Only environmental impact is examined (see Concern 2 in the previous white paper: The Great Green Washing Machine Part 1: Back to The Roots of Sustainability[225] and even that, is not being accurately measured (see Concerns 5 and 6). Fibers are being wasted and poverty augmented (see Concerns 1, 3, and 6). The current simplistic system considers only one aspect of sustainability. Moreover, it assumes that anything that is either produced organically, or has the prefix 're' (recycle, resale, rental), is automatically more sustainable. There is, however, no data to substantiate any of these claims and the reality is far more nuanced.

The simplest and quickest way to reduce the negative impact of fashion would be to increase the number of wears for every item produced (Concern 4). At present this is not considered in any system and it is self-evident that if consumers believe that as long as they rent, or purchase second-hand, or only choose 'sustainable' fibers, they can churn through as many different items as before, any improvements will be marginal at best (rental items "worn more than 40 times "[226] are not an improvement on the average of 80 wears per owner identified by Laitala and Klepp).

To prevent increasing global inequality and climate change - to attain the climate justice promised in COP26 - the need for reform is urgent and obvious. Given the current paucity of robust data and analysis, the solution is less so. As it is, even the leading corporations' own initiative - TE - reports that most of their participating brands have little or no idea which country their various fibers/fabrics came from, let alone how much income was generated, water consumed, or GWP emitted in their production. TE's 2020 Material Change Insights Report[227] reveals that 54% of participants, accounting for 77% of uptake volume, did not know which country their polyester came from (page 99). This was a significant increase from 2019, when only 42% of participants, accounting for 48% of uptake volume, had no idea from which country their polyester was sourced (page 79).[228]

For the other fibers covered, in 2020, 42% of the uptake volume of cotton came with no known country of origin, and the same applied to 65% of polyamide, 60% of the feedstock for manmade cellulosics, 55% of wool, and 60% of leather.[229]

As for the validity and reliability of the data corporations were able to provide, in TE's 2019 report, companies participating in the Corporate Fiber & Materials Benchmark (CFMB) program were asked to complete a self-assessment of their data quality and accuracy. Only 7% thought it fully accurate, and 41% thought their own data quality and accuracy was average or worse (page 101).[230]

UNSPLASH: KATIE RODRIGUEZ

It will be interesting to see if the state of New York's proposed Fashion Act is passed[231], and if so, how the brands are able: *"to map a minimum of 50 percent of their supply chain, starting with the farms where the raw materials originate through factories and shipping. They would then be required to disclose where in that chain they have the greatest social and environmental impact when it comes to fair wages, energy, greenhouse gas emissions, water and chemical management, and make concrete plans to reduce those numbers".*
Because clearly, brands have a long way to go.

Accurately evaluating and tracing fiber and fabric sourcing costs money. Particularly at lower price points where margins are thin, for corporations to engage there must be a return. At the present time, anyone can make sustainability claims based on pay for play, paper-based certifications, and using unsubstantiated generic averages. As we have shown, these are all potentially, seriously misleading.

It is self-evident that to change the status quo will necessitate a change in the economic incentives surrounding sustainability claims. To achieve this **governments must step in**. Pucker observes: *"Executives and investors operate in keeping with the rules and incentives of the system. If their behaviour is to change, the rules that governments set and enforce also need to change."*[232]
For business' incentives to align with sustainability, government rules need to demand this.

Sustainability is a question of science - physical, political, and economic. It is time for fashion to turn to science and not vice versa. At the present time, even leading academic institutions like MIT look to fashion to provide sustainability 'data' without ever examining whether this 'data' is substantiated.[233 234]

As we have demonstrated, sustainability analysis requires inputs that accurately reflect the reality concerned - not 'numbers' plucked from out of date, unrepresentative studies (see Concern 6), crafted by excluding the upstream impact of major inputs (see Concern 5), or by conflating climate with production systems (see Concerns 5 and 6). In sustainable fashion, data is currently conspicuous by its absence.

In measuring impact, all interested parties must have a seat at the table, and the global south must be integrated into the conversation. It might for example reduce water consumption in the Punjab[235], if the Indian government set a fixed price (and subsidies where necessary) for conventional cotton rather than for conventional rice[236], something that would be much easier to do if large cotton purchasers like IKEA or H&M agreed to support the arrangement. Obviously, all this would require both better data and greater dialogue.

An ideal system would be in line with global COP26 commitments to just transitions with the rights of the least advantaged at the core. Establishing such an ideal system would require a complete overhaul of the present arrangement in which the largest brands and manufacturers, and their funded initiatives presume to 'evaluate' fiber sustainability, and to advise regulators.

Our hope is that this series of white papers will catalyse a conversation around what an ideal system would look like, how best to ensure that all stakeholders are represented, what studies are needed, by whom they should be undertaken, how they should be funded, and so on. We do not presume to know all the answers and whilst some of our recommendations are concrete and straightforward - the need to create disincentives for the use of plastic fibres, for example - others are decidedly tentative, and should be read in the spirit intended: as a direction rather than a directive.

We continue to propose that the following simple principle be adhered to throughout: **No data, no claim.** We are, however, aware that exactly what constitutes reliable data and how this is to be measured and tracked involves tradeoffs between, accuracy, cost, simplicity, speed etc. and it is not for us to decide which areas deserve primacy.

Our previous white paper[237] made 2 recommendations, fleshed out with some possible actions for implementation. The second recommendation, is of course, much more straightforward, and easier to implement than the first.

UNSPLASH: NIGEL TADYANEHONDO

Recommendation 1:

Fashion corporations and global policymakers must assess the socio-economic impacts of fiber production and place these front and center in any and all sustainability, claims, rankings, and labelling.

Recommendation 2:

Regulatory frameworks must include living wages. It is unscientific and illogical to assert that a garment is 'sustainable' based on fiber choice, when said garment was made by workers who were not paid a living wage.

Based on the analysis provided in this white paper, we now add a further three recommendations and possible associated actions for implementation. Again, the last recommendation: "5: Reduce the use of plastic fibres", is far simpler than recommendations 3 and 4, where both measurement and supervision will be complex.


UNSPLASH: NIGEL MATTHEW LANCASTER

Recommendation 3:

Governments must require fashion brands to provide comprehensive, accurate and verified sustainability information. Private corporations cannot be allowed to unilaterally decide upon the impact of different fibers.

As Milton Friedman pointed out, in a democratic society, it is not for corporations (or indeed, their appointed not for profits) to decide what is or is not in society's interest. [238]
To quote the former CIO of Sustainable Investing at Blackrock, Tariq Fancy[239]: Friedman *"argued that the responsibility for protecting society fell to civil servants, whose authority business executives should not usurp as such roles "must be elected through a political process." In fact, he called the idea of business executives taking on this role to be "intolerable" on grounds of political principle."*

In a globalized economy in which multinational corporations - including some in fashion - often have greater leverage and resources than many governments, it cannot be left to corporations alone to define sustainability. Those affected by their business models and business decisions must be integrated into the process, and it is for the peoples' representatives to ultimately decide what is socially desirable.

Consumer purchasing cannot be guided using proprietary LCAs commissioned from private companies and verified by third parties/a critical review panel, that has been hand-picked and almost certainly paid too little to permit any robust analysis.[240]

Companies need to gather data and report on the most important metric in sustainability, namely the number of wears of an apparel item (see Concern 4). Companies and legislators need to determine whether the findings of Laitala and Klepp can be replicated - whether 80 wears are indeed the average, whether this varies with fiber, whether silk garments are invariably kept the longest and worn the greatest number of times, followed by wool, and so on. Policy cannot be made based on a single study. Further work must be done, and the importance of this metric must be communicated with every item purchased. The public should not be duped into believing that because garments are made from a fiber that is ostensibly 'more sustainable", they can be purchased and thrown away at will.

We noted in our previous paper that all sustainability claims need to provide evidence of the positive socio-economic impact of the production of the fibre concerned (Recommendation 1). We would submit that the socio-economic impact of the 'less sustainable' fibre that it is being replaced should also be considered.

Actions for Implementation:

● Policy makers should agree on simple labeling or even an environmental health warning to make it clear to consumers that the more clothes they are buying and indeed renting, the greater their environmental impact. Whether the garment needs to be dry cleaned should also be clearly stated, and public service messaging provided, to highlight the environmental benefits of hand/low temperature washing, air-drying etc.

As we have demonstrated, significantly increasing consumer use per item is the most impactful step that can be taken at present. Fortunately, along with a tax on polyester (Recommendation 5), it would also appear to be one of the easiest and quickest objectives to achieve.

● Comparative sustainability indices and labelling should not be in the hands of private corporations. They must be open source, peer reviewed, consensus built, involving all parties, and should include independent recourse in the event of disagreement.

● Public sector organisations need to be just that.
The major brands and their funded initiatives cannot be allowed to chair and staff purportedly public sector organisations and consultations. To quote Pucker: *"corporations should be prevented from co-opting the regulatory apparatus."*[241]
Initiatives such as the EU PEF, and the UN Fashion Charter for Climate Action, should treat brands as merely one of many stakeholders. They should ensure that consumer interests are protected, that those whose lives will be most impacted by regulatory changes have a seat at the table, and they should not allow tendentious tools, employing faulty databases to influence serious policy work.

● Policy makers must enact regulations preventing corporations from claiming that their fibers have been produced in a sustainable manner, unless and until the brand provides clear evidence going right back to the field or factory. This would apply to all fibers from rPET to silk. What would constitute 'evidence' is a topic for further discussion. It is however self-evident that consumers should not be told that something has been produced 'more sustainably' based solely upon some certification's self-reporting on its outcomes, when it has already been clearly demonstrated that in many instances what is reported does not reflect the reality (see Concern 3[242]). Tracing systems - based on blockchain, fiber markers etc. - already exist and many more are in development. Again, all parties need to come to the table to determine what is practicable for everyone involved - from subsistence smallholders to major corporations - and allowances will doubtless need to be made for size and access to technology.

Recommendation 4:

Global resources must be better managed to promote the use of farmed fibers and coproducts.

As we have already pointed out, given that many farmers must farm, if we want to halt global warming and promote income equality, fiber sustainability needs to be viewed, not as a stand-alone, but as part of a broader picture. In the global south, malnutrition remains common. China has made significant progress in lifting its population out of poverty and hunger, but the World Food Program estimates that some 56 million rural Chinese still live in poverty, and that nationally, 9% of Chinese children are stunted through malnutrition[243]. In Laos, the stunting rate is 33%[244], and in Cambodia 32% of children under 5 are stunted [245]. Whilst 25% of the world's undernourished, live in India[246].

We have already pointed out that substituting cotton for rice in India might have beneficial outcomes in terms of water consumption. The resultant income could be used to purchase more nutritious foodstuffs, such as lentils, chickpeas and sorghum.[247]

Similarly, silkworm pupae can provide a valuable source of protein and vital amino acids [248],
and silk production already exists in all 4 countries mentioned. Clearly an integrated approach to fiber production could provide a powerful development tool, as well as a useful lever in halting climate change.

At the same time, waste of farmed coproducts must be eliminated. Globally, large amounts of coarse wool appear currently to be burnt, landfilled, or composted. Composting is a desirable use for wool (and cotton) garments at the end of their wearable life, but it is not an efficient use of virgin fiber in a resource-scarce world.[249] Similarly, US landfilling of 5.5 million low grade hides annually is an extraordinary waste of available resources (see Concern 6).

Actions for Implementation:

● Policy makers and fashion companies should promote the use of fibers with valuable coproducts, such as silk, and wool, and integrate these into international and regional development policies, as they can both encourage economic activity in remote areas and for indigenous communities and provide valuable sources of nutrition to deprived populations.[250]

● Policy makers and fashion companies should assess where and how farmed output is being wasted and take steps to halt this. The goal must be to maximise the use of all coproducts. Policy makers may need to introduce additional levers, for example subsidies or lower taxes.

It is self-evident that both actions will require considerable research, analysis, and debate, prior to implementation. Our intention here is to draw attention to this largely forgotten aspect of fiber production, and to encourage a more comprehensive and coherent approach to fiber sustainability.

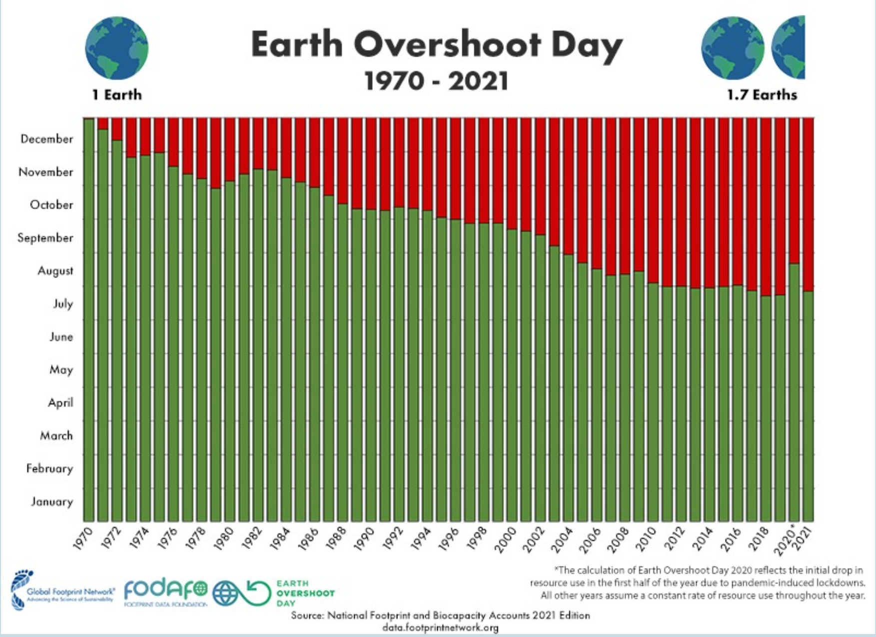


Figure 8

Recommendation 5:
Reduce the use of plastic fibres.

We must listen to science and scientists, such as The European Commission's Scientific Advice Mechanism, SAPEA (see Concern 7). The precautionary principle requires us to mitigate our use of plastic fibers - immediately. At the same time further research into the extent and impact of plastic micro and nanofibers is urgently needed.

Actions for Implementation: Create disincentives for the use of plastic fibres.

- Policy makers must enact regulation that penalises plastic fiber use in fashion, whether that fiber is bottle r-PET or virgin. This is one of the easiest, quickest, and most effective measures that policy makers could and should introduce. Only fiber-to-fiber recycled plastics would be excluded. The resultant revenues would be used to finance sector research. The aim here is both to mitigate plastics consumption and to promote circularity. The simplest policy lever would be a tax designed to make the prices of fossil fibers higher than those of farmed fibers. The increased cost would discourage both brand and consumer purchases, reducing volume, and creating a clear incentive: a) for the commercialisation of fiber-to-fiber recycling; b) for improvement in the quality of manufacturing to match the higher price point.
- Fashion companies should cooperate in funding the associated independent studies to advance research on micro and nano plastics.

As mentioned at the outset of this section the current system needs to change. Since, to our knowledge, there has never been any discussion of what sort of system should rule on fashion sustainability, it is not easy to know what would work, or what would constitute a fair and accurate scheme. As we are beginning to develop solutions, we need to engage with a broad range of stakeholders to further discuss and test the viability of our suggestions. We hope that this white paper, and our previous report will prove to be catalysts.

UNSPLASH: MOONSTARIOUS PROJECT

APPENDIX 1

LEATHER - an example of the impact of using different economic allocations

As we have already seen in the case of manure in both silk and organic cotton cultivation, whether and how production burdens are assigned across inputs, and so included in the final impact of the commodity, makes a huge difference to the purported impact of the fiber under consideration. Similarly, as already mentioned in the context of silk, many fibres, and this is true of virtually all farmed fibers, have co-products. Sheep produce wool, lanolin, skins, and meat (and sometimes dairy products); cattle produce hides for leather, meat and/or dairy products, manure, and sometimes saleable methane[251 252]; farming silkworms produces silk, pupae/pupal oil, and sericin, as well as mulberry fruit and other minor goods; cotton plants produce cottonseed, cotton fiber, and linters, and so on. When undertaking an LCA, one thing that must be decided is how the environmental impact of raising that sheep, silkworm, cotton, or cow is going to be allocated between the different co-products.

The ISO, International Organization for Standardization, accepts a number of different LCA methodologies. A concern here that has been raised by the leather industry is that none consider the economic driver of production. Cow hides would not be produced without dairy/meat. And even if the leather industry ceased to exist, most of the annual hide volume would continue unchanged, since the hide is not the driver of production.

That said, one common method of co-product impact allocation is economic allocation, and this is the approach that appears to be used by the Higg MSI for all farmed fibers, except wool.

What this means, using leather as an example, is that the total lifetime environmental impact of a cow or steer, is apportioned to the rawhide, in proportion to the hide's share of that cow's total lifetime economic value. For the average impact of generic leather, the Higg MSI uses an economic allocation of 3.6%. So, if for example, the lifetime impact of the steer in GWP was 1000, the Higg would allocate 3.6% or 36, to the rawhide.

The global leather industry protested this 3.6% allocation at the end of 2020, because it overstated the average market value of hides. We are told by Stephen Sothmann, President of the Leather and Hide Council of America (L&HCA) that the 3.6% was originally arrived at, using 2013-2014 hide data, during the EU PEFCR process - part of the development of the PEF labelling we refer to in the Executive Summary, and elsewhere in this paper.[253]

But, as Sothmann points out: a) the US and Brazilian cattle industries are very different from the EU industry and should therefore, not be lumped together using the same rules. And b) by historical standards, the period 2013-2015 witnessed record high global hide prices. Hides, Sothmann claims, have never been and may never be as expensive as they were at that time. So, the allocation standard itself is based on an anomaly in the market.

All of this is particularly disturbing when we consider that as the MSI itself states of its score for Cow hides, global average: *"This process is based on an average of equally weighted cow hides from Brazil and the US".* There is no EU production anywhere in the MSI data calculations for generic rawhides, and yet a political decision negotiated among the EU stakeholders, based on possibly historically unrepresentative and now, out of date, market values, is, it seems, being used to claim that globally, leather is "unsustainable".

Moreover, we should remember that cows also produce milk and calves (as do breeding bulls), and the lifetime production of manure/methane by all bovines may also have significant economic value, so slaughter values do not reflect lifetime contributions. For US cowhides at least, the USDA publishes daily market, drop credit reports, detailing the percentage share of the hide and other by-products in the slaughter value of a cull cow[254] or butt branded steer.[255] For the two largest categories - cattle and steers - these are even compiled monthly and annually. [256]

As of November 12, 2021, the hide represented 1.25% of the slaughter value of a cow (so a considerably lower percentage of the lifetime value of that cow in the case of dairy cattle), and 4.14% of the slaughter value of a steer (a lower percentage of the steer's lifetime value depending on its role in the production of manure for fertiliser and/or methane capture).[257]

The USDA also publishes average hide prices for the different qualities.[258] Higg Co. has substantial funding. It has received US$11 million in investment from Buckhill capital alone[259] and undisclosed amounts from Titan Grove and Sanjeev Bahl of Saiburg B.V.[260 261] It is hard to understand why the MSI does not spend all these funds on acquiring accurate and representative data, and hence why the MSI for US cattle hides does not automatically update, based on such readily available public data.

As it is, the Leather and Hide Council of America estimate that 5.5 million hides, allegedly enough to make 99 million pairs of shoes, went into landfill in the USA alone, in 2019.[262] If hides are being sent to landfill, because nobody will buy them, they clearly do not contribute 3.6% to the lifetime value of the cow or steer concerned. They are an additional cost. To encourage brands and consumers not to use such hides is both a significant waste of global resources, and harmful to the income of global cattle farmers. It is the opposite of sustainable on both counts by which sustainability should be measured.

The leather sector's repeated protests have, however, been to no avail, and Higg Co. refuse to change the economic allocation for generic global leather, which remains at 3.6%.

APPENDIX 1
LEATHER - an example of the impact of using different economic allocations

It is concerning that the economic allocation for generic cow leather is decided by a private company that does not need to be transparent to global stakeholders over their business decisions. This is particularly the case given the recent appearance of rawhide MSI scores, that are specific to two brands PrimeAsia[263] , a large US and Taiwan-based producer, with operations in China and Vietnam, and the world's biggest meat packer[264] Brazil's JBS.[265] JBS also has operations in the USA.[266] Indeed JBS is the largest meatpacker in the USA controlling 25% of the American capacity for slaughtering beef[267] along with Tyson Foods and Cargill (as well as Marfrig owned National Beef[268]). JBS currently stands accused of manipulating feedlot contract prices to the considerable disadvantage of both US cattle ranchers, and the public, and to the advantage of the processors themselves.[269]

Ranchers used to claim over half of what US consumers paid for meat. Since 2015, that has declined, and was only 37 cents of every dollar spent on beef last year. Whilst between July and September 2021, JBS US revenues were up 32 percent compared with the same quarter in 2020.[270]

On July 13, 2021, info@higg.com sent out an email announcing: *"Today, we're adding more than 30 new materials and manufacturing processes to the Higg Materials Sustainability Index (MSI), as part of our ongoing efforts to build a thorough database of materials' measured environmental impacts. In this update, new materials include: Repreve® yarn and resin, PVC foam, PrimeAsia leather…"*

We understand that to obtain an MSI score specific to a product, the manufacturer/producer must both pay for an LCA and pay for Higg Co. to evaluate it. Higg Co. claim to conduct data assessments at 'limited cost' to contributors, but limited cost is an imprecise and relative term, and LCAs are expensive.[271] By definition, this option appears to be only available to those companies able and willing to pay.

PrimeAsia portrays these new scores as a triumph for science, covering: *"11 supply chain configurations in three different continents...more than 266 process phases, 3,000 data points collected and operations in five different countries."* [272]

Examination of the Higg MSI however, suggests that the reduction in Prime Asia leather's purported impact is in reality, due solely to a reduction in the economic allocation used by the MSI to calculate the impact of Prime Asia leather's cow hides.

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THE MSI STATES THE FOLLOWING:

For Cow hide {PrimeAsia}, from Steers (US and Australia)
Modeling Notes
Adjusted allocation of GaBi dataset with primary data collected for allocation from PrimeAsia (in accordance with Leather PEFCR): **economic allocation 0.892%** Data from Sphera: Cattle hide, fresh, from slaughterhouse (economic allocation) GUID: **{EF2C8E6C-03C3-483B-9DE3-8D0B814A6E77}**

For Cow hide {PrimeAsia}, from South American raw hides:
Modeling Notes
Adjusted allocation of GaBi dataset with primary data collected for allocation from PrimeAsia (in accordance with Leather PEFCR): from Sphera: Cattle hide, fresh, from slaughterhouse (economic al**economic allocation 1%** Data location) GUID: **{EF2C8E6C-03C3-483B-9DE3-8D0B814A6E77}**

*Whilst for generic cow hide from Brazil, USA, and the global average, **"Allocation to the hide is 3.6%".***

Moreover, the modeling Notes for **generic Cow Hide**, **US** state:
Modeling Notes
Data from Sphera: Cattle hide, fresh, from slaughterhouse (economic allocation) GUID: {B61C1007-D1B2-4D33-999D-8A956A264366}

Whilst for **generic Cow hide, Brazil** they state:

Data from Sphera: Cattle hide, fresh, from slaughterhouse (economic allocation) GUID: **{EF2C8E6C-03C3-483B-9DE3-8D0B814A6E77}**

It would appear then, that the base data on the environmental impact of cattle for both PrimeAsia US and Australia, and PrimeAsia South America hides, does not come from PrimeAsia. The MSI states that it is derived from the Sphera database. Exactly which LCAs Sphera is using, how recent and representative the modelling, we cannot say, as this information is behind a paywall.[273]

As the screenshot below shows, MSI generic data suggests that US cattle have a much higher impact than Brazilian cattle: for example, eutrophication for generic US cowhides is said to average 17.26/kilo; for generic Brazilian hides, eutrophication is only 5.68/kilo.

Why only Brazilian data **(EF2C8E6C-03C3-483B-9DE3-8D0B814A6E77)** is used for all PrimeAsia hides, including Steers (US and Australia) is unclear.

What is obvious is that 0.892% is only 0.25 of 3.6%, and 1.0% is only 0.28 of 3.6%. All other things remaining identical then, we would expect the change in economic allocation to reduce the purported environmental impact of PrimeAsia's hides to around a quarter of the average impact for generic US hides, and 28% of that for generic Brazilian hides. In fact, the MSI claims to weight values by things like water scarcity in the region concerned (we are told that the MSI uses AWARE methodology)[275] and then normalises scores by process, apparently on a base average of 10, so this will automatically result in some perceived skewing of the numbers.

Grosso Modo however, as the following screenshots of the Higg MSI show, these anticipated percentage impact reductions do apply. The PrimeAsia US and Australia MSI impact values are roughly 25% of the generic US values, and The PrimeAsia South America values are about 28% of the MSI's generic Brazilian impact values.

Specifically, for the US/Australia values, PrimeAsia's 7/kilo for GWP, is exactly 25% of 28/kilo, which is the purported GWP impact of generic US cowhides. Similarly, 28/kilo - the purported eutrophication impact of PrimeAsia US and Australian hides, is a quarter of 112 - the stated eutrophication impact per kilo of generic US hides. Whilst, for Fossil Fuel impact, the 2.1/kilo assigned to PrimeAsia US/Australia hides is 25% of the 8.3/kilo assigned to generic US hides.


Select | Process | Impact | MSI Score

Process	Global Warming	Eutrophication	Water Scarcity	Resource Depletion, Fossil Fuels	Chemistry
Cow hide, Brazil	4.32	5.68	0.250	0.884	1.90
✓ Cow hides, global average	4.32	11.5	1.54	1.08	2.84
Cow hide, US	4.32	17.3	2.83	1.27	2.84
Cow hide {JBS and Asiatan}, Brazil	1.04	1.37	0.060	0.214	1.90
Cow hide {PrimeAsia}, from Steers (US and Australia)	1.07	4.28	0.700	0.315	1.90
Cow hide {PrimeAsia}, from South American raw hides	1.20	1.58	0.070	0.245	1.90

https://portal.higg.org/5f29070fddc3b80009bb60e3/product-tools/msi/example-materials screenshots taken on 20/07/21

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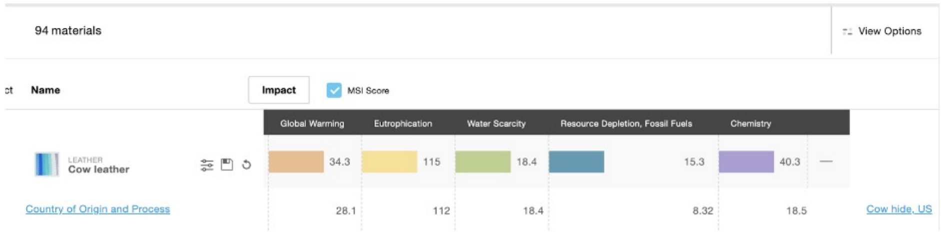
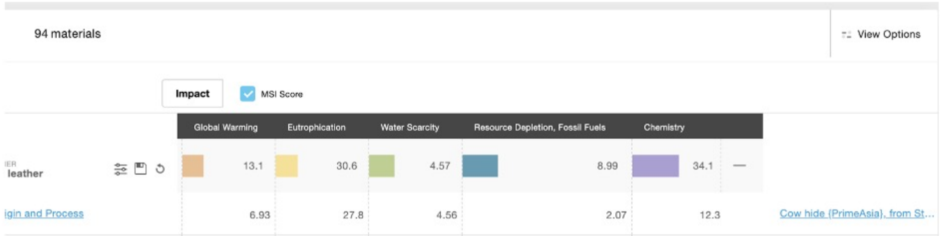
THE MSI STATES THE FOLLOWING:

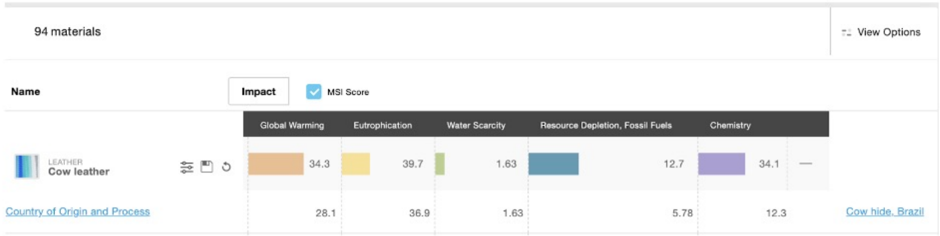


Generic USA



PrimeAsia, from US and Australia
Screenshots taken 21/12/21

Similarly, looking at the two sets of Brazilian data - generic and PrimeAsia - we see that for GWP, 7.8 is indeed, 28% of 28.1. Whilst for eutrophication, 10.2 is 28% of 36.9. And for Fossil Fuel depletion, 1.6 is 28% of 5.8.



Generic Brazil

In summary, the available evidence suggests, the recent claims of Higg Co. and PrimeAsia notwithstanding, that the only difference between the purported impact of PrimeAsia rather than any other US, Australian, or Brazilian hides, is that PrimeAsia has secured a significantly lower economic allocation from Higg Co, for its hides, and its hides alone.

It is important to note here that the MSI has not updated the baseline for leather with new information. Despite Higg Co.'s claim that new data will supersede old data as it is shared with them, the revised economic allocations are still based on the same old Sphera databases.

The MSI provides no explanation for assigning PrimeAsia hides an economic allocation that is only 25-28% of the generic values. And unless PrimeAsia only uses the lowest quality hides, and that does not appear to be the case, it is unclear what rational explanation is used to justify this.[279]

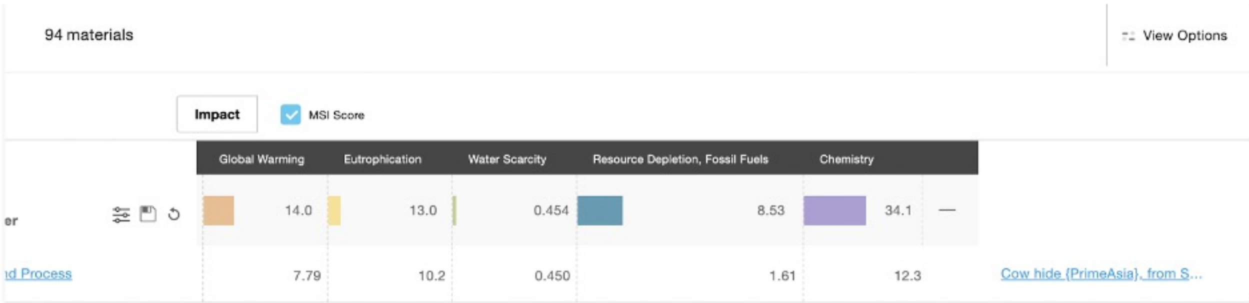
Since the PrimeAsia scores were added, additional major players in the leather industry such as Brazil's JBS have acquired brand specific MSI scores for their leather. This leaves other major leather producers with a predicament. Should they too pay for a lower economic allocation and so higher sustainability rating?

And whilst Friedman may have observed, of those avoiding self-serving CSR claims: *"At the same time, we can express admiration for those individual proprietors or owners of closely held corporations or stockholders of more broadly held corporations who disdain such tactics as approaching fraud."*[278] It must be extraordinarily difficult for honourable brands under the present system, as they must choose between honour and lost market share.

As for JBS leather, the Higg MSI Modeling Notes state: *"Adjusted allocation of GaBi dataset with primary data collected for allocation from **JBS** (in accordance with Leather PEFCR): Mass fraction 9.23%, **economic allocation 0.87%,** Data from Sphera: Cattle hide, fresh, from slaughterhouse (economic allocation)."*

With an even more favorable economic allocation of 0.87% (compared to PrimeAsia South America's 1%, and PrimeAsia US and Australia's 0.892%), as the screenshot below shows, it would appear that JBS hides are the world's most sustainable choice according to the MSI.

THE MSI STATES THE FOLLOWING:



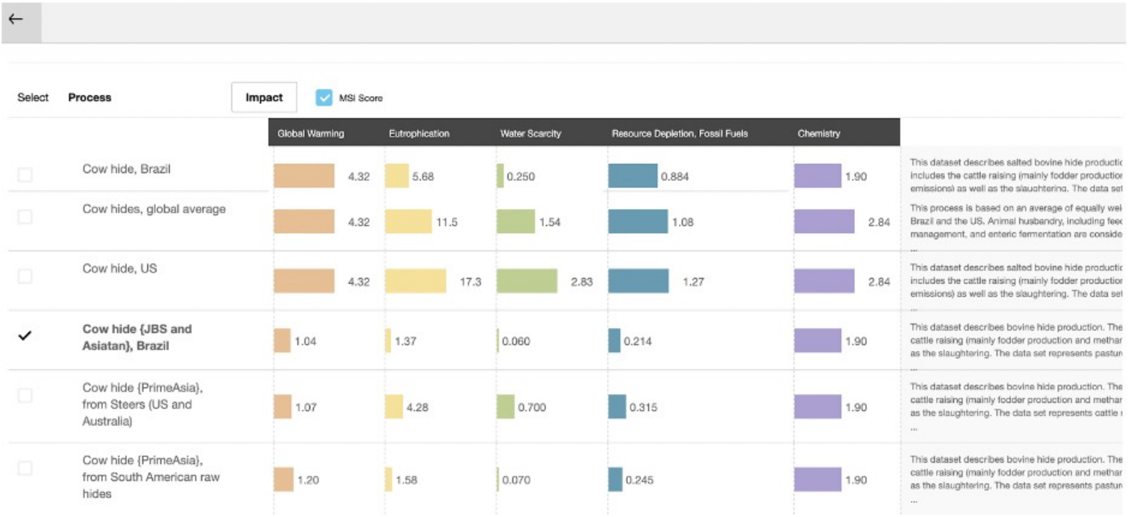
94 materials

View Options

Impact | MSI Score

	Global Warming	Eutrophication	Water Scarcity	Resource Depletion, Fossil Fuels	Chemistry	
er	14.0	13.0	0.454	8.53	34.1	—
d Process	7.79	10.2	0.450	1.61	12.3	Cow hide {PrimeAsia}, from S...

PrimeAsia from South America
https://portal.higg.org/5f29070fddc3b80009bb60e3/product-tools/msi/example-materials Screenshots taken 21/12/21 [276]



Select | Process | Impact | MSI Score

Process	Global Warming	Eutrophication	Water Scarcity	Resource Depletion, Fossil Fuels	Chemistry	
Cow hide, Brazil	4.32	5.68	0.250	0.884	1.90	This dataset describes salted bovine hide productio includes the cattle raising (mainly fodder productio emissions) as well as the slaughtering. The data se
Cow hides, global average	4.32	11.5	1.54	1.08	2.84	This process is based on an average of equally wei Brazil and the US. Animal husbandry, including fee management, and enteric fermentation are conside ...
Cow hide, US	4.32	17.3	2.83	1.27	2.84	This dataset describes salted bovine hide productio includes the cattle raising (mainly fodder productio emissions) as well as the slaughtering. The data se ...
✓ Cow hide {JBS and Asiatan}, Brazil	1.04	1.37	0.060	0.214	1.90	This dataset describes bovine hide production. The cattle raising (mainly fodder production and methar as the slaughtering. The data set represents pastur
Cow hide {PrimeAsia}, from Steers (US and Australia)	1.07	4.28	0.700	0.315	1.90	This dataset describes bovine hide production. The cattle raising (mainly fodder production and methar as the slaughtering. The data set represents cattle ...
Cow hide {PrimeAsia}, from South American raw hides	1.20	1.58	0.070	0.245	1.90	This dataset describes bovine hide production. The cattle raising (mainly fodder production and methar as the slaughtering. The data set represents pastur ...

Screenshot taken August 02, 2021

This is an interesting turn of events for a group whose owners were only recently released from jail on corruption charges - or as Bloomberg put it on July 15, 2021 "Brazil's Batista Brothers Are Out of Jail And Worth $6 Billion"[279] and whose cattle sourcing has been repeatedly tied to Amazon deforestation.[280 281 282]

Indeed, in Mighty Earth's Soy and Cattle tracker, JBS is the lowest ranked Brazilian producer[283] with their cattle sourcing tied to over 100,000 ha of deforested land in the Amazon and the Cerrado, some 74% of which may have been cleared illegally. Whilst a November 17, 2021, investigative piece by the New York Times, uncovered further details "An analysis showed that, among the JBS suppliers, ranches covering an estimated 2,500 square miles significantly overlapped Indigenous land, a conservation zone or an area that was deforested after 2008, when laws regulating deforestation were put in place in Brazil" [284] and:

"According to the numbers, between January 2018 and June 2021 ranches operating in Jaci-Paraná on illegally deforested land sold at least 17,700 cattle to intermediate ranches. The buyers were suppliers to the three big meatpackers, JBS, Marfrig and Minerva."

The problem is that there is no birth-to-slaughter traceability for individual animals, and as everyone in the industry is aware, and as the NYT reporters documented, cattle pass through middlemen, hiding their illegal origin.

The November 17, 2021, article by the NYT was followed by the November 29, 2021, release of a study by Slow Factory[285] connecting Amazon deforestation, much illegal, to JBS cowhides. And connecting JBS' s supply chain to 100 brands and corporations, including MSI promoters and supporters: Nike, Walmart, Gap, PVH, and H&M. [286]

THE MSI STATES THE FOLLOWING:

The MII, referred to in 5.4 above, whose sales deck, as noted in that section, is based upon the Higg MSI, promptly took advantage of the Slow Factory report to launch a 30 November email campaign, seeking donations to: *"Create a cleaner, kinder world with us,"* through investment in next-gen materials. The MII are, apparently oblivious to the fact that the index that they have built their vilification of silk and alpaca upon, finds JBS' hides the most sustainable, which surely calls into question the validity of the rest of the MSI's scoring and so the justification for the MII business model?

Similarly, TE lead the Responsible Leather Round Table (RLRT)[287] an initiative that *"evolved from Textile Exchange's vision for a global textile industry that protects and restores the environment, reduces the climate impact of our industry and enhances lives".*
But TE sustainability metrics are based on the Higg MSI, and indeed, Higg sponsored the 2021 RLRT Summit. [288] [289]

The absurdity of this situation can be lost on no one, and it is a sign of the inconsistency even incompetence that marks most current sustainability measurement, that both H&M and VF Corp have policies in place prohibiting leather sourced from Brazil, precisely due to traceability concerns.[290]

Yet both corporations are also avid supporters of the Higg MSI, which, as we have just pointed out, claims that JBS hides are the world's most sustainable.

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