GENEVA CENTER FOR **BUSINESS & HUMAN RIGHTS**

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The Rise of Life Cycle Analysis (LCAs) and the Fall of Sustainability

Illustrations from the Apparel and Leather Sector

WHITE PAPER

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Executive summary

THIS paper highlights the pitfalls of basing sustainability claims on Life Cycle Analysis (LCA). It should not however be read as a general criticism of the use of Life Cycle Analysis in the apparel and leather sector. Accurate, representative, generic LCAs can be helpful in enabling brands and manufacturers to identify environmental hotspots in the supply chain. Product-specific LCAs can also provide an important tool in enabling shoe, bag, and clothing brands to evaluate their own environmental impact. It is, however, vital to remember that LCAs are not absolute. There is no blueprint that everyone follows. From any given set of raw data, there is no single, unique value that will automatically be generated for emissions, water consumption etc. As this paper will show, vastly different purported impacts can be obtained from exactly the same data, by using different models, methodologies, and boundaries. Blanket statements such as 'LCAs have proven' or 'LCAs have demonstrated' are unscientific.

THIS is particularly relevant at the present time as the sector is dominated by the use of commercial indices and LCAs. Many are behind paywalls, and provide no transparency as to the methodologies and boundaries used, or the independence and robustness of the underlying data. This is the case, despite the fact that LCA outcomes are entirely dependent on these variables. From allocation and boundaries, to time spans and geographies, the sector has no agreed common standards, and those commissioning and providing LCAs can select at will, and according to opportune interests.

SINCE LCA outcomes cannot be compared unless the methodologies and boundaries are identical, this automatically means that the numbers currently bandied around, from the Sustainable Apparel Coalition's (SAC) Higg Materials Sustainability Index (Higg MSI) – the most widely used index in the global apparel and leather sector – to the individual product claims on many brand and manufacturer websites, are in fact, at best meaningless, at worst pernicious.

MOREOVER, attributional LCAs – LCAs which measure the average impact – are being universally promoted as a means to inform consumers of the environmental footprint of their fiber and fabric choices. The proposed European Union (EU) Product Environmental Footprint (PEF) legislation is a case in point. But in the context of selections between alternatives, accurate LCA methodology actually requires that consequential LCAs be used. These measure the impacts of the producers who are most likely to increase or reduce production respectively, in the face of a change in market conditions.

FURTHERMORE, as we shall demonstrate, the attributional LCAs that are being used are in most cases unrepresentative, outdated, and produced and/or selected by vested interests, whose funding in some cases, can be traced back to fossil fuel extraction.

FINALLY, as our analysis makes clear, it is the quality of the data that goes into an LCA that determines the quality of the output. Only if the data are representative and reliable are the outputs meaningful. As this paper demonstrates, there is an urgent need for such robust data to be obtained, transparently, and with input from all stakeholders.

Our analysis is particularly relevant at this point in time as legislation is currently proposed on both sides of the Atlantic that will be founded on existing commercial sustainability indices. As this paper demonstrates the purported impact values included in these indices are, in many cases, unsubstantiated and misleading. The use of such 'data' will almost certainly result in well-intentioned legislative measures which will not reduce global warming and may even augment it, increasing global poverty and inequality at the same time.

RECOMMENDATIONS

For LCA data to guide sustainability decisions in fashion, the following three criteria must be met.

1. Fashion industry indices, as well as any commercial indices upon which legislation might be based, must provide open access to their methodology. This implies open access to the complete process, from the collection of the base data to the calculation of the final outcomes, as well as the values obtained at each stage in the estimation of the purported impact scores.

2. The apparel and leather sector must come together with all major stakeholders, from farmers to climate scientists to discuss methodological standards for LCAs in different fiber supply chains and to agree on the amount and mechanism of funding that the industry will provide to commission independent, robust and comparable LCAs.

3. Legislators are currently relying on commercial databases and LCA experts to inform legislation. The New York Fashion Act will use metrics underpinned by the Higg MSI and the Higg PM. These in turn draw from the same databases as underpin the EU PEF. The latter are in evolution, but the decision as to which data will be used remains in the hands of LCA experts, not in the hands of experts in climate science, agronomy, or development.

This paper demonstrates that approach is misguided, and we strongly recommend that all legislation be postponed until this is rectified.

The Rise of Life Cycle Analysis (LCAs) and the Fall of Sustainability

Illustrations from the Apparel and Leather Sector

Introduction to Life Cycle Analysis (LCAs) and a major caveat

LCAs don’t equal sustainability

As environmental issues such as climate change, ecotoxicity, water scarcity, etc. have become more pressing, the global community has sought a means of measuring and monitoring environmental impact. The solution generally adopted is LCAs. An LCA is a method used to evaluate the environmental impact of a product from the extraction and processing of the raw materials – through the manufacturing, distribution, and use of the product – to recycling, and final disposal. Complete LCAs are referred to as 'cradle to cradle' or 'cradle to grave'. Even cradle to cradle LCAs however, have two major limitations:

1. They focus on environmental impacts without considering social impacts; and
2. LCA outcomes are highly context-specific. Attempts to generalize can result in serious inaccuracies.

The objective of this briefing paper is to explain how LCA methodologies emerged, and how they are currently being used in the analysis of sustainability in the apparel, leather and textile supply chain. We highlight the privatization of LCA data and methodologies, the lack of public accountability, and how seemingly small details can result in systematically misleading results for consumers, brands, investors, and legislators.

The Report of the World Commission on Environment and Development, "Our Common Future", pointed out the interconnected nature of social and environmental sustainability: *"The environment does not exist as a sphere separate from human actions, ambitions, and needs."* [1] With LCAs, companies in the apparel and leather sector are trying to evaluate only the environmental impact of a product, when a more comprehensive understanding of sustainability claims requires not just an LCA but also an SEIA - a Social and Economic Impact Assessment. Today, in most corporate social responsibility (CSR) reports, as well as in proposed legislation such as the New York State Fashion Sustainability and Social Accountability Act[2] (Fashion Act) and the European Union (EU) Product Environmental Footprint (PEF)[3], the socio-economic impact of fiber production is never mentioned. The environmental impact – as captured by LCAs – dominates the conversation. How this came to pass, as well as the shortfalls of this approach, is briefly summarized in Section I.

Section II highlights the relevance of the specific LCA context and methodology. For each LCA, decisions have to be taken as to which methodologies to use and which boundaries to impose. These decisions will radically alter the purported impact that will be calculated from any given set of data. Moreover, many commercially deployed LCAs, as well as the Higg MSI, cover not the full life cycle of a product, but only the impact from cradle to gate. This further compounds inaccuracies, as the most important metric in sustainability is not impact at the factory gate or cash register, it is impact per wear.

Section III illustrates that in fact, the quality of LCA output is wholly dependent on the quality of the raw data that goes into it. Bad – i.e. out of date, unrepresentative data that was collected without adequate scientific understanding – will produce inaccurate impact measurements that can be seriously misleading.

LCA expertise does not require extensive knowledge of agronomy, environmental science, soil science, climate science, human rights, economic development, or textile engineering. Our analysis shows however, that precisely these areas can determine the most vital aspects of the LCA models, namely the applicability of the boundaries, the potential for burden shifting implicit in the choice of methodologies, and the validity of the base data. LCA software and modeling experts are required to undertake LCAs in multiple and disparate industries. They will never have the internal expertise required for every LCA they undertake. This leaves commercial providers with two choices: hire or pay genuine experts in the area of the LCA in question, or do it internally and minimize costs. Not surprisingly, most appear to opt for the latter with predictably poor outcomes.

Pointing out the implications of different LCA models is timely and relevant because legislators are currently planning apparel regulation based on LCAs (e.g. the EU PEF).

I.
The emergence of Life Cycle Analysis and their impact on sustainability claims

Life Cycle Analysis – Emergence and current application

LCAs were conceived in the 1960s, initially for and by companies for internal use, to support decision-making to reduce cost and advance sustainability. By the 1990s, growing international collaboration and coordination in the scientific community meant that method development increasingly took place in universities. With the ensuing rise in academic publications, LCAs became the dominant methodology to assess environmental impacts.[4]

Today, however, LCAs are once again a largely private affair. With growing pressure for companies to market their sustainability, almost all LCAs are created by commercial providers. Such LCAs are, moreover, the foundation of current sustainability indices. Indeed, all of the major impact indices belong to LCA providers – such as Quantis[5], and Sphera[6] – or to associations that collect and collate data from LCA providers, such as Ecoinvent.[7] The Higg Materials Sustainability Index[8] – see 1.2 below – is based on a combination of all of these, and indeed Quantis also appears to use Ecoinvent and Ecoinvent to use Quantis and Sphera.[9]

These indices are all 'pay for play' and behind full or partial paywalls. The LCAs that these indices base their claims on are generally not named, let alone accessible. As a result, the general public has no insights into how, where, or when the data were collected, how large the sample size, how recent and representative the sources, the boundaries and the methodology employed, and the sensitivity and uncertainty levels of the outcomes. As we shall see in Sections 2 and 3, all of these variables have a huge influence on purported impact values, but they are firmly hidden from oversight.

The commercial provision of LCAs and associated lack of transparency inhibits public accountability. This recent privatization of LCAs stands in stark contrast to the original intention, as outlined in a 2012 publication of the International Organization for Standardization (ISO) titled '*Environmental Labels and Declarations: How ISO Standards Help*'.[10] In this guidance there is an explicit requirement that any sustainability claims made by manufacturers and businesses that could be seen as being self-declared must be verified before they are made, and that this information must be available on request to any person. The ISO 14021:1999 standard even stated that: *"if a claim can only be verified using confidential business information, then the claim must not be made."*[11]

In 2019, ISO has replaced their 2012 publication with a much briefer pamphlet "Environmental Labels" [12], which no longer mentions verification. Although the transparency requirement remains in the revised ISO 14021:2016, few manufacturers or consumers appear aware of their right to oversight.[13]

Oversight of Life Cycle Analysis methodologies

Over the past decade, it is not just standards agencies that have neglected the oversight of public sustainability claims. Legislators are referring to private indices as authoritative reference points for sustainability claims, without any apparent governmental oversight or regulation. As a result, the private LCA providers are in full control of what is considered sustainable and their business is booming.

This is good news for some companies and bad news for others, because the future sales of entire sectors can depend on these LCA ratings. For example, the Sustainable Apparel Coalition's Higg MSI assesses the purported impact of different fibers and fabrics, with a higher score representing a less sustainable material. It is noteworthy that 100% fossil fuel based polyester fabric is evaluated at an environmentally friendly, 36.2 'Higgies' per kilo. The impact of silk fabric, generated by mulberry leaf eating caterpillars, on the other hand, is claimed to be hugely unsustainable, with a total purported environmental impact of 1086 Higgies/kilo.[14] The MSI raw material data for silk is sourced from the Quantis database, known as WALDB. The MSI raw material data for polyester comes from Sphera's database known as GaBi.

These results are the values that will likely underpin the EU PEF and that indeed, do underpin the World Resources Institute (WRI)[15] and the World Wildlife Fund (WWF)[16] "Science Based" Targets, which in turn, will underpin the proposed Fashion Act.[17] (please see chart 2 on page 31 for a diagrammatic representation of these relationships)

As a recent film produced by Patagonia[18] in support of the Fashion Act observes: *"the fashion industry is also the fossil fuel industry."* [19] So, it is concerning that the WRI, the Sustainable Apparel Coalition (SAC), and the Policy Hub have all received funding from a foundation that is itself, indirectly financed by fossil fuel revenues.[20]

From the Fashion Act to the PEF, all current legislation it seems, will be based on the say-so of LCA providers and the brands that fund them. Here, it is important to note that neither the MSI, nor most commercial indices/commercial LCAs are **independently** peer-reviewed.[21] The business opportunity that this represents has not gone unnoticed. Sphera, for example, was recently acquired by Blackstone for USD1.4 billion.[22] Given the paltry and unsatisfactory level of oversight built into LCAs we can be fairly certain that, going forward, ISO standards will be increasingly flouted, as manufacturers jockey for better sustainability ratings, and LCA providers compete to supply them.

Some Governments - UK, Norway - are relying on consumer protection agencies to regulate claims, but the variety of sectors covered, combined with the complexity of LCAs, means that the use of unrepresentative data and selective methodologies is beyond their capacity to identify. For example, the Norwegian Consumer Authority's (NCA) recent ruling was based on a view that global average data is not suitable for consumer-facing product claims.[23] The NCA were unable to assess the validity or otherwise of the actual data presented. The EU intends to combat this with PEF/Substantiating Green Claims regulations. These, however, will remain predicated on data that, as our analysis shows, is in many cases unsound.

Our aim with this paper is to support voters and legislators in navigating sustainability claims. We hope to encourage both to require considerably greater transparency and independent verification of the LCAs that back sustainability claims and indices. And we suggest that far stronger means of public oversight are urgently required.

II.

Sustainability and environmental impact are not synonymous and in measuring the latter, the devil is in the details.

Sustainability versus environmental impact

Sustainability assessments based on purported environmental impact alone are incomplete. If legislators, brands and consumers prioritize fibers and fabrics based on such one-sided environmental evaluations, they may well contribute to counterproductive societal outcomes.

Farmed fibers provide income to some of the world's poorest nations and to some of the poorest communities within richer nations. For example, cotton generates over 50% of Benin's export earnings, and in rural areas in the global south, there are few employment opportunities other than agriculture.[24]

Ceasing to purchase Benin cotton, Brazilian silk, Peruvian alpaca, or Indian hides, will have little effect on global emissions or water consumption. Indeed, it may even increase both, as the farmer will have to cultivate the next most profitable cash crop, which may well be associated with higher water use and emissions than the cotton, silk, or alpaca that it replaces.

LCA methodology could account for this, by basing comparative assertions and choices between products, on so-called consequential LCAs. While attributional LCAs measure the impact of the average producer, consequential LCAs measure the impacts of the producers who are most likely to increase or reduce production respectively, in the face of a change in market conditions.

If, for instance, consumers are told viscose is more sustainable than cotton, a consequential LCA will evaluate the impact of the producer who will stop growing cotton. What will s/he grow instead and how? If the associated cottonseed was used for oil, what is required to replace the cottonseed oil no longer being produced? And so on and so forth. It will then compare this with the impact of the producer who will start or increase production of viscose, along with any associated impacts engendered by that change.

To our knowledge, there are no consequential LCAs of generic global fibers. Instead, current evaluations rely solely on attributional LCAs. This is problematic. Suppose the average producer of fiber A has a lower environmental impact than the average producer of fiber B. It does not automatically follow that the producer who would increase output of A, also has a lower environmental impact than the producer who would reduce or cease production of B.

For example, if consumers, brands, and manufacturers switch from cotton to viscose, the marginal cotton producer who drops out might be one in sub Saharan Africa, whose irrigation, pesticide, and fertilizer usage is well below the average. Whilst the viscose producer who would increase production might be tied to deforestation in Kalimantan, with an environmental impact that is well above average.[25] The net outcome of such a switch would be the opposite of that intended: there would be an increase in negative environmental impacts such as global warming and an increase in global inequality.

Allocation of environmental impacts

One key determinant of LCA outcomes is allocation. To understand its relevance, it is important to understand that many inputs and outputs in the apparel and leather sector are co-products. For example, raising cattle produces meat, dairy, manure, and hides. How does one allocate the impact of raising that cow or steer over the various co-products? There are a number of allocation options:

1. economic allocation, where impacts are allocated to each co-product in proportion to the contribution that they make to the lifetime value of the whole.

2. bio-physical allocation, e.g. by protein, where impacts are allocated between meat and wool, for example, based on their relative protein content.

3. system expansion – typically used in consequential LCAs – which looks at what the co-product could or does replace, and deducts the impact of one from the other.

Depending on the allocation method applied, the LCA will produce very different outcomes from the same set of input data.

Chart 1 is adapted from an open access, peer reviewed, wool LCA published in *The International Journal of Life Cycle Assessment*, that compared purported Greenhouse Gas Emissions (GHGs) using the same data from four different sheep farms, and then applying seven different methods of allocation between wool and meat.[26] What product was being studied is not, however, what we are interested in. The chart is here purely to illustrate the huge differences in impact that can be calculated by any given LCA from any given set of data. If we just look at the red bar (which represents the GHG impact of one farm - Farm 1), GHG emissions per kilogram of greasy wool vary from minus 27 to plus 39 Kg CO_2e – a difference of 66 Kg CO_2e – depending on the method of allocation selected.

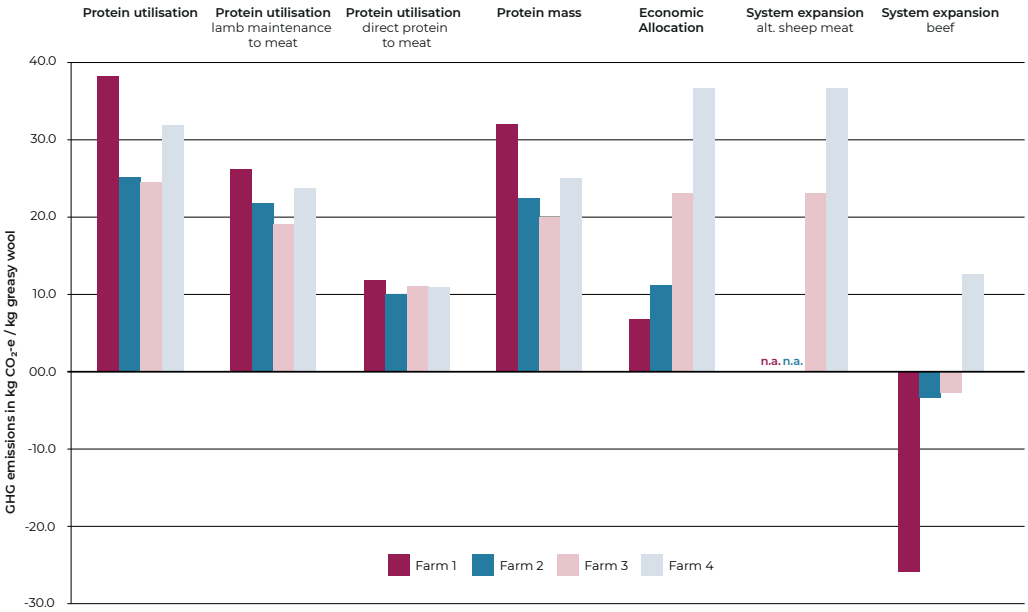

Chart 1. GHG emissions from greasy wool production across four case studies (farms) assessed with seven alternative methods for handling co-production of wool and meat. (n.a.: not applicable because no meat-specific sheep breeds were identified for farms 1 and 2.)

Entities commissioning LCAs will, of course, tend to choose the most favorable allocation method for their fiber. To interpret LCA results, then, it is first important to understand if vested interests were involved in commissioning the LCA in the first place, as this could bias results. Second, there must be transparency over the allocation method used, as only LCAs using **exactly** the same method of allocation are potentially comparable.

Precisely the same caveats apply to interpreting comparisons between brands and manufacturers. Based on the chart above, if told that the grey producer (Farm 4) had a GHG impact of only 11 kg CO_2e/kilo of wool, and that the red one (Farm 1) had an impact of almost 40 kg CO_2e/kilo of wool, how many would consider asking what method of allocation was used? Who would then realize that even "protein allocation" produces radically different results depending on whether the direct protein to wool or protein utilization is considered, and that when the same method is applied to both producers, both end up having very similar GHG impacts?

These will in turn be lower or higher than the producer of a substitute fiber. For example, Piñatex, a novel pineapple-based material, will fare differently compared to leather depending upon what method of allocation and boundaries are applied in any given Piñatex LCA.

In short, when presented with ostensibly massively different impacts 'based on LCAs', it is perfectly possible that the impacts are not radically different at all, and that with different boundaries and methodologies applied, the relative rankings could easily be reversed.

To add further complexity to the interpretation of comparative LCA results, it is important to ensure that identical products are compared. In the wool context, for example, there are coarse-textured wools for interior textiles (farms 1 and 2, red and blue in the chart) and medium to superfine garment wools (farms 3 and 4, pink and grey in the chart). Those fibers are not substitutes for each other so it would be utterly meaningless to look at the chart and say that the blue product is more sustainable than the grey one.

Similarly, comparing between tanneries, it would be completely inaccurate to say that tannery A is more sustainable than tannery B, when A only produces thin leathers for garments, whilst B produces heavy waterproof leathers for outdoor boots, which have a higher environmental impact, but also a completely different purpose.

Moreover, impact at the farm or factory gate is not the most important measure. Instead, we should assess impact per wear. Clothes, shoes, bags, etc., are not Kleenex. If a bag or dress "costs" 12, whether that is US Dollars or some environmental measure, and it is worn/used once, the cost is 12 per wear. If another bag "costs'' 1,200, and is used 100 times, the cost/impact is also 12 per use/wear. The difference is that at the end of those '100 times', in the first case there are 100 bags or dresses to dispose of, and in the second, only one.

By definition then, if a farm is producing a lower grade of wool, or a tannery a lower grade of leather, that will not last as long and/or be worn/used as many times, any perceived advantage in environmental impact in production could easily be eliminated or reversed in consumption. The PEF intends to incorporate a durability test, but physical durability and social durability are not one and

the same. Ensuring that a polyester dress which will be worn 5 times, is strong enough to withstand 50 wears, will only mean that it lasts longer in landfill.

Attributing impacts

As explained above, if different methods of allocation are employed in the respective LCAs, comparing the impacts of the products is **not possible.** The Higg MSI however, as well as the databases the Higg scores are derived from, appear to use different allocation methods for different fibers. For wool, impact allocation between meat and wool is determined by protein. For silk, in contrast, Higg bases its score on an LCA that uses economic allocation. If the Higg would use a protein-based allocation method for silk as well as for wool, the impact of silk would be 60% lower than the current LCA results suggest.[27]

So far, we have only discussed the difficulty in comparing final impact scores if different allocation methods were employed in the LCAs in question. But exactly the same concerns apply to the evaluation of inputs that are co-products or by-products of another production system.

In the LCA behind the Higg MSI for organic cotton, manure was treated as the worthless waste of another system and so, impact free.[28] In the LCA behind the silk MSI, in contrast, the manure used on the mulberry trees was treated as a valuable coproduct of livestock and consequently had hefty environmental impacts attached.[29]

Similarly for economic allocation, small details make a big difference for outcomes. Whether the economic allocation is 1% or 2% looks unimportant, but choosing the latter will double the impact values. A real-world example of this is the Higg MSI for leather. In the LCA used for generic hides, the economic allocation is 3.6%. But without specifying why, the MSI reduces the economic allocation for the hides of the world's largest meatpacker – JBS Foods[30] – to only 0.87%. This change, in turn, reduces JBS' impact scores for hides that are otherwise at best, no different, and at worst, more environmentally harmful than the average Brazilian hide, by 76% compared to the generic variant. This, according to the MSI, makes JBS the world's most sustainable cowhide producers. Or, as JBS advertise on their own website: *"Kind Leather has just been awarded the best score in the industry on the Higg Materials Sustainability Index (Higg MSI)."*, which seems astonishing given JBS hides have recently been tied to Amazon deforestation by three[31] leading publications.[32]

Each method of allocation has its advantages but if the intent is to use attributional LCAs to make comparative assertions, economic allocation must be the preferred methodology. Unlike allocation by protein for example, it can be applied across all fibers. It also captures the reality that if a co-product or by-product has no market value whatsoever, and would otherwise be discarded, it is an environmentally free good, and no impact should be attributed to using it.

III.
The pivotal role of data

Garbage in Garbage out (GIGO).

'Data' is not just numbers, it is numbers that capture the reality that they purport to reflect, with a fair degree of accuracy. Gathering data is a science unto itself, from the questions asked, to how the responses are collected and analyzed. As a general rule, the larger the sample size and the more independent the data collection is from those undertaking the study, those funding it, and those involved in generating the product concerned, the more likely it is that data will be representative. Many of the LCAs currently used in the apparel and leather sector however, use outdated values, too small sample sizes, producers who are not remotely indicative of the global production that they are supposed to represent, and data that was not independently collected. The result is data GIGO: Garbage in, garbage out.

For example, the Quantis silk production impact scores which currently underpin the EU PEF[33], the Science Based Targets in the Fashion Act, and the Higg MSI, are based on the practices of 100 farmers in India in 2006. It is now 2022, and 95% of globally traded silk comes from China.[34]

Similarly, the organic cotton LCA that underpins the Sphera GaBi database and thence, the Higg MSI, as well as the NY State Science Based Targets, and presumably the EU PEF, is both seriously outdated, based on data submitted by the organic initiatives themselves, and from a tiny sample size.[35]

As for the importance of independent collection in obtaining valid data rather than GIGO, a very good example is provided by two studies of:

1. conventional cotton,
2. BCI (Better Cotton Initiative) cotton, and
3. organic cotton farmers, commissioned by Cofra Industries' Laudes (formerly C&A) Foundation (see endnote 20) – a long time promoter and supporter of organic cotton production.[36]

For both studies, the data was collected in Madhya Pradesh, India, in 2017-2018, but from different sample sizes and in different ways: The data for the SEIA was collected from 3,600 farmers (1,200 of each type), whilst the LCA data was collected from only 300 farmers (100 of each type). In the case of the SEIA, data collection was undertaken by a third party. For the LCA, it appears to have been collected by the initiatives concerned *"with the help of C&A (Laudes) Foundation."* [37] From a statistical point of view then, the SEIA, given its larger sample size and its independent data gathering method, is considerably more reliable.

SEIAs and LCAs collect very similar data, but in different forms. An LCA for example, looks at the volume of irrigation used in tonnes per hectare. An SEIA will look at how much the farmer spent on irrigation.

When we compare the two studies, we see that the LCA claims outcomes for organic cotton that are far more favorable to the organic production system than those identified by the SEIA. Concretely, the LCA found that organic farmers used 60% less irrigation than their conventional neighbors. But the SEIA found that organic farmers devoted 25% more labor days, and 11% more expenditure, to irrigation, than their conventional counterparts. In other words, the SEIA found that organic farmers were using as much or more irrigation than the conventional farmers, not less – let alone 60% less as the LCA claims.

Overview table for studies comparing organic and conventional cotton:

	STUDY 1	STUDY 2
Sponsor	Laudes Foundation	Laudes Foundation
Method	SEIA based on data collected by an independent third-party agency.	LCA based on data collected by Laudes/the organic initiative (possibly CottonConnect, see endnote 20)
Sample Size	3,600 farmers	300 farmers
Findings on water use	25% more labor days and 11% more expenditure for organic cotton compared to conventional cotton	60% less water use for irrigation for organic cotton compared to conventional cotton

The Laudes LCA is an example of GIGO due to poor data collection. The Quantis silk impact claims are GIGO because they used an outdated and un-representative LCA of a tiny sample of silk farmers who didn't produce for the global market in any case. But the outcome is the same: misleading comparative impact scores, which if followed will increase both global warming and global inequality.

Conclusion.
LCA skepticism is growing

A recent New York Times (NYT) article questioned the validity and impartiality of the Higg – and so by extension, of the Quantis and Sphera impact scores that underpin the MSI.[38] As already mentioned, this was followed by a Norwegian Consumer Authority ruling against the use of the Higg MSI to make consumer-facing sustainability claims in Norway.[39]

The SAC contested the NYT's claims that: *"Stating that the Higg MSI favors synthetic materials over natural ones is incorrect. It does not favor synthetic over natural fibers, and it was not designed to compare the two."*[40] Whilst Higg Co responded to the NCA.[41]

The SAC's statement is patently belied by even a cursory examination of the Higg MSI portal.[42] But it is true that, as Higg claims, the NCA ruling only found that using global averages can "easily" be misleading. That finding may well be overturned if the SAC appeals to the Norwegian Market Court. Nonetheless, how supporters of the Higg – such as Nike[43], Patagonia, and H&M[44] – respond to all this, is, in our opinion, a clear test of such brands' due diligence and reputational liability. In the face of competing claims, the brands are ethically required to investigate the validity of the MSI organic cotton claims for themselves.

To conclude, it is important to repeat that this paper makes no general argument against LCAs. In fact, we believe that if used appropriately, LCAs can provide valuable insights into environmental impacts. However, as the many examples in this paper clearly illustrate, LCA experts alone are not qualified to assess whether the silk, wool, or cotton data that they are looking at is representative, let alone whether it is accurate. A far more collaborative, transparent, and inclusive approach is urgently required.

For LCA data to guide sustainability decisions in fashion, the following three criteria must be met.

1. Fashion industry indices, as well as any commercial indices upon which legislation might be based, must provide open access to their methodology. This implies open access to the complete process, from the collection of the base data to the calculation of the final outcomes, as well as the values obtained at each stage in the estimation of the purported impact scores.

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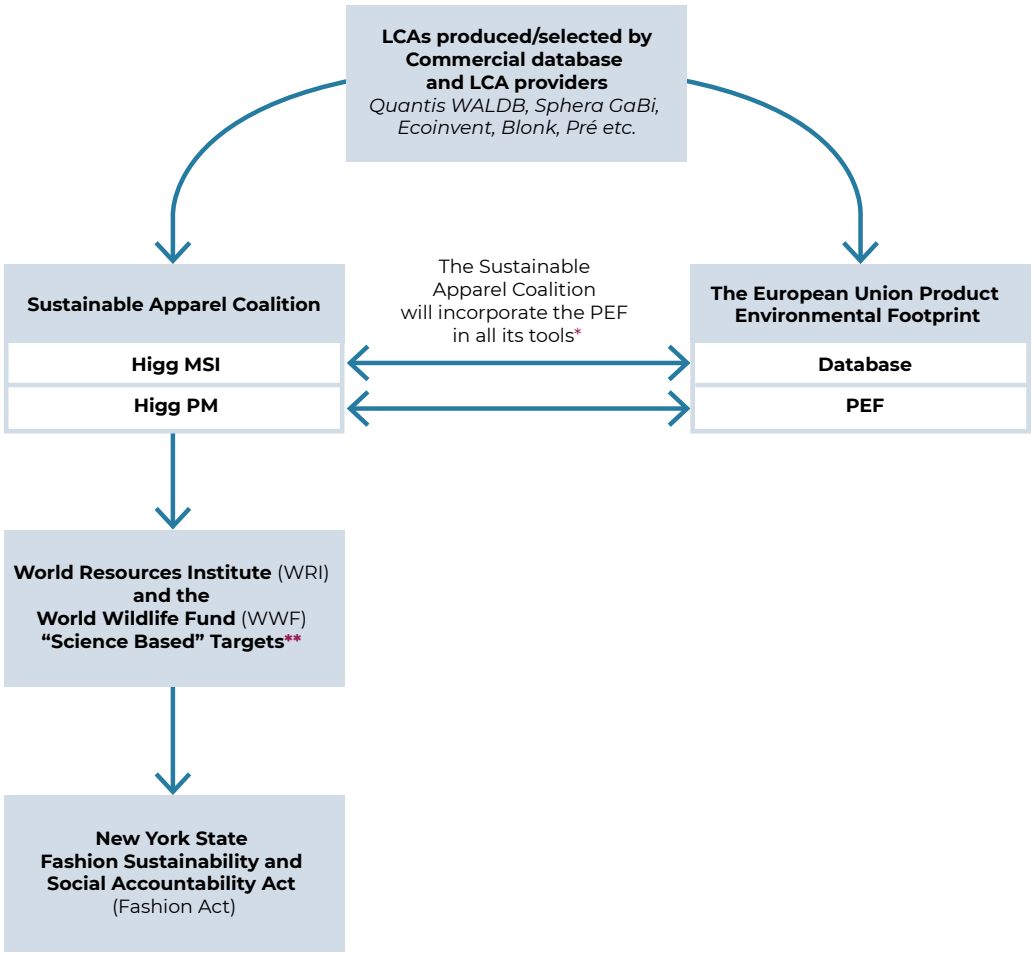
3. Legislators are currently relying on commercial databases and LCA experts to inform legislation. The New York Fashion Act will use metrics underpinned by the Higg MSI and the Higg PM. These in turn draw from the same databases as underpin the EU PEF. The latter are in evolution, but the decision as to which data will be used remains in the hands of LCA experts, not in the hands of experts in climate science, agronomy, or development.

This paper demonstrates that approach is misguided, and we strongly recommend that all legislation be postponed until this is rectified. If not, the use of misleading and unsubstantiated data will almost certainly result in well-intentioned legislative measures which will not reduce global warming, indeed, may even augment it - along with global poverty and inequality.

LCA Data Flow

Chart 2. The relationship between LCAs produced/selected by commercial providers andthe SAC's Higg MSI, the EU PEF, 'Science Based Targets', and the Fashion Act



* https://apparelcoalition.org/about-pef/

** https://sciencebasedtargets.org/resources/legacy/2019/06/SBT_App_Guide_final_0718.pdf

Abbreviations

BCI : Better Cotton Initiative

EU : European Union

Fashion Act : New York State Fashion Sustainability and Social Accountability Act

GHGs : Greenhouse Gas Emissions

Higg MSI : Higg Materials Sustainability Index

Higg PM : Higg Product Module

ISO : International Organization for Standardization

LCA : Life Cycle Analysis

NCA : Norwegian Consumer Authority

NYT : New York Times

PEF : Product Environmental Footprint

SAC : Sustainable Apparel Coalition

SEIA : Social and Economic Impact Assessment

WRI : World Resources Institute

WWF : World Wildlife Fund

Notes

[1] World Commission on Environment and Development. (1987). *Our common future.* Oxford: Oxford University Press. [Brundtland report].
https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf

For further detail on what this means specifically, see: Bates-Kassatly, V. & Baumann-Pauly, D. (2021). *The Great Greenwashing Machine - Part 1: Back to the Roots of Sustainability.*
https://gcbhr.org/backoffice/resources/reportfinal72dpi2.pdf

[2] The New York State Senate. *Assembly Bill A8352.*
Retrieved July 6, 2022, from https://www.nysenate.gov/legislation/bills/2021/A8352

[3] European Commission. *The Environmental Footprint Pilots.*
Retrieved July 6, 2022, from https://ec.europa.eu/environment/eussd/smgp/ef_pilots.htm
See also: European Commission. (2021, December 16). *Environmental footprint methods.*
https://environment.ec.europa.eu/news/environmental-footprint-methods-2021-12-16_en

[4] Bjørn, A., *et al.* (2018). LCA History. In: Hauschild, M., at al. (eds). *Life Cycle Assessment.* Springer.
https://link.springer.com/chapter/10.1007/978-3-319-56475-3_3#rightslink

[5] Quantis.
https://quantis.com/

[6] Sphera.
https://sphera.com/

[7] Ecoinvent. *Data Submission Process.*
Retrieved July 7, 2022, from https://ecoinvent.org/the-ecoinvent-database/data-submission-process/

[8] Higg. *Higg Materials Sustainability Index (Higg MSI).*
Retrieved July 7, 2022, from https://howtohigg.org/higg-msi/

[9] Ecoinvent. *Consultancies.*
Retrieved July 7, 2022, from https://ecoinvent.org/the-ecoinvent-association/consultancies/ ;
Ecoinvent. *EF 3.0 Data Provision.*
Retrieved July 7, 2022, from https://ecoinvent.org/activities/environmnetal-footprint-data/ef-3-0-data-provision/ ;
Ecoinvent. *Software Tools.*
Retrieved July 7, 2022, from https://ecoinvent.org/the-ecoinvent-association/software-tools/

[10] International Organization for Standardization. (2012). *Environmental Labels and Declaration: How ISO Standards Help.*
https://twosidesna.org/wp-content/uploads/sites/16/2018/05/Environmental_Labels_and_Declarations_How_ISO_Standards_Help.pdf

[11] Most LCAs state that they adhere to ISO standards but nobody is verifying this. Indeed, one of the authors of this report approached the ISO Central Secretariat in March 2019, detailing concerns about three specific LCAs that each claimed to adhere to ISO 14040/44. She was told that *"interpretation of ISO standards resides with the ISO technical committees, which comprise of the participation of the national ISO members"*, and instructed to contact her national ISO member. The British Standards Institute, in turn, informed her that they *"are unable to offer detailed advice on interpretation or application"* and suggested that she approach a qualified consultant who might be able to assist her (for a fee).

[12] International Organization for Standardization. (2019). *Environmental Labels.*
https://www.iso.org/publication/PUB100323.html

[13] One of the authors of this report wrote to Nuova Fratelli Boretti (NFB) s.r.l. in March 2019, requesting access to the LCAs substantiating their claims (See: Business Europe. (2018, December 10). *Nuova Fratelli Boretti textile processes from regenerated waste.* http://www.circulary.eu/project/nuovafratelliboretti/) for ReVerso wool and ReVerso cashmere: *"-82% of energy, -92% of water, -97% of CO2, -99% of SO2, -96% of chemicals and -97% in dyeing"*. She was told that *"The LCA study is at disposal of customers that buy our yarn or fabric. You can see only the result"*, by which they meant the summary of the outcomes. A follow up email pointing out that ISO 14021 requires that *"This information must be available on request to any person"* was met with silence.

[14] The Sustainable Apparel Coalition (SAC) created the Higg Index, a suite of 5 tools that includes the Material Sustainability Index or MSI. The MSI measures the purported impact of (currently) 23 different fibers, per kilogram of fabric, in what we refer to as 'Higgies'. The MSI is based on LCAs but it apparently takes the impact values of water, emissions, etc., normalizes them by process on a base of 10, weights by water scarcity and possibly other factors, and then comes up with a final 'number' in each of five impact areas – Global Warming, Eutrophication, Water Scarcity, Resource Depletion Fossil Fuels, and Chemistry.

Delaware registered for profit, Higg Co., which recently raised $50 million in series B funding, (See: Cision PR Newswire. (2022, April 27). *Technology platform Higg raises $50M Series B to accelerate supply chain sustainability.* https://www.prnewswire.com/news-releases/technology-platform-higg-raises-50m-series-b-to-accelerate-supply-chain-sustainability-301533966.html) is now the exclusive licensee of the entire Higg Index, including the MSI.
For further details on both organizations as well as the MSI itself, see:
Bates-Kassatly, V. & Baumann-Pauly, D. (2021). *The Great Greenwashing Machine - Part 1: Back to the Roots of Sustainability.* https://gcbhr.org/backoffice/resources/reportfinal72dpi2.pdf and Bates-Kassatly, V. & Baumann-Pauly, D. (2022). *The Great Green Washing Machine Part 2: The Use and Misuse of Sustainability Metrics in Fashion.* https://gcbhr.org/backoffice/resources/great-green-washing-machine-report-part-2final.pdf

[15] World Resources Institute. (2021, November 5). *Roadmap to Net Zero: Delivering Science-Based Targets in the Apparel Sector.*
https://www.wri.org/research/roadmap-net-zero-delivering-science-based-targets-apparel-sector

[16] World Wildlife Fund. *Science Based Targets Initiative.*
Retrieved July 7, 2022, from https://wwf.panda.org/discover/our_focus/climate_and_energy_practice/what_we_do/climatebusiness/science_based_targets_initiative/

[17] We quote: *"To calculate the GHG [Greenhouse Gas] emissions for materials in tiers 3 and 4 (see Figures 3 and 4), companies can use the MSI to estimate emissions for these tiers, assuming they know the mass of materials that is purchased for their products. [...] To calculate emissions for tiers 1 and 2 (using the Higg Index), companies can use the FEM assuming they know the portion of the facility's output that is theirs. As mentioned above, on tier 2 (e.g., textile mills), there may be some overlap between the FEM and MSI."* Science Base Targets & World Resources Institute. (2019). *Apparel and Footwear Sector Science-Based Targets Guidance.*
https://sciencebasedtargets.org/resources/files/SBT_App_Guide_final_0718.pdf

[18] Patagonia.
https://www.patagonia.com/home/

[19] Patagonia. *Why Plastics?.*
Retrieved July 7, 2022, from https://www.patagonia.com/why-plastics/?utm_source=em&utm_medium=email&utm_campaign=060822_footprint_plastics

[20] The technical secretariat developing the Global Apparel and Footwear Product Environmental Footprint (PEF) for the European Commission is led by the Sustainable Apparel Coalition (SAC)/Policy Hub (see: Sustainable Apparel Coalition. *About PEF.* Retrieved July 7, 2022, from https://apparelcoalition.org/about-pef/).

The World Resources Institute (WRI) *Roadmap to Net Zero: Delivering Science-Based Targets in the Apparel Sector* was funded by the Laudes Foundation. The Policy Hub states that they have one funding partner: Laudes. (See p. 10: Policy Hub. *Two Years of Progress 2019-2021.* Retrieved July 7, 2022, from https://assets-global.website-files.com/5dcda718f8a683895d9ea394/60cb13e78ff24e9304265ca8_Policy%20Hub%202%20Year%20Report_June%202021.pdf)

Laudes has also funded the SAC to *"Improve the Higg Material Sustainability Index (Higg MSI)"* (See: Laudes Foundation. *Overview of all grants.* Retrieved July 7, 2022, from https://www.laudesfoundation.org/grants/overview-all).

Laudes is the charitable arm of the Brenninkmeijer family and their holding company Cofra. (See: Laudes Foundation. *Who we are.* Retrieved July 7, 2022, from https://www.laudesfoundation.org/who-we-are).

Cofra has a number of ventures, one of which is Bregal Energy (see. Bregal Investments. *Bregal Energy.* Retrieved July 17, 2022, from http://web.archive.org/web/20210730134946/https://www.bregal.com/funds/bregal-energy/ and Bregal Investments. *Responsible Investment Report 2017.* https://www.bregal.com/media/1023/000070_bregal_esg_report_lowres.pdf), including Birchill Canada (http://birchill.com/), IMG Energy Solutions (see: IMG Energy Solutions. Board of Directors. Retrieved July 7, 2022, from https://imgenergysolutions.com/our-leadership/), and Inflection Energy (see: Cision PR Newswire. 2020, June 12). *Bregal Energy Completes Additional Investment in Inflection Energy.* https://www.prnewswire.com/news-releases/bregal-energy-completes-additional-investment-in-inflection-energy-159692345.html), which is possibly divested. Bregal has not attempted to hide these investments, and both Cofra and Laudes can invest in or fund, whatever they please, but there is a clear conflict of interest in legislators accepting advice from organizations that are indirectly connected to fracking.

Laudes Foundation are also co-owners with Textile Exchange, of CottonConnect (https://www.cottonconnect.org/) – a major implementer of identity cotton schemes. By "identity cotton" we mean cotton produced under the aegis of various programs, such as organic and BCI (Better Cotton Initiative), that are marketed to consumers as 'preferred' or 'more sustainable'. CottonConnect was established with the purpose of promoting organic cotton production by C&A (https://www.c-and-a.com) and Shell Oil (https://www.shell.co.uk/) through its foundation. (See: Bates-Kassatly, V. (2020, August 7). *Shaking Hands With The Devil: "Sustainable Cotton" and the Xinjiang Production and Construction Corp.* Retrieved July 8, 2022, from https://www.veronicabateskassatly.com/read/shaking-hands-with-the-devil-sustainable-cotton-and-the-xinjiang-production-and-construction-corp)

[21] In an attempt to combat the dangers of misleading analysis, the International Organization for Standardization (ISO) has settled on the construct of a 'Critical Review'. The idea here is that any LCA claiming to have been completed to ISO standards must hire several 'experts' in the relevant field, to testify that the study has indeed adhered to those standards. The problem, of course, is that: a) 'Expert' is a very loose term; and b) Whilst the reviews of this paper, and of the "Great GreenWashing Machine" series for example, were provided pro-bono, and so are entirely disinterested, this is not the case with commercial LCAs (or indeed, of reviews of the MSI commissioned by the SAC). Even if the selected reviewers are indeed 'experts', such reviews are a purely business transaction. If the budget allocated for the review is insufficient to cover detailed analysis by the reviewers, there will be no detailed analysis. On top of which, it does not appear that the reviewers themselves are accountable to anyone other than the corporation that commissioned them in the first place.

Moreover, even if the Review Panel does express serious concerns, there is nothing to stop those involved from distributing the study anyway, without even mentioning that the outcome has been questioned. An example is a recent LCA on plastic film recycling (see: Sphera. (2022, July 4). *Life Cycle Assessment of Chemical Recycling for Food Grade Film.* https://www.theconsumergoodsforum.com/wp-content/uploads/2022/04/Life-Cycle-Assessment-of-Chemical-Recycling-for-Food-Grade-Film.pdf), for which the Critical Review team expressed clear concern that Sphera was seriously underestimating methane emissions in oil and gas extraction. This is of course buried in Annex C of the report, so it is most unlikely that anyone will notice.

One of the author's of this report found a number of major issues in Sphera's 2018 LCA for Laudes Foundation (see: Bates-Kassatly, V. "Sustainable Cotton: Myths versus Reality." *Apparel Insider*, 9 November 2019. Retrieved July 9, 2022, from https://apparelinsider.com/wp-content/uploads/2020/02/organic-cotton-cover.pdf and Thinkstep. (2018, May). *Life Cycle Assessment of Cotton Cultivation Systems.* https://www.laudesfoundation.org/en/resources/4332environmentallcareportjune19.pdf) On June 3, 2019, she wrote to the Review Panel Chair to express her concerns, and received the following response: *"As reviewer for the study I am not the owner of the information and data. Due to the role as a reviewer according to ISO Standard I am not able to give you any insight further than what is already written and published in the review report and the study."*

Similarly in March 2020, she wrote to Tom Gloria of Harvard Extension School – who the SAC claim is their independent reviewer (see: Sustainable Apparel Coalition. (2016, November 3). *Sustainable Apparel Coalition Releases New Version of the Materials Sustainability Index.* https://apparelcoalition.org/sac-releases-new-version-of-the-materials-sustainability-index/) to express concerns about the MSI scores for organic cotton, polyester, and silk. Concerns which the SAC itself had repeatedly refused to address. Mr Gloria did not reply and forwarded her email to the SAC. The SAC responded as follows: *"Hello [...], I hope you're doing well. Tom Gloria forwarded your email below. In response to your questions, please see emails we sent on November 21, December 6, December 20, and January 20. All future questions regarding SAC should be sent to our organization directly. Should you wish to engage in the SAC member collaboration process, please consider joining the SAC. Thank you,"* (email of 2020, March 11).

[22] Blackstone. (2021, July 6). *Blackstone to Acquire Sphera, a Leading Provider of ESG Software, Data, and Consulting Services, From Genstar Capital for $1.4 Billion*.
https://www.blackstone.com/news/press/blackstone-to-acquire-sphera-a-leading-provider-of-esg-software-data-and-consulting-services-from-genstar-capital-for-1-4-billion/

[23] Forbrukertilsynet. *The Consumer Authority.*
Retrieved July 8, 2022, from https://www.forbrukertilsynet.no/villeder-om-miljovennlige-klaer

[24] Bates-Kassatly, V. & Baumann-Pauly, D. (2021). *op. cit.*

[25] Bates-Kassatly, V. & Baumann-Pauly, D. (2022). *op. cit.*

[26] Wiedemann, S. G., *et al.* "Application of life cycle assessment to sheep production systems: investigating co-production of wool and meat using case studies from major global producers." *The International Journal of Life Cycle Assessment*, vol. 20, 2015, pp.463-476.
Retrieved July 8, 2022, from https://link.springer.com/article/10.1007/s11367-015-0849-z#Fig1

[27] Bates-Kassatly, V. & Baumann-Pauly, D. (2022). *op. cit.*

[28] Textile Exchange. (2014). *Life Cycle Assessment of Organic Cotton: A Global Average.*
https://store.textileexchange.org/product/life-cycle-assessment-of-organic-cotton/

[29] The raw material Global Warming Potential (GWP) in organic cotton production is 1.3 'Higgies'/kilo, and eutrophication is 3.88/kilo. For silk fabric, those numbers are 78.8/kilo and 577/kilo, respectively. At first glance, that is an insurmountable difference in impact. But since in reality both industries apply similar amounts of manure per hectare, applying the same boundaries to both LCAs would reduce and possibly reverse the comparative scores (see: Astudillo, M. F. *et. al.* "Life cycle assessment of Indian silk". *Journal of Cleaner Production*, vol. 81, 15 October 2014, pp. 158-167. Retrieved July 9, 2022, from https://www.sciencedirect.com/science/article/abs/pii/S0959652614005939).

[30] JBS Foods.
https://jbsfoodsgroup.com/

[31] McCoy, T. & Ledur, J. "Devouring the Rainforest." *The Washington Post*, 29 April 2022.
Retrieved July 9, 2022, from https://www.washingtonpost.com/world/interactive/2022/amazon-beef-deforestation-brazil/

Brice, J. "How Big Beef Is Fueling the Amazon's Destruction." *Bloomberg*, 21 January 2022.
Retrieved July 9, 2022 from https://www.bloomberg.com/graphics/2022-beef-industry-fueling-amazon-rainforest-destruction-deforestation/#xj4y7vzkg

Andreoni, M., Tabuchi, H. & Sun, A. "How Americans' Appetite for Leather in Luxury SUVs worsens Amazon Deforestation." *The New York Times*, 17 November 2021.
Retrieved July 9, 2022 from https://www.nytimes.com/2021/11/17/climate/leather-seats-cars-rainforest.html

[32] See Bates-Kassatly, V. & Baumann-Pauly, D. (2022). *op. cit.*
Brazil's JBS Foods is the world's largest meat packer. Indeed, JBS is the leading meat packer in the USA, controlling 25% of US slaughter capacity. It is currently accused of manipulating US feedlot contract prices to the considerable disadvantage of both cattle ranchers, and the public. The company has also been repeatedly implicated in sourcing hides tied to illegal deforestation. In Mighty Earth's Soy and Cattle tracker, JBS is the lowest ranked Brazilian producer 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 JBS' owners, the Batista brothers, were only recently released from jail on corruption charges.

That none of these practices are normally associated with 'sustainability' is self-evident, and why Higg Co. decided to award such a favorable economic allocation to JBS is not explained (see: JBS Foods. *Kind Leather has the best score in the fashion industry sustainability index*. Retrieved July 9, 2022, from https://jbs.com.br/jbs-news/kind-leather-higg-index/).

[33] Letter of Emmanuelle Maire to the International Sericulture Commission (ISC), 10 March 2022. The raw material data sets that underpin the MSI also underpin the PEF transition phase. This is now completed. Changes may be made during the implementation phase, and it is to this that Mr Maire is referring. See note 34.

[34] The silk industry first protested the Quantis/Higg impact score in 2021, but have been unsuccessful in their attempts to have it changed. Concerned that Quantis' "data" might be used to underpin the PEF, the International Sericulture Commission reached out to the EU authorities. The EU's response (Letter from Emmanuelle Maire, 10 March 2022) was that the consortium Ecoinvent, Blonk (https://blonksustainability.nl/) and Pré (https://pre-sustainability.com/) had been awarded the contract to collect silk data for the PEF. Mr Maire further noted that *"the Commission always encouraged the data providers to get in touch with the industry"*, but didn't require it, and that the data will *"undergo an external review by experts in that industrial sector. The quality of those datasets will therefore be ensured."*

Examination of the Pré consulting website, however, reveals that Pré built the Higg MSI *"based on the best life cycle assessment (LCA) data currently available"* (see: Pré. *Tailored tools for sustainable product development in the apparel industry*. Retrieved July 8, 2022, from https://pre-sustainability.com/customer-cases/tools-for-sustainable-product-development-apparel-industry/.

Pré and Quantis are both LCA providers. They cannot possibly know if the data are accurate and representative without consulting the industry. Indeed, it is self-evident that if both find the Quantis data accurate and representative of global silk they are in absolutely no position to ensure the quality of the PEF silk data, whatever the EU might claim.

[35] The 2014 organic cotton LCA is based on data from 2012, when world organic production was 110,000 tonnes. World production is now double that, with all the growth in production coming from countries with higher environmental impacts than in India (China, Central Asia). Sphera itself states that the data set was only valid until 2017 (see: GaBi. *Process data set: Cotton fiber (organic) (at gin gate); technology mix; production mix, at producer (gin); (en).* Retrieved July 8, 2022, from http://gabi-documentation-2020.gabi-software.com/xml-data/processes/99f8544b-0b62-457a-b246-e1b071bf6cd1.xml).

Moreover, the data for China came from only a couple of farms (or perhaps only one) and the irrigation data was patently false (see: Bates-Kassatly, V. (2020, August 7). *op. cit.*) It is not possible to grow cotton in hot, dry Xinjiang with only 150 tonnes of water/ha. The norm for Xinjiang is 5,000-6,000 tonnes of irrigation per hectare (see: Bates-Kassatly, V. "Sustainable Cotton: Myths versus Reality." *op. cit.*).

It should moreover be noted that the organic cotton LCA suffers not only from a small sample size, but also, a lack of independence – indeed conflict of interest. We quote the LCA itself: *"Primary data for organic cotton cultivation was co-ordinated directly by the producer groups or external data collectors under facilitation of Textile Exchange. Specifically adapted questionnaires to collect inventory data for agricultural systems are used. These questionnaires were filled out by local consultants or directly by representatives of producer groups."* (See: Textile Exchange. (2014). *op. cit.*)

In short, Textile Exchange, which started life as Organic Exchange and is arguably the world's leading promoter of organic cotton as a 'sustainable' solution, appears not only to have commissioned the LCA, and so determined its boundaries, but also submitted the data.

[36] See Thinkstep. (2018, May). *op. cit.* and De Hoop, T., *et. al.* (2018, September). *Social and Economic Impact Assessment of Cotton Farming in Madhya Pradesh.* https://www.laudesfoundation.org/en/resources/4333socioeconomicstudyweb.pdf

[37] The SEIA data were collected by an independent third party, which was neither part of the three cotton production systems being comparatively evaluated – BCI, organic, and conventional – nor of the group completing the study – AIR USA. The LCA, on the other hand, describes two entirely different methods of data collection on two different pages (10 and 16). How this passed the critical review is baffling. Suffice it to say that it appears that the LCA data were submitted by "farmer representatives". Thus, the BCI implementing partners submitted the BCI data, the organic partners, the organic parameters. It was not independent data.

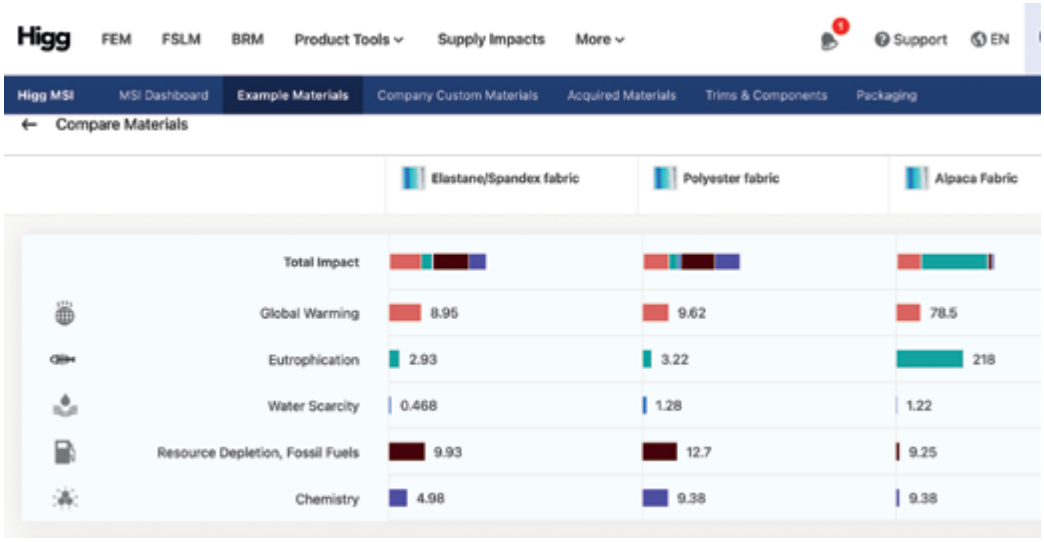
[38] Tabuchi, H. "How Fashion Giants Recast Plastic as Good for the Planet." *The New York Times*, 12 June 2022. https://www.nytimes.com/2022/06/12/climate/vegan-leather-synthetics-fashion-industry.html

[39] Abdulla, H. "H&M Group, Norrøna under fire in Norway over environmental claims". *Just Style*, 17 June 2022. https://www.just-style.com/news/hm-group-norrona-under-fire-in-norway-over-environmental-claims/

[40] Razvi, A. "SAC Statement in Response to New York Times Article". *Sustainable Apparel Coalition*, 13 June 2022. https://apparelcoalition.org/sac-statement-in-response-to-new-york-times-article-june-12-2022/

[41] Higg Trusted Sustainability Data. (2022, June 29). *Technology platform Higg unaffected by SAC's pause of transparency pilot.* https://higg.com/statement-on-nca/

[42] This screenshot was taken on the Higg website on 26 July, 2022. As you can see, the MSI absolutely does compare synthetic and natural fibers. That it favors synthetics is definitional. Just add up the respective totals: Alpaca 316/kilo; Elastane 27/kilo; Polyester 36/kilo.



[43] Nike. https://www.nike.com/

[44] H&M. https://www2.hm.com

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The Great Greenwashing Machine - Part 1: Back to the Roots of Sustainability
https://gcbhr.org/insights/2021/09/the-great-greenwashing-machine

The Great Green Washing Machine Part 2: The Use and Misuse of Sustainability Metrics in Fashion
https://gcbhr.org/insights/2022/03/the-great-greenwashing-machine-part-2-the-use-and-misuse-of-sustainability-metrics-in-fashion

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If you are interested in supporting independent research into sustainable fashion, please contact Pascale Chavaz: Pascale.Chavaz@unige.ch

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