

Wear it Kind



Taming Fashion

Part one: Why reducing the use of animals is crucial for a truly sustainable fashion industry

Key takeaways

Animal-derived materials (ADMs) are still used extensively in fashion. While much work is needed to develop and disseminate more data on the subject, the information available indicates that on average, ADMs have a devastating impact on both the environment and the animals involved in their production.

The problem

- The window to halt catastrophic climate change is rapidly closing. Action to reduce methane emissions is key to limiting global temperature rises to 1.5°C and helping to battle climate change. Livestock alone accounts for approximately 32% of human-caused methane emissions¹, and animal agriculture contributes 14.5–16.5% of total global Greenhouse Gas Emissions (GHG)^{2,3}.
- ADMs are not as natural as they may seem and require substantial processing. They are generally washed, filled, or coated with chemicals, heavy metals or fossil fuel-based substances to ensure cleanliness and comfort during use, and to prevent them from biodegrading.
- Each year, it is estimated that over 5 billion animals are used in textiles⁴. Animal protection organisations have published countless records of animal abuse, in both certified and uncertified textiles supply chains, highlighting the inherent risk to animal welfare within commercial systems. As a result, brands and consumers find it highly challenging to identify high welfare supply chains with certainty.
- By fuelling animal hair, skin and feather revenue streams, the fashion industry helps to provide the margins needed to sustain the growth of animal agriculture.

The solution

- **Invest in alternatives**
Unsurprisingly, consumer interest in animal-free fashion has been steadily growing, and over USD 3 billion invested into the next-gen material industry since 2013, an industry dedicated to developing environmentally preferable and animal-free alternatives to ADMs⁵.
- **Reduce use of ADMs**
Considering the urgent need to mitigate biodiversity loss and climate change, reducing industrialised animal agriculture, and designating more land to forest restoration is crucial. This will foster more biodiverse ecosystems and maximise carbon storage.
- **Refine supply chains**
Addressing supply chain risks is essential to improving animal welfare. However, brands must prioritise making public commitments to significantly reduce their use of ADMs and transition to more people, animal, and planet-friendly materials.

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Taming Fashion: Why Reducing the Use of Animals is Crucial for a Truly Sustainable Fashion

Industry is the first instalment of the FOUR PAWS Taming Fashion series, which presents an overarching perspective on the importance of carefully considering the use of ADMs.

For an in-depth analysis of the impacts of fur, wool, down and leather, and to explore the innovations within these material types, read [Taming Fashion: A review of the negative effects of fur, wool, down and leather](#).

Executive summary

The global focus on the negative environmental, social, and animal welfare impacts of the fashion industry has intensified over the past decade, and there is an ever-growing awareness amongst consumers of the implications of their fashion choices. Widely recognised as both a threat and a contributor to achieving the targets agreed upon in the United Nations (UN) Paris Agreement⁶, aiming to halve industry emissions by 2030, the fashion industry is under more pressure than ever to address the impact of its operations and all tiers of its supply chains.

To achieve these targets, the fashion industry must become more transparent, socially responsible, circular and highly innovative, and shift to a slow fashion model that emphasises the use of renewable energy and sustainable materials^{7,8}.

But what are sustainable materials? Animal-derived materials (ADMs) are often perceived as ‘sustainable’ based on their natural origin. However, these materials present numerous negative implications for the environment, particularly as most are intrinsically linked to animal agriculture. Animal agriculture is a key driver of climate change, conservatively estimated to be responsible for 14.5–16.5% of global Greenhouse Gas Emissions (GHG)^{9,10}, as well as a substantial contributor to air pollution, land, soil, and water degradation, and the reduction of biodiversity^{11,12}. ADMs are also usually the product of intensive farming systems that cause severe suffering to billions of sentient animals every year.

In 2020, the hides and skins of over 1.4 billion animals were used for leather production alone.

As ADMs come from sentient animals, more consideration must be given to how they are used, especially as they are sourced from industries that typically cannot guarantee the welfare of the animals involved. Concerns around the use of ADMs are also regularly dismissed based on the misconception that

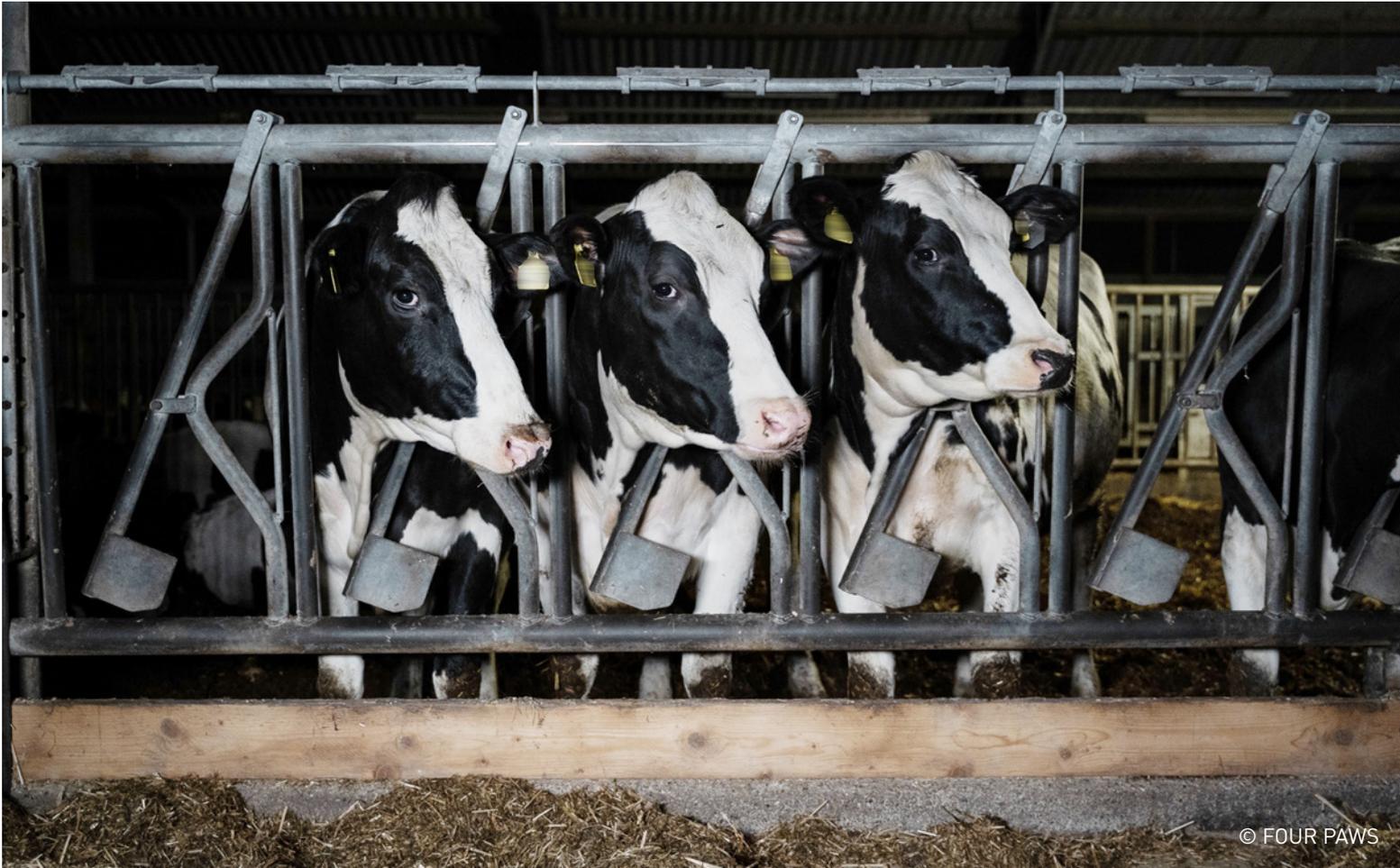
these materials are simply by-products of the meat industry that would otherwise go to waste. However, ADMs such as wool and leather are in fact highly profitable, and the justification for using these materials based on their claimed by-product status, only helps to maintain the status quo and enable these industries to continue expanding.

“There is no beauty in the finest cloth if it makes hunger and unhappiness.”

– Mahatma Gandhi

Humans are also negatively impacted by ADMs supply chains, and often present a significant risk to public health by fostering disease emergence¹³ and antibiotic resistance¹⁴. There are also well-documented poor working conditions for labourers throughout ADM supply chains, from the mental health impacts of those working in slaughterhouses¹⁵, to the health impacts of those working in tanneries¹⁶.

With tighter regulation of the fashion industry and its material sourcing looming, and in some locations already coming into effect¹⁷, some brands are already responding to the urgent need to move away from ADMs and are leading the way toward innovation and adaptation. However, the notion that ADMs are natural and therefore sustainable, leave some brands believing their only option is to make a trade-off between the impact of their material choice on the environment or on animals.



“Animal welfare is a key component of sustainability, and we must ensure that as efforts to address the impact on the environment rightfully increase, animals’ needs are properly considered, and so too is the reality of their use.”

– Jessica Medcalf, FOUR PAWS

We wanted to explore this assumption that ADMs are ‘natural’ and therefore ‘better’ and highlight both their animal welfare and environmental impacts.

By bringing together these two core ethical fashion pillars, we aim to enable more informed and holistic decision-making when it comes to material sourcing. The [Taming Fashion Report Series](#) helps to equip brands with a useful overview of the impacts of ADM use and highlights their less harmful alternatives. Using a combination of industry leading Life Cycle Assessment (LCA) data and animal welfare experts’ insight, we considered the animal welfare and environmental impacts of four widely used ADMs in global fashion supply chains. A detailed breakdown of these materials is available in the second part of this report series *Taming Fashion: A review of the negative effects of fur, wool, down and leather*.

“Across the board, not only do ADMs have a significant negative animal welfare impact risk, but they are also considerable contributors to climate change.”

ADMs undoubtedly have a greater animal welfare risk than other materials. But even from a purely environmental perspective, the data suggests that ADMs have a higher impact than any other material.

We found fur to be the most damaging ADM considered due to its inherent animal welfare risk and environmental impact. Based on Higg MSI data, leather was the worst-performing of the domesticated ADMs reviewed, when it comes to global warming impact,

followed by wool. Down is the least impactful of the ADMs when it comes to environmental considerations; however, there are more environmentally and animal-friendly alternatives available.

Broadly speaking, recycled non-ADMs and animal-free preferred materials, known as next-generation (next-gen) materials appear to hold the winning combination of being more environmentally friendly and presenting a negligible impact on animal welfare.

Call to action

To mitigate both the animal welfare and environmental risks presented by these materials, we strongly urge fashion brands to publicly commit to reducing their use of ADMs and instead transition to next-gen materials and recycled non-animal-derived materials (non-ADMs). Even if ADMs currently represent a small portion of a brand’s materials, it is crucial to further decrease their use.

For brands continuing to use ADMs, they must develop and communicate meaningful animal welfare policies. At a minimum, they should ensure to utilise 100% certified recycled ADMs (preferably post-consumer) or certified virgin ADM supply chains, adhering to the most stringent available standards. While certifications have value, they are not fool-proof, and brands

continuing to use animals should also go above and beyond certifications and work with their supply chains to ensure an excellent standard of welfare.

The use of wild animal derived materials – whether caught from the wild or considered genetically wild and farmed – must be eliminated.

“Brands must urgently make public timebound ADM reduction commitments and begin to utilise or invest in the development of more environmentally friendly alternatives.”

Introduction

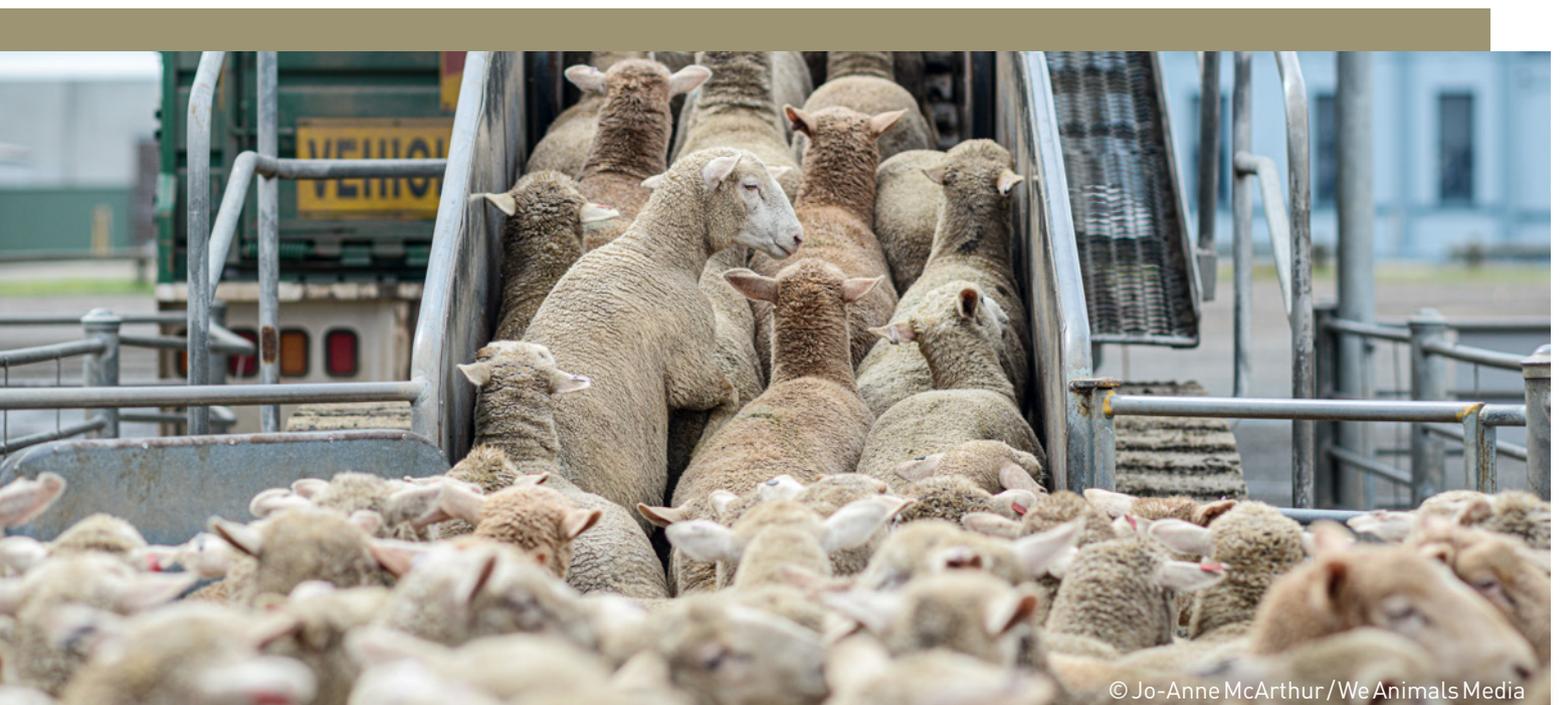
The global fashion industry is responsible for a wide range of negative impacts on people, the planet, and animals; impacts that should cause all of us to rethink how we produce and consume fashion. The use of animal skins and fibres in fashion is still very much 'business as usual', even as evidence for animal sentience becomes far too compelling to ignore¹⁸. The environmental impact of these materials is also becoming increasingly apparent, particularly due to their direct links to intensive livestock farming.

The link between intensive use of animals and sustainability issues was highlighted in a groundbreaking resolution by the UN, which recognised the nexus between animal welfare, the environment, and sustainable development, calling for intergovernmental support to take urgent action on the issue¹⁹. Importantly, a 2021 report by the World Resources Institute and Apparel Impact Institute, which presented critical levers for the apparel sector to reduce GHG emissions, stressed the need to accelerate the development of innovative materials and ramp up investment in next-gen materials, including textile recycling, bio-based materials, and plant-based leather²⁰.

The fashion industry's biggest environmental impacts are widely acknowledged to occur during the material

phase of the supply chain. This issue that was underscored by the development of the renewed Fashion Industry Charter for Climate Action at COP26, which calls for trade policy to incentivise the use of environmentally preferred materials²¹. Although technological advancements like novel animal feed additives are being explored as potential solutions to mitigate methane emissions in the livestock industry²², achieving the various global methane reduction targets requires a fundamental reduction in animal agriculture.

There has clearly never been a more critical time for the fashion industry to embrace change, reduce production generally and move away from the use of materials sourced from harmful systems.



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Shifting community expectations

As consumers become more aware of the impact of their fashion choices, they are increasingly choosing to express their values through their purchases. Consumers expect brands to take a stand on the issues that matter to them²³, and are more likely to stop buying products from brands whose practices conflict with their ethics²⁴. With more ethical fashion alternatives on the market each year, consumers are increasingly well-placed to spend their money in alignment with their values. And, when it comes to the issues that matter, animal welfare²⁵ and the environment are some of the biggest concerns for ethically conscious consumers²⁶.



Consumer perspectives

EU, UK, South African and Australian markets showed that*

86%

agreed that **companies should make animal protection a key priority** alongside environmental protection and social standards.

60%

thought fashion brands should be **responsible for ensuring animal welfare standards** are upheld through their supply chain.

54%

said fashion brands should be **transparent about their standards on animal welfare**.

44%

were **concerned about animal welfare in the fashion industry** in general.

37%

said they will choose one fashion brand over another if they **prioritise animal welfare**.

A 2021 survey conducted by the Vegan Society found that

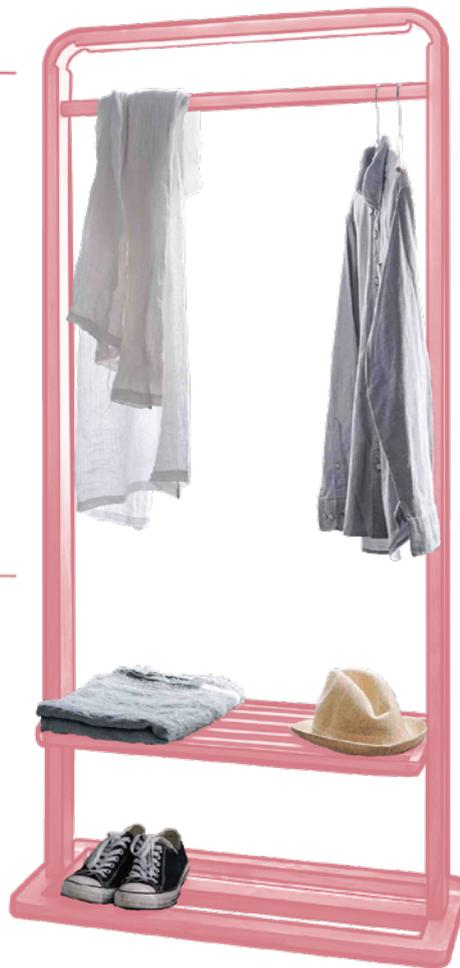
47%

of British citizens would like to **see more vegan items** across all fashion categories.

Sustainable fashion industry is **worth around 6.95 billion**

By 2025, that figure is projected to reach

10.281 billion⁸⁸



Gen Z is adopting more **sustainable behaviours** than any other groups

50%

reduced how much they buy

45%

stopped purchasing certain brands because of ethical or sustainability concerns.

As wealth transfers to younger generations, sustainability and ethical considerations will need to become the standard and should be transparent throughout the value chain.

– DeLoitte UK-based research, 2022⁸⁷

*based on a 2021 Global YouGov poll, commissioned by FOUR PAWS International.

The impact of ADMs on animal welfare

Intensive animal agriculture is inherently detrimental to the welfare of the animals involved. With 5 billion animals used in textiles each year²⁷, animals whose skins and fibres are sold to the global fashion industry, the risk of suffering is enormous. From sheep being mulesed without pain relief, to live plucking of ducks for their feathers and the dehorning of cattle as well as the shocking keeping conditions used in fur farming, there are many issues throughout the production process that pose significant implications for animal welfare. Such cruelty and the inherent risk in commercial systems, make it exceedingly challenging to ensure animals are treated humanely and in a manner that aligns with the expectations of most consumers.

Once these animals become materials for fashion products, it can be easy to dissociate these products from the suffering that went into their making. However, the animals used in these supply chains are sentient beings, with strong bonds, thoughts and feelings and should not simply be thought of as commodities; they are worthy of moral consideration and respect, and infinitely more than non-sentient fossil fuel or plant-based supply chains.

“There’s this kind of mindset – that killing animals just for handbags, slaughtering them, skinning them, cutting down our rain forests – is fine, that’s capitalism, and that’s how we should make money. I’m, like, – that should be guilt, you should feel bad when you work in that way.”

– Stella McCartney²⁸

Animal welfare certifications and brand policy

The fashion industry has attempted to mitigate some of the impacts of its operations on animal welfare through the introduction of various animal welfare schemes and certifications. These initiatives encompass a variety of strengths and weaknesses (for more information refer to the [Annex](#)), often legitimising and encouraging the use of high-risk fibres. In saying this,

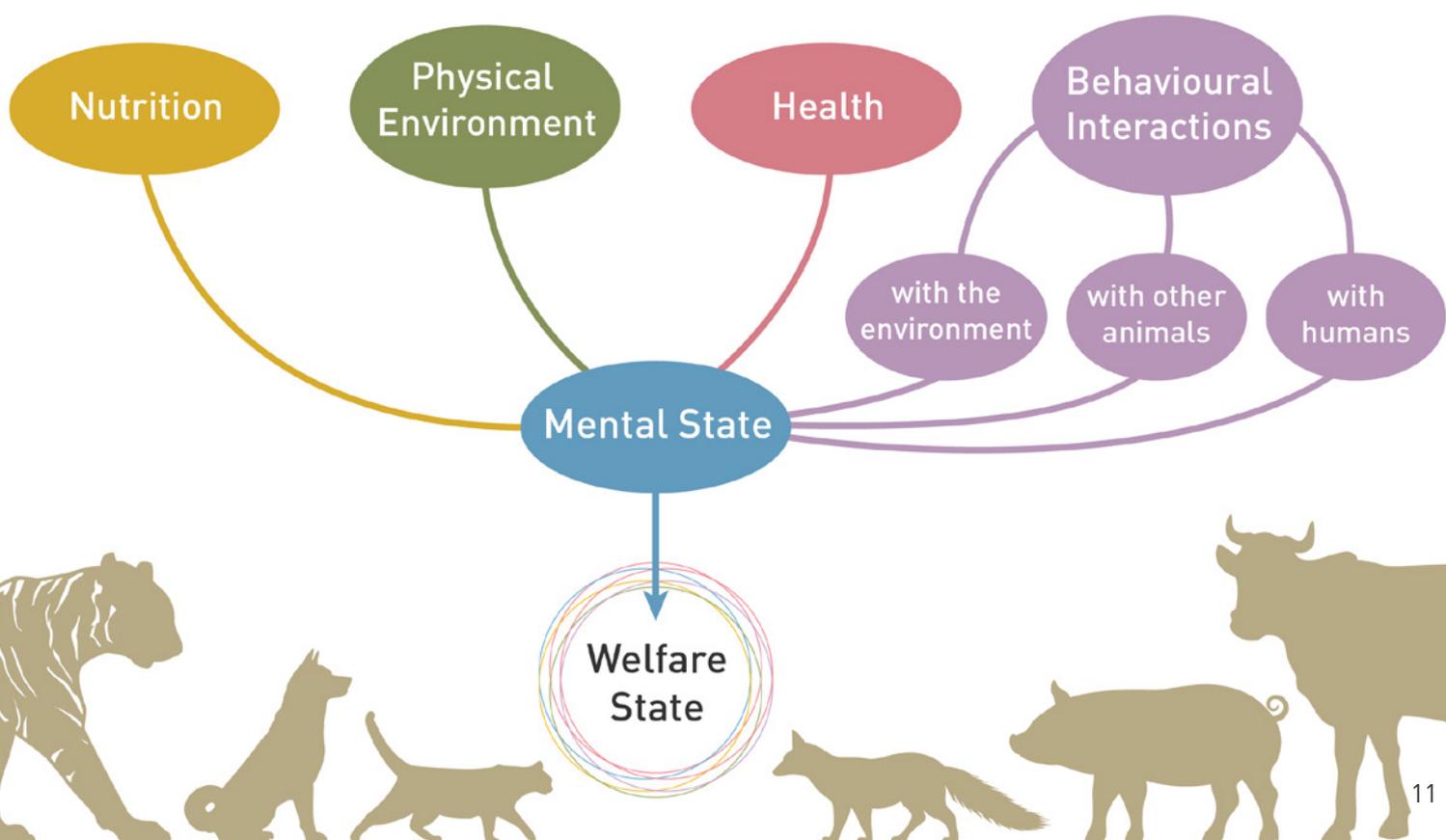
most farms and abattoirs selling skins, feathers and fibre are not certified at all, and most brands fail to commit to even partly certifying their supply chains.

Still today, formal brand animal welfare policies, if they even have them, often fail to reflect the latest scientific developments informing best practices in animal welfare. Most notably:

- Brand policies vary greatly in both quality and assurance, ranging from unverified claims and placing all responsibility on suppliers, to more involved responsibility and ensuring third-party audits.
- There are substantial issues with transparency and varying levels of regulation in upholding the use of animal welfare standards.
- Many policies are based on the concept of the 'Five Freedoms', despite the latest scientific research which finds this to be an outdated tool²⁹. To cover the fundamentals of animal welfare best practice, the General Animal Welfare Aims of the Five Domains model should be at the heart of all animal welfare standards and policies, the model should be understood by the responsible team, and backed by plans on how a brand is going to reach an excellent standard of welfare according to this model.

Despite the noted weaknesses, certification initiatives can still be an important avenue for fashion brands to help achieve higher standards of animal welfare,

The Five Domains model of Animal Welfare was developed to evaluate and enhance animals' well-being by considering their experiences in five interconnected domains: nutrition, environment, health, behaviour and their mental state.



and their use is the minimum a brand should commit to, to help achieve traceability and promote animal welfare. Ideally, brands would go beyond using certified supply chains, engage more directly with their supply chain, and support them to improve.

While certification does bring value, the sad reality is that they can not eliminate animal suffering in industrial ADM production. The complex commercial supply chains that originate in livestock systems are inherently high risk to the welfare of the animals caught up in them and will continue to cause immense and vast suffering whilst ever their welfare comes second to profit. The best way to eliminate risk completely is to avoid financial ties to these industries, avoid sourcing from industries that are often profiting from cruelty, and instead invest in the development, scaling, and use of alternatives.

For detailed information regarding the animal welfare implications of specific ADMs, please refer to the second part of this report series [Taming Fashion: A review of the negative effects of fur, wool, down and leather](#).

The impact of ADMs on the environment

In March 2023, the United Nations Intergovernmental Panel on Climate Change (IPCC) published the AR6 Synthesis Report, highlighting the urgent need for drastic action on GHG emissions reduction, concluding that climate impacts like flooding and drought are more severe than previously thought, with poorer global regions suffering the worst of the consequences³⁰. The report cited that changes in global food systems would reduce GHG emissions significantly, and with intensive animal agriculture fuelling the climate crisis, we must reduce the consumption of animal products, and implement solutions to halt this unfolding catastrophe.

The production of most ADMs is intrinsically linked to either the production of meat, dairy or eggs, and the negative environmental impacts of these industries. Livestock farming in general accounts for approximately 32% of human-caused methane emissions³¹, with cattle farming, the source of much of the global leather supply, representing about 65% of the livestock sector's emissions³². The associated waste from livestock farms, including manure, also has serious implications for water quality; water contaminated with fertiliser, pesticides, antibiotics, vaccines, hormones and zoonotic pathogens can run off from farms and impact local ecosystems and drinking-water sources³³. Livestock grazing is also responsible for almost 40% of global forest loss, and almost three-quarters of deforestation in South America³⁴.

- 70% of deforested land in the Amazon is used for cattle ranching³⁵, which is also the single largest driver of deforestation of tropical forests globally³⁶.
- Deforestation caused by cattle ranching in the Amazon rainforest accounts for almost 2% of global CO₂ emissions annually, equivalent to the emissions from all aeroplane flights globally³⁷.
- Australia is the only country in the developed world included in the WWF's list of global deforestation hotspots. Queensland is the nation's deforestation frontier, with cattle farming the major driver, accounting for 73% of all deforestation in the state between 2013 and 2019, rising to over 90% in the Great Barrier Reef catchment area³⁸.

Deforestation due to cattle farming



in the Amazon



in Queensland, Australia



Biodiversity, a crisis of unprecedented magnitude

Animal agriculture has had profound and far-reaching effects on biodiversity worldwide. Biodiverse ecosystems are filled with many different types of animals and plants, and are crucial for human well-being, the functioning of our planet, food-systems and climate change mitigation. They exhibit greater resilience, provide essential services such as clean air and water, nutrient cycling and pollination of crops, even serving as sources for medicinal discoveries. Furthermore, biodiverse ecosystems hold immense cultural, aesthetic and spiritual value³⁹.

The vast deforestation caused by animal agriculture, and the clearance of forests for livestock rearing or to cultivate the enormous volumes of feed required to sustain them, disrupts or annihilates ecosystems, and displaces and eradicates wildlife⁴⁰. Animal agriculture is also a key driver of habitat fragmentation, pathogen transmission, feed competition, and human-wildlife conflict⁴¹.

Intensive animal agriculture also exerts substantial pressure on water resources and contributes significantly to water pollution. The sector also generates copious amounts of waste, including over 22 billion tons of manure annually, which, when not properly managed, can contaminate water bodies with nitrogen and phosphorus, causing eutrophication⁴². This can be toxic to aquatic life, and contaminate drinking water, causing illness for humans and animals⁴³. It is time to bring the whole system back into balance.

“Nature has been most negatively impacted by land-use change and animal agriculture the primary cause of it⁴⁴.”

– IPBES

Not simply a by-product

A common misconception about ADMs and the justification of their use is that most are mere by-products of livestock farming that would otherwise go to waste. However, it is important to recognise that products like wool and leather are both highly lucrative. Leather, for instance, plays a vital role in the economic value chain of livestock, contributing up to 26% of an abattoir's earnings⁴⁵. Abattoirs are a critical component of industrialised agriculture, and their financial viability is supported by the sale of leather.

“Global raw leather and hide exports were valued at almost USD 18.5 billion in 2019⁴⁶, while global beef exports were valued at USD 60.1 billion in 2021⁴⁷.”

Similarly, wool is not only not a by-product but often the primary product. Sheep can be raised for milk, meat, and/or wool depending on the breed⁴⁸, and then slaughtered for meat when their wool quality diminishes⁴⁹. Sheep's wool can be a more profitable

commodity than sheep's meat. When the wool market is unstable or the value of wool drops, the value of meat is often relied on⁵⁰. Ultimately, ADM industries are intrinsically linked to slaughter-based industries, and the suffering and environmental impacts of those production supply chains.

Various other parts of animals killed for human consumption are also sold as commodities, from bovine collagen for beauty products (also recently linked to deforestation in the Amazon)⁵¹, to lanolin from sheep's wool for cosmetic and pharmaceutical products⁵² all of which are significant income earners^{53,54}. Those profiting from the sale of these 'by-products' are fuelling continued growth of the inefficient and high-risk meat industry.

“Wool is a highly profitable commodity; the world wool trade amounted to USD 2.5 billion in 2020, with Australia leading as the top export nation and China as the leading import nation⁵⁵.”

Consumption of meat and the role of regenerative farming

The ADM industry is closely intertwined with the meat industry, which has been proven to be an inefficient way to feed our growing global population⁵⁶. For example, livestock farming accounts for 77% of all global farming land, yet it produces only 18% of the world's calories, 37% of protein⁵⁷, while accounting for nearly 60% of all GHG emissions generated by the entire food sector⁵⁸.

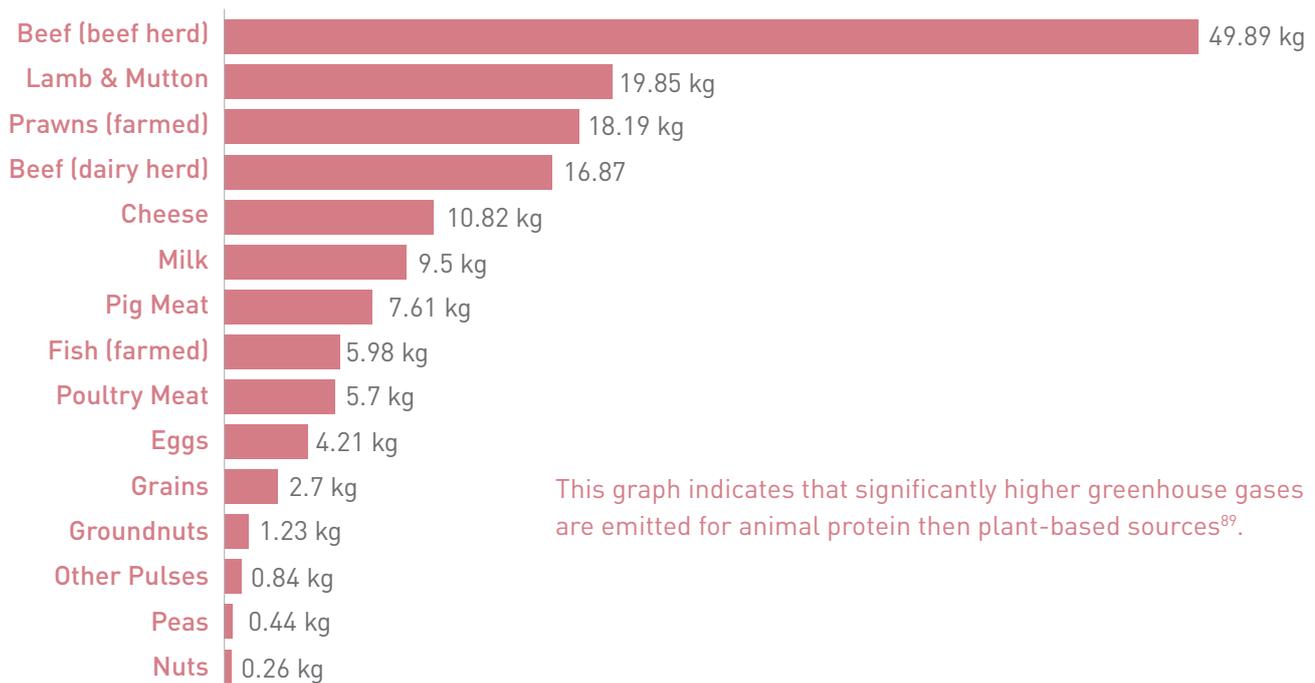
Given that a plant-based diet can adequately provide humans with all necessary nutrients⁵⁹, for those particularly for those in the Global North, the choice to adopt meat-rich diets is often driven by preference rather than necessity. The current global

consumption of meat exceeds both the environmental boundaries set by our planet and human dietary health recommendations. Humans consume twice the recommended amount of meat globally, and it is especially in the affluent nations in the Global North that should strive to reduce their meat intake by approximately 70%⁶⁰. Interestingly, while meat consumption is rising globally due to population growth and increasing wealth in certain countries, the number of people choosing animal-free diets and wardrobes is also growing^{61,62}.

To meet our global biodiversity and climate change targets, we need this trend to continue, and the fashion

Greenhouse gas emissions per 100 grams of protein

Emissions are measured in carbon dioxide-equivalents



Source: Joseph Poore and Thomas Nemecek (2018), Additional calculations by Our World in Data.

OurWorldinData.org/environmental-impacts-of-food | CC BY

industry can certainly help to make this happen. While regenerative practices in animal-based agriculture can reduce environmental impacts, we must not disregard the imperative to heavily decrease our consumption of animal-based products overall.

In addition, while animal welfare is often associated with regenerative agricultural practices, significant work is needed to firmly entrench animal welfare as a defining principle of the regenerative agriculture movement⁶³. While some potential welfare improvements for farmed animals may be realised via regenerative approaches, there are no guarantees. Regenerative farming makes no promise of improving basic welfare standards for animals such as the provision of suitable shelter, veterinary care, the prevention of family unit separation, or the avoidance of animal mutilations such as mulesing or castration without pain relief.

It is worth emphasising that nutrient cycling also does not necessarily require the use of animals which are part of a slaughter-based industry or to be owned domesticated animals. In fact, wildlife has the potential to fulfil the same role if given the opportunity. In

addition, plant-based agriculture can play a significant role in promoting soil regeneration⁶⁴.

“Rising animal production and consumption, whatever the farming system and animal type, is causing damaging GHG release and contributing to changes in land use. Ultimately, if high-consuming individuals and countries want to do something positive for the climate, maintaining their current consumption levels but simply switching to grass-fed beef is not a solution. Eating less meat, of all types, is.”

– Dr Tara Garnett of the Food Climate Research Network at the University of Oxford⁶⁵

For detailed information regarding the environmental implications of specific ADMs, and how ‘natural’ they are, refer to [Taming Fashion – Part Two: A review of the effects of fur, wool, down and leather](#).

The impact of ADMs on people

The fashion industry cannot be truly ethical unless it is inclusive of social and human rights, and there are many inherent social and human injustices in the industrialised production of ADMs, including their impact on public health, community environments, and supply chain workers.

Public health

COVID-19 recently exposed the health risks associated with using animals at scale in global supply chains, including in the fashion industry. Large numbers of animals kept in cramped conditions are characteristic of intensive farming and can provide a breeding ground for harmful pathogens and zoonoses to spread.

“In 2020, in Denmark alone, 17 million minks were culled when it was discovered that COVID-19 had spread to mink on fur farms, mutated, and then spread back to farm workers⁶⁶.”

COVID-19 is the latest in a long string of animal-borne diseases such as swine flu and avian flu, which are making headlines once again due to various outbreaks across the world^{67,68}. Avian flu is of particular concern at present, with intensive poultry farming exacerbating the issue⁶⁹. Poultry farming is also the main source of down and feathers, making material sourcing from these systems even more problematic.

Antibiotic resistance also poses a growing and alarming risk to human health, which is directly linked to livestock farming. The over-use and misuse of antibiotics in factory farms, aimed at mitigating disease outbreaks, is particularly prevalent in intensive



farming settings. This practice has been proven to fuel the emergence of antibiotic-resistant bacteria, presenting one of the most significant threats to contemporary society. Already estimated to cause approximately 700,000 deaths per year globally, there is a pressing need to end intensive agriculture⁷⁰.

“In some countries, approximately 80% of total consumption of medically important antibiotics is in the animal sector, largely for growth promotion in healthy animals.”

– World Health Organisation⁷¹

Impact on community environments

The environmental impacts of intensive farming and ADM production often disproportionately affect minority and low-income communities. For example, in an effort to export pollution problems, many tanneries are located in lower and middle-income countries where untreated wastewater is often released into waterways, impacting the health of surrounding land and communities⁷². Intensive farming also exacerbates environmental injustice with the placement of intensive farming operations near low-income communities⁷³ whose soil and water quality are negatively affected⁷⁴. A prime example of this is cattle ranching which is both the main driver of Amazon deforestation and a very real threat to the rights of Indigenous and traditional peoples who live there⁷⁵.



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Impact on workers in ADM supply chains

Working within these intensive farming systems and supply chains are labourers who are often subjected to poor working conditions. Labour trafficking, debt bondage, and other forms of forced labour have all been reported in leather producing countries^{76,77}. Slaughterhouses are known for having a negative impact on the mental health of those who kill animals for a living, with many suffering from symptoms of traumatic stress⁷⁸. Tannery workers also suffer from exposure to toxic chemicals during the tanning process, with many at increased risk of cancer⁷⁹.

Animal-free material innovation

As fashion brands, designers, and consumers evaluate the impacts of raw materials used in the industry, they are increasingly looking to innovative new materials that can offer the same functionality and quality without the cost to animals, the environment, and people. This has led to the development of a new material category known as 'next-gen materials.'



What are next-gen materials?

According to the Material Innovation Initiative (MII), next-gen materials can be defined as environmentally preferred, "livestock-free direct replacements for conventional animal-based silk, fur, down, wool, leather, and exotic skins. Their primary inputs are

usually plant-derived, mycelium, cultivated animal cells, microbe-derived, recycled material, or a blend of these materials, and a range of biomimicry approaches are used to replicate the aesthetics and performance of animal-derived counterparts⁸⁰."



Plant-derived

Applies to next-gen materials derived from virgin or waste/byproduct plant matter. For simplicity, fungi (fruiting body) and algae inputs are included in this category, even though they are not plants.



Mycelium

Applies to next-gen materials that utilise the root-like structure of some fungal species called mycelium. This category is distinctive from the plant-derived category due to the rich activity of next-gen innovation involving mycelium.



Cultivated animal cells

Applies to next-gen materials that utilise tissue engineering approaches to grow animal cell constructs (e.g. skin) in the laboratory.



Microbe-derived

Applies to next-gen materials that utilise cellular engineering approaches such as cell culture or fermentation processes to produce products such as proteins and biopolymers for next-gen material formulations.



Recycled material

Applies to next-gen materials that utilise recycled plastic or recycled textile feedstock as a main input.



Blend

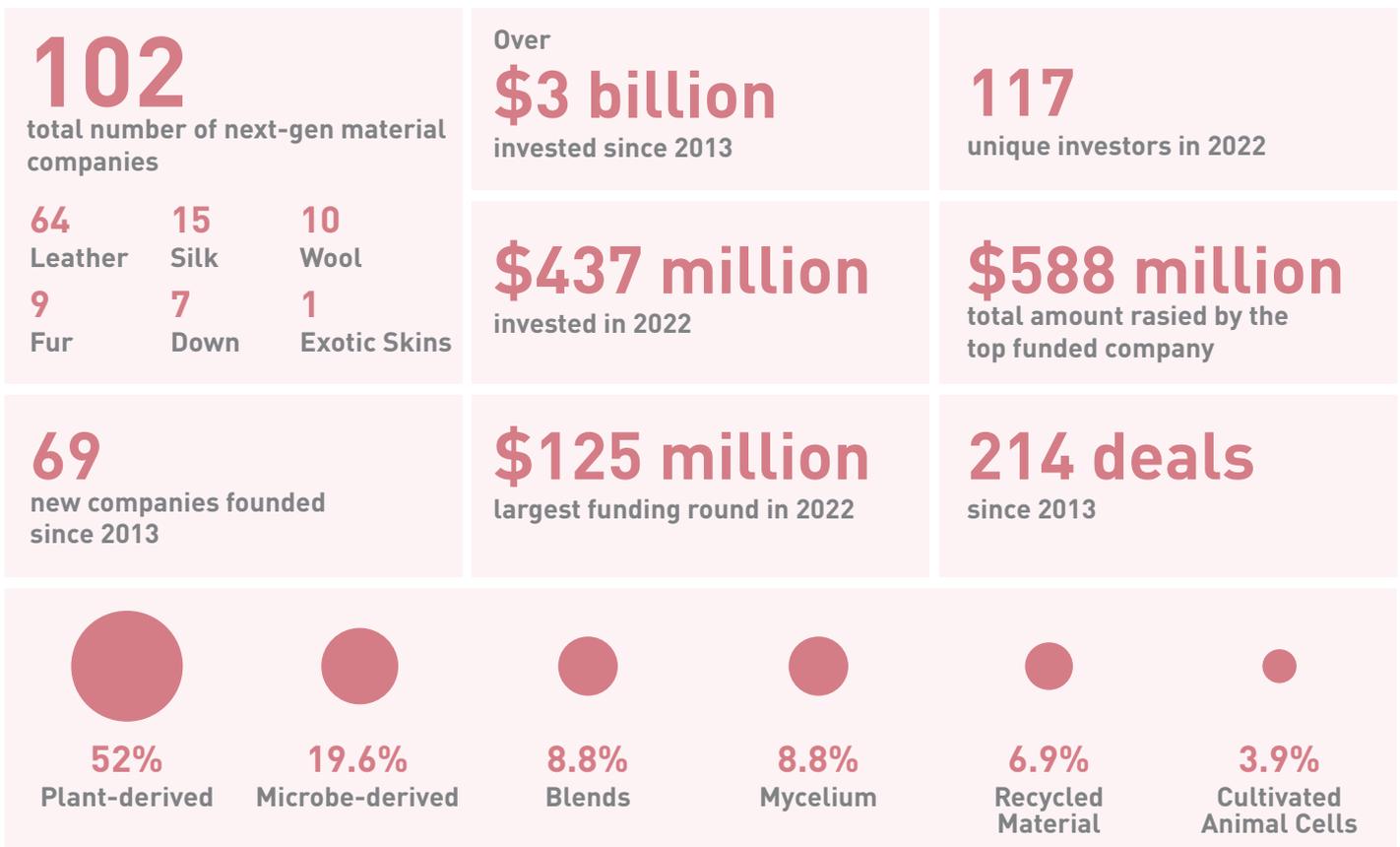
Applies to next-gen materials that use a blend of components not well-captured by any of the above categories.

In fact, over 100 brands are now utilising next-gen materials, and in response to this increasing interest, the last year has seen the continued acceleration of innovation, adaptation, and growth of next-gen materials and a rapidly growing number of highly innovative tech start-ups adopting ambitious and transformative approaches. Today there are 102 companies working to develop and/or scale up the production of next-gen materials⁸¹.

Millions of tonnes of agricultural waste from plant-based industries such as rice, oil palm wheat and corn, pineapple and banana have been identified as potential feedstock for next-gen material development. Utilising these will further reduce the fashion industry's reliance on virgin agricultural products⁸².

Brands can play an important role in developing the next-gen ecosystem, including funding internal and external innovation initiatives, switching to next-gen materials for their raw materials, and collaborating with next-gen material startups to create new products. There are numerous next-gen materials already catering to all segments of the fashion industry, and adopted by brands such as Stella McCartney, Adidas, Balenciaga and Lululemon Athletica⁸³.

Next-gen materials have the capacity to have a lower environmental impact and an almost non-existent animal welfare risk as these materials effectively decouple animal suffering in the production of textiles. The alternative material landscape is still developing and will require further support and investment so that reliance on ADMs can be significantly reduced as quickly as possible. While more research is being conducted in this area, next-gen materials currently present a promising opportunity for the fashion industry to combine the textile performance of ADMs (including look, feel, and durability) with a markedly reduced CSR risk.



Source: Material Innovation Initiative 2023⁹¹



Embracing change for animals and our planet

Given the sheer scale of the animal welfare and environmental implications of ADMs outlined above, it is essential that brands look to incorporate less damaging and more responsible materials in their supply chains. Fortunately, there are several proactive steps that brands can and are taking to mitigate the impact of their material choices and move toward more ethical supply chains.

Today, well over 100 leading brands are creating products with next-gen materials, including Adidas boxing gloves made from Desserto®, 'cactus leather', Hermes bags made from MycoWorks Mycelium and Hugo Boss shoes made using Piñatex®. Similarly innovative products have been developed by Gucci, H&M, Reformation, Stella McCartney and UGG, just to name a few.

But what animal-free and potentially more environmentally preferable alternatives are in the market today?

Table one: Examples of ADM alternatives

Recycled non-ADM	Next-gen and plant-based materials examples	Visual example per category
ALT FUR		
<p>Recycled PET</p> <p>Recycled faux fur</p> <p>Recycled denim</p>	<p>Bio-based fur, made from plant-based and recycled polyester materials, e.g. ECOPEL KOBA®</p> <p>Hemp</p> <p>Brewed Protein staple fibres, e.g., Spiber®</p>	
ALT WOOL		
<p>Recycled PET</p>	<p>Wood cellulose, e.g. Tencel®,</p> <p>Regenerated cellulose, e.g. Circulose®, Spinnova®, NuCycl™ by Evrnu</p> <p>Biobased regenerative fibres using waste, e.g. Woocoa® made from coconut and hemp</p> <p>Calotropis plant and regenerated organic cotton e.g. WEGANOOL™</p> <p>Nullabor® lyocell fibre that is tree-free, converting waste products into lyocell</p> <p>Brewed Protein staple fibers, e.g. Spiber®</p> <p>Hemp bicomponent & regenerated polyester, e.g. Polyana®</p> <p>Soybean protein fibre, uses leftover soybean pulp from tofu or soybean production, e.g. Vegetable Cashmere®, Baby Soy®</p> <p>Cotton</p>	
ALT DOWN		
<p>Recycled PET</p>	<p>Kapok fibre, e.g. Flocus®</p> <p>Brewed protein staple fibres, e.g. Spiber® are cut into short lengths, twisted and entangled</p> <p>Plant based fibre fill, e.g. FLWRDWN™ by Pangaia made using a combination of wildflowers, biopolymer and aerogel; SaltyCo® BioPuff® derived from wetland plants; Sorona® Aura a plant-based polymer</p> <p>Regenerated fibers, e.g. Thermoball™ Eco by The North Face, made from 100% recycled fabrics & insulation</p> <p>Temperature regulating finishes, e.g. 37.5®, made from active carbon particles obtained from volcanic sand; this patented technology helps your body naturally thermoregulate.</p>	

Recycled non-ADM	Next-gen and plant-based materials examples	Visual example per category
ALT LEATHER		
Recycled PET	Collagen-based leather, e.g. Modern Meadow® using precision fermentation	
Recycled PU	Agricultural waste and coated with plant-based oil resin, e.g. Mirum® by Natural Fiber Welding is 100% plant-based and plastic-free	
Recycled Rubber	Mycelium leather, currently being scaled up and produced by several companies, is made using the root like structure of a fungus, e.g. Mylo, Ecovative®, Myco Works®	
	Plant-based leathers and blends made from corn, bananas, cactus, pineapple leaves, apples, grapes, rice and more, e.g. Desserto®, Bananatex®, Piñatex®, Vegea®	
	High-density wood pulp cellulose, or recycled paper, e.g. Jacron, a paper-like or leather-like material	
	Brewed Protein polymer, e.g. Spiber®	
	Stem cell tissue engineering, e.g. VitroLab®, currently being commercialised	
	Biosynthetic using microorganisms found in nature which use greenhouse gases and turn them into a biodegradable replacement for synthetic plastic and animal leather, e.g. Newlight Technologies - Covalent™ and AirCarbon®	

For further information about how to source these materials, we recommend reaching out to groups such as the Material Innovation Initiative (MII) who specialise in supporting partnerships built to enable the uptake of these materials. MII also has a large range of resources available via their website, including the most recent State of Industry Report: Next-Gen Materials⁸⁴.

Brands on the frontier

From SMEs to the biggest players, these brands are investing in and trialling new materials, as well as collaborating with next-gen companies, and paving the way.

Pangaia

- **Who is PANGAIA and what is your team aiming to achieve?**

“First and foremost, PANGAIA is a materials science company. We started three years ago as a collective of scientists, designers, technologists, and creatives to build this new kind of business – one that operates in harmony with nature and works to safeguard a future for generations to come. We report on our progress towards our goal on an annual basis through the publication of our Impact Report.”

“Sustainability is always a series of compromises based on priorities, and we need a lot of people doing some things better, rather than a few people doing everything perfectly.”

– Dr Amanda Parkes, Chief Innovation Officer, Pangaia



- **Tell us about the highly innovative material – FLWRDWN™.**

“FLWRDWN™ is our patented plant-based alternative to animal and synthetic down materials. FLWRDWN™ was created as an innovative material solution that can replace goose down and synthetic polymer alternatives traditionally used for insulation purposes. FLWRDWN™ is a down-fill material made using a combination of wildflowers, a biopolymer and aerogel.”

We use wildflowers that directly support habitat conservation and are managed by a non-governmental organisation (NGO). They are also grown without any pesticides or artificial irrigation – preventing pollution and saving water. Our biopolymer is made from maize (corn). The wildflowers have a down-like microstructure, so when we combine them with our biopolymer it brings out the thermal-warming properties. Our patented Aerogel took our scientists over 10 years to develop. It gives strength to our FLWRDWN™ products, increasing their performance and durability.

This warm, breathable, and cruelty-free innovation is the first of its kind, used in our outerwear jackets, vests and accessories. Our latest iteration FLWRDWN™ 1.2 demonstrates that natural, animal-free alternatives are a viable option and that with greater adoption, we can push the apparel industry towards a more responsible, kinder future.”

Miomojo

- **What does Miomojo specialise in?**

“We are a vegan company and a certified B Corporation based in Bergamo, Italy, which designs and produces cruelty-free accessories. With creativity and compassion, we have proved that it is possible to have fashion, without fashion victims.”

- **What materials do you use, why and how do you source sustainability?**

“We use the entire range of incredibly innovative, next-generation materials derived from plant-based resources, such as apples, corn, grapes, rice, wood, and cactus. Turning skin into leather requires massive amounts of energy and dangerous chemicals, other than killing billions of animals per year. Nonetheless, this is just an intermediary step: we are working together with amazingly innovative companies to use lab-grown materials that put us on a path toward a more sustainable future. This is the time for evolution towards kindness, and it begins in nature.”

- **What is one piece of advice you'd give to other brands?**

“Become a change-maker, disrupting the unsustainable, unethical status quo! Brands that want to lead the cultural conversation need to think beyond reducing harm and consider ‘how could a product benefit the environment and really shift the thinking?’ Brands should anticipate the potential reputational damage of using animals. Consumer attitudes are shifting quickly. And they are shifting towards a kinder lifestyle with no compromise in ethics and aesthetics.”



Infantium Victoria

● Who is Infantium Victoria:

“Infantium Victoria is a luxury children’s fashion brand. We are known for our avant-garde and sustainable designs. It was founded in 2014 by Julia Gaydina and Dinie van den Heuvel. We focus on innovative techniques combined with eco-friendly materials to create stylish and conscious clothing for children. The collections often feature dark colours and bold designs reflecting a unique aesthetic that sets them apart in the children’s fashion market. Each season, we address current sustainable hot topics in ways children can understand and relate to.”

● Our commitment?

“We have been committed from the start to run a completely vegan fashion brand. From our buttons, our fabrics, and our dyes, we avoid all animal products. It’s something very close to our heart since both me and Julia have been vegan since longer than we can remember. We are PETA-certified and have been roaming the globe looking for the best plant-based fashion materials.”

● What keeps us going?

“Curiosity!! And a desire to help make the world a better place for all sentient beings. We recently have bought our first Malai coconut leather and are in the midst of experimenting with it. And a few years ago we came across Weganool, a plant-based textile that feels like cashmere, without using any animal products, and we fell in love with it. It’s light, natural, super soft and very warm. We started bringing it to Europe so other companies could also get to know it. We love the diversity plants can bring us.”

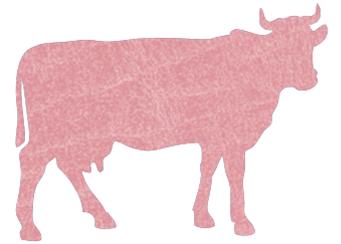


Recommendations

Brands wanting to do better for both animals and the environment are encouraged to:

Reduce

Reduce the overall volume of ADMs used, and clearly communicate time-bound targets to do so within their animal welfare policies and sustainability reports (e.g. a 25% reduction commitment by 2030). This must be a priority and all wild animal use should be completely avoided.



Replace

ADMs with more sustainable animal-free alternatives such as recycled non-ADMs and next-gen materials. Brands can invest in next-gen material innovation companies, commit to in-house research and development of new fabric innovations, and/or collaborate with next-gen material companies to create new products together.



Refine

For brands continuing to use ADMs, refine sourcing, and procurement choices to encourage higher levels of welfare within animal-based supply chains, thoroughly engage animal protection organisations, suppliers and growers, and join multi-stakeholder initiatives to help drive industry solutions.



Materials matter

Brands committed to social accountability should consider replacing 'business as usual' ADMs with materials from categories in the order listed below.

1 Next-gen materials and recycled non-animal derived materials (non-ADMs)

- Brands should first look to next-gen materials and recycled non-ADMs.
- Next-gen materials are already widely available. Seek them out and watch for those that are currently in development.
- Recycled non-ADMs have a lower risk profile than their ADM alternatives. Environmentally they often perform better as they are not reliant on virgin materials, and they have a negligible animal welfare risk.
- Where possible, ask for Life Cycle Assessment measurements to enable more accurate comparisons. Comparing materials undoubtedly remains a difficult issue for brands, but we must act with the data available today.

2 Recycled domesticated animal-derived materials (recycled ADMs)

- For those specifically wanting to use ADMs, we urge companies and consumers to first seek recycled domesticated ADMs. Fortunately, recycled ADMs are becoming increasingly available, and this trend is set to continue.
- When using recycled materials, ensure that they are officially certified to the Global Recycled Standard or an equivalent standard. Ideally these recycled materials would be from post-consumer waste rather than pre-consumer waste, to reduce both animal welfare risk and commercial incentives.



Sandals by Twoobs

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3 ADMs from high welfare supply chains

The only way to eliminate animal welfare risk is by removing ADMs from supply chains entirely. However, brands that continue to use ADMs must encourage a better standard of care by taking the following actions:

Develop and communicate robust animal welfare policies.

- Ensure that those policies are effectively enforced across all tiers of the supply chain.
- Brands should make every effort to engage with suppliers and other important stakeholders across the supply chain to enhance traceability to farm level and minimise poor practices. By meeting farmers directly, as well as suppliers, brands can better relay their expectations and support them to make animal welfare improvements.
- For detailed guidance on updating or implementing an animal welfare policy, check out the [Wear It Kind Industry Information](#).

Mandate use of ADMs certified to best available animal welfare standards and ideally go above and beyond.

- At a minimum, ensure ADMs are certified to the highest animal welfare standards available. Again, information can be found on [Wear It Kind Industry Information page](#) about FOUR PAWS view of the certifications available today. It is important to strive to use the best available standard, as even these will not eliminate animal welfare risks, and some do very little at all.
- To the benefit of brands, many certifications also help to address both environmental and animal welfare risk areas. While there is still a long way to go for these certifications to develop into more credible tools, it is vital that this be a minimum entry point for ADM material selection.
- Brands that opt to use uncertified ADMs without taking additional measures to ensure animal welfare and environmental protection are blatantly disregarding these concerns and, likely, contributing to the perpetuation of animal suffering.

NOTE: The use of wildlife-derived materials, both virgin and recycled, must be completely avoided without exception. Contrary to the rhetoric surrounding the idea of sustainable wildlife use, the fashion industry's historical reliance on wildlife has led to the endangerment or extinction of numerous species^{85, 86}. Additionally, the inherent suffering and welfare risk to genetically wild animals and their offspring (whether bred or captured from the wild) is extremely high.

Conclusion

This report demonstrates that animal welfare does not need to be 'traded off' for environmental benefits and that, in fact, fashion brands should be looking to embrace innovative solutions in the form of next-gen and/or recycled animal-free materials.

The various case studies highlighted in this report have also shown that when companies reduce the number, or improve the welfare, of animal supply chains, they not only position themselves in a market that increasingly demands better for animals, but are also effectively responding to changing consumer expectations.

Fortunately, due to rapid technological developments, there is an ever-growing range of next-gen and recycled materials available and, by embracing and supporting their development, fashion brands can

take a significant step towards greater sustainability. To make a meaningful impact, we must embrace this ever-changing landscape as one that is full of possibilities and opportunities for positive change. Our future needs to be one of innovation that works with – not against – nature.

Although it may seem like there is a long way to go before the fashion industry loses its insatiable appetite for ADMs, there is much to be hopeful for. With the ever-increasing demand for change from both consumers and regulators, reducing use of ADMs and adopting environmentally-preferred alternatives such as next-gen materials are critical steps the fashion industry must take to lessen its impact on animals and the environment.



Boots by Good Guys Don't Wear Leather

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Annex

FOUR PAWS assessment of the strengths and weaknesses of animal welfare certifications currently available.

	Animal welfare	Robustness and Traceability
Weaknesses	Behavioural interactions Most certifications are lacking in requirements for social interactions e.g., animals are not required to be kept in stable groups and mother-bonded rearing is not required. Most certifications also do not require any forms of environmental enrichments for the animals, despite being crucial to their overall positive mental state.	Governance Most certifications lack: <ul style="list-style-type: none"> - a grievance mechanism to raise complaints to standard-setting and other decision-making and public reporting on responses to such complaints - public reporting on findings from certified supply chain audits and responses to such findings
	Health Pain relief is very rarely specified as a mandatory requirement during animal procedures. Most certifications also do not require regular veterinary checks. In some cases, certifications do not even specify general welfare checks to be done by the farmers.	Implementation Certifications rely solely or heavily on audits, despite independent research from the garment and footwear sectors which reveal audits alone are typically insufficient for detecting systemic supply chain risks.
	Physical environment For most certifications, neither tethering nor individual keeping are prohibited (or one is, but not the other). Most also lack requirements for appropriate bedding and flooring in provided shelters.	Transport Most certifications do not specify traceability requirements for the appropriate handling of animals during transport and nor for actual the transport of the animals, which is largely invisible despite the detailed animal welfare requirements that are outlined for this aspect of the supply chain, which are effectively unverifiable.
Strengths	Prohibition of one or more cruel practices Most certifications prohibit one or more cruel practices in certified supply chains, such as mulesing and live plucking.	On-site audits Most certifications have a mandatory requirement for on-site audits for new entities to obtain certification.
	Shelter Most certifications make shelter of some form a requirement, with more than half of certifications requiring that it protects the animals from extreme temperatures.	Meaningful consequences for non-compliance Most certifications have proportional and meaningful consequences for non-compliance, which include cancellation or termination of certification for major core non-compliances.
	Injuries Most certifications maintain the health of animals by requiring inspection for possible injuries and the provision of appropriate sick care.	Chain of custody documentation Most certifications have detailed chain of custody documentation requirements to enable most entities along the supply chain to be traced and verified.

Contact

For more information about this report, please visit

wearitkind.four-paws.org/industry-information

or contact wearitkind@four-paws.org

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Limitations

This report has been developed to support companies in making a broader assessment of the environmental and animal welfare impacts of animal-derived materials in their supply chain. While comprehensive data, which considers all CSR risks and builds a more comprehensive picture is currently lacking, we have drawn on the data available to us. It is also important to note that the differences between materials in terms of quality and performance are not included in this report.

The conclusions drawn for the environmental component of this report rely on a variety of data, including from the Higg Material Sustainability Index (Higg MSI) which itself has several limitations. For example, the Higg MSI does not measure end of life impact of materials, nor does it account for biodiversity loss or land use changes. As these factors are not typically included in Life Cycle Assessments (LCAs), the environmental impact risks may be even higher than those highlighted in this report. We chose to consider the Higg Index, as despite the controversy, for high-level sustainability analysis, it remains accessible, provides broad-level data, and enables users to gain a sense of how materials compare.

It is expected that some of the information presented in this report will change over time as tools for measuring the impact of materials are improved and as data for new and innovative materials is made available. These documents may therefore be reviewed and re-issued periodically. Information included in this report should be considered in conjunction with other data sources, considering the purpose for which insights are intended.

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About FOUR PAWS

FOUR PAWS is the global animal welfare organisation for animals under direct human influence, which reveals suffering, rescues animals in need and protects them. Founded in 1988 in Vienna by Heli Dungler and friends, the organisation advocates for a world where humans treat animals with respect, empathy and understanding. The sustainable campaigns and projects of FOUR PAWS focus on companion animals including stray dogs and cats, farm animals and wild animals – such as bears, big cats and orangutans – kept in inappropriate conditions as well as in disaster and conflict zones. With offices in Australia, Austria, Belgium, Bulgaria, France, Germany, Kosovo, the Netherlands, Switzerland, South Africa, Thailand, Ukraine, the UK, the USA and Vietnam as well as sanctuaries for rescued animals in eleven countries, FOUR PAWS provides rapid help and long-term solutions.

FOUR PAWS has achieved many lasting improvements for animals used within the textiles industry, including:

- Launching the Wear It Kind animal-friendly fashion programme which encourages and advises brands on how to develop and implement meaningful animal welfare policies and has been supported by over one million people internationally.
- Continued support of the highly successful Fur Free Retailer programme, a global initiative run by Fur Free Alliance member organisations which over 1,500 brands and retailers have joined to stand united in their commitment against the use of fur.
- Exposing the cruelty of mulesing in the wool industry – over 350 brands have since expressed their opposition to the use of wool from mulesed sheep.
- Working with the European bedding and global outdoor clothing industries to lead a successful transition away from using down from live-plucked and force-fed ducks and geese.



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