Textile Exchange

Corporate Fiber & Materials Benchmark Program

Creating Material Change for Nature

Biodiversity Benchmark Companion Guide

Biodiversity Benchmark Companion Guide **2022**

Version 1

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Acknowledgements

The Biodiversity Benchmark and following guidance have been developed by Textile Exchange in partnership with The Biodiversity Consultancy and Dr. Helen Crowley (advisor to Conservation International), during her sabbatical from The Kering Group, and in consultation with Textile Exchange's Biodiversity Advisory Group. Made possible by the generous support of Sappi Ltd.

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Contents

This Companion to the Biodiversity Benchmark Survey Guide provides a "quick start" to contextualizing biodiversity risk from a materials sourcing starting point. While a company's biodiversity strategy is being fully developed and science-based targets confirmed, we advocate for a "no regrets" approach to action. The no-regrets approach (defined by the UNDP, UNEP, and IUCN and expressed by the Science Based Targets Network) focuses on *maximizing positive and minimizing negative aspects of nature-based adaptation strategies and options. No-regret actions include […] measures taken which do not worsen vulnerabilities [for instance, to climate change] or which increase adaptive capacities and measures that will always have a positive impact on livelihoods and ecosystems [e.g., regardless of how the climate changes].*

Textile Exchange is a member of the Science Based Targets Network Corporate Engagement Program.

Introducing the Biodiversity Benchmark

According to the World Benchmarking Alliance (WBA), benchmarking drives a "race to the top" and is one of the ways Textile Exchange (an ally of the WBA) mobilizes the industry to accelerate the uptake of preferred materials. Through Textile Exchange's Corporate Fiber & Materials Benchmark (CFMB) program and its annually published Material Change Index (MCI), participating companies are already making significant headway in identifying their portfolio of materials, the sustainability programs they are investing in, and targets for uptake and improvement, including Science Based Targets. The CFMB program also helps companies calculate uptake of preferred fibers and materials and report the extent to which materials are mapped back to the country of origin. This work forms the bedrock for understanding biodiversity risks and building a strategy to limit negative impacts from the company's supply base.

The role of the Biodiversity Benchmark is to help companies track how they understand biodiversity risk in their raw materials supply base and how they are addressing these risks through credible, good practice strategies. Our ambition is to help prepare the textile industry for urgent action on this important cross-cutting topic. The Benchmark is designed to help companies compare performance to fundamental elements of good practice biodiversity risk management. Practitioners can use the Biodiversity Benchmark to understand the direction of travel their company needs to commit to and implement in order to become nature positive by 2030. The Benchmark guidance provides practical knowledge and insights on biodiversity risks, relevance to the apparel and textile industry, and how these risks can best be managed.

The methodology for companies to set targets and track their contribution to the global goals for nature is being developed now through the Science Based Targets Network (SBTN). This Biodiversity Benchmark will develop alongside the Science Based Targets for Nature and we will work closely with the SBTN on consistency in language, frameworks, and measurements to support our benchmarking participants on their biodiversity journey. Use of this Benchmark - and its future iterations - will help companies prepare for stakeholder (including investor) questions around nature-related risk, such as those being developed by the Taskforce on Nature-related Financial Disclosures (TNFD), CDP, and Ceres. The Benchmark will also help companies in meeting the Sustainable Development Goals (SDGs).

The Biodiversity Benchmark was piloted in 2021 to establish a baseline of the engagement and effort that companies are starting to put into biodiversity. The findings from this first cycle were published as the first-ever Biodiversity Insights Report for the apparel and textile industry, helping us formulate where we should be heading and to appreciate what best practice looks like today.

Biodiversity Benchmark framework

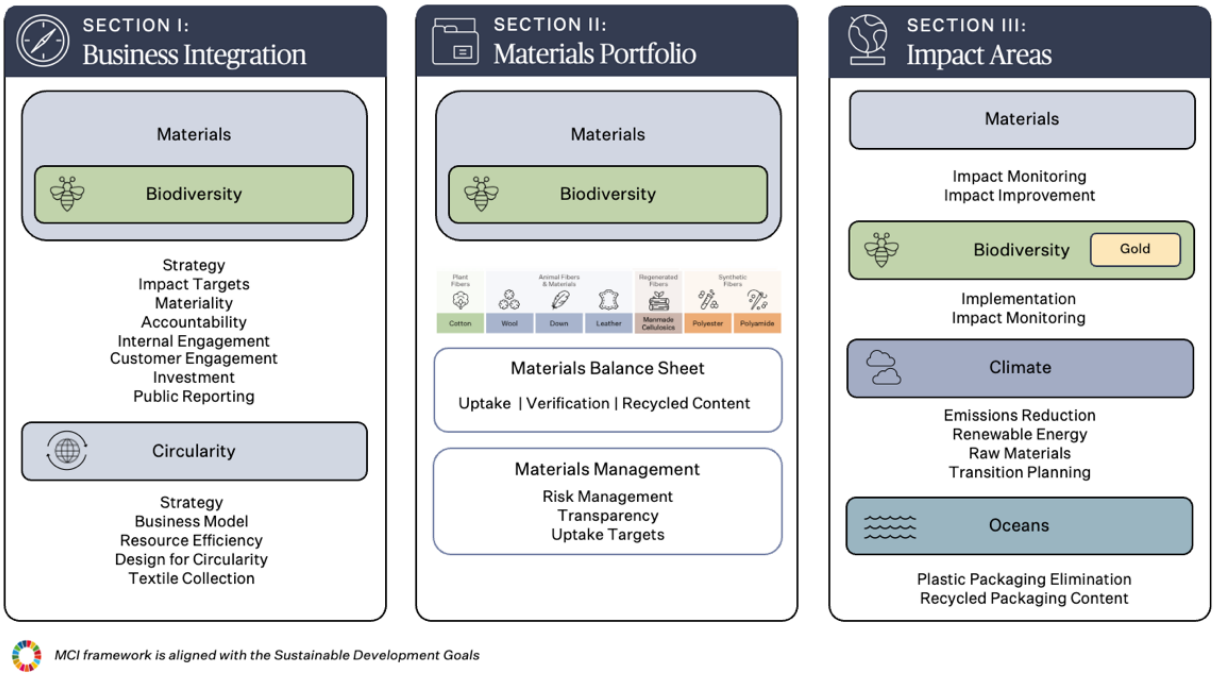


Figure 1: The Biodiversity Benchmark framework, Textile Exchange

Steps to Take Right Now for Biodiversity

There are steps to consider and actions you can take right now (while developing your biodiversity strategy). This section draws on the important work by the IUCN report Biodiversity Risks and Opportunities in the Apparel Sector, which highlights key steps that can be taken to address biodiversity risk today.

Determine your key focus areas in relation to nature. Based on your product lines and current knowledge of your supply base, identify the materials and locations that emerge as priorities in terms of biodiversity "hotspots." This should be done in consultation with stakeholders. Start broadening the scope of your risk and opportunity "lens" from supply chain to landscape, including river basins. See Kering's Environmental Profit & Loss for inspiration.

Distinguish between animal welfare and biodiversity conservation. Both issues are critical but distinct, and partners on the ground and globally will be different for these two issues. Animal welfare focuses on treating animals humanely, improving well-being, and eliminating suffering. The 5 Provisions should be pursued for the welfare of animals in captivity, including domestic/farmed animals. Conservation focuses on protection of wild species from extinction. The welfare of wildlife overlaps with biodiversity conservation, e.g., use of non-lethal management practices and work to reduce human-wildlife conflict.

Ensure your supply chains are free of deforestation and conversion. Raw materials based on terrestrial ecosystems (such as cropping and plantation agroecosystems, or forest ecosystems) must only be sourced from existing managed landscapes. This should be formalized in policy and/or through a public corporate commitment such as CanopyStyle or the Accountability Framework Initiative.

Check your certification schemes and country-level regulations. Run a biodiversity "health check" on the standards and certifications in use by your company. Do they incorporate criteria that avoid high risk species, areas, and practices or reduce their use? Do they restore or regenerate ecosystems, soils, etc.? Also, check the strengths of regulations in place in sourcing countries. What more do you need to do to protect biodiversity? Are there opportunities to engage with certification schemes, and/or national or sub-national government programs, to incorporate or strengthen criteria related to biodiversity?

Integrate biodiversity into business development. Business development offers possibly the best opportunity to incorporate biodiversity factors, including the selection of responsible raw materials and a transition to a circular use. It helps the company to think about products from a "hotspot" and lifecycle perspective, and to rethink each collection in terms of concept, size, and frequency. A sustainable design model offers the opportunity to incorporate biodiversity issues from the product creation phase (including raw materials sourcing origins) to the end of life (removing risk of terrestrial and ocean pollution).

Put product design first and foremost. A proactive approach to sustainable design plays a critical role in improving its impact on biodiversity. The conceptual design phase holds the most influence on decisions determining the raw materials, supply chains, and manufacturing processes needed for the final product. It is crucial to include (internal) design, sourcing, and product development teams in decision-making and to align your biodiversity targets and commitments to the core business processes, ways of working, and procedures.

Adaptation of extract (pgs. 6-8) ICUN Biodiversity Risks and Opportunities in the Apparel Sector Apparel (2016)

Biodiversity at Risk

"It is the sourcing of raw materials that is the direct interface between business and nature. Through sustainable sourcing and reconfiguring supply chains, we can help drive change in agriculture, mining, and forestry, and promote regenerative, wildlife-friendly approaches to production."

- **Dr. Helen Crowley, Partner, Pollination**

Biodiversity is vital for human health and livelihoods. Living organisms – plants, animals, and microorganisms – interact to form complex, interconnected webs of habitats and ecosystems, which in turn supply a wide variety of contributions to people and all life on earth.

All human activities make use of nature's contributions to people; for instance, areas of high biodiversity (e.g., tropical forests) provide important contributions such as carbon storage, air regulation, fuelwood, freshwater flow, and fish stocks. However, human activities also put pressure on biodiversity which underpins ecosystems and the services they deliver.

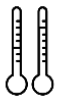
A growing human demand for natural resources, including biodiversity, is affecting the short- and long-term delivery of nature's contributions to people through causal factors (i.e., population growth), increasing consumption, indirect drivers (i.e., food, shelter, water, and energy needs), and direct pressures on biodiversity. Direct pressures are primarily physical, chemical, and biological in nature.

Human drivers and direct pressures threaten biodiversity and its ecosystems services, that we in turn depend upon. Habitat loss due to agriculture and overexploitation remain the biggest threats to biodiversity and ecosystems.

Five key threats to biodiversity have been identified by scientists

Habitat loss and degradation
This is the largest single source of pressure on biodiversity worldwide. Habitat loss is the direct conversion of natural habitats for human uses; degradation is the direct alteration or fragmentation of natural habitats for human uses. Habitat loss is largely due to the conversion of natural habitats to agriculture and unsustainable forest management. For inland aquatic ecosystems, habitat loss and degradation are largely accounted for by unsustainable water use and drainage for conversion to other land uses, such as agriculture and settlements. The encroachment of human activity into natural areas can lead to human-wildlife conflict (e.g., crop raiding, predation of livestock). In many cases this is addressed through lethal wildlife management. Encroachment also enables the emergence of zoonotic diseases.

Overexploitation of biological resources
The unsustainable harvesting of wild populations of animals, plants, fungi, and microorganisms for human use. For terrestrial ecosystems, overexploitation is largely reflected in unsustainable harvest of wildlife (including for industry, recreation, bushmeat, and by poaching).



Climate change
This is a change of climate which is attributed directly or indirectly to human activity and alters the composition of the global atmosphere in addition to natural climate variability observed over comparable time periods. Climate change is already having an impact on biodiversity under current levels of temperature change (globally averaged combined land and ocean surface temperature data as calculated by a linear trend show a warming of 0.85°Celcius over the period 1880 to 2012), which is projected to become progressively more significant in the coming decades (IPCC).

Pollution
This is the presence in or introduction into the environment of a substance which has harmful or poisonous effects. Pollution from excessive nutrients (e.g., nitrogen and phosphorous) and other chemicals pose a direct threat to biodiversity in terrestrial, freshwater, and coastal ecosystems. Sources of pollution include modern industrial processes, with major ones being chemically intensive agricultural practices (nitrogen and phosphorous from fertilizers in particular) and the burning of fossil fuels.

Invasive alien species
Defined as plants, animals, pathogens, and other organisms that are non-native to an ecosystem, and which may cause economic or environmental harm and/or adversely affect human health. In particular, the impact of invasive species upon biodiversity adversely by, *inter alia*, causing the decline or extirpation (local extinction) of native species and disrupting local ecosystem integrity and function.

These five threats do not occur in isolation but are interconnected and act synergistically. For example, the release of pollution into the natural environment, such as through excessive pesticide use, can lead to the loss of some species, which in turn can degrade the functioning of terrestrial or aquatic ecosystems. Or, as another example, species subject to the effects of climate warming may also be threatened by the presence of invasive alien species and/or overexploitation

(Based on WWF/ZSL Living Planet report (2020) and IUCN Biodiversity Risks and Opportunities in the Apparel Sector (2016)

Materials and Biodiversity

Feedstocks used by the textile industry can be either primary (virgin) materials (cultivated or extracted from the earth) or secondary feedstocks (reclaimed and recycled from pre-consumer or post-consumer waste streams and fed back into the production cycle). Materials can be either renewable or non-renewable.

- **Renewable materials** are typically not depleted when used. "Rapidly" renewable materials are usually harvested from fast-growing sources and take 10 or fewer years to grow or raise and to harvest in an ongoing and "sustainable" way. Examples include cotton, wool, and certain types of wood (for manmade cellulosic fibers).
- **Non-renewable materials,** also called finite resources, are natural resources that cannot be readily replaced by natural means at a quick enough pace to keep up with consumption. An example is carbon-based fossil fuel (the building blocks of virgin conventional synthetic fibers and materials). Earth minerals, metal ores, and groundwater in certain aquifers are other examples of non-renewable resources. Primary forests can also be considered non-renewable. That is, their "localized replenishment cannot occur within time frames meaningful to humans."
- **Recycled materials** can originate from renewable or non-renewable feedstocks. They are materials that would otherwise have become waste, which can be collected, separated, or processed, and returned to the economic mainstream in the form of raw materials or products.

There are biodiversity risks, opportunities, dependencies, and impacts associated with all material categories (both virgin and recycled) and can be found at all stages of the lifecycle. In this first version of the Biodiversity Companion Guide the four material categories covered are plant-based, animal-based, regenerated (manmade), and synthetic. The focus is on "tier 4" i.e., the cultivation and extraction phase.

Plant-based fibers and materials are "renewable" when cultivated or harvested using more sustainable methods (including protecting wild species from overexploitation). They include cultivation in fields or plantations such as cotton, flax (linen), hemp, and latex (rubber) or wild plants (such as nettles). Rubber can come from either plantations or small-scale forestry. Crops such as corn, sugar cane, and castor are being used as feedstocks for "bio" synthetics.

Animal-based fibers and materials are "renewable" (unless unsustainably harvested from overexploited or endangered species). They are derived from both farmed/domestic animals (such as from sheep, goats, cows, and some waterfowl) or wild animals (such as coyotes, opossums, crocodiles) for their skins, furs, hair, and wool. Note: also, that some of these "undomesticated" animals can also be farmed. Although less connected to the "animal" category, silk from the silkworm fits here, and can be farmed or wild.

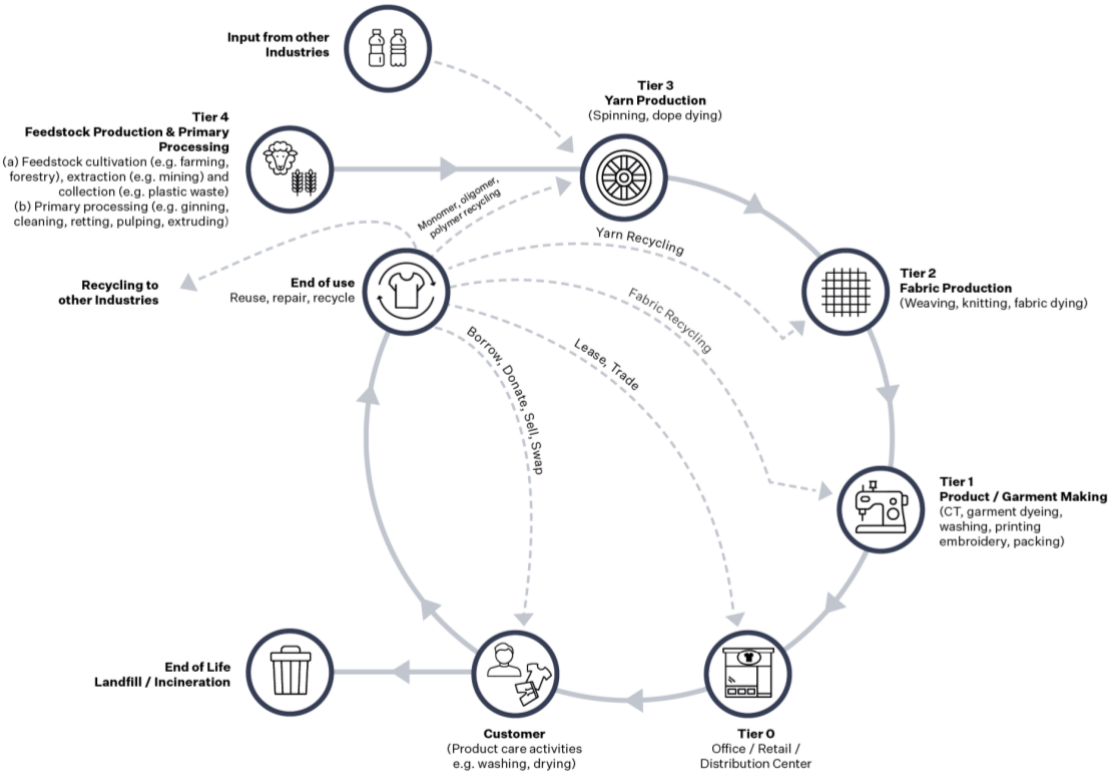
Regenerated manmade cellulosic fibers (MMCFs) such as viscose, modal, and lyocell have naturally produced feedstocks, mainly derived from forestry or other plants such as bamboo. They are considered renewable (unless unsustainably harvested). MMCFs are made from these feedstocks through industrial processes and consist of pure cellulose.

Synthetic fibers and materials can be grouped into conventional, recycled, and biobased. Conventional synthetics (such as virgin polyester, polyamide, synthetic rubber) are based on non-renewable fossil fuels extracted from the earth and synthesized into petrochemical feedstocks. They can also come from post-consumer plastic waste since the building blocks are often the same and given second or multiple lives through mechanical or chemical recycling into new synthetic textiles. Biobased synthetics are derived from plants such as corn and sugar.

In the conventional linear production model ("take – make – throw away") a product is considered waste when the owner has no further use for it. The product then becomes a burden on the environment either through its status as solid waste (going to landfill) or other pollution (e.g., emissions through incineration).

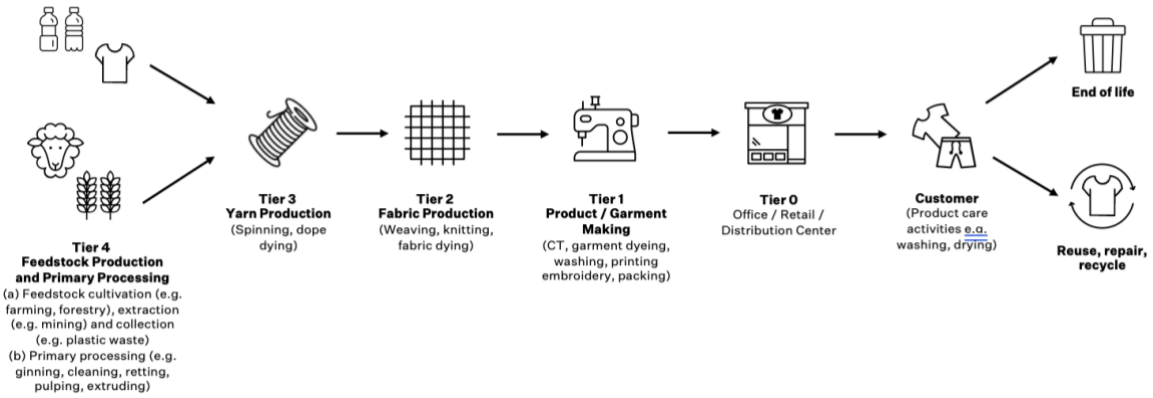
A circular model (or economy) requires a shift in mindset as well as technology and logistics to value waste as a resource – one that displaces the need for virgin materials and thereby relieves pressure on the natural world, including its biodiversity.

Figure 2: A representative depiction of a generic textile circular life cycle. Source: Textile Exchange

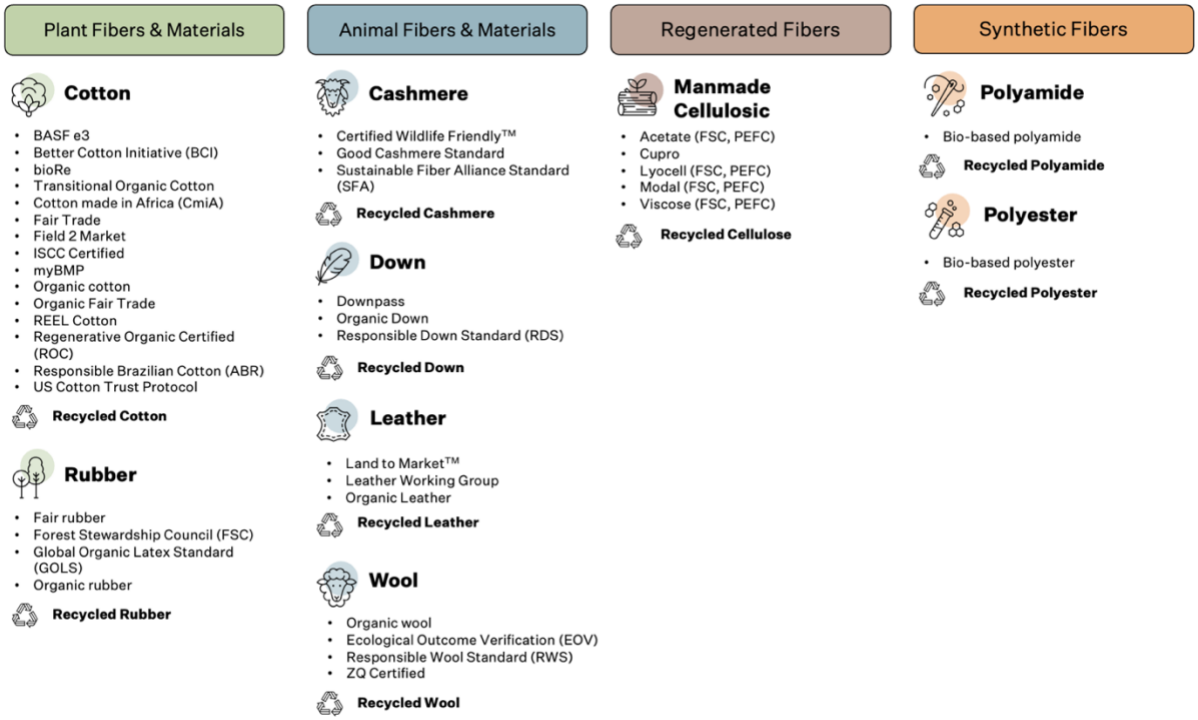


While "waste" can be generated and fed back into the production process at any step along the way, the supply chain models presented in this guide have been simplified based on the generic model below.

Figure 3: A representative depiction of a generic textile supply chain with a focus on feedstocks from tier 4 and end of use/recycling. Source: Textile Exchange



Programs (standards, initiatives, processes) exist to improve environmental and social impacts within production. We call this the "portfolio approach" to preferred fiber and material programs. Participation in a program is not a substitute for the practices required to achieve positive outcomes.



The next step of our biodiversity journey is to connect each material (type, program, and process-location) into a geospatial context. That way, biodiversity considerations can be more deeply embedded in strategy.

Figure 4: From a portfolio to landscape (geospatial) approach. Source: Textile Exchange (illustration only

Navigating through Each Material

For each material category the following information is provided:

Supply Chain Models
Visual and simplified modelling of how raw materials pass through a textile supply chain (sometimes called a "value chain" or "supply network"). Beginning with raw material production and ending with "final product". Increasingly, linear supply models are being re-imagined as circular, with post-consumer "waste" displacing the need for virgin feedstocks.

Feedstock Location Maps
These basic materials production maps are intended to show the key production (sourcing) countries for each material type and an estimate of production scale originating from production countries. They do not show detailed locations or mapping of biodiversity risks or hotspots. *Further mapping will be carried out in due course.*

Biodiversity Risk Lists
Here, we briefly introduce the risks (impacts and dependencies) and provide risk lists for each material type. Note: Risk lists are broad (covering a range of environmental, socio-economic, and animal welfare-related risks) and include risks that may not be directly related to biodiversity. *Risk lists are not considered exhaustive or complete.*

AR^{3}T Action Framework Thought Starters
A simple thought starter to prompt thinking in accordance with the Science Based Targets Network AR^{3}T Action Framework: Avoid, Reduce, Restore, Regenerate, and Transform (also referred to as AR^{3}T). *We expect this section to become more comprehensive each year as benchmarking results build knowledge.*

Programs
A "program" is a material-specific standard, initiative, and/or process identified by Textile Exchange or a company as one that includes criteria that are environmentally and/or socially progressive as compared to conventional options. *Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity.*

Platforms and Projects
Signposts to industry-relevant stakeholder platforms and on-the-ground projects that offer biodiversity-related benefits*. Platform and project listings are not considered exhaustive or complete.*

References
Signposts to references used to develop this companion guide.

The AR3T Action Framework

The AR3T Action Framework is a tool for companies looking for a tool to help them manage their impacts on biodiversity and to achieve positive outcomes. This Framework was developed by the Science Based Targets Network (SBTN), builds on the Mitigation Hierarchy and Conservation Hierarchy, and is included in the Science Based Targets for Nature Initial Guidance for Business.

AR3T generic guidance

Avoid

Prevent impact from happening in the first place, eliminating the impact entirely. Avoidance applies to new or potential impacts and can include categorical exclusions of particular materials, geographic areas or ecosystems, or exclusions of particular types of impacts by avoiding specific technologies, land management practices, or processes. Avoiding some kinds of impacts to biodiversity is critical because: (a) some impacts are irreversible; (b) some impacts are poorly understood and thus require a precautionary approach; and (c) in some locations, biodiversity loss must be completely avoided to prevent unacceptable outcomes. This is the most effective measure and most preferred measure in the AR3T Action Framework, and it can also be the most cost effective in some circumstances.

Reduce

Minimize impacts, but without necessarily eliminating them. Reduce applies to existing impacts. Good practice is to reduce impact to "As Low as Reasonably Practicable" (ALARP). This principle recognizes that there is a trade-off between the cost and benefits of reducing impacts, which may involve changes in practices. Examples of reduction actions include improving eco-efficiency, production process changes, sourcing or supplier engagement (including sourcing from, or working towards, certified suppliers), and changes in product design.

Restore

Entails bringing a degraded natural system (like a watershed or peatland) back to a near-original natural condition or state of integrity. This can include initiation or acceleration of recovery, with a focus on permanent changes in state. Restorative actions may include supporting individual species recovery plans and rehabilitating degraded lands. It is important that companies avoid and reduce impacts as much as possible first, before moving onto restoration and regeneration, as outcomes from these measures are far more uncertain and take time to realize.

Regenerate

Increasing the functionality of an ecosystem, with focus on specific stocks (like soil) or services (like pollination). Regenerative actions are mainly applied in productive landscapes/seascapes & aim to increase biophysical function and/or ecological productivity in providing specific nature's contributions to people without changing the land/sea use. Regenerative agriculture often focuses on carbon sequestration, food production, nitrogen & phosphorus retention.

Transform

Take action that contributes to an "enabling environment" and likelihood of success of a company's own actions using the other elements of the AR3T Action Framework, and for others beyond the company's own supply network. Transformative actions are taken by a company to ensure systemic change within the apparel and textile industry. This includes contributions to changing the fundamental drivers of biodiversity loss. Companies should consider transformative measures within and beyond their own supply chain, based on their control and influence in the sector.

Cotton

Supply Chain

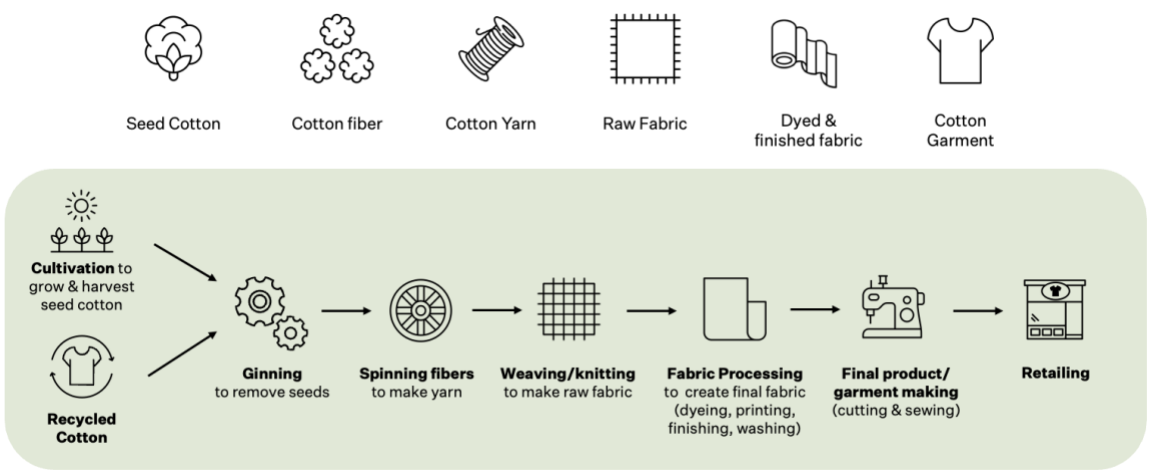
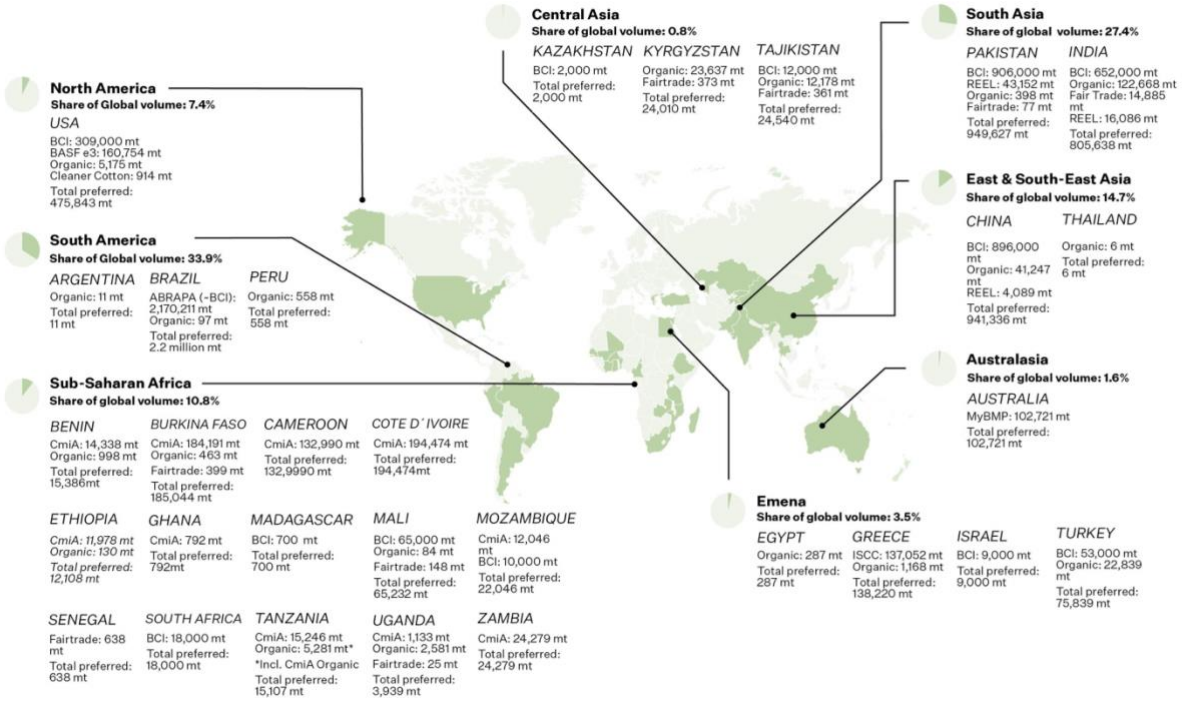


Figure 5: Cotton supply chain. Source: Textile Exchange

Feedstock Locations

The map shows the global distribution and associated production volumes of "preferred" cotton as reported in the Textile Exchange Preferred Fiber & Materials – Market Report 2020. We preferred cotton locations displayed here mirror global production, the map is not assumed complete for all cotton producing countries. For mapping of all (including conventional) cotton production, see the FAO Data on Cottonseed.

Figure 6: Cotton programs. Source: Textile Exchange



Biodiversity Risks

The textile industry relies on the supply of cotton as feedstock for products containing cotton fibers. Cotton production depends on natural capital such as healthy soils, a reliable supply of water, energy, sunlight, dependable weather/seasons, and a stable climate for its ongoing availability. It also depends on other natural

contributions to people including pollination and preventing economic damage to crops from pests and disease. Activities potentially associated with cotton growing such as land clearing and monoculture, excessive use of chemicals, water abstraction, and irrigation increase the risk of biodiversity loss and deplete soils, water, and other natural capital. Depending on the location of the cotton farms and proximity to areas of high conservation value and species habitat, cotton production activities can negatively impact "non-productive" land and can also threaten biodiversity and wildlife populations in other ways, e.g., through land clearing, chemical contamination, harmful wildlife management practices to prevent crop damage, and human-wildlife conflict and/or restricting free and safe movement and access to natural habitat, food, and drinking water.

Cotton Feedstock Production
(Cultivation)

Environmental

- Agricultural pests and disease
- Biodiversity loss
- Chemical-related risks
- Climate change
- Energy use
- Greenhouse gas emissions
- Harmful wildlife management practices
- Invasive species
- Land Occupancy
- Loss of habitat connectivity
- Loss of natural habitat
- Presence of hunting or poaching
- Soil contamination
- Soil degradation
- Species endangerment / extinction
- Water pollution
- Water scarcity
- Zoonotic disease transmission

Social

- Child labor
- Forced labor
- Human rights violation
- Human-wildlife conflict
- Negative impacts on local communities
- Pesticide exposure
- Poverty and debt
- Other labor-related risks

Cotton Feedstock Production
(Ginning, shredding)

Environmental

- Energy use
- Green-house gas emission
- Water depletion
- Water pollution

Social

- Child labor
- Forced labor
- Human rights violation
- Negative impacts on local communities
- Occupational health and safety
- Other labor-related risks

Note: Zoonotic disease transmission could be both social as well as environmental.

Refers to the direct biodiversity risks.

AR^{3}T Action Framework Thought Starter

Avoid

Avoid sourcing cotton cultivated using monoculture and intensive inputs such as broad-spectrum insecticides and nitrogen-based artificial fertilizer. Avoid use of cotton with opaque origins not allowing for due diligence to be conducted.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin cotton with recycled. Source preferred cotton from farms certified to standards with biodiversity-beneficial criteria (and monitored outcomes). Reduce impacts on habitat connectivity by protecting wildlife corridors.

Restore

Invest in programs or projects with criteria for restoring degraded ecosystems on both productive and "non-productive" land. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Regenerate

Adopt cotton standards, initiatives, and other programs or projects with criteria for regenerating soil and land such as agroecology, agroforestry, regenerative, or in-conversion organic farming. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining others who are making public commitments, investing, and taking action, such as the 2025 Sustainable Cotton Challenge.

Stakeholder Platforms and Projects

- 2025 Sustainable Cotton Challenge, Textile Exchange
- Chetna Coalition, operating in India
- Cotton 2040, Forum for the Future
- InoCotton Grow, Sponsored by the German Federal Ministry of Education and Research
- Organic Cotton Accelerator
- Organic Cotton Round Table, Textile Exchange
- Smallholder Farmers Alliance, operating in Haiti
- Sustainable Cotton Round Table, Textile Exchange
- West African Organic & Fairtrade Cotton Coalition

References

- Preferred Fiber & Materials Market Report 2021, Textile Exchange
- Organic Cotton Market Report 2021, Textile Exchange
- Material Change Index Survey Guide CFMB 2020, Textile Exchange
- Sustainable Cotton Matrix, Textile Exchange
- 2025 Sustainable Cotton Challenge, 4th Annual Report 2022, Textile Exchange.

Programs: standards, initiatives, and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

Cotton Programs (alphabetical)	Biodiversity Overview	Link to Further Information
BASF e3	Includes pesticide, soil and fertility management.	Program overview
Better Cotton Initiative (BCI)	Requires farmers to prepare a Biodiversity Management Plan.	Principles
Cotton made in Africa (CmiA)	Committed to protecting soil, water, biodiversity, the climate, and the environment, including by banning the use of genetically modified organisms and reducing the negative effects of crop protection.	Principles
Fairtrade Cotton	Prohibits the felling of forests with high conservation value and require farmer co-operatives to map risk areas, raise their members' climate awareness and promote climate-friendly production methods.	Fairtrade and Sustainability
Field to Market®	Alliance for Sustainable Agriculture uses an outcomes-based approach to measure sustainability, with a focus on commodity crops.	Biodiversity monitoring
Intl. Sustainability & Carbon Certified (ISCC)	Depending on the certification, covers deforestation-free, among other criteria.	Deforestation-Free Certification
myBMP	Training includes a module on "Sustainable Natural Landscapes."	Module overview
Organic Cotton (including bioRe™ and bio-dynamic)	Organic agriculture aims to attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Organic certification is controlled through country-level regulations.	Organic Principles
REEL Cotton	Program aims to build capacity of the farmers so that they can learn and adopt sustainable practices to preserve the biodiversity of their farms.	Biodiversity Statement
Regenerative Organic Certified (ROC)	Consists of three pillars: Soil Health and Land Management, Animal Welfare, and Farmer & Worker Fairness. ROC has three levels: Bronze, Silver, and Gold. Each requires a different number and scope of regenerative organic practices used.	ROC framework
Responsible Brazilian Cotton (ABR)	Farmers grow cotton in line with the ABR Standard and can sell their cotton as Better Cotton.	Program overview
US Cotton Trust Protocol	Drives continuous improvement in six key sustainability metrics – land use, soil carbon, water management, soil loss, greenhouse gas emissions, and energy efficiency.	Commitments
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Can also play a role in reducing waste (that can end up in the environment).	See Textile Exchange Standards

Rubber

Supply chain

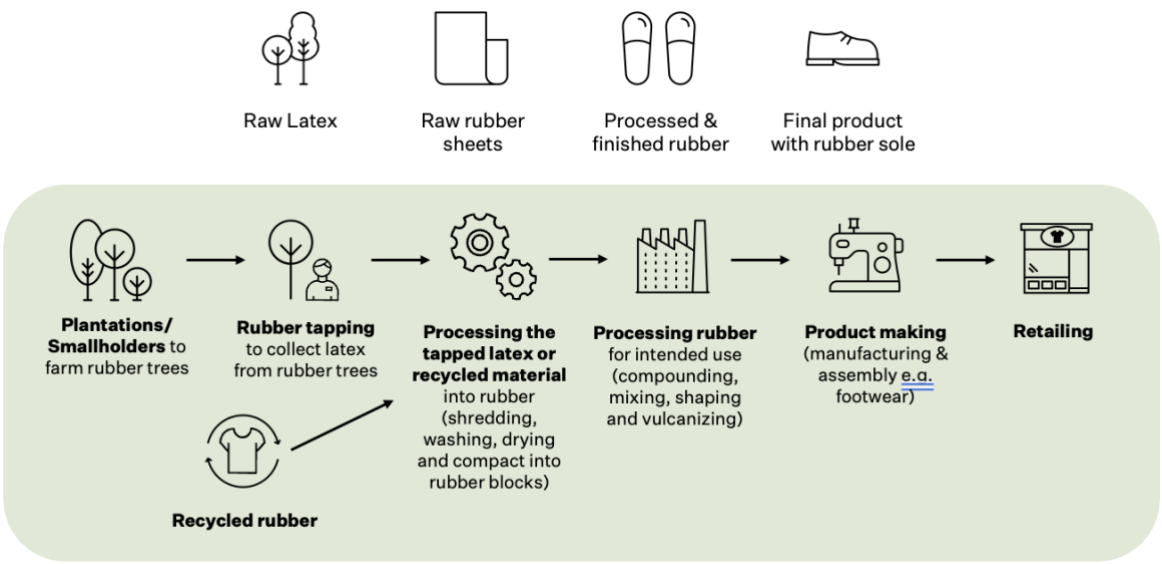


Figure 7: Rubber supply chain. Source: Textile Exchange

Feedstock Locations

The map shows the global distribution of rubber production and volumes of natural latex produced as reported by the Food and Agriculture Organization of the United Nations in 2018.

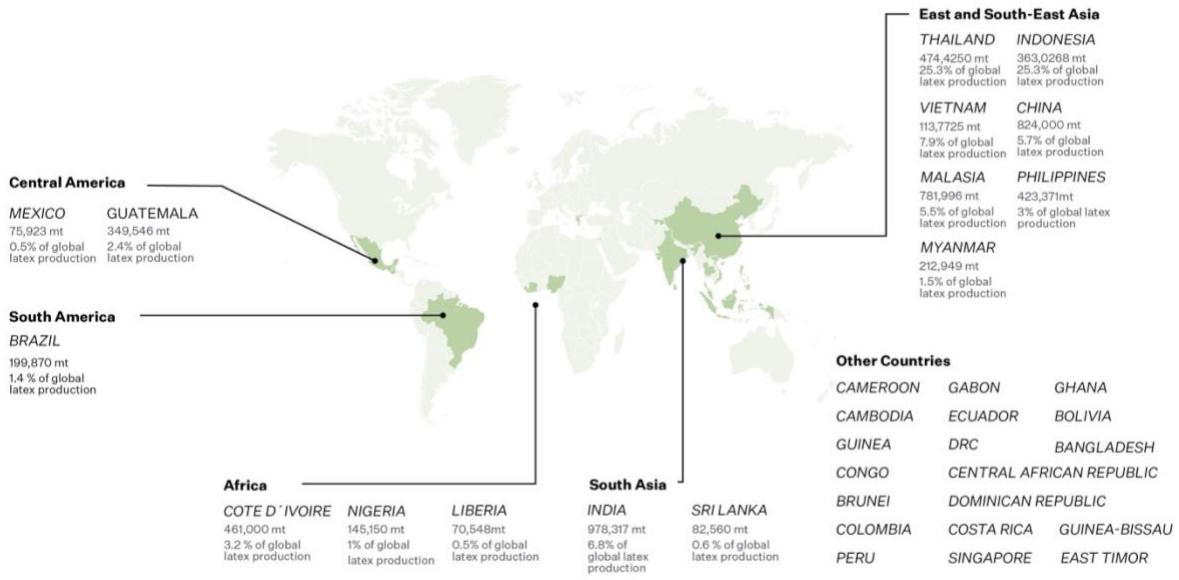


Figure 8: Rubber production. Source: FAO, Textile Exchange

Biodiversity Risks

The textile industry relies on the supply of sap (latex) produced by rubber trees as feedstock for products containing natural rubber components (such as footwear). Rubber production depends on natural capital such as healthy trees and soils, a reliable supply of water, energy, sunlight, dependable weather/seasons, and a stable climate for its ongoing availability. Healthy forest-based crops depend on nature's contributions to people for pollination and preventing economic damage to rubber trees from pests and disease. Originating from the Amazon region, rubber trees are mainly grown in plantations in Asia (Thailand, Indonesia, Malaysia, India, and Vietnam), likely in close proximity to areas of high conservation value and wildlife habitat. Activities potentially associated with natural rubber production, such as land clearing and plantation/monoculture, increase the risk of biodiversity loss and depletion of other natural capital on both productive and "non-productive" land. Rubber production can also threaten biodiversity and wildlife populations in other ways, e.g., through habitat loss, harmful wildlife management practices to prevent crop damage and human-wildlife conflict, and/or restricting free and safe movement and access to natural habitat, food, and drinking water.

Rubber Feedstock Production
(Forestry, tapping of latex)

Environmental

- Agricultural pests and disease
- Biodiversity loss
- Chemical-related risks
- Climate change
- Energy use
- Greenhouse gas emissions
- Harmful wildlife management practices
- Invasive species
- Land Occupancy
- Loss of habitat connectivity
- Loss of natural habitat
- Presence of hunting or poaching
- Soil contamination
- Soil degradation
- Species endangerment / extinction
- Water pollution
- Water scarcity
- Zoonotic disease transmission

Social

- Child labor
- Forced labor
- Human rights violation
- Human-wildlife conflict
- Negative impacts on local communities
- Pesticide exposure
- Poverty and debt
- Other labor-related risks

Rubber Feedstock Production
(Block production, shredding, washing, drying)

Environmental

- Energy use
- Green-house gas emission
- Water depletion
- Water pollution

Social

- Child labor
- Forced labor
- Human rights violation
- Negative impacts on local communities
- Occupational health and safety
- Other labor-related risks

Note: Zoonotic disease transmission could be both social as well as environmental.

Refers to the direct biodiversity risks.

AR3T Action Framework Thought Starter

Avoid

Avoid sourcing rubber that is linked to the clearing of natural forests, e.g., by making a zero-deforestation commitment. Avoid use of rubber with opaque origins not allowing for due diligence to be conducted.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin (conventional) rubber use with recycled. Source rubber from small-holders and plantations certified and/or committed to conservation (and outcomes monitored), and from those that allow safe passage of wildlife.

Restore

Invest in rubber standards, initiatives, and other programs or projects with criteria for restoring degraded landscapes, ecosystems and forests on both productive and surrounding "non-productive" (natural) areas. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Regenerate

Adopt rubber standards, initiatives, and other programs or projects with criteria for regenerating soil and land such as agroecology and agroforestry. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining others who are making public commitments, investing, and taking action, such as the Global Platform on Sustainable Rubber (GPSR).

Stakeholder Platforms and Projects

- Accountability Framework initiative (AFi)
- Fair Rubber Association
- Global Platform for Sustainable Natural Rubber (GPSNR)
- Veja Rubber Project Brazil

References

- Growing Need for Deforestation-free Rubber as Tire Demand Destroys Native Forests, Mongabay
- Mighty Earth
- Natural rubber: ESG policy transparency assessments, ZSL Sustainability Policy Transparency Toolkit (SPOTT)
- Transforming the Global Rubber Market, WWF

Programs: standards, initiatives, and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

Rubber Programs (alphabetical)	**Biodiversity Overview**	**Link to Further Information**
Fair Rubber	Fair Rubber criteria include requirements on sustainable harvest, use of pesticides and handling of waste, and specific obligations to protect ecosystems and biodiversity.	Standards
Forest Stewardship Council (FSC)	FSC certification confirms that a product is not linked to forest degradation or deforestation, and that the producer has implemented best management practices. It ensures traceability from the forest or plantation to the consumer.	Standards and Statement on Natural Rubber
Global Organic Latex Standard (GOLS)	Organic agriculture aims to attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. This standard builds on top of organic agriculture regulations.	Standard
Organic Rubber	Organic agriculture aims to attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Organic certification is controlled through country- level regulations.	Organic Principles
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Can also play a role in reducing waste (that can end up in the environment).	See Textile Exchange Standards

Wool

Supply Chain

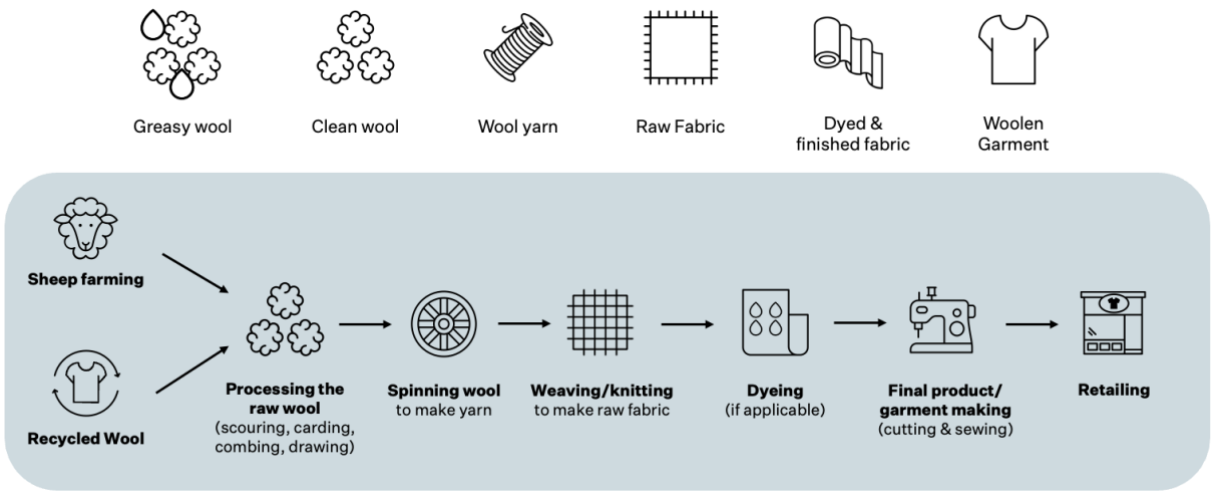


Figure 9: Wool supply chain, Textile Exchange

Feedstock Locations

The map shows the global distribution and associated wool production volumes (in metric tons) as reported by the International Wool Textile Organisation (IWTO) in 2019. The map also highlights the key countries for sourcing wool grown to criteria of specific sustainability programs. Note: locations on this map are not considered complete.

Figure 10: Global wool production and wool sustainability programs. Source: IWTO, Textile Exchange

Biodiversity Risks

The textile industry relies on the supply of sheep wool to produce woolen products. Sheep farming depends on healthy grazing lands and other natural capital such as healthy soils, a reliable supply of water, energy, sunlight, dependable weather/ seasons, and a stable climate for its ongoing availability. It also depends on nature's contributions to people for pollinating native pastures and controlling pests and disease.

Depending on the location, sheep farming can be in close proximity to areas of high conservation value and wildlife habitat. Activities potentially associated with sheep farming, such as overgrazing and introduction of exotic species, increase the risk of biodiversity loss and depletion of other natural capital on both productive and "non-productive" land. Domestic animal farming can also threaten biodiversity and wildlife populations in other ways, e.g., through habitat loss, lethal predator control, and/or restricting free and safe movement and access to natural habitat, food, and drinking water.

Wool Feedstock Production
(Sheep farming)

Animal welfare

- 5 Provisions (nutrition, health environment, behavior and mental experience)
- Mulesing

Environmental

- Agricultural pests and disease
- Biodiversity loss
- Climate change
- Endangerment/ extinction of species
- Energy use
- Greenhouse gas emissions
- Harmful wildlife management practices
- Invasive species
- Land degradation from overgrazing
- Land Occupancy
- Lethal predator control
- Loss of habitat connectivity
- Loss of natural habitat
- Presence of hunting or poaching
- Water pollution
- Water scarcity

Social

- Human rights violation
- Human-wildlife conflict
- Negative impacts on local communities
- Zoonotic disease transmission
- Other labor-related risks

Wool Feedstock Production
(Scouring, drying)

Environmental

- Air pollution
- Chemical–related risks
- Energy use
- Green-house gas emission
- Solid waste/disposal
- Water depletion
- Water pollution

Social

- Human rights violation
- Negative impacts on local communities
- Occupational health and safety
- Other labor-related risks

Note: Zoonotic disease transmission could be both social as well as environmental.

Refers to the direct biodiversity risks.

AR^{3}T Action Framework Thought Starter

Avoid

Avoid sourcing wool produced using intensive farming or herding practices and inputs that degrade soils and landscapes. Avoid sourcing wool from farms that use lethal wildlife management practices. Avoid use of wool with opaque origins not allowing for due diligence to be conducted.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin (conventional) wool with recycled. Source wool from farms certified to standards with biodiversity-beneficial criteria (and outcomes monitored) such as the Responsible Wool Standard (RWS).

Restore

Invest in programs or projects with criteria for restoring degraded ecosystems on both productive and surrounding "non-productive" (natural) areas. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Regenerate

Adopt wool standards or invest in initiatives and other programs or projects with criteria for regenerating soil and grazing land such as the Responsible Wool Standard (RWS), regenerative grazing, or in-conversion organic farming. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining others who are making public commitments, investing, and taking action.

Stakeholder Platforms and Projects

- Animal Fibers Round Table, Textile Exchange
- Help Build™, NativeEnergy (see Regenerative Wool for Climate project, EILEEN FISHER)
- PUR Projet (see insetting initiative by Burberry with Australian wool growers)
- The Savory Global Network, (see regenerative agriculture initiatives by Kering, VF Corporation)
- Wildlife Friendly Enterprise Network

References

- Material Change Index Survey Guide CFMB, Textile Exchange
- Preferred Fiber & Materials Market Report, Textile Exchange
- Regenerative Agriculture Project for Long Term Carbon Sequestration, NativeEnergy

Programs: standards, initiatives, and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

Wool Programs (alphabetical)	Biodiversity Overview	Link to Further Information
Certified Wildlife Friendly™	Certified Wildlife Friendly™ products contribute directly to the conservation of species by being directly linked to on-the- ground actions that benefit biodiversity. Criteria require ongoing monitoring, threat reduction, non-lethal management practices, and habitat protection and connectivity.	Global Criteria and Additional Livestock Production Criteria
Organic Wool	Organic farming aims to attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Organic certification is controlled through country-level regulations.	Organic Principles
Ovis 21 Network - Land to Market, Savory Institute	Ecological Outcome Verification (EOV) is the "science inside" the Savory Institutes Land to Market program. Soil health, biodiversity and ecosystem function data is captured at the farm, then trended for positive outcomes across key land health criteria.	About EOV
Regenerative Organic Certified (ROC)	Consists of three pillars: Soil Health and Land Management, Animal Welfare, and Farmer & Worker Fairness. ROC has three levels: Bronze, Silver, and Gold. Each requires a different number and scope of regenerative organic practices used.	ROC Framework
Responsible Wool Standard (RWS)	The RWS addresses the welfare of sheep, land management and social welfare. The standard requires that farmers have an understanding of what will impact of the biodiversity of their land and have a strategy to protect and improve it over time. The farm shall develop a Biodiversity Management Plan (BMP) that conserves and enhances biodiversity on and around the farm.	Responsible Wool Standard
ZQ Grower Standard	Helps growers create a land environment plan, which outlines how their individual property will be managed, risks assessed, to mitigate negative impact. This includes water quality and various biodiversity projects.	ZQ Grower Standard
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Can also play a role in reducing waste (that can end up in the environment).	See Textile Exchange Standards

Cashmere

Supply Chain

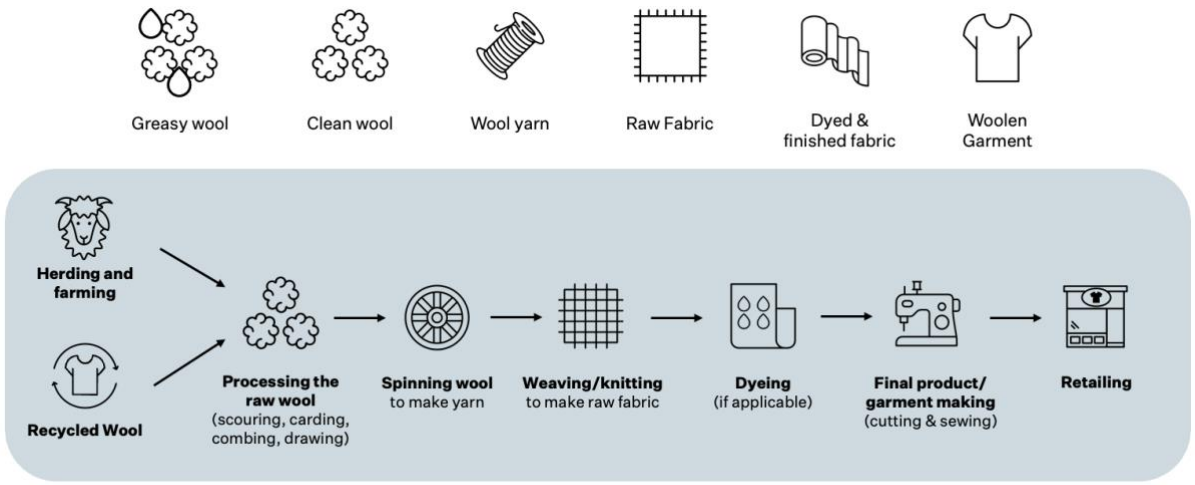
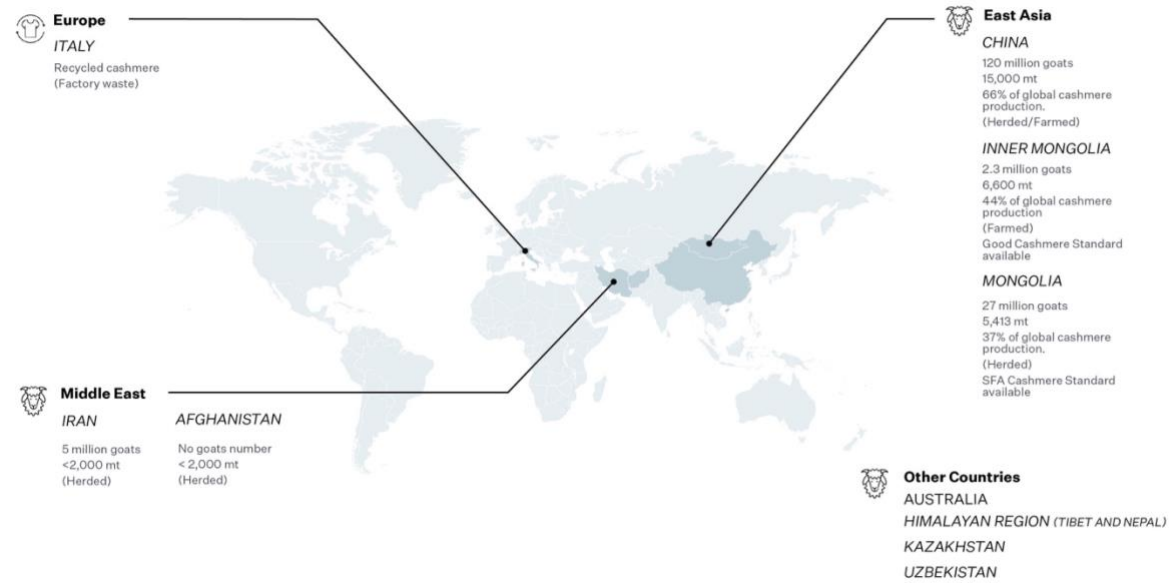


Figure 11: Cashmere supply chain, Textile Exchange

Feedstock Locations

The map shows global cashmere production which was an estimated at 15,000 mt fiber (2018) from a global cashmere goat population of 700 million (2018). China (including Inner Mongolia) and Mongolia produces an estimated 60-70% of global volumes and Iran and Afghanistan produce 20-30%. Smaller quantities are also produced in the Himalayan region (Nepal and Tibet), Kazakhstan, and Uzbekistan. Pre-consumer recycled cashmere is "regenerated" in Italy (among other countries).

Figure 12: Global cashmere production. Source: Textile Exchange, based on data reported in The Annual Cashmere Market



Report (Schnieder, 2019). Regenerated cashmere cited in article (2019).

Biodiversity Risks

The textile industry relies on the supply of cashmere for its cashmere-based products. Cashmere goat herding and farming depends on healthy grazing lands and other natural capital such as healthy soils, a reliable supply of water, energy, sunlight, dependable weather/seasons, and a stable climate for its ongoing availability. It also depends on nature's contributions to people for pollinating native pastures and controlling pests and disease. The majority of cashmere goats are farmed or herded in China (Inner Mongolia) and Mongolia, with lower numbers in the Middle East and Central Asia. Cashmere goat herding and farming can be in close proximity to areas of high conservation value and wildlife habitat. Activities potentially associated with cashmere goat farming, such as overgrazing and introduction of exotic species, increase the risk of biodiversity loss and depletion of other natural capital on both productive and "non- productive" land. Both domestic animal farming and herding can also threaten biodiversity and wildlife populations in other ways, e.g., through lethal predator control, human-wildlife conflict, and/or restricting free and safe movement and access to natural habitat, food, and drinking water.

Wool Feedstock Production
(Herding and farming)

Animal welfare

- 5 Provisions (nutrition, health environment, behavior and mental experience)

Environmental

- Agricultural pests and disease
- Biodiversity loss
- Climate change
- Endangerment/ extinction of species
- Energy use
- Greenhouse gas emissions
- Harmful wildlife management practices
- Invasive species
- Land degradation from overgrazing
- Land Occupancy
- Lethal predator control
- Loss of habitat connectivity
- Loss of natural habitat
- Presence of hunting or poaching
- Water pollution
- Water scarcity

Social

- Human rights violation
- Human-wildlife conflict
- Negative impacts on local communities
- Zoonotic disease transmission
- Other labor-related risks

Wool Feedstock Production
(Scouring, drying)

Environmental

- Air pollution
- Chemical–related risks
- Energy use
- Green-house gas emission
- Solid waste/disposal
- Water depletion
- Water pollution

Social

- Human rights violation
- Negative impacts on local communities
- Occupational health and safety
- Other labor-related risks

Note: Zoonotic disease transmission could be both social as well as environmental.

Refers to the direct biodiversity risks.

AR3T Action Framework Thought Starter

Avoid

Avoid sourcing cashmere produced using intensive farming or herding practices and inputs that degrade soils and landscapes. Avoid sourcing cashmere from farms or herders that use lethal wildlife management practices. Avoid use of cashmere with opaque origins not allowing for due diligence to be conducted.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin cashmere with recycled. Source cashmere from farms or herders certified to standards or schemes with explicit biodiversity-beneficial criteria (and outcomes monitored).

Restore

Invest in initiatives and other programs or projects with criteria for restoring soil and landscapes. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective, such as the Wildlife Conservation Society's Sustainable Cashmere Project in Mongolia.

Regenerate

Adopt cashmere standards, initiatives and other programs or projects with criteria for regenerating soil and land such as the Good Cashmere Standard in Inner Mongolia or the Sustainable Fibre Alliance (SFA) in Mongolia. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining Textile Exchange's Cashmere Round Table and others who are making public commitments, investing, and taking action.

Stakeholder Platforms and Projects

- Animal Fibers Round Table, Textile Exchange
- Ensuring Sustainability and Resilience (ENSURE) of Green Landscapes in Mongolia, UNDP Mongolia
- Green Gold and Animal Health Project, Swiss Agency for Development and Cooperation in Mongolia
- Mongolia Sustainable Cashmere Platform, UNDP Green Commodities Program
- Sustainable Cashmere Platform
- Sustainable Cashmere Project, Wildlife Conservation Society
- Wildlife Friendly Enterprise Network

References

- Comparative Analysis of Sustainable Cashmere Projects in Mongolia, UNDP (2019)
- Preferred Fiber & Materials Market Report 2021, Textile Exchange
- Roadmap for the establishment of Mongolia's multi-stakeholder sustainable cashmere platform, UNDP
- Mongolia Program, Zoological Society London (ZSL)
- Mongolia Sustainable Cashmere Platform, UNDP Mongolia

Programs: standards, initiatives, and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

Cashmere Programs (alphabetical)	Biodiversity Overview	Link to Further Information
Certified Wildlife Friendly™	Certified Wildlife Friendly™ products contribute directly to the conservation of species by being directly linked to on-the- ground actions that benefit biodiversity. Criteria require ongoing monitoring, threat reduction, non-lethal management practices, and habitat protection and connectivity.	Global Criteria and Additional Livestock Production Criteria
Good Cashmere Standard (Aid by Trade Foundation)	Goals include promote animal welfare in (farmed) cashmere production in Inner Mongolia (only); promote social criteria for herders and employed workers; protect the environment and promote biodiversity.	Principles
Sustainable Fibre Alliance (SFA) Cashmere Standard	The SFA codes of practice set out the requirements that herders and processors need to comply with to be accredited against the SFA Cashmere Standard. Producers are certified at bronze (minimum requirements met), silver or gold (fully compliant with requirements) level.	Codes of Practice
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Can also play a role in reducing waste (that can end up in the environment).	See Textile Exchange resources

Leather

Supply Chain

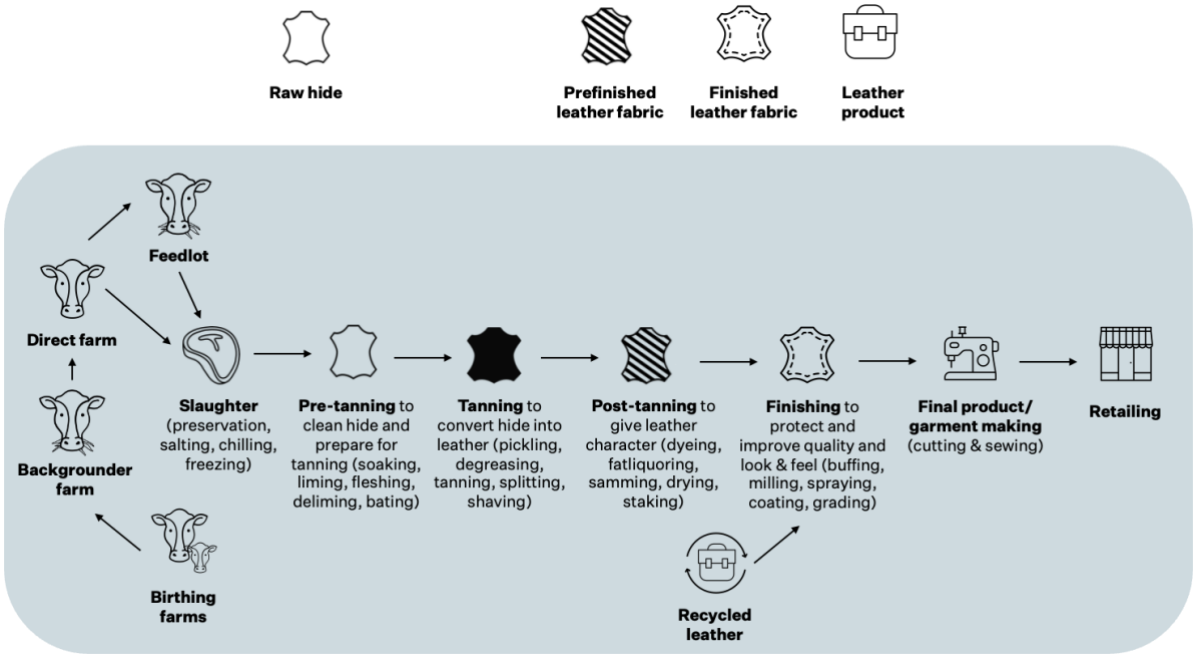


Figure 13: Leather supply chain, Textile Exchange

Feedstock Locations

The map shows the global distribution and associated volumes of cattle-raised and "fresh hides" production as reported by the Food and Agriculture Organization of the United Nations in 2018.

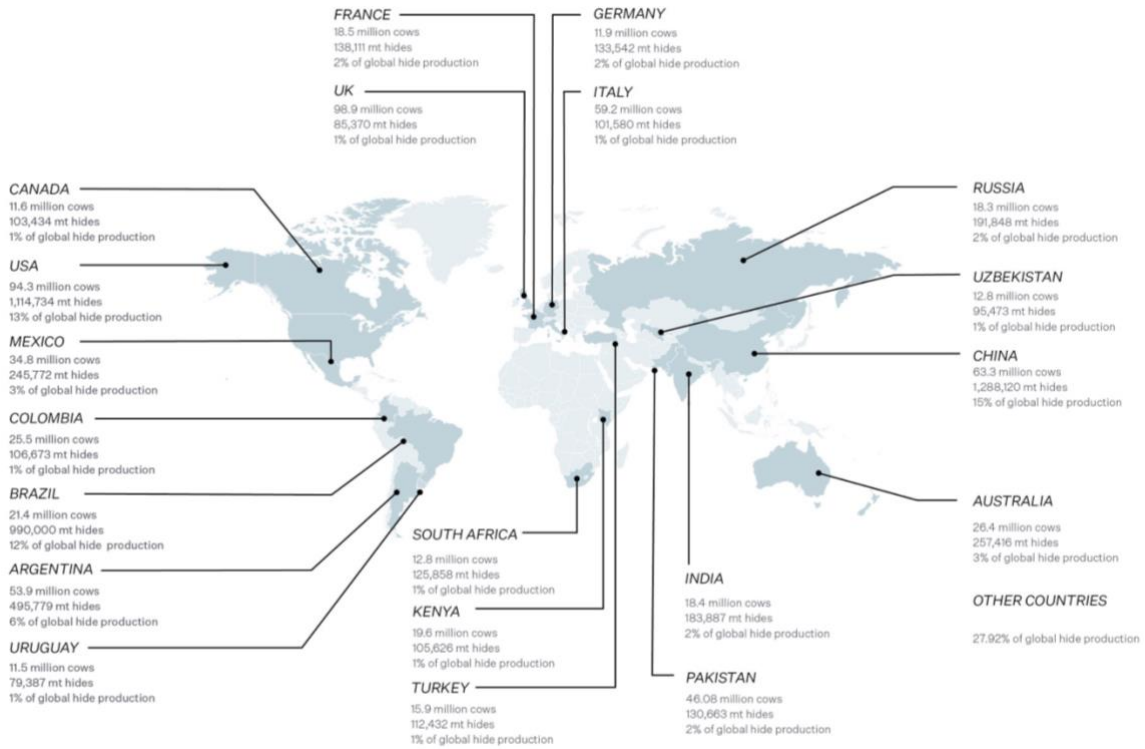


Figure 14: Global leather production. Source: FAO, Textile Exchange.

Biodiversity Risks

The textile industry depends on the supply of animal hides for its leather products. Leather is often the by-product of the meat industry and depends on grazing lands and other natural capital such as healthy soils, a reliable supply of water, energy, sunlight, dependable weather/seasons, and a stable climate for its ongoing availability. It also depends on nature's contributions to people for pollinating native pastures and controlling pests and disease. Livestock farming and leather hide production is truly global. However, significant biodiversity "hotspots" are in Brazil and other parts of Latin America where large numbers of cattle ranches are located. Cattle ranches can be in close proximity to areas of high conservation value and wildlife habitats. Activities potentially associated with cattle farming, such as land clearing, deforestation, overgrazing, and introduction of exotic species increase the risk of biodiversity loss and depletion of other natural capital on both productive and "non-productive" land. Cattle ranching can also threaten biodiversity and wildlife populations in other ways, e.g., through lethal predator control, human-wildlife conflict, and/or restricting free and safe movement and access to natural habitat, food, and drinking water.

Leather Feedstock Production
(Animal farming)

Animal welfare

- 5 Provisions (nutrition, health environment, behavior and mental experience)

Environmental

- Agricultural pests and disease
- Biodiversity loss
- Climate change
- Deforestation
- Endangerment/ extinction of species
- Energy use
- Greenhouse gas emissions
- Harmful wildlife management practices
- Human-wildlife conflict
- Invasive species
- Land degradation from overgrazing
- Land Occupancy
- Lethal predator control
- Loss of habitat connectivity
- Loss of natural habitat
- Presence of hunting or poaching
- Water pollution
- Water scarcity

Social

- Human rights violation
- Human-wildlife conflict
- Negative impacts on local communities
- Zoonotic disease transmission
- Other labor-related risks

Leather Processing
(Tanning and other processes)

Environmental

- Air pollution
- Chemical–related risks
- Energy use
- Green-house gas emission
- Solid waste/disposal
- Water depletion
- Water pollution

Social

- Human rights violation
- Negative impacts on local communities
- Occupational health and safety
- Other labor-related risks

Note: Zoonotic disease transmission could be both social as well as environmental.

Refers to the direct biodiversity risks.

AR3T Action Framework Thought Starter

Avoid

Avoid sourcing leather from farms associated with land clearing and/or using intensive farming practices and inputs that degrade soils and landscapes. Avoid sourcing leather from farms that use lethal wildlife management practices. Avoid use of leather with opaque origins not allowing for due diligence to be conducted.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin leather with recycled. Source leather from suppliers certified to standards with explicit biodiversity-beneficial criteria (and outcomes monitored) such as the Savory Institute's Ecological Outcomes Verified (EOV) program

Restore

Invest in leather and grazing initiatives and other programs or projects with criteria for restoring soil and landscapes on both productive and "non-productive" lands. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Regenerate

Adopt leather standards, or invest in initiatives and programs or projects with criteria for regenerating soil and grazing land such as the Savory Institute's Ecological Outcomes Verified (EOV) program and Textile Exchange's Leather Impact Accelerator (LIA) Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining Textile Exchange's Cashmere Round Table and others who are making public commitments, investing, and taking action.

Stakeholder Platforms and Projects

Accountability Framework Initiative
Leather Impact Accelerator (LIA), Textile Exchange
Leather Working Group
Responsible Leather Round Table, Textile Exchange
Savory Global Network, Savory Institute
Sustainable Leather Foundation

References

Material Change Index Survey Guide, Textile Exchange
Preferred Fiber & Materials Market Report 2021, Textile Exchange

Programs: standards, initiatives and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

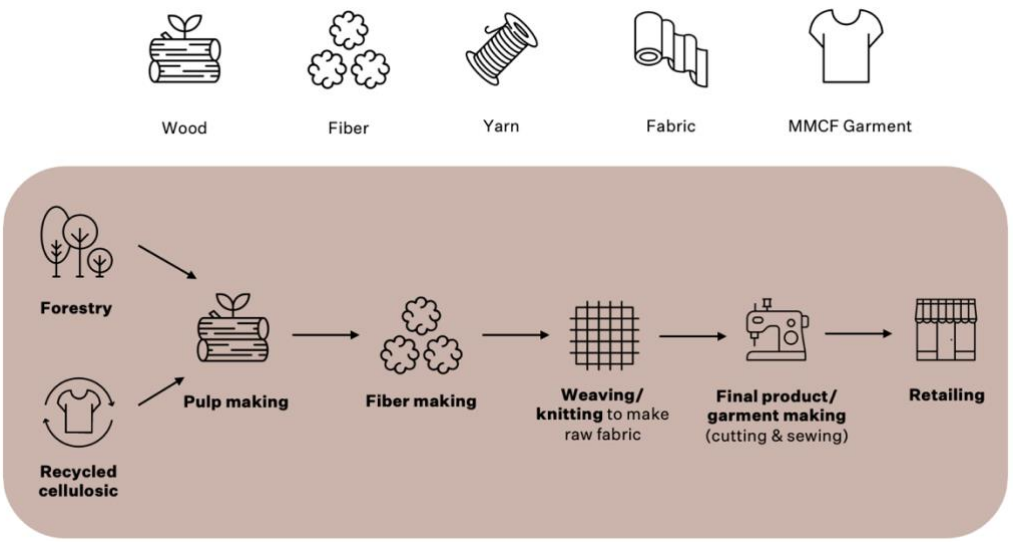
Leather Programs (alphabetical)	Biodiversity Overview	Link to Further Information
Brazilian Leather Certification of Sustainability	Standards for sustainable economic, social and environmental production.	About the CSCB
Certified Wildlife Friendly™	Certified Wildlife Friendly™ products contribute directly to the conservation of species by being directly linked to on- the-ground actions that benefit biodiversity. Criteria require ongoing monitoring, threat reduction, non-lethal management practices, and habitat protection and connectivity.	Global Criteria and Additional Livestock Production Criteria
Land to Market, Savory Institute	Ecological Outcome Verification (EOV) is the science inside Savory's Land to Market program. Soil health, biodiversity and ecosystem function data is captured at the farm, then trended for positive outcomes across key land health criteria.	Program overview
Leather Impact Accelerator (LIA)	LIA incorporates the Deforestation/Conversion-Free (DCF) protocol which requires third-party verification of zero-gross deforestation or conversion at the farm level.	Program overview
Leather Working Group (LWG)	In 2008, LWG included a section within the audit protocol to assess a supplier's ability to be able to trace their raw material back to the slaughterhouse. This ensures that the leather manufacturers within the LWG program have a clear understanding of where their raw material is originating from. With this information and in co-operation with NGOs, the LWG aims to provide increased visibility around material origin for brands and consumers.	Traceability
Organic Leather	Organic agriculture aims to attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity.	Organic Principles
Regenerative Organic Certified (ROC)	Consists of three pillars: Soil Health and Land Management, Animal Welfare, and Farmer & Worker Fairness. ROC has three levels: Bronze, Silver, and Gold. Each requires a number and scope of regenerative organic practices used.	ROC Framework
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Also plays a role in reducing waste (that can end up in the environment).	See Textile Exchange resources

Manmade Cellulosic Fibers

Supply Chain

Manmade Cellulosic Fibers (MMCFs) include viscose, modal, lyocell, acetate, and cupro (recycled cotton linters). This category increasingly includes a variety of innovative materials made from recycled cellulose and non-textile residues such as orange pulp waste.

Figure 15:



Manmade cellulosic fiber supply chain. Textile Exchange

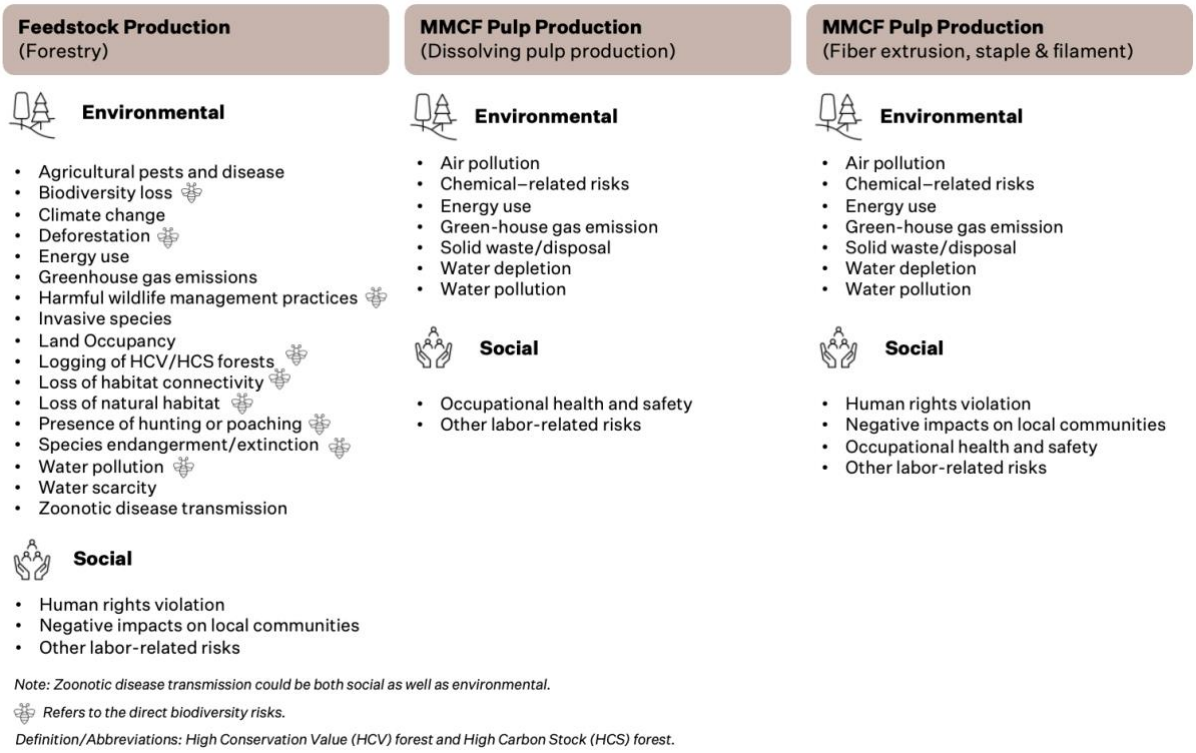
Feedstock Locations

The map shows FSC certified forest area (2018) and PEFC (including SFI) certified forest area (2019) as reported by the respective certification owner. Note: "certified forest area" is reported as share (%) of total global area in hectares (ha) under each certification scheme. Textile Exchange's PFMR, 2020 estimated that ~40-50% of all MMCF was certified to either FSC and/or PEFC. The map also shows the global distribution and associated pulp production volumes of pulp mills as reported by Canopy Planet.

Figure 16: Global forest and pulp production for MMCFs. Source: Canopy, FSC, PEFC, Textile Exchange.

Biodiversity Risks

The textile industry depends on the supply of wood as feedstock which is pulped and manufactured into manmade cellulosic fibers (MMCF) such as viscose, lyocell, and acetate. It depends on other natural capital such as healthy trees and soils, a reliable supply of water, energy, sunlight, dependable weather/seasons, and a stable climate for the ongoing availability of feedstock. Healthy forests depend on nature's contributions to people for pollination and preventing economic damage to the trees from pests and disease. Trees for MMCF production (including beech, eucalyptus, and pine) are mainly grown in plantations in Canada, the U.S., Asia (Indonesia, Malaysia, and India), Europe, and South Africa. However, they can also be felled from primary, secondary, or managed forest. They are likely to be in close proximity to areas of high conservation value, high carbon storage, and wildlife habitats. Activities potentially associated with MMCFs (due to feedstock production), such as land clearing, deforestation, and plantation/ monoculture, increase the risk of biodiversity loss and depletion of other natural capital on both productive and "non-productive" land. MMCF production can also threaten biodiversity and wildlife populations in other ways, e.g., through harmful wildlife management practices to prevent crop damage and human-wildlife conflict and/or restricting free and safe movement and access to natural habitat, food, and drinking water.



AR3T Action Framework Thought Starter

Avoid

Avoid sourcing that negatively impacts High Conservation Value (HCV) and High Carbon Storage (HCS) areas. Avoid the use of manmade cellulosic fibers (MMCFs) with opaque origins not allowing for due diligence to be conducted.
Look to Canopy Style's annual Hot Button Report and Rankings for guidance.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin (conventional) MMCFs with alternatives made from recycled cellulose or reclaimed waste residues. Source MMCFs from suppliers certified to forestry standards with biodiversity-beneficial criteria (and outcomes monitored).

Restore

Invest in forestry programs or initiatives with criteria for restoring forestry, wetlands and peatlands, such as the WWF's Forest Landscape Restoration (FLR) Program. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Regenerate

Adopt forestry standards, initiatives and other programs or projects with criteria for regenerating forestry, wetlands and peatlands, such as the Earthworm Foundation's Healthy Forests Programs. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining others who are making public commitments, investing, and taking action, such as through the Canopy Style and the Forum for the Future/Textile Exchange Round Table and Industry Vision.

Stakeholder Platforms and Projects

Accountability Framework Initiative
CanopyStyle
Changing Markets Roadmap
Earthworm Foundation
Envisioning the future of manmade cellulosic fibers, Forum for the Future
MMCF Round Table, Textile Exchange
Roadmap to Zero and MMCF Guidelines, ZDHC

References

Canopy Hot Button Report 2019
Material Change Index Survey Guide CFMB 2020, Textile Exchange
Forest Certification Assessment Tool (CAT), WWF
Sustainable Policy Transparency Toolkit (SPOTT) Annual Report 2019, Zoological Society London (ZSL)
Preferred Fiber & Materials Market Report 2021, Textile Exchange

Programs: standards, initiatives, and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

MMCF Programs (alphabetical)	Biodiversity Overview	Link to Further Information
CanopyStyle	CanopyStyle Audits of global producers of manmade cellulosic fiber. Auditors verify that producers are meeting audit criteria and whether and when they can be recognized as being at low risk of sourcing from ancient and endangered forests or controversial sources.	Audit Guidelines and Hot Button Rankings
Forest Stewardship Council (FSC)	See WWF Forestry Certification Assessment Tool (CAT) for details.	WWF – Forest Certification Assessment Tool (CAT) and FSC Standards
Programme for the Endorsement of Forest Certification (PEFC)	See WWF Forestry Certification Assessment Tool (CAT) for details of PEFC criteria. Note: PEFC incorporates the Sustainable Forestry Initiative (SFI).	WWF – Forest Certification Assessment Tool (CAT)
Sustainable Forestry Initiative (SFI)	See WWF Forestry Certification Assessment Tool (CAT) for details of WWF criteria.	WWF – Forest Certification Assessment Tool (CAT)
ZDHC Manmade Cellulosic Fibres Production Guidelines	A [new] set of guidelines that "address integrated expectations for discharge wastewater quality, emissions to air, and chemical recovery for manufacturing facilities producing MMCFs."	Guidelines
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Also plays a role in reducing waste (that can end up in the environment).	See Textile Exchange resources

Synthetic Fibers

Conventional (fossil-based) synthetic feedstocks, including polyester and polyamides (such as nylon), are derived from oil and carry a similar feedstock risk profile to plastics. Biobased synthetic feedstocks are derived from plant-based materials.

Recycled synthetic fibers may be made from pre- or post-consumer plastic or textile waste. The two most common forms of recycled synthetics are recycled polyester and recycled nylon. Recycled polyester (rPET) may be made from pre- or post-consumer waste. Used PET bottles and other PET packaging are the most common sources of rPET. Pre-consumer rPET may include waste generated during production e.g., from the cutting of garments. Post-consumer rPET includes soda bottles and packaging diverted from landfill, ocean waste, used clothing, and other used textiles. Recycled nylon is usually from pre-consumer spinning or fabric waste and may also come from post-consumer industrial fishing nets retrieved from the ocean.

Biobased synthetic fibers ("biosynthetics") are created from either partial or 100% renewable resources for the manufacture into synthetic fibers. Most biosynthetics are derived from "first generation" feedstocks such as corn, sugar cane, sugar beet, and castor. Risks associated with first generation biosynthetics are the same as any risk associated with agriculture-based production systems (e.g., land use, agrochemical use, water, etc.). "Second generation" biosynthetics (much less common) are derived from waste or residue from wood or crops, and "third generation" are experimenting with algae, fungi, etc.

Supply Chain

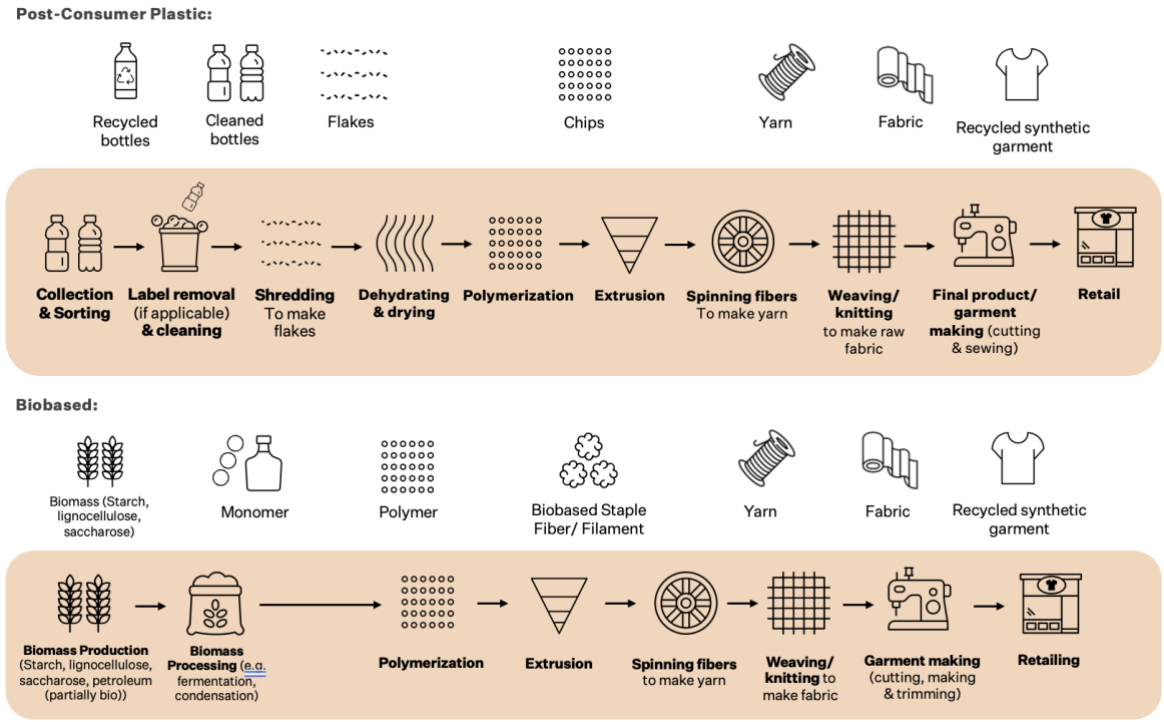


Figure 17: Recycled synthetic textile (e.g., rPET) supply chain, Textile Exchange
Figure 18: Biosynthetic textile supply chain, Textile Exchange

Feedstock Locations

The map shows the geographical distribution of plastic waste around the world and key countries for the production of corn and sugar (primary crops for biobased materials). Note: origins of oil and gas reserves that form the origins of conventional virgin polyester and other synthetics are not displayed on the map.

Post-consumer plastic feedstock: Typically, "harvested" from plastic waste collected by waste pickers and municipal collection services, use of this feedstock can have a positive impact on terrestrial and aquatic (including ocean) ecosystems by removing contaminants from the environment. The map shows the locations and qualities of plastic waste around the world and is adapted from a graphic in the IUCN report Boucher, J. and Friot D. (2017). Primary Microplastics in the Oceans: A Global Evaluation of Sources (Global releases to the world oceans: comparison with plastics originating from mismanaged wastes).

Biobased feedstock: There are three typical sources of starches produced on industrial scales globally and used to produce biosynthetics: corn, sugar cane, and sugar beets. For purposes of converting starch into biosynthetic fibers, the sugar from beets and cane are similar enough to consider identical. The map shows the top five producers of corn and sugar (sugar cane and sugar beet) globally (2019), as registered in the USDA FAS PSD Online.

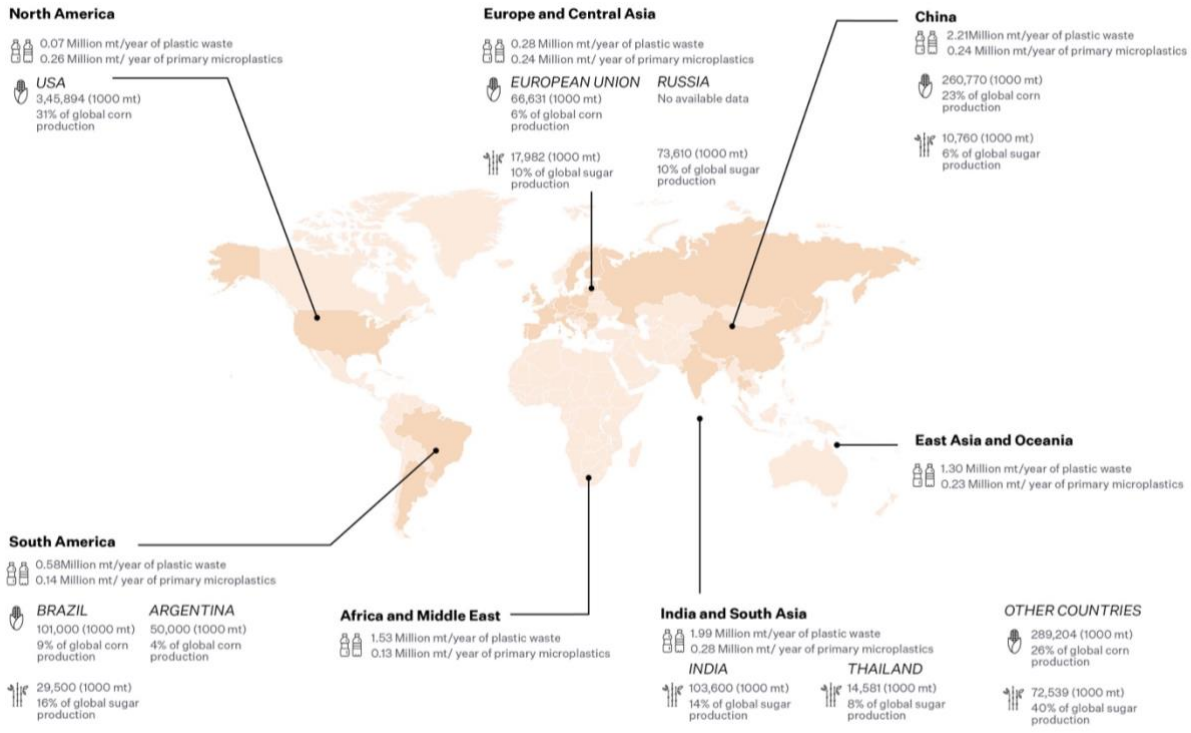


Figure 19: Global repositories of plastic waste (potential rPET sources) and key corn and sugar cultivation countries (potential biosynthetic fiber feedstock). Source: IUCN and USDA (respectively), Textile Exchange.

Biodiversity Risks

The textile industry relies primarily on petrochemicals derived from fossil fuels for its synthetic textile products, such as polyester and nylon. Since fossil fuels are not renewable and are a significant contributor to climate change, the industry must find alternatives.

Reducing the industry's dependency on virgin polyester, post-consumer plastic waste (bottles, packaging etc.,) as a feedstock for recycled polyester (rPET) brings an important opportunity for the textile industry to help clean up plastic from terrestrial and ocean ecosystems, where their impact on wildlife health and safety is of major concern. While not a perfect solution (since it does not mitigate plastic risk or the risk of microplastics and microfibers), there are worthwhile outcomes for biodiversity restoration from the use of post-consumer plastic feedstocks. The long-term goal is that textiles are produced from post-consumer textiles rather than plastics, thus "closing the loop" on materials use.

Biobased feedstocks (such as corn and sugar) for biosynthetics is another option. Biobased feedstocks are depend on healthy soil, water supply, and nature's contributions to people for pollination and for preventing economic damage to the crops from pests and disease. Biobased feedstocks are mainly grown in the U.S., Latin America, and Europe and may be in close proximity to areas of high conservation value and wildlife habitats. Activities potentially associated with crop production, such as land clearing and monoculture, increase the risk of biodiversity loss and depletion of other natural capital on both productive and "non- productive" land. Crop production can also threaten biodiversity and wildlife populations in other ways, e.g., harmful wildlife management practices to prevent crop damage and human-wildlife conflict, and/or restricting free and safe movement and access to natural habitat, food, and drinking water.

Synthetic Fibers Feedstock Production
(Oil extraction, post-consumer, crop cultivation)

Environmental

- Agricultural pests and disease
- Biodiversity loss
- Climate change
- Endangered species/extinction
- Food insecurity (Biosynthetics)
- Greenhouse gas emissions
- Harmful wildlife management practices
- Invasive species
- Land Occupancy
- Land use related risks (biobased)
- Loss of natural habitat
- Presence of hunting or poaching
- Species endangerment / extinction
- Water pollution
- Water scarcity
- Zoonotic disease transmission

Social

- Health risks of vulnerable informal waste pickers (recycled)
- Human rights violation
- Negative impacts on local communities
- Other labor-related risks

Processing
(Polymer, chemicals, shredding, crop cleaning)

Environmental

- Energy use
- Green-house gas emission
- Plastic pollution/danger to freshwater and marine ecosystems
- Solid waste/disposal
- Water depletion
- Water pollution

Social

- Human rights violation
- Negative impacts on local communities
- Occupational health and safety
- Other labor-related risks

Note: Zoonotic disease transmission could be both social as well as environmental.

Refers to the direct biodiversity risks.

AR3T Action Framework Thought Starter

Avoid

Avoid the use of synthetics with opaque origins not allowing for due diligence to be conducted. Avoid sourcing bio-based feedstocks from monoculture and intensive chemical inputs such as broad-spectrum insecticides and excessive nitrogen-based artificial fertilizer. Avoid sourcing biobased feedstocks from areas of High Conservation Value (HCV) and High Carbon Stock (HCS). Avoid sourcing biobased feedstocks that are linked to clearing of natural forests, e.g., by making a zero-deforestation commitment.

Reduce

Reduce impacts and dependencies on land, ecosystems, and natural resources by shifting business models that reduce consumption and/or displace a share of virgin (non-renewable fossil-based) synthetic materials with recycled plastic (increasingly from post-consumer textile products). Source biobased synthetic materials from suppliers certified to standards with biodiversity-beneficial criteria (and outcomes monitored).

Restore

Invest in recycling initiatives and other programs or projects aimed at diverting waste from landfills or removing plastics waste from terrestrial ecosystems and oceans. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Regenerate

Adopt standards or invest in initiatives and other programs or projects with criteria for regenerating soil and land such as agroecology, agroforestry, regenerative, or in-conversion organic farming. Work with local and other stakeholders to approach activities from a regional or landscape-based perspective.

Transform

Accelerate whole-industry progress by joining others who are making public commitments, investing, and taking action such as Textile Exchange's Recycled Polyester and Biosynthetics Round Tables.

Stakeholder Platforms and Projects

Biosynthetics Round Table, Textile Exchange
Fashion Positive and the Circular Materials Guidelines
Recycled Polyester Round Table, Textile Exchange
Roundtable on Sustainable Biomaterials (RSB), see the RSB "Textile & Fibers" booklet

References

The Sustainability of Biosynthetics Report, Textile Exchange
Material Change Index Survey Guide CFMB, Textile Exchange
Plastics for Change
Preferred Fiber & Materials Market Report 2021, Textile Exchange
Resource: Plastic Hub and No Plastic In Nature A Practical Guide for Business Engagement, WWF

Programs: standards, initiatives, and processes

Participation in a program is not a substitute for the actual practices required to achieve positive outcomes or impacts for biodiversity. This is a list of some available programs for this material.

Recycled Synthetic Programs (alphabetical)	Biodiversity Overview	Link to Further Information
Cradle to Cradle	To receive certification, products are assessed for environmental and social performance across five critical sustainability categories: material health, material reuse, renewable energy and carbon management, water stewardship, and social fairness. A product is assigned an achievement level (Basic, Bronze, Silver, Gold, Platinum) for each category.	Principles and the SDGs
Plastics for Change (Fair Trade Certified)	Helps to create dignified livelihoods to address the root cause of plastic pollution in developing countries.	Program overview
Recycled	Can help reduce pressure on natural resources by potentially reducing the need for virgin feedstocks. Also plays a role in reducing waste (that can end up in the environment).	See Textile Exchange resources

Biosynthetic Programs (alphabetical)	Biodiversity Overview	Link to Further Information
Bonsucro (sugar)	The Bonsucro Production Standard uses 7 principles to achieve sustainability in the production of sugarcane and its derived products. Principle 4 is to manage biodiversity and ecosystems.	Program overview and Principles
Fair for Life (sugar)	The Fair for Life standard includes a section on local impact covering legitimate use rights and use of biodiversity and traditional knowledge.	Program and Standards
Fair Trade Sugar	Prohibits the felling of forests with high conservation value and require farmer co-operatives to map risk areas, raise their members' climate awareness and promote climate-friendly production methods.	Fairtrade and Sustainability
Intl. Sustainability & Carbon Certified (ISCC)	Depending on the certification, covers deforestation- free, among other criteria.	Deforestation-Free Certification
Organic	Aims to attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity.	Principles
Regenerative Organic Certified (ROC)	Consists of three pillars: Soil Health and Land Management, Animal Welfare, and Farmer & Worker Fairness. ROC has three levels: Bronze, Silver, and Gold. Each requires a different number and scope of regenerative organic practices used.	ROC Framework
SuCCESS (castor)	The SuCCESS Code has 11 management principles, with Principle 9 being Biodiversity Management.	Program and Code

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Conservation International works to spotlight and secure the critical benefits that nature provides to humanity. Building upon a strong foundation of science, partnership and field demonstration, Conservation

International's mission is to empower societies to responsibly and sustainably care for nature, our global biodiversity, for the well-being of humanity. Visit: https://www.conservation.org/

The Biodiversity Consultancy works with sector-leading clients to integrate nature into business decision-making and build sustainable pathways to positive environmental outcomes. Through our strategic, technical and policy expertise, we guide clients in the fashion and textile sector through biodiversity risk and develop project- and corporate-level biodiversity strategies, risk screening programs, value chain foot printing, and resilient management plans. Our science-based, pragmatic approach delivers robust solutions to complex biodiversity challenges such as achieving Net Gain for biodiversity, creating science-based targets for nature, developing biodiversity offsets, metrics and indicators, and discovering opportunities to go Nature Positive. Visit: https://www.thebiodiversityconsultancy.com/

Textile Exchange is a global nonprofit that creates leaders in the preferred fiber and materials industry. We build a community that can collectively accomplish what no individual or company can do alone. We develop, manage, and promote a suite of leading industry standards, as well as collect and publish critical industry data and insights that enable brands and retailers to measure, manage, and track their use of preferred fiber and materials. With a robust membership representing leading brands, retailers, and suppliers, Textile Exchange is positively impacting the climate through accelerating the use of preferred fibers across the global textile industry.

Climate+ With our new Climate+ strategy, Textile Exchange is the driving force for urgent climate action on textile fiber and materials with a goal of 45% reduced greenhouse gas (CO_2e) emissions from textile fiber and material production by 2030. By benchmarking the industry and providing actionable tools for improvement, Textile Exchange is driving a race to the top. Visit: https://textileexchange.org/about-us/

For all inquiries, please contact CFMB@TextileExchange.org

Textile Exchange | Corporate Fiber & Materials Benchmark Program

Find out more about the Material Change Index here:

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