Biodiversity Risks and Opportunities in the Apparel Sector

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FOREWORD

There is an increasing recognition among businesses that depend on natural resources for their raw materials that the risks associated with their operations and their dependency on biodiversity and ecosystem services[1] can have major implications both for their financial and operational performance. Negative impacts on biodiversity and ecosystem services from unsustainable business operations pose a number of risks to corporate performance. Some of these risks include for example the following areas:

- Operational: increased scarcity and cost of raw materials such as freshwater; disruptions to business operations caused by natural hazards; and higher insurance costs for natural disasters.
- Market: customers switching to more sustainably sourced or certified products; and governments implementing new sustainable procurement policies.
- Regulatory: emergence of new government policies such as taxes and moratoria on extractive activities.
- Reputational: damage to corporate reputation from media and NGO campaigns; shareholder resolutions; and changing consumer preferences.
- Access to capital: restricted access as the financial community adopts more rigorous investment and lending policies.

In this context, in 2015, Hugo Boss and IUCN agreed to collaborate to gain a better understanding of the dependence and impacts of the company's main product value chains (apparel and accessories) on biodiversity and ecosystem services; and to identify potential opportunities for mitigating negative impacts to biodiversity and ecosystem services across the value chains.

There is growing awareness amongst stakeholders in the apparel sector of the social and environmental sustainability challenges faced by complex value chains due to the sector's global distribution and diverse range of sources and types of raw materials, manufacturing processes, and consumer markets. With this awareness comes the pressure to take action to address both social and environmental challenges.

This report aims at providing a better understanding of the relationship between the apparel sector value chains and biodiversity, and in particular of the dependencies and impacts of the apparel sector on biodiversity (a sustainability issue that has not been given much attention in this sector). It proposes a risk assessment framework based on the sector's dependencies and impacts, and it makes suggestions for realizing opportunities to address negative impacts on biodiversity. It is an initial analysis based on desktop research and information and discussions with Hugo Boss on the types of value chains and raw materials typically found in the apparel sector.

We hope this report will create more awareness about the urgent need to take action in relevant parts of the apparel sector value chain directly contributing to the loss of biodiversity, in order to mitigate and proactively avoid significant risks to our planet's natural capital from this sector.

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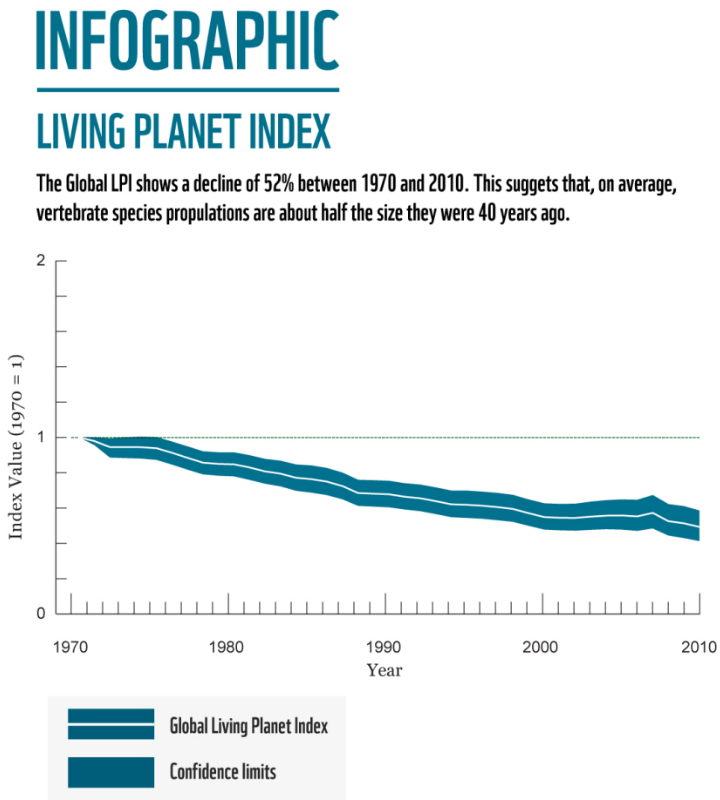
[1] Defined as 'benefits people obtain from ecosystems', Millennium Ecosystem Assessment (2006)

1. THE STATE OF BIODIVERSITY

Biological diversity - or biodiversity - is the term given to the variety of life on Earth and the natural systems it forms. Biodiversity is defined as the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. This includes diversity within species (i.e. genetic diversity), between species, and of ecosystems[2]. Biodiversity is the life support system of the Earth, with human livelihoods also directly dependent on genetic, species and ecosystem diversity and function.

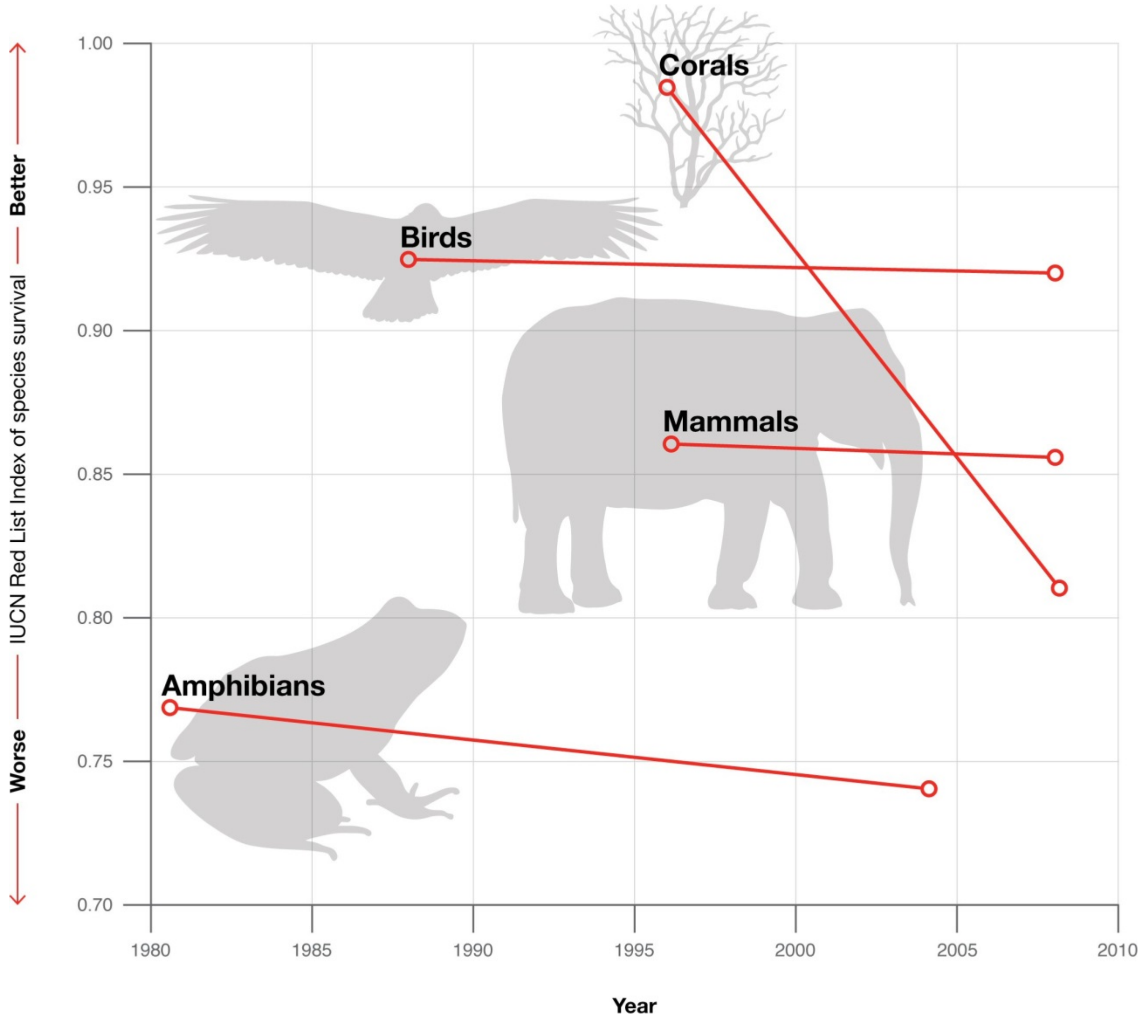
A range of indicators of the status of biodiversity suggest that, based on current trends, pressures on biodiversity will continue to increase at least until 2020, and the global status of biodiversity will continue to decline. The Living Planet Index (LPI - WWF 2012) and the Red List Index are two examples of such indicators. The LPI measures more than 10,000 representative populations of mammals, birds, reptiles, amphibians and fish, and has declined by 52 percent between 1970 and 2010 (see Figure 1).



[2] Text based on UN Convention on Biological Diversity definitions

The IUCN Red List of Threatened Species[3] provides a comprehensive, objective and global approach for evaluating the conservation status of plant and animal species. Its main purpose is to catalogue and highlight those plants and animals that are facing a higher risk of global extinction. The Red List Index[4] (RLI) is an important indicator of the global status of biodiversity. Currently, the RLI is available for four taxonomic groups: amphibians, birds, corals and mammals. The RLIs are plotted over the period 1980-2010 and highlight that the conservation status of these major groups is continuing to decline, particularly for amphibians and corals (see Figure 2: plotting conservation status change from worse to better on the vertical axis against years on the horizontal axis).

Figure 2: Trends in the Red List Index



[3] http://www.iucnredlist.org/about/overview

[4] RLIs are based on the number of species in each Red List category, and on the number changing categories between assessments as a result of genuine improvement or deterioration in status. For more information: http://www.iucnredlist.org/about/summary-statistics#TrendsInBiodiversityStatus

Main pressures on biodiversity

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 ecosystem services upon which all life depends. All human activities make use of ecosystem services; for instance areas of high biodiversity (e.g. tropical forests) provide important ecosystem services 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 ecosystem services 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. There are five main direct pressures that constitute the major threats to global biodiversity:

1. **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, and degradation - the direct alteration or fragmentation of natural habitats for human uses. For terrestrial ecosystems, habitat loss is largely reflected in the conversion of natural habitats to agriculture and unsustainable forest management**.** For inland aquatic ecosystems, habitat loss and degradation is largely accounted for by unsustainable water use and drainage for conversion to other land uses, such as agriculture and settlements. In coastal ecosystems, habitat loss and degradation is driven by a range of factors including fisheries and marine aquaculture.

2. **Overexploitation of biological resources:** is the unsustainable harvesting of wild population 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, bush meat, and by poaching). For marine ecosystems, overexploitation is largely accounted for by unsustainable commercial fisheries and is the major pressure being exerted on these types of ecosystems.

3. **Pollution**: 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 (e.g. nitrogen).

4. **Climate change**: 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[5]. Climate change is already having an impact on biodiversity under current levels of temperature change (globally averaged

[5] http://unfccc.int/files/documentation/text/html/list_search.php?what=&val=&valan=a&anf=0&id=10

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 2014).

5. **Invasive alien species**: are 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, invasive species impact 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 pressures do not occur in isolation but are interconnected and act synergistically. For example, the release of pollution such as excessive pesticides into the natural environment 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.

2. DEPENDENCIES AND IMPACTS OF THE APPAREL SECTOR VAUE CHAIN ON BIODIVERSITY

For business sectors to support and actively contribute to the conservation and sustainable use of biodiversity and the maintenance of ecosystem services, an important first step is to fully understand how its activities both impact on and depend upon biodiversity. To do so it is important to understand how individual organisations and industry sectors affect biodiversity and ecosystem services along value chains.

The apparel sector value chain is complex due to its global distribution and diverse range of sources and types of raw materials used, manufacturing facilities, and consumer markets. The value chain can be categorised into four main parts:

1. Raw materials: the extraction, production and processing of raw materials such as cotton, wool, pulp, rubber, leather, metals, and petrochemicals, used in apparel products.
2. Manufacturing: the processing and assembly of raw materials into intermediate and final apparel products. A typical example of a textile manufacturing chain would include: dyeing and wet processes; spinning, weaving and knitting; cutting and trimming; and, finishing and packaging.
3. Goods transportation: the distribution of finished or partially finished goods by shipping, rail, road, and/or air.
4. Consumer care and end-of-life disposal: the use, maintenance, and disposal of goods by consumers.

Each part of the value chain also has biodiversity and wider environmental impacts associated with it, which directly impact on the biodiversity that it is dependent on. Below is a brief overview of these impacts[6] (see also Figure 3):

1. Raw materials

Fibres made from farmed plants, such as cotton grown on farms, can require large quantities of water and pesticides to produce, while farmed animals can have impacts on the ecosystems where the animals are raised (e.g. water pollution from animal waste, habitat degradation from grazing, and pasture expansion into natural habitat). Fibres made from wild plants and animals, such as wood pulp, skins or fur, can have significant ecosystem impacts when harvested unsustainably (e.g. diminished wildlife populations, local extirpations). Synthetic fibres are often made from petrochemicals that require a lot of energy to produce, though can sometimes be recycled. Fabric choice at the design table also drives consumer care requirements, which themselves have large water, energy, and toxic chemical impacts. The main sources of fibre currently used in the sector can be divided into two broad categories: 1) Natural fibres: including farmed and wild animal skins, furs and wools; farmed and wild silk; farmed cotton; forestry pulp; and natural rubber, 2) Synthetic fibres: based on petrochemicals (e.g. polyester, synthetic rubber); and those based on recycled chemical materials (e.g. plastic bottles).

2. Manufacturing

The manufacture of garments can also result in large environmental impacts. High-volume textile dyeing and finishing mills in particular are high-impact producers of water pollution and greenhouse gas (GHG) emissions. Many of these mills are located in lower income countries, and often lack the capacity to adequately monitor the environmental impacts of manufacturing processes or to enforce compliance with environmental regulations and standards.

3. Transportation of Goods

The apparel sector is a global industry with raw materials, manufacturers and retailers situated around the world. Transportation of raw materials, processed garments and finished products results in significant GHG emissions, and other forms of air and water pollution (e.g. particulate matter in air and fuel leakage in water). Designers and retailers must choose between container ships, rail, road, and/or air to move their garments during the production process, with each mode of transportation resulting in different levels of pollution.

4. Consumer care and end-of-life disposal

The way consumers clean and care for garments can also have a large environmental impact, for example through water and energy use. Garments that are frequently laundered or dry-cleaned can also create their biggest environmental impact once they have left the store. Designers are also increasingly releasing new collections throughout the year (as opposed to traditional seasons). This, combined with the limited recycling or reuse of old clothes in general (EPA 2013), adds substantially to household waste streams and contributes to environmental impacts through waste management, GHG emissions, and land take for expanding areas for landfill.

[6] Main environmental impacts in each stage are based on IUCN NGO Member Natural Resources Defense Council's (NRDC) analysis of the apparel sector: http://www.nrdc.org/international/cleanbydesign/default.asp

In order to gain a more detailed understanding of how these impacts contribute to direct pressures on biodiversity, Table 1 presents analyses of each part of the value chain against each of the five pressures, based on desktop-research of sector-level information for major materials and processes. By understanding in-depth how the apparel sector contributes to each of the five pressures on biodiversity, it is possible to propose a biodiversity risk assessment framework for business operators across the apparel sector value chain.

Table 1: How the 4 operational areas across the value chain of the apparel sector contribute to direct pressures on biodiversity and ecosystems

		DIRECT PRESSURES ON BIODIVERSITY				
MAIN IMPACT AREAS ACROSS VALUE CHAIN	**Main environmental impact areas across the value chain ↓**	**Loss, degradation & fragmentation of natural habitats**	**Overexploitation of biological resources**	**Excessive nutrient loads (especially nitrogen & phosphorous) & other forms of pollution**	**Climate change, including acidification of the oceans**	**Invasive alien species impacts on ecosystems**
	Raw materials for natural fibre: sourced from farmed crops Main material used: cotton; Other sources of material used: flax (source of linen), hemp.	Cotton: Represents ~30-40% of all fibre used for textiles (90% of natural fibres), occupies 2.4% of global cropland, (50% irrigated land) & production is expected to grow from both yield increases & area expansion (esp. in Africa and South Asia regions) (OECD-FAO 2013). Unsustainable cotton farming uses large amounts of water, with significant ecosystem impacts – e.g. the destruction of ecosystems of the Aral Sea in central Asia (WWF 1999). Area expansion could result in the loss, degradation and fragmentation of natural habitats in tropical and sub-tropical regions of the world. Expansion of cotton production can also negatively impact food security, particularly where it may compete with food crops in food insecure regions - but as a cash crop it can also create additional income for farmers. Flax and hemp: Represent a small proportion of both fibre and global cropland and typically use far less water compared to cotton, so generally has limited direct impacts on habitats compared to cotton (SEI 2005; NRDC 2011).	N/A to farmed crops	Cotton: Cotton is typically a chemically intensive crop and grown using fertilizers, herbicides and pesticides. In spite of occupying 2.4% of global cropland, cotton accounts for 22.5% of the world's insecticides and 10% of all pesticide use (WWF 2015). Flax and hemp: Both use fewer chemicals compared to cotton, and cultivation occupies less land area globally, so limited pollution impacts in general (SEI 2005; NRDC 2011).	Sources of GHG emissions include: fossil fuels used in the production and use of agrochemicals for farming, the distribution of raw materials, and land use change from expansion of land for cultivation. Limited climate change impacts in terms of GHG emissions, compared to other more energy-intensive parts of the value chain.	Cotton, linen and hemp are not considered invasive alien species as per the Global Invasive Species Database (GISD 2015) which focuses on species that threaten native biodiversity and natural ecosystems.
	Raw materials for natural fibre: sourced from domesticated or farmed animals Main types in use are animal skins (cows), wools (goats, sheep, alpaca), furs and silk (various species).	Animal skins: Most leather comes from cows raised for both beef and milk. However, leather is not always an incidental product as it can often be the most profitable part of the animal. Use of leather therefore can exert a significant demand on the livestock sector. The livestock sector is the world's largest land user with grazing land and crop land used for feed grain production covering 80% of agriculturally used land globally (FAO 2006). Expansion of livestock production is a key factor in deforestation, especially in Latin America (FAO 2006). Wools: Mainly comes from sheep and goats – grazing animals that are part of the livestock sector. But there is enormous diversity in wool production between and within countries and a limited	N/A to domesticated or farmed animals. But animal welfare issues are an important consideration in the exploitation of biological resources, for e.g. mulesing for sheep or live plucking of feathers for down or appropriate management of wild animals under captive conditions. The process of making silk requires the killing of the larvae when the cocoon is boiled (FF 2007), because of this sericulture has been criticized by animal welfare and rights activists.	Animal skins: The livestock sector is probably the largest sectoral source of water pollution, contributing to eutrophication, "dead" zones in coastal areas, degradation of coral reefs, human health problems, and emergence of antibiotic resistance (FAO 2006). The major sources of pollution are from animal wastes, antibiotics and hormones, fertilizers and pesticides used for feedcrops, and sediments from eroded pastures (FAO 2006). Wools: In addition to the livestock sector pollution impacts listed above (which would depend on the type of production system being deployed – e.g. low input systems would create less pollution), sheep wool production typically uses pesticides to protect the sheep fur from parasites, which	Sources of GHG emissions include: fossil fuels used in the production and use of agrochemicals, for farming and the distribution of feed crops, and land use change from expansion of land for pastoral purposes or feed crop production.	Domesticated animals used for skins and wool are not considered to be invasive species that threaten native biodiversity and natural ecosystems. However, several animal species used in fur farms are considered alien invasive species. The main examples are: North American Mink (*Mustela vison*), brushtail possum (*Trichosurus vulpecula*), coypu (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*) and raccoon dog (*Nyctereutes procyonoides*) all of which are 'generalists', meaning they are able to exploit a wide range of resources. All of the above have deliberately (or sometimes accidentally) been introduced for the benefit of the fur trade and all have had a dramatic and detrimental impact on indigenous wildlife and wider ecosystems.

		amount of data for key stages of the value chain which makes it difficult to present a global view of impacts (Henry 2011). For example, extensive grazing of natural pastures in climates where shelter is not required in winter months is typically a low input, low impact system relative to production requiring grain or imported feed and heated shelter (Henry 2011). <u>Furs</u>: 85% of the world's fur trade originates from farmed animals; most of the farmed fur is produced in Europe and accounts for 70% of global mink production (EU = 64%) and 63% of fox production (EU = 47%); skins from goats and a variety of sheep also enter the fur trade (IFTF 2013). Fur farms typically concentrate their land use (as animals are usually caged) and may be integrated with other farming systems, so contribution to direct habitat conversion appears to be minimal. Related to fur is the use of down feathers from birds. Most of the world's feathers come from China (80%) and Eastern Europe (25%) where the birds (geese and ducks) are raised for their meat, with down typically being a by-product (ADFC 2014). <u>Silk</u>: Conventional silk is derived from silkworms that feed largely on mulberry leaves, usually indoors in large trays; this type of silk is called "cultivated" and is produced on large, industrial scale farms so does not seem to drive land conversion - therefore direct habitat impacts are limited. Much of the silk in the US is produced in China and India. (ITC 2005)		can then be released into the environment without proper management (NRDC 2012). <u>Furs</u>: Fur farms can release significant amounts of animal manure into local waterways, contributing specifically to nitrogen and phosphorus pollution. Fur requires intensive chemical treatment to prevent it from rotting (as it is a natural material) which led to fur dressing being ranked as one of the world's five worst industries for toxic-metal pollution in manufacturing according to the World Bank (PETA 2015). <u>Silk</u>: The cleaning process of silk involves chemicals and the polluted waste water can be discharged to local waterways as a pollutants. Silk for most places is not a local resource, so processing and transportation contributes to pollution.		Countries for which the impact of mink on native species has been studied show that mink can have a significant effect on ground-nesting birds, rodents, amphibians and mustelid (Bonesi & Palazon 2007) Two of the species - the possum and coypu - are listed on the GISD's '100 of the World's Worst invaders'.
	Raw materials for natural fibre: sourced from wild animals Main animal skins and fur in use are case-specific and include well-known examples such as pythons, crocodiles, vicuna, and shahtoosh.	<u>Animal skins, fur and wool</u>: Unsustainable harvesting of wild species can have significant impacts on the ecosystems they are sourced from. For example, by diminishing populations, causing extirpations, and affecting ecosystem integrity. For example, by removing individuals at the top of the food chain (such as predatory cats) from a population may deprive ecosystems of a vital component as predator-prey relationships may be altered resulting in changes to the ecosystem. The trapping of non-target species by fur trappers is another big threat to wildlife populations. <u>Silk</u>: Cocoons of semi-wild and wild moths in India and China that have emerged from their cocoons naturally are a source of "wild silk". In general, the harvesting of wild silk does not appear to impact the natural habitats where the silk works live (NRDC 2012). For instance, in India wild silk helps maintain the forest habitat of moths by linking the livelihood of tribal spinners	<u>Animal skins, fur and wool</u>: Wild animals account for 15% of the world's fur trade (IFTF 2013). In countries where environmental regulations include sustainable quotas and are enforced, populations are generally not overexploited. However where they are not, populations can be drastically reduced with species nearing extinction. Examples of animal skins and wool include pythons (substantial proportion are sourced illegally and beyond agreed quotas (ITC 2012); crocodiles (Nile crocodile and American alligator were endangered in the 1960s but have rebounded as a result of strict regulation, ranching and farming); vicuna (South American camelids - from a population of 2 million 500 years ago to 6,000 in 1960, to 250,000 individuals today as a result of strict regulations and sustainable use programmes for communities); shahtoosh (Tibetan antelope	N/A to wild animals	N/A to wild animals	<u>Animal skins and fur</u>: The Burmese python (*Python molurus bivittatus*) is a common source of wild animal skins in Southeast Asia. As a result of accidental and purposeful releases into the wild from the pet trade, it has become a well-known invasive species in the US.

		and weavers to the existence of these trees (NRDC 2012).	– poaching and significant illegal trade is ongoing, but much reduced compared to the 1990s) (Zegna 2011; India Today 2012).			
	Raw materials for natural fibre: Trees, seaweed Trees: Main plant types in use are trees from both natural and plantation forests (for example, Eucalyptus, Bamboo) to produce 'dissolving pulp' to produce rayon fabrics such as tencel, viscose, modal, and cupro. Pulp from both natural and plantation forests are also used for paper and cardboard packaging. Natural rubber made from resin from rubber trees (grown in plantation forests) is also used in some apparel products such as shoes. Seaweed: SeaCell is fibre based on combining cellulosic fibre (up to 95%) from dissolving pulp from forests, with a minority proportion of fibre sourced from marine algae.	Trees: More than 70 million trees are logged every year (from both natural forests and plantations) and turned into dissolving pulp for cellulosic fabric (Canopy 2014). Canada and Indonesia are the largest dissolving pulp exporters to China and, along with Brazil, provide almost two thirds of China's dissolving pulp imports. Canopy and Rainforest Action Network suggest that endangered forest ecosystems in Indonesia (rainforest and peatlands), Canada's boreal forest, North America's west coast temperate rainforests, and the Brazilian Amazon are being logged for sourcing dissolving pulp for cellulosic fabric. The use of dissolving pulp for fabrics is estimated to double by 2050 (Canopy 2014). Rubber: Strong international demand for natural rubber is driving expansion of industrial-scale and smallholder monoculture plantations into natural habitats, with >2 million ha established during the last decade. Mainland Southeast Asia and Southwest China represent the epicenter of rapid rubber expansion. A recent review of the impacts on forest ecosystems and biodiversity estimates that 4.3–8.5 million ha of additional rubber plantations are required to meet projected demand by 2024, threatening significant areas of Asian forest, including many protected areas (Warren-Thomas et al. 2015). Seaweed: SeaCell appears to use a small proportion of seaweed-based fibre, and the species is a common algal species in marine ecosystems of the northern Atlantic Ocean (Smartfiber AG 2015). Its harvesting should have limited impacts provided it is sustainable – i.e. within the ecological limits of the concerned ecosystem it is being extracted from. Unsustainable harvesting of seaweed can have cascading effects on other species as it provides habitat structure and food for many marine species.	Overexploitation of a particular species is unknown, but if endangered forests are being converted, some globally threatened species could well be negatively impacted. Seaweed The algal species used in SeaCell is *Ascophyllum nodosum*: common brown algae (Smartfiber AG 2015). It is a seaweed species of the northern Atlantic Ocean, common on the north-western coast of Europe (from Svalbard to Portugal) including east Greenland and the north-eastern coast of North America. It is mainly harvested for use in alginates, fertilisers and for the manufacture of seaweed meal for animal and human consumption. Use in the apparel sector appears small (and is combined with pulp from trees) but could grow as it could substitute for cotton. Although the species is common at present, if its commercial use grows its populations could diminish. This would impact the conservation status of the species, but also other species that depend on it (see habitat impacts).	Plantation forests can utilise agrochemicals which can pollute waterways and soil if unsustainably managed. Pulp mills can discharge many pollutants in surrounding water bodies including persistent toxic chlorine compounds like dioxin, organic materials that consume oxygen during decomposition, sulphur dioxide that contributes to lake acidification, air-polluting nitrogenous compounds and phosphates that boost algae growth. While new technology has substantially reduced water emissions from many mills, there is significant variation around the world in the use of this technology and major polluting incidents still occur (WWF 2014).	Loss of forests, particularly old growth forests, can result in significant GHG emissions. Today, deforestation causes approximately 15% of global GHG emissions (IPCC 2014a). In the last decade >2m ha of rubber plantations have been established in SE Asia. It is known that natural forest has been recently converted to rubber plantations in mainland SE Asia ((Warren-Thomas et al. 2015). Natural forest clearing for rubber plantations is taking place and expected to continue in Vietnam, Cambodia. The pulp and paper industry is the fourth largest industrial user of energy globally, and the largest share of GHG released in pulp and paper manufacturing comes from the energy production to power the mills (WWF 2014).	Dissolving pulp can be sourced from plantations which are often based on Eucalyptus (several species are used for commercial purposes and are known to be invasive species that negatively impact local wildlife). For instance, Eucalyptus plantations have often replaced oak woodlands, for example in California, Spain and Portugal. The resulting monocultures of these invasive species that replace natural forest can threaten native biodiversity and natural ecosystems: for example, through the loss of acorns that mammals and birds feed on, the absence of hollows in oak trees that provide shelter and nesting sites for birds, small mammals and bee colonies (Sax 2002). Some of the 1450 species of Bamboo can also be invasive. The seaweed species used in SeaCell is not considered to be invasive as per GISD.
	Raw materials for synthetic fibres: petroleum-based fibres Main types in use are polyesters, synthetic rubber, nylon and plastic for hangers and packaging.	Polyester and synthetic rubber is derived from petroleum. Mining for non-renewable resources that create polyester (coal and petroleum) can destroy natural habitats during the process. The degree of risk depends on whether the demand for polyester is increasing pressure on natural habitats or if it is met from existing fossil fuel sources as a by-product (it is most likely the latter, but this is not known in detail).	N/A as a specific species is not exploited.	Most commonly, the chemicals used in production are not released to the environment; and, water consumption in producing polyester is much lower compared to farmed sources such as cotton. However factories without end-of-pipe wastewater treatment systems, release antimony along with a host of other potentially dangerous substances like	Energy requirements for fibre production are high. Energy inputs and GHG emissions in polyester production are high (125 MJ/kg fibre versus 100 MJ/kg of viscose (cellulose-based) fibre) (NRDC 2012).	N/A as a specific species is not exploited.

				cobalt, manganese salts, sodium bromide, and titanium dioxide (NRDC 2012).		
	Raw materials for synthetic fibres:: fibres based on recycled material Main recycled material for textiles is recycled polyester made from recycled plastic bottles (PET) or used polyester clothes, and recycled nylon made from post-industrial waste.	Use of recycled materials such as plastic bottles or used clothes that would have gone to landfill saves petroleum, reduces dependency on oil, and reduces pressure on existing landfills – thereby reducing pressure on conversion of natural habitats.	N/A as a specific species is not exploited.	One consideration in the recycling of PET is antimony, which is present in 80-85 % of all virgin PET, and is converted to antimony trioxide at high temperatures that are necessary during recycling, releasing this carcinogen from the polymer and making it available for intake into living systems (OE 2012). The risk depends on how such pollutants are managed in the production of the recycled fibre.	Use of recycled materials can reduce GHG emissions, provided lifecycle emissions profiles clearly demonstrate this. For instance recycled PET, on average, requires 50% less energy than virgin fibre (Libolon 2015).	N/A as a specific species is not exploited.
	Manufacturing	Manufacturing typically takes place in industrial areas, but a due diligence process (e.g. Environmental Impact Assessments) for any biodiversity risks of the manufacturing site must be conducted.	N/A as manufacturing takes place typically in industrial areas and does not use species.	The energy, water and chemical uses of the apparel sector, specifically the manufacturing stage of the value chain, make it an extremely resource-intensive industry sector. Producing textiles uses a wide range of chemicals, many of which can be toxic and have the potential to harm workers and cause irreversible damage to the environment. For instance, an estimated 17 to 20% of industrial water pollution comes from textile dyeing and treatment and an estimated 8,000 synthetic chemicals are used throughout the world to turn raw materials into textiles, many of which will be released into freshwater sources. Large amounts of water and energy are used during many of these processes and non-biodegradable waste effluent is produced. Effluent treatment plants are not a legal requirement in many producing countries. Particularly where environmental regulations are lacking or not enforced this can have enormous impacts on freshwater biodiversity and freshwater resources. Apart from textiles, the manufacturing of leather from raw hides and skins is also chemically intensive and also toxic. The tanning process uses chemicals and toxins including ammonia, cyanide-based dyes, formaldehyde, and lead. Some of these products are carcinogenic, and all are environmental pollutants, which end up being released into the air, ground, and water supply (PETA 2015).	The apparel industry is a large GHG emitter owing to its global size, scope and energy use. Many processes and products that go into the making of fibres, textiles and apparel products consume significant quantities of fossil fuels. The exact contribution of the sector to the 30% of global emissions that industry as a whole is responsible for is difficult to assess due to the complexity of the supply chains. In regards to energy use, different fibres have varying energy impacts depending on the raw materials used in their production. Polyester is made from non-renewable petroleum and requires large energy inputs to produce the fibre. Over 70% of the total energy used for a polyester garment occurs at this production phase (FF 2007).	N/A as manufacturing does not use species.
	Transportation for goods movement	N/A typically because transport does not involve habitats or wildlife	N/A typically because transport does not involve habitats or wildlife	N/A	Textile production has always been a global business, with raw materials being produced in parts of the world where the climate suits them best. In the past 5-10 years, textile production has become increasingly concentrated in China, Pakistan, Bangladesh, India, Mexico, Romania, Cambodia and Turkey (FF 2007). However, the biggest markets are	Transport has a high invasive species transfer potential, depending on the transportation type – movement of goods is one of the vectors for introduction of invasive species, particularly through shipping. The exact contribution of the apparel sector to transferring invasive species through its transportation lines is as yet unknown.

					in the West, meaning clothes travel long distances before they reach consumer markets (FF 2007). Transporting clothing and components over such large distances produces significant GHG emissions. Whilst the majority of clothing is transported using road and sea (much lower emissions compared to air), poor planning and unexpected sales patterns can lead to the use of air freight – which is responsible for much higher levels of carbon emissions per product (FF 2007).	
	Consumer care	Over the last two decades clothing has become increasingly affordable in higher income countries in particular, and retailers and brands have capitalised on this affordability by moving away from a 'summer' and 'winter' season to fresh collections throughout the year (FF 2007). Increasing amounts of clothing is ending up in landfill when it could be recycled or reused. For example, 1.9m tonnes of textiles were disposed of in 2005 in the UK, 1.2m tonnes went into the rubbish bin, and only 0.3m tonnes were resold or recycled through charities (DEFRA 2006). In some countries such as the US, research has shown that the fastest growing sector in household waste is textiles (EPA 2013). Waste disposal by landfill can impact on biodiversity as a result of loss of habitat through direct land take.	N/A because consumer care does not involve species.	Where textiles are disposed of in landfills or incinerators (i.e. not recycled or reused) pollutants released into the environment can include: leachates which affect groundwater, and other air pollutants released to the atmosphere. Textiles are amongst many components of household waste. Significant pollution and water consumption occurs from the washing of clothes: detergents and microfibers washing into local and regional waterways, and eventually oceans.	Washing, drying and ironing often accounts for the most significant use of energy in the clothing lifecycle (FF 2007). Depending on the fabric the clothes are made from, as much as 80% of the carbon 'footprint' of clothing can be caused in its washing and care (FF 2007). For example, for cotton most of the energy impacts occur in the use phase, when the consumer is washing, drying and ironing the garment (TED 2010).	N/A because consumer care does not involve species.

3. ASSESSING RISKS ON AND OPPORTUNITIES FOR BIODIVERSITY CONSERVATION

Assessing the risk to biodiversity of a company's operation is the most effective approach for defining a forward looking, proactive action plan to manage biodiversity impacts. Biodiversity risks in a business context have been defined by the World Economic Forum's Global Risks Report as: "Business risks related to biodiversity in the broadest sense. This includes risks as a result of direct impacts or dependencies on biodiversity or ecosystem services, as well as regulatory, financing, reputational and supply chain risks that arise due to business's relationships with biodiversity and ecosystems"[7]. From the biodiversity conservation perspective, it is critical then to clearly understand when there **are high risks of negatively impacting biodiversity** as a result of direct impacts or supply chain impacts from economic operators in the apparel sector value chain.

Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat (or hazard). *Quantitative risk assessment* requires calculations of two components of risk *(R)*: the magnitude of the potential loss *(L)*, and the probability *(p)* that the loss will occur[8].

In the proposed framework the focus is on understanding when there **are high risks of negatively impacting biodiversity** as a result of direct impacts or supply chain impacts from economic operators in the apparel sector value chain. Based on the general sector-level description in Table 1, we chose to focus on the raw materials and manufacturing parts of the apparel sector value chain (excluding transportation and consumer care), as raw materials and manufacturing are significant sources of direct impacts to biodiversity and these parts of the value chain are more easily influenced by companies.

For each specific stage of the value chain, we offer indications on how to assess when the magnitude of impact and the probability that the loss will occur are high. More specifically, we propose the circumstances when there is:

- High probability of impact: we ask what are the conditions under which impacts are highly likely to occur?
- High Magnitude of impact: we ask what are the conditions under which impacts are likely to be high and/or irreversible (without mitigation measures in place or planned)?

Table 2 offers examples of how risks and opportunities can be defined for materials commonly used in the sector.

[7] World Economic Forum (WEF) Global Risks Report (2010)
[8] http://en.wikipedia.org/wiki/Risk_assessment

Table 2: Circumstances in raw materials and manufacturing parts of the apparel sector value chain that are potentially high risk, in terms of contributing directly to the 5 pressures on biodiversity

Hyperlinks have been provided where there are known sources of information to help determine specific circumstances for the company.

	DIRECT PRESSURES ON BIODIVERSITY				
STAGE OF VALUE CHAIN	**Loss, degradation & fragmentation of natural habitats**	**Overexploitation of biological resources**	**Excessive nutrient loads (especially nitrogen & phosphorous) & other forms of pollution**	**Climate change (CC), including acidification of the oceans**	**Invasive alien species impacts on ecosystems**
Raw material for natural fibre: Fibre for fabric from farmed crops. Examples: cotton, flax, hemp.	HIGH RISK: High probability of impact: When sourcing from regions with at least one of the following: a. Weak environmental regulations, particularly for natural habitats b. Water scarcity (see here for other water tools as applicable) c. Cumulative impacts from multiple land uses are contributing to deforestation pressures in areas of cotton production. d. If areas of expansion or replacement of food crops by cotton are in food insecure regions, there is also a high likelihood of negatively impacting food security. High magnitude of impact: Irreversible loss of natural habitat through conversion and fragmentation from expansion, or irreversible degradation from reduced water availability for natural habitats due to diversion for irrigation. Impact would be globally significant if expansion, degradation (incl. unsustainable water management) or fragmentation is negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here.	N/A to farmed crops	HIGH RISK: High probability of impact: When sourcing from regions with at least one of the following: a. Weak environmental regulations, particularly for pollution and pesticide management b. Cumulative impacts from point and non-point sources of pollution, particularly nitrogen and phosphorous from agrochemicals, are contributing to excessive nutrient loads in waterways and soil High magnitude of impact: Excessive nutrient loads in waterways and/or pesticides impacting native wildlife and local water resources. Impact would be globally significant if excessive nutrient loads and other forms of pollution are negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here.	IMPACTS TO CC: RELATIVELY LOW IMPACTS FROM CC: HIGH Probability and magnitude of impact: Cotton production both contributes to climate change and is at risk from its impacts. On the contribution side, GHG emissions from cotton production vary greatly across countries. Cotton production contributes to between 0.3% and 1% of total global GHG emissions (ITC 2011). GHG emissions in the cotton value chain are derived mainly from the consumer use phase (30%–60%), and manufacture (20%–30%). Emissions from cotton production amount to only 5%–10% of the total emissions of the value chain. Thus, while the likelihood of the impact is high (i.e. cotton cultivation does contribute to climate change through GHG emissions), the magnitude of the impact from cotton cultivation is low (as it is not a large contributor of emissions compared to other crops). On the other hand, the likelihood and magnitude that cotton production will be impacted by climate change is high, because: • Agriculture is extremely vulnerable to climate change. Higher temperatures eventually reduce yields of desirable crops while encouraging weed and pest proliferation. Changes in precipitation patterns increase the likelihood of short-run crop failures and long-run production declines. • Climate change will affect cotton production as a result of higher concentrations of CO2 and average warming temperatures. Both these changes will set off a series of other actions that will have direct and indirect impacts on cotton production, for example through water availability and the incidence of cotton pests and diseases (ITC 2011). Indirect impacts can include the displacement of cotton production to forest frontiers resulting in habitat loss and GHG emissions (known as indirect land use change in the bioenergy sector).	Cotton is not an invasive species known to negatively impact native ecosystems (GISD), but cotton monocultures could harbour invasive species.

Raw material for natural fibre: Fibre for leather, wool and fur from farmed animals (domesticated and wild species). Examples: cow, sheep, buffalo, goat, camel, red deer, snakes, mink, fox	HIGH RISK: High probability of impact: When sourcing from regions with at least one of the following: a. Weak environmental regulations, particularly for natural habitats and over-grazing b. Water scarcity (see here for other water tools as applicable) c. Cumulative impacts from multiple land uses are contributing to deforestation pressures in areas of pasture for livestock that is a source of leather High magnitude of impact: Irreversible loss of natural habitat through conversion and fragmentation from expansion for pastures, or irreversible degradation from over-grazing or reduced water availability for natural habitats due to diversion for irrigation. Impact would be globally significant if expansion, degradation (incl. unsustainable water management) or fragmentation is negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here. Note on fur from farmed animals: In general, animals farmed for fur are in concentrated land use (as animals are usually caged), and may be integrated with other farming systems. Contribution to direct habitat conversion appears to be minimal. A majority of farmed fur is produced in Europe (e.g. 70% of global mink production and 63% of fox production). Potentially high impacts are expected from pollution and invasive species (see next columns).	N/A to domesticated or farmed animal species (animal welfare issues can be considered here)	HIGH RISK: High probability of impact: High when sourcing from regions with at least one of the following: a. Weak environmental regulations, particularly for nitrogen and phosphorous from animal manure in waterways and soil b. Cumulative impacts from point and non-point sources of pollution, particularly nitrogen and phosphorous from animal manure, are contributing to excessive nutrient loads in waterways and soil High magnitude of impact: Excessive nutrient loads in local water resources and soil impacting native wildlife. Impact would be globally significant if excessive nutrient loads and other forms of pollution are negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here.	IMPACTS TO CC: HIGH IMPACTS FROM CC: HIGH Probability and magnitude of impact: Livestock production both contributes to climate change and is at risk from its impacts. On the contribution side, globally, the livestock sector contributes 18% of global GHG emissions (cumulative emissions from energy, waste, land use, land use change and forestry (LULUCF) and agriculture for feed production) (FAO 2006). The agriculture sector as a whole accounts for ~24% (IPCC 2014) of global GHG emissions, so the livestock sector accounts for 75% of all emissions from agriculture. Thus, the likelihood and magnitude of the impact is high (i.e. the livestock sector contributes to climate change through GHG emissions, and is a significant proportion); however, given that livestock's major use is meat, the specific contribution for leather use is difficult to assess and warrants further research. The likelihood and magnitude that livestock production will be impacted by climate change is high, because: • Livestock products would become costlier if agricultural disruption leads to higher grain prices. In general, intensively managed livestock systems will be easier to adapt to climate change than will crop systems. • Pastoral systems may not adapt so readily. Pastoral communities tend to adopt new methods and technologies more slowly, and livestock depend on the productivity and quality of rangelands, some of which may be adversely affected by climate change. In addition, extensive livestock systems are more susceptible to changes in the severity and distribution of livestock diseases and parasites, which may result from global warming. Note on farmed animals: if energy for running the farms is from non-renewable sources then there is a contribution to GHG emissions (but these are relatively limited compared to other more energy-intensive parts of the value chain).	Domesticated animals: Typically livestock species are not considered invasive species. Note that the IUCN/SSC Invasive Species Specialist Group (ISSG) classifies feral cattle (animals escaped into the wild) as invasive alien species (but feral pigs, goats and rabbits have higher negative impacts on native biodiversity, especially in small islands). Risks would be high where such escapes occur and impact native species and ecosystems. Farmed animals (wild-based species): HIGH RISK: High probability of impact: When sourcing from regions with at least one of the following: a. Weak environmental regulations, particularly for invasive species control b. No or inappropriate tools and management plans to assess and manage the risk of invasive species escaping to the wild are being applied and implemented High magnitude of impact: Irreversible impact on indigenous wildlife and the wider ecosystem if the following species are farmed in non-native regions with weak environmental regulations or no management plans: North American Mink (*Mustela vison*), brushtail possum (*Trichosurus vulpecula*), coypu (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*) and raccoon dog (*Nyctereutes procyonoides*). Two of the species - possum and coypu - are listed on the GISD's '100 of the World's Worst invaders'.
Raw material for natural fibre: Fibre for leather, wool and fur from wild animals. Examples: kangaroo, boas, pythons, crocodiles	HIGH RISK: High probability of impact: When unsustainably harvesting individuals (i.e. removal above sustainable limits, see next column) at higher levels of a food chain (e.g. predators) from a population - this can deprive ecosystems of a vital trophic component as predator-prey relationships may be altered resulting in cascading changes to the ecosystem. Unsustainable wildlife harvesting diminishes wildlife populations, can lead to	HIGH RISK: High probability of impact: When sourcing from Countries where at least one of the following apply: a. Weak wildlife trade regulations, particularly for the prevention of overexploitation of target species to ensure its long term viability and productivity. Specifically, regulations for use of wild species do not require management plans that establish strategies for sustainable overexploitation of target species,	N/A to wild species	Generally N/A to wild species, but if ecosystem-level impacts are significant then this can have negative impacts on the carbon-sequestering capacity of the ecosystem (particularly for grasslands and forests)	

	species extirpation and can erode ecosystem integrity and function. <u>High magnitude of impact</u>: When the harvested species is at the top of the food chain (e.g. predatory cats) - because it's unsustainable removal can have irreversible effects on other species down the food chain and in the wider ecosystem.	which would include information on: harvest limits, strategies and locations; monitoring and assessment of target populations; harvest and trade reviews; and, response mechanisms to indications of over-exploitation. b. Corruption regarding wildlife regulation enforcement / known participant in illegal wildlife trade <u>High magnitude of impact</u>: Unsustainable exploitation of species, i.e., above the maximum sustainable yield, can result in declining and diminished populations, with increased extinction risk for species. The extent of impact resulting from unsustainable harvesting would depend on the extinction risk the species in question faces. This can be assessed through a risk assessment to assess vulnerability to exploitation. Species at highest risk of extinction are: a. Globally threatened species (IUCN Red List: Critically Endangered (CR), Endangered (EN), and Vulnerable categories (VU)) b. CITES Appendix I species c. Regional or National lists of threatened species d. Endemic (to single countries and/or small geographic units) e. Naturally rare in occurrence f. Particularly vulnerable to over-exploitation due to life history traits (e.g. low fecundity)			
Raw material for natural fibre: Fibre for fabric, rubber, and packaging from natural (or less cultivated systems such as plantations) ecosystems Examples: Trees, seaweed .	HIGH RISK: <u>High probability of impact:</u> When sourcing from regions with at least one of the following: a. Weak forest management regulations or practices, particularly if sustainable forest management approaches are not enforced for timber extraction b. Water scarcity (see here for other water tools as applicable), particularly if plantations are involved c. Cumulative impacts from multiple land uses are contributing to deforestation pressures in areas of timber extraction <u>High magnitude of impact</u>: Irreversible loss of natural habitat (particularly if primary forest) through conversion and fragmentation from timber extraction from natural forests or plantations, or degradation or reduced water availability from intensive plantation management. Impact would be globally significant if expansion, degradation (incl. unsustainable water management) or fragmentation is	UNKNOWN: Overexploitation of a particular species is unknown, but if endangered forests are being converted, some globally threatened species could be negatively impacted. Apart from tree species, it is not clear yet if there are other wild botanical species used in the apparel sector.	HIGH RISK: <u>High probability of impact:</u> When sourcing from regions with weak environmental regulations, particularly for management of toxic compounds involved with the pulping process. <u>High magnitude of impact</u>: High: excessive nutrient loads in local water resources and soil impacting native wildlife. Impact would be globally significant if excessive nutrient loads and other forms of pollution are negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here.	IMPACTS TO CC: HIGH IMPACTS FROM CC: HIGH Loss of forests, particularly primary or old growth forests can result in significant GHG emissions. Deforestation currently accounts for approximately 15% of global GHG emissions (IPCC, 2014). The pulp and paper industry is the fourth largest industrial user of energy, and the largest share of GHG released in pulp and paper manufacturing comes from the energy production to power the mills (WWF, 2010). Changing climate patterns such as lower precipitation levels and warming temperatures will negatively impact forest or plantation productivity.	IF PLANTATIONS WITH INVASIVE EUCALYPTUS OR BAMBOO SPECIES ARE INVOLVED: <u>High probability of impact:</u> When sourcing from regions with at least one of the following: a. Weak environmental regulations, particularly for invasive species control b. No or inappropriate tools and management plans to assess and manage the risk of invasive species escaping to the wild are being applied and implemented

	negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here. Note on seaweed use: Common species of seaweed and small volumes are currently used in the apparel sector so habitat and species impacts would be limited. If volumes of seaweed go up, then wild seaweed must be sustainably harvested, and farmed seaweed must be sustainably managed.				
Manufacturing processes - particularly dyeing and wet processes for textiles, and tanneries for leather (but applicable to all manufacturing processes)	Manufacturing takes place typically in industrial areas, but a due diligence (e.g. EIA) for any biodiversity risks of the manufacturing site must be conducted. HIGH RISK: High probability of impact: When manufacturing in areas of water scarcity (see here for other water tools as applicable) the water used for manufacturing processes can have negative impacts on native species and ecosystems, if used unsustainably. High magnitude of impact: Irreversible loss of natural habitats or native species that are not receiving sufficient water supply. Impact would be globally significant if unsustainable water management is negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here.	N/A as species are not directly involved with manufacturing processes.	HIGH RISK: High probability of impact: When sourcing from regions with weak environmental regulations, particularly for management of toxic compounds involved with the dyeing and wet processes and tannery processes. High magnitude of impact: High: excessive nutrient and toxic compound loads in local water resources and soil impacting native wildlife. Impact would be globally significant if excessive nutrient and toxic compound loads and other forms of pollution are negatively impacting Key Biodiversity Areas (KBAs: sites contributing significantly to the global persistence of biodiversity). KBAs are present in virtually all countries and oceans (but only 56% of KBAs globally have legal protection): see a global map here.	IMPACTS TO CC: HIGH IMPACTS FROM CC: HIGH High likelihood and magnitude of impact when energy sources for manufacturing processes are non-renewable and therefore contribute to GHG emissions (manufacturing is an energy-intensive part of the apparel value chain). Manufacturing uses water, which can have variable availability under changing climate patterns.	N/A as species are not directly involved with manufacturing processes.

4. MANAGING THE IDENTIFIED RISKS AND OPPORTUNITIES

As a biodiversity risk and opportunity assessment is conducted, potential action areas to mitigate risks to, and realize opportunities for, biodiversity conservation emerge. It is recommended to consider taking some initial steps that can help to ensure that relevant policies, strategies and action plans are developed and implemented coherently and systemically. Establishing and publicly communicating such commitments, ambitions or aspirations can be inspiring and demonstrates a clear and coordinated direction for biodiversity action planning.

These steps include:

Define clearly your commitments in relation to nature conservation. Based on your product lines and the results of the risk and opportunity assessment identify the areas that emerge as priority in terms of highest risk and opportunities. In the apparel sector, the following types of commitments are likely to match some of the risks and opportunities:

- **Move to deforestation-free supply chains**: Ensure that major product lines using raw materials that are based on terrestrial ecosystems (such as cotton or plantation agro-ecosystems, or natural forest ecosystems), will only source from existing managed landscapes for agriculture or forestry activities.
- **Promote land restoration**: For raw materials or commodities that have a potential impact on land use (for example cotton), join or develop land restoration initiatives at the landscape level (i.e. help bring back productivity to adjacent areas, thereby reducing the risk of natural habitat conversion for other land uses, including food production).
- **Substitute more hazardous chemicals with less hazardous ones**: As evidence improves on impacts of industrial chemicals on human and environmental health, best practices, laws and international norms related to such chemical use, substitute more toxic substances with less toxic ones, and improve the targeting and precision of chemical use to minimize non-target impacts.
- **Sustainable water management**: Across the value chain, commit to using and managing water resources sustainably. Advanced corporate strategies should aim to recognise, map and reduce water risks for wider multi-stakeholder benefits at river basin scale. This approach should underpin work on mitigating biodiversity risks (for example water quality), and encourage business to support better public sector policy development, regulatory mechanisms and monitoring.
- **Contribute to sustainable livelihoods**: Benefit local communities in your supply chains (particularly in developing countries) that are dependent on natural resources for their livelihoods by creating opportunities for sustainable natural resource management (for e.g. good agricultural practices, water stewardship) with the aim of transforming these supply chains for both community and conservation benefit.

Integrate credible certification schemes in your supply chains. Identify what would be the most suitable standard and certification systems, based on company's areas of sourcing (e.g. are environmental regulations in place and effective in the sourcing countries) and operation and the company's values. Eventually define ways to support relevant certification systems and/or national or sub-national governments to improve their capacity to respond to sustainability, quality and market requirements (i.e. origin of the cotton).

Distinguish between animal welfare and biodiversity conservation issues. Both issues are critical, but clearly distinct. The strategies and actions shall be clearly separate in order to ensure that the impacts are correctly addressed as well as the opportunities. Furthermore, partners on the ground and globally will very likely be different for these two issues.

Adopt the mitigation hierarchy. In developing a sustainability strategy for biodiversity, it is advisable to use the mitigation hierarchy as a framework for action. This calls for three main steps:

- Define what impacts can be avoided and address them first (for e.g. avoiding sourcing of wild species that are globally threatened)
- Define options for minimizing environmental impacts and maximizing conservation opportunities (e.g. purchasing organic or sustainably-certified cotton minimises the impact of intensive agrochemicals on local biodiversity in production regions; identifying areas near cotton plantation for restoration).
- Assess your residual impact (including the sourcing of raw materials) and consider compensation actions such as biodiversity offsets or other conservation actions (e.g. improving the management effectiveness of legally protected areas in managed landscapes where offsets are not possible because of the absence of natural areas with similar biodiversity to that being negatively impacted from residual effects). Develop, in collaboration with other end users, a Net Positive Impact strategy to offset the impacts at the landscape level (IUCN, 2015).

Biodiversity offsets
Biodiversity offsets are measurable conservation outcomes resulting from actions designed to compensate for significant residual adverse biodiversity impacts arising from project development after appropriate prevention and mitigation measures have been taken. The goal of biodiversity offsets is to achieve No Net Loss and preferably a Net Gain of biodiversity on the ground with respect to species composition, habitat structure, ecosystem function and people's use and cultural values associated with biodiversity. Source: BBOP (2012)

Residual Impact
Adverse impacts that cannot be avoided, minimised and / or rehabilitated or restored.

Identify sustainable value addition your company can contribute to. In the assessment of negative impacts from supply chains, also consider the potential for positive impacts from certain activities (including on local livelihoods) such as sustainable wild species sourcing and sourcing from smallholder farmers as a means of supporting local livelihoods and employment.

Integrate Sustainability in the conceptual phase of the business development. A sustainable design approach offers the possibility to incorporate environmental or biodiversity factors into the conceptual design phase such as the selection of the raw materials. In addition, it allows the company to think about the efficiency and sustainability of its product from a lifecycle perspective[9]: rethink the collections plans in terms of concept, size and frequency; in addition, use a sustainable design model that offers the opportunity to incorporate environmental issues from the creation phase to the end of life disposal.

Develop and implement a sustainable use strategy relating to wildlife resources. From the perspective of maximizing opportunities for biodiversity conservation, the apparel sector can play a major role in supporting the sustainable use of wild resources. Sustainable use is recognised as a conservation strategy by IUCN, the Convention on Biological Diversity and the UN Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). IUCN recognizes that "the ethical, wise and sustainable use of some wildlife can provide an alternative or supplementary means of productive land-use, and can be consistent with and encourage conservation, where such use is in accordance with appropriate safeguards" (18th Session of the General Assembly (Perth, 1990), Rec. 18.24). This position was re-affirmed at the following session of the Union's General Assembly in 1994 (Rec. 19.54) and subsequently at the World Conservation Congress in 1996 (Res. 1.39). Sustainable use is also one of three main objectives of the UN Convention on Biological Diversity (CBD) (https://www.cbd.int/sustainable/?sec=more) and is endorsed by (http://www.cites.org/eng/res/08/08-03R13.php). A Sustainable Use Policy Statement was also adopted at the IUCN World Conservation Congress in 2000 (Sustainable Use of Wild Living Resources (Resolution 2.29).

In implementing a sustainable use strategy relating to wildlife resources, a key decision is whether to sustainably harvest animals, plants and/ or fungi from the wild or to intensively manage species in captive environments. Each production method has associated potential costs, benefits and impacts as outlined and a range of factors need to be considered in formulating strategies. These include species factors, governance factors, supply-chain factors and end-market factors (Cooney *et al.* 2015). Decision-making on the mode of production should be treated on a case by case, or species by species basis, giving consideration to each of these factors. The most appropriate production method may be sustainably wild caught harvest, where species can demonstrably be harvested sustainably using the most appropriate harvest methods, thereby benefitting from lower production costs, as well as delivering benefits to local communities through employment or opportunities to earn income associated with harvest. Alternatively, it may be that intensively managing resources in a captive environment is most suitable based on existing operations or supply chains (which enable natural systems to be left alone from sourcing) or consumer preferences for a given product but which may also present opportunities for local communities to benefit through associated employment opportunities. The challenge to selecting the most appropriate strategy is working through the combination of factors in order to mitigate the risks and identify the opportunities which will deliver maximum benefits for the conservation of biodiversity, maintenance of ecosystem services and opportunity for supporting local livelihoods.

[9] See resources on sustainable design from UNEP: http://www.unep.org/resourceefficiency/Business/SustainableProducts/DesignforSustainability/tabid/78845/Default.aspx

The strategy should include:

1. Assessment of the species
2. Identification of best practices for harvesting/colleting
3. Develop a monitoring plan to assess practices and identify benefits
4. Developing a trusted and cost-effective traceability system for sourcing species
5. Determine credible claims that can be made in relation to the use of these species in its production lines.

Annex 1 provides more details on the process for establishing a strategy for the sustainable use of wild resources.

To conclude, it should be noted that from the perspective of risk mitigation, this sector's high risks to biodiversity stem largely from the raw materials and manufacturing parts of the value chain, which can be locally and/or globally distributed. In general, it is therefore suggested to work on action planning with different partners and at different scales (relevant to the size of operations and supply chain distribution). It should be noted that proactively taking a sustainable design approach for the design of a product (which would typically take place within the manufacturing part of the value chain) would play a critical role in improving its sustainability performance. Indeed, the conceptual design phase holds the most influence on decisions defining the raw materials, supply chains and manufacturing processes needed for the final product.

ANNEX 1: SUSTAINABLE USE OF BIODIVERSITY

A.1 Introduction to wildlife trade

Wildlife trade, the sale or exchange of wild animal, plant and fungi resources by people, takes place to meet a range of human wants and needs (Broad *et al.* 2003). It includes the harvest and trade in live animals and plants, animal skins and furs, bones and trophies, plant seeds, oils, and resins, among many other derivatives, for nutritional, medicinal, socio-economic and cultural reasons. This includes the use of wildlife as food, medicine, pets, collection items, as decorative, fashion and luxury items, and as timber. It takes place at local, national and international levels and supports the livelihoods of millions of people in the developing world, in particular indigenous peoples and local communities, but also in developed regions. For instance, it encompasses the sale and exchange of wild animals and plants for subsistence purposes in the developing world but equally the retail of luxury products (e.g., handbags made from crocodile or snake skin) in high-end markets (e.g., in Europe).

Quantifying wildlife trade is inherently difficult because much of it occurs through informal networks and is poorly monitored. However, international trade has been estimated to be worth US$323 billion annually (TRAFFIC 2014), the majority of which comprises fisheries and timber, and wildlife trade is growing in terms of value and volumes (Roe 2008). Excluding fisheries and timber, international trade has been estimated to be worth US$61 billion annually (Engler 2008) and involves a plethora of wildlife species and their derivatives among mammals (e.g., furs, skins), birds (e.g., live, feathers), amphibians and reptiles (e.g., for pets, skins), invertebrates, plants (including orchids and cacti) and corals.

The trade in wildlife has primarily been governed by regulation both nationally, through laws and regulations, and internationally through CITES, the Convention on International Trade in Endangered Species of Wild Fauna and Flora which entered into force in 1975. However, while most wildlife trade is legal, that is it takes place within national laws and conventions, large volumes of illegal trade also takes place which contravenes these measures. Independent of legal estimates, illegal wildlife trade is estimated to be worth US$50-150 billion annually (UNEP 2014) and involves iconic species and their derivatives such as elephant ivory and rhino horn, trade in which is increasing (Underwood *et al.* 2013; Wittemyer *et al.* 2014). Yet, it also involves a multitude of lesser known species traded for food, medicine, pets, collections and fashion among other uses and includes pangolins, bears, great apes and other mammals (e.g., the Tibetan antelope for its wool; Thomas 2013), amphibians, reptiles, birds and marine fishes (Challender *et al.* 2015).

Key to ensuring that wildlife trade does not threaten biodiversity is making sure that it does not exceed biologically sustainable levels, i.e. is unsustainable. This is the focus of the CITES Convention which applies to international trade and which relies on a regulatory approach. A predominantly regulatory approach has also been championed and prioritised in recent years as a result of increasing levels of illegal trade, for example, the need to strengthen regulation, enforcement and trade restrictions. However, although strengthening regulations may be appropriate to address illegal trade in some circumstances, in others instances strict regulation may be problematic for ensuring sustainable harvest and trade of wildlife. For instance, this could be the case where it prevents trade which is legal, sustainable and well-regulated and which could deliver positive outcomes for biodiversity conservation in terms of species and habitat conservation, and benefits to local communities in terms of livelihoods.

A.2 Introduction to sustainable use

The conservation of biodiversity and maintenance of ecosystem services relies on careful management and protection of wildlife resources, and where wildlife is traded, to ensure that trade does not occur at unsustainable levels. Sustainable use is defined by the Convention on Biological

Diversity (CBD) as the 'use of components of biological diversity in a way and at a rate that does not lead to the long-term decline of biological diversity, thereby maintaining its potential to meet the needs and aspirations of present and future generations' (CBD 1993). Where the harvest and trade in wildlife resources is unsustainable, i.e. occurs at a level faster than biological recovery, it can threaten wildlife populations, the existence of species, and detrimentally impact ecosystems. It also threatens the livelihoods of those people who depend on wildlife resources in the long term. This may be through income generation as part of their daily livelihood strategies or as an additional source of income, by removing their ability to benefit from use which is sustainable, which also impacts their ability to contribute to conservation efforts.

Unsustainable harvest and trade leads to declines in populations of wildlife species and in extreme circumstances can lead to local, or even global, extinction of species or sub-species. There are a number of examples where overexploitation has led to diminished populations or the depletion of natural resources, including non-timber forest products such as nuts and seeds (NTFP; Neumann and Hirsch 2000) and the extinction of the Javan Rhino *Rhinoceros sondaicus* in Vietnam in 2011 as a result of overexploitation for its horn for illegal trade (Brooks *et al.* 2011).

However, declines in populations or the loss of species from ecosystems, especially 'keystone species' – those that have a significant impact on their native ecosystems (Power *et al.* 1996) – can also result in cumulative impacts on ecosystems and ultimately threaten ecosystem integrity and function. For example, species declines or losses impact on species-species interactions (e.g., predator-prey relationships) which can have additional effects along the food chain – so called 'trophic cascades' (Pace *et al.* 1999). An example would be where a species is lost in an area where it is the primary prey for a predator, so with the loss of the prey species can be the loss of the predator species. Loss of species can also impact on other ecosystem services such as nutrient cycles, seed dispersal or pollination, as is the case with unsustainable harvest of species for bushmeat in Africa and Asia (e.g., Harrison *et al.* 2013), resulting in the erosion of ecosystem function.

Millions of people around the world depend on wildlife resources to varying degrees and unsustainable harvest and trade also affects them in a number of ways. First, it can inhibit their ability to harvest and trade species sustainably and thereby reap the socio-economic and other benefits of doing so, ultimately meaning that they need to pursue alternative livelihood strategies. Similarly, where species become rare and the costs associated with harvest increase, harvest of particular species may no longer be feasible as a livelihood activity and people may similarly need to consider alternative livelihood means (Cooney *et al.* 2015). Third, where harvest and trade is industrial, and dominated by large corporations, it can result in local communities receiving only a small share of the value of the harvest, or they may be excluded from the economic benefits associated with this trade altogether (Roe 2008; Cooney *et al.* 2015). Each of these impacts is negative both for biodiversity and for people's livelihoods – unsustainable harvesting and trade can remove the incentive for local people to value and become stewards of species and habitats found in and around their communities.

Conversely, where species can be sustainably harvested and traded, under the right conditions, both harvest and trade can have positive impacts for both biodiversity conservation and local livelihoods. These conditions include species' biological characteristics, governance factors (e.g., laws and policies and their enforcement and implementation), supply-chain factors, and end-market factors (see Cooney *et al.* 2015). There are good examples from around the world where these conditions have enabled legal, sustainable trade which has been beneficial both to species and people's livelihoods. Examples include the sustainable harvest and trade of vicuña in South America, crocodiles in some African countries, and trophy hunting of Markhor in Pakistan, which have resulted in increasing populations of these species in the wild and social, economic and development benefits to local communities who live with or close to these species.

A.3 How to use CITES: Appendix I, II and III

A.3.1 What is CITES?

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) is an international agreement between Governments and is a UN Convention. The aim of the Convention is to ensure that international trade in specimens of wild animals and plants does not threaten their survival in the wild. Much of the focus of the Convention is on putting in place mechanisms to guide sustainable legal trade of species but CITES also focuses on combatting illegal trade.

Because the trade in wild animals and plants crosses international borders, international cooperation is required to monitor and regulate trade to safeguard certain species from over-exploitation. In recognition of this need for such international collaboration, CITES was agreed by 80 countries in 1973. The Convention entered into force on 1 July 1975 and has 181 Parties as of June 2015. More than 30,000 plant and animal species are listed on the three Appendices of the Convention, depending on their biological status and the impact that international trade may have upon this status.

A.3.2 How CITES functions?

CITES is an international agreement (a treaty) to which States (countries) adhere voluntarily. States that sign and ratify the Convention ('join' CITES) agree to be bound by it and are known as Parties to the Convention. Although CITES is legally binding on the Parties – in other words they have to implement the Convention – it does not take the place of national laws. Rather it provides a framework to be respected by each Party, which has to adopt its own domestic legislation to ensure that CITES is implemented at the national level. The Convention works by subjecting international trade in specimens of selected species to certain controls. All import, export, re-export and introduction from the sea of species covered by the Convention needs to be authorized through a licensing system.

Member countries, known as Parties, work together in a variety of ways to fulfil the Convention's aims. For instance:

- Species listed on CITES Appendix I are threatened with extinction at least in part because of international trade, so trade for commercial purposes is prohibited. Trade in specimens of these species is permitted only for exceptional non-commercial purposes (such as for scientific research). Species on Appendix I include, for example: tigers; almost all whale species; all marine turtles; elephants; all the great apes; as well as some crocodiles. . However, in some cases, Appendix I species can be traded if they are closed-cycle captive bred (where no animals, including young / eggs, are taken from the wild) which has been established to be without detriment to the wild population. In order to trade internationally, such facilities must be registered as "CITES-registered captive breeding operations". Captive breeding facilities have been established for a number of Appendix I listed crocodile species for example, including *Alligator sinensis*, *Crocodylus moreletii*, *C. acutus*, *C. porosus* and *C. siamensis*.

- Species listed on CITES Appendix II are species that are not yet threatened with extinction, but may become so unless international trade is regulated. Species can only be exported when the exporting country has determined that the international trade will not be detrimental to the species' survival in the wild and is in compliance with their own national and domestic legislation. Trade of Appendix II species is regulated through a system of permits based on scientific and management determinations made by the exporting Party - all exports must be accompanied by a permit.

Appendix II listed species include, for example, all those primates, cats, cetaceans, birds of prey, parrots, crocodiles and orchids not listed in Appendix I, and other species such as freshwater turtles, mahogany, orchids, sea horses and the whale and basking sharks. The source of traded Appendix II species may be from the wild (if managed in a way that is non-detrimental to the species) or also through ranching / captive breeding (where animals are raised in captivity but stock, for example eggs / young, may be supplemented from the wild, which must also be non-detrimental to the species).

- When a species is listed on CITES Appendix III by a range State (the State / nation whose territory is within the natural range of distribution of a species), exports from that range State (and other range States that also list the species) are only allowed when the Management Authority is satisfied that the specimen has been legally obtained. Exports from other range States (that have not included their own populations of the species on Appendix III) must be accompanied by Certificates of Origin, stating the exporting country. A good example of this is ramin (*Gonystylus* spp.), which Indonesia included in Appendix III of CITES in 2001.

In order to comply with CITES' requirements, each CITES Party is required to designate a Management Authority to issue permits for trade in species listed in the CITES Appendices and a Scientific Authority to provide scientific advice on imports and exports. CITES enforcement is often the responsibility of Customs, Police and similar agencies.

A.3.3 The IUCN Red List

The IUCN Red List of Threatened Species™ is the world's most comprehensive information source on the global conservation status (threat of extinction) of animal, plant and fungi species and their links to human livelihoods. It provides information and analyses on the status, trends and threats to species in order to inform and catalyse action for biodiversity conservation. Each Red List assessment for a species includes a rich compendium of information including geographic range (including species distribution maps), habitat, ecology, population size and trends as well as threats, global status and conservation actions being taken to reduce or prevent extinctions.

The Red List uses an objective system to assess the global risk of extinction of a species based on past, present, and projected threats. Species assessments are made using a standardized process that includes the rigorous IUCN Red List Categories and Criteria which are based on population size, trends and structure, as well as geographic range. Species are assigned to one of eight Red List Categories, from Least Concern to Extinct or Extinct in the Wild, according to whether they meet the quantitative thresholds for at least one of the five criteria. Species listed as Critically Endangered, Endangered or Vulnerable are collectively described as threatened.

The three "threatened" Red List categories all mean that the species has been found to have a high threat of extinction at the global level. Critically Endangered species face an extremely high level of threat for global extinction, Endangered species face a very high level of threat and Vulnerable species face a high level of threat for extinction. Each category is denoted quantitatively through evaluation against five different criteria that focus on population trends, size and geographic distribution. For example, if the population of a species at the global level reduces by 80 to 90% over a 10 year period (or specified period based on the species' life history) then it qualifies to be Critically Endangered.

The highest standards of scientific documentation, information management, expert review and justification are used in the process. An independent review process must take place before publication of a species assessment on the Red List. Inclusion of a species on The IUCN Red List does not necessarily mean that it should be a priority for a particular kind of conservation action, or that legal regulations automatically apply to it in any country or region, though countries often do use Red List assessments to make conservation and management based decisions.

A.3.4 IUCN Red List Link to CITES

IUCN Red List data is used in a number of international policy fora including CITES, CBD and the UN Millennium Development Goals (MDGs). It is used regularly by Parties (countries) to CITES, for example when considering if species should be added to or are appropriately listed on CITES Appendix I, II or III (meaning that international trade restrictions / controls are implemented for these species) and for reviewing whether international trade levels of CITES-listed species are too high (detrimental) for the survival of the species.

IUCN attends all CITES meetings and presents IUCN Red List data and other types of information there to assist countries with decision-making. IUCN is an International Governmental Organization (IGO) so is an observer to CITES since only countries / Parties to the Convention can make CITES decisions, for example to list species on the CITES Appendices. However, IUCN's role is to provide independent, science-based information to the meetings in partnership with its scientists in the Species Survival Commission. In this regard, for each major CITES meeting (the Convention of the Parties or CoP), IUCN along with TRAFFIC, the wildlife trade monitoring network, which is a joint programme of IUCN and WWF, independently review all proposals to add, transfer or remove species from the CITES Appendices in a project called the CITES Analyses.

TRAFFIC's work focuses on trade specifically, and its' mission is to ensure that trade in wild plants and animals is not a threat to the conservation of nature. TRAFFIC engages in activities such as investigating and analysing wildlife trade trends, patterns, impacts and drivers, including illegal trade, as well as providing information, encouragement and advice to the private sector on effective approaches to ensure that sourcing of wildlife uses sustainability standards and best practices.

The CITES biological criteria for determining whether a species should be added to the CITES Appendices are based very closely on the IUCN Red List Categories and Criteria, with the IUCN Red List providing additional information for considering whether species require trade restrictions. Countries use IUCN Red List data to assist with CITES decision-making as well as for implementing species conservation and management decisions at the national and trans-boundary level.

Generally, species that are on CITES Appendix II and can be traded commercially are not threatened on the IUCN Red List while most of those on CITES Appendix I that cannot be traded commercially are threatened on the Red List. However, a global Red List threatened status (e.g. Critically Endangered, Endangered or Vulnerable) for a species does not necessarily mean that it should not be used or traded, for example in the case of Appendix I species that can still be bred in closed- cycle captive breeding facilities and traded since no animals from the wild are used.

Another example is the CITES Appendix II listed species *Python bivittatus* (Burmese python) which is listed as Endangered on the IUCN Red List – captive breeding of the species is common and contributes to local livelihoods as outlined in a recent publication by the IUCN SSC Boa & Python Specialist Group. Another consideration is that although a species may be listed as globally Least Concern, the species may be more threatened in particular countries, making site-specific sourcing information important. Normally for CITES species, important differences between countries in the threat status of a species is reflected in the CITES Appendices (e.g. if a species is less common in one country it can be listed in CITES Appendix I rather than II). However, it is important to also check the status of species on national-level Red Lists. IUCN provides guidelines for these regional assessments, though does not usually endorse them – however, they are valuable sources of local information. Legal and governance conditions within the country where species / species products are sourced is also important in terms of whether environmental / sustainable trade safeguards such as CITES are adequately implemented.

A number of species on CITES Appendix II are good examples of those being used and traded sustainably through sustainable management regimes and captive breeding.

Examples of this include:

- Yellow Anaconda in Argentina (*Eunectes notaeus*, CITES Appendix II) – more information here
- Broad-snouted caiman in Argentina (*Caiman latirostris,* CITES Appendix I except for Argentina which is CITES Appendix II) – more information here and here and here
- Vicuña (*Vicugna vicugna,* CITES Appendix I except for certain populations in various countries in CITES Appendix II) and Guanaco (*Lama guanicoe,* CITES Appendix II) in Andean countries – more information here
- Chinese Alligator (*Alligator sinensis*, CITES Appendix I) and Siamese crocodile (*Crocodylus siamensis*, CITES Appendix I) – more information here and here

A.3.5 Mapping IUCN Knowledge and Tools
A number of reports, tools and guidelines have been developed by IUCN already for helping businesses and companies determine what considerations to take in terms of sustainably sourcing and using species. These have been developed in close collaboration with the more than 130 Specialist Groups in IUCN's Species Survival Commission, a network of more than 10,000 volunteer scientists around the world who work in tandem with IUCN's Global Species Programme. Publications which relate to sustainable use and trade of species and the apparel industry include:

- The IUCN Policy Statement on Sustainable Use of Wild Living Resources
- CITES and Community-Based Natural Resource Management (CBNRM): proceedings of an international symposium on "The relevance of CBNRM to the conservation and sustainable use of CITES-listed species in exporting countries (see in particular sections 3 and 4 of this document)
- IUCN SSC Sustainable Use Specialist Group - Analytic Framework for Assessing Factors that Influence Sustainability of Uses of Wild Living Natural Resources
- Biodiversity for Business: A guide to using knowledge products delivered through IUCN
- IUCN SSC Boa & Python Specialist Group - Assessment of Python Breeding Farms Supplying the International High-end Leather Industry
- ITC and IUCN SSC CEESP Sustainable Use and Livelihoods Specialist Group – The Trade in Wildlife: A Framework to Improve Biodiversity and Livelihood Outcomes
- In progress - IUCN SSC CEESP Sustainable Use and Livelihoods Specialist Group - Guidelines for Appropriate Uses of IUCN Red List Data: Harvesting of threatened species
- In progress - IUCN SSC Boa & Python Specialist Group (with CITES) - Guidelines to assist Parties in monitoring and controlling captive-breeding operations and other production systems
- In progress - IUCN SSC Boa & Python Specialist Group (with CITES) - Guidelines for Parties on the available methods to differentiate between wild and captive-bred CITES-listed snakes in trade
- In progress - IUCN SSC Boa & Python Specialist Group (with CITES) - Guide to CITES Parties on the appropriate use of Source Codes (Source codes are used on CITES permits and certificates to inform Parties of the management system used to produce specimens for international trade – this document focuses on ensuring that source codes are clearly

defined and understood and that the impact of each regime on wild populations is appropriately assessed)

- In progress - IUCN SSC Boa & Python Specialist Group (with CITES) - Model for guides / checklists for the inspection of captive-breeding and ranching facilities and review of permit / certificate applications for captive-bred and ranched specimens
- In progress (with ITC) – Review of the Global Reptile Pet Trade – Focusing on Freshwater Turtles and Tortoises, Crocodiles, Alligators and Snakes

A number of IUCN SSC Specialist Groups are working on the sustainability of wildlife products with businesses and other key partners, such as Kering (e.g. through the Python Conservation Partnership), the International Trade Centre, and the CITES Secretariat, the latter of which a number of new reports are being developed for upcoming meetings. Key IUCN SSC Specialist Groups that are involved in this work and their contact details are:

- Sustainable Use and Livelihoods Specialist Group – Focused on community engagement in tackling illegal wildlife crime through a recent symposium and also produced the new publication "Trade in Wildlife" with ITC.
- Boa & Python Specialist Group – Leads on advice regarding snake operations including advantages and challenges of captive bred vs wild operations and CITES, works closely already with luxury brand businesses.
- Tortoise & Freshwater Turtle Specialist Group - Leads on advice regarding tortoise and freshwater turtle operations including CITES Non-Detriment Findings.
- South American Camelid Specialist Group – Works closely with local communities to develop strategies for the sustainable use of species and with buyers of wool.
- Crocodile Specialist Group – Leads on advice regarding crocodile ranching operations, often advising governments in this regard.
- Australasian Marsupial and Monotreme Specialist Group – Focuses on all Australian marsupials including kangaroos.

The IUCN Secretariat also works closely with a number IUCN Members and partners on sustainable use and trade. One of these is the IUCN Member International Fur Federation which, among other activities, promotes and encourages high standards of animal welfare for wild and farmed fur based on scientific research. We also work closely with the International Trade Centre, joint agency of the World Trade Organization and the United Nations, whose mission is to foster sustainable economic development in developing countries and transition economies through trade.

A.3.6 Business solutions for sustainable use

If companies want to own, transport or trade animals or plants (or their parts/ products), they must comply with domestic and international rules and regulations for these activities. Each country will have policies and legislation that will address these topics while international mechanisms provide overarching frameworks such as CITES for international trade and IATA Live Animals Regulations for transport.

Private sector companies can ensure the good practice and due diligence of their operations by ensuring that any materials that they use for their products are sustainably sourced. This can be done through the following checks and considerations:

- The company can check whether the species they are using or plan to use is listed on CITES Appendix I, II or III. Appendix I species cannot be traded commercially unless, in some cases, through closed-cycle captive breeding (where no animals are taken from the wild). Appendix II species can be traded internationally for commercial purposes but only accompanied by permits which state that the trade is non-detrimental (assessed by government authorities in the exporting State). Appendix III species can also be traded internationally for commercial purposes but similarly require appropriate permits or certificates.

- The company should also check whether the country that they are sourcing from is an active Party to CITES and implementing the decisions and resolutions of the Convention (e.g. countries which are not subject to export bans caused by non-compliance with CITES).
- Companies should also work only with businesses that abide by CITES regulations. In this way, companies can use existing international mechanisms such as CITES to ensure that they are meeting the highest level standards of environmental safeguards for their products possible.
- The country itself where the species is sourced may have national-level measures / certification standards in place for sustainable wildlife-based production facilities / use of wildlife species - this should be investigated.
- If the species of interest is not listed in the CITES Appendices, then companies can determine whether the species they are using or plan to use is listed on the IUCN Red List of Threatened Species™, in particular as globally threatened (Vulnerable, Endangered or Critically Endangered). Special attention should also be paid to species which have not yet been assessed on the IUCN Red List of Threatened species (though they might have been assessed nationally, see below) or are listed as Data Deficient (so cannot be categorized because there is not enough information about them) or Near Threatened.
- Companies should check whether there is a National Red List for the country that they are sourcing from and, if so, whether the species that they are using or plan to use for their products is listed on the National Red List as threatened. In this regard, companies can check whether the species has been protected at the national level. Note that if a species is threatened, it does not necessarily mean that it cannot be used as some species can still be either wild-sourced in a sustainable way or can be farmed / captive-bred meaning that there is no take from the wild and thus no negative impact on the wild population of the species but the following provides some guidance of considerations in that regard.
- Companies can check whether they can source relevant species from farming operations or from the wild – in some cases there may be no choice (e.g. the species is only available through captive breeding operations) but in other cases, there may be reputable suppliers who are sourcing species from the wild in a way that is both sustainable and advantageous to the conservation of the species as well as to the livelihoods of local communities.

Consideration of whether to source species from the wild should include the following (Cooney *et al.* (2015)):

- Decisions regarding wild harvest of threatened species should be made on a case by case basis, taking into account species' biological characteristics and the social, economic and institutional context.
- Decisions should be based on the best available knowledge, scientific information and indigenous and local knowledge.
- Consideration should be given to the incentives and revenue for conservation generated by wild harvest, including likely impacts on cooperative relationships with indigenous and local communities, human-wildlife conflict, retention of species habitat, and the motivations and capacity of key stakeholders to carry out actions for protection, conservation and sustainable use in the short and long term.
- The status of the specific regional/ national/ subnational species population subject to harvest, not just its global status as threatened, should be considered.
- The reasons that a species is listed on the Red List should be considered before decisions about harvest are made to assess the likely impacts of harvest.

- For species listed under Red List criterion A, the reasons for decline of the species' population should be considered before decisions are made on harvest in order to assess whether harvest will exacerbate decline or not.
- For species listed under Red List criterion B, local abundance of the species should be considered to assess whether harvest may be sustainable.
- For species listed under Red List criterion C or D, the likelihood of adequate monitoring and management of the species should be considered.
- Consideration of the form of harvest strategy most likely to promote sustainability should be made, given the characteristics of the species and context of use.
- The form of production approach most likely to promote sustainability, given the characteristics of the species and context of use, should be evaluated.

Some additional information on business engagement in CITES can be found in the World Economic Forum publication entitled "Green Light – Creating the Business Case for CITES: A New Finance Mechanism" which has a section on Traceability and Technology. Also, in terms of traceability, the CITES Secretariat with leading business entrepreneurs launched a smartphone application in 2013 called '**ASKING**', which allows consumers to query the wildlife source their products are made from, with the intent of ensuring the sustainable use of species for food, medicine or fashion products. There are various emerging tools and guidelines that can assist companies in ensuring that they have the processes and checks in place to ensure sustainability from source material to product.

A.3.7 Implementing a sustainable use strategy: wild caught vs. intensively managed wild resources
In order to most effectively mitigate the negative impacts and promote the positive impacts of the apparel sector on biodiversity conservation and the maintenance of ecosystem services, it is important to evaluate the costs and benefits of different production systems, that is, the means of producing wildlife resources for harvest and trade, and their associated potential impacts on biodiversity and livelihoods in the short and long-term. A major consideration in particular, is whether sourcing from the wild or intensively managing wild resources in a captive environment (e.g. farming, captive breeding, ranching) will have better outcomes for conservation and livelihoods.

Another crucial consideration in decision-making is the species' global conservation status and its status regionally, nationally and sub-nationally. Decisions on whether to use species from the wild or from farms should be made on a case by case basis and consider factors including why species may be threatened as well as opportunities for incentives and revenue generation for conservation (See Section 5.3.6). Key factors to consider in the formulation of strategies to ensure sustainable use of wildlife resources include species biological factors, governance factors, supply-chain factors and end-market factors, each of which has a number of considerations (Cooney *et al.* 2015) as outlined below.

Species factors – is a species suitable for sustainable wild harvest and trade and/or intensively managed captive production?

- Are target species resilient to wild harvest? Factors to consider include the following (also see Section 5.3.6):
  - Are target species widely distributed or distributed locally?
  - Are target species habitat specialists (i.e. occur only in very specific habitats)?
  - Are target species dietary specialists (i.e., subsist on a specialist diet such as insectivorous?)
  - Do target species have a high or low reproductive output?
  - Do target species have a high or low growth rate?
  - Do target species have a short or long time until maturation?

    - Are target species abundant?
    - Do target species have high or low population connectivity?
    - Do target species have high or low dispersal ability?
    - Do target species have high or low genetic viability?
  - Can target species be intensively managed in captivity? Factors to consider include:
    - Can target species be maintained in captivity with adequate welfare?
    - Does a suitable captive diet exist for target species and is it readily available?
    - Can suitable housing/ shelter be provided for the target species?
    - Are there national regulations on maintaining the target species in captive environments?

  - What level of wild harvest for trade is sustainable?
    - Have sustainable harvest levels for target species been determined?
    - Are sustainable harvest levels supported by peer-reviewed scientific research?
    - Are there conditions relating to sustainable harvest (e.g., harvest can only occur in a specific season, only specimens of a minimum size may be harvested?)

  - What harvest methods from the wild are sustainable?
    - Will harvest involve removing the entire individual from the ecosystem? For example, vicuñas can be sheared so that the animals are not removed.
    - Will harvest be lethal or non-lethal?
    - In which life stage will individuals of target species be harvested?

  - Are wild caught / intensively managed resources likely to create livelihood opportunities for rural communities?
    - Will there be employment opportunities or opportunities for local communities to earn income from wild-caught harvest vs. intensively managed resources?

Governance factors – do the governance and institutional regimes in the species' source country support / provide incentives for conservation, sustainable use and benefit-sharing?
  - Are property rights for land and resources well-defined and secure?
  - Are policies supportive of sustainable trade from the wild?
  - Does the broader governance context enable legal, sustainable trade and livelihood opportunities?
  - Are globally or regionally threatened species prohibited from sustainable use (see Section 5.3.6)?

Supply-chain factors – does the supply-chain structure provide incentives for conservation and opportunities for local communities to participate in and benefit from trade?
  - Is sustainable wild harvest and trade in this species cost-effective?
  - Is wildlife trade the most cost-effective use of wildlife and land resources?
  - Are there opportunities for poor communities to participate in the value chain?
  - Is the supply-chain structure impeding conservation outcomes?
  - Is the supply-chain structure a constraint to livelihood benefits?

End-market factors – do the returns from trade, and the type of products in demand, create sufficient incentives for market entry and sustainable use?
  - Is there a market to warrant sustainable harvest of this species?
  - Is market value sufficiently high to generate livelihood benefits and conservation incentives?
  - Does the nature of demand create risks for overharvest or illegal trade?
  - Do consumer preferences create an opportunity or a risk for conservation and sustainable livelihoods?

- Do consumers have a preference for wild caught vs. intensively managed resources?

Costs and benefits as well as potential impacts for wild caught vs. intensively managed resources

Wild caught production
There are costs, benefits and potential impacts associated with wild caught vs. intensively managed resources. The costs, benefits and impacts of wild caught production include:

Costs
- *Higher harvest costs* – sourcing from the wild can result in higher harvest costs associated with identifying and procuring target specimens of species from the wild.
- *Less control over quality* – sourcing from the wild can result in less control over the quality of production, for example, disease affecting species, condition of animals.
- *Less control over production volumes* – sourcing from the wild can result in less control over the rate of production which will be dependent on reproductive rates of species.

Benefits
- *Lower production costs* - harvesting from the wild can result in lower production costs as species/ derivatives are produced in the wild without input of resources such as food needed as a part of intensively managed production approaches.

Potential Impacts
- Where wild harvest and trade is industrial it could marginalise local communities.
- Where wild harvest of species normalises collection it could lead to illegal trade, placing greater harvest pressure on wild populations and beyond sustainable levels.
- Sustainable harvest and trade could provide incentives for local people to conserve species in the wild and therefore conserve habitats, and thereby contribute to the conservation of ecosystems.
- Sourcing from the wild at sustainable levels could provide an opportunity for local community members to gain employment / earn income.
- Sustainable sourcing of wild caught specimens of species could lead to increases in populations of target species;
- Sustainable sourcing of wild caught specimens of species could deliver local economic development benefits in the developing world;
- The delivery of benefits to local people can go beyond economic benefits to broader livelihood and development outcomes, for example building community networks and local enterprise development (see Cooney *et al.* 2015).
- Adoption of robust standards or certification systems for sustainable harvest and trade from the wild could provide opportunities for apparel companies to implement good practices, monitor the impacts, and communicate the sustainability outcomes to demonstrate leadership in responsible harvesting from the wild.

Intensively managed resources
Key costs, benefits and impacts of intensively managed resources include the following:

Costs
- *Higher production costs* – intensively managing resources can result in higher production costs associated with housing, feeding, breeding, and maintaining resources (e.g., veterinary costs) intensively in captive environments.

- Focusing production exclusively on intensively managed resources could remove incentives for the conservation of species *in situ* resulting in habitat loss and degradation and the erosion of ecosystems.
- Intensive *ex situ* production can adversely impact on wild populations where wild animals are caught to stock or re-populate captive operations, to supply feed for captive animals, or are laundered as animals produced solely in captivity.

Benefits

- *Lower harvest costs* – intensively managing wild resources will likely result in lower harvest costs as a result of species being in captive environments which can be harvested at will.
- *Greater control over quality* – intensively managing resources should mean there is greater control over the quality of production (e.g., maintaining species free of disease).
- *Greater control over production volumes* – intensively managing resources should mean there is greater control over the rate of reproduction and therefore production rates, subject to biological parameters of the species concerned and ethical considerations (e.g., not 'overbreeding').

Impacts

- Moving from wild caught to intensive management could reduce harvest pressure on wild populations.
- Intensively managing resources could remove or at least miss opportunities to provide incentives for species and habitat conservation among local communities.
- Intensively managing wild resources could remove or at least miss opportunities to provide socio-economic and development benefits to local communities.
- Intensively managing wild resources could miss opportunities to support the growth of wildlife populations through sustainable use.
- Intensively managing wild resources could result in pollution associated with production (e.g., energy consumption, wastewater disposal).

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