

focus paper

Lenzing Group
Biodiversity and ecosystems
Issue April 2024

Table of Contents:

- Introduction 3
- Lenzing’s impacts and dependencies on biodiversity 5
 - Lenzing’s actions 7
- Ecosystems: Forests are more than raw materials for production 9
- Biodiversity management in Lenzing’s supply chain 10
 - Plantation forestry 11
 - Management in LD Celulose’s plantation..... 11
 - Biodiversity in European semi-natural forests..... 14
- Supporting forest and biodiversity conservation beyond Lenzing’s supply chain..... 21
- Forestry and climate change..... 26
- „Transform“ - Stakeholder activities 26
 - CDP Forests..... 26
 - Austrian Federal Forests (Österreichische Bundesforste, ÖBf) 27
 - Textile Exchange (TE) Biodiversity Benchmark..... 27
 - Wood K plus..... 28
 - ICEP 28
- Index of Figures 29
- References and Endnotes 29

In the 2021 double materiality analysis of the Lenzing Group, the topic of biodiversity increased in importance and became a material topic. Therefore, from 2021 onwards, the Sustainability Reports of the Lenzing Group contain the dedicated chapter “Biodiversity and ecosystems”. Please refer for yearly updates there.



Introduction

Biodiversity was defined in a recent report by IPCC (Intergovernmental Panel on Climate Change) and IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services)¹ as “the variability among living organisms from all sources including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are a part”. Biodiversity is visible on all levels of life, as genetic diversity within and between species, as the abundance of individuals of one species and as the abundance of species in ecosystems. The higher the diversity, the higher is the resilience of a system to outside pressures, for example, diseases² or disturbances associated with climate change³. We are in the middle of an immense biodiversity crisis, the sixth mass extinction, which could cause that up to three-quarters of the today’s living species would go extinct in the next 300 years. The last mass extinction, which occurred 65.5 million years ago, wiped out the dinosaurs^{4,5}. Although mass extinctions occur naturally, the one we are experiencing now is fueled and accelerated by human interference, for example, deforestation, conversion of land and water and air pollution. Biodiversity loss and climate change are strongly connected, which is why taking action is of utmost importance for humanity. While healthy ecosystems and a high level of biodiversity can mitigate climate change and lead to a “good quality of life” for humans due to their ecosystem services, they are under threat by human impacts and climate change⁶ (see Fig. 1).

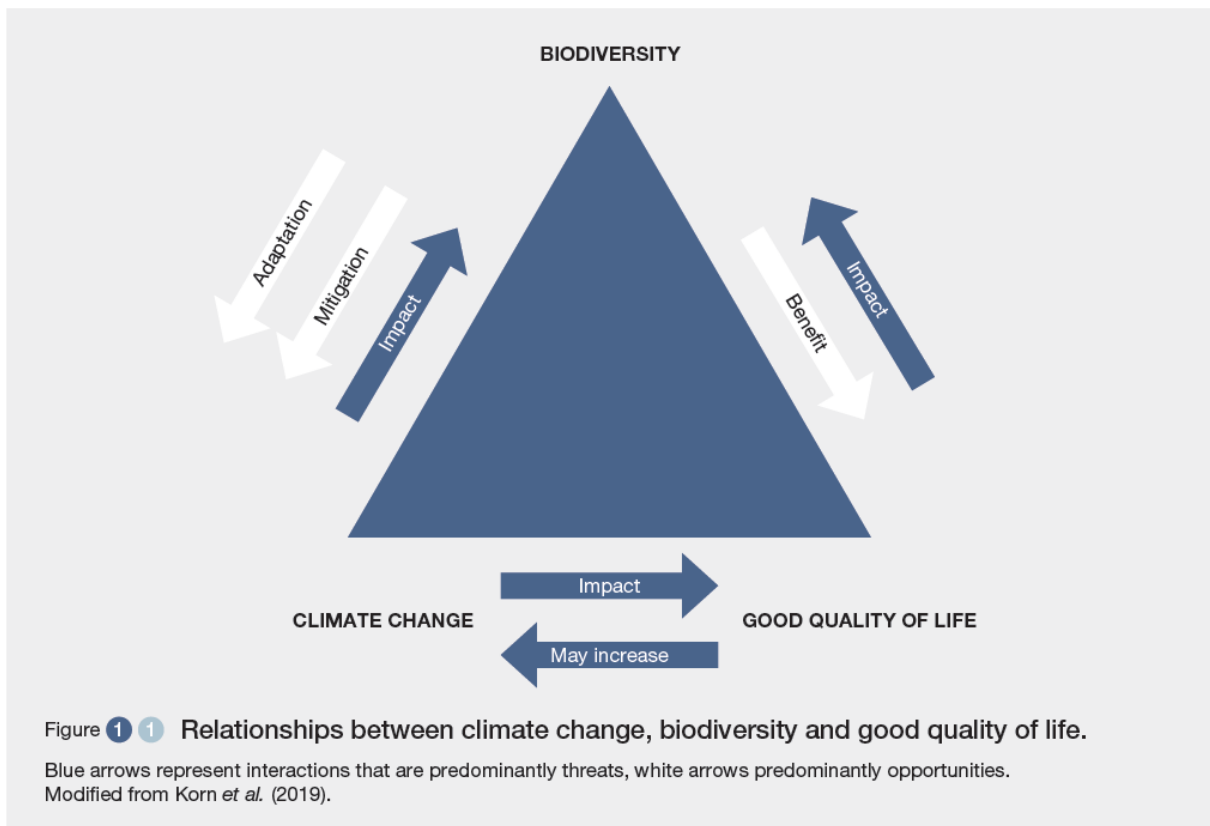


Figure 1: Relationship between Biodiversity, Climate Change and Good Quality of Life. Taken from: IPBES-IPCC 2021: Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change

Global biodiversity loss has recently moved into the focus of the sustainability debate in many industries, including the textile and nonwoven sector. The World Economic Forum identifies nature loss as one of the top three systemic risks to the economy, people, and planet. Numerous initiatives have been established to address this issue, while others have adopted work streams dedicated to biodiversity.

According to the IPBES, pressures on nature leading to loss of biodiversity and ecosystem functions are categorized into five groups (IPBES 2019⁷ cited after Science Based Targets for Nature (SBTN) 2020⁸):

1. Land / water / sea use change
2. Resource exploitation
3. Climate change
4. Pollution
5. Invasive species

Economists have been trying to express ecosystem services in monetary values, the benefits that are provided range from food to resources and tourism. It has been estimated that these benefits amounted to USD 125 – 140 trillion in 2011 (Costanza et al. 2014⁹). Damaging or losing just one ecosystem service could therefore lead to an immense economical loss to local and global economies.

Between 1997 and 2011, the world lost an estimated USD 4-20 trillion per year in ecosystem services due to land-cover change and USD 6-11 trillion per year due to land degradation. Specifically, biodiversity loss can result in reduced crop yields and fish catches, increased economic losses from flooding and other disasters, and the loss of potential new sources of medicine (as the majority of drugs used for healthcare and disease prevention are derived from biodiversity) (OECD 2019¹⁰).

Restoring already damaged ecosystems can also be a lucrative investment, apart from the social values leading to monetary benefits far outweighing the initial costs¹⁰. Some estimated values of selected biodiversity and ecosystem services can be found in table 1:

Table 1: Examples for estimated values of selected biodiversity and ecosystem services (Taken from¹¹: Swiss Re Institute Biodiversity and Ecosystem Services – A business case for re/insurance, 2020)

Scale	Good or service	Estimated annual values
Global	Seagrass nutrient cycling	USD 1.9 trillion
Global	Value of animal pollinated crops	USD 235 – 577 billion
Global	First sale of fisheries and aquaculture	USD 362 billion
Global	Coral reef tourism	USD 36 billion
Europe	Services from the European protected areas network (Natura 2000)	EUR 223-314 billion
Canada	Value of commercial landings from marine and freshwater fisheries	CAD 3.4 billion
France	Recreational benefits of forest ecosystems	EUR 8.5 billion
Germany	Direct and indirect income from recreational fishing	EUR 6.4 billion
Italy	Habitat provision	EUR 13.5 billion
Japan	Water purification from tidal flats and marshes	JPY 674 billion
UK	Physical and mental health benefits of nature	GBP 2 billion



US	Air purification from trees and forests (avoided morbidity and mortality)	USD 6.8 billion
----	---	-----------------

In the context of global biodiversity loss, the textile and apparel industry has recently become more aware of its contribution to this problem^{12,13}. The focus is currently on the agricultural production of natural fibers and pollution issues related to fiber production and textile processing, although wood sourcing from forests is also seen as a potential cause of biodiversity loss. Products have potential impacts at the end of their life due to waste pollution in land and water ecosystems, especially via non-biodegradable materials that are leaked into the environment.

Lenzing’s impacts and dependencies on biodiversity

To address its impacts and dependencies on biodiversity, Lenzing is utilizing the framework proposed by the Science Based Targets for Nature initiative (SBTNI). In its Initial Guidance for Business (2020)⁸ it describes a five –step process: Assess, Interpret & prioritize, Measure, set [targets] disclose, Act, Track.



Figure 2: Framework by SBTNI for setting targets related to biodiversity

Steps 1 and 2: Assessment and prioritization

Lenzing as a leading cellulose fiber manufacturer is focusing on three areas: its wood and pulp sourcing, production processes, and products’ end of use, in order to address biodiversity loss.

Wood is the most important raw material for Lenzing. The main source of potential impact from the Lenzing Group’s operations and supply chain is therefore connected to land use by forestry. Lenzing also mainly depends on biodiversity and the proper functioning of forest ecosystems that provide the raw material of wood. Negative effects on biodiversity can arise from the intensified utilization of forests. On the other hand, the positive effects of sustainable forest management on biodiversity and ecosystems are well known and can be further explored and implemented (see feasibility study “Biodiversity initiative Lenzing AG”, p.20 in this focus paper).

Additional potential impacts on water, soil, and air can arise from production facility emissions. At the end of the value chain of textile and nonwoven products, biodiversity impacts can arise from non-degradable plastics entering the environment.

Lenzing is highly depended on healthy forests and plantations as these are the source for its most important raw material wood. At the same time for wood-based cellulose fibers, the main potential

negative impact on biodiversity can arise from the intensified use of wood resources, which at the moment are mostly forest or plantations.

The Lenzing Group uses two different types of forestry for its wood sourcing, depending on the global region: sustainable and multi-functional forest management is applied in the Northern hemisphere by Lenzing’s wood and pulp suppliers in Europe and North America. Plantation forestry with high sustainability standards is conducted mainly in the Southern hemisphere by Lenzing’s pulp supplier in South Africa and by the new pulp plant in Brazil.

Biodiversity and ecosystem status monitoring in the Lenzing Group are performed in the global regions via two different approaches.

In Europe, biodiversity is monitored at a national level according to the Forest Europe Criteria. Results are published regularly in the European overview^{14,15}. Recent reports paint a mixed picture of success and issues still to be resolved. The measures to be taken are better understood thanks to intensive research activities.

For the Brazil operations, a long-standing monitoring program on plantation level is conducted by Lenzing’s joint venture partner Dexco (formerly Duratex), which began in the 1970s with the establishment of its first plantations. LD Celulose, the joint venture and Lenzing’s Brazilian legal entity, continues this program at its managed plantations. Data is gathered every six months to cover seasonal variations, and is reported annually.

Pulp suppliers apply their own biodiversity monitoring schemes.

Steps 3 and 4: Measurement, target setting, disclosure and Actions

Attempts to quantify impacts from land use on biodiversity usually consist of two components: the quantity of land (forest) area used, and the intensity of use. The estimation of land area used for Lenzing’s wood sourcing is part of the initiated “Biodiversity concept” project and of the pilot case studies for testing the new Greenhouse Gas Protocol draft guidance on Land Sector and Removals. Variations in data availability and data quality can arise depending on the forest type, the land ownership, the sourcing area and the supply chain position (wood or pulp sourcing to Lenzing).

Quantity of forest area used for Lenzing’s wood sourcing: data availability and quality **Table 2**

Lenzing sources	Forest type	Land use intensity	Data/estimates	(Expected) data quality
Wood	Plantation	High	Known (see "Quantitative description of area managed and influenced by LD Celulose", Table 4)	High
Wood	Semi-natural	Low to medium	Estimates needed based on regional statistical data	Medium
Pulp (pulp supplier sources wood)	Plantation	High	Estimates possible	Medium
Pulp (pulp supplier sources wood)	Semi-natural	Low to medium	Rough estimates	Low

To respond to the pressures on nature by taking positive action, the Science Based Targets for Nature initiative introduced the Action Framework with five key types of actions: “Avoid – Reduce – Restore and Regenerate – Transform”. This scheme was also adopted by the Textile Exchange Biodiversity Benchmark. The main steps for taking action (step 4) of this framework are:





Framework of actions for nature, from SBTN (2020)^a

Table 3

Avoid

Prevent impact from happening in the first place: prevent the impact entirely

Reduce

Minimize impacts, but without necessarily eliminating them

Restore

Initiate or accelerate the recovery of an ecosystem with respect to its health, integrity, and sustainability, with a focus on permanent changes in its state

Regenerate

Take measures designed to increase the biophysical function and/or ecological productivity of an ecosystem or its components within existing land uses, often with a focus on a few of nature's specific contributions to people (e.g. regenerative agriculture often focuses on carbon sequestration, food production, and nitrogen and phosphorus retention)

Transform

Take measures contributing to system-wide change, notably to alter the drivers of nature loss, e.g. through technological, economic, institutional, and social factors and changes in underlying values and behaviors

a) Science-based targets for nature. Initial guidance for businesses. 2020

Lenzing's actions

For Lenzing, several targets have been derived from the Sustainability strategy and the Better Growth corporate strategy, containing elements that positively influence biodiversity and ecosystem services or nature's contributions to people. For more information on these targets and the progress made in 2023, please see the latest Sustainability Report.

Category of action	Reference	Lenzing's approach
Avoid	Wood and Pulp Policy	Lenzing explicitly commits to avoiding deforestation in the procurement criteria of the Wood and Pulp Policy
Reduce	"Textile recycling" target	To offer viscose, modal and lyocell staple fibers with up to 50 percent post-consumer recycled content on a commercial scale by 2025
Restore	"Conservation project Albania" target	To implement a conservation solution of 20 ha in Albania in combination with a social impact project by 2024
	"Conservation area Brazil" target	To implement conservation solutions on 15,000 ha at the new pulp mill in Indianópolis (Brazil) by 2030
Regenerate & Transform	"Conservation projects" target	To engage in further conservation, biodiversity protection and restoration activities in regions where forests are at risk or should be improved by 2025

Avoid: Biodiversity due diligence via sustainable sourcing

The Lenzing Group takes responsibility by focusing on sustainable sourcing. Lenzing only sources wood and dissolving wood pulp from semi-natural forests and plantations (as defined by the Food and Agriculture Organization of the United Nations). Moreover, it does not source materials from natural or ancient and endangered forests.

In order to protect the earth's remaining ancient and endangered forests as well as the biodiversity and ecosystems' integrity within these forests, Lenzing is committed to avoiding the use of wood and pulp containing wood sourced from regions such as the Canadian and Russian Boreal Forests, Coastal Temperate Rainforests, tropical forests and peatlands of Indonesia, the Amazon and West Africa.

Lenzing's wood procurement management system ensures that all wood is sourced from legal and sustainably managed sources. The forest certificates held by the Lenzing Group cover general criteria for biodiversity and forest ecosystem protection according to international standards. Additional criteria can be found in the national standards which vary between countries. For example, the percentage of area set aside for conservation varies between countries and even regions within countries.

Regular risk assessments, audits, on-site visits, and independent third-party certification of sustainable forest management programs ensure compliance with the policy and Lenzing's commitment to no-deforestation.

For more information on Lenzing's wood sourcing practices and policies, please see the "[Raw material security](#)" chapter of the latest Sustainability Report or the "[Wood and Pulp](#)" Focus paper.

Reduce: Lowering emissions to air and water, and biogenic resource use

Thanks to its climate strategy and science-based targets in line with the Paris Agreement and UN SDG 13, Lenzing is on the road to reducing CO₂ emissions. For more details, see the "[Climate change](#)" chapter. In accordance with the strategic focus area "Greening the value chain", the Lenzing Group has targets and programs in place to reduce emissions affecting water and air. For example, closed loop water and chemical cycles are implemented. Lenzing follows the Changing Markets roadmap for the manmade fibers industry. All sites have been assessed through the ZDHC¹⁶ scheme. For more information on emissions to air and water, please see the chapter "[Pollution](#)" in the latest Sustainability Report or the "[Responsible Production](#)" focus paper.

Furthermore, Lenzing has set the target to offer fiber products with 50 % recycled cotton content as part of the portfolio until 2025, which would reduce the need for virgin materials from agricultural or forest resources. For more information on recycling, please see the "[Resource use and circular economy](#)" chapter in the latest Sustainability Report.

Restore: Enhance ecosystem quality in managed forests

Sustainably managed semi-natural forests in Europe and other parts of the Northern hemisphere are multifunctional in the way that they provide not just timber but also many ecosystem services such as water regulation or protection against natural disasters, while maintaining biodiversity at the same time. The Lenzing site (Austria) mainly uses beech wood and small amounts of other hardwoods and spruce, whereas the Paskov plant (Czech Republic) mainly utilizes spruce. The percentage of broadleaf forest, especially beech, is increasing in wood-sourcing countries as forests are being returned to a more natural mix of tree species, contributing to climate change resilience. The area devoted to spruce cultivation is decreasing, although stocks are still increasing in most sourcing countries due to low felling rates. The utilization of beech wood to manufacture fibers provides relatively high value creation versus wood use for energy generation, making it an important economic factor for the regeneration of forests with more deciduous (= leaf-losing) species. Adapting forest ecosystems in Central Europe to climate change through greater species diversity is a crucial transition and is in line with the EU Biodiversity Strategy.

Regenerate

Lenzing is contributing to conservation and afforestation projects in endangered areas outside of its value chain. These include an afforestation project in Albania, recently expanded to several countries in the Western Balkans, and a conservation project in Congo. For more information on these and other commitments, please see the below part “Supporting forest and biodiversity conservation beyond Lenzing’s supply chain”.

Transform: Partnering for systemic change

Lenzing is part of several initiatives dedicated to fight biodiversity loss and negative impacts of the fashion industry. For more information on stakeholders, please see the [“Stakeholder engagement”](#) focus paper and “Transform: Stakeholder activities” below.

Ecosystems: Forests are more than raw materials for production

Forests provide much more than just raw materials for production. Apart from their beauty and recreational value, they fulfill a multitude of environmental functions and are essential for climate regulation. People benefit from ecosystem (goods and) services. Not all benefits of ecosystems to people can be measured in monetary terms. It is therefore important to include other values as well, such as health, social or conservation values. The sustainable management of forests ensures that the different ecosystem services provided are maintained and protected while a steady supply of material for the wood-based industry is ensured. This is the core element of foresters’ job description and an important part of their training.

Figure 3 provides an overview of the functions of forest ecosystems associated with the provisioning of wood. Depending on the location and environment, some systems might be more important than others in one forest.

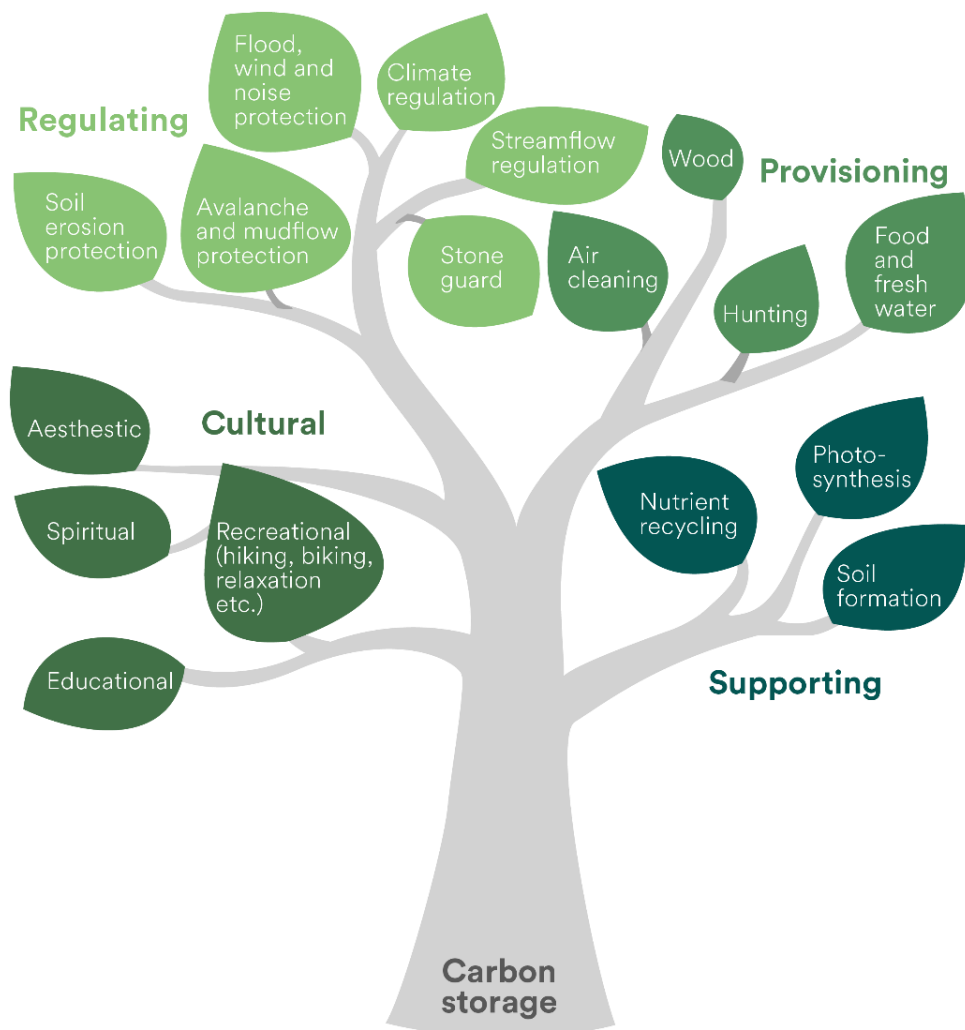


Figure 3: Functions of forest ecosystems, adapted from Lambini et al. 2019¹⁷ and WRI 2005.¹⁸

The concept of ecosystem services is increasingly used to describe the links between the natural environment, e.g. forests, economic activities, and society. Natural forests offer a big potential for biodiversity among many areas of life, such as insects, mammals, plants and bacteria. By protecting natural forests (especially primeval forests), all these species can be conserved.

Planting trees is one of the most appropriate and proven measures for limiting global warming, as trees are highly efficient in capturing carbon from the atmosphere and storing it for a long time. At the same time, forests can have a cooling effect, which can be measured on a global scale¹⁹. The utilization of forest products to replace fossil-based products with higher greenhouse gas emissions can be used as a further measure to limit global warming. Wood will be a core resource for the developing bioeconomy. On the other hand, greater utilization of wood resources can lead to unwanted negative effects on biodiversity.

Biodiversity management in Lenzing's supply chain

The Lenzing Group addresses its impacts and dependencies on biodiversity through regionally adapted approaches of sustainable forest management. In the Northern hemisphere, Lenzing's wood and pulp suppliers manage semi-natural, multifunctional forests in Europe and North America. Plantation forestry

is conducted mainly in the Southern hemisphere by Lenzing’s pulp suppliers e.g. Sappi in South Africa and by the new in-house operations in Brazil (LD Celulose).

Plantation forestry

In total, some 80 percent of the land used for plantation forestry in South Africa, is certified to FSC® standards ²⁰. The focus is on two natural ecosystems: grasslands and wetlands. Both are included in conservation and regeneration programs run by plantation operators on their own and/or managed land²¹. Approximately 25 percent of this land is not planted with trees but conserved for biodiversity²². Plantation forestry can reduce deforestation pressure on natural (primary) forest areas by providing wood at very high yields per unit area as an alternative to sourcing it from natural forests. FSC® certification entails management criteria to protect biodiversity²³, as determined in detail in the national standards. For this certification, among other requirements, management practices include a proportion of 20 % of reserved conservation areas.

Management in LD Celulose’s plantation

Lenzing constructed a new pulp mill in Brazil in a joint venture with Dexco (formerly Duratex), which started operation in 2022. The pulp mill is supplied by wood from plantations, which are owned and managed under this joint venture (LD Celulose). The whole area of the plantation is currently 90,200 hectares, which include 19,884hectares of protected area (Table 4). The increased plantation area will all be FSC® certified when the newly planted trees have grown up to the required size. Eucalyptus is grown in these plantations since it is a fast growing and high-yielding species with a high cellulose content, making the trees very suitable for conversion to fibers. Every 7 years the trees are harvested, and a new generation of eucalyptus can grow. For each harvested tree, a new one is planted. In areas, where the tree yield was very good, it is possible to regrow the trees from stumps (so called second rotation). LD Celulose does not use genetically modified organisms (GMOs).

Quantitative description of areas managed and influenced by LD Celulose Table 5

	2021		2022		2023	
	ha	%	ha	%	ha	%
Total area	71,631	100	78,640	100	90,200	100
Forest/plantation area	54,081	75	58,194	74	63,757	71
Owned	–		–		–	
Leased/managed	54,081	75	58,194	74	63,757	71
Protected	14,623	20	17,065	22	19,884	22
FSC® area	43,835	61	47,608	60	47,608	53
Infrastructure	2,927		3,380	4	6,559	7



Figure 4 A: Eucalyptus plantation (Source: LD Celulose) (B) Replanting of Eucalyptus trees (Source: LD Celulose)

LD Celulose’s plantations are in areas that were converted to agriculture many decades ago. There are generally large areas nearby for planting soy and coffee or grazing livestock. Some areas under LD Celulose’s management are determined for the Legal Reserve and Permanent Preservation Areas, as the law requires. The conservation unit closest to the LD Celulose planting area is Páú Furado State Park, which is about 30 kilometers from the plantation. That means this particular conservation unit is not impacted by LD Celulose’s activities. The managed land contains a proportion of conservation area dedicated to biodiversity protection that goes beyond the legal requirements and FSC® standards. The managed area belongs to the Cerrado biome (vast ecoregion of tropical savanna in eastern Brazil) and is located around 800 kilometers away from the Amazon region (see Fig. 5).

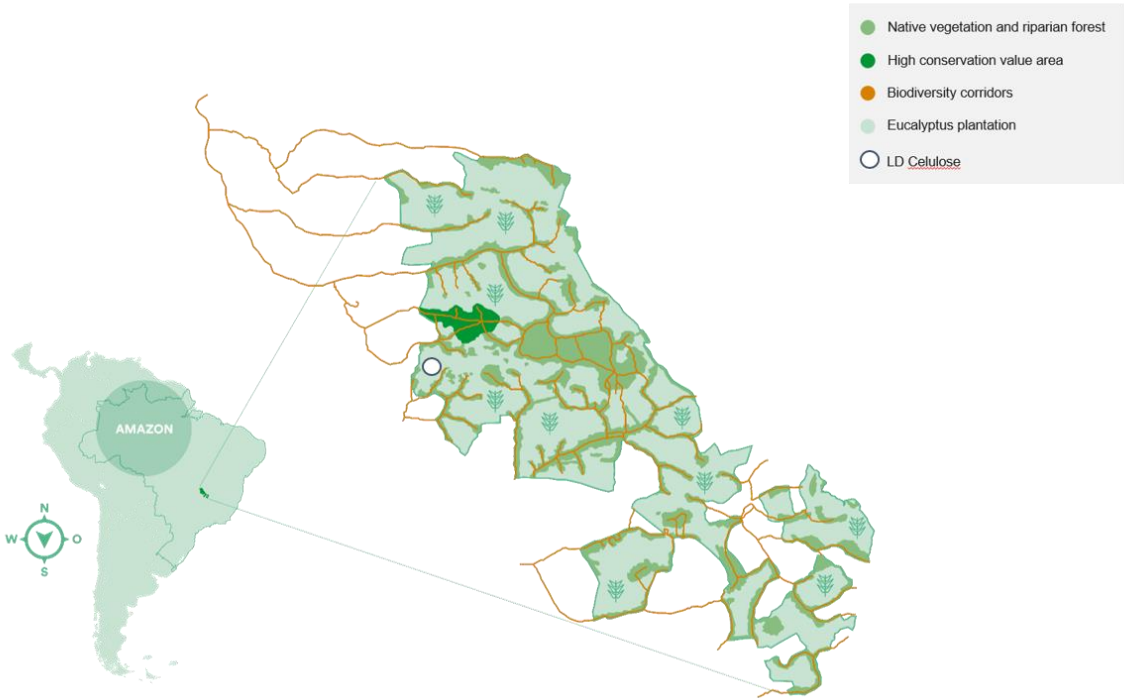


Figure 5: Map of plantations owned and managed by LD Celulose in Brazil

Brazilian environmental law determines the maintenance of Permanent Preservation Areas (APPs) and Legal Reserve areas. APPs are specific areas of vegetation such as ciliary forests, areas of vegetation adjacent to watercourses, and areas of vegetation on slopes. Legal Reserve areas correspond to the obligation to preserve at least 20 % of a property in a rural area (Table 7). The APPs are very useful in avoiding, for example, the silting of rivers and the collapse of slopes, while the Legal Reserve guarantees the preservation of the native vegetation of Brazilian biomes (biome = large ecological zone). More information on the main aspects of the Brazilian Forestry Code (Law No. 12.651 of 2012), including the challenges Brazil faces in applying this important law, is available in a report from 2016 by Observatório do Código Florestal (OCF)²⁴.

LD Celulose is aware of the diversity of flora and fauna found in its forest areas, since the 1970s when Dexco (formerly: Duratex) started its biodiversity research projects. Biodiversity research projects are undertaken in these areas through partnerships with universities²⁵ in addition to internal programs. LD Celulose monitors fauna and flora in the forest areas and areas directly influenced by the pulp mill site.

These programs are carried out annually in the dry and rainy seasons and aim to monitor possible impacts on local biodiversity. The programs are also required by the Brazilian environmental agency. There have been no significant impacts on biodiversity to date.



Figure 6: *Pseudopaludicola facureae* (Source: LD Celulose)

LD Celulose's forestry unit is supervised by ecology and environmental specialists who were also responsible for identifying a High Conservation Value Area (HCVA) in the plantation area in 2021. These contain *Pseudopaludicola facureae*, a species of frog found only in this region of Minas Gerais (Fig. 6). However, this frog was not observed in the annual fauna monitoring in 2022. Nonetheless, the area is still considered an HCVA as the monitoring process spans over 2 years. The forestry unit constantly works to identify any area that needs to be classified as HCVA to ensure the protection of animal and plant species. One method of monitoring is the use of cameras. With the help of these cameras, LD Celulose was able to identify the presence of endangered species, such as the maned wolf and giant anteater (Fig. 7). Approximately 450 different species of fauna and 204 species of flora were identified on the plantations.



Figure 7 A+B: Maned Wolf (A) and Giant Anteater (B) captured on camera within LD Celulose's plantations. (Source: LD Celulose)

In the responsible management practiced by LD Celulose, techniques are employed that aim to protect biodiversity as well as soil and water quality. Examples of these measures are:

- **Minimum cultivation:** for soil conservation, LD Celulose uses the minimum cultivation technique, which consists of keeping the remaining plant material at the harvest site to form layers of soil protection and ensure the cycling of nutrients.
- **Nutritional recommendation:** LD Celulose performs soil analyses to determine the requisite fertilizer recommendation for maintaining soil fertility.
- **Preservation and monitoring of riparian forests:** LD Celulose also monitors and protects the riparian forest within the plantation area. The trees and other vegetation along the river act as a guard that protects the river water by keeping the soil in place. This is extremely important for the animals living here and the people in surrounding areas who need clean water.
- **Connectivity:** To improve the connectivity of the Permanent Preservation Areas and legal reserves, LD Celulose carries out mosaic planting, establishing ecological corridors that aim to connect fragments of native forest. These corridors are strips of natural vegetation without planting or harvesting of trees (Fig. 8). Biodiversity corridors can ensure that individuals of a different population within one species can mate, in order to maintain or increase genetic diversity. This measure is a voluntary activity beyond the legal or certification-related requirements.



Figure 8: Biodiversity corridor and plantation area. In the picture, on the left: forest plantation; on the right: legal reserve with native vegetation

Biodiversity in European semi-natural forests

The Lenzing Group's pulp mills in Europe source more than 90% of their wood in four countries, in Austria, the Czech Republic, Slovakia, and Germany.

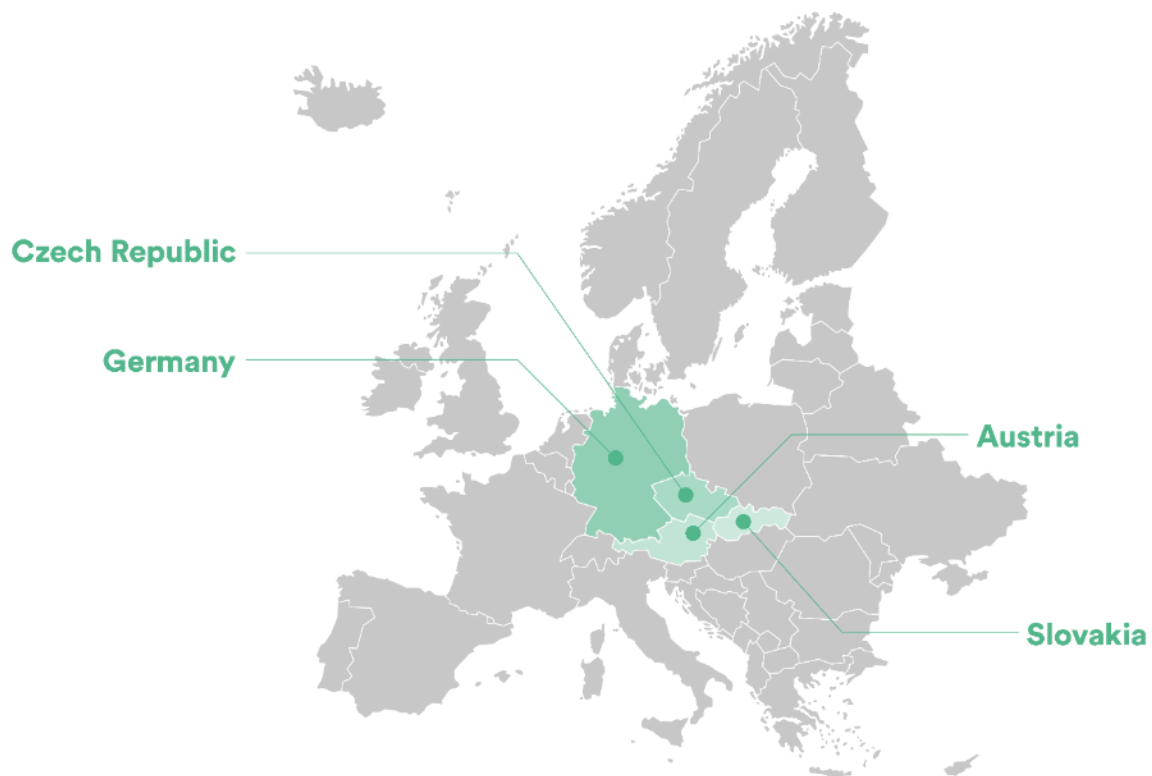


Figure 9: Main wood sourcing countries in Europe (for complete list see the [Sustainability Report 2023](#))

For semi-natural forests in Central Europe, forestry laws have been implemented since the 19th century in order to balance the demand for wood sourcing with nature conservation and the ecosystem services provided by forests. This approach has been at the core of a forester's job description and an important part of the corresponding training for a long time.

As an overarching political process for the European Union and beyond, the Forest Europe political process was initiated in 1990 by the Ministerial Conference on the Protection of Forests in Europe, which is comprised of 46 states, to promote sustainable forest management in Europe. A set of indicators grouped into six different criteria was developed to measure the sustainability performance of European forests and set targets for improvement. Current efforts focus on climate change adaptation, water protection and biodiversity. As a major buyer of wood in Europe, the Lenzing Group supports these targets, which aim to ensure the continued and improved function of forests in their ecosystems while maintaining the long-term availability of wood as a raw material. Requirements for intensified biodiversity measures will likely come out of the European Union Biodiversity Strategy and Forestry Strategy in the process of development. Lenzing contributed to the Open Consultation on the Forest Strategy in 2021.

Publications on biodiversity in managed versus unmanaged forests in Europe, and the effects of some national strategies have been reviewed in the scientific literature of recent years. The level of species richness varied in the comparisons depending on the region and taxonomic group, but differences were rather small.

The study by Paillet et al.²⁶, a comprehensive review of 49 papers (meta-analysis) on species richness comparing the differences between managed and unmanaged forests in Europe is probably the main authority on this issue. The main conclusion is "a small, marginally significant effect of forest management on total species richness. Species richness tended to be higher in unmanaged than in managed forests (+6.8 percent), but the response varied widely among taxonomic groups." (page 108). In the region of Thuringia in Germany, the formal records on species richness date back 250 years²⁷. There, biodiversity has shown to be higher in managed forests than unmanaged forests. For endangered

species with special habitat requirements, protection measures other than non-management are required. The beech forests in Thuringia (Thüringer Wald) are an important sourcing region for Lenzing.

Another study describes the beneficial impacts of sustainable forest management on biodiversity in Northern Germany²⁸. The report documents the high biodiversity in managed forests and shows that biodiversity has already improved as a result of Germany’s national strategy (established in 2007) for multi-functional forestry and towards more natural forest ecosystems.

The EU’s biodiversity strategy for 2030 published in May 2020¹ is a long-term plan to protect nature and reverse ecosystem degradation, preparing Europe for future threads such as climate change, forest fires, food insecurity and disease outbreaks. Its action strategy contemplates 16 targets and other transformative changes¹, which include, among others:

- Establishing a larger EU-wide network of protected areas on land (30%) and at sea (30%)
- Launching an EU nature restoration plan, which will also impact farmland management, for example, promoting agro-ecological practices as reduction of pesticides and fertilizers.
- Unlocking funding (20 billion EUR/year) for biodiversity and setting in motion a new governance framework, in the form of the LIFE program¹ or Horizon Europe¹
- Putting the EU in a leading position in addressing the global biodiversity crisis

Interreg Europe names in its most recent Policy Brief “*Preserving and Restoring Biodiversity*” a few successful examples, recommendations, and key learnings on this regard happening under the EU Biodiversity Strategy 2030²⁹, mentioning relevant projects related to pollinators, light pollution, afforestation, sustainable forestry, protection and restoration.

For its pulp mills in Europe, Lenzing sources more than 90% of its wood in four countries, Austria, the Czech Republic, Slovakia, and Germany. Table 5 gives an overview of some basic indicators of forest sustainability and nature protection in these countries.

Table 6: Selected forest indicators for the four main sourcing countries of Lenzing’s pulp mills in Europe

Country	Austria	Germany	Czech Republic	Slovakia	Source
Share of forest area (%)	47 %	32 %	34 %	39 %	FAO-FRA 2020: according to national statistics, Austria has 48%
Forest area in 2020 (1000 ha)	3,899	11,419	2,677	1,926	FAO-FRA 2020
Forest area increase (1990-2020) (%)	3.3 %	1.8 %	1.1 %	1.3 %	FAO- FRA 2020
Certified forest area PEFC+FSC® (% , 2019)	75 %	78 %	69 %	67 %	PEFC Global statistics; Slovakia: FRA 2020



Forest area with some kind of special protection	approx. 25 %	approx. 80 %	approx. 30 %	approx. 40 %	Forest Europe 2020 ³⁰ , Austria: Walddialog 2020 ³¹
Growing stock increase (1990-2020) (%)	26%	30%	27%	34%	Forest Europe 2020 ³²

In Austria, forest biodiversity is monitored according to a Biodiversity Index (Geburek et al. 2015³³), which originates from 2004, when the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management (BMLFUW) initiated a project to develop suitable indicators to describe the condition and trends of biodiversity in Austria. This initiative (MOBI-e – Monitoring, Biodiversity, and Development) was expected to identify important indicators for all land, river and lake habitats, in order to make a long-term contribution - after the establishment of a monitoring system - to reporting obligations amongst other things³⁴.

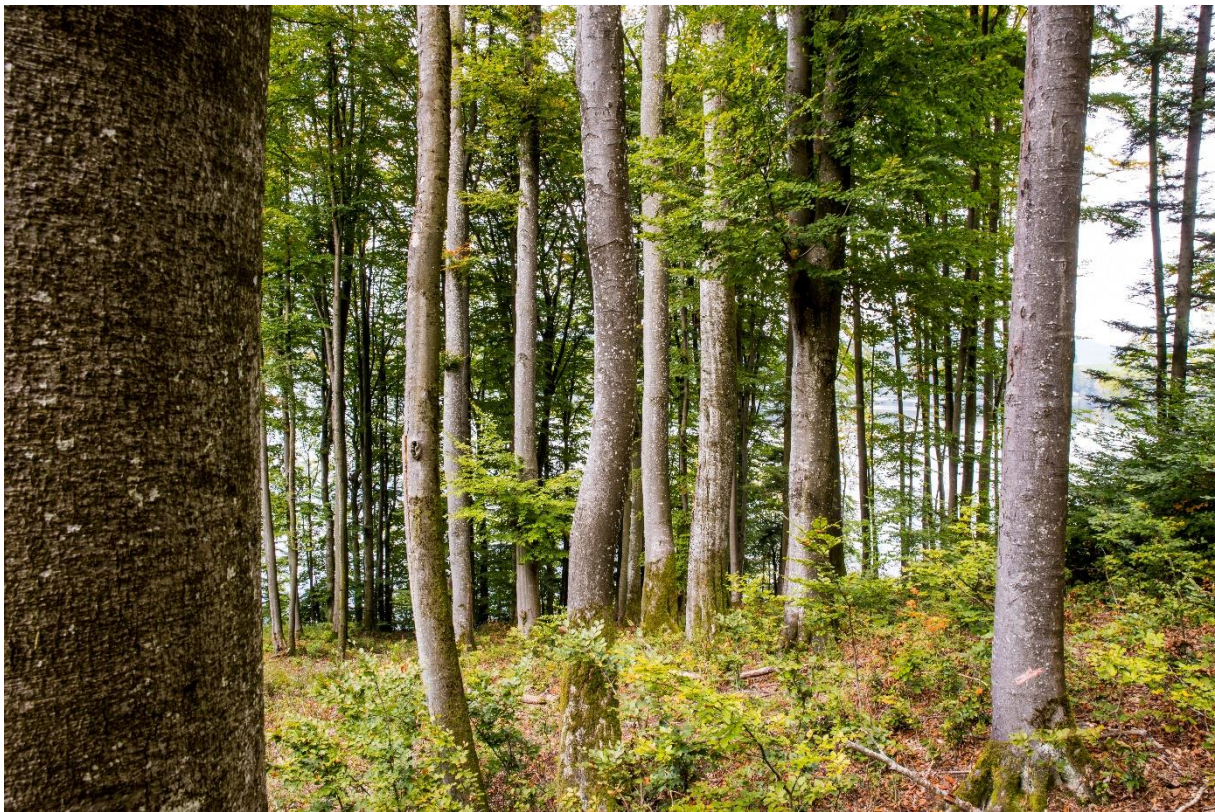


Figure 10: Beech forest in Central Europe

For semi-natural forests in Central Europe, forestry laws have long since prioritized biodiversity protection in forest management. In Austria, forest biodiversity is monitored according to a Biodiversity Index and will be further regulated according to the governmental biodiversity strategy. An increase in the proportion of protected and strictly protected areas is expected.

Lenzing and some of its biggest wood suppliers invest in voluntary biodiversity-related projects, where Lenzing cooperates with competent partners, nature conservation organizations, etc. However, biodiversity projects are complex, and even the protection or restoration of small areas can be very resource-intensive. Lenzing, thus started the intensive search for potential projects a few years ago.

Some of those projects are already in the execution stage or finalized. New initiatives will be consolidated over the medium-term.

Here are some of the activities to improve biodiversity in semi-natural forests from which Lenzing sources its wood:

- A biodiversity island is a small forest area without forest management, i.e. no timber harvest, etc. These islands serve as steppingstones for animal or bird species throughout the commercial forest because they are home to very old and huge trees with cavities for small mammals, such as martens or dormice, birds, such as owls or woodpeckers, and bats. Forest islands are a voluntary activity of forest managers like Österreichische Bundesforste AG. Our wood supplier's main approach, however, is to ensure a high level of species diversity in commercially used forests, as well.
- Standing and lying dead wood is a valuable habitat for fungi and lichens
- Moist biotopes are a hot spot of biodiversity. Amphibians such as salamanders, frogs or toads depend on those habitats for reproduction. When our wood supplier repairs its forest roads and has a digger handy, it often creates artificial moist biotopes for those amphibian species
- Diverse hedges on the fringe of the forest are valuable habitats for birds, insects and small mammals, such as the hazel dormouse, which benefits from the flowers of bushes in spring, from the berries and nuts in autumn, and from branches as a hiding place throughout the year. These structures often occur naturally, but sometimes our wood supplier assist nature and plants bushes and small trees where the forest meets meadows or farmland (the key is to choose the right plant species).



Figure 11: Standing and lying dead wood is a valuable habitat for fungi and lichens (Photo provided by Österreichische Bundesforste AG)

Specifically for the Lenzing supply from Austrian beech forests, Lenzing commissioned a feasibility study with Umweltdachverband, an Austrian umbrella organization of environmental NGOs. Umweltdachverband studied the possibilities to connect Lenzing's wood sourcing with activities for protecting biodiversity, especially endangered species, in managed beech forests in Austria. The case study has concluded that there are numerous species living in managed beech forests in Austria, among them also red-list species, which have adapted themselves to the management practices. Others are species of the open land, which have found habitat in managed forests. Therefore reversing these semi-natural forests to completely natural forests (stopping all management) could potentially harm these species (see box below).

Feasibility study “Biodiversity initiative Lenzing AG”: Key messages by Umweltdachverband in summary (shortened)

Challenges for humanity – protecting biodiversity and the climate

The two greatest global environmental challenges of our time are climate change and the loss of biodiversity. Biodiversity or biological diversity encompasses all species and organisational levels of living organisms, their genetic diversity, the diversity of ecosystems (habitats) and the processes at work in these systems. It not only forms an important basis for human life, but is also the foundation for numerous economic sectors. Companies depend on species and ecosystems in many ways. In order to maintain the ecosystem services provided free of charge by nature in the long term, the sustainable use of natural resources is of utmost importance.

Tropical rainforests – the lungs of the earth

Tropical rainforests are hotspots of biodiversity and are among the most species-rich ecosystems on our planet. However, unlike European forests these fascinating megadiversity centres are low in nutrients. They store high amounts of CO₂, yet, they are increasingly endangered by various human activities, such as deforestation or slash-and-burn practices. Rainforests obtain their nutrients mainly from dying plant remains of the rainforest and not from the soil, as this is washed out of nutrients due to intensive rainfall. If the rainforest is cleared, no nutrients can be replenished from the soil, making reforestation much more difficult. Therefore, a further deforestation in tropical regions must be avoided. As a consequence, forestry in these regions relies on intensely managed plantations, which are planted on agricultural land (segregative approach).

Forests of Central Europe

These forests are by nature comparatively species-poor as a result of the displacement of tree species in the course of the ice ages. Nutrient-rich soils allow sustainable use over centuries. Well over 100 forest biotope types prevail, all of which harbour characteristic fauna and flora. Beech forest types play an important role in this. Intensive use of forests (short rotation periods, pure stands etc.) leads to the endangerment of species. So-called Red Lists include on the one hand relict species of primeval forests, such as wood-dwelling beetles and certain lichen species, and on the other hand species of sparse or economically used forests. Many of these species have adapted to managed cultivated landscapes over many centuries and are often tied to moist or dry specific sites.

What does this mean for European nature conservation?

In the light of European efforts to promote the bioeconomy, it is indispensable to think about and consider biodiversity in forestry management. In order to maintain diversity in the forests in the long term, a combination model of segregation and integration should be aimed for. The EU Biodiversity Strategy and the EU Forest Strategy envisage precisely such a combination model: 30 % of the country's land area is to be placed under effective protection and 10 % under strict protection. The 10 % target includes, for example, virgin forests and near-to virgin forests as well as forests with high

nature conservation value, such as national parks, wilderness areas and natural forest reserves. These are not to be used economically (segregative approach).

What does this mean for the beech forests?

Austria is still home to original primeval beech forests and stands close to primeval forests, most of which are already under strict protection, for example, in the Kalkalpen National Park, in the Dürrenstein-Lassingtal Wilderness Area and in the core zone of the Wienerwald Biosphere Reserve. These beech forests with a high proportion of old trees, standing as well as lying deadwood offer an ideal habitat for many endangered animal and plant species. There are sufficient natural tree cavities in which cavity-nesting birds, bats and many other creatures find breeding space and shelter. The number of animal species in beech forests is estimated at up to 10,000. Only some of the Red List species can be secured in strict protected areas. Therefore, biodiversity measures are also needed in managed forests (integrative approach). For this purpose, PEFC partner organisations in Austria define regionally coordinated biodiversity targets.

How can Lenzing AG contribute to the preservation of biodiversity?

Lenzing has identified biodiversity as a material topic and starts to assess its dependencies and impacts in a learning phase, in order to define targets and implement specific actions.

Lenzing can support best practices adopted by suppliers. A best practice example is ÖBf AG's Ecological Landscape Management, an initiative for more biodiversity in the forest in the sense of integrated ecological forestry. A variety of nature conservation measures are implemented: from deadwood management and bird protection measures to wild bee protection and support measures for amphibians.

How can Lenzing AG communicate this biodiversity commitment?

Biodiversity has not yet found its way into the communication of wood products. Yet the topic offers a wealth of emotional stories, messages and images that could be used to communicate the value of forest biodiversity in an extremely promising way. The connection between biodiversity, sustainable forest management and the natural product wood-based fiber for a good life could be shown.

Lenzing AG's commitment to biodiversity means that the company is not only a supplier of sustainable fibers for clothing and nonwovens, but also an active environmental and nature conservationist. Without biodiversity, we as humans lack the natural basis for life – Lenzing contributes to protecting and preserving valuable and healthy natural environments. In addition, Lenzing fulfils a responsible educational mandate to communicate the value of biodiversity and to link it to the value of wood-based, renewable materials.

Supporting forest and biodiversity conservation beyond Lenzing's supply chain

As a consequence of our understanding of greater responsibility and leadership, to bring positive change beyond the own supply chain or sphere of direct influence. In addition to activities related to its own supply chain, Lenzing supports conservation solutions in other regions outside its own sourcing areas.

Lenzing supports conservation solutions in other regions not related to its own supply chain, such as afforestation in Albania, DR Congo and the USA. Additionally, Lenzing is committed to addressing the protection of ancient and endangered forests in Canada (Broadback Forest Quebec, Vancouver Island) and Indonesia (Leuser Ecosystem) at the political level. In 2023, Lenzing signed the letter "World's MMCF Producers Call on the Convention of Biological Diversity to support conserving at least 30 percent of the world's forests by 2030" prepared as a response to the COP 15 conference in the Convention of Biological Diversity (Montreal).

With the NGO **One Tree Planted**, Lenzing supported the "Earth Day Campaign" 2019, including the restoration of the Yosemite National Park in California, USA. With the support of this initiative not only the land was restored, but also the wildlife habitat was positively impacted. In 2020, some 10,000 trees were planted. In 2021, 33,025 trees were planted, mainly in California and Colorado, as well as in Haiti. In 2022, around 1,000 trees were planted. This amounts to a total of around 60,000 trees since 2019 that have been planted with the support of Lenzing.

Biodiversity around the production site in Lenzing (Austria)

Lenzing has built a photovoltaic plant on a former landfill site in the immediate vicinity of the Lenzing (Austria) site, which was finished in 2022. Currently, Lenzing is creating a biodiversity island at this site by planting a lean meadow between the photo-voltaic modules. This will ensure that the area can become a habitat for local insects, birds and other animals, while at the same time delivering renewable energy to the site. Seeds for local plants were carefully selected to ensure a high diversity of wild plants for the local animal population. At the edges of the rough pastures, maintenance measures are deliberately avoided in order to create natural habitats for microorganisms and insects through dead wood, stone accumulations and foliage.

Lenzing manages a forest association of around 40 hectares around the main plant in Lenzing. The forest serves as a "green belt", a natural barrier for site specific emissions around the Lenzing site, and offers several ecosystem services, including recreational ones for the local community. The forest area, especially in the 80-year-old stand, is a habitat for wildlife and insects. Lenzing follows a sustainable management concept that avoids clear-cutting. It favors the selective removal of individual trees and uses this local wood for its fiber production. It also disposes of the rootstocks and other waste parts through the local district heating generator. This way, Lenzing reduces emissions and keeps the raw material in the region. When reforesting, emphasis is also placed on native and diverse tree species to mitigate future challenges of climate change. Lenzing works with local partners to keep the added value in the region.

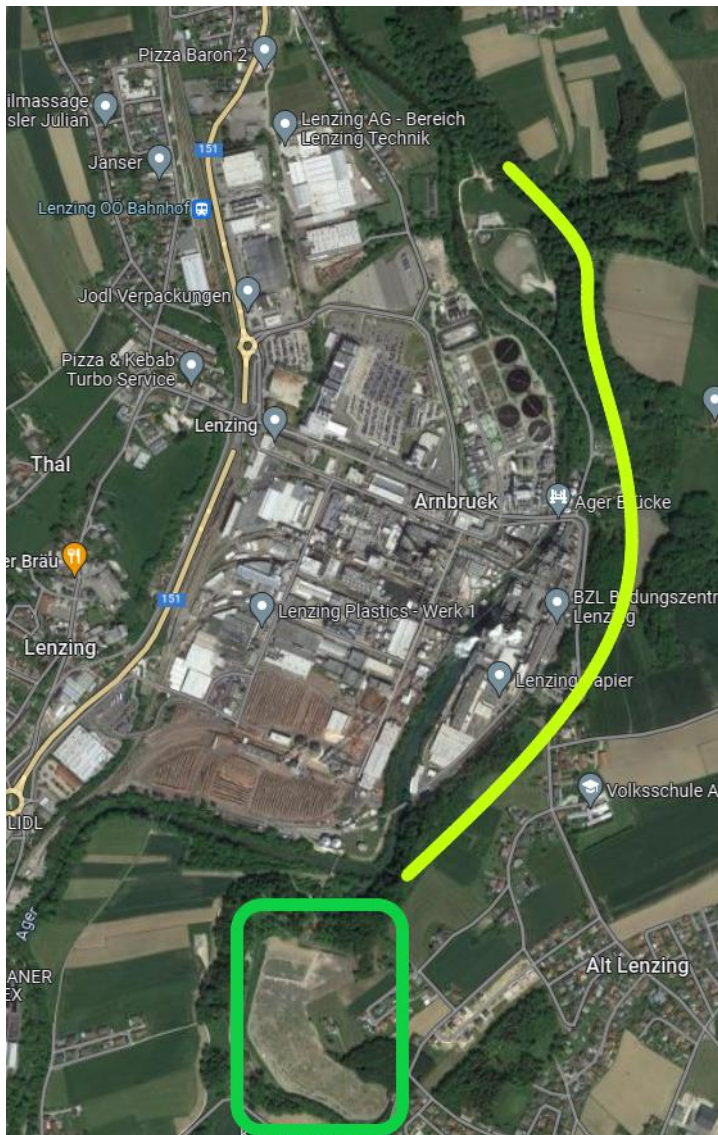


Figure 12: Map of Lenzing (Austria). Shown are the “green belt” managed by Lenzing AG and the location of the photovoltaic plant (plant not shown). Map taken modified from Google, <https://www.google.at/maps>, accessed 14.03.2024

Buzzing for Nature - Maintenance and support of ecosystem services in Austria

In 2023, Lenzing actively engaged in the maintenance and support of ecosystem services that are provided by forests of its wood suppliers. This was achieved through a collaboration with Österreichische Bundesforste AG (ÖBf, Austrian Federal Forests). The primary aim of the collaboration is to support the protection of moorland and peat bogs in the state of Upper Austria. Besides the peat bog restoration, the project also supports additional activities, which improve or maintain the ecosystem services provided by forests.

In 2023 Lenzing funded a project of the ÖBF in Reindlmühl, Steinbach am Attersee and Frauschereck (Upper Austria). In this project 3.5 to 4 km of forest edges were restored to create

bee-friendly habitats for wild bees. The aim of the project is to counteract the decline of pollinators by restoring wild bee habitats, as pollinators are negatively affected by land use changes, intensive agriculture, pesticides, invasive species, diseases and climate change. The selected plants include various fruit-bearing trees and shrubs such as pear, apple, blackthorn, trembling poplar, wild rose, hazelnut, walnut, willow, rowan, and others. Flowering shrubs are particularly important as they provide food for bees in spring and birds in autumn.

During 2023, Lenzing and ÖBf jointly outlined and prepared an action plan for the engagement on peat bog protection in the coming year.



Figure 13: Planting of bee-friendly shrubs. (Credits: Lenzing AG/Nenad Šimunović)

Bee protection project in Brazil

For many years, LD Celulose has been involved in an initiative to support beekeepers. The company maintains a partnership with associations of honey producers in the Triangulo Mineiro region and in rural São Paulo. LD Celulose makes part of its forests available so that beekeepers can set up their bee boxes there. The 4,000 boxes currently installed produce about 50 tons of honey per year. This partnership benefits both the environment and the local communities, as it leads to increased protection and monitoring of the forests, an increase in bee populations and higher income for the beekeepers. A

new phase of the project is the implementation of a training program for young people on how to produce honey, together with the partner associations of honey producers.

Conservation project in Albania extended to West Balkan countries

Albania is one of the countries in Europe with the greatest need for improvement in its forest areas. New forest management approaches were recently implemented by the government to address environmental problems and fulfil the current needs of society with respect to the sustainable use of natural resources. The Lenzing Group started a forest conservation project in Albania in 2019. The project will continue until the end of 2024 as planned. Additionally, the scope of the project has been significantly expanded to include neighboring countries, this expanded project will continue after 2024. It is managed by the Austrian Development NGO ICEP and is funded by ADA (Austrian Development Agency) and the Lenzing Group. The original aim was to support the development of rural areas in Albania in the broader region of Shkoder (Ana e Malit) and Diber (Peshkopi) by using natural resources sustainably and fostering alternative income sources for communities. The goal of the original scope was to implement conservation solutions covering 20 hectares in this area. The extended scope now aims to afforest 45 ha of degraded land and restore additional 75 ha in the area. To achieve this 110,000 trees will be planted.

The transboundary catchment area, which is an area of land where water collects when it rains, of the Drin River includes the countries of Albania, Kosovo, North Macedonia and Montenegro. This area consists of large forest and pasture areas, rich biodiversity ecosystems and is one of the most water-rich areas in Europe in terms of freshwater ecosystems. Over the last three decades, the forest area in the four target countries along the river basin has been heavily exploited and is under threat due to increased illegal logging activities and consequences of climate change like drought and forest fires.

The long-term impact of the project is to contribute to climate change mitigation and sustainable development along the Drin River through strengthened integrated forest management (IFM). Through the set measures, the living conditions of rural communities in the target areas will be improved. The overall outcome of the project is to increase socio-economic and environmental benefits for local communities through ecosystem services. The project applies a multi-stakeholder approach, integrating national and international experts as well as local communities, central and local authorities, and on-going initiatives.

Achievements in 2023

- 5 ha afforested
- 10,778 trees planted
- 63 local forest workers have been employed and educated in reforestation and the use of machinery
- Kick-off conference on Integrated Forest Management with 60 participants from public administration, ministries, universities, public and private forestry companies, etc.

Mai Ndombe REDD+ project

The rainforests in the **Congo** basin are the second largest tropical rainforests area and home to numerous wildlife species including bonobos, chimpanzees, and forest elephants. Lenzing supported the Mai Ndombe REDD+ project to contribute to the protection of these globally important forests with a one-time donation in 2022. It takes the approach to improve the livelihood of the local communities through new opportunities for income, which has a positive effect on the protection of forests and ecosystem as well as biodiversity. The project supports the protection of 300,000 hectares at the west side of the Mai Ndombe Lake in DR Congo, which is part of the world's second largest rainforest and

home to numerous wildlife species. The area is threatened by deforestation through legal and illegal logging.



Figure 14 : Mai Ndombe Lake (Photography by Everland/Filip Ago)

The project uses carbon revenues to prevent logging contracts from being renewed in the area and creates alternative livelihoods for the local communities. This enables the forest and wildlife to regenerate, which will promote biodiversity. To further advance the community’s self-determined development, trainings and demonstrations about sustainable (fish) farming are held to improve food security while also conserving natural resources. Lenzing’s contribution was directed towards restoring the fish stocks and the environmental health of Lake Mai Ndombe.

Innovation for people: Reducing the carbon footprint, protecting forests and improving lives of rural communities vulnerable to the effects of the climate crisis

This pilot project in the Democratic Republic of Congo, Luozi Region, combines both social and environmental components in a holistic approach to sustainably protect the environment, reduce CO2 emissions and sustainably improve the lives of vulnerable children and families in one of the poorest countries in the world. In this research project, CO2 is to be reduced by means of innovative products, such as agricultural waste-based charcoal and energy-saving stoves. Using this alternative charcoal reduces the need for wood harvest in the forests. In addition, income-generating activities will provide alternatives for small-scale farmers so that they no longer must produce and sell wooden charcoal. Ecological and smart integrated agricultural activities, such as combining agroforestry with beekeeping, will increase the income of smallholders, improve soil fertility and reduce deforestation. Accompanying advocacy and education measures are carried out to minimize slash-and-burn agriculture and improve forest protection.



Figure 15: Innovation for people. (Pictures were kindly made available by Caritas Austria)

Forestry and climate change

Forests play a vital role in climate change mitigation. Sustainable forest management aims to balance the interest in material production with biodiversity and climate aspects. For the interconnections between Lenzing’s forestry matters and climate change, see the Focus Paper “Wood and Pulp”.

„Transform“ - Stakeholder activities

CDP Forests

The Lenzing Group contributed to the Carbon Disclosure Project (CDP) in the areas of Climate and Forests for the first time in 2020. It received a double “A” score for tackling climate change and acting to protect forests. In 2021, Lenzing added the area Water and received a triple “A” rating, among only 14 companies worldwide. The same rating was achieved in 2022 among 12 companies. Only 16 companies worldwide have an “A” rating for forests in 2020. 24 in 2021, and 25 in 2022. Through its significant demonstrable actions in these areas, Lenzing has taken a leading position in corporate environmental ambition, action, and transparency. In 2021 for the first time, Lenzing reported on its activities in Brazil. The efforts to ensure legal compliance and to ensure that activities (e.g. leasing of new areas for plantations) do not contribute to deforestation in Brazil were examined. Transition risks were included and published in the risk reporting. Data was collected and it was extensively reported on the activities in Brazil, ensuring a share of certified or controlled wood input greater than 99 percent. The CDP forest score confirms that the production of Lenzing’s wood-based cellulosic fibers does not contribute to deforestation - through a combination of a stringent wood sourcing policy, forest certification and a dedicated collaboration with the CanopyStyle initiative.

Austrian Federal Forests (Österreichische Bundesforste, ÖBf)

As the Lenzing site pulp mill obtains more than 35 percent of its wood from Austrian forests, the state of Austria's forests is especially important for the sourcing situation. In Austria, forest biodiversity is monitored regularly according to a Biodiversity Index³⁵. Recent outcomes are reported in the "Indicators of sustainable forest management 2020"³⁶ from the multi-stakeholder organization "Walddialog", as a contribution to the Forest Europe indicators and targets process. Biodiversity in Austrian forests is a focus of the ongoing governmental biodiversity strategy since 2020. . As a consequence, an increase in the shares of protected and strictly protected areas is targeted. For example, every type of forest defined by ecological science is going to be represented in natural forest protected areas ("Naturwaldreservate").

One important wood supplier to the Lenzing site (Austria) is the state-owned company Österreichische Bundesforste (ÖBf AG, Austrian Federal Forests). Managing 10 percent of the national territory and 15 percent of Austria's woodland, ÖBf is the largest ecosystem manager, forest managing company and owner of hunting and fishing licenses. Sustainability forms the guiding principle for all ÖBf activities. The ÖBf team for ecological landscape management is developing individual nature conservation plans for each of the 120 ÖBf-forest units in addition to the existing forest management plans³⁷. These include specific measures to protect endangered species and increase biodiversity under local conditions, which are integrated into daily forest management work.

BIMUWA - Biodiversity and multifunctional forest management"

The publicly funded research project "Biodiversity and multifunctional forest management" (BIMUWA³⁸) developed specific measures to protect endangered species (red-list species) and increase biodiversity under local conditions of the PEFC region 6 (located in Austrian provinces Styria and Carinthia), which are integrated into daily forest management work. ÖBf is cooperating with the NGO umbrella organization Umweltdachverband on this. As the measures are very concrete and easy to implement, positive effects can be scaled to large forest areas. In 2023, Lenzing supported the roll-out of the results to the interested private forest owners by presenting its view during the information events in the region.

Textile Exchange (TE) Biodiversity Benchmark

The Textile Exchange Biodiversity Benchmark was launched on December 2, 2020. The benchmark is part of the TE Corporate Fiber and Materials Benchmark (CFMB) Program and is connected to TE's "Climate+" strategy. The role of the benchmark is to address biodiversity loss and support improvements in the industry's sphere of influence through knowledge-sharing. The methodology for companies to set targets for nature is being developed through the Science-Based Targets Network (SBTN). It has taken an initial big step by surveying companies about integrating biodiversity into their business strategies and operations, making commitments, setting targets, and aligning with the Sustainable Development Goals (SDGs):

In 2021, Lenzing contributed as a member of the advisory group, providing input to the tool development and its own input to the benchmark. The "Biodiversity insights Report 2021"³⁹ provides "a first global baseline for the apparel and textile industry" regarding the awareness of its impacts on biodiversity. It describes approaches to actions in business integration, transparency, materiality, implementation, monitoring and evaluation, as well as corporate reporting. In 2022, the findings of the Insights Report were integrated as a new chapter of questions into the CFMB program. In 2023, the "Biodiversity Landscape Analysis" report was published, with a focus on natural fibers from plants (cotton) and animal hair (wool), and some limited general statements on regenerated cellulose fibers.



Wood K plus

Many Austrian companies, including Lenzing, and scientific bodies have joined forces in the “Kompetenzzentrum Holz”. It is a leading research institute in wood and wood-related renewable resources in Europe. One workstream of Wood K plus for Lenzing is sustainability in wood sourcing. In 2021, the focus shifted to biodiversity, including support for the work for the Textile Exchange Biodiversity Benchmark. A master’s thesis on the assessment of biodiversity impacts in textile fiber production by Life cycle assessment (LCA) methods was finalized in 2022⁴⁰, with these approach & results:

A Delphi survey approach was used. Expert interviews were conducted on the challenges of biodiversity in LCA, with backgrounds ranging from ecology to LCA-modelling. Three rounds of interviews were conducted. The findings were applied to three fibers/production systems: beech, cotton, and eucalyptus. Holistic and technical approaches to tackle challenges were suggested by experts. Data availability and a common understanding of biodiversity amongst researches are the groundwork to create a replicable study. For now, the focus will lie on species diversity until more data becomes available. For the three compared production systems, (regional) data must be gathered on the history of land use, the type and the intensity of land use that is conducted and the behavior of the ecosystem and species in response. There are high levels of uncertainty concerning the regional resolution. LCA is a promising methodology and should be considered to disclose biodiversity impact, however, the previously mentioned challenges must be taken into account. In 2023 a doctoral study has been started on the topic of biodiversity metrics for the assessment of corporate impacts and dependencies. This work is supporting the development of Lenzing’s biodiversity strategy.

ICEP

ICEP is an independent Austrian non-governmental organization (NGO) with a business-oriented focus. ICEP works with partner organizations in emerging markets and with Austrian companies and implements projects worldwide with the aim of getting more people actively involved in economic life. ICEP supports Lenzing since 2018 in the implementation of an ADA co-financed afforestation and conservation project in Albania. In 2023, a feasibility study for engagement in biodiversity improvement and social impact actions around the LD Celulose site in Indianópolis (Brazil) has been agreed, which will start in 2024

WWF Austria

Lenzing has been invited to present at an event of the WWF Climate Group Talks on “How to integrate biodiversity in your core business.” Additionally, Lenzing contributed to a study by WWF and Ernst & Young “Management in the biodiversity crisis – How Austrian companies minimize risks and seize opportunities”⁴¹ (translated title, study is in German language) with general insights and a case study.

Index of Figures

- Fig. 1: Relationship between Biodiversity, Climate Change and Good Quality of Life.
Fig. 2: Framework by SBTNI for setting targets related to biodiversity
Fig. 3: Functions of forest ecosystems
Fig. 4 A+B: Eucalyptus plantation (Source: LD Celulose) (B) Replanting of Eucalyptus trees (Source: LD Celulose)
Fig. 5: Map of plantations own and managed by LD Celulose in Brazil
Fig. 6: *Pseudopaludicola facureae* (Source: LD Celulose)
Fig. 7 A+B: Maned Wolf (A) and Giant Anteater (B) captured on camera within LD Celulose's plantations. (Source: LD Celulose)
Fig. 8: Biodiversity corridor and plantation area
Fig. 9: Main wood sourcing countries in Europe
Fig. 10: Beech forest in Central Europe
Fig. 11: Standing and lying dead wood is a valuable habitat for fungi and lichens
Fig. 12: Map of Lenzing (Austria).
Fig. 13: Planting of bee-friendly shrubs. (Credits: Lenzing AG/Nenad Šimunović)
Fig. 14: Mai Ndombe Lake (Photography by Everland/Filip Agoo)
Fig. 15: Innovation for people (Pictures were kindly made available by Caritas Austria)

References and Endnotes

-
- ¹ IPBES-IPCC 2021: Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change
² Civitello, David J., et al. "Biodiversity inhibits parasites: Broad evidence for the dilution effect." *Proceedings of the National Academy of Sciences* 112.28 (2015): 8667-8671.
³ Thompson, I., Mackey, B., McNulty, S., Mosseler, A. (2009). *Forest Resilience, Biodiversity, and Climate Change. A synthesis of the biodiversity/resilience/stability relationship in forest ecosystems*. Secretariat of the Convention on Biological Diversity, Montreal. Technical Series no. 43, 67 pages.
⁴ Barnosky, A. D., Matzke, N., Tomiya, S., Wogan, G. O., Swartz, B., Quental, T. B. & Ferrer, E. A. (2011). Has the Earth's sixth mass extinction already arrived?. *Nature*, 471(7336), 51-57.
⁵ Barnosky, A. D., Matzke, N., Tomiya, S., Wogan, G. O., Swartz, B., Quental, T. B. & Ferrer, E. A. (2011). Has the Earth's sixth mass extinction already arrived?. *Nature*, 471(7336), 51-57.
⁶ IPBES-IPCC 2021: Scientific outcome of the IPBES-IPCC co-sponsored workshop on biodiversity and climate change
⁷ IPBES 2019: *Global assessment report on biodiversity and ecosystem services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services*. E. S. Brondizio, J. Settele, S. Díaz, and H. T. Ngo (editors). IPBES secretariat, Bonn, Germany. <https://ipbes.net/global-assessment>
⁸ Science-based targets for nature. Initial guidance for businesses. 2020.
⁹ Costanza R., de Groot R., Sutton P., van der Ploeg S., Anderson S. J., Kubiszewski I., Farber S. & Turner R. K. (2014). Changes in the global value of ecosystem services. *Global Environmental Change* Volume 26, May 2014, Pages 152-158; <https://doi.org/10.1016/j.gloenvcha.2014.04.002>
¹⁰ OECD (2019), *Biodiversity: Finance and the Economic and Business Case for Action*, report prepared for the G7 Environment Ministers' Meeting, 5-6 May 2019.
¹¹ Swiss Re Institute, *Biodiversity and Ecosystem Services – A business case for re/insurance*, 2020
¹² Textile Exchange, *Biodiversity Insights Report 2021*. <https://mci.textileexchange.org/biodiversity/insights/>
¹³ Global Fashion Pact, *Transforming the industry*. 2020. <https://thefashionpact.org/wp-content/uploads/2020/10/038906e111abca13dce4c77d419e4f21.pdf>
¹⁴ Forest Europe 2015, and 2020: *State of Europe's Forest 2015*. Ministerial Conference on the Protection of Forests in Europe, June 2016., and 2020, *State of Europe's Forest 2020*. <https://foresteurope.org/publications/>
¹⁵ Indicators of sustainable forest management in Austria reports from 2017 and 2020. <https://info.bmlrt.gv.at/themen/wald/walddialog/dokumente.html>, Czech Republic and Slovakia forest reports: Ministry of Agriculture of the Czech Republic, *Information on Forests and Forestry in the Czech Republic by 2017* (English), *Zpráva o stavu lesa a lesního hospodářství České republiky v roce 2020* (Czech). Ministry of Agriculture and Rural Development of the Slovak Republic, *Report on the Forest Sector of the Slovak Republic 2020*.
¹⁶ Zero discharge of hazardous chemicals, <https://www.zdhc-gateway.com/>
¹⁷ Lambini C. K., Nguyen T. T., Abildtrup J., Pham Van D., Tenhunen J., Garcia S. (2018). Are Ecosystem Services Complementary or Competitive? An Econometric Analysis of Cost Functions of Private Forests in Vietnam. In: *Ecological Economics*, Vol. 147, pp. 343-352
¹⁸ World Resources Institute, 2005: *MEA – Millennium Ecosystem Assessment (2005): Ecosystems and Human Wellbeing: Synthesis*. World Resources Institute. Island Press, Washington D.C.

- ¹⁹ [Frontiers | The Unseen Effects of Deforestation: Biophysical Effects on Climate \(frontiersin.org\)](#)
- ²⁰ Suresh, A., Identification of low carbon sources of man made cellulosic fibers. Report by UN FCCC Fashion Industry Charter for Climate Action, 2023.
https://unfccc.int/sites/default/files/resource/Final_230630%20BLS23044%20UCC%20report%20MMCF%20fiber%20v04.pdf
- ²¹ <https://www.sappi.com/managing-for-biodiversity>
- ²² Manufacturers association of South Africa, PAMSA (2016). Celebrating trees, wood and water this Arbor Week. Available at: [Home - The Paper Story \(PAMSA\)](#) . <https://www.thepaperstory.co.za/celebrating-trees-wood-and-water-this-arbor-week-4-10-september/>
- Sappi Southern Africa. Forest. Available at: [Sappi Forests | Sappi Global](#)
- ²³ FSC Global Development GmbH (2014). FSC® and Plantations. FSC's position on plantations. Available at: <https://fsc.org/en>
- ²⁴ Brazil's Forest Code. Assessment 2012-2016. IPAM Amazonia – Amazon Environmental Research Institute.
https://ipam.org.br/wp-content/uploads/2017/01/relat%C3%B3rio_en_ocf_web.pdf
- ²⁵ Duratex Annual Report (2018). Available at: <https://www.duratex.com.br/Relatorio-Anual-2018/en/index.html> [Accessed 21 January 2019]
- ²⁶ Paillet, Y., Bergès, L., Hjältén, J., Ódor, P., Avon, C., Bernhardt-Römermann, M. A. R. K. U. S., ... & Virtanen, R. (2010). Biodiversity differences between managed and unmanaged forests: Meta-analysis of species richness in Europe. *Conservation biology*, 24(1), 101-112.
- ²⁷ Schulze, E. D., & Ammer, C. (2015). Spannungsfeld Forstwirtschaft und Naturschutz: Konflikte um eine nachhaltige Entwicklung der Biodiversität. *Biologie in unserer Zeit*, 45(5), 304-314.
- ²⁸ Ministeries of Agriculture Brandenburg and Mecklenburg-Vorpommern (2010). Biologische Vielfalt in den Wäldern Nordostdeutschlands. Edited by: Ministerium für Infrastruktur und Landwirtschaft Brandenburg and Ministerium für Landwirtschaft, Umwelt und Verbraucherschutz Mecklenburg-Vorpommern. Potsdam and Schwerin
<https://www.interregeurope.eu/sites/default/files/2022-04/Policy%20Brief%20Preserving%20biodiversity.pdf>
- ²⁹ Forest Europe 2020: State of Europe's forests 2020.
- ³⁰ Forest Europe 2020: State of Europe's forests 2020.
- ³¹ Walddialog 2020. Indikatorenbericht 2020. [Indikatorenbericht 2020 \(bml.gv.at\)](#)
- ³² Forest Europe 2020: State of Europe's forests 2020.
- ³³ Geburek, T., Büchsenmeister, R., Englisch, M., Frank, G., Hauk, E., Konrad, H., Liebmann, S., Neumann, M., Starlinger, F. and Steiner, H. (2015). Austrian Forest Biodiversity Index – Concept and Evaluation. BFW Praxisinformation 37, pp. 6-8
- ³⁴ Bogner, D., Holzner, W. (Eds.)(2006): MOBI-e. Entwicklung eines Konzeptes für ein Biodiversitäts -Monitoring in Österreich. Report from the Austrian Federal Ministry of Agriculture, Forestry, Environment and Water Management
https://www.stadtland.at/hm/aktuelles/MOBI_e_Entwicklung_eines_Konzeptes_fuer_ein_Biodiversitaetsmonitoring_in_OEsterreich.pdf
- ³⁵ Geburek, T., Büchsenmeister, R., Englisch, M., Frank, G., Hauk, E., Konrad, H., Liebmann, S., Neumann, M., Starlinger, F. and Steiner, H. (2015). Biodiversitätsindex Wald – Einer für alle! In: Biodiversität im Wald. BFW Praxisinformation 37, pp. 6-8
<https://info.bmlrt.gv.at/themen/wald/walddialog/dokumente/indikatorenbericht-2020.html>
- ³⁷ <https://www.bundesforste.at/die-bundesforste/naturschutz/biodiversitaet/oekologisches-landschaftsmanagement.html>
- ³⁸ BIMUWA website: <https://www.bundesforste.at/leistungen/naturraum-management/foerderprojekte/biodiversitaet-und-multifunktionale-bewirtschaftung-imwald.html>
- ³⁹ OECD (2019), Biodiversity: Finance and the Economic and Business Case for Action, report prepared for the G7 Environment Ministers' Meeting, 5-6 May 2019.
- ⁴⁰ Sunny Klassen, Biodiversity Footprint of the Fashion Industry-Evaluating the Applicability of LCA to Depict the Biodiversity Impact of Plant Derived Fiber Raw Materials. Master thesis, University of Graz, 2022
- ⁴¹ https://www.wwf.at/wp-content/uploads/2024/01/WWF_Studie_Biodiversitaets-Management-Unternehmen_2024.pdf

Imprint

Lenzing Group, Biodiversity and Ecosystems Focus Paper
Issue April 2024, information as at year end 2023

Editorial team

K. Christian Schuster, Luise Waldow, Peter Bartsch, Danijela Cafuta

Inquiries to: sustainability@lenzing.com

