FACTSHEET : MANUFACTURING

Version 1 (August 2023)

AIM OF THE FACTSHEET

The benchmark factsheet is designed for companies or investors to assess a sector's impact on biodiversity. Companies can use the factsheet to compare their impacts (e.g., assessed with the Global Biodiversity Score tool) to the sector average or to estimate their impacts and main pressures on biodiversity. Also, investors can use it to screen their biodiversity impacts, or rate specific companies' performance against sectoral benchmarks. Finally, factsheets will help nourish the work of the EU Taxonomy by identifying low impact companies. It is supported by a technical annex and a reading guide.

The calculations were performed using GBS version 1.4.4 in April 2023.

WHAT DOES THE SECTOR INCLUDE?

The sector covers the following manufacturing categories:

- textiles, leather and fur including wearing apparel;
- paper and wood products;
- mineral and petroleum products;
- electronics, vehicles and machinery equipment;
- tobacco, rubber and plastic products;
- other products including media printing and furniture.

Those 6 categories group 23 EXIOBASE industries and are further described in the annex (1).

KEY MESSAGES

➤ Most impacts of the manufacturing sector fall under Scope 3 as manufacturing processes are located downstream of the value chain of other economic sectors, such as the raw materials extraction and agriculture and agrifood sectors.

➤ Wood-based (Paper and wood products) industries are the ones with the highest biodiversity impacts intensities within the manufacturing sector.

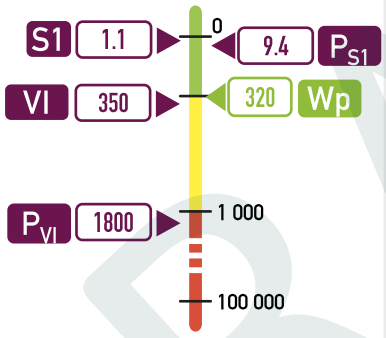
➤ The main dynamic pressure of the manufacturing sector is Climate change, except for wood-based industries. Because forestry activities are land-intensive, the associated spatial pressures are the most important.

ECOSYSTEM SERVICES DEPENDENCIES Scope 1

Textiles, leather and fur: 25 %	Electronics, vehicles and machinery: 19 %
Paper and wood products: 12 %	Tobacco, rubber and plastics: 26 %
Mineral and petroleum products: 13 %	Other manufacturing: 13 %

TERRESTRIAL STATIC PERFORMANCE OF THE SECTOR

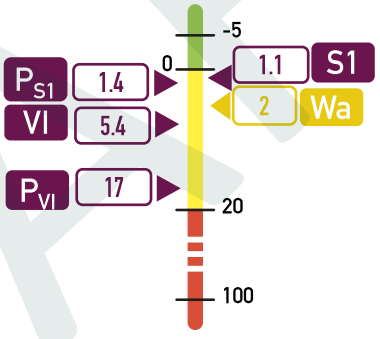
Intensity (MSA.m²/kEUR)



- S1: Sectoral Scope 1 terrestrial static intensity (3)
- VI: Sectoral Vertically integrated (4) terrestrial static intensity
- PS1: Paper and wood products Scope 1 terrestrial static intensity
- PVI: Paper and wood products Vertically integrated (4) terrestrial static intensity
- Wp: World terrestrial static intensity compatible with planetary boundaries (6)

TERRESTRIAL DYNAMIC PERFORMANCE OF THE SECTOR

Intensity (MSA.m²/kEUR)



- S1: Sectoral Scope 1 terrestrial dynamic intensity (3)
- VI: Sectoral Vertically integrated (4) terrestrial dynamic intensity
- PS1: Paper and wood products Scope 1 terrestrial dynamic intensity
- PVI: Paper and wood products Vertically integrated (4) terrestrial dynamic intensity
- Wa: Corporate world average terrestrial dynamic intensity

STATIC AGGREGATED SCORE Vertically integrated (4)

Textiles, leather and fur: 9 500 MSAppb/bEUR	Electronics, vehicles and machinery: 2 300 MSAppb/bEUR
Paper and wood products: 22 700 MSAppb/bEUR	Tobacco, rubber and plastics: 9 600 MSAppb/bEUR
Mineral and petroleum products: 2 800 MSAppb/bEUR	Other manufacturing: 4 700 MSAppb/bEUR

BIODIVERSITY FOOTPRINT (2)

Realm	Accounting category	Impact intensity – MSA.m²/kEUR					
		Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronics, vehicles and machinery	Tobacco, rubber and plastics	Other processes
		vertically integrated (4)	vertically integrated (4)	vertically integrated (4)	vertically integrated (4)	vertically integrated (4)	vertically integrated (4)
Terrestrial	Static	660	1 800	190	150	580	330
	Dynamic	5.8	17	10	2.7	5.4	4.0
Aquatic (5)	Static	47	96	15	11	54	23

(1) The list of the EXIOBASE industries covered by this factsheet and corresponding NACE divisions are presented in the technical annex. The manufacturing of food and beverages , chemicals as well as metals are not covered by this factsheet as they are respectively included in the Agriculture and agrifood, Chemicals and Manufacture of metals factsheets.
(2) The results are broken down into six main categories: those related to Textiles, leather and fur, those related to Paper and wood products, those related to Petroleum and minerals, those related to Electronics, vehicles and machinery, those related to Tobacco, rubber and plastics, and those related to Other processes.
(3) The sectoral Scope 1 impacts also include the impacts from the Paper and wood products.
(4) The vertically integrated results refer to the sum of Scope 1, 2 and upstream Scope 3 impacts.
(5) The aquatic dynamic results have a high uncertainty and are therefore not presented here. However, the data is available in the technical annex.
(6) World terrestrial static intensity compatible with planetary boundaries $= \frac{terrestrial\ static\ impact\ compatible\ with\ planetary\ boundary}{global\ turnover} = \frac{28\% MSA * total\ emerged\ land\ surface}{global\ turnover}$

GBS GLOBAL BIODIVERSITY SCORE®

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KEY ISSUES OF THE SECTOR

ECOSYSTEM SERVICES DEPENDENCIES OF THE SECTOR

The direct dependencies of the sector are calculated by the GBS using the ENCORE model, a tool developed to provide knowledge on sectors' dependency on various ecosystem services. Details about the methodology and the graphs displaying the output of all the dependencies are provided in the technical annex.

The dependencies figures displayed in the left boxes of the "Key figures" section are an aggregated score over all ecosystem services for Scope 1. The most dependent manufacturing categories are Tobacco, rubber and plastics (26 %), and Textiles, leather and fur (25 %).

The highest Scope 1 dependencies of the benchmark sector are on **water-related ecosystem services**(1). Indeed, manufacturing industries rely on water for many processes, such as cooling or washing. More precisely, the current demand from the manufacturing industry accounts for 22 % of global freshwater withdrawal (Gleick 2003).

The sector's dependencies on ecosystem services can depend on the type of raw materials extracted or produced for manufacturing processes. Therefore, fully understanding them would require looking at Upstream dependencies as well, which are further studied in the annex.

HOW DOES THE SECTOR CONTRIBUTE TO CHANGES IN THE STATE OF NATURAL CAPITAL?

Major value chain biodiversity impact drivers can be linked to manufacturing inputs (raw materials, agricultural products). Raw material suppliers are responsible for **habitat loss and degradation** (CBD 2018) impacts, such as the conversion of natural land habitats to agriculture. This can be coupled with the overexploitation of biological resources, such as deforestation. Therefore, as a result of their land-intensive underlying supply production system, industries that manufacture textiles/leather, rubber, paper, wood products and tobacco products are responsible through their value chain for an important portion of current and future global habitat loss.

In terms of Vertically integrated results, the **spatial pressures** are typically greater for the Paper and wood products category than for other sectors.

Lastly, the manufacturing of Mineral and petroleum products, and especially the cement, lime and plaster industry, contributes the most to **Climate change**. Indeed, the required burning of fossil fuels causes this industry to have significant CO_2 emissions.

RISKS AND OPPORTUNITIES

Because manufacturing is at the heart of modern economies, it accelerates with the ever-growing consumers' demands. However, the growth and activities of manufacturing industries are associated with biodiversity challenges, including point-source pollution from factories design, land use changes linked to manufacturing inputs, and the over-harvesting of biological resources.

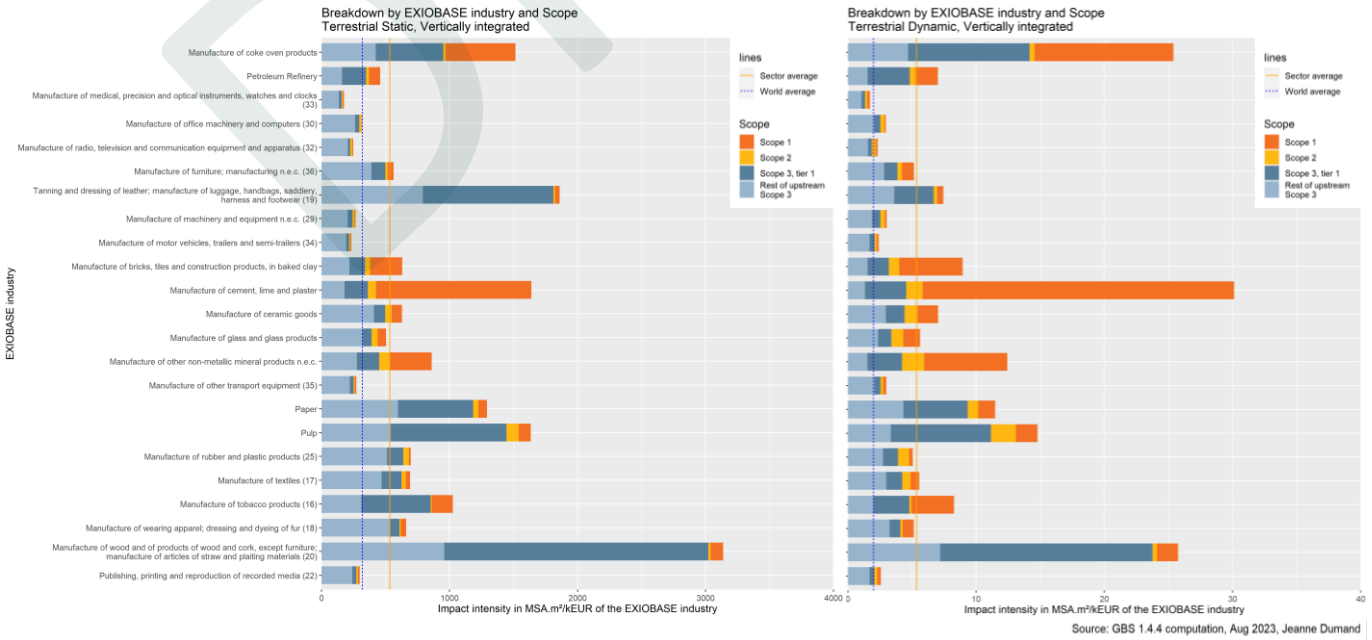
Even though biodiversity loss can occur over the whole manufacturing value chain, the most significant land use changes might occur at the level of raw material producers. To alleviate pressures on biodiversity, manufacturers can therefore **engage with their suppliers or seek more responsible ones** (CBD 2018).

Additionally, some actions toward a more sustainable development of the manufacturing sectors could help reducing its significant greenhouse gases (GHG) emissions and mitigate the Climate change pressure. This could include **sustainably retrofitting the industries** with an increased resource-use efficiency, and a greater adoption of low-impact technologies and industrial processes.

SCOPE AND INDUSTRY BREAKDOWN

Here is presented the breakdown of the terrestrial static and dynamic impacts by Scope and EXIOBASE industry. The results are in MSA.m²/kEUR of turnover *i.e.,* for each industry the impact is divided by the turnover of the corresponding industry, allowing the industries to position themselves compared to one another. The Climate change pressure is included in both static and dynamic results graphs in this factsheet. Please note that while the static results are also presented without the Climate change pressure in the annex (which has more uncertainties), there is a specific focus on the static impacts of Climate change.

For most industries, **the great majority of the static and dynamic impacts occurs within the upstream Scope 3**. Indeed, the manufacturing sector comes downstream of high-impact industries such as the raw materials extraction and agriculture sectors. For more information on the Raw materials extraction and the Agriculture and agrifood's impacts, please check the corresponding factsheets. The Manufacture of wood and of products of wood and cork industry has the most significant static impacts, mostly due to Land use (forestry activities). Nevertheless, there are also **significant dynamic and static impacts occurring within Scope 1**. This is especially the case for mineral manufacturing industries. Among them, the Manufacture of cement, lime and plaster industry has the highest Scope 1 impact of the benchmark sector, mostly due to GHG emissions.

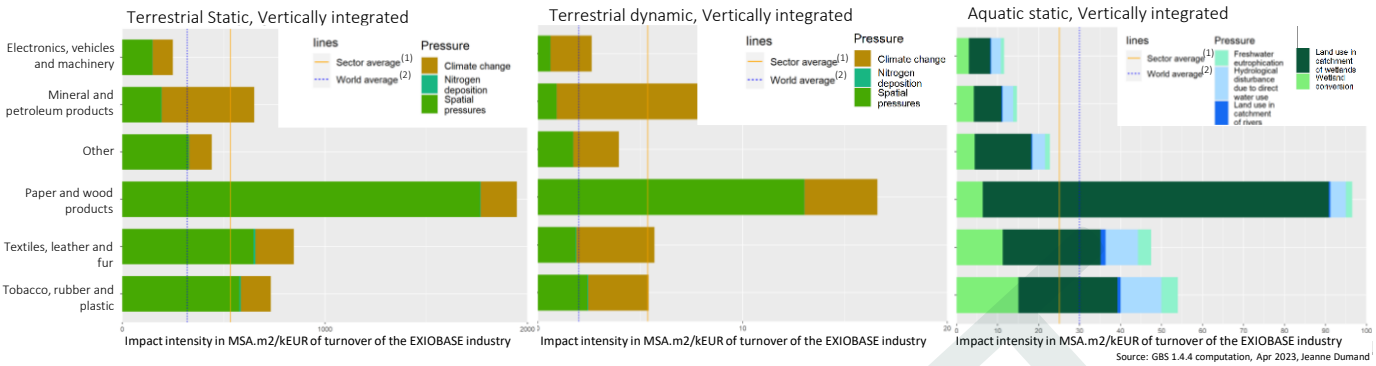


(1) Water related services are "Surface water", "Ground water" and "Water flow maintenance". Please find the ENCORE definitions of each ecosystem services in the factsheet reading guide.

(2) Sector average is an average of the Scope 1 impacts of all EXIOBASE industries of the benchmark sector weighted by the turnover of each industry.

(3) World average is an overall average of the Scope 1 impacts of all EXIOBASE industries for all regions of the world weighted by the turnover of each industry / region couple.

IMPACT DRIVERS BREAKDOWN



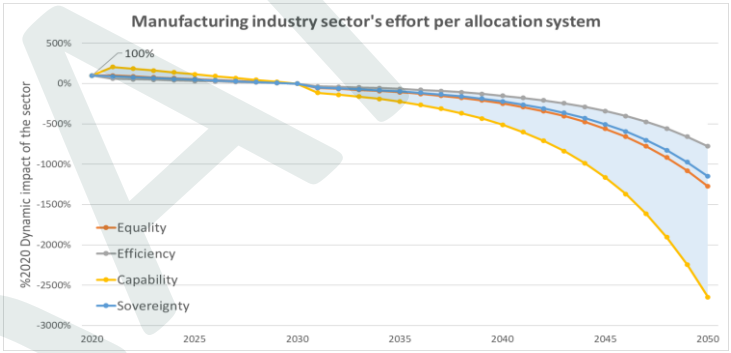
Spatial pressures are the main drivers of Paper and wood products' dynamic and static impacts. Indeed, forestry activities (plantations and forest used for production) are land-intensive. However, Climate change is the main dynamic pressure for the other manufacturing categories. The Climate change pressure is particularly high for the Mineral and petroleum products category, as their transformation processes require a lot of energy and encompasse chemical reactions that release greenhouse gases.

The aquatic impacts are mostly due to Pollution (related to Land use in catchment of wetlands) and Land use (via Wetland conversion).Nevertheless, the other pressures (Freshwater eutrophication, Hydrological disturbance due to direct water use, and Land use in catchment of rivers) are significant as well for many categories of the manufacturing sector. For instance, the Textiles, leather and fur industries are responsible for important flow deviation from natural runoff during the transformation processes, such as washing and tanning (Ulya, Arifuddin, et Hidayat 2021).

TRAJECTORIES TO ACHIEVE INTERNATIONAL TARGETS

The post-2020 Global Biodiversity Framework (GBF) aims to reach at least a global no net loss of biodiversity in 2030 (interpreted as a global dynamic impact of 0 in 2030) and restore biodiversity between 2030 and 2050 (interpreted here as return to the "zone of functional integrity of the Earth system" by 2050). This global budget needs to be allocated to economic sectors and companies. Different allocation approaches (listed below) can be used to allocate efforts: these methods lead to different sectoral trajectories.

ALLOCATION	APPROACH	DATA USED
Equality	Everyone has the same right	Number of employees in the sectors (2010)
Efficiency	Cost-effectiveness	Restoration cost (EUR/[MSA.m²])
Capability	Industries' ability to pay	Turnover (MEUR) (2011)
Sovereignty	Grandfathering(3)	2020 dynamic impact (MSA.km²/year)



The Manufacturing sector is **one of the sectors that must achieve the greatest efforts to meet the objectives** of the post-2020 Global Biodiversity Framework. Indeed, the Manufacturing industry sector has one of the highest turnovers, a large number of employees, and relatively low restauration costs in comparison to other sectors.
Please note that the Sovereignty method uses Scope 1 dynamic impacts, therefore it might not reflect the significant dynamic impacts that the Manufacturing sector makes along its value chain.

POSSIBLE ACTIONS TO REDUCE THE SECTOR'S IMPACT ON BIODIVERSITY(4)

SCOPE 1	Operations and production: • Process optimization (*i.e.*, cement manufacturing process improvement) • Product eco-design and technology improvement for efficiency, recycling and emission reduction (CBD 2018) • Substitute hazardous chemicals with less hazardous ones (Aiama et al. 2016) • Apply the mitigation hierarchy (avoid, reduce, restore, offset) to all impacts from manufacturing activities (Aiama et al. 2016)
SCOPE 2	• Alternative, low-impact, or renewable energy sources adoption • Energy-efficiency improvement
UPSTREAM SCOPE 3	Raw material supply: • Use of low-impact, sustainable raw materials sourcing (*i.e.*, extensive and sustainable practices for biomass-based materials such as cotton, tobacco, rubber and wood) • Move to deforestation-free supply chains for the wood industries (Paper and wood products) (Aiama et al. 2016) • Engaging suppliers to act towards biodiversity, deepen engagement with the value chain (CBD 2018) • Increase use of recycled raw materials Water resources: • Adopt a sustainable water management (Aiama et al. 2016)

(1) Sector average is an average of the Scope 1 impacts of all EXIOBASE industries of the benchmark sector weighted by the turnover of each industry.
(2) World average is an overall average of the Scope 1 impacts of all EXIOBASE industries for all regions of the world weighted by the turnover of each industry / region couple.
(3) The grandfathering approach means that the obligations of industries (or companies) are based on their historic impacts, here their 2020 biodiversity dynamic impact.
(4) More information can be found in the annex to distinguish between transversal actions and actions which can be more industry-specific.

ENVIRONMENTAL SAFEGUARDS

Some impacts and pressures are not covered by the figures displayed in this benchmark factsheet (partly due to limitations in the Global Biodiversity Score tool used to obtain them). The technical annex provides a more detailed description of the uncertainties and limitations of the results. They should not be ignored when defining the biodiversity action plan.

- **Avoid locating activities on or near sites of high environmental value** or establish a specific management plan. For instance, avoid deforestation and encroachment on protected areas.
- **Restore habitats** during operations and/or after operations (IFC 2012).
- Conduct a **systematic review** to identify priority ecosystem services, meaning those on which project operations are most likely to have an impact and those on which the project is directly dependent (e.g., water) (IFC 2012).

Moreover, of the three components of biodiversity, the GBS only focuses on the ecosystem diversity, and does not cover species or genetic diversity.

See the GBS review report "Quality assurance" for the full list of environmental safeguards to implement (CDC Biodiversité 2020; IFC 2012).

The **EU Taxonomy Climate Delegated Act**, published in the official journal in December 2021, describes conditions for activities to make a substantial contribution to the climate objectives. Some economic activities related to the manufacturing sector are included in the taxonomy. Here are some examples of technical screening criteria for industries of the sector:

Manufacture of cement:
- Grey cement clinker where the specific GHG emissions are lower than 0,722 tCO_2e per tonne of grey cement clinker.
- Cement from grey clinker or alternative hydraulic binder, where the specific GHG emissions from the clinker and cement or alternative binder production are lower than 0,469 tCO_2e per tonne of cement or alternative binder manufactured.

Manufacture of low carbon technologies for transport:
- Trains, passenger coaches and wagons that have zero direct (tailpipe) CO_2 emissions.

Technical screening criteria for a substantial contribution to climate change mitigation, extracts from the Delegated Act on climate objectives (Official Journal of the European Union 2021) are presented in the annex.

BIODIVERSITY FOOTPRINT ASSESSMENT

GENERAL OBJECTIVES OF A GBS-BASED ASSESSMENT

The factsheet helps companies of each sector to understand their most material impacts. However, a Biodiversity Footprint Assessment is more company-specific and allows to calculate the companies' impacts on biodiversity. Indeed, a GBS-based assessment uses companies' data (emissions, land use or other pressures, raw materials and products purchased and produced by the companies) to calculate biodiversity impacts.

Thus, a GBS-based Biodiversity Footprint Assessment allows to:

- **Quantitatively assess the biodiversity footprint** generated by the activity of the company or by its investment portfolio and to **assess the contribution of the company to global biodiversity erosion**;
- Understand which impacts drivers on biodiversity the company contributes to
- Provide elements for a **short-term** and a **mid-term action plan to reduce the footprint** on biodiversity.
- **Comply with existing and anticipate future mandatory biodiversity footprint and dependency disclosure** in France (action 30 of the French National Biodiversity Plan), in the European Union (CSDR), and in the world (Global Biodiversity Framework).

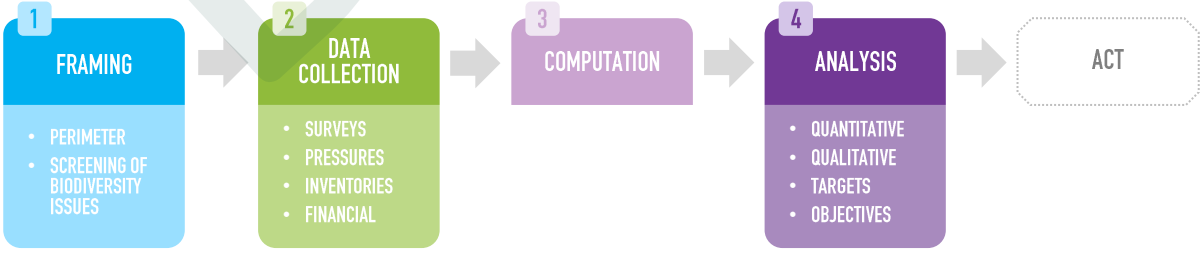
Limitations: The assessment does not consider some pollution impact drivers nor the existence and impacts of invasive species, the impacts on genetic and marine biodiversity.

HOW TO LEAD A BIODIVERSITY FOOTPRINT ASSESSMENT BASED ON THE GLOBAL BIODIVERSITY SCORE?

A GBS-based assessment can be led by **various organisms**:
- The company itself, after being trained to use the GBS
- CDC Biodiversité or external GBS-trained assessors (list available here), instructed by the company
- A GBS-trained non-financial rating agency

A Biodiversity Footprint Assessment follows **4 main steps**, as shown below:
- The **framing** step validates the scope of the assessment, particularly in terms of **Scopes and assessed pressures**.
- During the **data collection** step, the **methodological choices** are validated: assumptions applied, proxies used, possible limits identified
- The **computation** uses the refined analysis and the pressure-impact relationships of the GBS tool to compute impacts.
- The **analysis** step explains the results obtained with the GBS by **identifying major impacts** as well as the **main sources of these impacts**. It is also an opportunity to identify objectives and **impact reduction actions, aligned with international recommendations**.

The **relevance** of the assessment depends on:
- The inclusion of direct operations and value chain impacts
- The consistency and transparency of the data and methodology used
- The appropriate quality assurance and complete disclosure of the results



Manufacturing industry factsheet version 1.0, April 2023. GBS computations: GBS 1.4.4, April 2023, Jeanne Dumand.

More information
About the GBS: https://www.cdc-biodiversite.fr/le-global-biodiversity-score/
About the factsheets: https://www.cdc-biodiversite.fr/documentation-gbs/
Measuring the contributions of business and finance towards the post-2020 global biodiversity framework (CDC Biodiversité, 2020)
Establishing an ecosystem of stakeholders to measure the biodiversity performance of human activities (CDC Biodiversité, 2021)
The sources are referenced in the section "Manufacturing industry" of the technical annex.