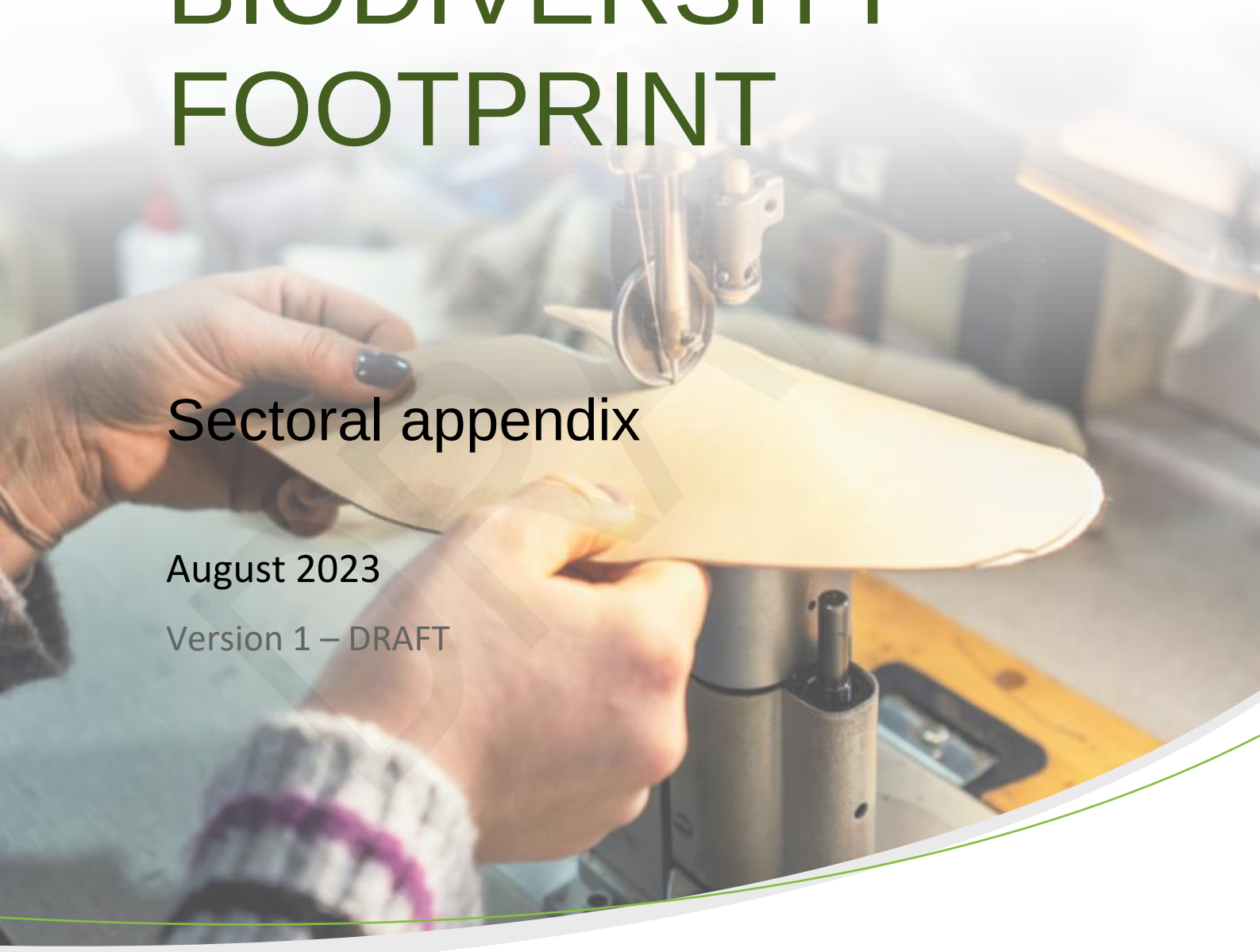
GLOBAL BIODIVERSITY SCORE

MANUFACTURING BIODIVERSITY FOOTPRINT



Sectoral appendix

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Version 1 – DRAFT

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A. PURPOSE OF THE DOCUMENT

The current **sectoral appendix** supports the **Manufacturing benchmark factsheet** and provides additional content that could not be included in the factsheet due to space constraints. Such additional content relates to the perimeter of the factsheet, more detailed results and charts and specific methodology and references.

In addition to the sectoral appendix, this factsheet is supplemented by two documents, common to all the factsheets:

- A **general appendix**, which provides methodological elements to understand how the sectoral benchmark factsheets are built and how computations and charts are obtained. It includes all the methodology and references which are common to all the factsheets, as well as guidance on how to read and use the factsheets.

- A **reading guide**, which explains the structure of the factsheets. It provides the main contents, definitions and necessary elements to know how to read the factsheets for readers with limited knowledge about the Global Biodiversity Score.

Figure 1 below encapsulates the four benchmark documents available for each sector.

Figure 1: The four benchmark documents.

B. WHAT DOES THE SECTOR INCLUDE?

Manufacturing includes the transformation (physical or chemical) of raw materials, substances, or components into new products (EUROSTAT 2008). The output of a manufacturing process can be finished and ready for use or semi-finished as an input for further manufacturing.

The manufacturing sector generates biodiversity impacts that vary across the different manufacturing industries. Similarly, its dependencies to biodiversity vary depending on specific activities. Those impacts and dependencies

are both coming from direct operations (*e.g.*, factory location and its direct pollution) and the upstream value chain (*i.e.*, through the supply chain), and are screened in this annex and the corresponding factsheet.

1. Perimeter of the factsheet in terms of impact calculation

The factsheet covers the Manufacturing sector that includes sixteen EXIOBASE industry **groups** (in bold) and xx EXIOBASE **industries** (displayed below each group):

- **Manufacture of tobacco products**
  i16 - Manufacture of tobacco products (16)
- **Manufacture of textiles**
  i17 - Manufacture of textiles (17)
- **Manufacture of wearing apparel**
  i18 - Manufacture of wearing apparel; dressing and dyeing of fur (18)
- **Manufacture of leather and related products**
  i19 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear (19)
- **Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials**
  i20 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (20)
- **Manufacture of paper and paper products**
  i21.1 - Pulp
  i21.2 - Paper
- **Printing and reproduction of recorded media**
  i22 - Publishing, printing and reproduction of recorded media (22)
- **Manufacture of coke and refined petroleum products**
  i23.1 - Manufacture of coke oven products
  i23.2 - Petroleum Refinery
- **Manufacture of rubber and plastic products**
  i25 - Manufacture of rubber and plastic products (25)
- **Manufacture of other non-metallic mineral products**
  i26.a - Manufacture of glass and glass products
  i26.b - Manufacture of ceramic goods
  i26.c - Manufacture of bricks, tiles and construction products, in baked clay
  i26.d - Manufacture of cement, lime and plaster
  i26.e - Manufacture of other non-metallic mineral products n.e.c.
- **Manufacture of machinery and equipment n.e.c.**
  i29 - Manufacture of machinery and equipment n.e.c. (29)
- **Manufacture of computer, electronic and optical products**
  i30 - Manufacture of office machinery and computers (30)
  i33 - Manufacture of medical, precision and optical instruments, watches and clocks (33)
- **Manufacture of electrical equipment**
  i32 - Manufacture of radio, television and communication equipment and apparatus (32)
- **Manufacture of motor vehicles, trailers and semi-trailers**
  i34 - Manufacture of motor vehicles, trailers and semi-trailers (34)
- **Manufacture of other transport equipment**

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i35 - Manufacture of other transport equipment (35)

- **Manufacture of furniture**
  I36 - Manufacture of furniture; manufacturing n.e.c. (36)

These EXIOBASE industry groups are consistent with the divisions from the NACE rev 2 classification section C "Manufacturing" (EUROSTAT 2008).
The NACE section C "Manufacturing" includes:

- The transformation of raw materials
- The assembly of components parts of manufactured products
- Manufacturing processes leading to finished (ready for utilisation) and semi-finished (an input for further manufacturing) outputs
- The manufacture of new final products even if waste is an input in these processes
- The installation and repair of machinery and equipment

However, the transformation of waste into secondary raw materials (as opposed to new final products) is not included in section C "Manufacturing", as the treatment or processing of waste is considered to be the primary purpose of these processes. They are classified in the NACE section E "water supply ; sewerage, waste management and remediation activities", and will be tackled in the benchmark factsheet "Waste and waste management".

The entire section C is covered, except for the divisions included in other benchmark factsheets: division 10 "Manufacture of food products" and division 11 "Manufacture of beverages", addressed in the Agriculture and Agrifood benchmark, division 20 "Manufacture of chemicals and chemical products" and division 21 "Manufacture of basic pharmaceutical products and pharmaceutical preparations", addressed in the Chemical benchmark, division 24 "Manufacture of basic metals" and division 25 "Manufacture of fabricated metal products, except machinery and equipment", addressed in the Manufacture of basic and fabricated metals benchmark.

The NACE division 27 "Manufacture of electrical equipment" will also be tackled in the future benchmark factsheet Electrical equipment and is therefore not included in this Manufacturing benchmark factsheet. The NACE divisions and EXIOBASE industry groups follow a very similar classification, and the correspondences are usually transparent. However, there is a difference between the NACE division 27 "Manufacture of electrical equipment" and the EXIOBASE industry group with the same name "Manufacture of electrical equipment". Indeed, one of the industries from the EXIOBASE industry group "Manufacture of electrical equipment": "Manufacture of radio, television and communication equipment and apparatus" is not included in the NACE division "Manufacture of electrical equipment" but in the NACE divisions "Manufacture of computer, electronic and optical products" as can be seen in Figure 2. For the purpose of this benchmark factsheet, the EXIOBASE classification will be followed. A more comprehensive description of the relevant NACE sections with a detailed listing of the economic activities included and excluded is provided in section 3. NACE rev 2 (EUROSTAT 2008).

Figure 2 shows the correspondence between the EXIOBASE industries covered by the benchmark factsheet and the NACE divisions.

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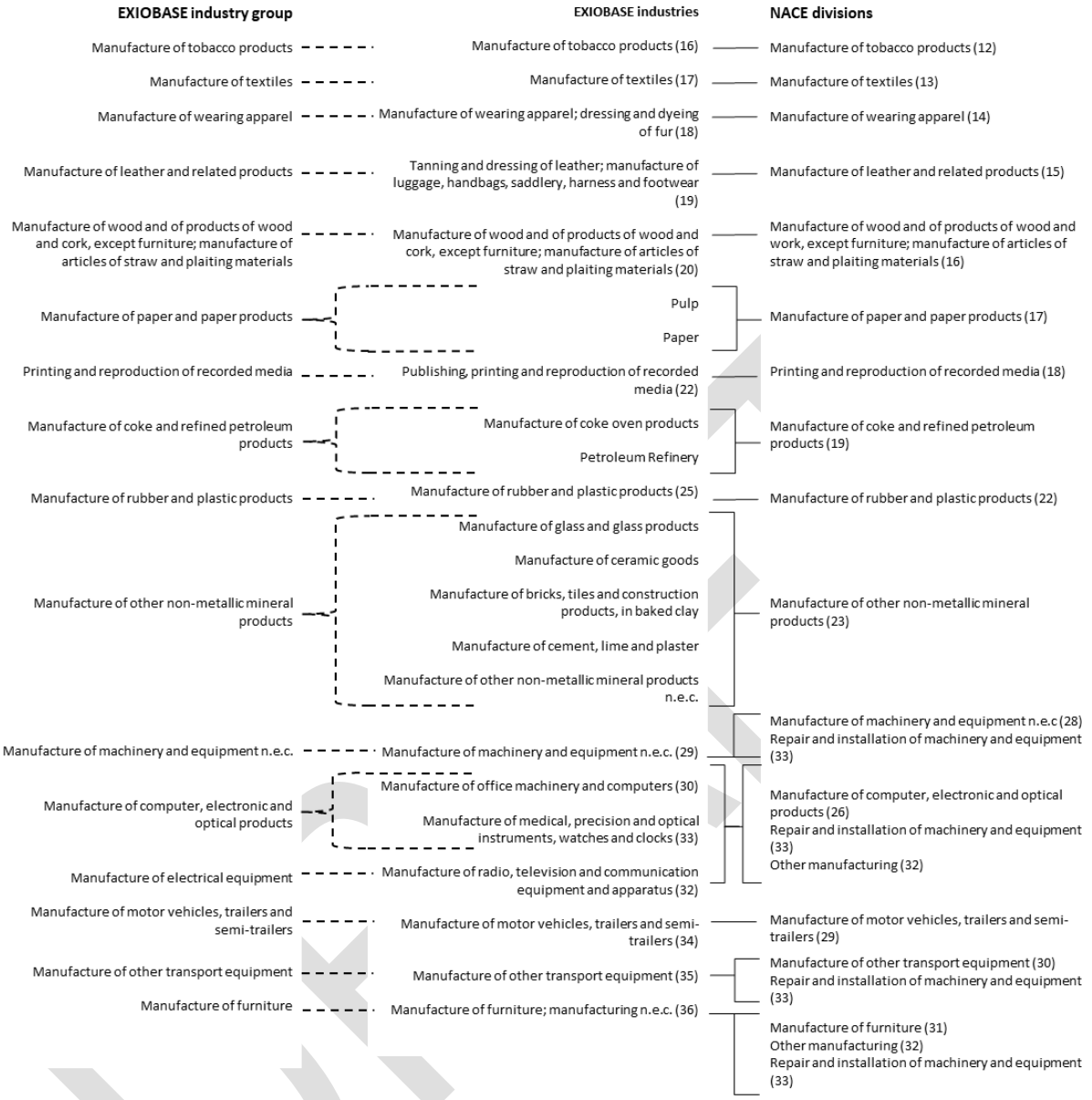

Figure 2: Correspondence between EXIOBASE and NACE rev 2 for the Manufacturing benchmark factsheet

The perimeter of this manufacturing benchmark factsheet encompasses the chemical or physical transformation of materials, substances, or components into new products. These materials, substances, or components can come from raw materials produced by agriculture, fishing, forestry, quarrying and mining, but they can as well be outputs from other manufacturing activities. The extraction of raw materials, such as coal, petroleum, or natural gas are attributed to NACE's section B "Mining and quarrying" and are tackled as Scope 1 impacts in the benchmark factsheet "Raw materials extraction". Forestry is also covered in the Scope 1 of the benchmark factsheet "Raw materials extraction". The impacts of the extraction are thus considered in the Upstream Scope 3 impacts of this Manufacturing factsheet. In the same way, the cultivation of biomass constitutes the Scope 1 of the benchmark factsheet "Agriculture and agrifood" and is here considered in the Upstream Scope 3 impacts as well.

Please note that this factsheet uses GBS version 1.4.4. The previous factsheets used older versions of the GBS, thus results might differ.

Most results in the factsheet are expressed in MSA.m²/kEUR of turnover. The impacts are indeed divided by the turnover of the EXIOBASE industries (the associated unit is therefore the *MSA.m²/kEUR of the EXIOBASE industry*) or by the turnover of a group of industries (expressed in *MSA.m²/kEUR*). Table 1 shows the distribution of the industries' turnover included in the Manufacturing factsheet. Please note that version 1.4.4 of the GBS uses 2011 turnover data.

Table 1: Turnover of the EXIOBASE industries included in the Manufacturing benchmark factsheet (data obtained from GBS 1.4.4 and therefore from EXIOBASE 3.8.1)

EXIOBASE industry	Turnover (MEUR)	Share of the EXIOBASE industry in the benchmark perimeter
Manufacture of machinery and equipment n.e.c. (29)	2 900 000	15 %
Manufacture of motor vehicles, trailers and semi-trailers (34)	2 800 000	14 %
Petroleum Refinery	2 000 000	11 %
Manufacture of radio, television and communication equipment and apparatus (32)	1 500 000	7.8 %
Manufacture of rubber and plastic products (25)	1 400 000	7.1 %
Manufacture of furniture; manufacturing n.e.c. (36)	1 000 000	5.4 %
Manufacture of textiles (17)	1 000 000	5.3 %
Manufacture of other transport equipment (35)	950 000	4.9 %
Publishing, printing and reproduction of recorded media (22)	890 000	4.6 %
Manufacture of medical, precision and optical instruments, watches a nd clocks (33)	730 000	3.8 %
Paper	670 000	3.5 %
Manufacture of office machinery and computers (30)	660 000	3.4 %
Manufacture of wearing apparel; dressing and dyeing of fur (18)	610 000	3.2 %
Manufacture of wood and of products of wood and cork, except furni ture; manufacture of articles of straw and plaiting materials (20)	390 000	2.0 %
Manufacture of cement, lime and plaster	320 000	1.7 %
Manufacture of glass and glass products	290 000	1.5 %
Manufacture of other non-metallic mineral products n.e.c.	290 000	1.5 %
Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear (19)	270 000	1.4 %
Manufacture of ceramic goods	250 000	1.3 %
Manufacture of tobacco products (16)	170 000	0.9 %
Manufacture of coke oven products	75 000	0.4 %
Pulp	65 000	0.3 %
Manufacture of bricks, tiles and construction products, in baked clay	35 000	0.2 %
Total		**100%**

The Manufacturing sector includes many different industries, not leading to the same type of impacts on the biodiversity and not occurring at the same spatial scale. Therefore, and for ease of analysis, it was decided that the results will be presented by breaking them down into six main manufacturing categories created for the purpose of this benchmark study:

- *Manufacture of textiles, leather and fur*, which gathers the EXIOBASE industry groups "Manufacture of textiles", "Manufacture of wearing apparel" and "Manufacture of leather and related products"

- *Manufacture of paper and wood products except furniture*, which gathers "Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials" and "Manufacture of paper and paper products"

- *Manufacture of mineral and petroleum products,* which gathers “Manufacture of coke and refined petroleum products”, and “Manufacture of other non-metallic mineral products”

- *Manufacture of electronics, vehicles and machinery* which gathers “Manufacture of computer, electronic and optical products”, “Manufacture of motor vehicles, trailers and semi-trailers”, “Manufacture of other transport equipment”, “Manufacture of machinery and equipment n.e.c” and “Manufacture of electrical equipment”

- *Manufacture of tobacco, rubber and plastics* which gathers “Manufacture of tobacco products”, and “Manufacture of rubber and plastic products”

- *Other manufacturing* which gathers “Printing and reproduction of recorded media”, and “Manufacture of furniture”.

Please note that the category “Other manufacturing” does not include manufacturing processes linked to agrifood, chemicals, or metals, as mentioned previously. It includes exclusively the two processes “Printing and reproduction of recorded media” and “Manufacture of furniture”.

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Figure 3: EXIOBASE industry grouping into categories

Figure 4 below summarizes the perimeter of the benchmark factsheet.

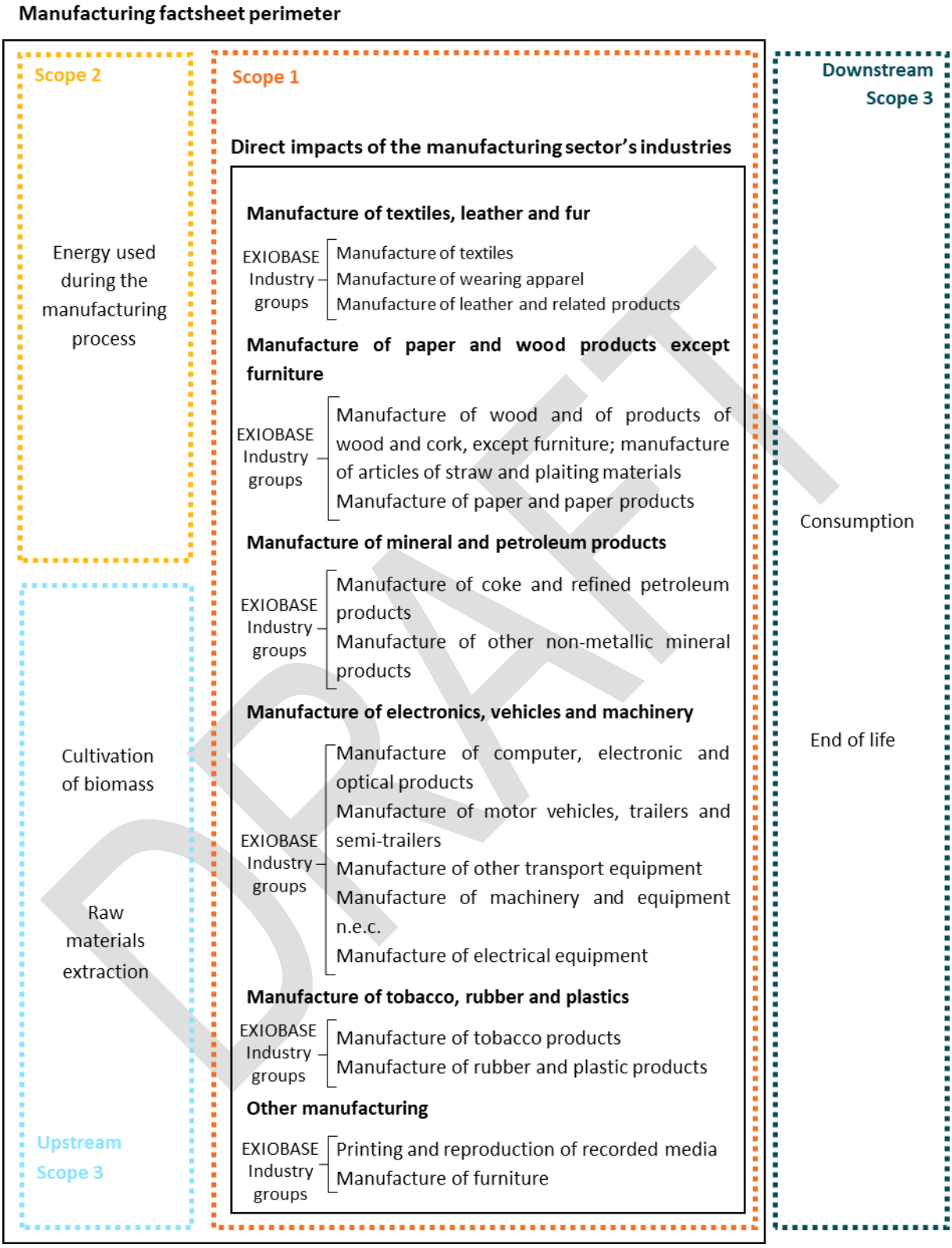

Figure 4: Perimeter of the Manufacturing benchmark factsheet and associated Scopes

2. Perimeter of the factsheet for the dependencies analysis

To understand the dependencies of the manufacturing sector, a correspondence of EXIOBASE and ENCORE is necessary. Figure 5 below illustrates the correspondence between the EXIOBASE industries and the ENCORE sub-industries for the Manufacturing sector.

Please note that the pulp and the manufacture of ceramic goods industries are not addressed by ENCORE, thus they do not appear in the correspondence below.

Figure 5: Correspondence between EXIOBASE and ENCORE for the Manufacturing benchmark factsheet

3. NACE rev 2 (EUROSTAT 2008)

This section contains extracts from the NACE rev 2 classification (EUROSTAT 2008) and details the sectors covered by the Manufacturing benchmark factsheet.

Section C - Manufacturing

Manufacture of tobacco products **(12)**

This division includes the processing of an agricultural product, tobacco, into a form suitable for final consumption.

Manufacture of tobacco products **(12.0)**

Manufacture of tobacco products **(12.00)**

This class includes:

- manufacture of tobacco products and products of tobacco substitutes: cigarettes, fine cut tobacco, cigars, pipe tobacco, chewing tobacco, snuff
- manufacture of "homogenised" or "reconstituted" tobacco

This class also includes:

- stemming and redrying of tobacco

This class excludes:

- growing or preliminary processing of tobacco, see 01.15, 01.63

Manufacture of textiles **(13)**

This division includes preparation and spinning of textile fibres as well as textile weaving, finishing of textiles and wearing apparel, manufacture of made-up textile articles, except apparel (e.g. household linen, blankets, rugs, cordage etc.). Growing of natural fibres is covered under division 01, while manufacture of synthetic fibres is a chemical process classified in class 20.60. Manufacture of wearing apparel is covered in division 14.

Preparation and spinning of textile fibres (13.1)

Preparation and spinning of textile fibres (13.10)

This class includes preparatory operations on textile fibres and the spinning of textile fibres. This can be done from varying raw materials, such as silk, wool, other animal, vegetable or man-made fibres, paper or glass etc.

This class includes:

- preparatory operations on textile fibres:
  - reeling and washing of silk
  - degreasing and carbonising of wool and dyeing of wool fleece
  - carding and combing of all kinds of animal, vegetable and man-made fibres
- spinning and manufacture of yarn or thread for weaving or sewing, for the trade or for further processing :
  - scutching of flax
  - texturising, twisting, folding, cabling and dipping of synthetic or artificial filament yarns

This class also includes:

- manufacture of paper yarn

This class excludes:

- preparatory operations carried out in combination with agriculture, see division 01
- retting of plants bearing vegetable textile fibres (jute, flax, coir etc.), see 01.16
- cotton ginning, see 01.63
- manufacture of synthetic or artificial fibres and tows, manufacture of single yarns (including high-tenacity yarn and yarn for carpets) of synthetic or artificial fibres, see 20.60
- manufacture of glass fibres, see 23.14

Weaving of textiles (13.2)

Weaving of textiles (13.20)

This class includes weaving of textiles. This can be done from varying raw materials, such as silk, wool, other animal, vegetable or man-made fibres, paper or glass etc.

This class includes:

- manufacture of broad woven cotton-type, woollen-type, worsted-type or silk-type fabrics, including from mixtures or artificial or synthetic yarns (polypropylene etc.)

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- manufacture of other broad woven fabrics, using flax, ramie, hemp, jute, bast fibres and special yarns

This class also includes:
- manufacture of woven pile or chenille fabrics, terry towelling, gauze etc.
- manufacture of woven fabrics of glass fibres
- manufacture of woven carbon and aramid threads - manufacture of imitation fur by weaving

This class excludes:
- manufacture of knitted and crocheted fabrics, see 13.91
- manufacture of textile floor coverings, see 13.93
- manufacture of non-woven fabrics, see 13.95
- manufacture of narrow fabrics, see 13.96
- manufacture of felts, see 13.99

Finishing of textiles (13.3)

Finishing of textiles (13.30)

This class includes finishing of textiles and wearing apparel, i.e. bleaching, dyeing, dressing and similar activities.

This class includes:
- bleaching and dyeing of textile fibres, yarns, fabrics and textile articles, including wearing apparel
- dressing, drying, steaming, shrinking, mending, sanforising, mercerising of textiles and textile articles, including wearing apparel

This class also includes:
- bleaching of jeans
- pleating and similar work on textiles
- waterproofing, coating, rubberising, or impregnating purchased garments
- silk-screen printing on textiles and wearing apparel

This class excludes:
- manufacture of textile fabric impregnated, coated, covered or laminated with rubber, where rubber is the chief constituent, see 22.19

Manufacture of other textiles (13.9)

This group includes the manufacture of products produced from textiles, except wearing apparel, such as made-up textile articles, carpets and rugs, rope, narrow woven fabrics, trimmings etc.

Manufacture of knitted and crocheted fabrics(13.91)

This class includes:
- manufacture and processing of knitted or crocheted fabrics:
- pile and terry fabrics
- net and window furnishing type fabrics knitted on Raschel or similar machines
- other knitted or crocheted fabrics

This class also includes:
- manufacture of imitation fur by knitting

This class excludes:
- manufacture of net and window furnishing type fabrics of lace knitted on Raschel or similar machines, see 13.99
- manufacture of knitted and crocheted apparel, see 14.39

Manufacture of made-up textile articles, except apparel (13.92)

This class includes:
- manufacture, of made-up articles of any textile material, including of knitted or crocheted fabrics:
    - blankets, including travelling rugs
    - bed, table, toilet or kitchen linen
    - quilts, eiderdowns, cushions, pouffes, pillows, sleeping bags etc.
- manufacture of made-up furnishing articles:
    - curtains, valances, blinds, bedspreads, furniture or machine covers etc.
    - tarpaulins, tents, camping goods, sails, sunblinds, loose covers for cars, machines or furniture etc.
    - flags, banners, pennants etc.

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- dust cloths, dishcloths and similar articles, life jackets, parachutes etc.

This class also includes:
- manufacture of the textile part of electric blankets
- manufacture of hand-woven tapestries

This class excludes:
- manufacture of textile articles for technical use, see 13.96

Manufacture of carpets and rug (13.93)

This class includes:
manufacture of textile floor coverings:

- carpets, rugs and mats, tiles

This class also includes:
- manufacture of needle-loom felt floor coverings

This class excludes:
- manufacture of mats and matting of plaiting materials, see 16.29
- manufacture of floor coverings of cork, see 16.29
- manufacture of resilient floor coverings, such as vinyl, linoleum, see 22.23

Manufacture of cordage, rope, twine, and netting (13.94)

This class includes:
- manufacture of twine, cordage, rope and cables of textile fibres or strip or the like, whether or not impregnated,
- coated, covered or sheathed with rubber or plastics
- manufacture of knotted netting of twine, cordage or rope
- manufacture of products of rope or netting: fishing nets, ships' fenders, unloading cushions, loading slings,
- rope or cable fitted with metal rings etc.

This class excludes:
- manufacture of hairnets, see 14.19
- manufacture of wire rope, see 25.93
- manufacture of landing nets for sports fishing, see 32.30

Manufacture of non-wovens and articles made from non-wovens, except apparel (13.95)

This class includes all activities related to the manufacture of textiles or textile products, not specified elsewhere in division 13 or 14, involving a large number of processes and a great variety of goods produced

Manufacture of other technical and industrial textiles (13.96)

This class includes:
- manufacture of narrow woven fabrics, including fabrics consisting of warp without weft assembled by means of
- an adhesive
- manufacture of labels, badges etc.
- manufacture of ornamental trimmings: braids, tassels, pompons etc.
- manufacture of fabrics impregnated, coated, covered or laminated with plastics
- manufacture of metallised yarn or metallised gimped yarn, rubber thread and cord covered with textile material, textile yarn or strip covered, impregnated, coated or sheathed with rubber or plastics
- manufacture of tyre cord fabric of high-tenacity man-made yarn
- manufacture of other treated or coated fabrics: buckram and similar stiffened textile fabrics, fabrics coated with
- gum or amylaceous substances
- manufacture of diverse textile articles: textile wicks, incandescent gas mantles and tubular gas
- manufacture of mantle fabric, hosepiping, transmission or conveyor belts or belting (whether or not reinforced
- with metal or other material), bolting cloth, straining cloth
- manufacture of automotive trimmings
- manufacture of artists' canvas boards and tracing cloth

This class excludes:

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- manufacture of transmission or conveyor belts of textile fabric, yarn or cord impregnated, coated, covered or
- laminated with rubber, where rubber is the chief constituent, see 22.19
- manufacture of plates or sheets of cellular rubber or plastic combined with textiles for reinforcing purposes
- only, see 22.19, 22.21
- manufacture of cloth of woven metal wire, see 25.93

Manufacture of other textiles n.e.c. (13.99)

This class includes:

- manufacture of felt
- manufacture of tulles and other net fabrics, and of lace and embroidery, in the piece, in strips or in motifs
- manufacture of pressure sensitive cloth-tape
- manufacture of shoe-lace, of textiles
- manufacture of powder puffs and mitts

This class excludes:

- manufacture of needle-loom felt floor coverings, see 13.93
- manufacture of textile wadding and articles of wadding: sanitary towels, tampons etc., see 17.22

Manufacture of wearing apparel **(14)**

This division includes all tailoring (ready-to-wear or made-to-measure), in all materials (e.g. leather, fabric, knitted and crocheted fabrics etc.), of all items of clothing (e.g. outerwear, underwear for men, women or children; work, city or casual
clothing etc.) and accessories. There is no distinction made between clothing for adults and clothing for children, or between modern and traditional clothing.
Division 14 also includes the fur industry (fur skins and wearing apparel).

Manufacture of wearing apparel, except fur apparel (14.1)

This group includes manufacture of wearing apparel. The material used may be of any kind and may be coated, impregnated or rubberised.

Manufacture of leather clothes (14.11)

- This class includes:
- manufacture of wearing apparel made of leather or composition leather including leather industrial work
- accessories as welder's leather aprons

This class excludes:

- manufacture of fur wearing apparel, see 14.20
- manufacture of leather sports gloves and sports headgear, see 32.30
- manufacture of fire-resistant and protective safety clothing, see 32.99

Manufacture of workwear (14.12)

This class excludes:

- manufacture of footwear, see 15.20
- manufacture of fire-resistant and protective safety clothing, see 32.99
- repair of wearing apparel, see 95.29

Manufacture of other outerwear (14.13)

This class includes:

- manufacture of other outerwear made of woven, knitted or crocheted fabric, non-wovens etc. for men, women and children:
    - coats, suits, ensembles, jackets, trousers, skirts etc.

This class also includes:

- custom tailoring
- manufacture of parts of the products listed

This class excludes:

- manufacture of wearing apparel of fur skins (except headgear), see 14.20
- manufacture of wearing apparel of rubber or plastics not assembled by stitching but merely sealed together, see 22.19, 22.29
- manufacture of fire-resistant and protective safety clothing, see 32.99

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- repair of wearing apparel, see 95.29

Manufacture of underwear (14.14)

This class includes:

- manufacture of underwear and nightwear made of woven, knitted or crocheted fabric, lace etc. for men, women and children:
    - shirts, T-shirts, underpants, briefs, pyjamas, nightdresses, dressing gowns, blouses, slips, brassieres, corsets etc.

This class excludes:

- repair of wearing apparel, see 95.29

Manufacture of other wearing apparel and accessories (14.19)

This class includes:

- manufacture of babies' garments, tracksuits, ski suits, swimwear etc.
- manufacture of hats and caps
- manufacture of other clothing accessories: gloves, belts, shawls, ties, cravats, hairnets etc.

This class also includes:

- manufacture of headgear of fur skins
- manufacture of footwear of textile material without applied soles
- manufacture of parts of the products listed

This class excludes:

- manufacture of sports headgear, see 32.30
- manufacture of safety headgear (except sports headgear), see 32.99
- manufacture of fire-resistant and protective safety clothing, see 32.99
- repair of wearing apparel, see 95.29

Manufacture of articles of fur (14.2)

Manufacture of articles of fur (14.20)

This class includes:

- manufacture of articles made of fur skins:
    - fur wearing apparel and clothing accessories
    - assemblies of fur skins such as "dropped" fur skins, plates, mats, strips etc.
    - diverse articles of fur skins: rugs, unstuffed pouffes, industrial polishing cloths

This class excludes:

- production of raw fur skins, see 01.4, 01.70
- production of raw hides and skins, see 10.11
- manufacture of imitation furs (long-hair cloth obtained by weaving or knitting), see 13.20, 13.91
- manufacture of fur hats, see 14.19
- manufacture of apparel trimmed with fur, see 14.19
- dressing and dyeing of fur, see 15.11
- manufacture of boots or shoes containing fur parts, see 15.20

Manufacture of knitted and crocheted apparel (14.3)

Manufacture of knitted and crocheted hosiery (14.31)

This class includes:

- manufacture of hosiery, including socks, tights and pantyhose

Manufacture of other knitted and crocheted apparel (14.39)

This class includes:

- manufacture of knitted or crocheted wearing apparel and other made-up articles directly into shape: pullovers, cardigans, jerseys, waistcoats and similar articles

This class excludes:

- manufacture of knitted and crocheted fabrics, see 13.91
- manufacture of hosiery, see 14.31

Manufacture of leather and related products **(15)**

This division includes dressing and dyeing of fur and the transformation of hides into leather by tanning or curing and fabricating the leather into products for final consumption.
It also includes the manufacture of similar products from other materials (imitation leathers or leather substitutes), such as rubber footwear, textile luggage etc. The products made from leather substitutes are included here, since they

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are made in ways similar to those in which leather products are made (e.g. luggage) and are often produced in the same unit.

Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness; dressing and dyeing of fur (15.1)

This group includes the manufacture of leather and fur and products thereof.

Tanning and dressing of leather; dressing and dyeing of fur (15.11)

This class includes:

- tanning, dyeing and dressing of hides and skins
- manufacture of chamois dressed, parchment dressed, patent or metallised leathers
- manufacture of composition leather
- scraping, shearing, plucking, currying, tanning, bleaching and dyeing of fur skins and hides with the hair on

This class excludes:

- production of hides and skins as part of ranching, see 01.4
- production of hides and skins as part of slaughtering, see 10.11
- manufacture of leather apparel, see 14.11
- manufacture of imitation leather not based on natural leather, see 22.19, 22.29

Manufacture of luggage, handbags and the like, saddlery and harness (15.12)

This class includes:

- manufacture of luggage, handbags and the like, of leather, composition leather or any other material, such as
- plastic sheeting, textile materials, vulcanised fibre or paperboard, where the same technology is used as for leather
- manufacture of saddlery and harness
- manufacture of non-metallic watch bands (e.g. fabric, leather, plastic)
- manufacture of diverse articles of leather or composition leather: driving belts, packings etc.
- manufacture of shoe-lace, of leather
- manufacture of horse whips and riding crops

This class excludes:

- manufacture of leather wearing apparel, see 14.11
- manufacture of leather gloves and hats, see 14.19
- manufacture of footwear, see 15.20
- manufacture of saddles for bicycles, see 30.92
- manufacture of precious metal watch bands, see 32.12
- manufacture of non-precious metal watch bands, see 32.13
- manufacture of linemen's safety belts and other belts for occupational use, see 32.99

Manufacture of footwear (15.2)

Manufacture of footwear (15.20)

This class includes:

- manufacture of footwear for all purposes, of any material, by any process, including moulding (see below for exceptions)
- manufacture of leather parts of footwear: manufacture of uppers and parts of uppers, outer and inner soles, heels etc.
- manufacture of gaiters, leggings and similar articles

This class excludes:

- manufacture of footwear of textile material without applied soles, see 14.19
- manufacture of wooden shoe parts (e.g. heels and lasts), see 16.29
- manufacture of rubber boot and shoe heels and soles and other rubber footwear parts, see 22.19
- manufacture of plastic footwear parts, see 22.29
- manufacture of ski-boots, see 32.30
- manufacture of orthopaedic shoes, see 32.50

Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials **(16)**

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This division includes the manufacture of wood products, such as lumber, plywood, veneers, wood containers, wood flooring, wood trusses, and prefabricated wood buildings. The production processes include sawing, planing, shaping, laminating, and assembling of wood products starting from logs that are cut into bolts, or lumber that may then be cut further, or shaped by lathes or other shaping tools. The lumber or other transformed wood shapes may also be subsequently planed or smoothed, and assembled into finished products, such as wood containers.
With the exception of sawmilling, this division is subdivided mainly based on the specific products manufactured.
This division does not include the manufacture of furniture (31.0), or the installation of wooden fittings and the like (43.32, 43.33, 43.39).

Sawmilling and planing of wood (16.1)

Sawmilling and planing of wood (16.10)

This class includes:
- sawing, planing and machining of wood
- slicing, peeling or chipping logs
- manufacture of wooden railway sleepers
- manufacture of unassembled wooden flooring
- manufacture of wood wool, wood flour, chips, particles

This class also includes:
- drying of wood
- impregnation or chemical treatment of wood with preservatives or other materials

This class excludes:
- logging and production of wood in the rough, see 02.20
- manufacture of veneer sheets thin enough for use in plywood, boards and panels, see 16.21
- manufacture of shingles and shakes, beadings and mouldings, see 16.23
- manufacture of fire logs or pressed wood, see 16.29

Manufacture of products of wood, cork, straw and plaiting materials (16.2)

This group includes the manufacture of products of wood, cork, straw or plaiting materials, including basic shapes as well as assembled products.

Manufacture of veneer sheets and wood-based panels (16.21)

This class includes:
- manufacture of veneer sheets thin enough to be used for veneering, making plywood or other purposes:
  - smoothed, dyed, coated, impregnated, reinforced (with paper or fabric backing)
  - made in the form of motifs
- manufacture of plywood, veneer panels and similar laminated wood boards and sheets
- manufacture of oriented strand board (OSB) and other particle board
- manufacture of medium density fibreboard (MDF) and other fibreboard
- manufacture of densified wood
- manufacture of glue laminated wood, laminated veneer wood

Manufacture of assembled parquet floors (16.22)

This class includes:
- manufacture of wooden parquet floor blocks, strips etc., assembled into panels

This class excludes:
- manufacture of unassembled wooden floors, see 16.10

Manufacture of other builders' carpentry and joinery (16.23)

This class includes:
- manufacture of wooden goods intended to be used primarily in the construction industry:
  - beams, rafters, roof struts
  - glue-laminated and metal connected, prefabricated wooden roof trusses
  - doors, windows, shutters and their frames, whether or not containing metal fittings, such as hinges, locks etc.
  - stairs, railings
  - wooden beadings and mouldings, shingles and shakes
- manufacture of prefabricated buildings, or elements thereof, predominantly of wood, e.g. saunas
- manufacture of mobile homes
- manufacture of wood partitions (except free standing)

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This class excludes:
- manufacture of kitchen cabinets, bookcases, wardrobes etc., see 31.01, 31.02, 31.09
- manufacture of wood partitions, free standing, see 31.01, 31.02, 31.09

Manufacture of wooden containers (16.24)

This class includes:
- manufacture of packing cases, boxes, crates, drums and similar packings of wood
- manufacture of pallets, box pallets and other load boards of wood
- manufacture of barrels, vats, tubs and other coopers' products of wood
- manufacture of wooden cable-drums

This class excludes:
- manufacture of luggage, see 15.12
- manufacture of cases of plaiting material, see 16.29

Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials (16.29)

This class includes:
- manufacture of various wood products:
    - wooden handles and bodies for tools, brooms, brushes
    - wooden boot or shoe lasts and trees, clothes hangers
    - household utensils and kitchenware of wood
    - wooden statuettes and ornaments, wood marquetry, inlaid wood
    - wooden cases for jewellery, cutlery and similar articles
    - wooden spools, cops, bobbins, sewing thread reels and similar articles of turned wood
    - other articles of wood
- natural cork processing, manufacture of agglomerated cork
- manufacture of articles of natural or agglomerated cork, including floor coverings
- manufacture of plaits and products of plaiting materials: mats, matting, screens, cases etc.
- manufacture of basket-ware and wickerwork
- manufacture of fire logs and pellets for energy, made of pressed wood or substitute materials like coffee or soybean grounds
- manufacture of wooden mirror and picture frames
- manufacture of frames for artists' canvases
- manufacture of wooden shoe parts (e.g. heels and lasts)
- manufacture of handles for umbrellas, canes and similar
- manufacture of blocks for the manufacture of smoking pipes

This class excludes:
- manufacture of mats or matting of textile materials, see 13.92
- manufacture of luggage, see 15.12
- manufacture of wooden footwear, see 15.20
- manufacture of matches, see 20.51
- manufacture of clock cases, see 26.52
- manufacture of wooden spools and bobbins that are part of textile machinery, see 28.94
- manufacture of furniture, see 31.0
- manufacture of wooden toys, see 32.40
- manufacture of brushes and brooms, see 32.91
- manufacture of coffins, see 32.99
- manufacture of cork life preservers, see 32.99

Manufacture of paper and paper products **(17)**

This division includes the manufacture of pulp, paper and converted paper products. The manufacture of these products is grouped together because they constitute a series of vertically connected processes. More than one activity is often carried out in a single unit.

There are essentially three activities: The manufacture of pulp involves separating the cellulose fibres from other matter in wood, or dissolving and de-inking of used paper, and mixing in small amounts of reagents to reinforce the binding of the fibres. The manufacture of paper involves releasing pulp onto a moving wire mesh so as to form a continuous sheet. Converted paper products are made from paper and other materials by various techniques.

The paper articles may be printed (e.g. wallpaper, gift wrap etc.), as long as the printing of information is not the main

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purpose.
The production of pulp, paper and paperboard in bulk is included in group 17.1, while the remaining classes include the production of further-processed paper and paper products.

Manufacture of pulp, paper and paperboard (17.1)

Manufacture of pulp (17.11)

This class includes:
- manufacture of bleached, semi-bleached or unbleached paper pulp by mechanical, chemical (dissolving or non-dissolving) or semi-chemical processes
- manufacture of cotton-linters pulp
- removal of ink and manufacture of pulp from waste paper

Manufacture of paper and paperboard (17.12)

This class includes:
- manufacture of paper and paperboard intended for further industrial processing

This class also includes:
- further processing of paper and paperboard:
- coating, covering and impregnation of paper and paperboard
- manufacture of crêped or crinkled paper
- manufacture of laminates and foils, if laminated with paper or paperboard
- manufacture of handmade paper
- manufacture of newsprint and other printing or writing paper
- manufacture of cellulose wadding and webs of cellulose fibres
- manufacture of carbon paper or stencil paper in rolls or large sheets

This class excludes:
- manufacture of corrugated paper and paperboard, see 17.21
- manufacture of further-processed articles of paper, paperboard or pulp, see 17.22, 17.23, 17.24, 17.29
- manufacture of coated or impregnated paper, where the coating or impregnant is the main ingredient, see class in which the manufacture of the coating or impregnant is classified
- manufacture of abrasive paper, see 23.91

Manufacture of articles of paper and paperboard (17.2)

Manufacture of corrugated paper and paperboard and of containers of paper and paperboard (17.21)

This class includes:
- manufacture of corrugated paper and paperboard
- manufacture of containers of corrugated paper or paperboard
- manufacture of folding paperboard containers
- manufacture of containers of solid board
- manufacture of other containers of paper and paperboard
- manufacture of sacks and bags of paper
- manufacture of office box files and similar articles

This class excludes:
- manufacture of envelopes, see 17.23
- manufacture of moulded or pressed articles of paper pulp (e.g. boxes for packing eggs, moulded pulp paper plates), see 17.29

Manufacture of household and sanitary goods and of toilet requisites (17.22)

This class includes:
- manufacture of household and personal hygiene paper and cellulose wadding products:
    - cleansing tissues
    - handkerchiefs, towels, serviettes
    - toilet paper
    - sanitary towels and tampons, napkins and napkin liners for babies
    - cups, dishes and trays
- manufacture of textile wadding and articles of wadding: sanitary towels, tampons etc.

This class excludes:
- manufacture of cellulose wadding, see 17.12

Manufacture of paper stationery (17.23)

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This class includes:
- manufacture of printing and writing paper ready for use
- manufacture of computer printout paper ready for use
- manufacture of self-copy paper ready for use
- manufacture of duplicator stencils and carbon paper ready for use
- manufacture of gummed or adhesive paper ready for use
- manufacture of envelopes and letter-cards
- manufacture of educational and commercial stationery (notebooks, binders, registers, accounting books, business forms etc.), when the printed information is not the main characteristic
- manufacture of boxes, pouches, wallets and writing compendiums containing an assortment of paper stationery

This class excludes:
- printing on paper products, see 18.1

Manufacture of wallpaper (17.24)

This class includes:
- manufacture of wallpaper and similar wall coverings, including vinyl-coated and textile wallpaper

This class excludes:
- manufacture of paper or paperboard in bulk, see 17.12
- manufacture of plastic wall paper, see 22.29

Manufacture of other articles of paper and paperboard (17.29)

This class includes:
- manufacture of labels
- manufacture of filter paper and paperboard
- manufacture of paper and paperboard bobbins, spools, cops etc.
- manufacture of egg trays and other moulded pulp packaging products etc.
- manufacture of paper novelties
- manufacture of paper or paperboard cards for use on Jacquard machines

This class excludes:
- manufacture of playing cards, see 32.40
- manufacture of games and toys of paper or paperboard, see 32.40

Printing and reproduction of recorded media **(18)**

This division includes printing of products, such as newspapers, books, periodicals, business forms, greeting cards, and other materials, and associated support activities, such as bookbinding, plate-making services, and data imaging. The support activities included here are an integral part of the printing industry, and a product (a printing plate, a bound book, or a computer disk or file) that is an integral part of the printing industry is almost always provided by these operations.

Processes used in printing include a variety of methods for transferring an image from a plate, screen or computer file to a medium, such as paper, plastics, metal, textile articles, or wood. The most prominent of these methods entails the transfer of the image from a plate or screen to the medium through lithographic, gravure, screen or flexographic printing. Often a computer file is used to directly ''drive'' the printing mechanism to create the image or electrostatic and other types of equipment (digital or nonimpact printing).

Though printing and publishing can be carried out by the same unit (a newspaper, for example), it is less and less the case that these distinct activities are carried out in the same physical location.

This division also includes the reproduction of recorded media, such as compact discs, video recordings, software on discs or tapes, records etc.

This division excludes publishing activities (see section J).

Printing and service activities related to printing (18.1)

This group includes printing of products, such as newspapers, books, periodicals, business forms, greeting cards, and other materials, and associated support activities, such as bookbinding, plate-making services, and data imaging. Printing can be done using various techniques and on different materials

Printing of newspapers (18.11)

This class also includes:
- printing of other periodicals, appearing at least four times a week

This class excludes:
- publishing of printed matter, see 58.1

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- photocopying of documents, see 82.19

Other printing (18.12)

This class includes:

- printing of magazines and other periodicals, appearing less than four times a week
- printing of books and brochures, music and music manuscripts, maps, atlases, posters, advertising catalogues, prospectuses and other printed advertising, postage stamps, taxation stamps, documents of title, cheques and other security papers, smart cards, albums, diaries, calendars and other commercial printed matter, personal stationery and other printed matter by letterpress, offset, photogravure, flexographic, screen printing and other printing presses, duplication machines, computer printers, embossers etc., including quick printing
- printing directly onto textiles, plastic, glass, metal, wood and ceramics

The material printed is typically copyrighted.

This class also includes:

- printing on labels or tags (lithographic, gravure printing, flexographic printing, other)

This class excludes:

- silk-screen printing on textiles and wearing apparel, see 13.30
- manufacture of stationery (notebooks, binders, registers, accounting books, business forms etc.), when the printed information is not the main characteristic, see 17.23
- publishing of printed matter, see 58.1

Pre-press and pre-media services (18.13)

This class includes:

- composing, typesetting, phototypesetting, pre-press data input including scanning and optical character recognition, electronic make-up
- preparation of data files for multi-media (printing on paper, CD-ROM, Internet) applications
- plate-making services including image setting and plate setting (for the printing processes letterpress and off-set)
- cylinder preparation: engraving or etching of cylinders for gravure printing
- plate processing: “computer to plate” CTP (also photopolymer plates)
- preparation of plates and dies for relief stamping or printing
- preparation of:
    - artistic works of technical character, such as preparation of lithographic stones and wood blocks
    - presentation media, e.g. overhead foils and other forms of presentation
    - sketches, layouts, dummies, etc.
    - production of proofs

This class excludes:

- specialised design activities, see 74.10

Binding and related services (18.14)

This class includes:

- trade binding, sample mounting and post press services in support of printing activities, e.g. trade binding and finishing of books, brochures, magazines, catalogues, etc., by folding, cutting and trimming, assembling, stitching, thread sewing, adhesive binding, cutting and cover laying, gluing, collating, basting, gold stamping; spiral binding and plastic wire binding
- binding and finishing of printed paper or printed cardboard, by folding, stamping, drilling, punching, perforating, embossing, sticking, gluing, laminating
- finishing services for CD-ROMs
- mailing finishing services such as customisation, envelope preparation
- other finishing activities such as die, sinking or stamping, Braille copying

Reproduction of recorded media (18.2)

Reproduction of recorded media (18.20)

This class includes:

- reproduction from master copies of gramophone records, compact discs and tapes with music or other sound recordings
- reproduction from master copies of records, compact discs and tapes with motion pictures and other video recordings
- reproduction from master copies of software and data on discs and tapes

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This class excludes:

- reproduction of printed matter, see 18.11, 18.12
- publishing of software, see 58.2
- production and distribution of motion pictures, video tapes and movies on DVD or similar media, see 59.11, 59.12, 59.13
- reproduction of motion picture film for theatrical distribution, see 59.12
- production of master copies for records or audio material, see 59.20

Manufacture of coke and refined petroleum products **(19)**

This division includes the transformation of crude petroleum and coal into usable products. The dominant process is petroleum refining, which involves the separation of crude petroleum into component products through such techniques as cracking and distillation.

This division includes the manufacture of gases such as ethane, propane and butane as products of petroleum refineries.

This division also includes the manufacture for own account of characteristic products (e.g. coke, butane, propane, petrol, kerosene, fuel oil etc.) as well as processing services (e.g. custom refining).

Not included is the manufacture of such gases in other units (20.14), manufacture of industrial gases (20.11), extraction of natural gas (methane, ethane, butane or propane) (06.20), and manufacture of fuel gas, other than petroleum gases (e.g. coal gas, water gas, producer gas, gasworks gas) (35.21). The manufacture of petrochemicals from refined petroleum is classified in division 20.)

Manufacture of coke oven products (19.1)

Manufacture of coke oven products (19.10)

This class includes:

- operation of coke ovens
- production of coke and semi-coke
- production of pitch and pitch coke
- production of coke oven gas
- production of crude coal and lignite tars
- agglomeration of coke

This class excludes:

- manufacture of coal fuel briquettes, see 19.20

Manufacture of refined petroleum products (19.2)

Manufacture of refined petroleum products (19.20)

This class includes the manufacture of liquid or gaseous fuels or other products from crude petroleum, bituminous minerals or their fractionation products. Petroleum refining involves one or more of the following activities: fractionation; straight distillation of crude oil; and cracking.

This class includes:

- production of motor fuel: gasoline, kerosene etc.
- production of fuel: light, medium and heavy fuel oil, refinery gases such as ethane, propane, butane etc.
- manufacture of oil-based lubricating oils or greases, including from waste oil
- manufacture of products for the petrochemical industry and for the manufacture of road coverings
- manufacture of various products: white spirit, Vaseline, paraffin wax, petroleum jelly etc.
- manufacture of petroleum briquettes
- blending of biofuels, i.e. blending of alcohols with petroleum (e.g. gasohol)

This class also includes:

- manufacture of peat briquettes
- manufacture of hard-coal and lignite fuel briquettes

Manufacture of rubber and plastic products **(22)**

This division includes the manufacture of rubber and plastics products.

This division is characterised by the raw materials used in the manufacturing process. However, this does not imply that the manufacture of all products made of these materials is classified here.

Manufacture of rubber products (22.1)

This group includes the manufacture of rubber products.

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Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres (22.11)

This class includes:

- manufacture of rubber tyres for vehicles, equipment, mobile machinery, aircraft, toy, furniture and other uses:
    - pneumatic tyres
    - solid or cushion tyres
- manufacture of inner tubes for tyres
- manufacture of interchangeable tyre treads, tyre flaps, "camelback" strips for retreading tyres etc.
- tyre rebuilding and retreading

This class excludes:

- manufacture of tube repair materials, see 22.19
- tyre and tube repair, fitting or replacement, see 45.20

Manufacture of other rubber products (22.19)

This class includes:

- manufacture of other products of natural or synthetic rubber, unvulcanised, vulcanised or hardened:
    - rubber plates, sheets, strip, rods, profile shapes
    - tubes, pipes and hoses
    - rubber conveyor or transmission belts or belting
    - rubber hygienic articles: sheath contraceptives, teats, hot water bottles etc.
    - rubber articles of apparel (if only sealed together, not sewn)
    - rubber sole and other rubber parts of footwear
    - rubber thread and rope
    - rubberised yarn and fabrics
    - rubber rings, fittings and seals
    - rubber roller coverings
    - inflatable rubber mattresses
    - inflatable balloons
- manufacture of rubber brushes
- manufacture of hard rubber pipe stems
- manufacture of hard rubber combs, hair pins, hair rollers, and similar

This class also includes:

- manufacture of rubber repair materials
- manufacture of textile fabric impregnated, coated, covered or laminated with rubber, where rubber is the chief constituent
- manufacture of rubber waterbed mattresses
- manufacture of rubber bathing caps and aprons
- manufacture of rubber wet suits and diving suits
- manufacture of rubber sex articles
- This class excludes:
- manufacture of tyre cord fabrics, see 13.96
- manufacture of apparel of elastic fabrics, see 14.14, 14.19
- manufacture of rubber footwear, see 15.20
- manufacture of glues and adhesives based on rubber, see 20.52
- manufacture of "camelback" strips, see 22.11
- manufacture of inflatable rafts and boats, see 30.11, 30.12
- manufacture of mattresses of uncovered cellular rubber, see 31.03
- manufacture of rubber sports requisites, except apparel, see 32.30
- manufacture of rubber games and toys (including children's wading pools, inflatable children rubber boats, inflatable rubber animals, balls and the like), see 32.40
- reclaiming of rubber, see 38.32

Manufacture of plastics products (22.2)

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This group comprises processing new or spent (i.e., recycled) plastics resins into intermediate or final products, using such processes as compression moulding; extrusion moulding; injection moulding; blow moulding; and casting. For most of these, the production process is such that a wide variety of products can be made.

Manufacture of plastic plates, sheets, tubes and profiles (22.21)

This class includes:

- manufacture of semi-manufactures of plastic products:
    - plastic plates, sheets, blocks, film, foil, strip etc. (whether self-adhesive or not)
- manufacture of finished plastic products:
    - plastic tubes, pipes and hoses; hose and pipe fittings
- cellophane film or sheet

This class excludes:

- manufacture of plastics in primary forms, see 20.16
- manufacture of articles of synthetic or natural rubber, see 22.1

Manufacture of plastic packing goods (22.22)

This class includes:

- manufacture of plastic articles for the packing of goods:
- plastic bags, sacks, containers, boxes, cases, carboys, bottles etc.

This class excludes:

- manufacture of luggage and handbags of plastic, see 15.12

Manufacture of builders' ware of plastic (22.23)

This class includes:

- manufacture of builders' plastics ware:
    - plastic doors, windows, frames, shutters, blinds, skirting boards
    - tanks, reservoirs
    - plastic floor, wall or ceiling coverings in rolls or in the form of tiles etc.
    - plastic sanitary ware like plastic baths, shower baths, washbasins, lavatory pans, flushing cisterns etc.
- manufacture of resilient floor coverings, such as vinyl, linoleum etc.
- manufacture of artificial stone (e.g. cultured marble)

Manufacture of other plastic products (22.29)

This class includes:

- manufacture of plastic tableware, kitchenware and toilet articles
- manufacture of diverse plastic products:
- plastic headgear, insulating fittings, parts of lighting fittings, office or school supplies, articles of apparel (if only sealed together, not sewn), fittings for furniture, statuettes, transmission and conveyer belts, self-adhesive tapes of plastic, plastic shoe lasts, plastic cigar and cigarette holders, combs, plastics hair curlers, plastics novelties, etc.

This class excludes:

- manufacture of plastic luggage, see 15.12
- manufacture of plastic footwear, see 15.20
- manufacture of plastic furniture, see 31.01, 31.02, 31.09
- manufacture of mattresses of uncovered cellular plastic, see 31.03
- manufacture of plastic sports requisites, see 32.30
- manufacture of plastic games and toys, see 32.40
- manufacture of plastic medical and dental appliances, see 32.50
- manufacture of plastic ophthalmic goods, see 32.50
- manufacture of plastics hard hats and other personal safety equipment of plastics, see 32.99

Manufacture of other non-metallic mineral products **(23)**

This division includes manufacturing activities related to a single substance of mineral origin. This division includes the manufacture of glass and glass products (e.g. flat glass, hollow glass, fibres, technical glassware etc.), ceramic products, tiles and baked clay products, and cement and plaster, from raw materials to finished articles.

The manufacture of shaped and finished stone and other mineral products is also included in this division.

Manufacture of glass and glass products (23.1)

This group includes glass in all its forms, made by any process, and articles of glass.

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Manufacture of flat glass (23.11)

This class includes:

- manufacture of flat glass, including wired, coloured or tinted flat glass

Shaping and processing of flat glass (23.12)

This class includes:

- manufacture of toughened or laminated flat glass
- manufacture of glass mirrors
- manufacture of multiple-walled insulating units of glass

Manufacture of hollow glass (23.13)

This class includes:

- manufacture of bottles and other containers of glass or crystal
- manufacture of drinking glasses and other domestic glass or crystal articles

This class excludes:

- manufacture of glass toys, see 32.40

Manufacture of glass fibres (23.14)

This class includes:

- manufacture of glass fibres, including glass wool and non-woven products thereof

This class excludes:

- manufacture of woven fabrics of glass yarn, see 13.20
- manufacture of fibre optic cable for data transmission or live transmission of images, see 27.31

Manufacture and processing of other glass, including technical glassware (23.19)

This class includes:

- manufacture of laboratory, hygienic or pharmaceutical glassware
- manufacture of clock or watch glasses, optical glass and optical elements not optically worked
- manufacture of glassware used in imitation jewellery
- manufacture of glass insulators and glass insulating fittings
- manufacture of glass envelopes for lamps
- manufacture of glass figurines
- manufacture of glass paving blocks
- manufacture of glass in rods or tubes

This class excludes:

- manufacture of optical elements optically worked, see 26.70
- manufacture of syringes and other medical laboratory equipment, see 32.50

Manufacture of refractory products (23.2)

Manufacture of refractory products (23.20)

This class includes the manufacture of intermediate products from mined or quarried non-metallic minerals, such as sand, gravel, stone or clay.

This class includes:

- manufacture of refractory mortars, concretes etc.
- manufacture of refractory ceramic goods:
    - heat-insulating ceramic goods of siliceous fossil meals
    - refractory bricks, blocks and tiles etc.
    - retorts, crucibles, muffles, nozzles, tubes, pipes etc.
- This class also includes:
- manufacture of refractory articles containing magnesite, dolomite or chromite

Manufacture of clay building materials (23.3)

Manufacture of ceramic tiles and flags (23.31)

This class includes:

- manufacture of non-refractory ceramic hearth or wall tiles, mosaic cubes etc.
- manufacture of non-refractory ceramic flags and paving

This class excludes:

- manufacture of artificial stone (e.g. cultured marble), see 22.23
- manufacture of refractory ceramic products, see 23.20

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- manufacture of ceramic bricks and roofing tiles, see 23.32

Manufacture of bricks, tiles and construction products, in baked clay (23.32)

This class includes:

- manufacture of structural non-refractory clay building materials:
    - manufacture of ceramic bricks, roofing tiles, chimney pots, pipes, conduits etc.
- manufacture of flooring blocks in baked clay

This class excludes:

- manufacture of refractory ceramic products, see 23.20
- manufacture of non-structural non-refractory ceramic products, see 23.4

Manufacture of other porcelain and ceramic products (23.4)

This group includes the manufacture of final products from mined or quarried non-metallic minerals, such as sand, gravel, stone or clay.

Manufacture of ceramic household and ornamental articles (23.41)

This class includes:

- manufacture of ceramic tableware and other domestic or toilet articles
- manufacture of statuettes and other ornamental ceramic articles

This class excludes:

- manufacture of imitation jewellery, see 32.13
- manufacture of ceramic toys, see 32.40

Manufacture of ceramic sanitary fixtures (23.42)

This class includes:

- manufacture of ceramic sanitary fixtures, e.g. sinks, baths, bidets, water closet pans etc.
- manufacture of other ceramic fixtures

This class excludes:

- manufacture of refractory ceramic goods, see 23.20
- manufacture of ceramic building materials, see 23.3

Manufacture of ceramic insulators and insulating fittings (23.43)

This class includes:

- manufacture of electrical insulators and insulating fittings of ceramics

This class excludes:

- manufacture of refractory ceramic goods, see 23.20

Manufacture of other technical ceramic products (23.44)

This class includes:

- manufacture of ceramic and ferrite magnets
- manufacture of ceramic laboratory, chemical and industrial products

This class excludes:

- manufacture of artificial stone (e.g. cultured marble), see 22.23
- manufacture of refractory ceramic goods, see 23.20
- manufacture of ceramic building materials, see 23.3

Manufacture of other ceramic products (23.49)

This class includes:

- manufacture of ceramic pots, jars and similar articles of a kind used for conveyance or packing of goods
- manufacture of ceramic products n.e.c.

This class excludes:

- manufacture of ceramic sanitary fixtures, see 23.42
- manufacture of artificial teeth, see 32.50

Manufacture of cement, lime and plaster (23.5)

Manufacture of cement (23.51)

This class includes:

- manufacture of clinkers and hydraulic cements, including Portland, aluminous cement, slag cement and superphosphate cements

This class excludes:

- manufacture of refractory mortars, concrete etc., see 23.20

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- manufacture of ready-mixed and dry-mix concrete and mortars, see 23.63, 23.64
- manufacture of articles of cement, see 23.69
- manufacture of cements used in dentistry, see 32.50

Manufacture of lime and plaster (23.52)

This class includes:

- manufacture of quicklime, slaked lime and hydraulic lime
- manufacture of plasters of calcined gypsum or calcined sulphate

This class also includes:

- manufacture of calcined dolomite

This class excludes:

- manufacture of articles of plaster, see 23.62, 23.69

Manufacture of articles of concrete, cement and plaster (23.6)

Manufacture of concrete products for construction purposes (23.61)

This class includes:

- manufacture of precast concrete, cement or artificial stone articles for use in construction:
    - tiles, flagstones, bricks, boards, sheets, panels, pipes, posts etc.
- manufacture of prefabricated structural components for building or civil engineering of cement, concrete or artificial stone

Manufacture of plaster products for construction purposes (23.62)

This class includes:

- manufacture of plaster articles for use in construction:
    - boards, sheets, panels etc.

Manufacture of ready-mixed concrete (23.63)

This class includes:

- manufacture of ready-mix and dry-mix concrete and mortars

This class excludes:

- manufacture of refractory cements, see 23.20

Manufacture of mortars (23.64)

This class includes:

- manufacture of powdered mortars

This class excludes:

- manufacture of refractory mortars, see 23.20
- manufacture of dry-mixed concrete and mortars, see 23.63

Manufacture of fibre cement (23.65)

This class includes:

- manufacture of building materials of vegetable substances (wood wool, straw, reeds, rushes) agglomerated with cement, plaster or other mineral binder
- manufacture of articles of asbestos-cement or cellulose fibre-cement or the like:
    - corrugated sheets, other sheets, panels, tiles, tubes, pipes, reservoirs, troughs, basins, sinks, jars, furniture, window frames etc.

Manufacture of other articles of concrete, plaster and cement (23.69)

This class includes:

- manufacture of other articles of concrete, plaster, cement or artificial stone:
    - statuary, furniture, bas- and haut-reliefs, vases, flowerpots etc.

Cutting, shaping and finishing of stone (23.7)

Cutting, shaping and finishing of stone (23.70)

This class includes:

- cutting, shaping and finishing of stone for use in construction, in cemeteries, on roads, as roofing etc.
- manufacture of stone furniture

This class excludes:

- activities carried out by operators of quarries, e.g. production of rough cut stone, see 08.11
- production of millstones, abrasive stones and similar products, see 23.9

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Manufacture of abrasive products and non-metallic mineral products n.e.c. (23.9)

This group includes the manufacture of other non-metallic mineral products.

Production of abrasive products (23.91)

This class includes:

- manufacture of millstones, sharpening or polishing stones and natural or artificial abrasive products on a support, including abrasive products on a soft base (e.g. sandpaper)

Manufacture of other non-metallic mineral products n.e.c. (23.99)

This class includes:

- manufacture of friction material and unmounted articles thereof with a base of mineral substances or of cellulose
- manufacture of mineral insulating materials:
    - slag wool, rock wool and similar mineral wools; exfoliated vermiculite, expanded clays and similar heat-insulating, sound-insulating or sound-absorbing materials
- manufacture of articles of diverse mineral substances:
    - worked mica and articles of mica, of peat, of graphite (other than electrical articles) etc.
- manufacture of articles of asphalt or similar material, e.g. asphalt-based adhesives, coal tar pitch etc.
- manufacture of carbon and graphite fibres and products (except electrodes and electrical applications)
- manufacture of artificial corundum

This class excludes:

- manufacture of glass wool and non-woven glass wool products, see 23.14
- manufacture of graphite electrodes, see 27.90
- manufacture of carbon or graphite gaskets, see 28.29

Manufacture of computer, electronic and optical products **(26)**

This division includes the manufacture of computers, computer peripherals, communications equipment, and similar electronic products, as well as the manufacture of components for such products. Production processes of this division are characterised by the design and use of integrated circuits and the application of highly specialised miniaturisation technologies.

The division also contains the manufacture of consumer electronics, measuring, testing and navigating equipment, irradiation, electromedical and electrotherapeutic equipment, optical instruments and equipment, and the manufacture of magnetic and optical media.

Manufacture of electronic components and boards (26.1)

Manufacture of electronic components (26.11)

This class includes the manufacture of semiconductors and other components for electronic applications.

This class includes:

- manufacture of capacitors, electronic
- manufacture of resistors, electronic
- manufacture of microprocessors
- manufacture of electron tubes
- manufacture of electronic connectors
- manufacture of bare printed circuit boards
- manufacture of integrated circuits (analogue, digital or hybrid)
- manufacture of diodes, transistors and related discrete devices
- manufacture of inductors (e.g. chokes, coils, transformers), electronic component type
- manufacture of electronic crystals and crystal assemblies
- manufacture of solenoids, switches and transducers for electronic applications
- manufacture of dice or wafers, semiconductor, finished or semifinished
- manufacture of display components (plasma, polymer, LCD)
- manufacture of light emitting diodes (LED)

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This class also includes:

- manufacture of printer cables, monitor cables, USB cables, connectors etc.

This class excludes:

- printing of smart cards, see 18.12
- manufacture of computer and television displays, see 26.20, 26.40
- manufacture of modems (carrier equipment), see 26.30
- manufacture of Xray tubes and similar irradiation devices, see 26.60
- manufacture of optical equipment and instruments, see 26.70
- manufacture of similar devices for electrical applications, see division 27
- manufacture of fluorescent ballasts, see 27.11
- manufacture of electrical relays, see 27.12
- manufacture of electrical wiring devices, see 27.33
- manufacture of complete equipment is classified elsewhere based on complete equipment classification

Manufacture of loaded electronic boards (26.12)

This class includes:

- manufacture of loaded printed circuit boards
- loading of components onto printed circuit boards
- manufacture of interface cards (e.g. sound, video, controllers, network, modems)

This class excludes:

- printing of smart cards, see 18.12
- manufacture of bare printed circuit boards, see 26.11

Manufacture of computers and peripheral equipment (26.2)

Manufacture of computers and peripheral equipment (26.20)

This class includes the manufacture and/or assembly of electronic computers, such as mainframes, desktop computers, laptops and computer servers; and computer peripheral equipment, such as storage devices and input/output devices (printers, monitors, keyboards). Computers can be analog, digital, or hybrid. Digital computers, the most common type, are devices that do all of the following: (1) store the processing program or programs and the data immediately necessary for the execution of the program, (2) can be freely programmed in accordance with the requirements of the user, (3) perform arithmetical computations specified by the user and (4) execute, without human intervention, a processing program that requires the computer to modify its execution by logical decision during the processing run. Analog computers are capable of simulating mathematical models and comprise at least analog control and programming elements.

This class includes:

- manufacture of desktop computers
- manufacture of laptop computers
- manufacture of main frame computers
- manufacture of handheld computers (e.g. PDA)
- manufacture of magnetic disk drives, flash drives and other storage devices
- manufacture of optical (e.g. CDRW, CDROM, DVDROM, DVDRW) disk drives
- manufacture of printers
- manufacture of monitors
- manufacture of keyboards
- manufacture of all types of mice, joysticks, and trackball accessories
- manufacture of dedicated computer terminals
- manufacture of computer servers
- manufacture of scanners, including bar code scanners
- manufacture of smart card readers
- manufacture of virtual reality helmets
- manufacture of computer projectors (video beamers)

This class also includes:

- manufacture of computer terminals, like automatic teller machines (ATM's), pointofsale (POS) terminals, not mechanically operated

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- manufacture of multifunction office equipment performing two or more of following functions: printing, scanning, copying, faxing

This class excludes:

- reproduction of recorded media (computer media, sound, video, etc.), see 18.20
- manufacture of electronic components and electronic assemblies used in computers and peripherals, see 26.1
- manufacture of internal/external computer modems, see 26.12
- manufacture of interface cards, modules and assemblies, see 26.12
- manufacture of loaded electronic boards, see 26.12
- manufacture of modems, carrier equipment, see 26.30
- manufacture of digital communication switches, data communications equipment (e.g. bridges, routers, gateways), see 26.30
- manufacture of consumer electronic devices, such as CD players and DVD players, see 26.40
- manufacture of television monitors and displays, see 26.40
- manufacture of video game consoles, see 26.40
- manufacture of blank optical and magnetic media for use with computers or other devices, see 26.80

Manufacture of communication equipment (26.30)

This class includes the manufacture of telephone and data communications equipment used to move signals electronically

over wires or through the air such as radio and television broadcast and wireless communications equipment.

This class includes:

- manufacture of central office switching equipment
- manufacture of cordless telephones
- manufacture of private branch exchange (PBX) equipment
- manufacture of telephone and facsimile equipment, including telephone answering machines
- manufacture of data communications equipment, such as bridges, routers, and gateways
- manufacture of transmitting and receiving antenna
- manufacture of cable television equipment
- manufacture of pagers
- manufacture of cellular phones
- manufacture of mobile communication equipment
- manufacture of radio and television studio and broadcasting equipment, including television cameras
- manufacture of modems, carrier equipment
- manufacture of burglar and fire alarm systems, sending signals to a control station
- manufacture of radio and television transmitters
- manufacture of communication devices using infrared signal (e.g. remote controls)

This class excludes:

- manufacture of electronic components and subassemblies used in communications equipment, including internal/external computer modems, see 26.1
- manufacture of loaded electronic boards, see 26.12
- manufacture of computers and computer peripheral equipment, see 26.20
- manufacture of consumer audio and video equipment, see 26.40
- manufacture of GPS devices, see 26.51
- manufacture of electronic scoreboards, see 27.90
- manufacture of traffic lights, see 27.90

Manufacture of consumer electronics (26.4)

Manufacture of consumer electronics (26.40)

This class includes the manufacture of electronic audio and video equipment for home entertainment, motor vehicle, public address systems and musical instrument amplification.

This class includes:

- manufacture of video cassette recorders and duplicating equipment
- manufacture of televisions
- manufacture of television monitors and displays

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- manufacture of audio recording and duplicating systems
- manufacture of stereo equipment
- manufacture of radio receivers
- manufacture of speaker systems
- manufacture of householdtype video cameras
- manufacture of jukeboxes
- manufacture of amplifiers for musical instruments and public address systems
- manufacture of microphones
- manufacture of CD and DVD players
- manufacture of karaoke machines
- manufacture of headphones (e.g. radio, stereo, computer)
- manufacture of video game consoles

This class excludes:

- reproduction of recorded media (computer media, sound, video, etc.), see 18.2
- manufacture of computer peripheral devices and computer monitors, see 26.20
- manufacture of telephone answering machines, see 26.30
- manufacture of paging equipment, see 26.30
- manufacture of remote control devices (radio and infrared), see 26.30
- manufacture of broadcast studio equipment such as reproduction equipment, transmitting and receiving antennas, commercial video cameras, see 26.30
- manufacture of antennas, see 26.30
- manufacture of digital cameras, see 26.70
- manufacture of electronic games with fixed (nonreplaceable) software, see 32.40

Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks (26.5)

This group includes the manufacture of measuring, testing and navigating equipment for various industrial and non-industrial purposes, including timebased measuring devices such as watches and clocks and related devices.

Manufacture of instruments and appliances for measuring, testing and navigation (26.51)

This class comprises manufacturing of search, detection, navigation, guidance, aeronautical, and nautical systems and instruments; automatic controls and regulators for applications, such as heating, airconditioning, refrigeration and appliances; instruments and devices for measuring, displaying, indicating, recording, transmitting, and controlling temperature, humidity, pressure, vacuum, combustion, flow, level, viscosity, density, acidity, concentration, and rotation; totalising (i.e., registering) fluid meters and counting devices; instruments for measuring and testing the characteristics of electricity and electrical signals; instruments and instrumentation systems for laboratory analysis of the chemical or physical composition or concentration of samples of solid, fluid, gaseous, or composite material; other measuring and testing instruments and parts thereof.

The manufacture of nonelectric measuring, testing and navigating equipment (except simple mechanical tools) is included here.

This class includes:

- manufacture of aircraft engine instruments
- manufacture of automotive emissions testing equipment
- manufacture of meteorological instruments
- manufacture of physical properties testing and inspection equipment
- manufacture of polygraph machines
- manufacture of radiation detection and monitoring instruments
- manufacture of surveying instruments
- manufacture of thermometers liquidinglass and bimetal types (except medical)
- manufacture of humidistats
- manufacture of hydronic limit controls
- manufacture of flame and burner control
- manufacture of spectrometers
- manufacture of pneumatic gauges

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- manufacture of consumption meters (e.g., water, gas, electricity)
- manufacture of flow meters and counting devices
- manufacture of tally counters
- manufacture of mine detectors, pulse (signal) generators; metal detectors
- manufacture of search, detection, navigation, aeronautical, and nautical equipment, including sonobuoys
- manufacture of radar equipment
- manufacture of GPS devices
- manufacture of environmental controls and automatic controls for appliances
- manufacture of measuring and recording equipment (e.g. flight recorders)
- manufacture of motion detectors
- manufacture of radars
- manufacture of laboratory analytical instruments (e.g. blood analysis equipment)
- manufacture of laboratory scales, balances, incubators, and miscellaneous laboratory apparatus for measuring, testing, etc.

This class excludes:

- manufacture of telephone answering machines, see 26.30
- manufacture of irradiation equipment, see 26.60
- manufacture of optical positioning equipment, see 26.70
- manufacture of dictating machines, see 28.23
- manufacture of weighing devices (other than laboratory balances), levels, tapemeasures etc., see 28.29
- manufacture of medical thermometers, see 32.50
- installation of industrial process control equipment, see 33.20
- manufacture of simple mechanical measuring tools (e.g. measuring tapes, calipers), see manufacturing class according to main material used

Manufacture of watches and clocks (26.52)

This class includes the manufacture of watches, clocks and timing mechanisms and parts thereof.

This class includes:

- manufacture of watches and clocks of all kinds, including instrument panel clocks
- manufacture of watch and clock cases, including cases of precious metals
- manufacture of timerecording equipment and equipment for measuring, recording and otherwise displaying intervals of time with a watch or clock movement or with synchronous motor, such as:
    - parking meters
    - time clocks
    - time/date stamps
    - process timers
- manufacture of time switches and other releases with a watch or clock movement or with synchronous motor:
    - time locks
- manufacture of components for clocks and watches:
    - movements of all kinds for watches and clocks
    - springs, jewels, dials, hands, plates, bridges and other parts
    - watch and clock cases and housings of all materials

This class excludes:

- manufacture of nonmetal watch bands (textile, leather, plastic), see 15.12
- manufacture of watch bands of precious metal, see 32.12
- manufacture of watch bands of nonprecious metal, see 32.13

Manufacture of irradiation, electromedical and electrotherapeutic equipment (26.6)

Manufacture of irradiation, electromedical and electrotherapeutic equipment (26.60)

This class includes:

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- manufacture of irradiation apparatus and tubes (e.g. industrial, medical diagnostic, medical therapeutic, research, scientific):
    - beta, gamma, Xray or other radiation equipment
- manufacture of CT scanners
- manufacture of PET scanners
- manufacture of magnetic resonance imaging (MRI) equipment
- manufacture of medical ultrasound equipment
- manufacture of electrocardiographs
- manufacture of electromedical endoscopic equipment
- manufacture of medical laser equipment
- manufacture of pacemakers
- manufacture of hearing aids

This class also includes:

- manufacture of food and milk irradiation equipment

This class excludes:

- manufacture of tanning beds, see 28.99

Manufacture of optical instruments and photographic equipment (26.7)

Manufacture of optical instruments and photographic equipment (26.70)

This class includes the manufacture of optical instruments and lenses, such as binoculars, microscopes (except electron, proton), telescopes, prisms and lenses (except ophthalmic); the coating or polishing of lenses (except ophthalmic); the mounting of lenses (except ophthalmic) and the manufacture of photographic equipment such as cameras and light meters.

This class includes:

- manufacture of optical mirrors
- manufacture of optical gun sighting equipment
- manufacture of optical positioning equipment
- manufacture of optical magnifying instruments
- manufacture of optical machinist's precision tools
- manufacture of optical comparators
- manufacture of film cameras and digital cameras
- manufacture of motion picture and slide projectors
- manufacture of overhead transparency projectors
- manufacture of optical measuring and checking devices and instruments (e.g. fire control equipment, photographic light meters, range finders)
- manufacture of lenses, optical microscopes, binoculars and telescopes
- manufacture of laser assemblies

This class excludes:

- manufacture of computer projectors, see 26.20
- manufacture of commercial TV and video cameras, see 26.30
- manufacture of householdtype video cameras, see 26.40
- manufacture of complete equipment using laser components, see manufacturing class by type of machinery
- (e.g. medical laser equipment, see 26.60)
- manufacture of photocopy machinery, see 28.23
- manufacture of ophthalmic goods, see 32.50

Manufacture of magnetic and optical media (26.8)

Manufacture of magnetic and optical media (26.80)

This class includes the manufacture of magnetic and optical recording media.

This class includes:

- manufacture of blank magnetic audio and video tapes
- manufacture of blank magnetic audio and video cassettes
- manufacture of blank diskettes
- manufacture of blank optical discs
- manufacture of hard drive media

This class excludes:

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- reproduction of recorded media (computer media, sound, video, etc.), see 18.2

Manufacture of machinery and equipment n.e.c. **(28)**

This division includes the manufacture of machinery and equipment that act independently on materials either mechanically or thermally or perform operations on materials (such as handling, spraying, weighing or packing), including their mechanical components that produce and apply force, and any specially manufactured primary parts. This includes the manufacture of fixed and mobile or hand-held devices, regardless of whether they are designed for industrial, building and civil engineering, agricultural or home use. The manufacture of special equipment for passenger or freight transport within demarcated premises also belongs within this division.

This division distinguishes between the manufacture of special-purpose machinery, i.e. machinery for exclusive use in a NACE industry or a small cluster of NACE industries, and general-purpose machinery, i.e. machinery that is being used in a wide range of NACE industries.

This division also includes the manufacture of other special-purpose machinery, not covered elsewhere in the classification, whether or not used in a manufacturing process, such as fairground amusement equipment, automatic bowling alley equipment, etc.

This division excludes the manufacture of metal products for general use (division 25), associated control devices, computer equipment, measurement and testing equipment, electricity distribution and control apparatus (divisions 26 and 27) and general-purpose motor vehicles (divisions 29 and 30).

Manufacture of general-purpose machinery (28.1)

Manufacture of engines and turbines, except aircraft, vehicle and cycle engines (28.11)

This class includes:

- manufacture of internal combustion piston engines, except motor vehicle, aircraft and cycle propulsion engines:
    - marine engines
    - railway engines
- manufacture of pistons, piston rings, carburettors and such for all internal combustion engines, diesel engines etc.
- manufacture of inlet and exhaust valves of internal combustion engines
- manufacture of turbines and parts thereof:
    - steam turbines and other vapour turbines
    - hydraulic turbines, waterwheels and regulators thereof
    - wind turbines
    - gas turbines, except turbojets or turbo propellers for aircraft propulsion
- manufacture of boilerturbine sets
- manufacture of turbinegenerator sets
- manufacture of engines for industrial application

This class excludes:

manufacture of electric generators (except turbine generator sets), see 27.11

- manufacture of prime mover generator sets (except turbine generator sets), see 27.11
- manufacture of electrical equipment and components of internal combustion engines, see 29.31
- manufacture of motor vehicle, aircraft or cycle propulsion engines, see 29.10, 30.30, 30.91
- manufacture of turbojets and turbo propellers, see 30.30

Manufacture of fluid power equipment (28.12)

This class includes:

- manufacture of hydraulic and pneumatic components (including hydraulic pumps, hydraulic motors, hydraulic and pneumatic cylinders, hydraulic and pneumatic valves, hydraulic and pneumatic hose and fittings)
- manufacture of air preparation equipment for use in pneumatic systems
- manufacture of fluid power systems
- manufacture of hydraulic transmission equipment
- manufacture of hydrostatic transmissions

This class excludes:

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- manufacture of compressors, see 28.13
- manufacture of pumps for nonhydraulic applications, see 28.13
- manufacture of valves for nonfluid power applications, see 28.14
- manufacture of mechanical transmission equipment, see 28.15

Manufacture of other pumps and compressors(28.13)

This class includes:

manufacture of air or vacuum pumps, air or other gas compressors

- manufacture of pumps for liquids whether or not fitted with a measuring device
- manufacture of pumps designed for fitting to internal combustion engines: oil, water and fuel pumps for motor vehicles etc.

This class also includes:

- manufacture of hand pumps

This class excludes:

- manufacture of hydraulic and pneumatic equipment, see 28.12

Manufacture of other taps and valves (28.14)

This class includes:

- manufacture of industrial taps and valves, including regulating valves and intake taps
- manufacture of sanitary taps and valves
- manufacture of heating taps and valves

This class excludes:

- manufacture of valves of unhardened vulcanised rubber, glass or of ceramic materials, see 22.19, 23.19 or
- 23.44
- manufacture of inlet and exhaust valves of internal combustion engines, see 28.11
- manufacture of hydraulic and pneumatic valves and air preparation equipment for use in pneumatic systems,
- see 28.12

Manufacture of bearings, gears, gearing and driving elements (28.15)

This class includes:

- manufacture of ball and roller bearings and parts thereof
- manufacture of mechanical power transmission equipment:
    - transmission shafts and cranks: camshafts, crankshafts, cranks etc.
    - bearing housings and plain shaft bearings
- manufacture of gears, gearing and gear boxes and other speed changers
- manufacture of clutches and shaft couplings
- manufacture of flywheels and pulleys
- manufacture of articulated link chain
- manufacture of power transmission chain

This class excludes:

- manufacture of other chain, see 25.93
- manufacture of hydraulic transmission equipment, see 28.12
- manufacture of hydrostatic transmissions, see 28.12
- manufacture of (electromagnetic) clutches, see 29.31
- manufacture of subassemblies of power transmission equipment identifiable as parts of vehicles or aircraft, see
- divisions 29 and 30

Manufacture of other generalpurpose machinery (28.2)

Manufacture of ovens, furnaces and furnace burners (28.21)

This class includes:

- manufacture of electrical and other industrial and laboratory furnaces and ovens, including incinerators
- manufacture of burners
- manufacture of permanent mount electric space heaters, electric swimming pool heaters
- manufacture of permanent mount nonelectric household heating equipment, such as solar heating, steam
- heating, oil heat and similar furnaces and heating equipment

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- manufacture of electric householdtype furnaces (electric forced air furnaces, heat pumps, etc.), nonelectric
- household forced air furnaces

This class also includes:

- manufacture of mechanical stokers, grates, ash dischargers etc.

This class excludes:

- manufacture of household ovens, see 27.51
- manufacture of agricultural dryers, see 28.93
- manufacture of bakery ovens, see 28.93
- manufacture of dryers for wood, paper pulp, paper or paperboard, see 28.99
- manufacture of medical, surgical or laboratory sterilisers, see 32.50
- manufacture of (dental) laboratory furnaces, see 32.50

Manufacture of lifting and handling equipment (28.22)

This class includes:

- manufacture of handoperated or powerdriven lifting, handling, loading or unloading machinery:
    - pulley tackle and hoists, winches, capstans and jacks
    - derricks, cranes, mobile lifting frames, straddle carriers etc.
    - works trucks, whether or not fitted with lifting or handling equipment, whether or not selfpropelled, of the type
    - used in factories (including hand trucks and wheelbarrows)
    - mechanical manipulators and industrial robots specifically designed for lifting, handling, loading or unloading
- manufacture of conveyors, teleferics etc.
- manufacture of lifts, escalators and moving walkways
- manufacture of parts specialised for lifting and handling equipment

This class excludes:

- manufacture of industrial robots for multiple uses, see 28.99
- manufacture of continuousaction elevators and conveyors for underground use, see 28.92
- manufacture of mechanical shovels, excavators and shovel loaders, see 28.92
- manufacture of floating cranes, railway cranes, cranelorries, see 30.11, 30.20
- installation of lifts and elevators, see 43.29

Manufacture of office machinery and equipment (except computers and peripheral equipment) (28.23)

This class includes:

- manufacture of calculating machines
- manufacture of adding machines, cash registers
- manufacture of calculators, electronic or not
- manufacture of postage meters, mail handling machines (envelope stuffing, sealing and addressing machinery; opening, sorting, scanning), collating machinery
- manufacture of typewriters
- manufacture of stenography machines
- manufacture of officetype binding equipment (i.e. plastic or tape binding)
- manufacture of cheque writing machines
- manufacture of coin counting and coin wrapping machinery
- manufacture of pencil sharpeners
- manufacture of staplers and staple removers
- manufacture of voting machines
- manufacture of tape dispensers
- manufacture of hole punches
- manufacture of cash registers, mechanically operated
- manufacture of photocopy machines
- manufacture of toner cartridges
- manufacture of blackboards; white boards and marker boards
- manufacture of dictating machines

This class excludes:

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- manufacture of computers and peripheral equipment, see 26.20

Manufacture of powerdriven hand tools (28.24)

This class includes:

- manufacture of hand tools, with selfcontained electric or nonelectric motor or pneumatic drive, such as:
    - circular or reciprocating saws
    - chain saws
    - drills and hammer drills
    - hand held power sanders
    - pneumatic nailers
    - buffers
    - routers
    - grinders
    - staplers
    - pneumatic rivet guns
    - planers
    - shears and nibblers
    - impact wrenches
    - powder actuated nailers

This class excludes:

- manufacture of interchangeable tools for hand tools, see 25.73
- manufacture of electrical hand held soldering and welding equipment, see 27.90

Manufacture of nondomestic cooling and ventilation equipment (28.25)

This class includes:

- manufacture of refrigerating or freezing industrial equipment, including assemblies of components
- manufacture of airconditioning machines, including for motor vehicles
- manufacture of nondomestic fans
- manufacture of heat exchangers
- manufacture of machinery for liquefying air or gas
- manufacture of attic ventilation fans (gable fans, roof ventilators, etc.)

This class excludes:

- manufacture of domestic refrigerating or freezing equipment, see 27.51
- manufacture of domestic fans, see 27.51

Manufacture of other generalpurpose machinery n.e.c.(28.29)

This class includes:

- manufacture of weighing machinery (other than sensitive laboratory balances):
    - household and shop scales, platform scales, scales for continuous weighing, weighbridges, weights etc.
- manufacture of filtering or purifying machinery and apparatus for liquids
- manufacture of equipment for projecting, dispersing or spraying liquids or powders:
    - spray guns, fire extinguishers, sandblasting machines, steam cleaning machines etc.
- manufacture of packing and wrapping machinery:
    - filling, closing, sealing, capsuling or labelling machines etc.
- manufacture of machinery for cleaning or drying bottles and for aerating beverages
- manufacture of distilling or rectifying plant for petroleum refineries, chemical industries, beverage industries
- etc.
- manufacture of gas generators
- manufacture of calendaring or other rolling machines and cylinders thereof (except for metal and glass)
- manufacture of centrifuges (except cream separators and clothes dryers)
- manufacture of gaskets and similar joints made of a combination of materials or layers of the same material

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- manufacture of automatic goods vending machines
- manufacture of levels, tape measures and similar hand tools, machinists' precision tools (except optical)
- manufacture of nonelectrical welding and soldering equipment
- manufacture of cooling towers and similar for direct cooling by means of recirculated water

This class excludes:

- manufacture of sensitive (laboratorytype) balances, see 26.51
- manufacture of domestic refrigerating or freezing equipment, see 27.51
- manufacture of domestic fans, see 27.51
- manufacture of electrical welding and soldering equipment, see 27.90
- manufacture of agricultural spraying machinery, see 28.30
- manufacture of metal or glass rolling machinery and cylinders thereof, see 28.91, 28.99
- manufacture of agricultural dryers, see 28.93
- manufacture of machinery for filtering or purifying food, see 28.93
- manufacture of cream separators, see 28.93
- manufacture of commercial clothes dryers, see 28.94
- manufacture of textile printing machinery, see 28.94

Manufacture of agricultural and forestry machinery (28.3)

Manufacture of agricultural and forestry machinery (28.30)

This class includes:

- manufacture of tractors used in agriculture and forestry
- manufacture of walking (pedestriancontrolled) tractors
- manufacture of mowers, including lawnmowers
- manufacture of agricultural selfloading or selfunloading trailers or semitrailers
- manufacture of agricultural machinery for soil preparation, planting or fertilising:
    - ploughs, manure spreaders, seeders, harrows etc.
- manufacture of harvesting or threshing machinery:
    - harvesters, threshers, sorters etc.
- manufacture of milking machines
- manufacture of spraying machinery for agricultural use
- manufacture of diverse agricultural machinery:
    - poultrykeeping machinery, beekeeping machinery, equipment for preparing fodder etc.
    - machines for cleaning, sorting or grading eggs, fruit etc.

This class excludes:

- manufacture of nonpowerdriven agricultural hand tools, see 25.73
- manufacture of conveyors for farm use, see 28.22
- manufacture of powerdriven hand tools, see 28.24
- manufacture of cream separators, see 28.93
- manufacture of machinery to clean, sort or grade seed, grain or dried leguminous vegetables, see 28.93
- manufacture of road tractors for semitrailers, see 29.10
- manufacture of road trailers or semitrailers, see 29.20

Manufacture of metal forming machinery and machine tools (28.4)

This group includes the manufacture of metal forming machinery and machine tools, e.g. manufacture of machine tools for working metals and other materials (wood, bone, stone, hard rubber, hard plastics, cold glass etc.), including those using a laser beam, ultrasonic waves, plasma arc, magnetic pulse etc.

Manufacture of metal forming machinery (28.41)

This class includes:

- manufacture of machine tools for working metals, including those using a laser beam, ultrasonic waves, plasma arc, magnetic pulse etc.
- manufacture of machine tools for turning, drilling, milling, shaping, planing, boring, grinding etc.
- manufacture of stamping or pressing machine tools
- manufacture of punch presses, hydraulic presses, hydraulic brakes, drop hammers, forging machines etc.

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- manufacture of drawbenches, thread rollers or machines for working wires

This class excludes:

- manufacture of interchangeable tools, see 25.73
- manufacture of electrical welding and soldering machines, see 27.90

Manufacture of other machine tools (28.49)

This class includes:

- manufacture of machine tools for working wood, bone, stone, hard rubber, hard plastics, cold glass etc., including those using a laser beam, ultrasonic waves, plasma arc, magnetic pulse etc.
- manufacture of work holders for machine tools
- manufacture of dividing heads and other special attachments for machine tools
- manufacture of stationary machines for nailing, stapling, glueing or otherwise assembling wood, cork, bone, hard rubber or plastics etc.
- manufacture of stationary rotary or rotary percussion drills, filing machines, riveters, sheet metal cutters etc.
- manufacture of presses for the manufacture of particle board and the like
- manufacture of electroplating machinery

This class also includes:

- manufacture of parts and accessories for the machine tools listed

This class excludes:

- manufacture of interchangeable tools for machine tools (drills, punches, dies, taps, milling cutters, turning tools, saw blades, cutting knives etc.), see 25.73
- manufacture of electric hand held soldering irons and soldering guns, see 27.90
- manufacture of powerdriven hand tools, see 28.24
- manufacture of machinery used in metal mills or foundries, see 28.91
- manufacture of machinery for mining and quarrying, see 28.92

Manufacture of other special purpose machinery (28.9)

This group includes the manufacture of specialpurpose machinery, i.e. machinery for exclusive use in an NACE industry or a small cluster of NACE industries.

While most of these are used in other manufacturing processes, such as food manufacturing or textile manufacturing,

this group also includes the manufacture of machinery specific for other (nonmanufacturing industries), such as aircraft launching gear or amusement park equipment.

Manufacture of machinery for metallurgy (28.91)

This class includes:

- manufacture of machines and equipment for handling hot metals:
    - converters, ingot moulds, ladles, casting machines
- manufacture of metalrolling mills and rolls for such mills

This class excludes:

- manufacture of drawbenches, see 28.41
- manufacture of moulding boxes and moulds (except ingot moulds), see 25.73
- manufacture of machines for forming foundry moulds, see 28.99

Manufacture of machinery for mining, quarrying and construction (28.92)

This class includes:

- manufacture of continuousaction elevators and conveyors for underground use
- manufacture of boring, cutting, sinking and tunnelling machinery (whether or not for underground use)
- manufacture of machinery for treating minerals by screening, sorting, separating, washing, crushing etc.
- manufacture of concrete and mortar mixers
- manufacture of earthmoving machinery:
    - bulldozers, angledozers, graders, scrapers, levellers, mechanical shovels, shovel loaders etc.
- manufacture of pile drivers and pile extractors, mortar spreaders, bitumen spreaders, concrete surfacing machinery etc.
- manufacture of track laying tractors and tractors used in construction or mining

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- manufacture of bulldozer and angledozer blades
- manufacture of offroad dumping trucks

This class excludes:

- manufacture of lifting and handling equipment, see 28.22
- manufacture of other tractors, see 28.30, 29.10
- manufacture of machine tools for working stone, including machines for splitting or clearing stone, see 28.49
- manufacture of concretemixer lorries, see 29.10

Manufacture of machinery for food, beverage and tobacco processing (28.93)

This class includes:

- manufacture of agricultural dryers
- manufacture of machinery for the dairy industry:
    - cream separators
    - milk processing machinery (e.g. homogenisers)
    - milk converting machinery (e.g. butter chums, butter workers and moulding machines)
    - cheesemaking machines (e.g. homogenisers, moulders, presses) etc.
- manufacture of machinery for the grain milling industry:
    - machinery to clean, sort or grade seeds, grain or dried leguminous vegetables (winnowers, sieving belts, separators, grain brushing machines etc.)
    - machinery to produce flour and meal etc. (grinding mills, feeders, sifters, bran cleaners, blenders, rice hullers, pea splitters)
- manufacture of presses, crushers etc. used to make wine, cider, fruit juices etc.
- manufacture of machinery for the bakery industry or for making macaroni, spaghetti or similar products:
    - bakery ovens, dough mixers, doughdividers, moulders, slicers, cake depositing machines etc.
- manufacture of machines and equipment to process diverse foods:
    - machinery to make confectionery, cocoa or chocolate; to manufacture sugar; for breweries; to process meat or
    - poultry, to prepare fruit, nuts or vegetables; to prepare fish, shellfish or other seafood
    - machinery for filtering and purifying
    - other machinery for the industrial preparation or manufacture of food or drink
- manufacture of machinery for the extraction or preparation of animal or vegetable fats or oils
- manufacture of machinery for the preparation of tobacco and for the making of cigarettes or cigars, or for pipe or chewing tobacco or snuff
- manufacture of machinery for the preparation of food in hotels and restaurants

This class excludes:

- manufacture of food and milk irradiation equipment, see 26.60
- manufacture of packing, wrapping and weighing machinery, see 28.29
- manufacture of cleaning, sorting or grading machinery for eggs, fruit or other crops (except seeds, grains and
- dried leguminous vegetables), see 28.30

Manufacture of machinery for textile, apparel and leather production (28.94)

This class includes:

- manufacture of textile machinery:
    - machines for preparing, producing, extruding, drawing, texturing or cutting manmade textile fibres, materials or yarns
    - machines for preparing textile fibres: cotton gins, bale breakers, garnetters, cotton spreaders, wool scourers, wool carbonisers, combs, carders, roving frames etc.
    - spinning machines
    - machines for preparing textile yarns: reelers, warpers and related machines

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- weaving machines (looms), including hand looms
- knitting machines
- machines for making knotted net, tulle, lace, braid etc.

- manufacture of auxiliary machines or equipment for textile machinery:
  - dobbies, jacquards, automatic stop motions, shuttle changing mechanisms, spindles and spindle flyers etc.
- manufacture of textile printing machinery
- manufacture of machinery for fabric processing:
  - machinery for washing, bleaching, dyeing, dressing, finishing, coating or impregnating textile fabrics
  - n manufacture of machines for reeling, unreeling, folding, cutting or pinking textile fabrics
- manufacture of laundry machinery:
  - ironing machines, including fusing presses
  - commercial washing and drying machines
  - drycleaning machines
- manufacture of sewing machines, sewing machine heads and sewing machine needles (whether or not for household use)
- manufacture of machines for producing or finishing felt or nonwovens
- manufacture of leather machines:
  - machinery for preparing, tanning or working hides, skins or leather
  - machinery for making or repairing footwear or other articles of hides, skins, leather or fur skins

This class excludes:

- manufacture of paper or paperboard cards for use on jacquard machines, see 17.29
- manufacture of domestic washing and drying machines, see 27.51
- manufacture of calendaring machines, see 28.29
- manufacture of machines used in bookbinding, see 28.99

Manufacture of machinery for paper and paperboard production (28.95)

This class includes:

- manufacture of machinery for making paper pulp
- manufacture of paper and paperboard making machinery
- manufacture of machinery producing articles of paper or paperboard

Manufacture of plastics and rubber machinery (28.96)

This class includes:

- manufacture of machinery for working soft rubber or plastics or for the manufacture of products of these materials:
  - extruders, moulders, pneumatic tyre making or retreading machines and other machines for making a specific rubber or plastic product

Manufacture of other specialpurpose machinery n.e.c. (28.99)

This class includes the manufacture of specialpurpose machinery not elsewhere classified.

This class includes:

- manufacture of dryers for wood, paper pulp, paper or paperboard and other materials (except for agricultural products and textiles)
- manufacture of printing and bookbinding machines and machines for activities supporting printing on a variety of materials
- manufacture of machinery for producing tiles, bricks, shaped ceramic pastes, pipes, graphite electrodes, blackboard chalk etc.
- manufacture of semiconductor manufacturing machinery
- manufacture of industrial robots performing multiple tasks for special purposes
- manufacture of diverse specialpurpose machinery and equipment:
  - machines to assemble electric or electronic lamps, tubes (valves) or bulbs
  - machines for production or hotworking of glass or glassware, glass fibre or yarn
  - machinery or apparatus for isotopic separation

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- manufacture of tyre alignment and balancing equipment; balancing equipment (except wheel balancing)
- manufacture of central greasing systems
- manufacture of aircraft launching gear, aircraft carrier catapults and related equipment
- manufacture of tanning beds
- manufacture of automatic bowling alley equipment (e.g. pinsetters)
- manufacture of roundabouts, swings, shooting galleries and other fairground amusements

This class excludes:

- manufacture of household appliances, see 27.5
- manufacture of photocopy machines etc., see 28.23
- manufacture of machinery or equipment to work hard rubber, hard plastics or cold glass, see 28.49
- manufacture of ingot moulds, see 28.91

Manufacture of motor vehicles, trailers and semi-trailers **(29)**

This division includes the manufacture of motor vehicles for transporting passengers or freight. The manufacture of various parts and accessories, as well as the manufacture of trailers and semi-trailers, is included here. The maintenance and repair of vehicles produced in this division are classified in 45.20.

Manufacture of motor vehicles (29.1)

Manufacture of motor vehicles (29.10)

This class includes:

- manufacture of passenger cars
- manufacture of commercial vehicles:
    - vans, lorries, over-the-road tractors for semi-trailers etc.
- manufacture of buses, trolley-buses and coaches
- manufacture of motor vehicle engines
- manufacture of chassis for motor vehicles
- manufacture of other motor vehicles:
    - snowmobiles, golf carts, amphibious vehicles
    - fire engines, street sweepers, travelling libraries, armoured cars etc.
    - concrete-mixer lorries
- ATVs, go-carts and similar including race cars

This class also includes:

- factory rebuilding of motor vehicle engines

This class excludes:

- manufacture of electric motors (except starting motors), see 27.11
- manufacture of lighting equipment for motor vehicles, see 27.40
- manufacture of pistons, piston rings and carburettors, see 28.11
- manufacture of agricultural tractors, see 28.30
- manufacture of tractors used in construction or mining, see 28.92
- manufacture of off-road dumping trucks, see 28.92
- manufacture of bodies for motor vehicles, see 29.20
- manufacture of electrical parts for motor vehicles, see 29.31
- manufacture of parts and accessories for motor vehicles, see 29.32
- manufacture of tanks and other military fighting vehicles, see 30.40
- maintenance and repair of motor vehicles, see 45.20

Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers (29.2)

Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers (29.20)

This class includes:

- manufacture of bodies, including cabs for motor vehicles
- outfitting of all types of motor vehicles, trailers and semi-trailers
- manufacture of trailers and semi-trailers:
    - tankers, removal trailers etc.

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- caravans etc.

- manufacture of containers for carriage by one or more modes of transport

This class excludes:

- manufacture of trailers and semi-trailers specially designed for use in agriculture, see 28.30
- manufacture of parts and accessories of bodies for motor vehicles, see 29.32
- manufacture of vehicles drawn by animals, see 30.99

Manufacture of parts and accessories for motor vehicles (29.3)

Manufacture of electrical and electronic equipment for motor vehicles (29.31)

This class includes:

- manufacture of motor vehicle electrical equipment, such as generators, alternators, spark plugs, ignition wiring harnesses, power window and door systems, assembly of purchased gauges into instrument panels, voltage
- regulators, etc.

This class excludes:

- manufacture of batteries for vehicles, see 27.20
- manufacture of lighting equipment for motor vehicles, see 27.40
- manufacture of pumps for motor vehicles and engines, see 28.13

Manufacture of other parts and accessories for motor vehicles (29.32)

This class includes:

- manufacture of diverse parts and accessories for motor vehicles:
    - brakes, gearboxes, axles, road wheels, suspension shock absorbers, radiators, silencers, exhaust
- pipes, catalytic converters, clutches, steering wheels, steering columns and steering boxes
- manufacture of parts and accessories of bodies for motor vehicles:
    - safety belts, airbags, doors, bumpers
- manufacture of car seats

This class excludes:

- manufacture of tyres, see 22.11
- manufacture of rubber hoses and belts and other rubber products, see 22.19
- manufacture of pistons, piston rings and carburettors, see 28.11
- maintenance, repair and alteration of motor vehicles, see 45.20

Manufacture of other transport equipment **(30)**

This division includes the manufacture of transportation equipment such as ship building and boat manufacturing, the manufacture of railroad rolling stock and locomotives, air and spacecraft and the manufacture of parts thereof.

Building of ships and boats (30.1)

This group includes the building of ships, boats and other floating structures for transportation and other commercial purposes, as well as for sports and recreational purposes.

Building of ships and floating structures (30.11)

This class includes the building of ships, except vessels for sports or recreation, and the construction of floating structures:

This class includes:

- building of commercial vessels:
    - passenger vessels, ferry boats, cargo ships, tankers, tugs etc.
- building of warships
- building of fishing boats and fish-processing factory vessels
- This class also includes:
- building of hovercraft (except recreation-type hovercraft)
- construction of drilling platforms, floating or submersible
- construction of floating structures:
    - floating docks, pontoons, coffer-dams, floating landing stages, buoys, floating tanks, barges, lighters, floating
- cranes, non-recreational inflatable rafts etc.
- manufacture of sections for ships and floating structures

This class excludes:

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- manufacture of parts of vessels, other than major hull assemblies:
    - manufacture of sails, see 13.92
    - manufacture of ships' propellers, see 25.99
    - manufacture of iron or steel anchors, see 25.99
    - manufacture of marine engines, see 28.11
- manufacture of navigational instruments, see 26.51
- manufacture of lighting equipment for ships, see 27.40
- manufacture of amphibious motor vehicles, see 29.10
- manufacture of inflatable boats or rafts for recreation, see 30.12
- specialised repair and maintenance of ships and floating structures, see 33.15
- ship-breaking, see 38.31
- interior installation of boats, see 43.3

Building of pleasure and sporting boats (30.12)

This class includes:

- manufacture of inflatable boats and rafts
- building of sailboats with or without auxiliary motor
- building of motor boats
- building of recreation-type hovercraft
- manufacture of personal watercraft
- manufacture of other pleasure and sporting boats:
    - canoes, kayaks, rowing boats, skiffs

This class excludes:

- manufacture of parts of pleasure and sporting boats:
    - manufacture of sails, see 13.92
    - manufacture of iron or steel anchors, see 25.99
    - manufacture of marine engines, see 28.11
- manufacture of sailboards and surfboards, see 32.30
- maintenance and repair of pleasure boats, see 33.15

Manufacture of railway locomotives and rolling stock (30.2)

Manufacture of railway locomotives and rolling stock (30.20)

This class includes:

- manufacture of electric, diesel, steam and other rail locomotives
- manufacture of self-propelled railway or tramway coaches, vans and trucks, maintenance or service vehicles
- manufacture of railway or tramway rolling stock, not self-propelled:
    - passenger coaches, goods vans, tank wagons, self-discharging vans and wagons, workshop vans, crane vans, tenders etc.
- manufacture of specialised parts of railway or tramway locomotives or of rolling stock:
    - bogies, axles and wheels, brakes and parts of brakes; hooks and coupling devices, buffers and buffer parts; shock absorbers; wagon and locomotive frames; bodies; corridor connections etc.

This class also includes:

- manufacture of mining locomotives and mining rail cars
- manufacture of mechanical and electromechanical signalling, safety and traffic control equipment for railways,
- tramways, inland waterways, roads, parking facilities, airfields etc.
- manufacture of railway car seats

This class excludes:

- manufacture of unassembled rails, see 24.10
- manufacture of assembled railway track fixtures, see 25.99
- manufacture of electric motors, see 27.11
- manufacture of electrical signalling, safety or traffic-control equipment, see 27.90
- manufacture of engines and turbines, see 28.11

Manufacture of air and spacecraft and related machinery (30.3)

Manufacture of air and spacecraft and related machinery (30.30)

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This class includes:

- manufacture of airplanes for the transport of goods or passengers, for use by the defence forces, for sport or
- other purposes
- manufacture of helicopters
- manufacture of gliders, hang-gliders
- manufacture of dirigibles and hot air balloons
- manufacture of parts and accessories of the aircraft of this class:
    - major assemblies such as fuselages, wings, doors, control surfaces, landing gear, fuel tanks, nacelles etc.
    - airscrews, helicopter rotors and propelled rotor blades
    - motors and engines of a kind typically found on aircraft
    - parts of turbojets and turboprops for aircraft
- manufacture of ground flying trainers
- manufacture of spacecraft and launch vehicles, satellites, planetary probes, orbital stations, shuttles
- manufacture of intercontinental ballistic missiles (ICBM)

This class also includes:

- overhaul and conversion of aircraft or aircraft engines
- manufacture of aircraft seats

This class excludes:

- manufacture of parachutes, see 13.92
- manufacture of military ordinance and ammunition, see 25.40
- manufacture of telecommunication equipment for satellites, see 26.30
- manufacture of aircraft instrumentation and aeronautical instruments, see 26.51
- manufacture of air navigation systems, see 26.51
- manufacture of lighting equipment for aircraft, see 27.40
- manufacture of ignition parts and other electrical parts for internal combustion engines, see 27.90
- manufacture of pistons, piston rings and carburettors, see 28.11
- manufacture of aircraft launching gear, aircraft carrier catapults and related equipment, see 28.99

Manufacture of military fighting vehicles (30.4)

Manufacture of military fighting vehicles (30.40)

This class includes:

- manufacture of tanks
- manufacture of armoured amphibious military vehicles
- manufacture of other military fighting vehicles

This class excludes:

- manufacture of weapons and ammunitions, see 25.40

Manufacture of transport equipment n.e.c. (30.9)

This group includes the manufacture of transport equipment other than motor vehicles and rail, water, air or space transport equipment and military vehicles.

Manufacture of motorcycles (30.91)

This class includes:

- manufacture of motorcycles, mopeds and cycles fitted with an auxiliary engine
- manufacture of engines for motorcycles
- manufacture of sidecars
- manufacture of parts and accessories for motorcycles

This class excludes:

- manufacture of bicycles, see 30.92
- manufacture of invalid carriages, see 30.92

Manufacture of bicycles and invalid carriages (30.92)

This class includes:

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- manufacture of non-motorised bicycles and other cycles, including (delivery) tricycles, tandems, children's bicycles and tricycles
- manufacture of parts and accessories of bicycles
- manufacture of invalid carriages with or without motor
- manufacture of parts and accessories of invalid carriages
- manufacture of baby carriages

This class excludes:

- manufacture of bicycles with auxiliary motor, see 30.91
- manufacture of wheeled toys designed to be ridden, including plastic bicycles and tricycles, see 32.40

Manufacture of other transport equipment n.e.c. (30.99)

This class includes:

- manufacture of hand-propelled vehicles: luggage trucks, handcarts, sledges, shopping carts etc.
- manufacture of vehicles drawn by animals: sulkies, donkey-carts, hearses etc.

This class excludes:

- works trucks, whether or not fitted with lifting or handling equipment, whether or not self-propelled, of the type used in factories (including hand trucks and wheelbarrows), see 28.22
- decorative restaurant carts, such as a desert cart, food wagons, see 31.01

Manufacture of furniture **(31)**

This division includes the manufacture of furniture and related products of any material except stone, concrete and ceramic. The processes used in the manufacture of furniture are standard methods of forming materials and assembling components, including cutting, moulding and laminating. The design of the article, for both aesthetic and functional qualities, is an important aspect of the production process.

Some of the processes used in furniture manufacturing are similar to processes that are used in other segments of manufacturing. For example, cutting and assembly occurs in the production of wood trusses that are classified in division 16 (Manufacture of wood and wood products). However, the multiple processes distinguish wood furniture manufacturing from wood product manufacturing. Similarly, metal furniture manufacturing uses techniques that are also employed in the manufacturing of roll-formed products classified in division 25 (Manufacture of fabricated metal products). The moulding process for plastics furniture is similar to the moulding of other plastics products. However, the manufacture of plastics furniture tends to be a specialised activity.

Manufacture of furniture (31.0)

Manufacture of office and shop furniture (31.01)

This class includes the manufacture of furniture of any kind, any material (except stone, concrete or ceramic) for any place and various purposes.

This class includes:

- manufacture of chairs and seats for offices, workrooms, hotels, restaurants and public premises
- manufacture of chairs and seats for theatres, cinemas and the like
- manufacture of special furniture for shops: counters, display cases, shelves etc.
- manufacture of office furniture
- manufacture of laboratory benches, stools, and other laboratory seating, laboratory furniture (e.g. cabinets and tables)
- manufacture of furniture for churches, schools, restaurants

This class also includes:

- decorative restaurant carts, such as a desert cart, food wagons

This class excludes:

- blackboards, see 28.23
- manufacture of car seats, see 29.32
- manufacture of railway car seats, see 30.20
- manufacture of aircraft seats, see 30.30
- manufacture of medical, surgical, dental or veterinary furniture, see 32.50
- modular furniture attachment and installation, partition installation, laboratory equipment furniture installation, see 43.32

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Manufacture of kitchen furniture (31.02)

This class includes:

- manufacture of kitchen furniture

Manufacture of mattresses (31.03)

This class includes:

- manufacture of mattresses:
    - mattresses fitted with springs or stuffed or internally fitted with a supporting material
    - uncovered cellular rubber or plastic mattresses
- manufacture of mattress supports

This class excludes:

- manufacture of inflatable rubber mattresses, see 22.19
- manufacture of rubber waterbed mattresses, see 22.19

Manufacture of other furniture (31.09)

This class includes:

- manufacture of sofas, sofa beds and sofa sets
- manufacture of garden chairs and seats
- manufacture of furniture for bedrooms, living rooms, gardens etc.
- manufacture of cabinets for sewing machines, televisions etc.

This class also includes:

- finishing such as upholstery of chairs and seats
- finishing of furniture such as spraying, painting, French polishing and upholstering

This class excludes:

- manufacture of pillows, pouffes, cushions, quilts and eiderdowns, see 13.92
- manufacture of furniture of ceramics, concrete and stone, see 23.42, 23.69, 23.70
- manufacture of lighting fittings or lamps, see 27.40
- manufacture of car seats, see 29.32
- manufacture of railway car seats, see 30.20
- manufacture of aircraft seats, see 30.30
- reupholstering and restoring of furniture, see 95.24

Other manufacturing **(32)**

This division includes the manufacture of a variety of goods not covered in other parts of the classification. Since this is a residual division, production processes, input materials and use of the produced goods can vary widely and usual criteria for grouping classes into divisions have not been applied here.

Manufacture of jewellery, bijouterie and related articles (32.1)

This group includes the manufacture of jewellery and imitation jewellery articles.

Striking of coins (32.11)

This class includes:

- manufacture of coins, including coins for use as legal tender, whether or not of precious metal

Manufacture of jewellery and related articles (32.12)

This class includes:

- production of worked pearls
- production of precious and semiprecious stones in the worked state, including the working of industrial quality stones and synthetic or reconstructed precious or semiprecious stones
- working of diamonds
- manufacture of jewellery of precious metal or of base metals clad with precious metals, or precious or semiprecious stones, or of combinations of precious metal and precious or semiprecious stones or of other materials
- manufacture of goldsmiths' articles of precious metals or of base metals clad with precious metals:
    - dinnerware, flatware, hollowware, toilet articles, office or desk articles, articles for religious use etc.
- manufacture of technical or laboratory articles of precious metal (except instruments and parts thereof): crucibles, spatulas, electroplating anodes etc.

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- manufacture of precious metal watch bands, wristbands, watch straps and cigarette cases

This class also includes:

- engraving of personal precious and nonprecious metal products

This class excludes:

- manufacture of nonmetal watch bands (fabric, leather, plastic etc.), see 15.12
- manufacture of articles of base metal plated with precious metal (except imitation jewellery), see division 25
- manufacture of watchcases, see 26.52
- manufacture of (nonprecious) metal watch bands, see 32.13
- manufacture of imitation jewellery, see 32.13
- repair of jewellery, see 95.25

Manufacture of imitation jewellery and related articles (32.13)

This class includes:

- manufacture of costume or imitation jewellery:
    - rings, bracelets, necklaces, and similar articles of jewellery made from base metals plated with precious metals
    - jewellery containing imitation stones such as imitation gems stones, imitation diamonds, and similar
- manufacture of metal watch bands (except precious metal)

This class excludes:

- manufacture of jewellery made from precious metals or clad with precious metals, see 32.12
- manufacture of jewellery containing genuine gem stones, see 32.12
- manufacture of precious metal watch bands, see 32.12

Manufacture of musical instruments (32.2)

Manufacture of musical instruments (32.20)

This class includes:

- manufacture of stringed instruments
- manufacture of keyboard stringed instruments, including automatic pianos
- manufacture of keyboard pipe organs, including harmoniums and similar keyboard instruments with free metal reeds
- manufacture of accordions and similar instruments, including mouth organs
- manufacture of wind instruments
- manufacture of percussion musical instruments
- manufacture of musical instruments, the sound of which is produced electronically
- manufacture of musical boxes, fairground organs, calliopes etc.
- manufacture of instrument parts and accessories:
    - metronomes, tuning forks, pitch pipes, cards, discs and rolls for automatic mechanical instruments etc.

This class also includes:

- manufacture of whistles, call horns and other mouthblown sound signalling instruments

This class excludes:

- reproduction of prerecorded sound and video tapes and discs, see 18.2
- manufacture of microphones, amplifiers, loudspeakers, headphones and similar components, see 26.40
- manufacture of record players, tape recorders and the like, see 26.40
- manufacture of toy musical instruments, see 32.40
- restoring of organs and other historic musical instruments, see 33.19
- publishing of prerecorded sound and video tapes and discs, see 59.20
- piano tuning, see 95.29

Manufacture of sports goods (32.3)

Manufacture of sports goods (32.30)

This class includes the manufacture of sporting and athletic goods (except apparel and footwear).

This class includes:

- manufacture of articles and equipment for sports, outdoor and indoor games, of any material:

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- hard, soft and inflatable balls
- rackets, bats and clubs
- skis, bindings and poles
- skiboots
- sailboards and surfboards
- requisites for sport fishing, including landing nets
- requisites for hunting, mountain climbing etc.
- leather sports gloves and sports headgear
- basins for swimming and padding pools etc.
- ice skates, roller skates etc.
- bows and crossbows
- gymnasium, fitness centre or athletic equipment

This class excludes:

- manufacture of boat sails, see 13.92
- manufacture of sports apparel, see 14.19
- manufacture of saddlery and harness, see 15.12
- manufacture of whips and riding crops, see 15.12
- manufacture of sports footwear, see 15.20
- manufacture of sporting weapons and ammunition, see 25.40
- manufacture of metal weights as used for weightlifting, see 25.99
- manufacture of sports vehicles other than toboggans and the like, see divisions 29 and 30
- manufacture of boats, see 30.12
- manufacture of billiard tables, see 32.40
- manufacture of ear and noise plugs (e.g. for swimming and noise protection), see 32.99
- repair of sporting goods, see 95.29

Manufacture of games and toys (32.4)

Manufacture of games and toys (32.40)

This class includes the manufacture of dolls, toys and games (including electronic games), scale models and children's vehicles (except metal bicycles and tricycles).

This class includes:

- manufacture of dolls and doll garments, parts and accessories
- manufacture of action figures
- manufacture of toy animals
- manufacture of toy musical instruments
- manufacture of playing cards
- manufacture of board games and similar games
- manufacture of electronic games: chess etc.
- manufacture of reducedsize ("scale") models and similar recreational models, electrical trains, construction sets etc.
- manufacture of coinoperated games, billiards, special tables for casino games, etc.
- manufacture of articles for funfair, table or parlour games
- manufacture of wheeled toys designed to be ridden, including plastic bicycles and tricycles
- manufacture of puzzles and similar articles

This class excludes:

- manufacture of video game consoles, see 26.40
- manufacture of bicycles, see 30.92
- manufacture of articles for jokes and novelties, see 32.99
- writing and publishing of software for video game consoles, see 58.21, 62.01

Manufacture of medical and dental instruments and supplies (32.5)

Manufacture of medical and dental instruments and supplies (32.50)

This class includes the manufacture of laboratory apparatus, surgical and medical instruments, surgical appliances and supplies, dental equipment and supplies, orthodontic goods, dentures and orthodontic appliances. Included is the manufacture of medical, dental and similar furniture, where the additional specific functions determine the purpose of the

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product, such as dentist's chairs with builtin hydraulic functions.

This class includes:

- manufacture of surgical drapes and sterile string and tissue
- manufacture of dental fillings and cements (except denture adhesives), dental wax and other dental plaster preparations
- manufacture of bone reconstruction cements
- manufacture of dental laboratory furnaces
- manufacture of laboratory ultrasonic cleaning machinery
- manufacture of laboratory sterilisers
- manufacture of laboratory type distilling apparatus, laboratory centrifuges
- manufacture of medical, surgical, dental or veterinary furniture, such as:
    - operating tables
    - examination tables
    - hospital beds with mechanical fittings
    - dentists' chairs
- manufacture of bone plates and screws, syringes, needles, catheters, cannulae, etc.
- manufacture of dental instruments (including dentists' chairs incorporating dental equipment)
- manufacture of artificial teeth, bridges, etc., made in dental labs
- manufacture of orthopedic and prosthetic devices
- manufacture of glass eyes
- manufacture of medical thermometers
- manufacture of ophthalmic goods, eyeglasses, sunglasses, lenses ground to prescription, contact lenses, safety goggles

This class excludes:

- manufacture of denture adhesives, see 20.42
- manufacture of medical impregnated wadding, dressings etc., see 21.20
- manufacture of electromedical and electrotherapeutic equipment, see 26.60
- manufacture of wheelchairs, see 30.92
- activities of opticians, see 47.78

Manufacturing n.e.c. (32.9)

Manufacture of brooms and brushes (32.91)

This class includes:

- manufacture of brooms and brushes, including brushes constituting parts of machines, handoperated mechanical floor sweepers, mops and feather dusters, paint brushes, paint pads and rollers, squeegees and other brushes, brooms, mops etc.
- manufacture of shoe and clothes brushes

Other manufacturing n.e.c. (32.99)

This class includes:

- manufacture of protective safety equipment
    - manufacture of fireresistant and protective safety clothing
    - manufacture of linemen's safety belts and other belts for occupational use
    - manufacture of cork life preservers
    - manufacture of plastics hard hats and other personal safety equipment of plastics (e.g. athletic helmets)
    - manufacture of firefighting protection suits
    - manufacture of metal safety headgear and other metal personal safety devices
    - manufacture of ear and noise plugs (e.g. for swimming and noise protection)
    - manufacture of gas masks
- manufacture of pens and pencils of all kinds whether or not mechanical
- manufacture of pencil leads
- manufacture of date, sealing or numbering stamps, handoperated devices for printing, or embossing labels, hand printing sets, prepared typewriter ribbons and inked pads
- manufacture of globes
- manufacture of umbrellas, sunumbrellas, walking sticks, seatsticks

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- manufacture of buttons, pressfasteners, snapfasteners, pressstuds, slide fasteners
- manufacture of cigarette lighters
- manufacture of articles of personal use: smoking pipes, scent sprays, vacuum flasks and other vacuum vessels for personal or household use, wigs, false beards, eyebrows
- manufacture of miscellaneous articles: candles, tapers and the like; artificial flowers, fruit and foliage; jokes and
- novelties; hand sieves and hand riddles; tailors' dummies; burial coffins etc.
- manufacture of floral baskets, bouquets, wreaths and similar articles
- taxidermy activities

This class excludes:

- manufacture of lighter wicks, see 13.96
- manufacture of workwear and service apparel (e.g. laboratory coats, work overalls, uniforms), see 14.12
- manufacture of paper novelties, see 17.29

Repair and installation of machinery and equipment **(33)**

This division includes the specialised repair of goods produced in the manufacturing sector with the aim to restore machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included.

This division does only include specialised repair and maintenance activities. A substantial amount of repair is also done by manufacturers of machinery, equipment and other goods, in which case the classification of units engaged in these repair and manufacturing activities is done according to the valueadded principle which would often assign these combined activities to the manufacture of the good. The same principle is applied for combined trade and repair.

The rebuilding or remanufacturing of machinery and equipment is considered a manufacturing activity and included in other divisions of this section.

Repair and maintenance of goods that are utilised as capital goods as well as consumer goods is typically classified as repair and maintenance of household goods (e.g. office and household furniture repair, see 95.24).

Also included in this division is the specialised installation of machinery. However, the installation of equipment that forms an integral part of buildings or similar structures, such as installation of electrical wiring, installation of escalators or installation of airconditioning systems, is classified as construction.

This division excludes:

- cleaning of industrial machinery, see 81.22
- repair and maintenance of computers and communications equipment, see 95.1
- repair and maintenance of household goods, see 95.2

Repair of fabricated metal products, machinery and equipment (33.1)

This group includes the specialised repair of goods produced in the manufacturing sector with the aim to restore these metal products, machinery, equipment and other products to working order. The provision of general or routine maintenance (i.e. servicing) on such products to ensure they work efficiently and to prevent breakdown and unnecessary repairs is included.

This group excludes:

- rebuilding or remanufacturing of machinery and equipment, see corresponding class in divisions 2530
- cleaning of industrial machinery, see 81.22
- repair and maintenance of computers and communications equipment, see 95.1
- repair and maintenance of household goods, see 95.2

Repair of fabricated metal products (33.11)

This class includes the repair and maintenance of fabricated metal products of division 25.

This class includes:

- repair of metal tanks, reservoirs and containers
- repair and maintenance for pipes and pipelines
- mobile welding repair
- repair of steel shipping drums
- repair and maintenance of steam or other vapour generators
- repair and maintenance of auxiliary plant for use with steam generators:

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- condensers, economisers, superheaters, steam collectors and accumulators

- repair and maintenance of nuclear reactors, except isotope separators
- repair and maintenance of parts for marine or power boilers
- platework repair of central heating boilers and radiators
- repair and maintenance of fire arms and ordnance (including repair of sporting and recreational guns)
- repair and maintenance of shopping carts

This class excludes:

- sharpening of blades and saws, see 33.12
- repair of central heating systems etc., see 43.22
- repair of mechanical locking devices, safes etc., see 80.20

Repair of machinery (33.12)

This class includes the repair and maintenance of industrial machinery and equipment like sharpening or installing commercial and industrial machinery blades and saws; the provision of welding (e.g. automotive, general) repair services; the repair of agricultural and other heavy and industrial machinery and equipment (e.g. forklifts and other materials handling equipment, machine tools, commercial refrigeration equipment, construction equipment and mining machinery), including machinery and equipment of division 28.

This class includes:

- repair and maintenance of nonmotor vehicle engines
- repair and maintenance of pumps, compressors and related equipment
- repair and maintenance of fluid power machinery
- repair of valves
- repair of gearing and driving elements
- repair and maintenance of industrial process furnaces
- repair and maintenance of lifting and handling equipment
- repair and maintenance of industrial refrigeration equipment and air purifying equipment
- repair and maintenance of commercialtype generalpurpose machinery
- repair of powerdriven handtools
- repair and maintenance of metal cutting and metal forming machine tools and accessories
- repair and maintenance of other machine tools
- repair and maintenance of agricultural tractors
- repair and maintenance of agricultural machinery and forestry and logging machinery
- repair and maintenance of metallurgy machinery
- repair and maintenance of mining, construction, and oil and gas field machinery
- repair and maintenance of food, beverage, and tobacco processing machinery
- repair and maintenance of textile apparel, and leather production machinery
- repair and maintenance of papermaking machinery
- repair and maintenance of plastic and rubber machinery
- repair and maintenance of other specialpurpose machinery of division 28
- repair and maintenance of weighing equipment
- repair and maintenance of vending machines
- repair and maintenance of cash registers
- repair and maintenance of photocopy machines
- repair of calculators, electronic or not
- repair of typewriters

This class excludes:

- installation, repair and maintenance of furnaces and other heating equipment, see 43.22
- installation, repair and maintenance of elevators and escalators, see 43.29
- repair of computers, see 95.11

Repair of electronic and optical equipment (33.13)

This class includes the repair and maintenance of goods produced in groups 26.5, 26.6 and 26.7, except those that are considered household goods.

This class includes:

- repair and maintenance of the measuring, testing, navigating and control equipment of group 26.5, such as:

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  - aircraft engine instruments
  - automotive emissions testing equipment
  - meteorological instruments
  - physical, electrical and chemical properties testing and inspection equipment
  - surveying instruments
  - radiation detection and monitoring instruments
- repair and maintenance of irradiation, electromedical and electrotherapeutic equipment of class 26.60, such as:
  - magnetic resonance imaging equipment
  - medical ultrasound equipment
  - pacemakers
  - hearing aids
  - electrocardiographs
  - electromedical endoscopic equipment
  - irradiation apparatus
- repair and maintenance of optical instruments and equipment of class 26.70, if the use is mainly commercial, such as:
  - binoculars
  - microscopes (except electron and proton microscopes)
  - telescopes
  - prisms and lenses (except ophthalmic)
  - photographic equipment

This class excludes:

- repair and maintenance of photocopy machines, see 33.12
- repair and maintenance of computers and peripheral equipment, see 95.11
- repair and maintenance of computer projectors, see 95.11
- repair and maintenance of communication equipment, see 95.12
- repair and maintenance of commercial TV and video cameras, see 95.12
- repair of householdtype video cameras, see 95.21
- repair of watches and clocks, see 95.25

Repair of electrical equipment (33.14)

This class includes the repair and maintenance of goods of division 27, except those in class group 27.5 (domestic appliances).

This class includes:

- repair and maintenance of power, distribution, and specialty transformers
- repair and maintenance of electric motors, generators, and motor generator sets
- repair and maintenance of switchgear and switchboard apparatus
- repair and maintenance of relays and industrial controls
- repair and maintenance of primary and storage batteries
- repair and maintenance of electric lighting equipment
- repair and maintenance of currentcarrying wiring devices and non currentcarrying wiring devices for wiring
- electrical circuits

This class excludes:

- repair and maintenance of computers and peripheral computer equipment, see 95.11
- repair and maintenance of telecommunications equipment, see 95.12
- repair and maintenance of consumer electronics, see 95.21
- repair of watches and clocks, see 95.25

Repair and maintenance of ships and boats (33.15)

This class includes the repair and maintenance of ships and boats. However, the factory rebuilding or overhaul of ships is classified in division 30.

This class includes:

- repair and routine maintenance of ships
- repair and maintenance of pleasure boats

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This class excludes:

- factory conversion of ships, see 30.1
- repair of ship and boat engines, see 33.12
- ship scrapping, dismantling, see 38.31

Repair and maintenance of aircraft and spacecraft (33.16)

This class includes the repair and maintenance of aircraft and spacecraft.

This class includes:

- repair and maintenance of aircraft (except factory conversion, factory overhaul, factory rebuilding)
- repair and maintenance of aircraft engines

This class excludes:

- factory overhaul and rebuilding of aircraft, see 30.30

Repair and maintenance of other transport equipment (33.17)

This class includes the repair and maintenance of other transport equipment of division 30, except motorcycles and bicycles.

This class includes:

- repair and maintenance of locomotives and railroad cars (except factory rebuilding or factory conversion)
- repair of animal drawn buggies and wagons

This class excludes:

- factory overhaul and rebuilding of locomotives and railroad cars, see 30.20
- repair and maintenance of military fighting vehicles, see 30.40
- repair and maintenance of shopping carts, see 33.11
- repair and maintenance of railway engines, see 33.12
- repair and maintenance of motorcycles, see 45.40
- repair of bicycles, see 95.29

Repair of other equipment (33.19)

This class includes the repair and maintenance of equipment not covered in other groups of this division.

This class includes:

- repair of fishing nets, including mending
- repair or ropes, riggings, canvas and tarpaulins
- repair of fertiliser and chemical storage bags
- repair or reconditioning of wooden pallets, shipping drums or barrels, and similar items
- repair of pinball machines and other coin-operated games
- restoring of organs and other historical musical instruments

This class excludes:

- repair of household and office type furniture, furniture restoration, see 95.24
- repair of bicycles, see 95.29
- repair and alteration of clothing, see 95.29

Installation of industrial machinery and equipment (33.2)

Installation of industrial machinery and equipment (33.20)

This class includes the specialised installation of machinery. However, the installation of equipment that forms an integral part of buildings or similar structures, such as installation of escalators, electrical wiring, burglar alarm systems or airconditioning systems, is classified as construction.

This class includes:

- installation of industrial machinery in industrial plant
- assembling of industrial process control equipment
- installation of other industrial equipment, e.g.:
    - communications equipment
    - mainframe and similar computers
    - irradiation and electromedical equipment etc.
- dismantling large-scale machinery and equipment
- activities of millwrights

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- machine rigging
- installation of bowling alley equipment

This class excludes:

- installation of elevators, escalators, automated doors, vacuum cleaning systems etc., see 43.29
- installation of doors, staircases, shop fittings, furniture etc., see 43.32
- installation (setting-up) of personal computers, see 62.09

C. ADDITIONAL RESULTS

1. Overall sector's impacts

The following calculations were performed using GBS 1.4.4 in April 2023. Note that, given the complexity of the subject, the methodology and results are constantly improving: the current limitations and uncertainties are detailed in Section C.3.

Table 2 provides the absolute impact of the Manufacturing sector in MSA.km² for Scope 1 and Table 3 for vertically integrated (sum of Scope 1, Scope 2, and Upstream Scope 3) results. Please note that the terrestrial static impacts related to the pressure Climate change are not included in this section. They are presented in a specific focus in section 5 "Terrestrial static Climate change calculation" but are not included in the rest of the annex.

The aquatic dynamic results are included in the following tables to compute aggregated scores in MSAppb*/bEUR but they are not reported in the rest of the results due to uncertainty. Please refer to section 3 Limits and uncertainties for further information about uncertainties.

Table 2: Absolute Scope 1 biodiversity impact of the Manufacturing sector by category of industry, computation with GBS 1.4.4

Realm	Accounting category	Scope 1 impact in MSA.km²					
		Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronics, vehicles and machinery	Tobacco, rubber and plastic	Other manufactu-ring
Terrestrial	Static	4 400	11 000	2 300	1 500	1 200	870
	Dynamic	1 300	1 600	15 000	1 500	960	1 200
Aquatic	Static	99	490	68	60	55	44
	Dynamic	14	18	150	15	10	12

Table 3: Absolute vertically integrated biodiversity impact of the Manufacturing sector by category of industries, computation with GBS 1.4.4

Realm	Accounting category	Vertically integrated impact in MSA.km²					
		Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronics, vehicles and machinery	Tobacco, rubber and plastic	Other manufactu-ring
Terrestrial	Static	1 200 000	2 000 000	640 000	1 400 000	910 000	640 000
	Dynamic	11 000	19 000	33 000	25 000	8 400	7 700
Aquatic	Static	90 000	110 000	49 000	110 000	84 000	44 000
	Dynamic	*310*	*340*	*510*	*600*	*310*	*190*

1.1 Impact intensities of the benchmark sector

Table 4 below displays the Scope 1 biodiversity impact figures of the manufacturing sector, and Table 5 displays the vertically integrated figures. The results are expressed as contributions in MSA.m²/kEUR to the intensity of benchmark sector. Table 6 and Table 7 present the contributions of each manufacturing category (Textiles, leather and fur; Paper and wood products; Mineral and petroleum products; Electronics, vehicles and machinery; Tobacco, rubber and plastic; Other) to the overall benchmark sector intensity. They are computed by dividing the impacts of each industry in MSA.m² by the turnover of the benchmark sector. The results are also converted into MSAppb per bEUR and are then aggregated to MSAppb* per bEUR (See 2.3 for methodology).

As mentioned previously, the tables and figures of the overall sector's impacts and Breakdown by EXIOBASE industries sections do not include the terrestrial static results for the pressure Climate change. Those impacts are assessed in the specific section 5 Terrestrial static Climate change calculation.

Table 4: Scope 1 impact intensities for the Manufacturing sector, computation with GBS 1.4.4

Realm	Accounting category	Footprint in MSA.m²/kEUR of the sector	Footprint in MSAppb/bEUR	Aggregated score in MSAppb*/bEUR
Terrestrial	Static	1.1	8.1	9.8
	Dynamic	1.1	8.4	
Aquatic	Static	0.04	4.1	
	Dynamic	0.01	1.1	

Table 5: Vertically integrated impact intensities for the Manufacturing sector, computation with GBS 1.4.4

Realm	Accounting category	Footprint in MSA.m²/kEUR of the sector	Footprint in MSAppb/bEUR	Aggregated score in MSAppb*/bEUR
Terrestrial	Static	350	2 700	150
	Dynamic	5.4	40	
Aquatic	Static	25	2 400	
	Dynamic	0.12	11	

Table 6: Scope 1 impact contribution to the intensity of the Manufacturing sector, computation with GBS 1.4.4

Category of industries	Realm	Accounting category	Contributions in MSA.m²/kEUR to the benchmark sector	Contributions in MSAppb/bEUR	Contributions to the aggregated score in MSAppb*/bEUR
Textiles. leather and fur	Terrestrial	Static	2.3	18	1.2
		Dynamic	0.71	5.3	
	Aquatic	Static	0.052	5.1	
		Dynamic	0.0016	0.7	
Paper and wood products	Terrestrial	Static	9.4	71	15
		Dynamic	1.4	11	
	Aquatic	Static	0.44	43	
		Dynamic	0.016	1.6	
Mineral and petroleum products	Terrestrial	Static	0.71	5.3	39
		Dynamic	4.6	34	
	Aquatic	Static	0.020	2	
		Dynamic	0.045	4.4	
Electronics. vehicles and machinery	Terrestrial	Static	0.16	1.2	1.4
		Dynamic	0.16	1.2	
	Aquatic	Static	0.0063	0.61	
		Dynamic	0.0016	0.16	
Tobacco. rubber and plastic	Terrestrial	Static	0.77	5.8	5.5
		Dynamic	0.62	4.6	
	Aquatic	Static	0.035	3.4	
		Dynamic	0.0062	0.6	
Other manufactu-ring	Terrestrial	Static	0.45	3.4	5.3
		Dynamic	0.62	4.6	
	Aquatic	Static	0.023	2.2	
		Dynamic	0.0062	0.6	

Table 7: Vertically integrated impact intensities for the Manufacturing sector, computation with GBS 1.4.4

Category of industries	Realm	Accounting category	Contributions in MSA.m²/kEUR to the benchmark sector	Contributions in MSAppb/bEUR	Contributions to the aggregated score in MSAppb*/bEUR
Textiles. leather and fur	Terrestrial	Static	660	4 900	250
		Dynamic	5.8	43	
	Aquatic	Static	47	4 600	
		Dynamic	0.17	16	
Paper and wood products	Terrestrial	Static	1 800	13 000	610
		Dynamic	17	130	
	Aquatic	Static	96	9 300	
		Dynamic	0.30	30	

Category of industries	Realm	Accounting category	Contributions in MSA.m²/kEUR to the benchmark sector	Contributions in MSAppb/bEUR	Contributions to the aggregated score in MSAppb*/bEUR
Mineral and petroleum products	Terrestrial	Static	190	1 500	150
		Dynamic	10	75	
	Aquatic	Static	15	1400	
		Dynamic	0.15	15	
Electronics. vehicles and machinery	Terrestrial	Static	150	1 100	71
		Dynamic	2.7	20	
	Aquatic	Static	11	1100	
		Dynamic	0.062	6.1	
Tobacco. rubber and plastic	Terrestrial	Static	580	4 400	250
		Dynamic	5.4	41	
	Aquatic	Static	54	5200	
		Dynamic	0.20	20	
Other manufactu-ring	Terrestrial	Static	330	2 500	130
		Dynamic	4.0	29	
	Aquatic	Static	23	2 200	
		Dynamic	0.10	9.3	

1.2 Terrestrial static impacts

The figures below do not include the static impacts due to Climate change.

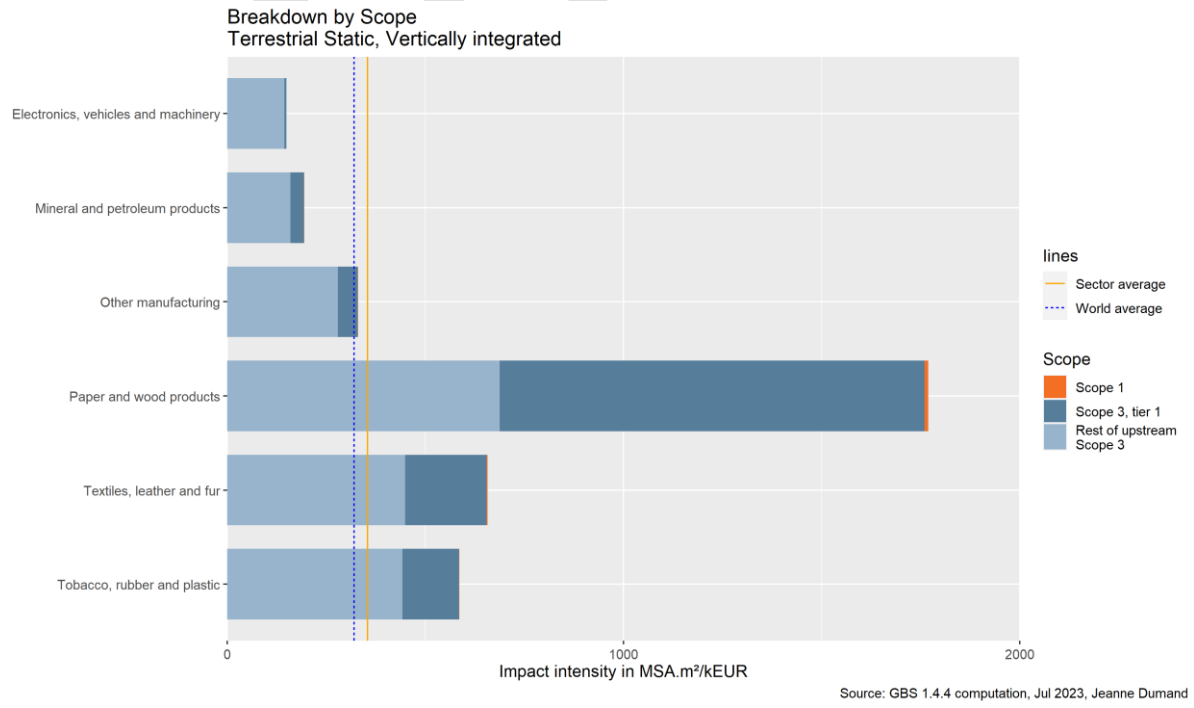

Figure 6: Vertically integrated terrestrial static intensities, by manufacturing category and by Scope (in MSA.m²/kEUR of each manufacturing category turnover)

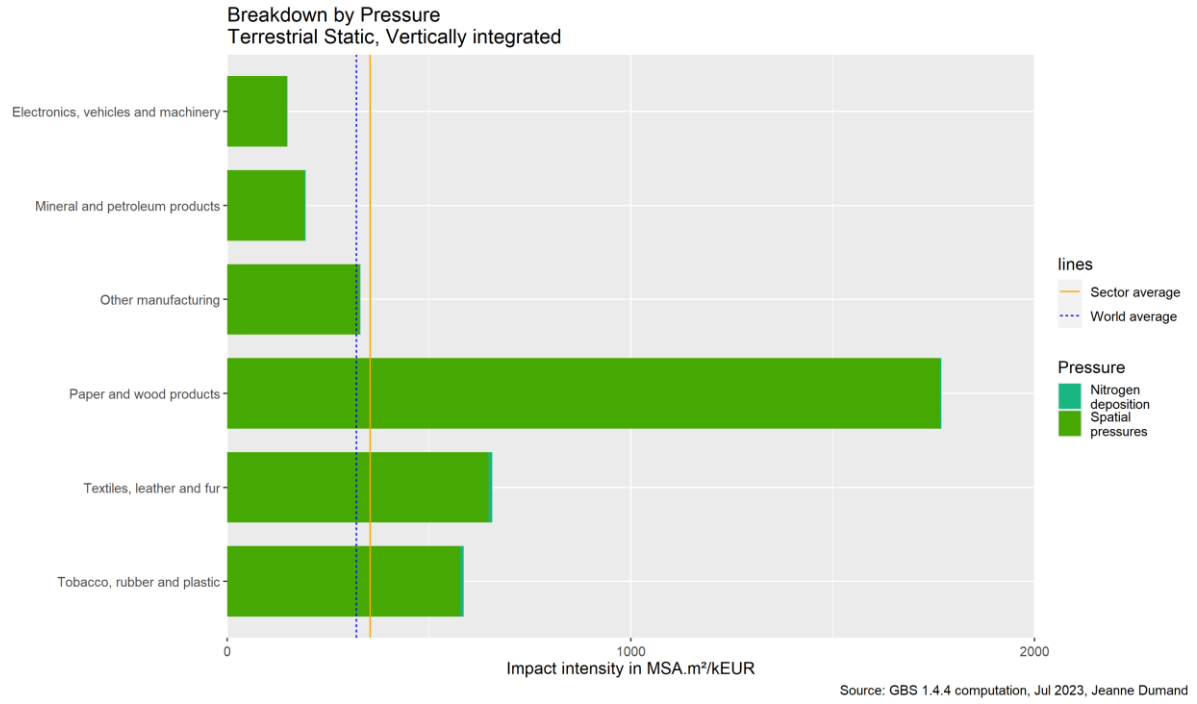

Figure 7: Vertically integrated terrestrial static intensities, by manufacturing category and by pressures (in MSA.m²/kEUR of each manufacturing category turnover)

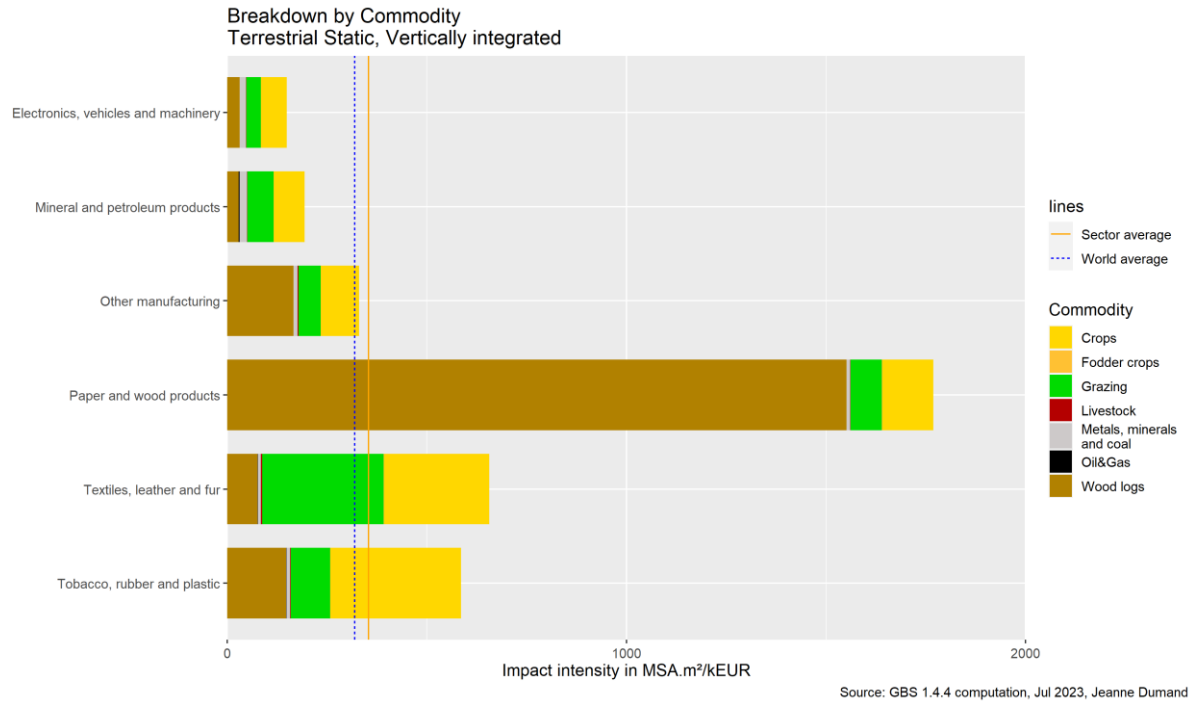

Figure 8: Vertically integrated terrestrial static intensities, by manufacturing category and by commodity (in MSA.m²/kEUR of each manufacturing category turnover)

The terrestrial static impacts of the Paper and wood products category are significantly larger than those of the other manufacturing industries. Most of the Paper and wood products category impacts come from wood impacts, and they occur in the upstream value chain. However, the turnover of the Paper and wood products category is the lowest of all categories, accounting for only 5.8 % of the entire factsheet sector's turnover. On the contrary, the Electronics, vehicles and machinery category, with the lowest terrestrial static impacts of the sector, accounts for almost half of the turnover of the entire manufacturing sector (49.2 %). This tends to decrease the impact in MSA.m²/kEUR of the Paper and wood products category compared to the other categories with higher turnover. In the same logic, it increases the impact in MSA.m²/kEUR of the Electronics, vehicles and machinery category.

Moreover, because of the important terrestrial impacts of the Paper and wood products category, it is legitimate to consider whether sustainable forest management practices for the wood logging sector, which represents most of the impact of the category (see Figure 8), result in a reduction of biodiversity loss. This problematic was studied for the benchmark factsheet Raw materials extraction. The GBS 1.4.4 (and its wood logs CommoTool) does not account for differences between sustainable and non-sustainable wood, and because of data availability limitations, only "business as usual" management is retained in its current impact factors. However, there is evidence in the literature that good forest management practices can lead to beneficial effects on conserving forest biodiversity. For further details, please check the corresponding section in the technical annex of the Raw materials extraction sector.

Attention needs also to be paid to spatial pressures. The impacts of the Mineral and petroleum products category, as for the other categories, occur mostly in upstream Scope 3, meaning raw materials supplies are responsible for the impacts. However, the raw materials for the Mineral and petroleum products category mostly come from mining and petroleum extraction, which is operating at a completely different scale than the forestry areas supplying the Paper and wood products category. This is especially important to keep in mind, especially when the mineral and petroleum products category seems to have a small spatial impact, as the metric used in this factsheet is expressed in km^2 of surface land.

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1.3 Terrestrial dynamic impact

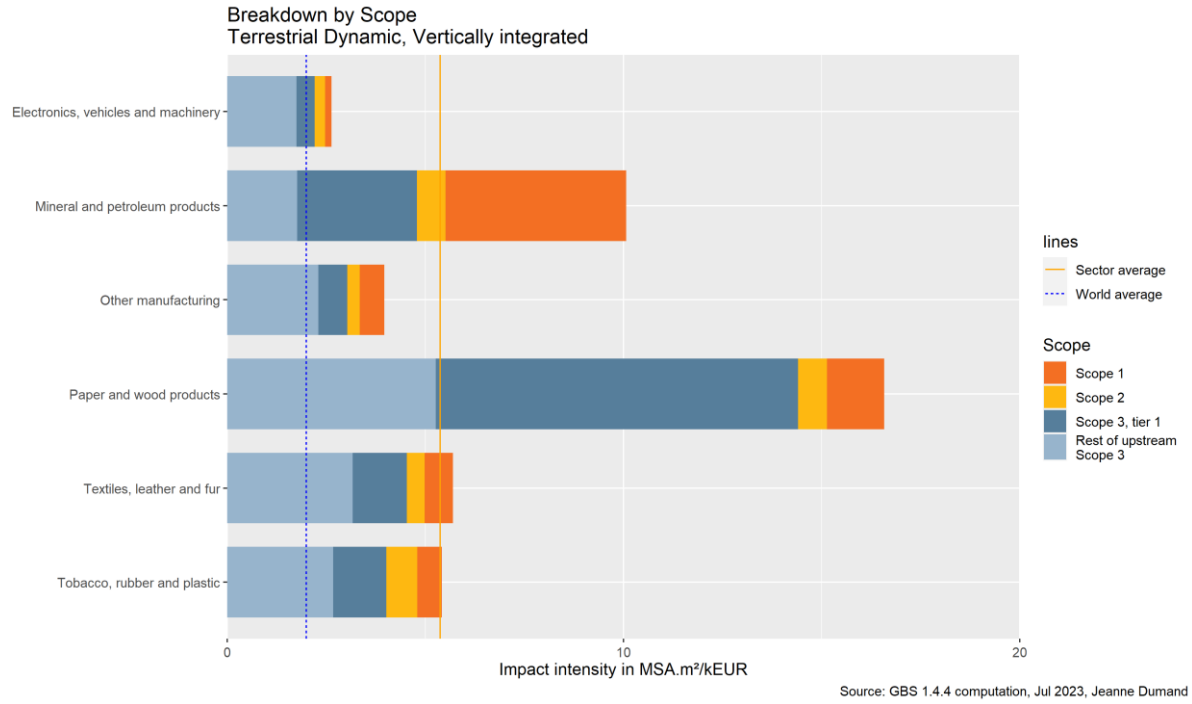

Figure 9: Vertically integrated terrestrial dynamic intensities, by manufacturing category and by Scope (in MSA.m²/kEUR of each manufacturing category turnover)

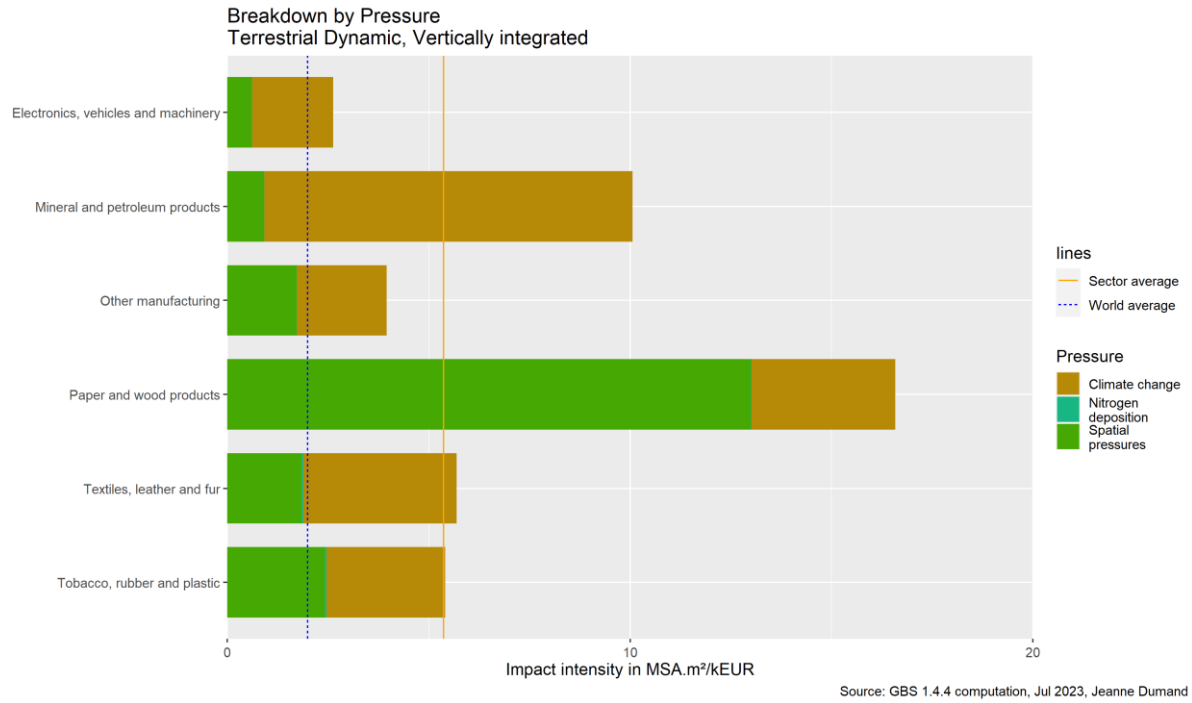

Figure 10: Vertically integrated terrestrial dynamic intensities, by manufacturing category and by pressures (in MSA.m²/kEUR of each manufacturing category turnover)

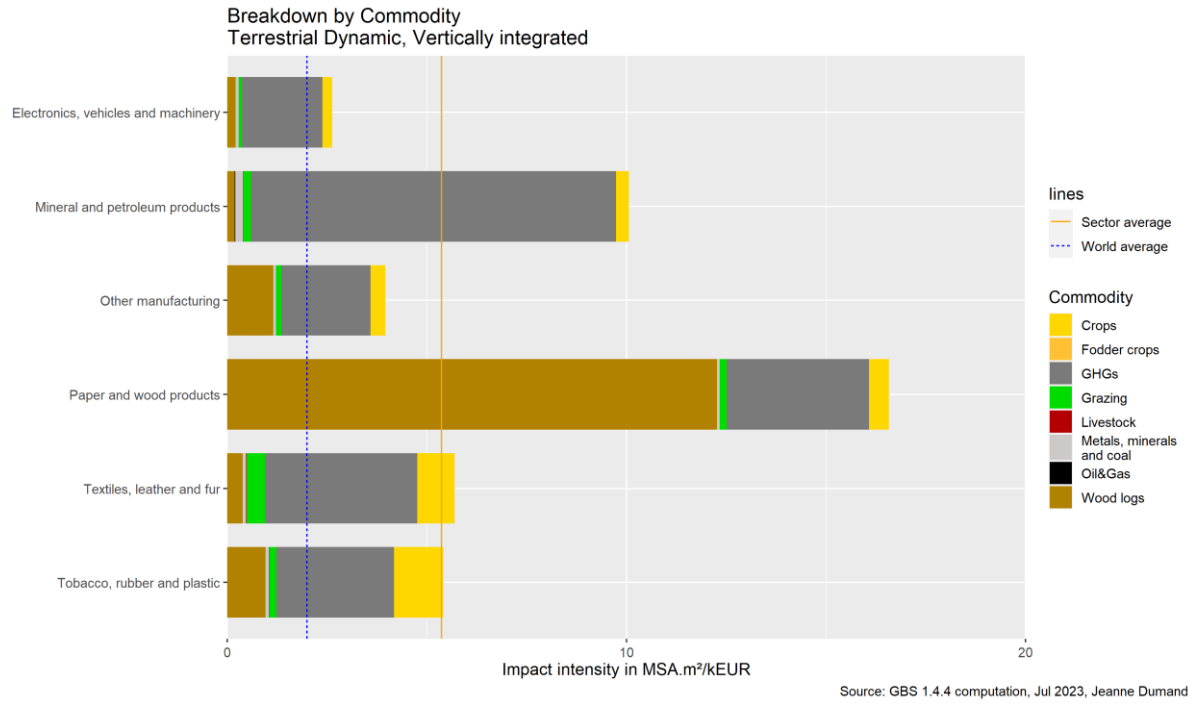

Figure 11: Vertically integrated terrestrial dynamic intensities, by manufacturing category and by commodity (in MSA.m²/kEUR of each manufacturing category turnover)

The terrestrial dynamic impacts of the manufacturing sector occur at all levels of the value chain. Indeed, manufacturing industries require a lot of energy to operate. They are responsible for around 35 % of global electricity use (United Nations Environment Programme 2011).

Except for the Paper and wood category, the terrestrial dynamic impacts of the manufacturing sector are mainly related to GHG emissions and the pressure Climate Change. Significant emissions occur at the factory level in many manufacturing industries, with stack emissions (CBD 2018). It is especially the case for the dynamic impacts of the Mineral and petroleum products category, which are largely related to GHGs. If manufacturing industries are responsible for 25 % (6.7Gt) of total world emissions, 27 % of those manufacturing emissions come from non-metallic minerals, and principally cement (United Nations Environment Programme 2011). Please note that the use and combustion of petroleum products are included neither in the perimeter of this factsheets and thus nor in the results.

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1.4 Aquatic static impact

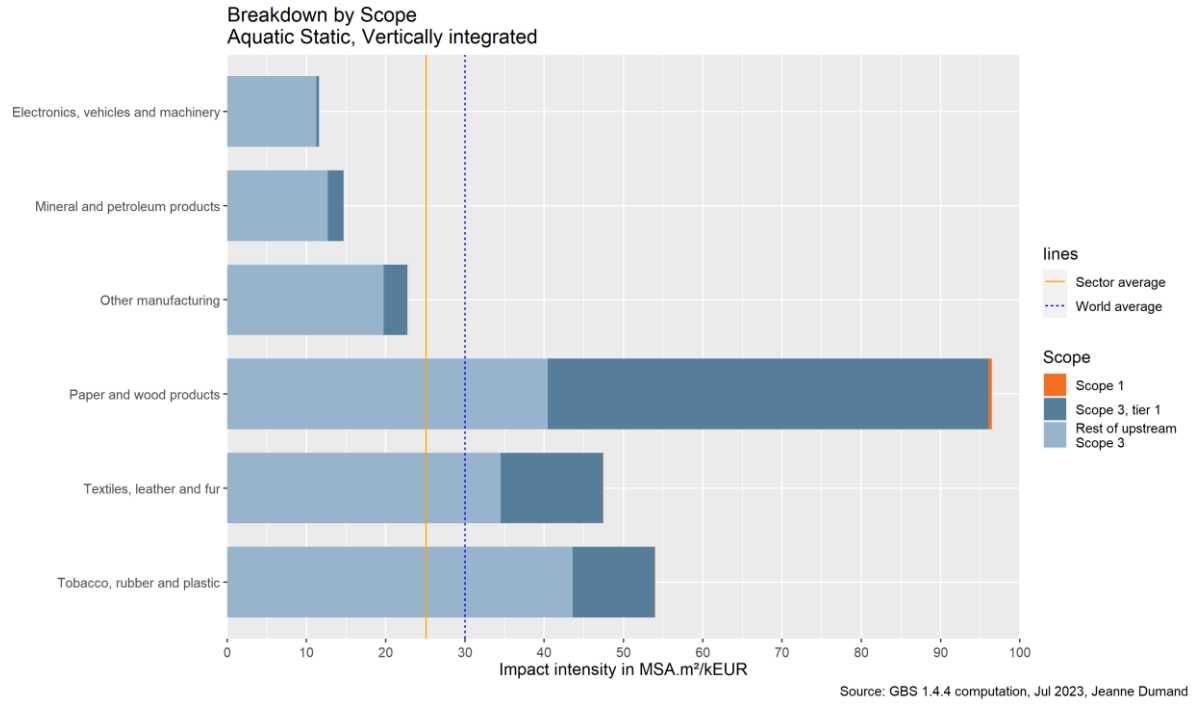

Figure 12: Vertically integrated aquatic static intensities, by manufacturing category and by Scope (in MSA.m²/kEUR of each manufacturing category turnover)

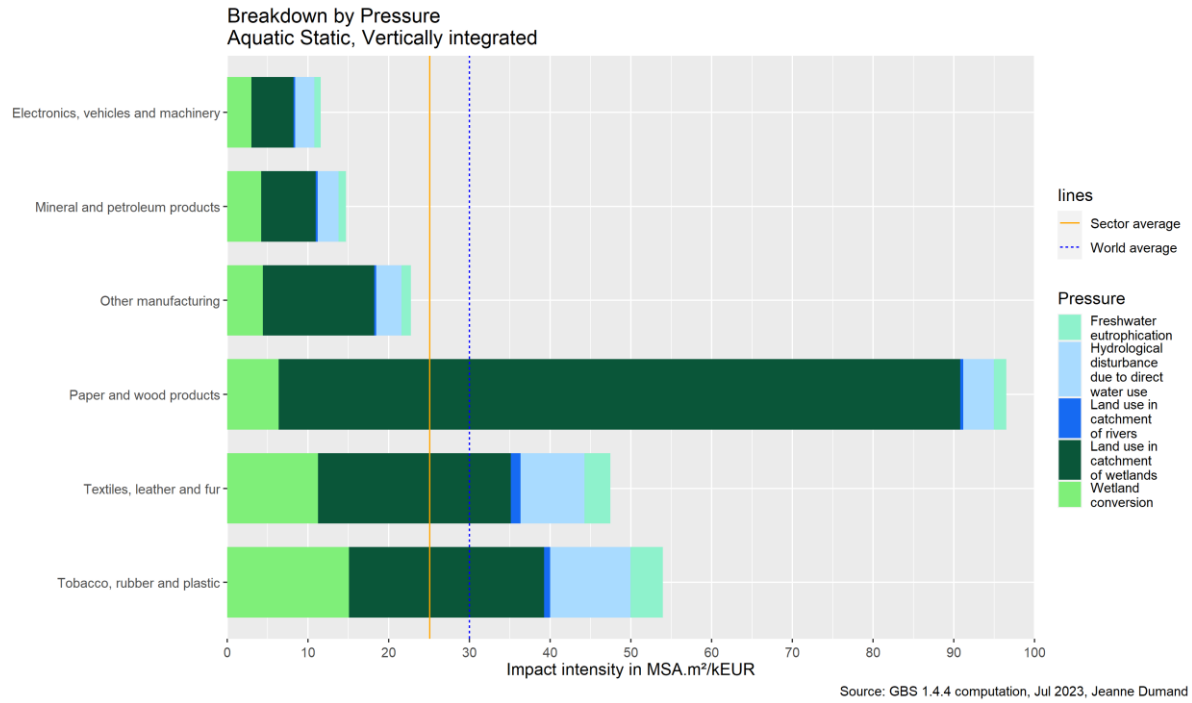

Figure 13: Vertically integrated aquatic static intensities, by manufacturing category and by pressure (in MSA.m²/kEUR of each manufacturing category turnover)

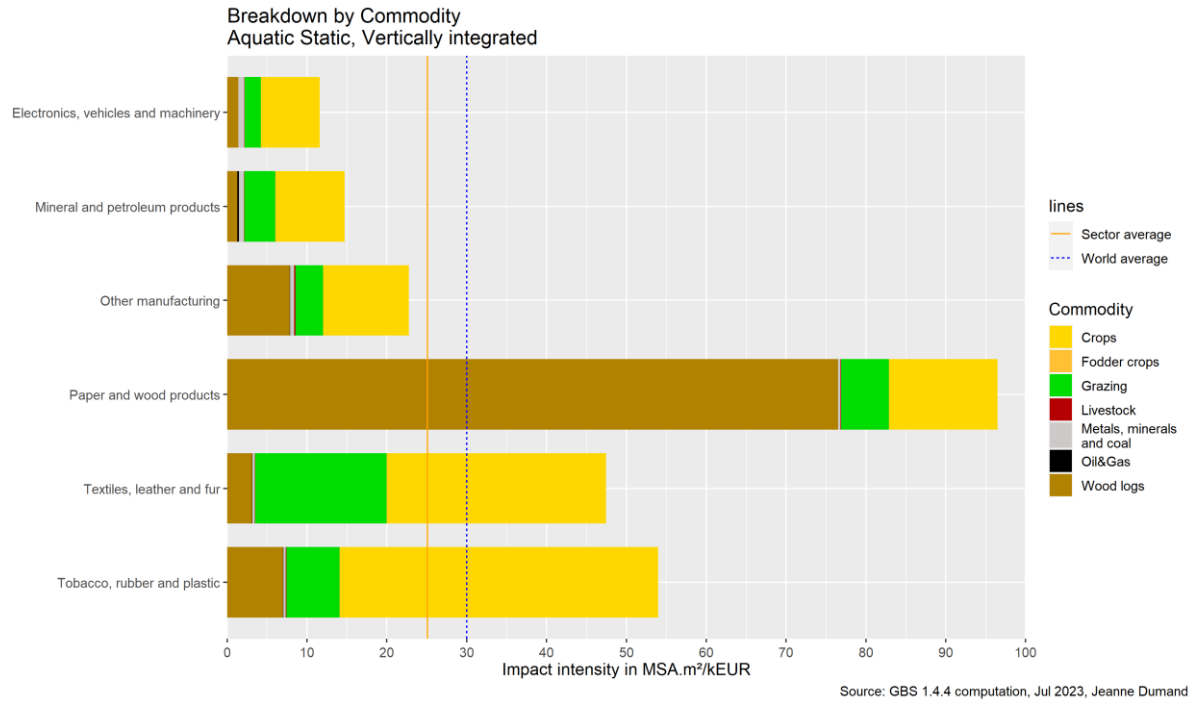

Figure 14: Vertically integrated aquatic static intensities, by manufacturing category and by commodity (in MSA.m²/kEUR of each manufacturing category turnover)

The vertically integrated aquatic static impacts are of the same order of magnitude as the terrestrial static impacts (2 400 MSAppb/bEUR for aquatic static and 2 700 MSAppb/bEUR for terrestrial static) as can be seen in Table 5. Therefore, they should not be overlooked. The impacts are mainly due to pollution pressures, in particular Land use in catchment of wetlands.

Moreover, due to GBS limitations, some aquatic pressures are not covered for some commodities, meaning the impacts on freshwater ecosystems is likely to be under-estimated. This is the case for the Wetland conversion pressure, which is not assessed for livestock husbandry, grazing and wood logs; and the Hydrological disturbance due to climate change, which is not assessed for wood logs. The Freshwater eutrophication is considered negligible for mining and mineral processing and for wood logs but is not assessed for livestock husbandry, where it could have a significant impact. The underestimation of impacts could be especially important for industry categories relying on wood logs, grazing and livestock husbandry such as the manufacturing of Paper and wood products and of Textiles, leather and fur.

Additionally, for manufacturing sectors relying on agriculture and forestry in their supply chain, indirectly rely on green and blue water. . Blue water refers to water from rivers, lakes and underground aquifers used for irrigation and industrial purposes or domestic water use. Green water on the other hand refers to the water from precipitation that does not run off or recharge the groundwater but is stored in the root zone of soil and used by plants for growth. However, the impacts of green water are not quantified by the GBS for the pressure Hydrological disturbance due to direct water use (HD_{water}), partly due to a lack of available satisfying method to dimension them. Consequently, the risks related to the pressure HD_{water} are likely to be underestimated. A specific focus on this matter can be found in the benchmark factsheet annex of the Raw materials extraction sector, for further details please refer to it.

2. Breakdown by EXIOBASE industries

In this section, the results are presented in MSA.m²/kEUR of the 2011 turnover of the EXIOBASE industry *i.e.*, for each industry the impact in MSA.m² is divided by the turnover of the corresponding industry. This allows the different industries to position themselves within the benchmark sector. The terrestrial static results do not include the results associated with the pressure Climate change.

2.1 Breakdown by Scope

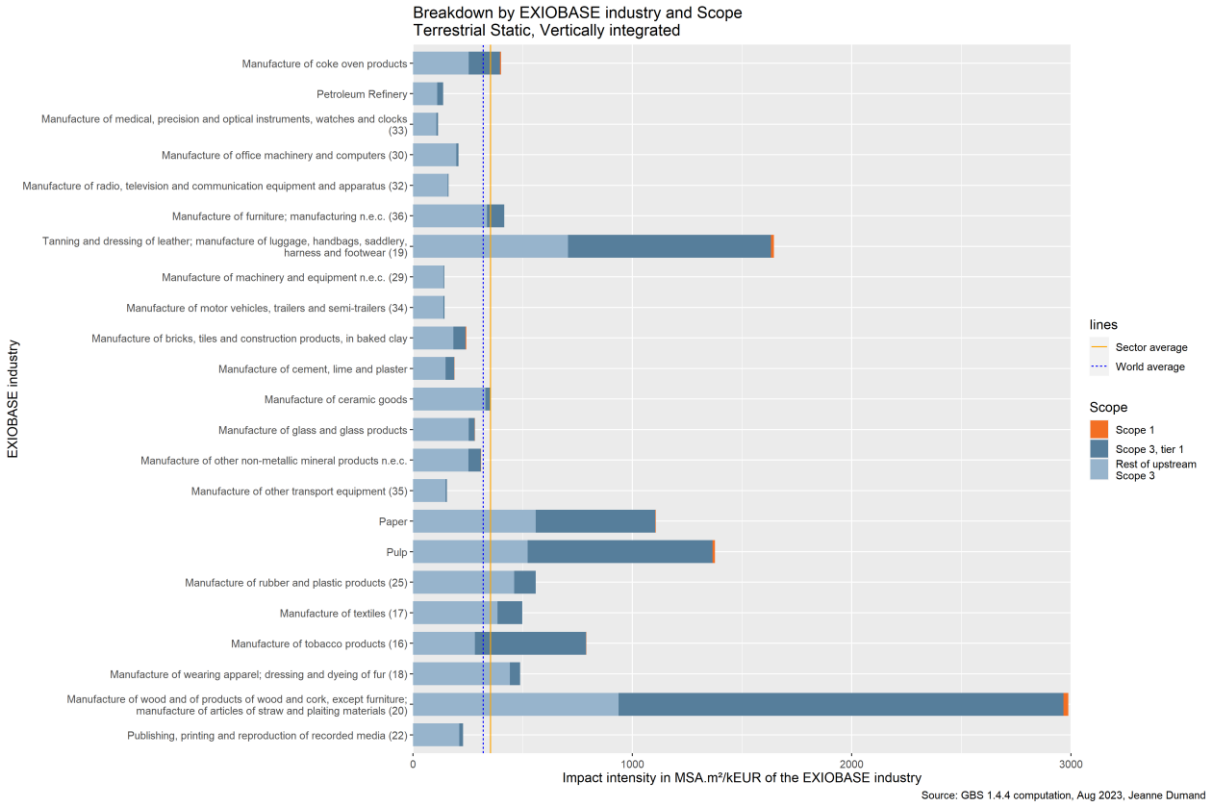

Figure 15: Breakdown by EXIOBASE industry and Scope, Terrestrial static, vertically integrated, results by kEUR of each industry turnover.

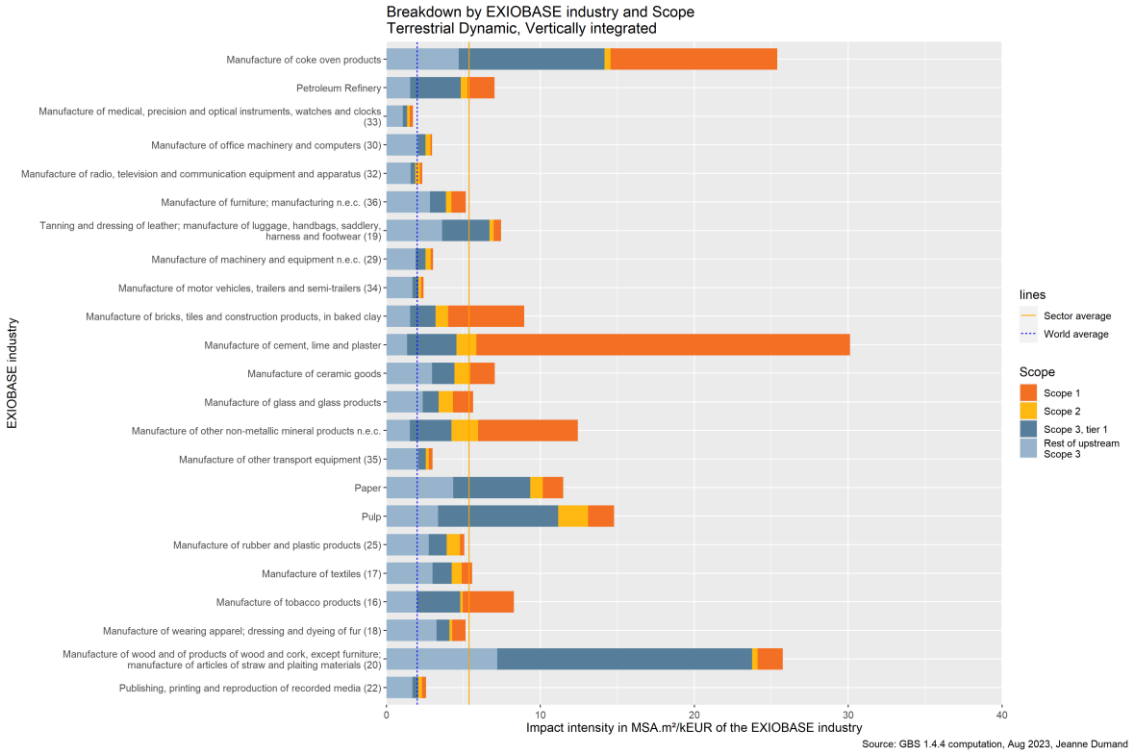

Figure 16: Breakdown by EXIOBASE industry and Scope, Terrestrial dynamic, vertically integrated, results by kEUR of each industry turnover.

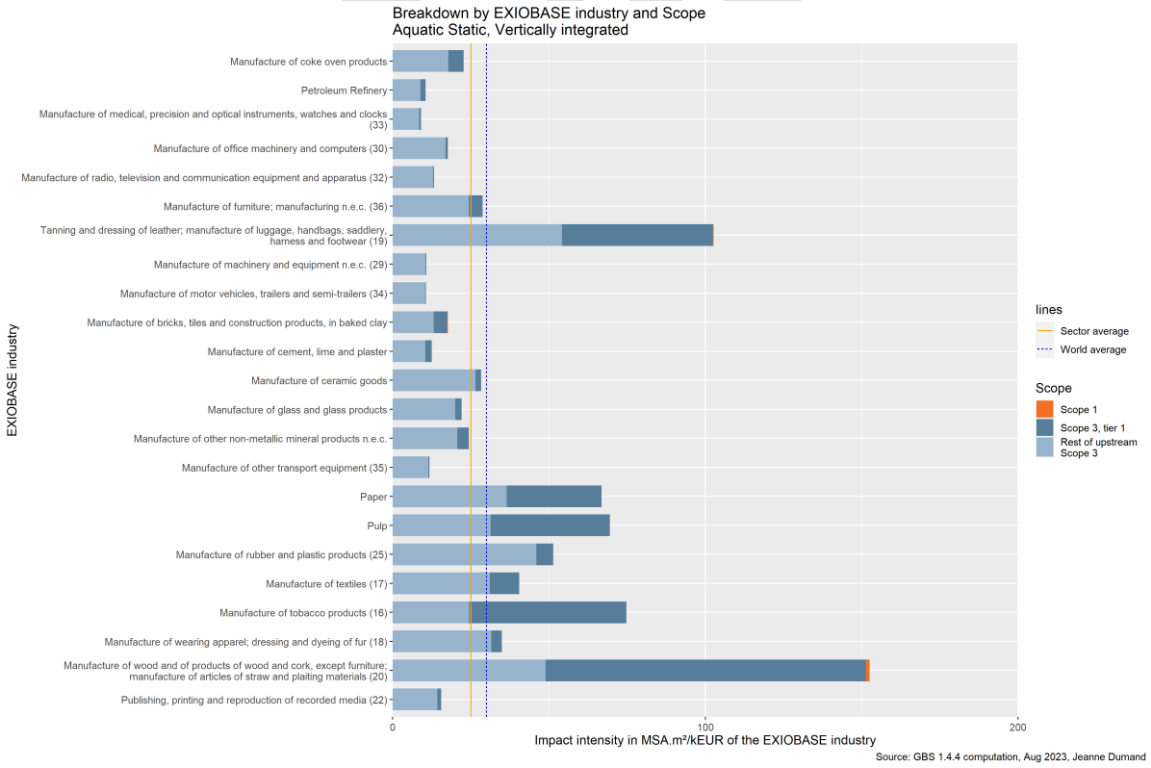

Figure 17: Breakdown by EXIOBASE industry and Scope, Aquatic static, vertically integrated, results by kEUR of each industry turnover.

The static terrestrial and aquatic impacts of all manufacturing industries of the perimeter are almost entirely attributed to upstream Scope 3. More precisely, a significant part of the impacts occurs at the rest of upstream Scope 3, where manufacturers may have a limited level of influence.The upstream value chain (Scope 3) biodiversity impacts of manufacturing industries are linked to manufacturing inputs and suppliers of raw materials. Indeed, the productions of raw materials are responsible for significant biodiversity impacts, especially those related to habitat loss or degradation (CBD 2018), such as agriculture or forestry based raw materials, often associated with deforestation. Besides, habitat loss and degradation are the biggest single source of pression on biodiversity worldwide (Secretariat of the Convention on Biological Diversity 2010). As it can be seen in section 1.3 Terrestrial dynamic impact, the dynamic impacts are more nuanced than the static impacts scope-wise. A significant part of the dynamic impacts is attributed to the direct operations of the manufacturing industries (Scope 1), especially for mineral and petroleum manufacturing industries. Similarly, the impacts of the EXIOBASE industry Manufacture of cement, lime and plaster occur mainly at Scope 1 level.

2.2 Breakdown by pressure

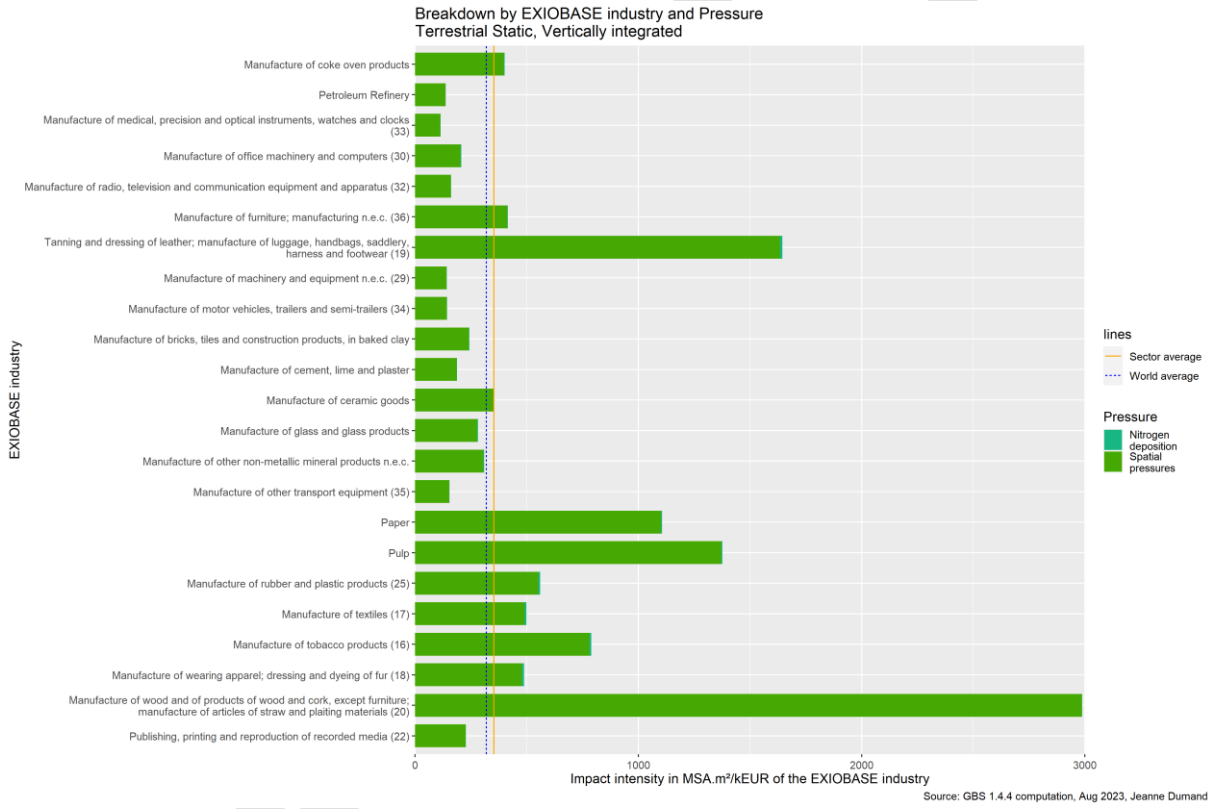

Figure 18: Breakdown by EXIOBASE industry and pressure, Terrestrial static, vertically integrated, results by kEUR of each industry turnover.

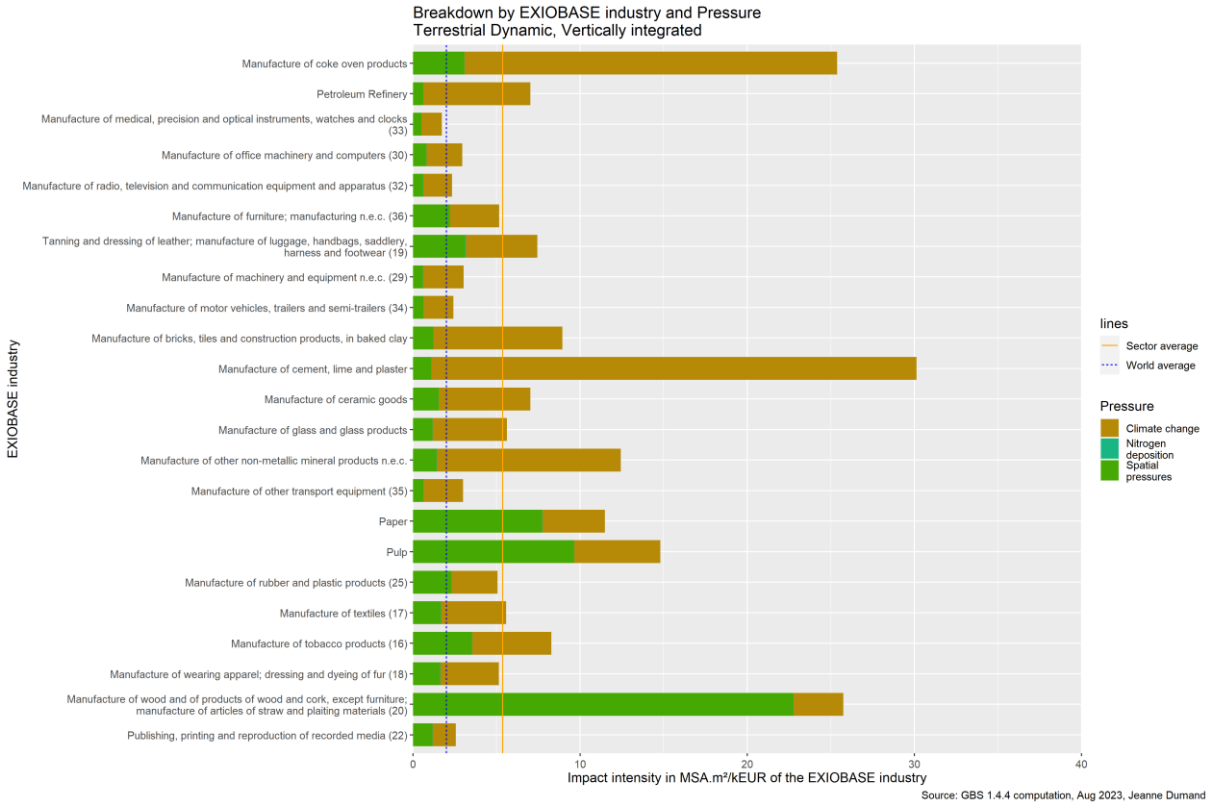

Figure 19: Breakdown by EXIOBASE industry and pressure, Terrestrial dynamic, vertically integrated, results by kEUR of each industry turnover.

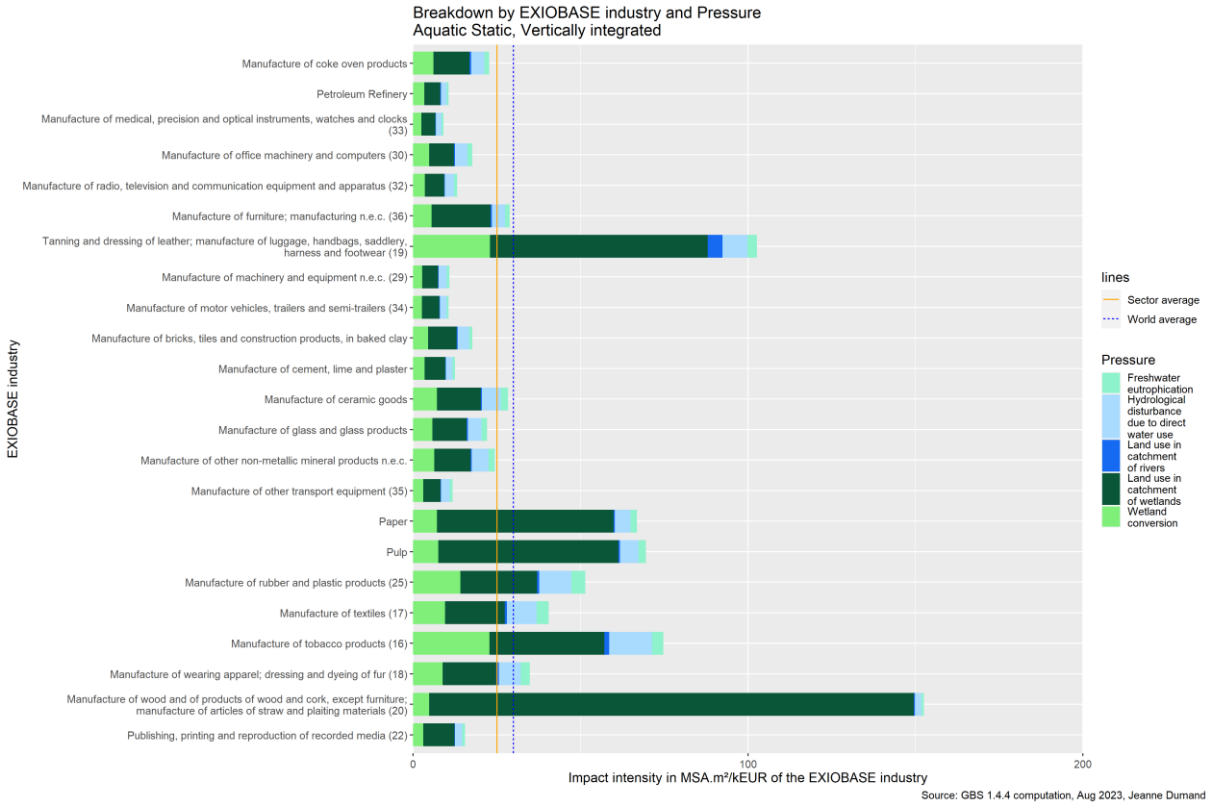

Figure 20: Breakdown by EXIOBASE industry and pressure, Aquatic static, vertically integrated, results by kEUR of each industry turnover.

Spatial pressures are the main drivers of terrestrial static impacts and are particularly high for the industry Manufacture of wood and of products of wood[1]. Indeed, plantations and forests used for production require a lot of land surface, as they cover respectively 1.3 and 11.5 million km^2 (FAO 2020). Please note that the static climate change impacts are not included in the graphs and are computed separately in section 5 Terrestrial static Climate change calculation.

Regarding terrestrial dynamic pressures, the same global conclusions than for the categories (section 1.3 Terrestrial dynamic impact) can be drown at the EXIOBASE industry level. Climate change is the main pressure for most manufacturing industries, except for wood-based industries that produce paper, pulp or wood products, where Spatial pressures, linked to forestry activities, are the main pressures. Particularly high Climate change pressures are associated with the Manufacture of cement, lime and plaster industry. Indeed, the burning of fossil fuels to create the energy required for the cement manufacturing process causes this industry to emit roughly 7 % of the worldwide CO_2 emissions (Ali, Saidur, and Hossain 2011).

The Tanning and dressing of leather industry and the Manufacture of wood and of products of wood industry are the ones with the highest aquatic impacts. Their impacts are mostly caused by wetlands related pressures, and especially the land use in catchment of wetlands pressure, which is related to pollution The value chain of such industries are closely associated with agricultural practices which are typically linked to non-point source pollution, resulting in significant risks to freshwater ecosystems (CBD 2018).

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[1] For readability reasons, the EXIOBASE industry “Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (20)” will be called “Manufacture of wood and of products of wood” in the rest of this annex.

2.3 Breakdown by commodity

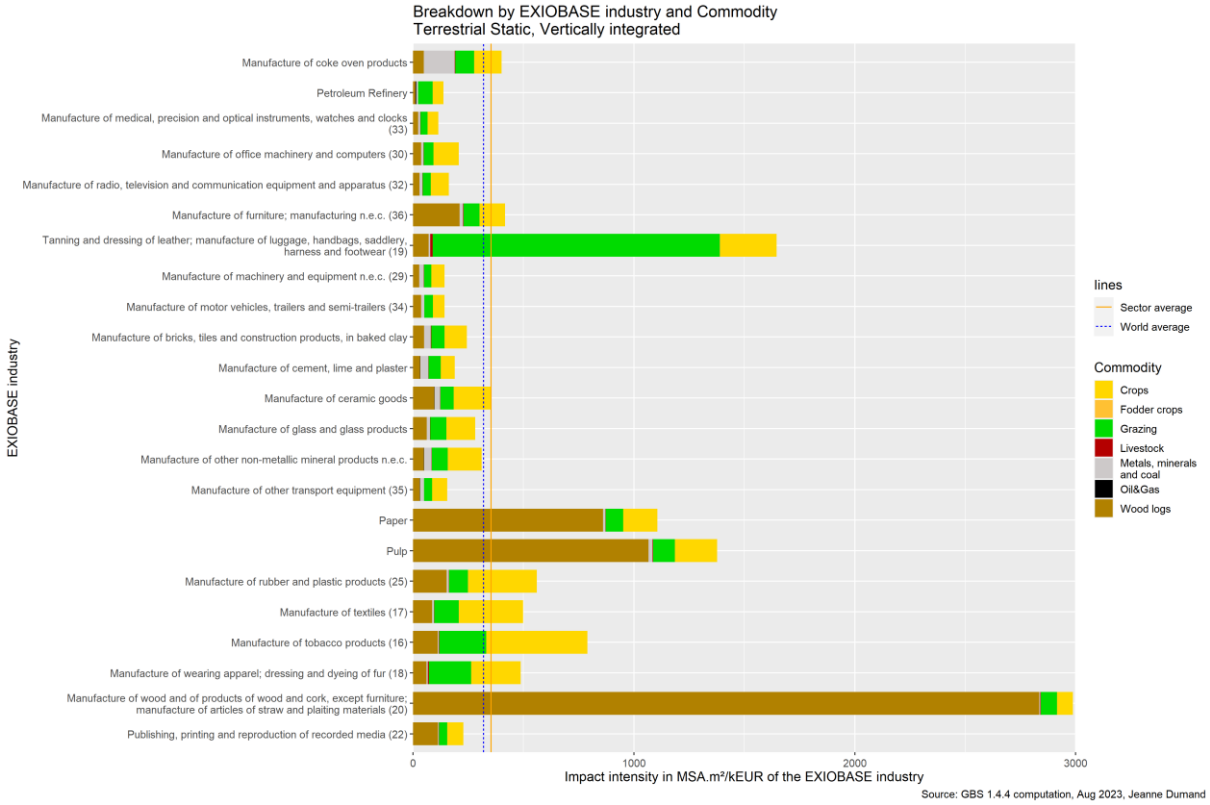

Figure 21: Breakdown by EXIOBASE industry and commodity, Terrestrial static, vertically integrated, results by kEUR of each industry turnover.

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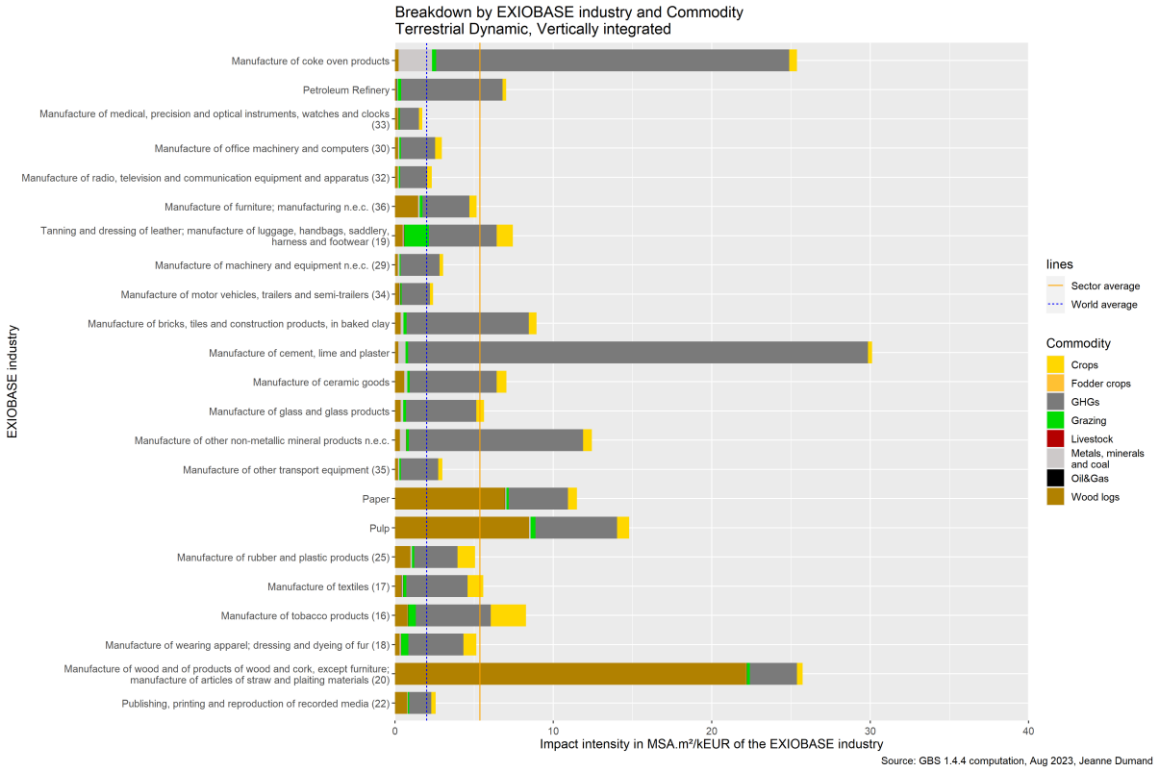

Figure 22: Breakdown by EXIOBASE industry and commodity, Terrestrial dynamic, vertically integrated, results by kEUR of each industry turnover.

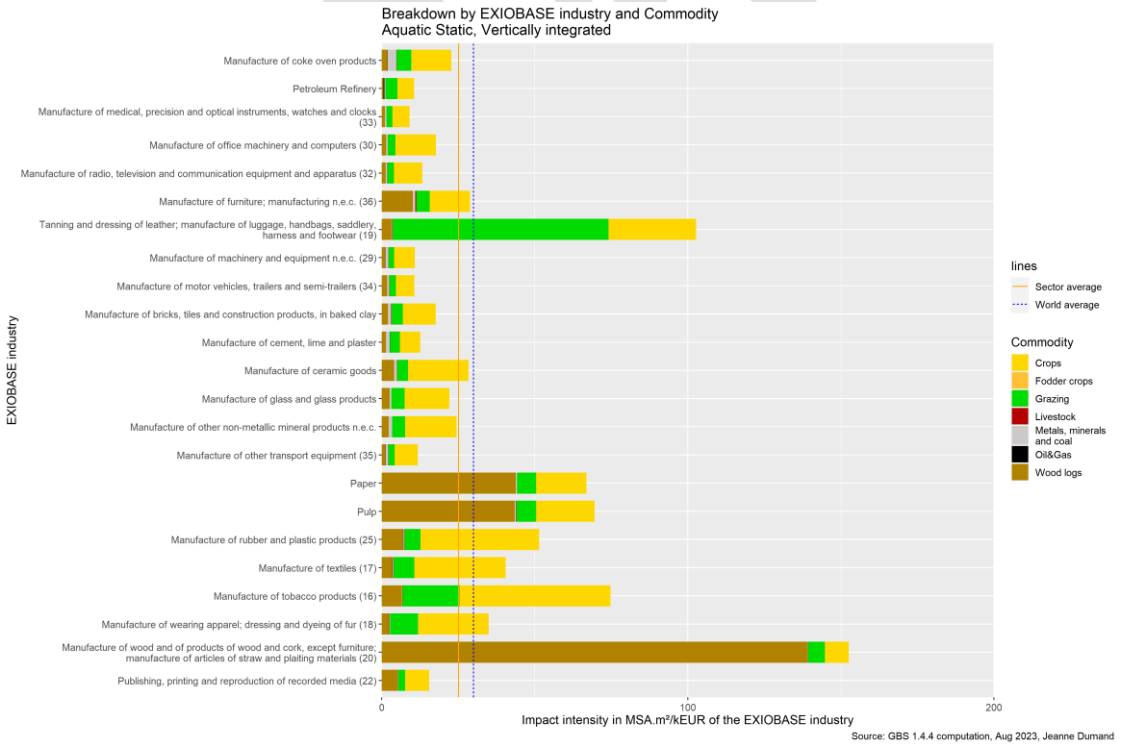

Figure 23: Breakdown by EXIOBASE industry and commodity, Aquatic static, vertically integrated, results by kEUR of each industry turnover.

Unsurprisingly and following the previous conclusions, the impacts of wood-based industries that produce paper, pulp or wood products are mostly associated with wood logs.

The impacts from the Tanning and dressing of leather industry are mainly associated with grazing and crops. The crops and grazing impacts come from the feeding supplies or grazing directly that make up the rations for leather producing cattle. The impacts associated to "Livestock" are those related to the buildings and emissions directly related to livestock husbandry (but not to the feed, which are covered by Crops and Grazing).

Particular attention needs to be paid to industries with a terrestrial static impact near the world average, for industries which do not rely on biomass supply. This is the case for the "Manufacture of ceramic goods", "Manufacture of glass and glass products", and "Manufacture of other non-metallic mineral products" EXIOBASE industries. A significant proportion of the static impacts is caused by crops and grass commodities, which does not seem consistent. Among potential sources of error, one concerns possible inaccuracies in EXIOBASE purchases. In all cases, these impacts are not material compared to other sectors (*e.g.,* the crops and grass impact for the Cattle Farming sector within the industry group "Manufacture of food & beverage").

3. Limits and uncertainties

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

The EXIOBASE industries grouping into categories was manually performed to ease the analysis and reading of this benchmark. The proposed grouping gathers industries with similar biodiversity issues and challenges, or using the same types of inputs for manufacturing processes (*i.e.*, biomass, electronic pieces, extractive raw materials…)

GBS calculations do not cover the downstream impacts of manufacturing industries, due to a lack of available data and method to track the use and disposal / end-of-life of produced manufactured goods. However, it is important to remember that those steps can also have a significant impact on biodiversity. For the Textiles, leather and fur industries for example, the consumers' cleaning and caring habits as well as limited reuse or recycling of wearing apparel contribute to significant impacts (Aiama et al. 2016).Additionally, the pressure Ecotoxicity is not included in the results because of intrinsic difficulties in modelling that generate higher uncertainties. The aquatic dynamic results also have a high uncertainty and are therefore only presented in the Overall sector's impacts section for the computation of aggregated scores in MSAppb*/bEUR.

4. Sector's dependencies

In this section are presented the results on the Manufacturing sector's dependencies, including a breakdown by EXIOBASE industries. A detailed methodology for calculating dependencies is available in 2.4. Please note that for readability purposes, the EXIOBASE industries' names are shortened in the following dependencies graphs.

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Figure 24: Scope 1 dependency scores by EXIOBASE industry, based on ENCORE data

For now, Scope 1 dependencies are not computed for the manufacturing industries “Pulp” and “Manufacture of ceramic goods”. This is because ENCORE does not provide any information on ecosystem services dependencies for the manufacture of these products.

The results are presented by categories in Table 8. They are calculated by weighting the dependency score of each category’s EXIOBASE industries by their turnover for the six categories previously mentioned. The turnover of the industries not covered by ENCORE are not included in the calculation.

Table 8: Average ecosystem services dependency scores of the Manufacturing sector for Scope 1

	Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronics, vehicles and machinery	Tobacco, rubber and plastic	Other manufactu-ring
Average dependency score Scope 1	25 %	12 %	13 %	19 %	26 %	13 %

Essentially, all the industries of the Manufacturing sector are dependent on ecosystem services. The most dependent categories are “Textiles, leather and fur” (25 %) and “Tobacco, rubber and plastic” (26 %). More precisely, the industries with the highest average dependency score for Scope 1 are “Manufacture of rubber and plastic products”, “Manufacture of textiles”, and “Manufacture of wearing apparel; dressing and dyeing of fur” with a score of 27 %. Those industries depend on average on respectively 12, 10, and 10 ecosystem services out of 21. The industry “Manufacture of other transport equipment” also has one of the highest average dependency scores of the sector, with a score of 26 % for Scope 1, but it is also the one that depends on the greatest number of ecosystem services (14 out of 21). On average, the industries of the Manufacturing sector depend on 7 ecosystem services for their Scope 1. Among the highest average dependencies of the Manufacturing sector are ground water, surface water, flood and storm protection, mass stabilization and erosion control, water flow maintenance, and water quality. Please note that the definition of each ecosystem service can be found in the factsheet reading guide.

This sector is particularly dependent on ground water and surface water ecosystem services (red cells in Figure 24). Indeed, the current demand from the manufacturing industry accounts for 22 % of global freshwater withdrawal, and the water consumed by industries is already exceeding agricultural consumption in most developed countries (Gleick 2003). Moreover, global manufacturing water consumption is projected to increase by a factor of more than 5 by 2050 compared to the baseline year 2000, from 245 to 1552 billion m^3, as a result of strong industrial activity development, particularly in developing countries (see Figure 25)(OECD n.d.).

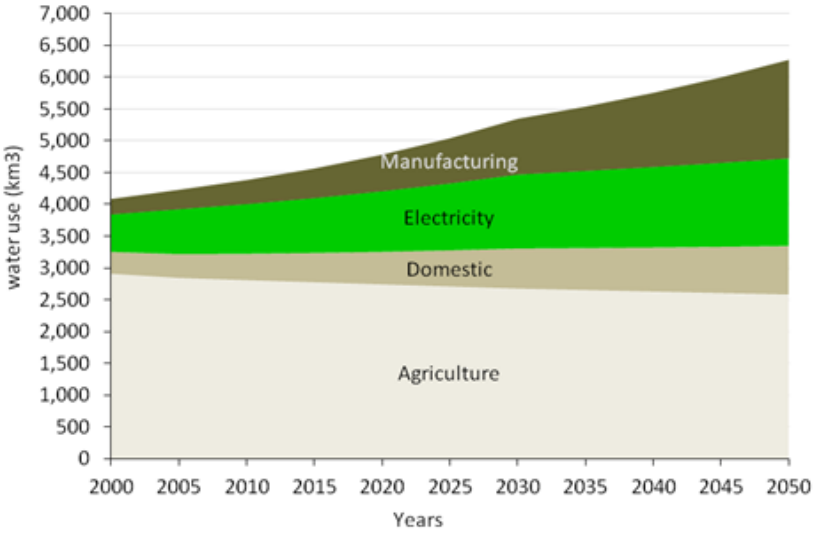

Figure 25: World water use in km^3 by OECD sector

The average dependency score used above for Scope 1 calculates the average dependency of a company on all ecosystem services. The upstream dependency score is a weighted average of each upstream sectoral dependency score, meaning that a high dependency for one of the sectors of the supply chain might be lessened by a low dependency of another sector on a given ecosystem service. Therefore, despite pockets of high

dependencies from suppliers in sectors such as agriculture, raw materials extraction, or forestry, the average Upstream dependency score is rather low because a large part of purchases come from low dependency sectors.

Figure 26: Dependency heatmap for Upstream Scope 3 dependencies, based on ENCORE data

Finally, the critical dependency score can be read as the share of a company's value chain that is critically dependent, *i.e.* not substitutable, on at least one ecosystem service. A critical dependency is defined as a "High" or "Very high" dependency according to ENCORE. It can offer complementary information on the dependencies

of the Upstream Scope 3 (or Scope 1). For further information about the critical dependencies methodologies please refer to section 2.4 C of the general technical annex.

Critical dependencies show that for most of the manufacturing industries, more than 50 % of their purchases are critically dependent on at least one ecosystem service (Figure 27).

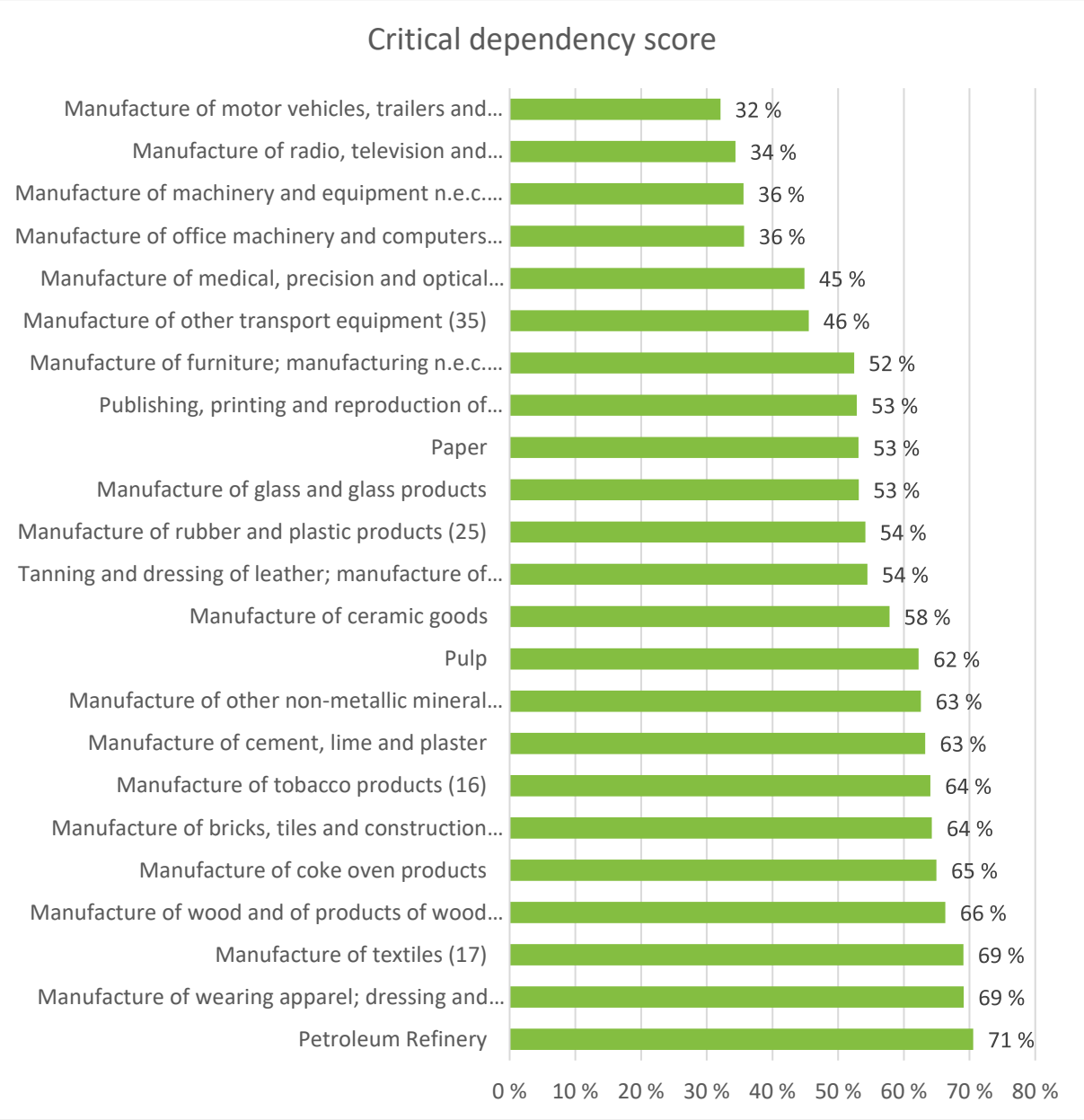

Figure 27: Upstream Scope 3 Critical dependency scores per EXIOBASE industry

"Petroleum Refinery"'s value chain is the most critically dependent on ecosystem services. Indeed, 71 % of the purchases of "Petroleum Refinery" are critically dependent on at least one ecosystem service. Globally, 10 industries of the sector have a medium to high critical dependency score (more than 60 %).
Despite the apparent low *average* dependency of the Upstream Scope 3 of the manufacturing industries (Figure 26) looking at the distribution of high and very dependencies (i.e. looking at critical dependencies) reveals that

hotspots of critical dependencies exist and put those supply chain at risks. At least 32 % of their value chain is critically dependent on at least one ecosystem service. To fully understand such value chain dependencies would require looking at the dependencies of the raw material extraction and agriculture sectors, which are positioned upstream of the manufacturing sector. Those dependencies can be found in the respective "Raw material extraction" and "Agriculture and Agrifood" benchmark factsheets and corresponding annexes.

Because manufacturing supply chains are often globalized, tracking which ecosystem services matter the most to specific manufacturers can be challenging. This is mostly the case for manufacturers which have limited knowledge and awareness about the activities of its suppliers. Yet, manufacturing industries with a heavy reliance on ecosystem services such as provisioning ecosystem services (meaning the products obtained from ecosystems) will be more likely to suffer first from any increase in resource scarcity (CBD 2018).

5. Terrestrial static Climate change calculation

Climate change static impacts are not currently properly assessed by the GBS because historical emissions are needed to compute them. Therefore, they are not included in the Terrestrial static impacts section (see Figure 6, Figure 7 and Figure 8 for the terrestrial static results without the Climate change pressure).

The methodology used to estimate terrestrial static impacts from 2018 dynamic impacts and past emissions is available in paragraph 2.5 of the general annex.

A Global factor$_{1750}$ can be used to estimate the static impacts of Climate change in 2018.

$$Global\ factor_{1750} = \frac{global\ historic\ emissions\ from\ 1750\ to\ 2018}{global\ 2019\ emissions} = 50$$

This factor is also refined by sector, by estimating a sectoral ratio between historic emissions of the sector and 2019 emissions. Regarding the manufacturing sector, the Sectoral factor is 49 and should have been used. But due to technical limitations of GBS 1.4.4, the global factor was used instead. Because the difference between the 2 factors is minimal, it does not significantly impact the results.

Table 9: Absolute Scope 1 biodiversity impact, including the terrestrial static impact related to Climate change, of the Manufacturing sector by category of industry, computation with GBS 1.4.4

Realm	Accounting category	Scope 1 impact in MSA.km²					
		Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronics, vehicles and machinery	Tobacco, rubber and plastic	Other manufactu-ring
Terrestrial	Static	71 000	88 000	760 000	77 000	49 000	60 000
	Dynamic	1 300	1 600	15 000	1 500	960	1 200

Table 10: Absolute vertically integrated biodiversity impact, including the terrestrial static impact related to Climate change, of the Manufacturing sector by category of industries, computation with GBS 1.4.4

Realm	Accounting category	Vertically integrated impact in MSA.km²					
		Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronics, vehicles and machinery	Tobacco, rubber and plastic	Other manufacturing
Terrestrial	Static	1 600 000	2 200 000	2 200 000	2 400 000	1 100 000	850 000
	Dynamic	11 000	19 000	33 000	25 000	8 000	7 700

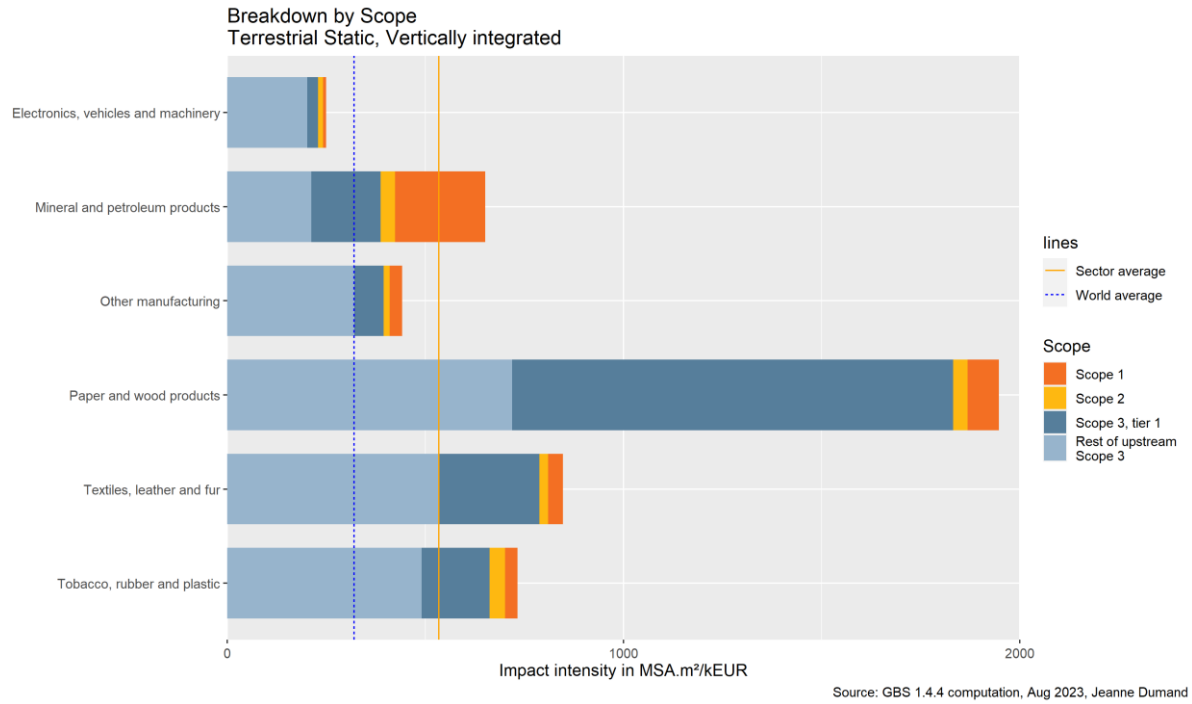

Figure 28: Vertically integrated terrestrial static impacts, by Scope, including the Climate change pressure

With the inclusion of the Climate Change static impacts, Scopes 1 and 2 terrestrial static impacts are significant. This contrasts with the results without including the Climate change pressure, where there were almost no impacts attributed to Scopes 1 and 2. Yet, most of the impacts are still happening in Scope 3.

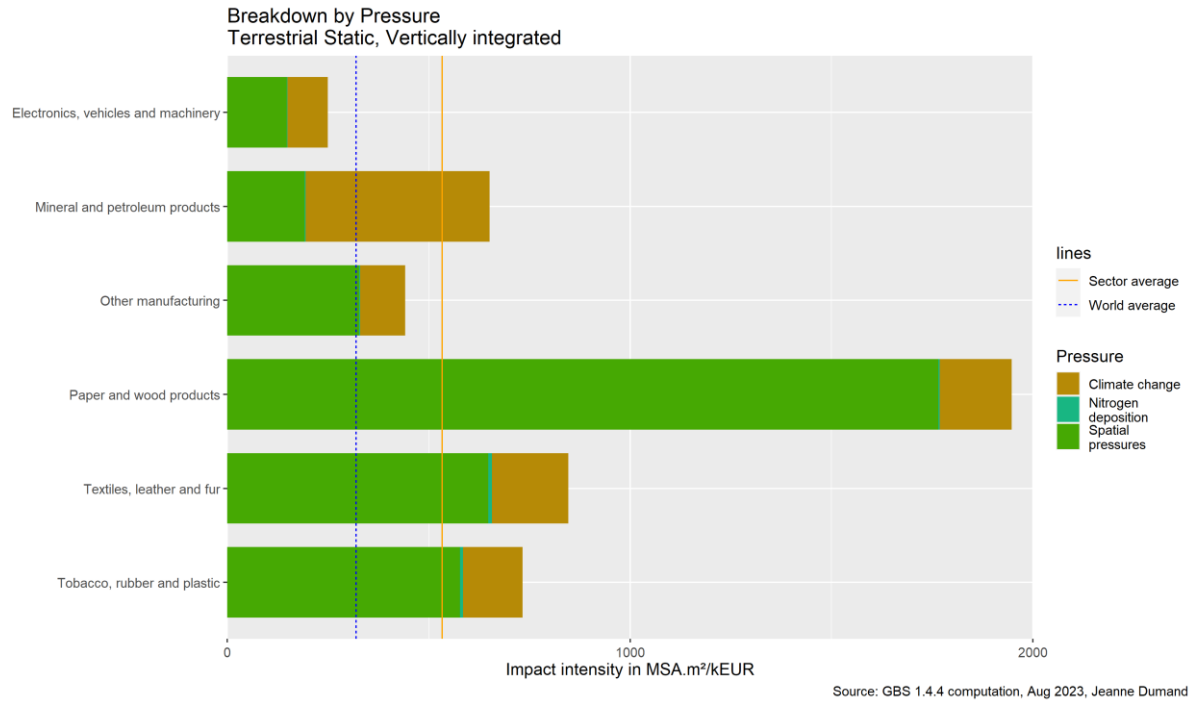

Figure 29: Vertically integrated terrestrial static impacts, by pressure, including the Climate change pressure

For vertically integrated impacts, Spatial pressures remains dominant for most manufacturing categories. However, this is not the case for the Mineral and petroleum products category, where the main pressures are attributed to Climate change. As mentioned previously, the cement industry releases CO_2 emissions to the atmosphere as a result of the burning fossil fuels required for its manufacturing process (Ali, Saidur, and Hossain 2011).

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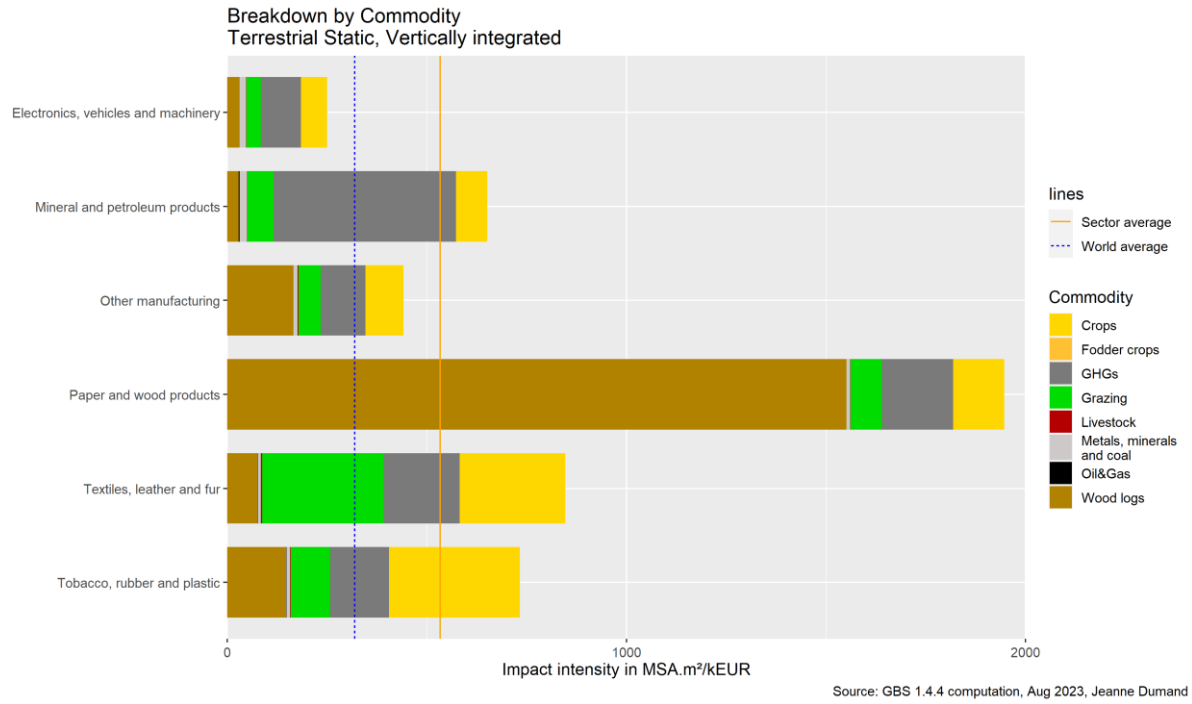

Figure 30: Vertically integrated terrestrial static impacts, by commodity, including the Climate change pressure

For all manufacturing categories, GHGs emissions account for an important part of the terrestrial static impacts, especially for the Mineral and petroleum products category.

6. Fiber sourcing for textiles

6.1 Baseline and assumptions

The global fibre production has almost doubled in the last 20 years, to reach a record of 113 million tonnes in 2021, and is expected to grow to 149 million tonnes in 2030 if business as usual continues (Textile Exchange 2022). Impacts from the textile industry are mainly associated with its upstream value chain and especially crops production to produce natural fibres. While synthetic fibres currently dominate the textile market, virgin cotton is still one of the most important fibres. However, several factors such as climate change, market conditions, and socio-political challenges, can affect the production of virgin cotton fibre. Additionally, conventional cotton farming is known to have important sustainability issues. Therefore, there is a need for alternative fibre resources. Recycled cotton production represented 270 thousand tonnes of the total 25 million tonnes of cotton produced in 2021 (*i.e.* about 1 % of the total) (Textile Exchange 2022).

The goal of this section is to study the biodiversity impacts of mechanically recycled cotton fibre production and to compare them with the biodiversity impacts of virgin cotton fibre. The Figure 31 describes the two systems compared:

(1) The impact per tonne is assessed with the following data:

- For recycled cotton, the data comes from a Life Cycle Assessment (LCA) (Wendin 2016) on recycling cotton (Table 11). The method chosen in the LCA is “Allocation cut-off by classification” (in accordance with the ISO standard - not allocated to the recycled content). By definition of the cut-off allocation, the impacts of the first life of the recycled fibre (*i.e.,* all the impacts related to virgin cotton production, cloth

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manufacturing, transport, etc. before the fibre starts its second life through recycling) is not attributed to the recycled material, only the impacts of the recycling process are assessed and attributed to the recycled material. The dataset used as a reference is called “market for cotton fibre GLO” with the system “Recycled Content” (Allocation cut-off by classification). The first step is collection and sorting at the stores, then the clothes are packed and sent to hubs (distribution centres)[2]. In the hubs, the clothes are loaded to a new container, to be sent from the hub to the port (the transport until the recycling facility includes boat and truck). The clothes are then mechanically recycled by shredding them into recycled cotton fibres. The extracted assessed data cover land use, ecotoxicity emissions, water consumption, GHG emissions, and freshwater eutrophication emissions.

Table 11. Collected data from the LCA to calculate recycled cotton fibre impacts (Wendin 2016)

Flow	Impact category	Unit	Total per 1 kg cotton fibre
Output	Climate change	kg CO_2 eq	0.38
Output	Freshwater eutrophication	kg P eq	0.00003
Output	Terrestrial ecotoxicity	kg 1,4-DB eq	0.0001
Output	Freshwater ecotoxicity	kg 1,4-DB eq	0.002
input	Water use and consumption	m^3	0.635
Input	Urban land occupation	m^2a	0.01

- For virgin cotton, the cotton seed production is assessed using the GBS crops CommoTool. "Seed cotton" is the only cotton-related commodity available in the GBS Crops CommoTool. It is defined as "Unginned cotton. Grown for both seed and for fibre [...]”.

(2) The tonnages considered are the same for both systems to make them comparable. The global production of recycled cotton is used (270 000 tonnes) so that the comparison focuses on what would be the total impact if all recycled cotton fibre was replaced by virgin cotton fibre. It is assumed that the weight of the cotton used in textile is the same for recycled and virgin cotton fibres. However, according to the FAO, 35 % of the seed cotton production is lint (cotton fibre) (FAO 2023). Therefore, this ratio is applied to transpose the seed into fibres for the virgin cotton fibre system.

(3) The impacts are calculated for the tonnages considered using the GBS Biodiversity impact factors.

[2] The estimated average mode of transport is Truck with payload 16-32 tonne and emission standard Euro IV.

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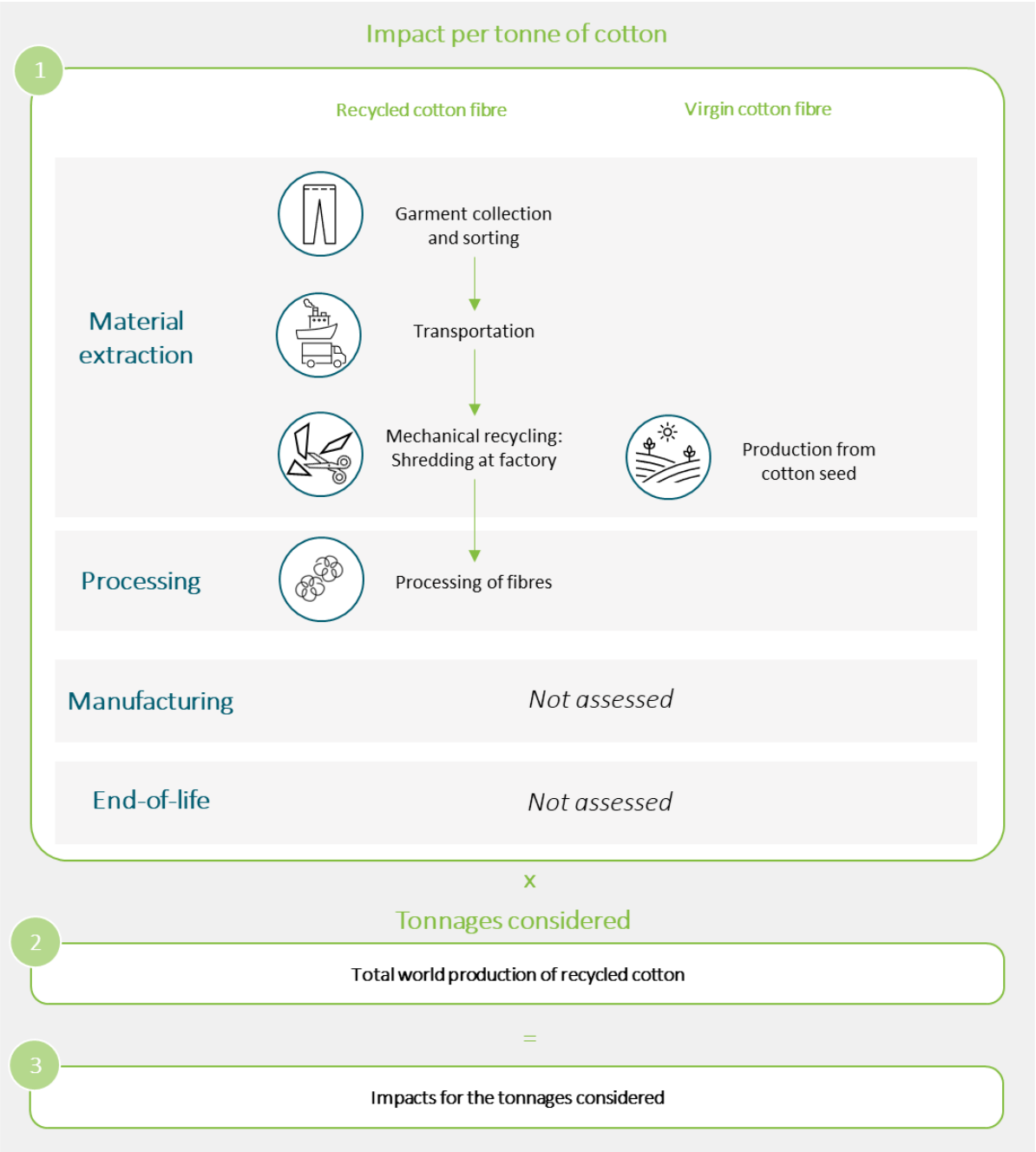

Figure 31: Calculation process for the biodiversity impacts of recycled and virgin cotton fibres production

The main principles of the cut-off allocation method are:

- The primary production is always attributed to the primary consumer of a material
- For a recycled material: no credits are given to the primary producer of this material
- Recycling materials are available without any charges for the recycling process
- Recycled materials only bear the impacts of the recycling process
- Wastes producers do not receive any credits link to the recycling or reuse of their wastes

This commonly used method has several advantages: it is easy to use and understand, it excludes the impacts on other life cycles and focuses on company processes, and it encourages the use of recycled materials. However, some studies have shown that the cut-off approach has certain limitations that are important to consider:

- LCA modelling should be done depending on the status given to the product: the "waste" status is subjective and questionable. The method used and the allocation of burden vary and must be different depending on the type of product we have (Pradel et al. 2016).
- The cut-off method generally has a poor approximation of complex LCAs because it does not consider some potentially important aspects outside the LCA product (Ekvall et al. 2020).

The overall guidelines for the GBS recommend using Allocation at the Point of Substitution (APOS) and not cut-off approaches. Data using a cut-off methodology were used in this section as no data using the APOS methodology were available but exploring the results of a cotton fibre recycling LCA with the APOS approach could help refining the study[3]. Indeed, APOS method follows an attributional approach in which the responsibility over burdens is shared between producers and downstream users (*i.e.*, recycling facilities here) after a processing activity. Burdens are attributed proportionally to specific processes. The APOS system model provides a better consideration of complex LCAs but is more difficult to realise and have longer results interpretation.

Overall, this calculation process has some limitations that should be considered. Some life-cycle steps for cotton textile production such as manufacture steps (*i.e.*, fibres processing into textile) and the use and end of life of the material are not assessed due to lack of data. In general, results obtained with the Ecotoxicity module of the GBS 1.x versions (including GBS 1.4.4 used for this assessment) involve more uncertainties than other modules (CDC Biodiversité 2020). Additionally, it is important to keep in mind that in reality, no product is made of 100 % recycled content and some virgin fibres are always necessary for technical reasons. Thus, the impact comparison gives an idea of the differences of impacts between recycled and virgin fibres but should always be interpreted in the context of the actual recycled content share of a company's products. Finally, the cut-off methodology used in the LCA for recycled cotton fiber also has limitations, which are discussed above.

6.2 Results

Table 12: Terrestrial and aquatic impacts of virgin and recycled cotton fibres production, excluding Climate change and Ecotoxicity static impacts

	Virgin cotton fibre		Recycled cotton fibre	
	Impact in MSA.km²	Main pressure in MSA.km²	**Impact in MSA.km²**	**Main pressure in MSA.km²**
Terrestrial Static	**440**	Land use: 360	**3.1**	Land use: 2.6
Terrestrial Dynamic	**1.6**	Land use: 1.3	**0.45**	Climate change: 0.45

[3] Previous biodiversity footprint assessments led by CDC Biodiversité on recycled cotton with an approach closer to an APOS method, using ecoinvent licences, had conclusions pointing in the same direction as this study.

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Aquatic Static	**44**	Land use in catchment of wetlands: 18	**5.7**	Hydrological disturbance due to direct water use: 5.1

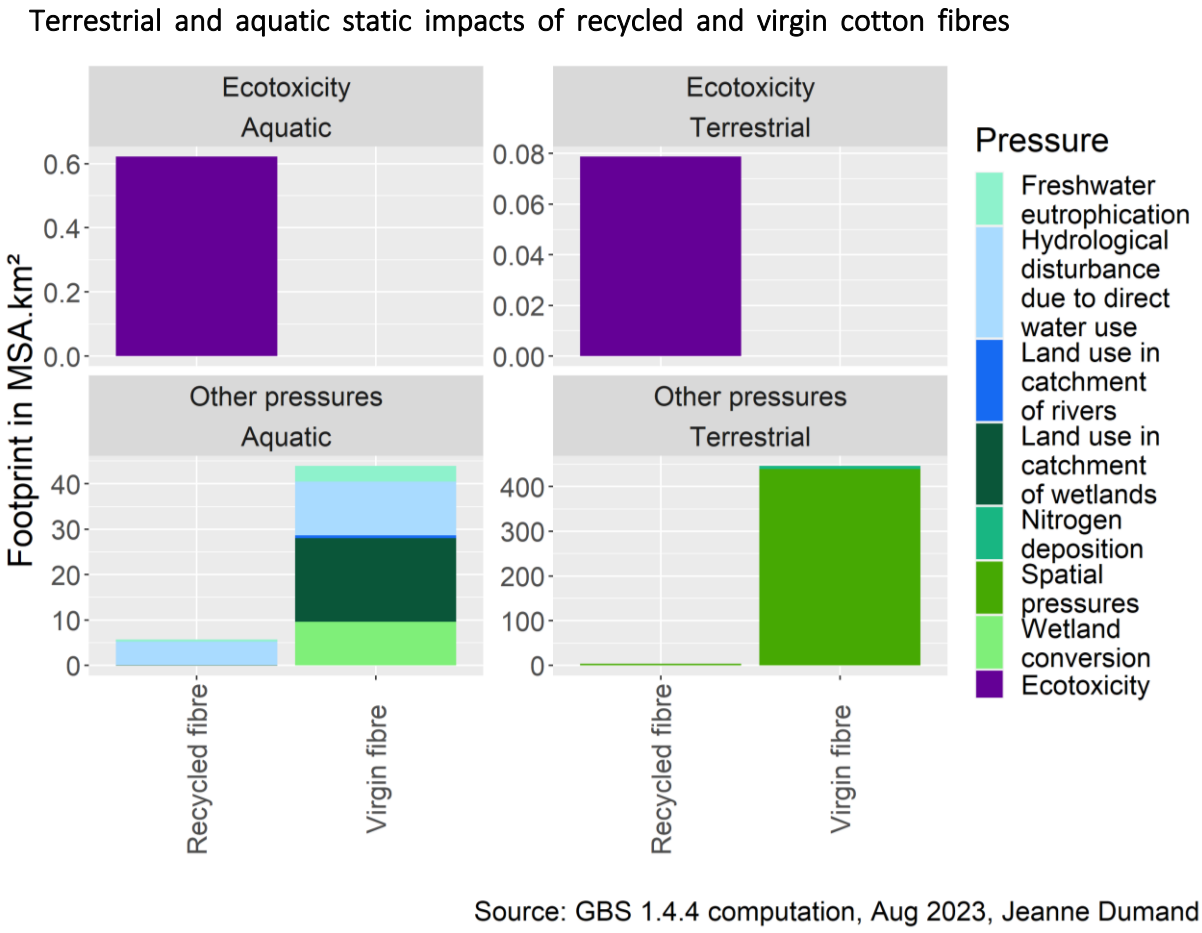

Figure 32. Terrestrial and aquatic static impacts of recycled and virgin cotton fibres, breakdown by pressures

The impacts of the recycled cotton fibre production appear to be significantly lower than for the virgin fibre production. Most of the terrestrial static impacts of the virgin cotton fibre production can be attributed to Spatial pressures through Land use, Fragmentation and Encroachment, caused by the agricultural lands required for the cotton crop production. For the recycled cotton fibre, the terrestrial static impacts are also mostly attributed to Land use pressure, that are caused by the land taken by the recycling facility. However, there is significantly less land needed for recycling facilities to produce 270 000 tonnes of cotton fibres than for agricultural land to produce the same amount of cotton fibres.

Regarding aquatic pressures, the most important pressures for the virgin cotton fibre production are associated with agricultural Pollution (Land use in catchment of wetlands), while they are mainly caused by Hydrological disturbance due to direct water use (HD_{water}) for the recycled cotton fibre. However, even though the HD_{water} pressure is the main aquatic pressure of the recycled cotton fibre, it is still responsible for less impacts than the

HD_{water} pressure of the virgin cotton fibre. The water consumption mostly comes from turbine use[4] (55 %), cooling (1 %) and raw material (44 %).

According to the LCA used to assess the impacts of the recycled cotton fibre (Wendin 2016), the Climate change results stems from sea freight, lorry freight and waste collection. The recycling process consumes electricity, which emits greenhouse gas to be produced, causing Climate change impacts.

The Ecotoxicity impacts for the recycled fibre originate from air emission of Antimony (land transport) and the water emissions of Manganese, Barium, Selenium and Copper. Uncertainties are higher for Ecotoxic impacts, which explains why they are reported separately. For recycled fibre, taken into account the uncertainties, the Ecotoxic impacts on aquatic biodiversity could be relatively significant compared to other pressures. Conversely, the impacts on terrestrial biodiversity are very low and not significant. For virgin fibre, the methodology behind the GBS's impact factors for cotton crops means no Ecotoxic impacts are calculated directly. As explained in the Ecotoxicity critical review document (CDC Biodiversité 2020), this does not mean there is no Ecotoxic impact. Instead, those impacts are accounted for within the Land use pressure for impacts occurring on-farm and within the Land use in catchment of wetlands, or Land use in catchment of rivers for diffuse impacts occurring in freshwater ecosystems (which also cover other pressures). Some of the impacts may also be underestimated.

Overall, this analysis shows that over the Material extraction (collecting used clothes vs cultivating cotton crop) and Processing (mechanically recycling them to produce cotton fibres), recycled fibres have considerable potential to lower the overall biodiversity impacts of textile production. In practice, products still require some virgin fibre for technical reasons so the impact reduction achieved will be lower than in this section. Besides, the limitations of this first analysis mean companies should use more comprehensive and specific datasets to assess the impacts of the fibres they use.

7. Cattle farming methods in the leather industry

7.1 Baseline and assumptions

The EXIOBASE industry "Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear (19)" is responsible for one of the highest impacts of this manufacturing sectoral benchmark. More precisely, the impacts from this leather industry are mainly associated with its upstream value chain and especially the feeding rations of the cattle: grass and crops. Overall, leather is a high impact commodity and is associated with important levers of action.

Please note that, even more than for the rest of the factsheet and its annex, the methodology associated to this section is susceptible to future updates. Due to the higher uncertainties associated to the current methodology, the conclusions should be taken with caution.

The goal of this section is to measure the biodiversity impacts of bovine leather production, and to estimate how extensive practices for cattle farming can influence the impacts of the leather industry.

[4] Water consumption due to turbine use is related to the production by dams of the electricity used in the recycling process. In a later version of the GBS (GBS 1.4.6), the hydrological disturbance impacts associated to the water going through the turbines have been revised to be negligible since the water is not really extracted from freshwater ecosystems. HDwater impacts would thus be reduced by 55 % starting in GBS 1.4.6.

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For the purpose of this study, different life-cycle steps from the leather production are accounted for (see Figure 33): animal feed production, livestock, production of leather, tannery. The impacts are therefore assessed for the production of cattle skin (animal livestock) and the processing of the material. Please note that use and end of life of the material are not assessed due to lack of data. This methodology is based on France's average factors and data, but is replicable to other countries and regions as needed.

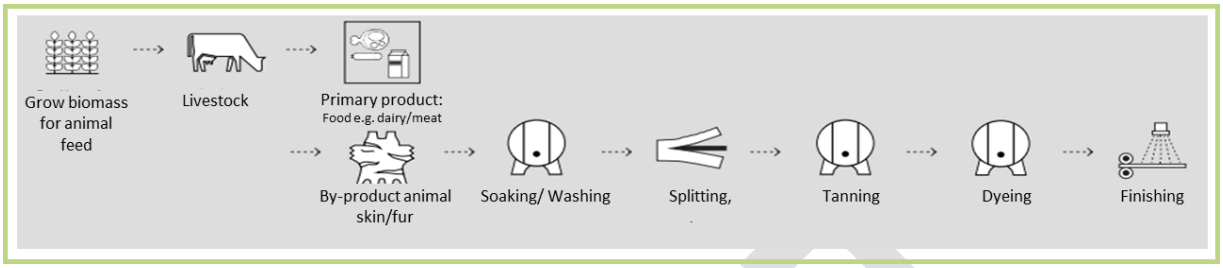

Figure 33. Perimeter of bovine leather production (Fashion for good and Biofabricate 2020) assessed

A change in animal feed for bovine leather from intensive practices towards more extensive practices was modelled. The assessment was made with three different types of feed rations, based on the GLEAM[5] supplement (FAO 2018): feedlot cattle, meat cattle and dairy cattle.

Figure 34 describes the three systems and the methodology used to calculate the impacts of the feed rations (I_R). The numbering below matches that of Figure 34 and Figure 38 (and thus starts at 2/; 1/ is the nutritional value and is described in subsequent sections).

2. The feed intake by ingredient per animal is assessed with the following data:

- **"Feedlot ration"- Intensive practices** - This system relies mostly on agro-industrial by-products (such as oilseed meals and grains) (Table 1).
- **"Meat cattle rations"- Extensive practices** - This system relies mostly on grazing (such as fresh grass and hay) for meat cattle (Table 1).
- **"Dairy cattle rations"- Extensive practices** - This system relies mostly on grazing (such as fresh grass and hay) but for dairy cattle (Table 1).

The percentage of feed ingredients ($F_{\%}$) in the composition of food for feedlot, meat or dairy cattle is provided by the GLEAM model supplement (FAO 2018) . This composition is regionalized according to the agricultural practices of the country where the animals are raised (Western Europe). The origin of the commodities used in the composition of the diet (e.g., barley or soybeans) is also regionalized (European Union).

The quantities of the annual feed intake (in kg of dry matter) ingested by all bovine animals, the live weight of animals (W) and the number of heads per country (to have the total feed intake per animal TFI) data are retrieved from the online tool GLEAM-i[6]. The GLEAM-i tool does not currently provide data for these parameters for the

[5] The Global Livestock Environmental Assessment Model is a modelling framework developed within the Animal Production and Health Division of FAO. It simulates the functioning and environmental impacts of livestock production activities. The annex uses GLEAM 2.0, which is compatible with the GLEAM-i tool, and uses 2010 data for animal numbers and distribution, herd parameters, feed yields, feed rations and manure management systems. Please note that an updated version (GLEAM 3.0) was recently released, and the content of this datasets can be found along with additional resources on the GLEAM Resources page.

[6] The GLEAM-interactive (GLEAM-i) tool brings the core functionalities of the FAO Global Livestock Environmental Assessment Model in an Excel file. The current version of GLEAM-i allows the direct comparison between Baseline and Scenario conditions, includes feedlot systems for cattle and incorporates the 2010 background data from GLEAM (version 2.0). The tool is accessible online at this link, with additional resources available on the GLEAM Analytical tools page

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feedlot system. Therefore, an average between meat and dairy was calculated and used as a proxy for the feedlot practices. These datasets are regionalized according to the agricultural practices at the country level, where the animals are raised. For this analysis, the selected region in GLEAM-i is France (more information on Figure 34).

3.Some allocation factors are applied.

Because GLEAM annual quantities of feed ingested are expressed in kg of dry matter per year, a conversion to as-fed feed items is made using dry matter contents (DM_{GBS}) and when necessary, allocations factors of dry matter content are used to retrieve Crops Commotool item weights in kg per year.

Additionally, an economic allocation factor ($Af_{e\text{-}s}$) is used at the slaughterhouse in percentage attributing the share of impacts related to the animal feed of the leather sector to leather production, from the PEFCR sectoral guide (3.5 % for bovine) (European Commission 2017). Indeed, cattle hides are co-products of the livestock industry which provides meat and milk as products main interests.

4. The yield (Y) is taken from xxx.

5. The GBS 1.4.4 Biodiversity impact factors (IF) (in MSA.km²/tonne of commodities) are used.

As shown in Figure 35, the **impacts from the animals on the farm (I_A)** are calculated using Average animal weight (W) data from GLEAM (FAO 2018). The PEFCR economic allocation factor ($Af_{e\text{-}i}$)is also applied to attribute the share of impacts related to the animal feed of the leather sector to leather production.

The **impacts from the tannery process (I_T)** are calculated using data from LCA (Ulya, Arifuddin, and Hidayat 2021). It gives information on ecotoxic substances emissions, GHG emissions, and water consumptions. It was carried out in Indonesia (largest exporter of tanned leather), from 1 tanning industry (called UD. PKX). The UD. PKX plant processes 1.5 tonnes of raw cowhides into 285.4 kg of cow tanned leather but the results are brought back to 1 kg of raw cowhides to match the other parameters' unit in this study. A factor is used to convert raw hides into dry leather. As for the methodology, the LCA used OpenLCA version 1.6.3 with a CML (baseline) version 4.4, in January 2015. The database used is open_lca_methods_1_5_6.zolca. The impacts are calculated by linking to the following "midpoints":

- for ecotoxic substances: "1,4 dichlorobenzene eq"
- for GHG emissions: "t CO2 eq"
- for ground water consumption and water waste: m^3

An estimation of the quantity of leather made from one animal (Q_L) is used to convert the impacts per animal to impacts per kg of dry skin.

The tonnages considered are the same for all systems (extensive and intensive) to make them comparable. The assessment uses the total amount of leather produced in France in 2015 (L) (latest FAO available data): 115.5 thousand tonnes of bovine hides and skins (wet salted weight) (FAO 2016).

Figure 34 and Figure 35 illustrates the processes to calculate the leather production impacts, and use the following abbreviations:

TFI	Total feed intake per animal and per year (kg of dry matter / year / animal)
$F_{\%}$	Percentage of feed ingredient in the ration (%)
DM_{GBS}	Dry matter content of the corresponding item in the GBS (%)
$Af_{e\text{-}s}$	Skin economic allocation factor (% of impacts attributed to the skin)
$Af_{e\text{-}i}$	Ingredient Economic allocation factor (% of impacts attributed to the skin)
IF	GBS Biodiversity impact factor (MSA.km^2 / kg of wet crop)
Y	Yield (t/ha)
IF_{ha}	Impact factor per hectare (MSA.km^2/ha)
W	Average animal weight (kg / animal)
T	Tannery impacts from the LCA (MSA.km^2/kg of fresh skin)
Q_L	Quantity of dry skin per animal (kg of dry skin/animal)
I_S	Impact per kg of dry skin (MSA.km^2 / kg of dry skin)
I_R	Impact from feed ration (MSA.km^2)
I_A	Impact from animals on the farm (MSA.km^2)
I_T	Impact from the tannery process (MSA.km^2)
IF_A	Impact per animal
L	Quantity of leather produced in France (kg)
TI	Total impact assessed (MSA.km^2)

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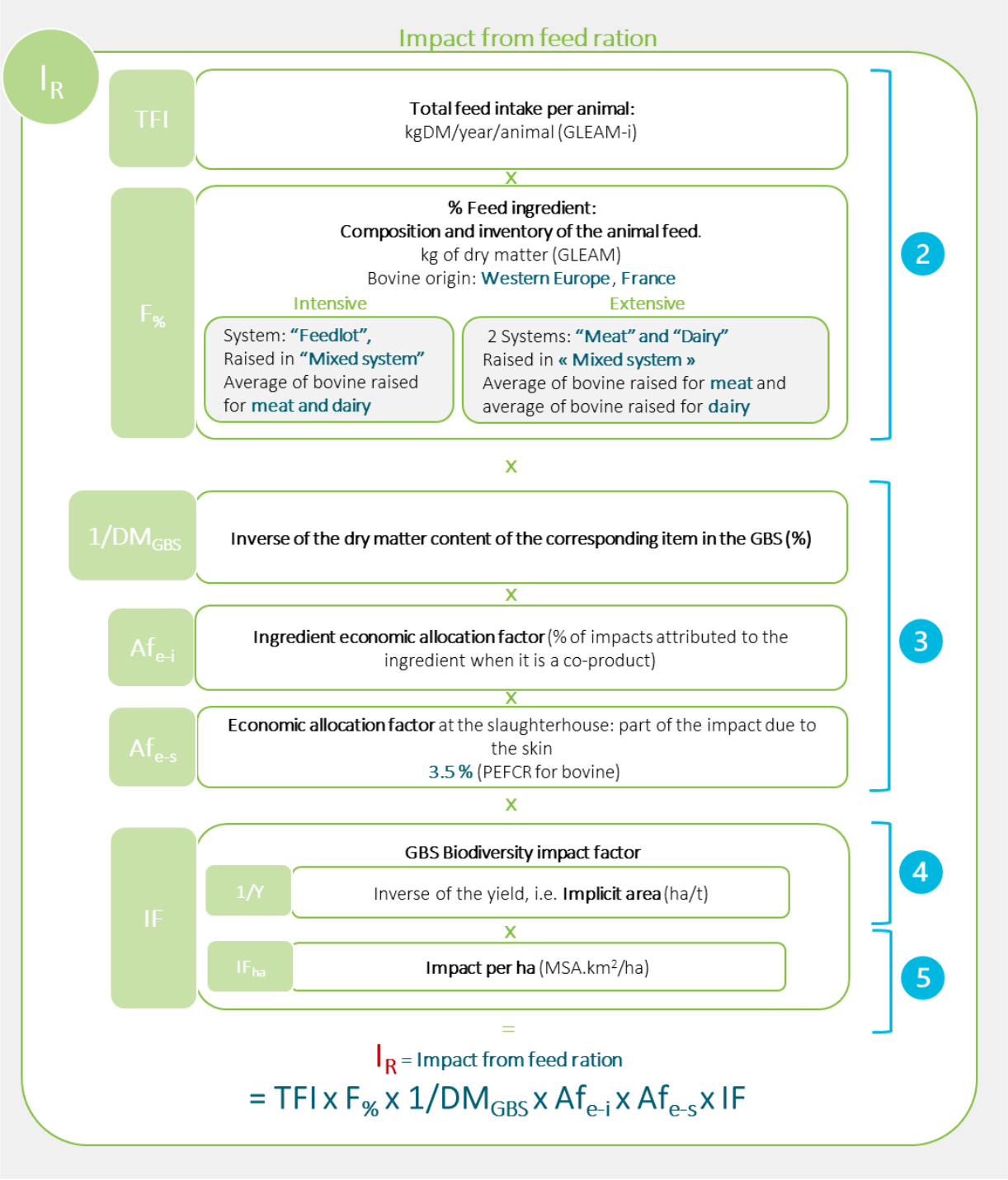


Figure 34 Calculation process for the biodiversity impacts of the bovine feed ration in France (I_R). This step is part of the final calculation process to retrieve the Total impact of leather production. A correspondence between the calculation process and the results presented in Figure 38 and Figure 39 is shown in the blue dots. The next steps, especially to calculate the impact from the animal on the farm, and from the tannery process are described in the next figure. Please note that unit conversions are not included in this figure.

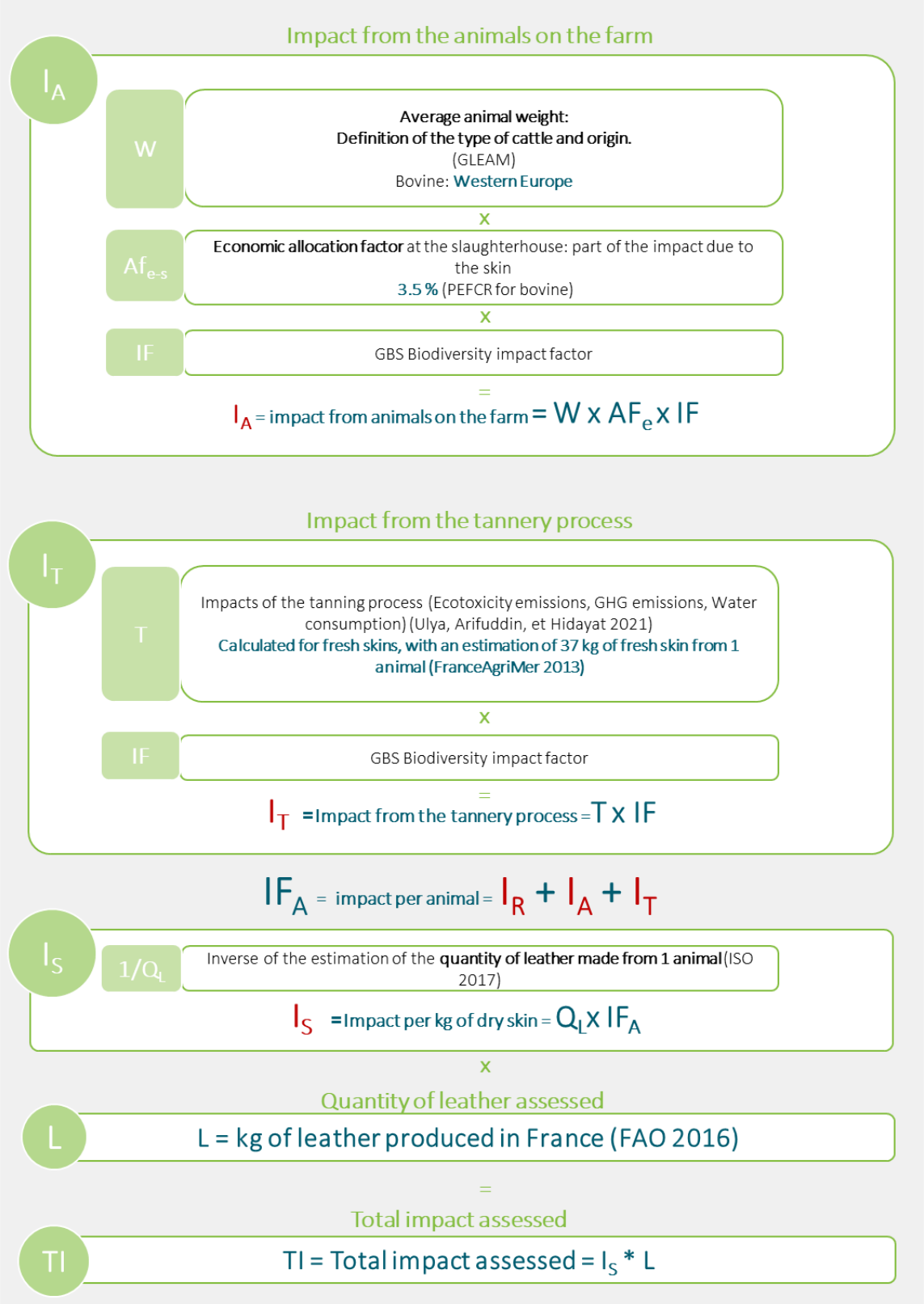


Figure 35 Calculation process for the biodiversity impacts of the animals on the farm (I_A), from the tannery process (I_T); and finally for the Total impact assessed (TI) in France. Please note that unit conversions are not included in this figure.

Table 1. Intensive and extensive rations, regional average for Western Europe, in percentage of total dry matter intake (FAO 2018)

Feed material	Extensive (Meat) %	Intensive (Feedlot) %
Roughages		
Fresh grass	26	0
Hay	20	0
Fodder beet	1	0
Legumes and silage	25	5
Crop residues	3	0
Sugarcane tops	0	0
Leaves	0	0
Agro-industrial by-products		
Bran	4	0
Oilseed meals	8	15
Wet distilleries grain	0	0
Grains	12	73
Molasses	0	0
Pulp	1	0

As mentioned previously, the composition of animal feed comes from the GLEAM model and is given in kg of dry matter per year. The dry matter content of each feed is used to be able to use the feed quantities in tonnes in the crops and grazing CommoTools. The correspondence with the CommoTools is as follows:

- "*Legumes and silage*": directly used in the GBS crops Commotool under "Forage and silage, legumes".
- "*Oilseed meals*": considered to be flour from soybeans linked to the kg of oilseed meal ingested by bovine, and the "Soybeans" item of the GBS crops Commotool.
- "*Grains*": Correspondence in the GBS with "Grains from barley (*Hordeum vulgare*), oat (*Avena sativa*), buckwheat (*Fagopyrum esculentum*) and fonio (*Digitaria spp.*)". For simplification for this calculation, "grains" are considered to be entirely barley grains (item "Barley" chosen in the GBS).
- "*Fresh grass*": directly used in the GBS grazing Commotool under "Grazing". The wet weight is corrected to match the humidity of the moisture content of the "Grazing" item in the Commotool (15% humidity).
- "*Hay*": directly used in the GBS under "Grazing". The wet weight is corrected to match the humidity of the moisture content of the "Grazing" item in the Commotool (15% humidity).
- "*Fodder beet*": directly used in the GBS under "Beet for fodder".
- "*Crop residues*", "*Bran*", "*Sugarcane tops*", "*Leaves*", are crop residues and co-products to which no impact is currently attributed in the GBS with an economic allocation of impacts.
- "*Pulp*" was not assessed as this item does not exist in this form in the GBS. Since it represents only 1 % of the extensive ration (and 0 % of the intensive ration), this omission is not significant.

To determine the Scope 1 impact of the farm and meat production (*i.e.* impacts of the husbandry buildings and associated direct operation emissions and withdrawals), the item "Meat, Cattle", was chosen in the GBS livestock Commotool. The average weight of cattle animals in "feedlot" (average of meat and dairy) and "dairy" system is

obtained via the GLEAM model (Gleam-i). The weight data is regionalized according to the agricultural practice of the country where the animals are raised (France for this study).

Overall, the whole calculation process has some limitations that should be considered:

- The calculation of the Scope 2 static impact of leather production is not taken into account. Indeed the GBS 1.4.4 does not have a specific module to assess the impact of electricity and heat production.
- Some life-cycle steps for leather such as the manufacture (*e.g.* of leather bags) and the use and end of life of the leather-made products are not assessed due to lack of data.
- The use of the GLEAM model and the GLEAM-i platform to model the feed ration of animals requires the choice of geographical regions and countries for the composition of the rations. Therefore, the results will vary for different regions and countries, but here only one location (France and Western Europe) was selected.
- Additives added to the food were not considered due to a lack of impact factors in the GBS 1.4.4.
- The GLEAM-i patform does not provide provide feedlot data for the parameters "Number of heads", "Live weight" and "Total feed intake". An average between dairy cattle and meat cattle data was used as a proxy and could differ significantly from accurate feedlot data, therefore they should be replaced with the corresponding GLEAM-i feedlot data when available.
- The "Grains" feed item from GLEAM is considered to be entirely barley grain in this study, but it could correspond to grains from barley (*Hordeum vulgare*), oat (*Avena sativa*), buckwheat (*Fagopyrum esculentum*) and fonio (*Digitaria spp.*). As they represent a large part of the feedlot ration, this choice significantly influence the terrestrial static results, which could be underestimated. Indeed, there is a lower impact associated with the production of one tonne of Barley than with the production of one tonne of oat or buckwheat in France (by up to 40%).
- The GBS currently takes unprocessed raw materials into account (but not processed products), so yield factors have been used to go from the quantity of processed product to the quantity of raw material required (in this study, the quantities of soybeans to produce soybean meals). This method takes into account the resources used in the field, but does not take into account the resources used during the transformation processes. The impacts from processing are thus unaccounted for.
- Among the products not taken into account, particularly in extensive feed, a proportion of the tonnage of the ration is not evaluated ("*Crop residues*", "*Bran*", "*Sugarcane tops*", "*Leaves*"). In the GBS, an economic allocation is currently applied between crops and crop residues (which have no economic value), resulting in a zero impact. When considering the Western Europe rations, 8 % of extensive (dairy and cattle) feed in terms of tonnage has not been taken into account. "*Pulp*" was also not assessed as this item does not exist in this form in the GBS. It represents only 1 % of the extensive ration (and 0 % of the intensive ration), therefore this omission is not significant.
- In general, results obtained with the Ecotoxicity module of the GBS 1.4.4 include more uncertainties than other modules. The impact factors of the ecotoxicity module were determined from an emission model in the steady-state ecosystem. These steady stream emissions help to maintain a constant concentration and are considered to cause static (and not dynamic) impact. The ecotoxicity module critical review document describes these accounting issues in more detail (CDC Biodiversité 2020).
- The water discharges being higher than withdrawals because wet skins tend to release water and animal fluids during the process (especially the drying steps), the version 1.4.4 of the GBS does not allow to calculate impacts for HD_{water} tanning process but it does not represent a significant impact. However, as the discharges are suspected to be polluted water, they could be considered as water consumed (and not available as habitats for freshwater species).

7.2 Bovine leather impacts

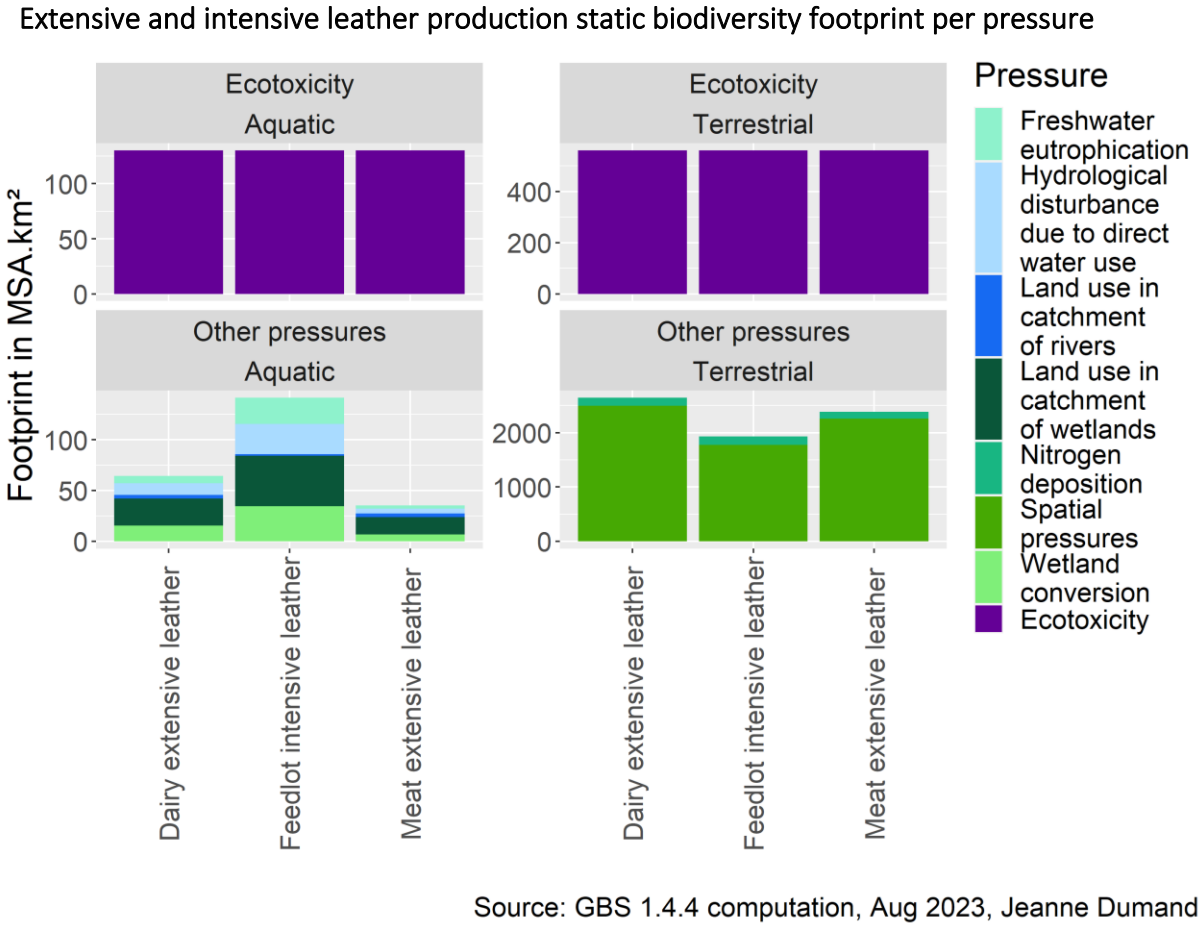


Figure 36. Bovine leather impacts per pressure, vertically integrated – terrestrial and aquatic static impacts in MSA.km²

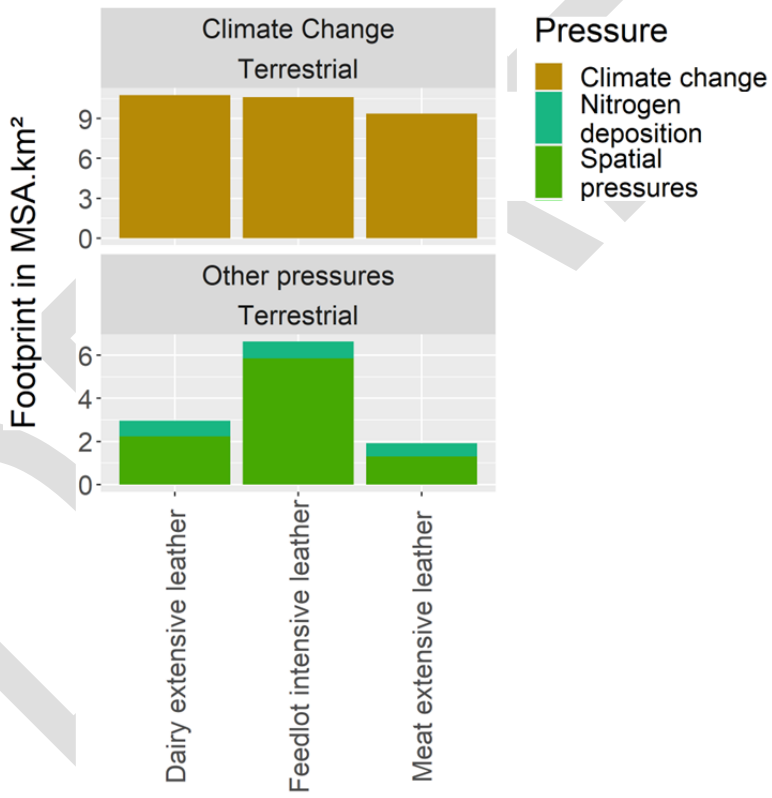
The absolute static impacts of the leather production in France are presented above, for feedlot animal sourcing (intensive) and more extensive sourcing (for both dairy and meat systems). For all herd systems, regarding the terrestrial static impacts, the most significant pressure of the leather production is Land use (Spatial pressures). These impacts can mostly be attributed to the feed rations, which are using agricultural land for their production. For the aquatic static impacts, they are also mainly coming from the animal feed, and are associated with Wetland conversion, Land use in catchment of wetlands, and Hydrological disturbance due to direct water use from the crops production. For intensive leather, the freshwater eutrophication pressure is also significant. The tanning processes are also responsible for terrestrial and freshwater discharges of polluting substances, representing a risk of impacts regarding Ecotoxicity pressures.

For the tanning process, taking into account the uncertainties, the Ecotoxic impacts on aquatic biodiversity could be relatively significant compared to other pressures, particularly because of chromium salts according to the LCA (Ulya, Arifuddin, and Hidayat 2021), that would need further investigation in future versions. Conversely, the impacts on terrestrial biodiversity are very low and not significant.

For the feed ration production, the methodology behind the GBS's impact factors for crops means no Ecotoxic impacts are calculated directly. As explained in the Ecotoxicity critical review document (CDC Biodiversité 2020), this does not mean there is no Ecotoxic impact. Instead, those impacts are accounted for within the Land use pressure for impacts occurring on-farm and within the Land use in catchment of wetlands, or Land use in catchment of rivers for diffuse impacts occurring in freshwater ecosystems (which also cover other pressures). Some of the impacts may also be underestimated.

The assessment tends to show that there are higher terrestrial impacts associated with extensive leather than intensive leather. As a reminder, this section is still under development and the results might change in future versions. However, these results are based on the assumptions that animals spend all year either in feedlots or in the more extensive system. In reality, according to GLEAM (FAO 2018), animals spend only a certain amount of days per year in feedlot. These days in feedlots are called the "finishing" phase, but they spend the rest of the year in their respective native system (*e.g.*, in the more extensive cattle meat or dairy system), in the "rearing" phase. A yearly allocation associated with feedlot production and a more detailed comparison of the terrestrial static results for intensive and extensive leather is further explored in section 7.3.

Extensive and intensive leather production dynamic biodiversity footprint per pressure



Source: GBS 1.4.4 computation, Aug 2023, Jeanne Dumand

Figure 37 Bovine leather impacts per pressure, vertically integrated – terrestrial and aquatic dynamic impacts in MSA.km²

For the terrestrial dynamic impacts Figure 37, the main pressures are Climate change and Land use, but there also is a risk of impacts caused by Atmospheric nitrogen deposition associated with the use of fertiliser for the feed production and livestock husbandry for the cattle emissions. As opposed to the static terrestrial impacts, the dynamic impacts are higher for intensive practices than for extensive practices in France. The Climate change

results mostly (more than 90%) come from I_A, the impacts from the animals on the farm: this explains why Climate change impacts are very similar across the 3 systems (the same data are used for all 3 with regards to I_A).

7.3 Consequences of a switch from intensive to extensive practices for bovine animal feed sourcing to produce leather

The following charts break down the factors explaining why, in our modelling, intensive systems perform better than extensive ones in terms of static impacts.

Compared to previous charts, they also display the nutritional values (in MJ of metabolizable energy), tonnage of feed commodities (in tonnes), and associated surface area occupied (ha), prior to applying any economic allocation for leather for steps 1 and 2 (*i.e.,* the full tonnages and surfaces are reported). The nutritional value provides information on whether the higher static impacts is caused by larger nutritional needs of animals within some systems or by a low nutritional value per kg for some feed ingredients (*i.e.* is 1 kg of grass worth 1 kg of grain?).

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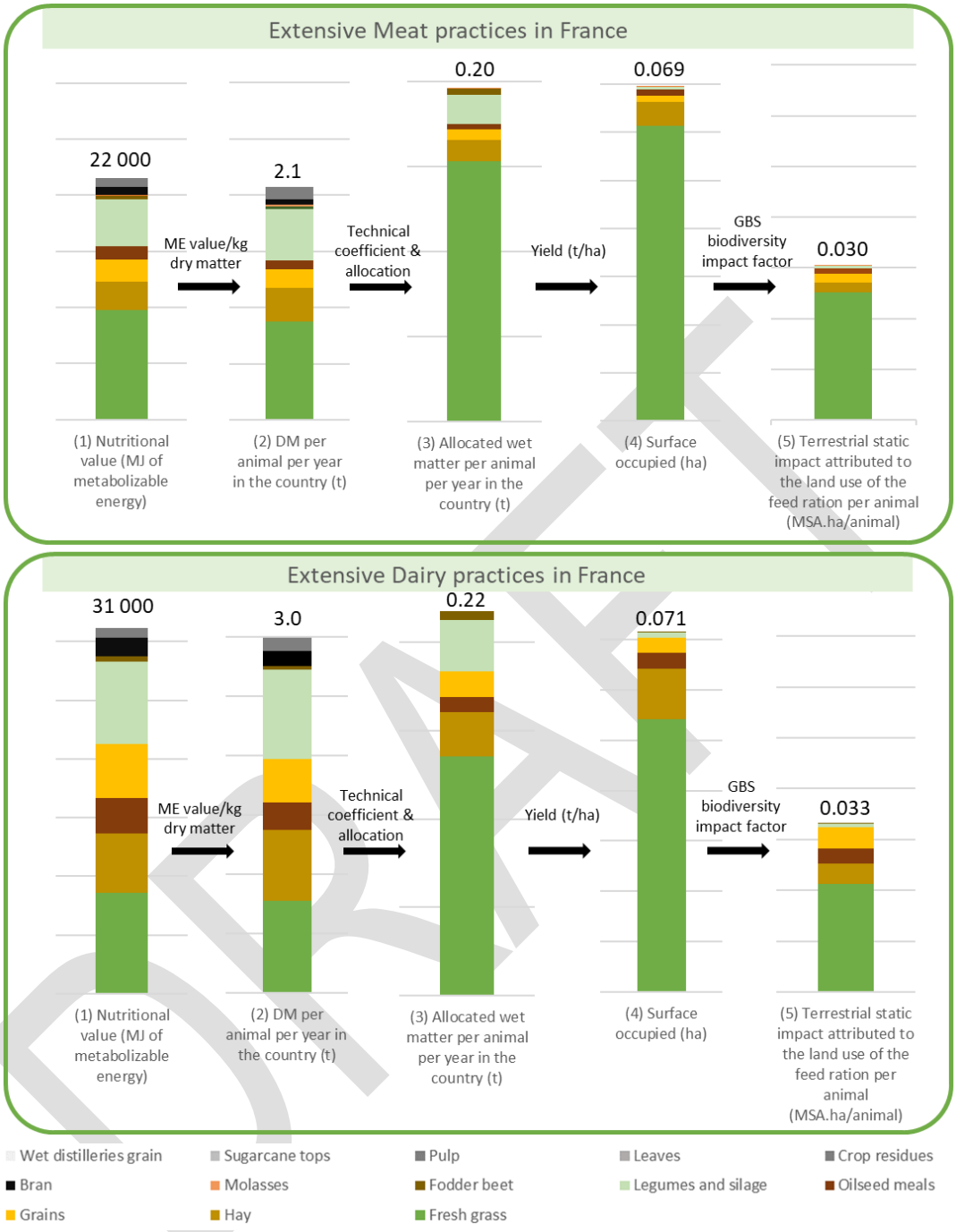

Figure 38 Extensive practices (meat and dairy cattle) feed rations characteristics in France

Figure 39 intensive (feedlot cattle) feed rations characteristics in France. The "all year in feedlot" graph illustrates the characteristics of a system where the cattle would spend all year in feedlot. However, the cattle usually spend only part of the year in the feedlot system, for the finishing phase, and the rest in their native (meat or dairy) systems for the rearing phase. This is illustrated in the "year-round" graph, which represents a more accurate version of feedlot practices.

Steps 2 to 5 of Figure 38 and Figure 39 match the steps represented in blue in Figure 34. The first (1) column of the above graphs represents the nutritional values of the feed rations for each studied herd system, through metabolizable energy (ME). ME for ruminants is the difference between the gross energy in the feed and the gross energy in the faeces, urines and gasses, which is not corrected for nitrogen retention. The ME value are from Feedipedia (FAO, INRA, and CIRAD 2023), except for ryegrass (Amanuel Abraha et al. 2015). Please find the list of items selected for each feed ingredient in Table 13 below. When the feed material is made from multiple matching items, the mean of their respective ME is calculated.

Table 13: Correspondence table between feed ingredients and items used for their nutritional values.

Feed material	Matching item(s)	Nutritional value (ME value / kg dry matter)
Fresh grass	White clover (Trifolium repens); ryegrass (Lolium multiflorum)	11
Hay	Alfalfa hay	8.4
Fodder beet	Fodder beet roots	12
Legumes and silage	Kudzu (Pueraria montana); Prickly sesban (Sesbania bispinosa); Sainfoin (Onobrychis viciifolia); Sulla (Hedysarum coronarium), silage	9.4
Oilseed meals	Soybean meal	13
Grains	Barley grain	13
Molasses	Sugarcane molasses	9.6

Between (2) and (3), technical coefficients and allocation specific to each feed commodity are applied. A conversion from dry matter to wet ingredients is also applied between (2) and (3).

Between (3) and (4) a calculation dividing the commodities quantities (in tonnes) by each commodity's yield (European Union yields are used and come from the grazing and crops CommoTools (Table 14)) is applied to obtain the hectares occupied to produce the feed rations.

Table 14: GLEAM feed ingredients and associated GBS yields, see the list of correspondence between feed ingredients and Commotool items presented earlier for more information.

Feed ingredient	EU yields, tonnes/ha
Fresh grass	2.5
Hay	2.5
Fodder beet	57
Legumes and silage	31
Oilseed meals	2.7
Grains	4.7
Molasses	62

Finally, between (4) and (5), GBS Biodiversity Land use impact factors were applied[7]. The column (5) displays the static terrestrial biodiversity impacts of the feed rations.

The nutritional values for animals in feedlot and extensive systems can differ due to the distinct feeding practices employed in each method. In feedlot systems, cattle are confined in densely populated areas and fed based on high-energy feeds. As a results, the feedlot rations typically have a higher metabolizable energy content. This controlled diet aims to rapidly fatten the animals. However, the literature shows that cattle diseases such as acidosis, liver abscesses and feedlot bloat can occur as a consequence of the substantial use of processed grain

[7] The Land use impacts associated to each hectare occupied depends on the impacts per hectare of the crops cultivated to produce the feed ingredients. The Land use static impact per hectare range from about 70 % to about 90 %. Crop cultivation also generates Encroachment, Fragmentation and Atmospheric Nitrogen Deposition pressures: the ratio of total static terrestrial impacts over Land use static terrestrial impacts related to cultivation range from about 1.25 to about 2.

and low levels of roughage in cattle finishing diets (Galyean and Rivera 2003). As an example, acidosis can lead to a decreased feed intake and lower performance for feedlot cattle (Owens et al. 1998).

On the other hand, pasture systems involve animals consuming a diet based mostly on grass and forages.

As mentioned previously, in an effort to be closer to actual herd systems an assessment of the year-round impact of cattle involved in feedlot systems was conducted. Indeed, on a yearly base, animals only spend a certain number of days in feedlots (the "finishing" phase), while they spend the rest of the year (the "rearing" phase) outside of feedlots, in the respective native system (either in dairy or meat specialized herd, in a more mixed extensive system).

According to GLEAM, the rearing phase lasts 245 days and the finishing phase 120 days. To calculate impacts for a mixed system involving both a rearing phase in extensive systems and a finishing phase in intensive ecosystems, a simple weighted mean is applied:

Impact of the mixed rearing and finishing system = (*Impact of the extensive system* x 245 + *Impact of the intensive system* x 120)/365

With Impact of the extensive system = the average of the Mixed dairy and Mixed meat systems.

Extensive feed rations, which consists mostly of grazing and roughages, have been observed (to have equivalent or higher (1 700 and 1 600 MSA.km^2 for dairy and meat extensive practices) terrestrial static impacts on biodiversity when compared to intensive (feedlot) feed rations (1 600 MSA.km^2) that mostly include grains and oilseed meals. Indeed, grains have both a high nutritional value and a high yield, which means less is required and for an even smaller surface area. Fresh grass and even more hay (grazing) have a lower yield compared to grains and oilseed meals, meaning that there is a risk of increasing the impacted surfaces. However, the reduction in impacted surfaces achieved with grains-based rations of the finishing phase of the feedlot system is not sufficient to make a significant terrestrial static impact reduction compared to the extensive meat system. As dairy extensive systems require higher metabolizable energy and therefore quantities of feed intake than the other systems, they also require higher surfaces for fresh grass and hay.

An even more significant subtlety to take into account is that the age at slaughter likely differs between systems. As a consequence, the number of animals required to produce the same number of skins annually, and thus the impacts per skin also differ. Seeking data on age at slaughter fell outside this version of the benchmark factsheet but future versions should investigate the effect of this parameter. It is likely to lead to underestimation of the impacts of extensive systems (where animals are likely to be slaughtered later).

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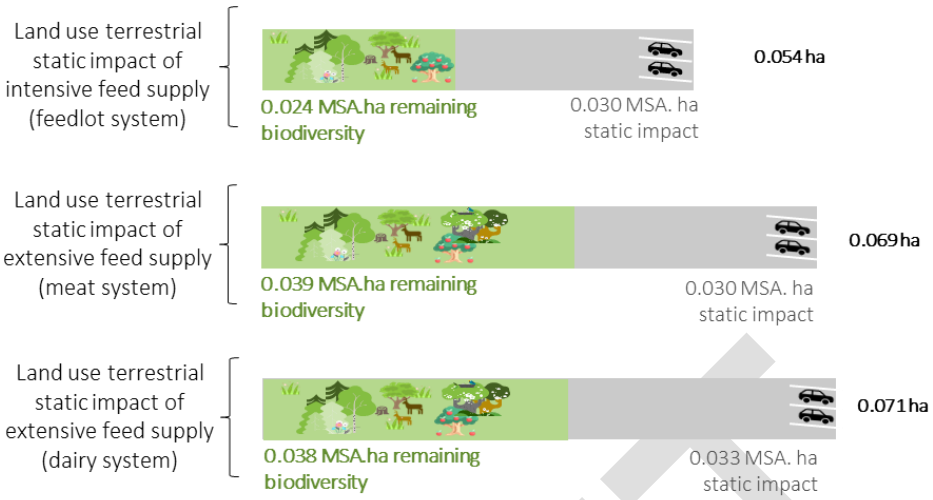

Figure 40. Remaining biodiversity for the three systems considered

Moreover, the situation is not entirely straightforward, even though there is higher terrestrial static impacts associated with the feed ration of extensive practices, there is a higher remaining biodiversity associated with extensive feed rations (Figure 40). Indeed, grazing fields have more remaining biodiversity than land dedicated solely to grain production.

So far, situations have been compared for a given year. What about switching from one system to another from one year to the next?

A switch from intensive practices toward extensive practices could result in additional dynamic impacts as the static impacts are higher for extensive practices. It would however increase the remaining biodiversity. Such a switch would still be relevant to maintain higher remaining biodiversity but should be paired with biodiversity safeguards such as no land use conversion (from forest to agriculture for example), and no land use intensification (no increase of fertilizers or pesticides). In practice, it means leather producing companies should look for existing supplier using extensive practices and not push suppliers to deforest or degrade land to convert to extensive practices[8].

The conclusion regarding which feed ration is more detrimental to biodiversity requires a comprehensive evaluation of various factors. As expected, the surfaces needed for the feed rations and the terrestrial static impacts would be higher for extensive practices for the same feed intake in tonnes, as more land area is necessary to produce the same amount of feed component than for intensive agriculture (due to lower yields and to some extent nutriotional values). Nevertheless, extensive practices allow to keep a higher remaining biodiversity on the surfaces used for agriculture. These conclusions are very sensitive to the yields of crops and may thus change depending on the geographies considered (as yields vary by geography). Overall, this points to (i) the need for a detailed assessment of the impacts of any husbandry system to ensure impacts on biodiversity are minimised

[8] Please note that switching from intensive practices toward a supplier which is already practicing extensive farming would not reduce the static impacts (= the accumulated negative impacts).

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and remaining biodiversity is maximised and (ii) carefully balancing competing objectives: maximizing remaining biodiversity per hectare while also minimizing the static impacts. One way forward is also to focus on net periodic (dynamic) gains of biodiversity instead of on solely static impacts.

8. Trajectories for achieving international biodiversity targets

The objective of this section is to estimate the efforts that need to be provided by the Manufacturing industry sector to achieve sustainable biodiversity objectives. This section develops an approach that distributes among all economic sectors the share of efforts to meet the objectives of the post-2020 Global Biodiversity Framework (GBF) adopted during COP15.

A "central trajectory" to bend the curve of biodiversity loss is built based on an interpretation of the CBD's Global Biodiversity Framework. It aims to reach at least a global no net loss of biodiversity in 2030 and restore biodiversity between 2030 and 2050. This is interpreted as a net global dynamic impact of 0 in 2030 and a return to the "zone of functional integrity of the Earth system" by 2050. Thus, a global budget of maximum biodiversity loss (from 2020 to 2030), as well as a minimum biodiversity gain (from 2031 to 2050) are defined. The detailed methodology is available in 2.6. The amount of efforts is to be allocated to economic sectors and companies. Different allocation approaches described in can be used to share efforts and lead to different sectoral trajectories.

Please note that for benchmark sectors comparative purposes and because of data availability, the turnovers used for the capability allocation method are from 2011. The efforts might therefore be underestimated for sectors that have experienced a growth significantly greater than the other sectors.

Table 15: Allocations and data used to draw sectoral trajectories

Allocation	Approach	Parameter	Data source
Equality	Everyone has the same right	Number of employees in the sector	Eurostat (2010)
Efficiency	Cost-effectiveness	Cost of restoration (EUR/[MSA.m²])	CDC Biodiversité internal estimation
Capability	Industries' ability to pay	Turnover (MEUR)	EXIOBASE (2011)
Sovereignty	Grandfathering	2020 dynamic impact (MSA.km²/year)	GBS computation

Table 16: Data used and proportion of each allocation for the Manufacturing industry sector

Equality	Efficiency	Capability	Sovereignty

Number of employees (thousand persons)	*proportion of the sector's effort compared to the overall effort*	*Restoration cost (EUR/[MSA.m²])*	*proportion of the sector's effort compared to the overall effort*	*Turnover (MEUR)*	*proportion of the sector's effort compared to the overall effort*	*Net Impact 2020 (MSA.km²/year)*	*proportion of the sector's effort compared to the overall effort*
2.0E+04	8 %	5	0.2 %J	1.7E+07	17 %	1.9E+04	7 %

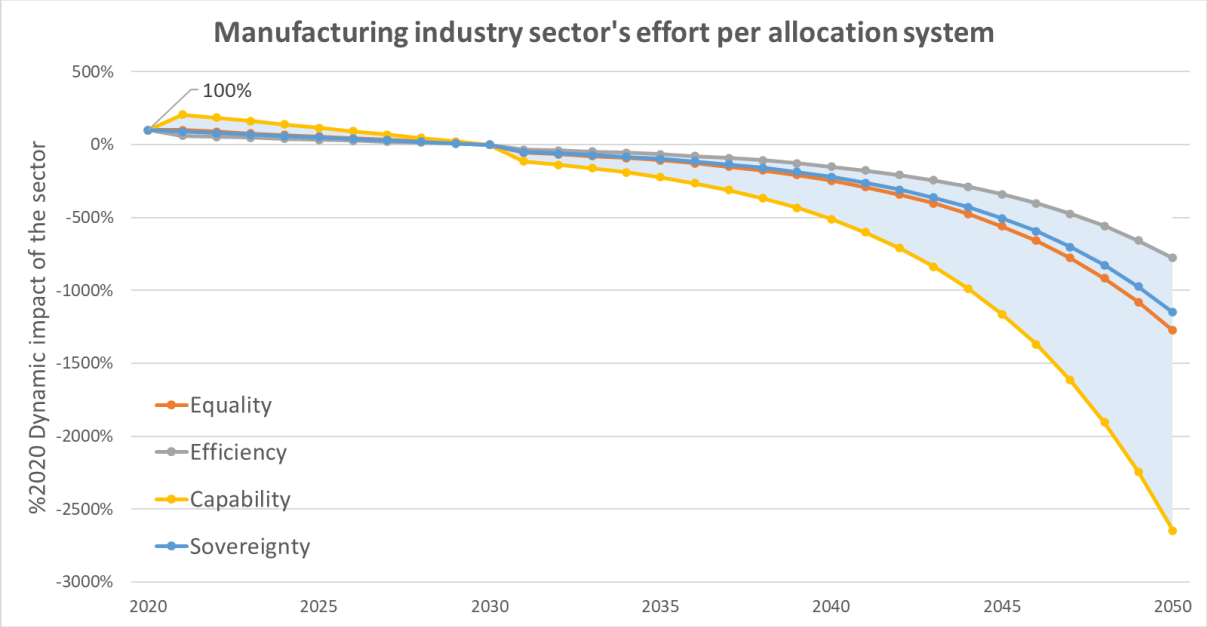

Figure 41: Manufacturing industry sector's dynamic impact per allocation system

The Manufacturing industry sector is one of the sectors that must provide the greatest efforts to meet the objectives of the CBD. 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 (for further information about the trajectories for the Agricultural and agrifood, energy, chemicals, construction, electrical machinery, raw materials extraction sectors, please check the corresponding factsheets). Therefore, the efforts for capability, equality and efficiency are important.

Attention needs to be paid to the sovereignty method here. The dynamic impacts used are from Scope 1, but almost all the Manufacturing industry sector impacts are coming from Upstream Scope 3. Consequently, this method might not reflect the significant dynamic impacts that the Manufacturing sector makes along its value chain.

9. Possible actions to reduce the impact on biodiversity

The following section suggests some actions to alleviate the impacts of the manufacturing sector. However, please note that the following actions should only be considered when relevant to a given manufacturing industry.

9.1 Actions for the global manufacturing sector

This section discusses some general actions to consider to reduce the impacts of the manufacturing sector. When focusing on Scope 1 impacts, a significant leverage could be scaling up product eco-design and technology improvement, aiming for enhanced efficiency, recycling capabilities, and emission reduction (CBD 2018). Additionally, substituting hazardous chemicals with less harmful alternatives can significantly contribute to safeguarding biodiversity (Aiama et al. 2016). Many industrial processes rely on the use of chemicals which, if not properly managed, can find their way into the environment through various pathways such as air emissions, wastewater discharges, or improper waste disposal. Lastly, applying the mitigation hierarchy, which involves avoiding, reducing, and restoring impacts from manufacturing activities, is essential for comprehensive biodiversity conservation. To be effective and provide significant impact reductions, the first two steps (avoid and reduce) should be highly prioritized over restoring.

For Scope 2, embracing alternative, low-impact, or renewable energy sources will help reduce greenhouse gas emissions and therefore biodiversity loss. Prioritizing energy efficiency improvements can also further enhance sustainability efforts.

For Scope 3, in the realm of raw material supply, adopting sustainable sourcing practices is crucial. As most of the impacts comes from the Upstream Scope 3, industries should emphasize the use of low-impact materials. This should be achieved by engaging suppliers and deepening value chain collaboration. Finally, adopting sustainable water management practices is vital for conserving water resources and minimizing negative impacts on aquatic ecosystems.

9.2 Actions for specific industries

For industries for which most of the direct operational impacts (Scope 1) are associated with Climate change, a specific focus should be put on reducing GHG emissions. This is especially the case for industries of the Mineral and petroleum products category. One crucial step is process optimization, where industries can improve their manufacturing processes, such as the cement manufacturing process. Promoting material efficiency and reducing the clinker-to-cement ratio can contributes to direct emission reductions (David Hodgson and Paul Hugues 2022).

Furthermore, for industries relying on biomass-based materials (such as cotton, tobacco, rubber, and wood), implementing sustainable practices is an important step.

Lastly, as the Wood and paper products category is the most impactful manufacturing category, important measures should be considered to effectively reduce its impacts. One way to achieve reduction is through transitioning to deforestation-free supply chains (Aiama et al. 2016).

Figure 42 below summarizes the suggested actions and highlights the manufacturing categories that could benefit the most from their implementation.

	Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronic, vehicles and machinery	Tobacco, rubber and plastic	Other
Product eco-design and technology improvement	✓	✓	✓	✓	✓	✓

	Textiles, leather and fur	Paper and wood products	Mineral and petroleum products	Electronic, vehicles and machinery	Tobacco, rubber and plastic	Other
for efficiency, recycling, and emission reduction						
Substituting hazardous chemicals with less hazardous ones	✓	✓	✓	✓	✓	✓
Apply the mitigation hierarchy (avoid, reduce, restore)	✓	✓	✓	✓	✓	✓
Alternative, low-impact, or renewable energy sources adoption	✓	✓	✓	✓	✓	✓
Energy-efficiency improvement	✓	✓	✓	✓	✓	✓
Use of low-impact, sustainable raw materials sourcing from biomass	✓	✓			✓	
Process optimization to reduce direct emissions			✓			
Move to deforestation-free supply chains	✓	✓			✓	
Engaging suppliers to act towards biodiversity	✓	✓	✓	✓	✓	✓
Increase use of recycled raw materials	✓	✓	✓	✓	✓	✓
Adopt a sustainable water management	✓	✓	✓	✓	✓	✓

Figure 42: Reduction actions per manufacturing category

D. EU TAXONOMY GUIDELINES

1. Economic activities included in the EU taxonomy

The economic activities and their description (Official Journal of the European Union 2021) belonging to the Manufacturing sector covered directly by the EU taxonomy are:

- **Manufacture of cement**:

Manufacture of cement clinker, cement or alternative binder.
The economic activities in this category could be associated with NACE code C23.51 in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006.
An economic activity in this category is a transitional activity as referred to in Article 10(2) of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

- **Manufacture of energy efficiency equipment for buildings:**
  Manufacture of energy efficiency equipment for buildings.
  The economic activities in this category could be associated with several NACE codes, in particular C16.23, C23.11, C23.20, C23.31, C23.32, C23.43, C.23.61, C25.11, C25.12, C25.21, C25.29, C25.93, C27.31, C27.32, C27.33, C27.40, C27.51, C28.11, C28.12, C28.13, C28.14, in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006. An economic activity in this category is an enabling activity in accordance with Article 10(1), point (i), of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

- **Manufacture of equipment for the production and use of hydrogen:**
  Manufacture of equipment for the production and use of hydrogen. The economic activities in this category could be associated with several NACE codes, in particular C25, C27, C28, in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006. An economic activity in this category is an enabling activity in accordance with Article 10(1), point (i), of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

- **Manufacture of low carbon technologies for transport:**
  Manufacture, repair, maintenance, retrofitting, repurposing and upgrade of low carbon transport vehicles, rolling stock and vessels. The economic activities in this category could be associated with several NACE codes, in particular C29.1, C30.1, C30.2, C30.9, C33.15, C33.17 in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006. An economic activity in this category is an enabling activity in accordance with Article 10(1), point (i), of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

- **Manufacture of other low carbon technologies**
  Manufacture of technologies aimed at substantial GHG emission reductions in other sectors of the economy, where those technologies are not covered in Sections 3.1 to 3.5 of this Annex. The economic activities in this category could be associated with several NACE codes, in particular from C22, C25, C26, C27 and C28 in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006. An economic activity in this category is an enabling activity in accordance with Article 10(1), point (i), of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

- **Manufacture of renewable energy technologies**
  Manufacture of renewable energy technologies, where renewable energy is defined in Article 2(1) of Directive (EU) 2018/2001. The economic activities in this category could be associated with several NACE codes, in particular C25, C27, C28 in accordance with the statistical classification of economic activities established by Regulation (EC) No 1893/2006. An activity in this category is an enabling activity in accordance with Article 10(1), point (i), of Regulation (EU) 2020/852 where it complies with the technical screening criteria set out in this Section.

Figure 43 below shows the economic activities related to the Manufacturing sector covered by the EU taxonomy and their associated NACE divisions.

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Figure 43: Economic activities related to the Manufacturing sector covered by the EU taxonomy and their associated NACE divisions

The screening criteria published so far in the Delegated Act on climate objectives (Official Journal of the European Union 2021) do not specifically address activities related to the NACE divisions Manufacture of tobacco products (12), Manufacture of textile (13), Manufacture of wearing apparel (14), Manufacture of leather and related products (15), Manufacture of paper and paper products (17), Printing and reproduction of recorded media (18), Manufacture of coke and refined petroleum products (19), Manufacture of furniture (31), and Other manufacturing (32).

2. 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)

Manufacture of cement

The activity manufactures one of the following:

a. grey cement clinker where the specific GHG emissions (99) are lower than 0,722(100) tCO2e per tonne of grey cement clinker;

b. cement from grey clinker or alternative hydraulic binder, where the specific GHG emissions (101) from the clinker and cement or alternative binder production are lower than 0,469 (102) tCO2e per tonne of cement or alternative binder manufactured.

Where CO2 that would otherwise be emitted from the manufacturing process is captured for the purpose of underground storage, the CO2 is transported and stored underground, in accordance with the technical screening criteria set out in Sections 5.11 and 5.12 of this Annex.

Manufacture of energy efficiency equipment for buildings

The economic activity manufactures one or more of the following products and their key components (94):

(a) windows with U-value lower or equal to 1,0 W/m2K;

(b) doors with U-value lower or equal to 1,2 W/m2K;

(c) external wall systems with U-value lower or equal to 0,5 W/m2K;

(d) roofing systems with U-value lower or equal to 0,3 W/m2K;

(e) insulating products with a lambda value lower or equal to 0,06 W/mK;

(f) household appliances falling into the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 of the European Parliament and of the Council (95) and delegated acts adopted under that Regulation;

(g) light sources rated in the highest two populated classes of energy efficiency in accordance with Regulation

(EU) 2017/1369 and delegated acts adopted under that Regulation;

(h) space heating and domestic hot water systems rated in the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 and delegated acts adopted under that Regulation;

(i) cooling and ventilation systems rated in the highest two populated classes of energy efficiency in accordance with Regulation (EU) 2017/1369 and delegated acts adopted under that Regulation;

(j) presence and daylight controls for lighting systems;

(k) heat pumps compliant with the technical screening criteria set out in Section 4.16 of this Annex;

(l) façade and roofing elements with a solar shading or solar control function, including those that support the growing of vegetation;

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(m) energy-efficient building automation and control systems for residential and non-residential buildings;

(n) zoned thermostats and devices for the smart monitoring of the main electricity loads or heat loads for

buildings, and sensoring equipment;

(o) products for heat metering and thermostatic controls for individual homes connected to district heating

systems, for individual flats connected to central heating systems serving a whole building, and for central

heating systems;

(p) district heating exchangers and substations compliant with the district heating/cooling distribution activity set out in Section 4.15 of this Annex;

(q) products for smart monitoring and regulating of heating system, and sensoring equipment.

Manufacture of equipment for the production and use of hydrogen

The economic activity manufactures equipment for the production of hydrogen compliant with the Technical Screening Criteria set out in Section 3.10 of this Annex and equipment for the use of hydrogen:

The activity complies with the life-cycle GHG emissions savings requirement of 73,4 % for hydrogen [resulting in life-cycle GHG emissions lower than 3tCO2e/tH2] and 70 % for hydrogen-based synthetic fuels relative to a fossil fuel comparator of 94 g CO2e/MJ in analogy to the approach set out in Article 25(2) of and Annex V to Directive (EU) 2018/2001.

Life-cycle GHG emissions savings are calculated using the methodology referred to in Article 28(5) of Directive (EU) 2018/2001 or, alternatively, using ISO 14067:2018 (119) or ISO 14064-1:2018 (120).

Quantified life-cycle GHG emission savings are verified in line with Article 30 of Directive (EU) 2018/2001 where applicable, or by an independent third party.

Where the CO2 that would otherwise be emitted from the manufacturing process is captured for the purpose of underground storage, the CO2 is transported and stored underground, in accordance with the technical screening criteria set out in Sections 5.11 and 5.12, respectively, of this Annex

Manufacture of low carbon technologies for transport

The economic activity manufactures, repairs, maintains, retrofits (74), repurposes or upgrades:

(a) trains, passenger coaches and wagons that have zero direct (tailpipe) CO2 emissions;

(b) trains, passenger coaches and wagons that have zero direct tailpipe CO2 emission when operated on a track with necessary infrastructure, and use a conventional engine where such infrastructure is not available (bimode);

(c) urban, suburban and road passenger transport devices, where the direct (tailpipe) CO2 emissions of the vehicles are zero;

(d) until 31 December 2025, vehicles designated as categories M2 and M3 (75) that have a type of bodywork classified as 'CA' (single-deck vehicle), 'CB' (double-deck vehicle), 'CC' (single-deck articulated vehicle) or 'CD' (double-deck articulated vehicle) (76), and comply with the latest EURO VI standard, i.e. both with the requirements of Regulation (EC) No 595/2009 of the European Parliament and of the Council (77) and, from the time of the entry into force of amendments to that Regulation, in those amending acts, even before they become applicable, and with the latest step of the Euro VI standard set out in Table 1 of Appendix 9 to Annex I to Commission Regulation (EU) No 582/2011 (78) where the provisions governing that step have entered into force but have not yet become applicable for this type of vehicle (79). Where such standard is not available, the direct CO2 emissions of the vehicles are zero;

(e) personal mobility devices with a propulsion that comes from the physical activity of the user, from a zeroemissions motor, or a mix of zero-emissions motor and physical activity;

(f) vehicles of category M1 and N1 classified as light-duty vehicles (80) with:

(i) until 31 December 2025: specific emissions of CO2, as defined in Article 3(1), point (h), of Regulation (EU) 2019/631 of the European Parliament and of the Council (81), lower than 50 g CO2/km (low- and zero-emission light-duty vehicles);

(ii) from 1 January 2026: specific emissions of CO2, as defined in Article 3(1), point (h), of Regulation (EU) 2019/631, are zero;

(g) vehicles of category L (82) with tailpipe CO2 emissions equal to 0 g CO2e/km calculated in accordance with the

emission test laid down in Regulation (EU) 168/2013 of the European Parliament and of the Council (83);

(h) vehicles of categories N2 and N3, and N1 classified as heavy-duty vehicles, not dedicated to transporting fossil fuels with a technically permissible maximum laden mass not exceeding 7,5 tonnes that are 'zero-emission heavy-duty vehicles' as defined in Article 3, point (11), of Regulation (EU) 2019/1242 of the European Parliament and of the Council (84);

(i) vehicles of categories N2 and N3 not dedicated to transporting fossil fuels with a technically permissible maximum laden mass exceeding 7,5 tonnes that are zero-emission heavy-duty vehicles', as defined in Article 3, point (11), of Regulation (EU) 2019/1242 or 'low-emission heavy-duty vehicles' as defined in Article 3, point (12) of that Regulation;

(j) inland passenger water transport vessels that:

(i) have zero direct (tailpipe) CO2 emissions;

(ii) until 31 December 2025, are hybrid and dual fuel vessels using at least 50 % of their energy from zero direct (tailpipe) CO2 emission fuels or plug-in power for their normal operation;

(k) inland freight water transport vessels, not dedicated to transporting fossil fuels, that:

(i) have zero direct (tailpipe) CO2 emission;

(ii) until 31 December 2025, have direct (tailpipe) emissions of CO2 per tonne kilometre (g CO2/tkm), calculated (or estimated in case of new vessels) using the Energy Efficiency Operational Indicator (85), 50 % lower than the average reference value for emissions of CO2 defined for heavy duty vehicles (vehicle subgroup 5-LH) in accordance with Article 11 of Regulation (EU) 2019/1242;

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(l) sea and coastal freight water transport vessels, vessels for port operations and auxiliary activities, that are not dedicated to transporting fossil fuels, that:

(i) have zero direct (tailpipe) CO2 emissions;

(ii) until 31 December 2025, are hybrid and dual fuel vessels that derive at least 25 % of their energy from zero direct (tailpipe) CO2 emission fuels or plug-in power for their normal operation at sea and in ports;

(iii) until 31 December 2025, and only where it can be proved that the vessels are used exclusively for operating coastal and short sea services designed to enable modal shift of freight currently transported by land to sea, the vessels that have direct (tailpipe) CO2 emissions, calculated using the International Maritime Organization (IMO) Energy Efficiency Design Index (EEDI) (86), 50 % lower than the average reference CO2 emissions value defined for heavy duty vehicles (vehicle subgroup 5-LH) in accordance with Article 11 of Regulation (EU) 2019/1242;

(iv) until 31 December 2025, the vessels have an attained Energy Efficiency Design Index (EEDI) value 10 % below the EEDI requirements applicable on 1 April 2022 (87) if the vessels are able to run on zero direct (tailpipe) CO2 emission fuels or on fuels from renewable sources (88);

(m) sea and coastal passenger water transport vessels, not dedicated to transporting fossil fuels, that:

(i) have zero direct (tailpipe) CO2 emissions;

(ii) until 31 December 2025, hybrid and dual fuel vessels derive at least 25 % of their energy from zero direct (tailpipe) CO2 emission fuels or plug-in power for their normal operation at sea and in ports;

(iii) until 31 December 2025, the vessels have an attained Energy Efficiency Design Index (EEDI) value 10 % below the EEDI requirements applicable on 1 April 2022 if the vessels are able to run on zero direct (tailpipe) CO2 emission fuels or on fuels from renewable sources (89).

Manufacture of other low carbon technologies

The economic activity manufactures technologies that are aimed at and demonstrate substantial life-cycle GHG emission savings compared to the best performing alternative technology/product/solution available on the market.

Life-cycle GHG emission savings are calculated using Commission Recommendation 2013/179/EU (96) or, alternatively, ISO 14067:2018 (97) or ISO 14064-1:2018 (98).

Quantified life-cycle GHG emission savings are verified by an independent third party.

Manufacture of renewable energy technologies

The economic activity manufactures renewable energy technologies.

4. Other European initiatives

The manufacturing industry is responsible for a significant burden on our environment, as industrial installations account for a significant share of total emissions of greenhouse gases, air pollutants and other important environmental impacts. There is a general tendency for European industry to move away from heavy and polluting types of manufacture, and companies start to engage in voluntary schemes to reduce their environmental impact (European Environment Agency 2022). However, most initiatives are oriented toward carbon emissions savings, and not so much toward biodiversity, even though they are closely related. To limit

industrial pollution, the European Union has established the Industrial Emissions Directive (IED) (European Parliament and Council of the European Union 2010). It defines for identified large industrial installations emission limit values for selected pollutants, to minimise polluting emissions to the atmosphere, water, and soil, as well as to reduce waste.

Moreover, the Green Deal Industrial Plan (Comission to the European Parliament et al. 2023) aims to enhance the competitiveness of Europe's net-zero industry, with strategies to scale up the EU's manufacturing capacity for the net-zero technologies and products required to meet Europe's climate targets. The Green Deal Industrial Plan cover four key pillars, the first one being about creating a predictable and simplified regulatory environment. As part of this pillar, the Net-Zero Industry Act (European Commission and Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs 2023) initiative has the ambition to increase the EU's manufacturing capacity of technologies that support the clean energy transition. The goal is to have a strategic net-zero technologies manufacturing capacity of the EU approaching or reaching at least 40% of annual deployment needs by 2030. The Act proposes to lower administrative burden for developing net-zero manufacturing projects and simpler and faster permitting procedures. In this context, strategic projects will benefit from even faster permitting, to increase planning and investment certainty.

To implement the European Green Deal commitments, the EU Strategy for Sustainable and Circular Textiles addresses the production and consumption of textiles (Commission to the European Parliament et al. 2022). As part of the strategy, the Commission will set design requirements for textiles to make them easier to recycle, as well as requirements on minimum recycled content.

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