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JRC TECHNICAL REPORT

EU Country profiles in the Raw Materials Information System (RMIS): Denmark

Country-level key data and information related to non-food, non-energy raw materials

Nita, V., Garbossa, E., Ciută, T., Bonollo, B., Mancini, L., Vidal-Legaz, B., Latunussa, C., Wittmer, D., Hamor, T., d'Elia, E. Unguru, M. and Manfredi, S.

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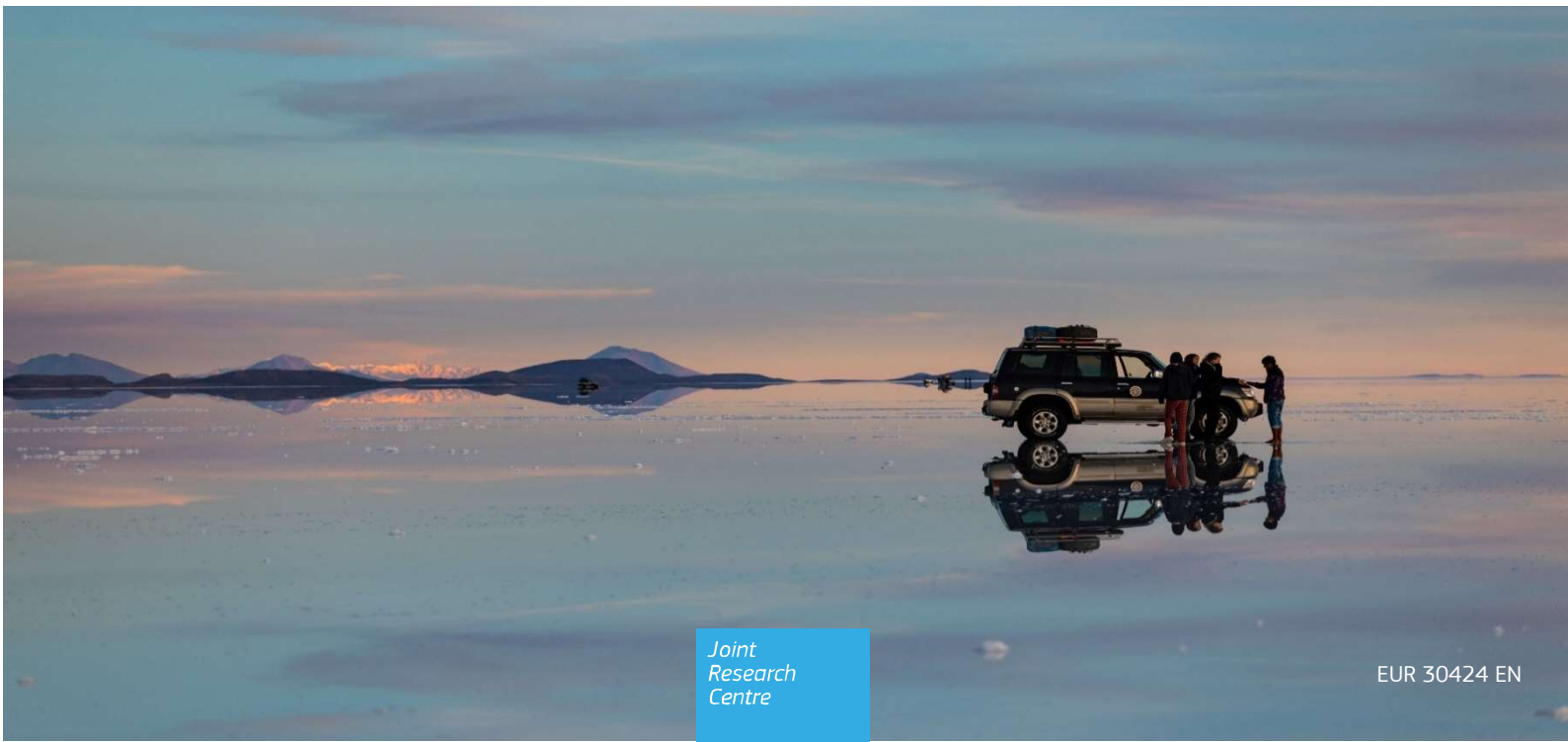

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Contact information
Name: Simone Manfredi
Address: via E. Fermi 2749, 21027 Ispra, Italy
Email: simone.manfredi@ec.europa.eu
Tel.: 0039.0332.786046

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Foreword

The Raw Materials Information System (RMIS), developed and hosted by the Joint Research Centre (JRC), is the EC's reference knowledge platform on non-food, non-energy raw materials from primary to secondary sources. The RMIS includes a number of thematic sections, covering a broad range of topics relevant to raw materials policy. Among them, EU Country Profiles provide data and indicators for EU countries.

This report mirrors the content of the profile developed for Denmark, as available online in the RMIS.

Authors

Viorel Nita, Elisa Garbossa, Theodor Ciută, Bianca Bonollo, Lucia Mancini, L., Beatriz Vidal-Legaz, Cynthia Latunussa, Dominic Wittmer, Tamas Hamor, Eleonora d'Elia, Manuela Unguru and Simone Manfredi

Abstract

The module European Country Profiles of the European Commission's Raw Materials Information System (RMIS) provides country-specific data and indicators related to non-food, non-energy raw materials. These data and indicators are derived from data from official sources and well-established data providers, or by their elaboration. Each profile is structured into nine thematic sections: i) Key indicators; ii) Investment and regulatory framework; iii) research, development and innovation; iv) Resources and reserves; v) Supply; vi) Raw materials use; vii) Trade; viii) Environment; and ix) Social & Policy.

The current country report presents the data and indicators for Denmark, mirroring the EU Country Profile for Denmark included in the RMIS in December 2019, which is the reference month of the data used.

1 Introduction

The module European Country Profiles ([1]) of the European Commission's Raw Materials Information System (RMIS) aims to provide country-specific knowledge for non-food, non-energy raw materials. Seventeen EU countries profiles are currently accessible in the RMIS. For the remaining EU countries, work is ongoing.

These country profiles synthetize key data, information and indicators related to raw materials by either using data from established data providers (e.g., Eurostat, IMF, World Bank, UNIDO, UN Statistics) or by JRC elaboration based on the available official data (e.g., data on country's trade in raw materials at HS 6-digit level, country's exports of mining equipment, etc.).

Each profile is structured into nine thematic sections, as presented hereafter.

Key Indicators (section 1) and *Research, development and innovation* (section 3) include both selected economy-wide indicators (e.g., industrial competitiveness, contribution of mining sector to national economies, industry and manufacturing value added as share of GDP) and data on the economic performance of industrial sectors particularly relevant for raw materials - e.g. value added, employment, labour productivity, as well as magnitude of research and development expenditure.

Indicators of country-level and sectorial investments (e.g., share of total investment in GDP, foreign direct investments and exploration budget in metals and mining), as well the specificities of countries' mining legislative frameworks are presented in section 2, *Investment and regulatory framework*.

Data relating to country's estimated mineral resources and reserves are provided in section 4, *Resources and reserves*.

Supply section (section 5) presents data on country's volume of imported goods, domestic extraction by broad category of materials, production value of selected mining and manufacturing sectors, and country's production of non-food, non-energy minerals.

Section 6, *Raw material use*, focuses on utilization of raw materials, presenting data on country's volume of goods exported and domestic consumption by broad category of materials.

Section 7, *Trade*, presents country indicators and data on trade in non-food, non-energy raw materials, by relevant material category, product cluster, and Harmonized System chapter and subheading. Based on the methodology developed within the framework of Raw Materials Scoreboard ([2]), this section also presents the country's exports of mining equipment.

Environment section (section 8) includes tables and charts of selected indicators of environmental performance of relevant industrial sectors, such as emissions of greenhouse gases and particulate matter and generation of waste.

Several social and policy indicators are displayed in the section 9, *Social & Policy*, such as governance quality, policy perception, country risk and occupational safety.

The current country report presents data and indicators for Denmark, as elaborated in the *EU Country Profiles* module in the RMIS. This country profile was developed in December 2019, which is the reference month of the most data used (i.e., it includes the data available at that time).

Denmark's industry ranked 21st in the UNIDO's Competitive Industrial Performance Index in 2016.

In 2018, industrial value added accounted for one fifth of Denmark's GDP, and manufacturing industry almost 13 percent.

Based on the share in the total manufacturing's value added, important raw material relevant manufacturing sectors are chemicals and chemical products and fabricated metal products.

From the selected raw material relevant sectors, manufacture of other non-metallic minerals was by far the most significant contributor to both total value added and employment of the whole industry over the period 2008-2016.

([1]) https://rmis.jrc.ec.europa.eu/?page=country-profiles#/

([2]) For more methodological details and the list of 21 six-digit HS codes covered by this indicator, Raw materials scoreboard 2018, Methodological notes, Mining equipment exports, https://op.europa.eu/en/publication-detail/-/publication/117c8d9b-e3d3-11e8-b690-01aa75ed71a1

Despite its declining share of production value in total industry, mining and quarrying (Section B, NACE Rev.2) had by far the highest labour productivity among the four big components of industry (i.e., NACE Rev.2, sections B-E) over the period 2010-2016.

Denmark has a high-quality business regulatory environment, ranking 3rd out of 190 economies in the World Bank's *Doing Business 2019*.

Two sectors, manufacture of other non-metallic mineral products and manufacture of rubber and plastics products had the highest level of business expenditure on R&D from the selected raw material relevant sectors in 2017. Manufacture of basic metals, manufacture of other non-metallic minerals and manufacture of wood and wood products had high production value in 2016.

In 2017, Denmark's production of diatomite accounted for 5.4 percent of world's production.

In 2017, Denmark was a net importer of two HS broad product groups - Intermediate goods and Consumer goods - and had trade surplus for the other two – Raw Materials and Capital goods.

As per the four raw materials relevant HS product clusters selected, Denmark was a net importer of Stone and Glass, Wood and Metals, and had trade surplus for Minerals in 2017. At HS 2-dit level, Denmark had significant trade surplus for *Salt; sulphur; earths and stone; plastering materials, lime and cement* (HS 25) in the same year.

As far as the environmental performance of the raw material relevant industrial sectors is concerned, manufacture of other non-metallic minerals had by far the highest greenhouse gas emission intensity, while manufacture of wood and wood products the highest PM 2.5 emission intensity in 2017.

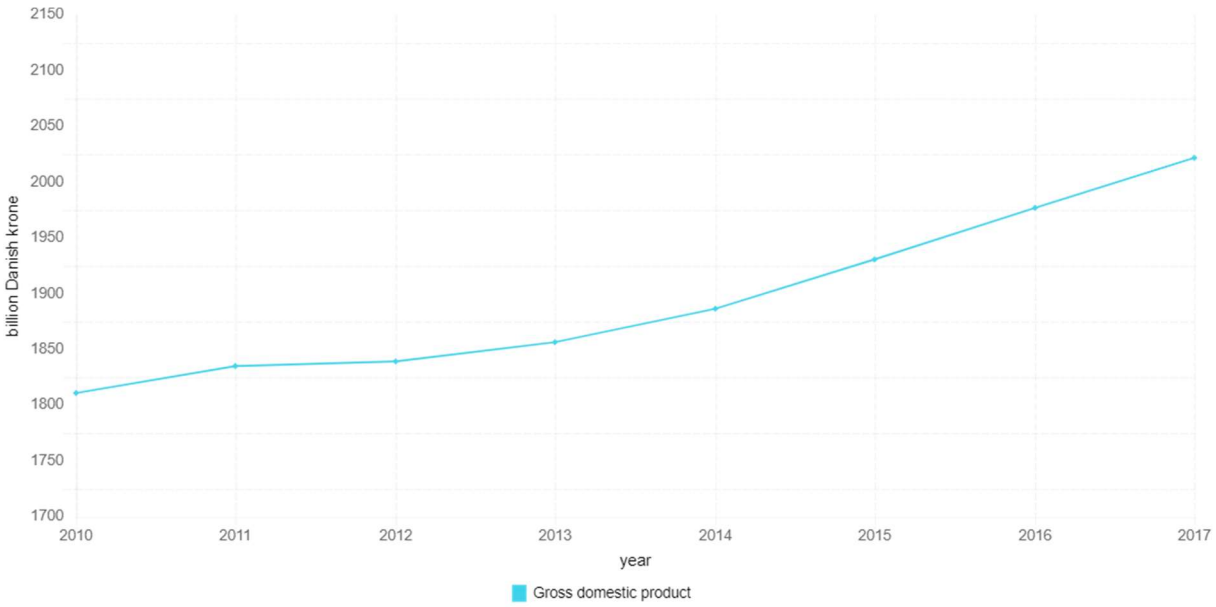
Denmark ranks high for the six dimensions of governance, according to the Worldwide Governance Indicators, and has a very low country risk, according to INFORM index.

2 Key indicators

2.1 Gross domestic product

Definition: GDP data are expenditure-based, in constant prices and billions of national currency units. Base year is country specific.

Figure 1. Gross domestic product (constant prices; 2010)([3])



2.2 Competitive Industrial Performance Index

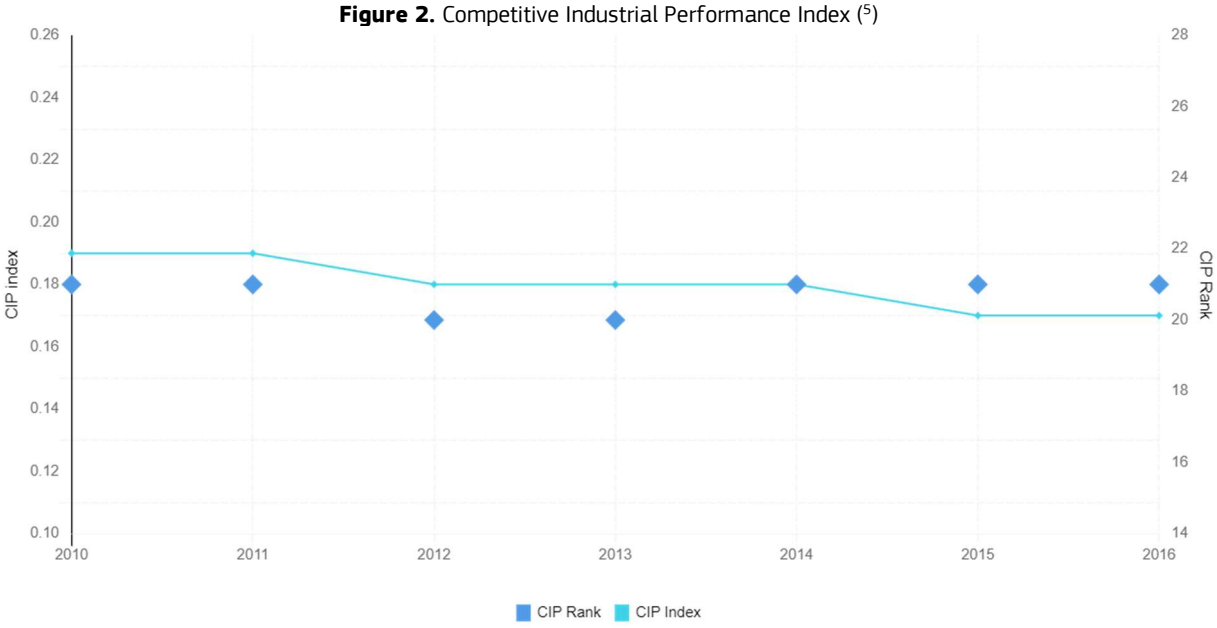
Definition: As calculated by UNIDO, Competitive Industrial Performance Index (CIP) aims at measuring the industrial performance of countries. CIP is a composite index based on eight indicators, grouped into three dimensions of industrial competitiveness: production and export capability; technology; and impact on global industrial production and trade.

The 2018 CIP report covers 150 economies ([4]).

([3]) IMF, World Economic Outlook Databases, https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases#sort=%40imfdate%20descending

([4]) UNIDO, Competitive Industrial Performance Report 2018, https://www.unido.org/sites/default/files/files/2019-05/CIP_Report_2019.pdf

Figure 2. Competitive Industrial Performance Index ([5])



2.3 Mining Contribution Index

Definition: The 2018 Mining Contribution Index (MCI) quantifies the extent of mining sector's contribution to a country's economy. It is an index composed of four indicators, namely:

1. mineral and metal contribution to country's exports in 2016
2. change in export contribution of mining and metal exports over the period 2011-2016
3. mineral production value in 2016, expressed as a percentage of GDP
4. mineral rents as percentage of GDP.

Table 1. Mining Contribution Index 2018 ([6])

Mining Contribution Index 2018	**2018 MCI Score**: 26.1	**Rank**: 145 (out of 182)

2.4 Industry's and manufacturing's value added as share of GDP

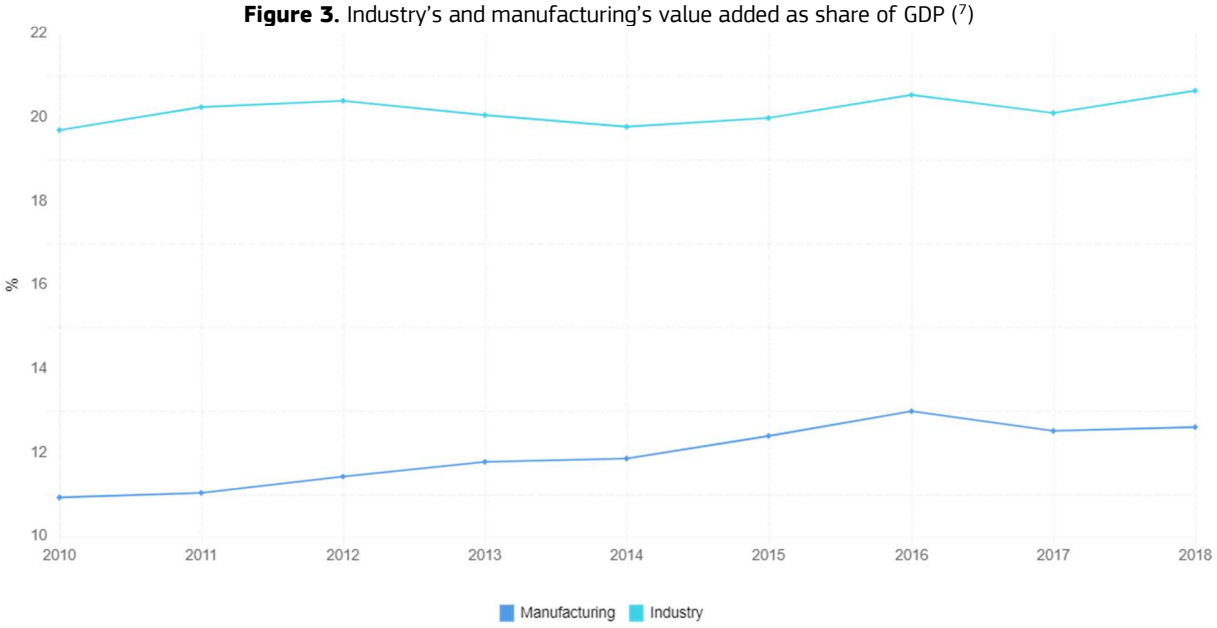
Definition: Value added is the net output of a sector. As defined by World Bank, industry covers here the International Standard Industrial Classification (ISIC) divisions 10-45. Industry's value added comprises value added in mining, manufacturing, construction, electricity, water, and gas.

Part of the industry, manufacturing covers the ISIC divisions 15-37.

([5]) UNIDO, Competitive Industrial Performance Index, https://stat.unido.org/ .

([6]) Source of data (and details on MCI calculation): International Council on Mining and Metals, Role of mining in national economies. Mining Contribution Index 2018 4th edition, https://www.icmm.com/en-gb/society-and-the-economy/role-of-mining-in-national-economies/mining-contribution-index

Figure 3. Industry's and manufacturing's value added as share of GDP ([7])



2.5 Main five manufacturing sectors

This indicator presents the country's leading five manufacturing sectors, based on their share in the total value added of manufacturing sector.

Table 2. Main five manufacturing sectors (share of value added; 2017) ([8])

Rank	Manufacturing sector (ISIC Rev. 3.0, 2 digits)	Share (%)
1	Chemicals and chemical products	26.6
2	Machinery and equipment n.e.c.	18.0
3	Food and beverages	13.2
4	Furniture; manufacturing n.e.c.	10.0
5	Fabricated metal products	7.4

2.6 Value added of selected industrial sectors

Definition: As calculated by Eurostat, "Value added at factor costs is the gross income from operating activities after adjusting for operating subsidies and indirect taxes; value adjustments (such as depreciation) are not subtracted" ([9]).

The figure includes data for the following NACE Rev.2 sectors relevant for industrial raw materials:

1. B07, Mining of metal ores
2. B08, Other mining and quarrying
3. B09.9, Support activities for other mining and quarrying
4. C16, Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
5. C17, Manufacture of paper and paper products

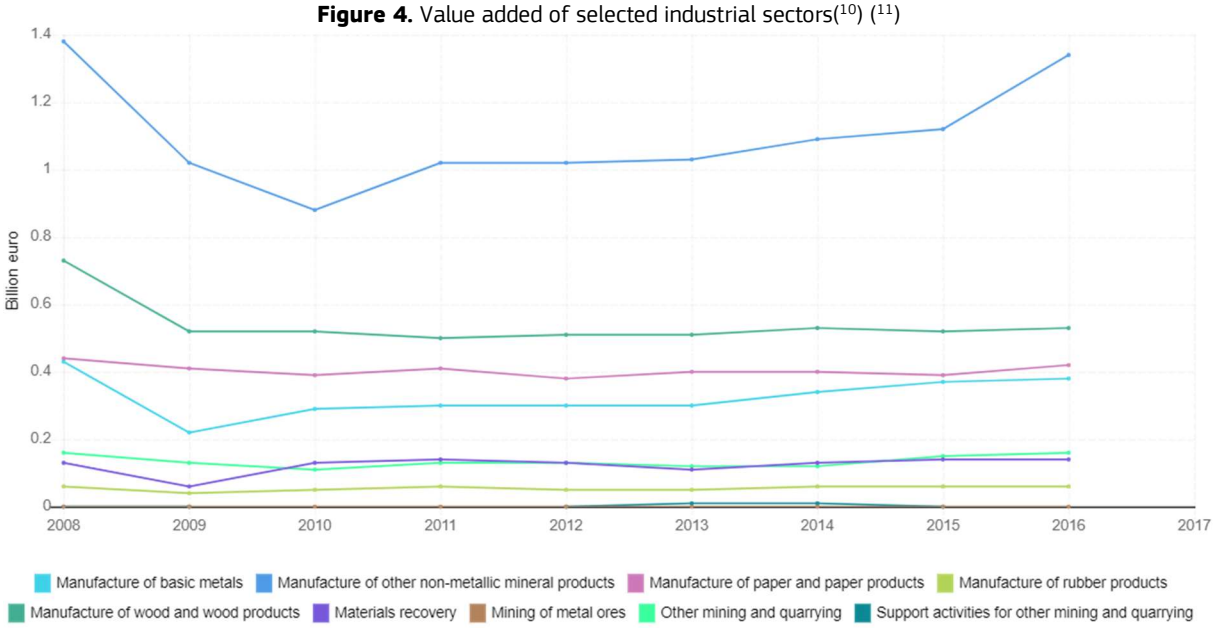
([7]) World Bank, World Development Indicators. https://data.worldbank.org/products/wdi
([8]) UNIDO, Country profile, http://stat.unido.org/?_ga=2.94848220.1164807116.1524737768-1906126199.1524492512
([9]) Eurostat, metadata of Structural Business Statistics, https://ec.europa.eu/eurostat/cache/metadata/en/sbs_esms.htm

6. C22.1, Manufacture of rubber products
7. C23, Manufacture of other non-metallic mineral products
8. C24, Manufacture of basic metals
9. E38.3, Materials recovery

As complete time series for value added were not available, the forestry-related sectors are not covered.

The contribution (percentage) of each sector to the total value added of industry (NACE sections B-E) is also presented in the figure.

Figure 4. Value added of selected industrial sectors([10]) ([11])



2.7 Number of employees in selected industrial sectors

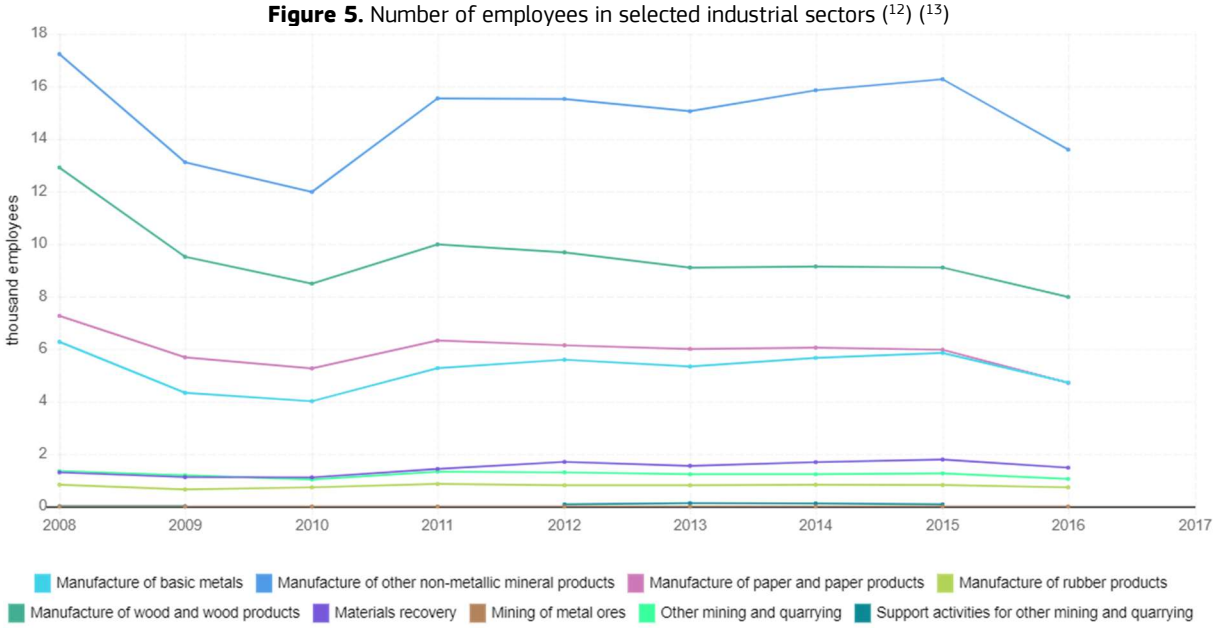
Definition: One of the indicators used for monitoring employment sectors is the *Number of employees*. This variable is defined by Eurostat as those persons who work for an employer and who have a contract of employment and receive compensation in the form of wages, salaries, fees, gratuities, piecework pay or remuneration in kind. A worker from an employment agency is considered to be an employee of that temporary employment agency and not of the unit (customer) in which they work.

The NACE Rev.2 sections used to collect data and calculate the sectoral percentage of employees in the total industry sectors are the following: B, Mining and quarrying; C: Manufacturing; D: Electricity, gas, steam and air conditioning supply; E: Water supply; sewerage, waste management and remediation activities.

([10]) Value added at factor cost in raw materials sectors over time. It also shows the contribution of these activities to the value added of the whole industrial sector (including: mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage, waste management and remediation activities).

([11]) Eurostat, Structural business statistics (sbs), Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), dataset code: sbs_na_ind_r2, Value added at factor cost. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_na_ind_r2&lang=en

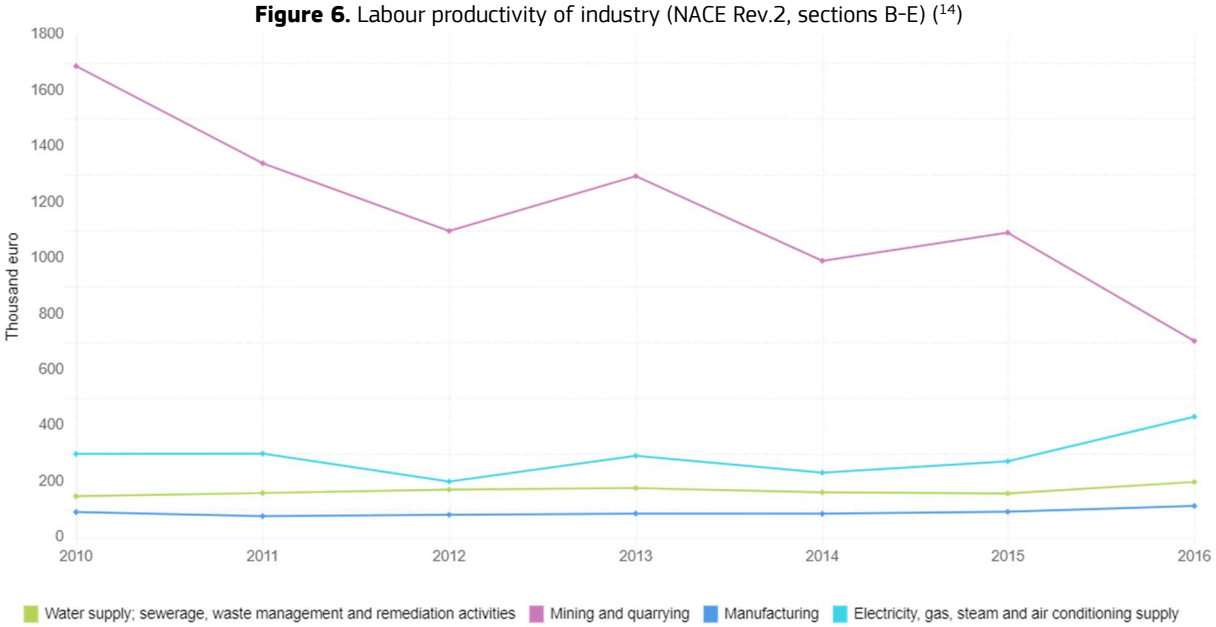
Figure 5. Number of employees in selected industrial sectors ([12]) ([13])



2.8 Labour productivity of industry

This indicator presents the labour productivity of the four NACE Rev.2 sections of industry (B, Mining and quarrying; C, Manufacturing; D, Electricity, gas, steam and air conditioning supply; E, Water supply; sewerage, waste management and remediation activities), calculated by Eurostat as gross value added per employee.

Figure 6. Labour productivity of industry (NACE Rev.2, sections B-E) ([14])



([12]) Number of employees in the raw materials sectors over time. It also shows the contribution of these activities to the total number of jobs in the industrial sector (including: mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage, waste management and remediation activities).

([13]) Eurostat, Structural business statistics (sbs), Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), dataset code: *sbs_na_ind_r2, Employees - number.* http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_na_ind_r2&lang=en

([14]) Eurostat, Structural business statistics (sbs), Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), dataset code: *sbs_na_ind_r2, Gross value added per employee*

2.9 Production value of mining and quarrying as share in total industry

Definition: Production value measures "the amount produced based on sales and including changes in stocks and the resale of goods and services. It is calculated by Eurostat as turnover plus/minus the changes in stocks of finished products, work in progress and goods and services purchased for resale, minus the purchases of goods and services for resale, plus capitalized production, plus other operating income (excluding subsidies). Income and expenditure classified as financial or extraordinary in company accounts is excluded from production value"([15]).

Data provided in the chart for *Mining and quarrying sector* are calculated as share of total industry (i.e., sections B-E, NACE Rev.2).

Figure 7. Production value of mining and quarrying as share in total industry (sections B-E, NACE Rev.2)([16])

([15]) Eurostat, Structural Business Statistics, Reference Metadata, http://ec.europa.eu/eurostat/cache/metadata/en/sbs_esms.htm

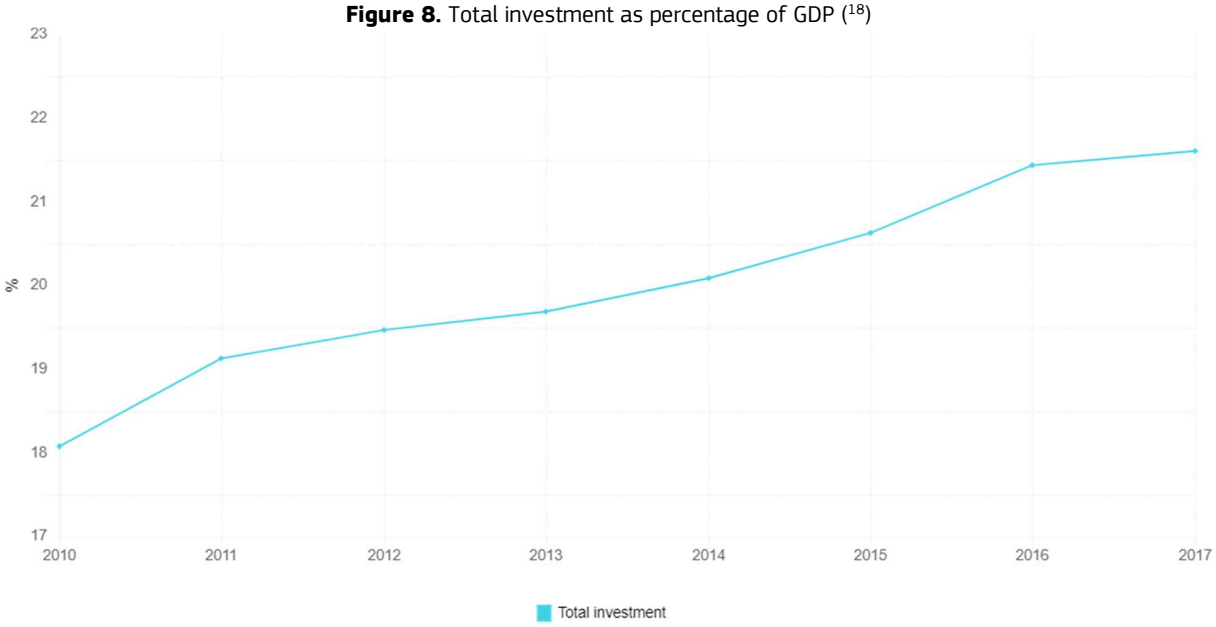
([16]) Eurostat, Structural business statistics (sbs), Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), dataset code: sbs_na_ind_r2, Production value http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_na_ind_r2&lang=enz

3 Investments and regulatory framework

3.1 Total investment as percentage of GDP

This indicator is calculated by the International Monetary Fund as a "ratio of total investment (in current local currency) and GDP (in current local currency). Investment or gross capital formation is measured by the total value of the gross fixed capital formation and changes in inventories and acquisitions less disposals of valuables"([17]).

Figure 8. Total investment as percentage of GDP ([18])



3.2 Foreign direct investments: flows and stocks

As defined by UNCTAD in the *Methodological Note* accompanying the World Investment Report 2017([19]):

1. "flows of FDI comprise capital provided (either directly or through other related enterprises) by a foreign direct investor to an FDI enterprise, or capital received from an FDI enterprise by a foreign direct investor",
2. "FDI stock is the value of the share of their capital and reserves (including retained profits) attributable to the parent enterprise, plus the net indebtedness of affiliates to the parent enterprise".

([17]) IMF, World Economic Outlook Databases, https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases#sort=%40imfdate%20descending

([18]) IMF, World Economic Outlook Databases, https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases#sort=%40imfdate%20descending

([19]) http://unctad.org/en/PublicationChapters/wir2017chMethodNote_en.pdf

Figure 9. Inward flows and stocks ([20])

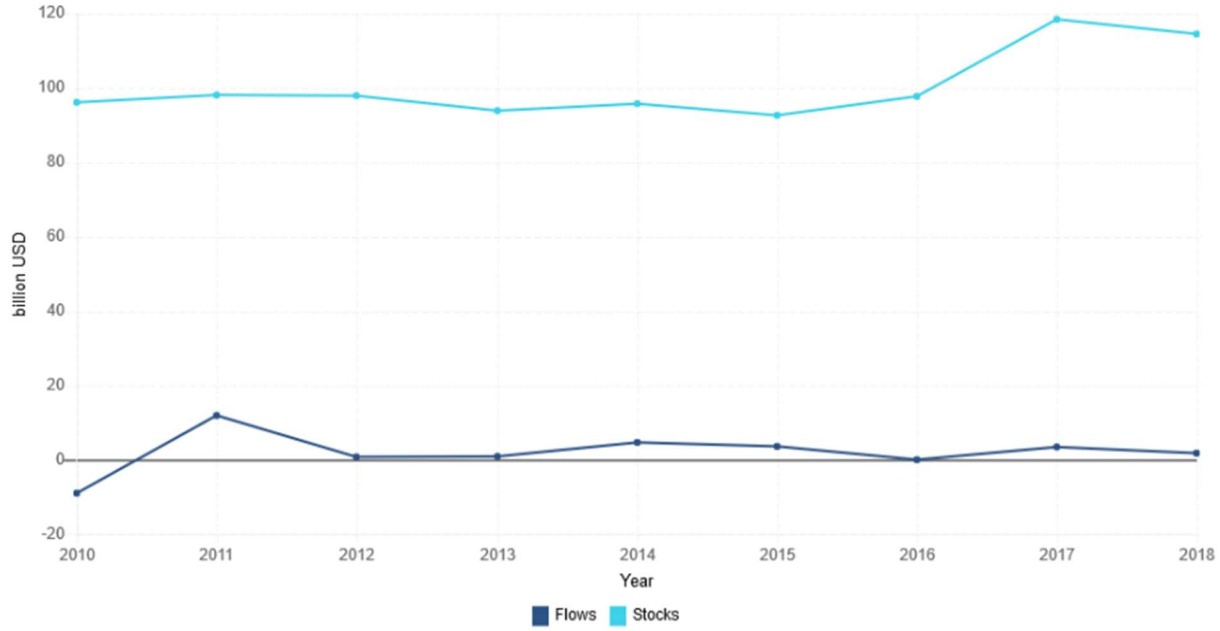
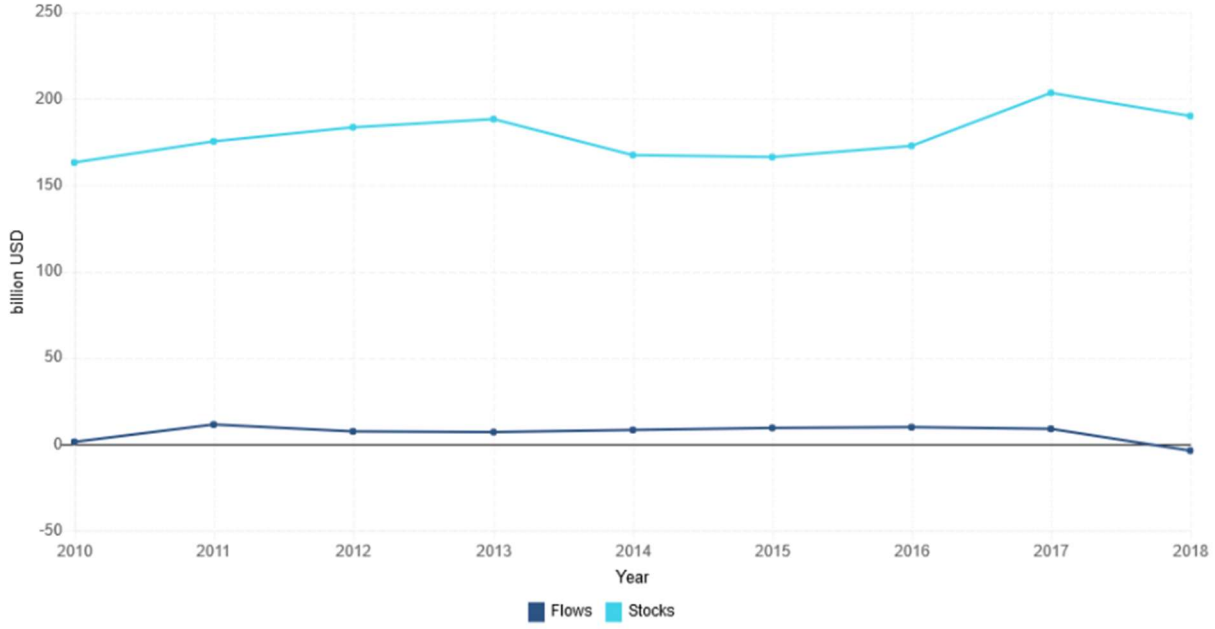


Figure 10. Outward flows and stocks ([21])



([20]) UNCTAD, Statistics Data Center, Foreign direct investments, http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en
For detailed data see the FDI Stocks and Flows section in Economics &Trade module, https://rmis.jrc.ec.europa.eu/?page=fdi-stocks-and-flows-86abca#/

([21]) UNCTAD, Statistics Data Center, Foreign direct investments, http://unctadstat.unctad.org/wds/ReportFolders/reportFolders.aspx?sCS_ChosenLang=en
For detailed data see the FDI Stocks and Flows section in Economics &Trade module, https://rmis.jrc.ec.europa.eu/?page=fdi-stocks-and-flows-86abca#/

3.3 Flows and stocks of foreign direct investment in mining and quarrying sector

Table 3. Flows and stocks of foreign direct investment in mining and quarrying sector (million USD)([22])

Mining and quarrying	2013	2014	2015	2016
Inward flows	-310.7	N/A	-307.5	465.9
Inward stocks	-1130.3	N/A	1849.4	2093.7
Outward flows	-127.3	N/A	N/A	1896.8
Outward stocks	9284	N/A	N/A	N/A

3.4 Annual exploration budget in metals and mining

S&P Global Market Intelligence is the provider of these data on annual exploration budget in metals and mining, based on the data reported by companies and its own estimates. The nonferrous exploration budgets covered by S&P Global Market Intelligence include spending for gold, base metals, platinum group metals, diamonds, U3O8, silver, rare earths, potash/phosphate, and many other hard-rock metals, but exclude exploration budgets for iron ore, coal, aluminium, oil and gas, and many industrial minerals ([23]).

No data available for Denmark.

3.5 Business environment

Doing Business aims at measuring business regulation in economies by examining five dimensions:

i) Starting a business,

ii) Getting a location,

iii) Accessing finance,

iv) Dealing with day-to-day operations,

v) Operating in a secure business environment.

It contains 11 indicator sets: Starting a business; Labor market regulation; Dealing with construction permits; Getting electricity; Registering property; Getting credit; Protecting minority investors; Trading across borders; Paying taxes; Enforcing contracts; and Resolving insolvency (according to *Doing Business 2018. Reforming to Create Jobs*([24])).

Table 4. Business environment ([25])

Ease of doing Business index 2019	**Rank:** 3 (out of 190)

3.6 Regulatory framework

The regulatory framework review is focusing on minerals ownership, major governing laws, permitting rules and competent authorities. This extract is based on the MINLEX report published by DG GROW.([26])

([22]) International Trade Center, Investment Map, https://www.investmentmap.org/
([23]) S&P Global Market Intelligence, Country profile, Exploration Budget Trends
([24]) http://www.doingbusiness.org/reports/global-reports/doing-business-2019
([25]) World Bank, Doing Business. Measuring Business Regulations, http://www.doingbusiness.org/
([26]) DG GROW, Legal framework for mineral extraction and permitting procedures for exploration and exploitation in the EU, final report of MINLEX project, 2017, https://publications.europa.eu/en/publication-detail/-/publication/18c19395-6dbf-11e7-b2f2-01aa75ed71a1/language-en

Legislation, ownership, and categories of minerals

On-shore mineral resources belong to the landowner whereas marine resources are owned by the State. The exploration and extraction of Danish non-energy minerals is mainly governed by the Raw Material Act, the Act on Use of Subsoil, the Government Regulation on Marine Raw Materials.

Regulatory framework and permitting

Denmark has a decentralised permitting regime for land-based minerals and a centralised regime for offshore ones. Denmark has a "one-stop shop" for the issuing of permits (exploration, extraction) related to land and marine-based minerals. In case of land-based minerals the Regional Council acts as a "one-door-authority'. Concerning exploration for land-based raw materials, a permit is not required when the expected number of extracted samples is less than 200 m3/year and the samples are not used commercially. The exploration of land-based raw materials is a subject primarily governed by a contract between the landowner and the explorer.

An extraction permit is valid for 10 years which can be renewed. The respective authorities are also responsible for surveying raw materials within their respective jurisdictions and planning for their extraction and supply. The plan covers a 12-year period and every 4 years it is reviewed. It is the responsibility of the Danish Water and Nature Agency to conduct exploration for marine-based raw materials and the results forms the basis for the definition of areas for extraction activities. It is also possible for a company to explore for marine-based raw materials.([27])

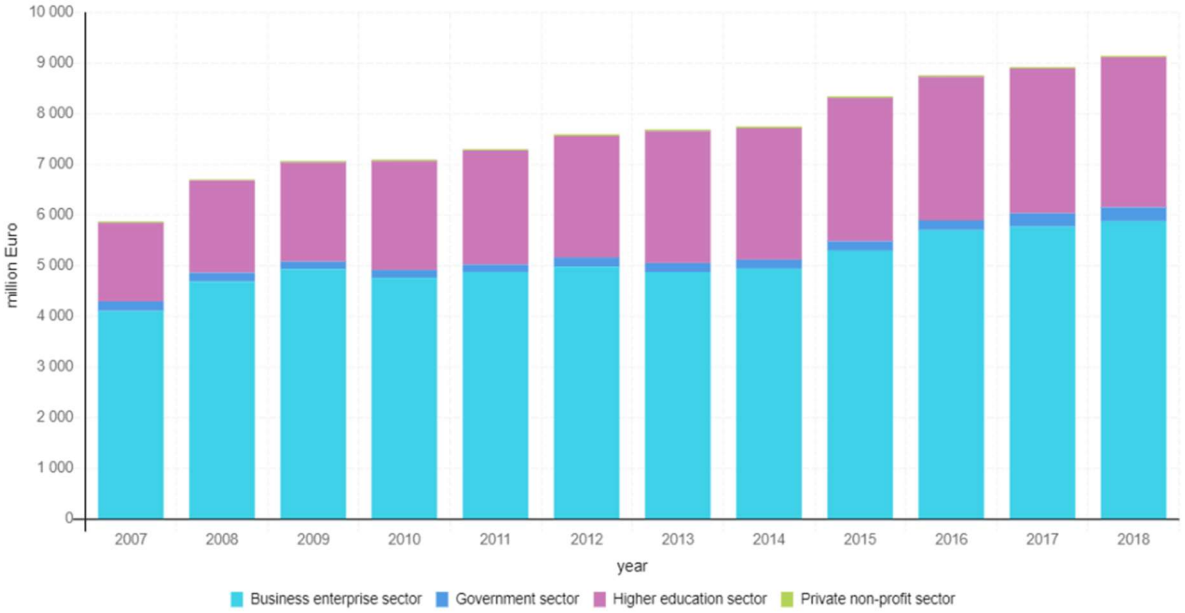
([27]) DG GROW, Legal framework for mineral extraction and permitting procedures for exploration and exploitation in the EU, final report of MINLEX project, 2017. More detailed information on the legal and regulatory framework can be found at the Policy&Legislation/Member States Legislation section.

4 Research, development, and innovation

4.1 Gross domestic expenditure on R&D

Definition: Gross domestic expenditure on R&D (GERD) includes expenditure on research and development by business enterprises (BERD), higher education institutions, as well as government and private non-profit organizations. For additional methodological details, see Eurostat, Statistics on research and development (rd) ([28]).

Figure 11. Gross domestic expenditure on R&D ([29])



4.2 Business expenditure on R&D by relevant NACE Rev. 2 sector

Definition: Expenditure on R&D in the business enterprise sector (BERD) includes all business R&D carried out on national territory ([30]).

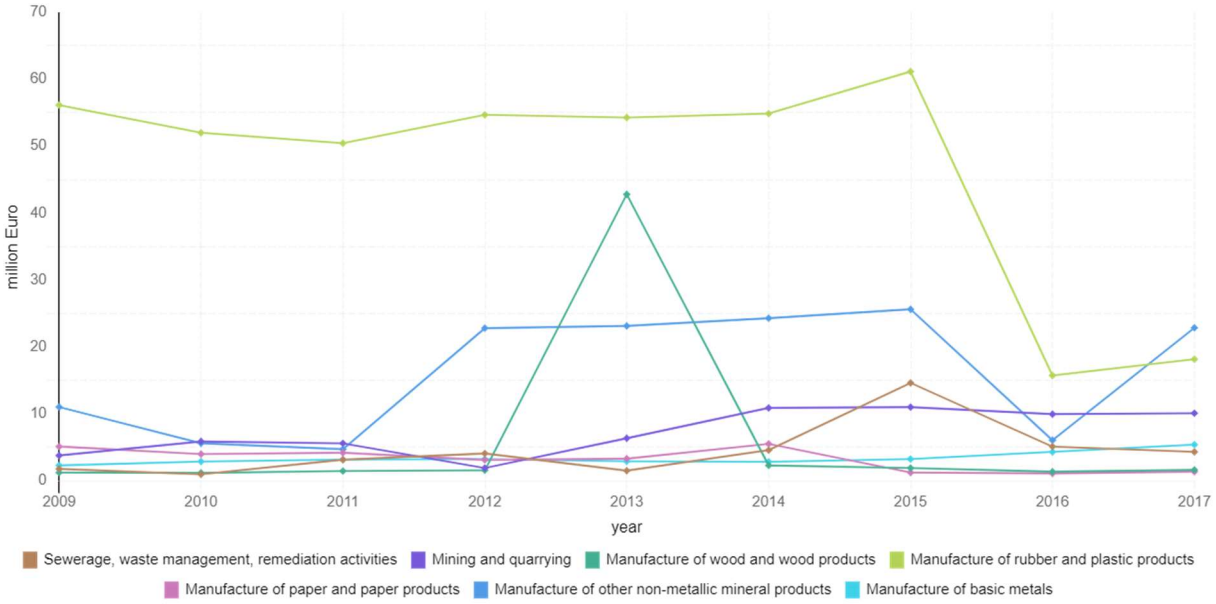
The figure includes data for the following NACE Rev.2 sectors:

1. Mining and quarrying (B);
2. Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (C16);
3. Manufacture of paper and paper products (C17);
4. Manufacture of rubber and plastic products (C22);
5. Manufacture of other non-metallic mineral products (C23);
6. Manufacture of basic metals (C24);
7. Sewerage, waste management, remediation activities (incl. materials recovery) (E37-E39).

For additional methodological details, see Eurostat, Statistics on research and development (rd) ([31])

([28]) http://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm
([29]) Eurostat, Gross domestic expenditure on R&D (GERD) by sectors of performance, dataset code: *rd_e_gerdtot*, http://ec.europa.eu/eurostat/product?code=rd_e_gerdtot&language=en&mode=view
([30]) DG EUROSTAT (2000): Structural business statistics. EU economy in the Triad with contrasted results. In: Statistics in focus, Theme 4, 23/2000
([31]) https://ec.europa.eu/eurostat/cache/metadata/en/rd_esms.htm

Figure 12. Business expenditure on R&D by relevant NACE Rev. 2 sector ([32])



([32]) Eurostat, Business expenditure on R&D (BERD) by NACE Rev. 2 activity, dataset code: *rd_e_berdindr2*, http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=rd_e_berdindr2&lang=en

5 Resources and reserves

5.1 Estimated resources

Definition: The term is synonymously used for "mineral resource", "inferred mineral resource", "indicated mineral resource" and "measured mineral resource". In this case, confidence in the existence of a resource is indicated by the geological knowledge and preliminary data, while at the same time the extraction would be legally, economically, and technically feasible.

Table 5. Estimated resources ([33])

Commodity	Sub-Commodity	Reporting code	Quantity	Unit	Weighted average Grade	Classification
Aggregates and related materials	Marine Sand, Gravel, Rubble and Stone	None	14000	Million cubic metres		

5.2 Estimated reserves

Definition: The term is synonymously used for "mineral reserve", "probable mineral reserve" and "proven mineral reserve". In this case, confidence in the reserve is measured by the geological knowledge and data, while at the same time the extraction would be legally, economically, and technically feasible and a licensing permit is certainly available.

Reserves in the dataset are not subdivided in proved, probable and possible categories, but it can be expected that less than 20% of the total mapped resources can be extracted.

Table 6. Estimated reserves([34])

Commodity	Sub-Commodity	Reporting code	Quantity	Unit	Weighted average Grade	Classification
Aggregates and related materials	Limestone	None	Confidential	Million cubic metres		Confidential
Aggregates and related materials	Marine Sand, Gravel, Rubble and Stone	None	2800	Million cubic metres	20%	Total
Aggregates and related materials	Sand and gravel, variable grain size and quality	None	1232.5	Million cubic metres		Estimated
Clay	Brick clay	None	43.3	Million cubic metres		Estimated
Clay	Expandable smectite clay	None	22.2	Million cubic metres		Estimated
Diatomite	Diatomite	None	16.1	Million cubic metres		Estimated
Other minerals	Other (Silt etc.)	None	1.6	Million cubic metres		Estimated
Silica	Pure quartz sand	None	24.1	Million cubic metres		Estimated

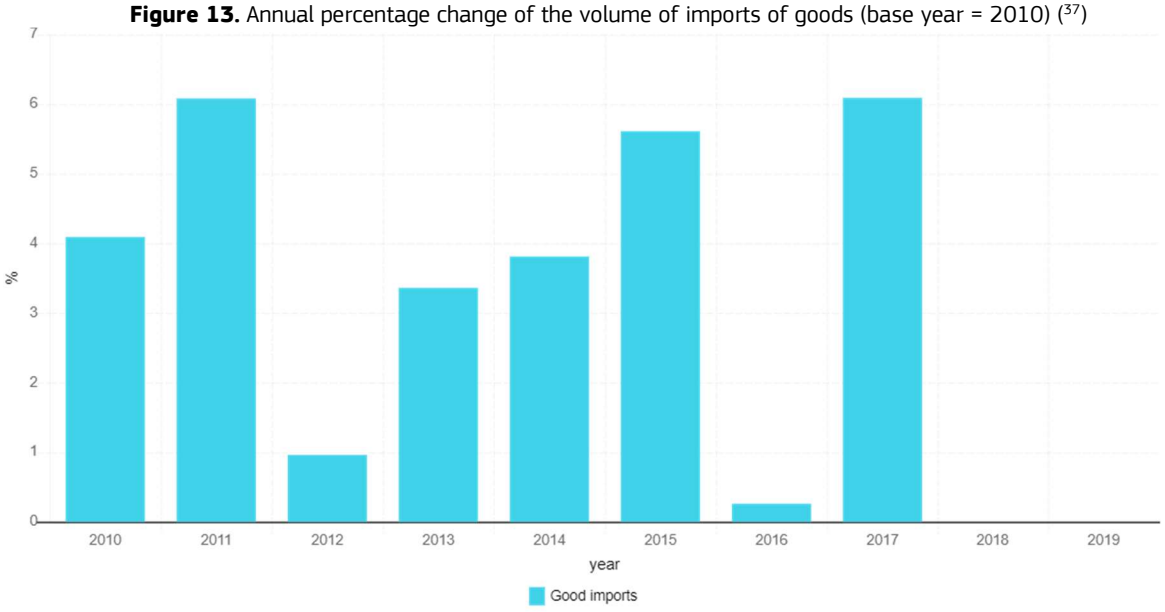
([33]) Minerals4EU, accessible at http://minerals4eu.brgm-rec.fr/m4eu-yearbook/
([34]) Minerals4EU, accessible at http://minerals4eu.brgm-rec.fr/m4eu-yearbook/

6 Supply

6.1 Annual percentage change of the volume of imports of goods

As defined in the methodology of IMF's World Economic Outlook, October 2018, *Annual change of imports of goods* refers to the aggregate change in the quantity of imports of goods. This indicator measures the percentage change in the volume estimates of imports of goods from the base year, which is country specific([35]). According to the OECD's definition, trade in goods includes "all goods which add to, or subtract from, the stock of material resources of a country by entering its economic territory (imports) or leaving it (exports)"([36]). The goods commodity group aggregates commodity classes referring to the subheadings of the Harmonized System.

Figure 13. Annual percentage change of the volume of imports of goods (base year = 2010) ([37])



6.2 Domestic extraction by main category

Definition: Domestic extraction indicates the total amount of material extracted by resident units from the natural environment for further processing in the economy; the visualizations include three material categories (metals ores, non-metallic minerals, and woods).

The domestic extraction figure refers to the data provided by Eurostat's Economy-wide material flow accounts (EW-MFA).

([35]) According to Export and Import Price Index Manual: Theory and Practice, Glossary; also http://www.imf.org/external/pubs/ft/weo/2013/01/weodata/index.aspx
([36]) https://data.oecd.org/trade/trade-in-goods.htm#indicator-chart
([37]) IMF, World Economic Outlook Database, April 2019, https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx

Table 7. Domestic extraction by main category (million tonnes)([38])

Material category	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Metal ores (gross ores)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-metallic minerals	67.1	48.8	47.1	57.9	59.4	52.1	54.0	60.5	64.6	67.4	70.2
Wood	2.1	1.9	2.1	1.8	1.9	1.9	2.0	2.2	2.1	2.2	N/A

6.3 Production of relevant industrial sectors

This section presents the gross output of selected raw materials related sectors in monetary terms (million Euro).

Sectoral data are taken from Eurostat, Structural Business Statistics. According to Eurostat's methodology, *Production value* is an output-related variable that "*measures the amount produced based on sales and including changes in stocks and the resale of goods and services. Production value is calculated by Eurostat as turnover plus/minus the changes in stocks of finished products, work in progress and goods and services purchased for resale, minus the purchases of goods and services for resale, plus capitalized production, plus other operating income (excluding subsidies)*"([39]).

Table 8. Production of relevant industrial sectors (million Euro; 2016) ([40])

Sector	Production
Mining of metal ores (B07, NACE Rev.2)	0.0
Other mining and quarrying (B08, NACE Rev.2)	391.4
Mining support service activities (B09, NACE Rev.2)	851.1
Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials (C16, NACE Rev.2)	1,488.4
Manufacture of other non-metallic mineral products (C23, NACE Rev.2)	3,088.5
Manufacture of basic metals (C24, NACE Rev.2)	1,241.0

6.4 Production of primary minerals

Definition: Mineral Raw Materials are defined as mineral constituents of the earth's crust, which are of economic value, including output from mines as well as the output from processing at or near the mines.

The data related to mineral raw materials were obtained by WMD through evaluation of questionnaires sent to the National Committees of member countries of the World Mining Congress as well as to other bodies such as Embassies, Foreign Trade Representatives etc. In addition, WMD have also used, when available, official mining statistics such as BGS and USGS.

([38]) Eurostat, Material Flows and Resource Productivity, https://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity

([39]) Eurostat, Structural Business Statistics, Reference Metadata, http://ec.europa.eu/eurostat/cache/metadata/en/sbs_esms.htm

([40]) Eurostat, Structural business statistics (sbs), Annual detailed enterprise statistics for industry (NACE Rev. 2, B-E), dataset code: *sbs_na_ind_r2, Production value* http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=sbs_na_ind_r2&lang=en

Table 9. Production of primary minerals in 2017([41])

Commodity	Quantity	Unit	% of world production
Bentonite	69594	Tonnes	0.37
Diatomite	110000	Tonnes	5.39
Salt	600000	Tonnes	0.21
Sulfur	4004	Tonnes	0.01

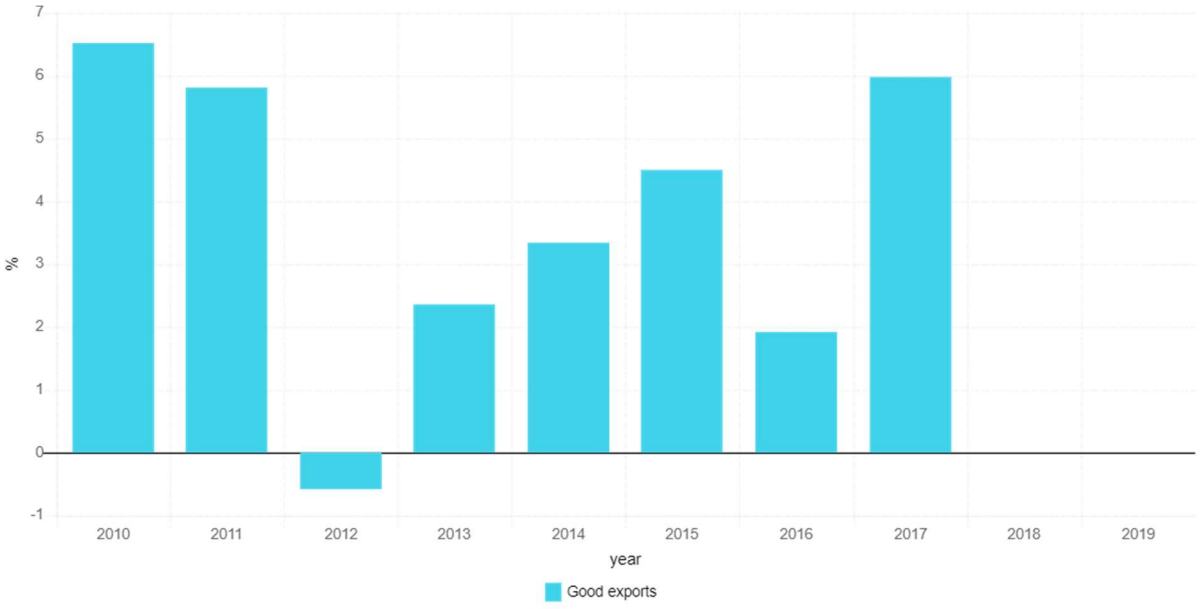
([41]) The mineral raw materials production refer to the data provided by The World Mining Data (WMD).
The production data reported by WMD indicate the content of recoverable valuable elements and compounds.
World mining data 2019, http://www.world-mining-data.info/wmd/downloads/PDF/WMD2019.pdf

7 Raw material use

7.1 Annual percentage change of the volume of exports of goods

As defined in the methodology of IMF's World Economic Outlook, October 2017, *Annual change of exports of goods* refers to the aggregate change in the quantity of exports of goods. This indicator measures the percentage change in the volume estimates of exports of goods from the base year, which is country specific([42]). According to the OECD's definition, trade in goods includes "*all goods which add to, or subtract from, the stock of material resources of a country by entering its economic territory (imports) or leaving it (exports)*".([43]) The goods commodity group aggregates commodity classes referring to the subheadings of the Harmonized System.

Figure 14. Annual percentage change of the volume of exports of goods (base year = 2010) ([44])



7.2 Domestic material consumption by main category

Definition: Domestic material consumption (DMC), measures the total amount of materials directly used by an economy and is defined as the annual quantity of raw materials extracted from the domestic territory, plus all physical imports minus all physical exports.

Table 10. Domestic material consumption by main category (million tonnes) ([45])

Category	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Metal ores (gross ores)	2.2	0.4	0.2	0.2	0.6	1.1	0.8	0.4	0.6	0.7	0.9
Non-metallic minerals	71.2	52.0	50.0	61.7	62.9	55.9	57.1	63.4	68.4	69.4	73.4
Wood	4.6	4.3	5.1	5.0	5.4	5.4	5.3	5.1	6.2	7.0	N/A

([42]) According to Export and Import Price Index Manual: Theory and Practice, Glossary; also http://www.imf.org/external/pubs/ft/weo/2013/01/weodata/index.aspx
([43]) https://data.oecd.org/trade/trade-in-goods.htm#indicator-chart
([44]) IMF, World Economic Outlook Databases, https://www.imf.org/en/Publications/SPROLLs/world-economic-outlook-databases#sort=%40imfdate%20descending
([45]) Eurostat, Material Flows and Resource Productivity, https://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity

8 Trade

8.1 Import value index

Definition: Data are provided by World Bank, World Development Indicators, based on United Nations Conference on Trade and Development, Handbook of Statistics and data files, and International Monetary Fund, International Financial Statistics. For calculation of this index, import values are the current value of imports (f.o.b.) converted to U.S. dollars and expressed as a percentage of the average for the base period (year 2000).

Figure 15. Import value index (2000 = 100)([46])

8.2 Export value index

Definition: Data are provided by World Bank, World Development Indicators, based on United Nations Conference on Trade and Development, Handbook of Statistics and data files, and International Monetary Fund, International Financial Statistics. For calculation of this index, export values are the current value of exports (f.o.b.) converted to U.S. dollars and expressed as a percentage of the average for the base period (year 2000).

([46]) World Bank, World Development Indicators, https://data.worldbank.org/indicator/TM.VAL.MRCH.XD.WD

Figure 16. Export value index (2000 = 100) ([47])

8.3 Raw materials' physical trade balance by selected material category

Definition: Physical trade balance is calculated as imports minus exports, by material category.

Table 11. Raw materials' physical trade balance by selected material category (million tonnes)([48])

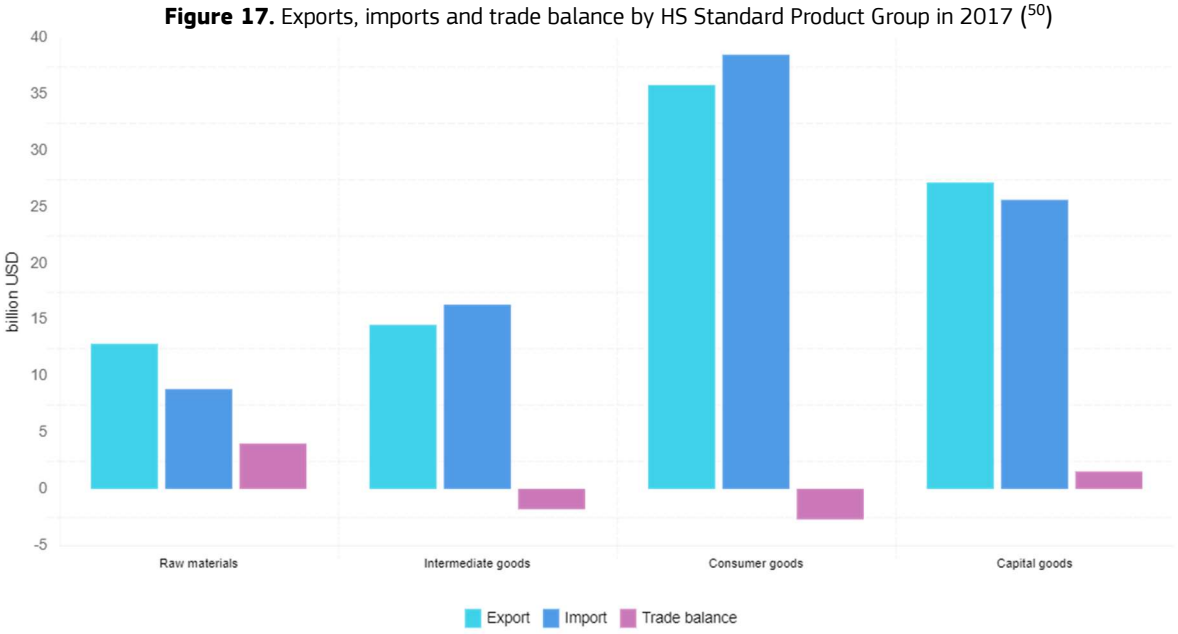
Material category	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Metal ores (gross ores)	2.2	0.4	0.2	0.2	0.6	1.1	0.8	0.4	0.6	0.7	0.9
Non-metallic minerals	4.0	3.1	2.8	3.8	3.5	3.8	3.1	2.9	3.8	2.0	3.2
Wood	2.5	2.4	3.0	3.2	3.6	3.5	3.4	2.9	4.0	4.7	N/A

8.4 Exports, imports and trade balance by HS Standard Product Group

The four HS Standard Product Groups provided by UNCTAD - i.e. *Raw Materials (SoP1), Intermediates (SoP2), Consumer Goods (SoP3) and Capital Goods (SoP4)* – are commodity aggregates that also include food and energy-related products([49]). They are available in the predefined product clusters of the Advanced Query tool of the World Integrated Trade Solutions database (WITS).

([47]) World Bank, World Development Indicators, https://data.worldbank.org/indicator/TM.VAL.MRCH.XD.WD
([48]) Eurostat, Material Flows and Resource Productivity, https://ec.europa.eu/eurostat/web/environment/material-flows-and-resource-productivity
([49]) WITS Reference Data, https://wits.worldbank.org/referencedata.html

Figure 17. Exports, imports and trade balance by HS Standard Product Group in 2017 ([50])



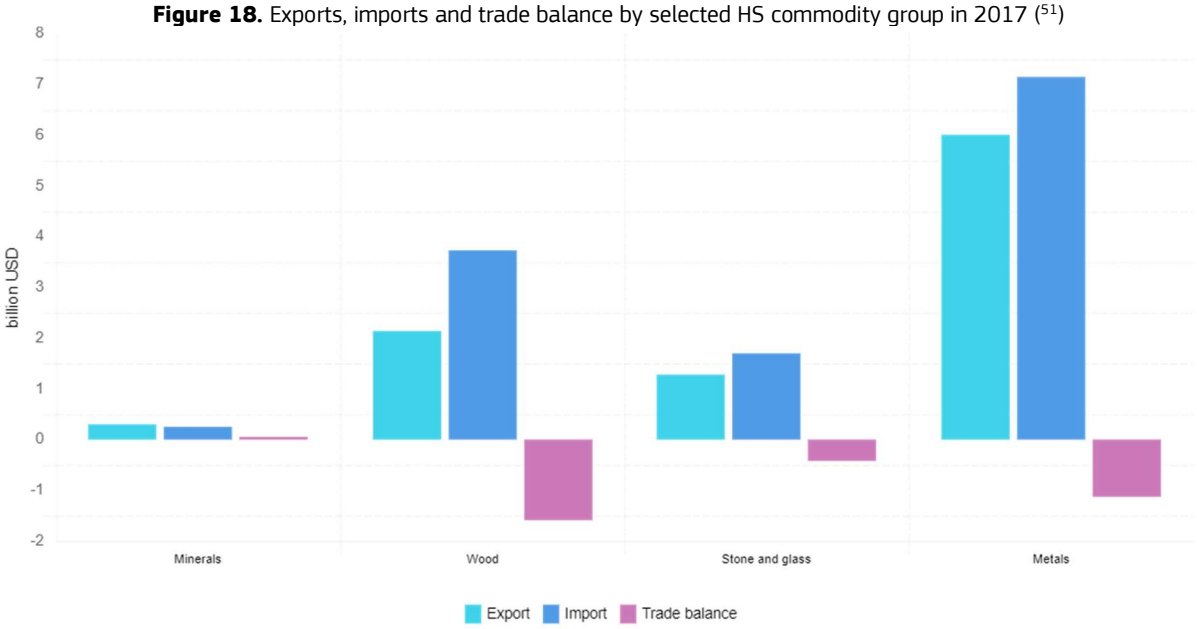
8.5 Exports, imports, and trade balance by selected HS commodity group

The selected HS commodity groups are:

1. Metals (HS chapters 72-83),
2. Minerals (HS chapters 25 and 26),
3. Stone and Glass (HS chapters 68-71)
4. Wood (HS chapters 44-49).

These selected commodity groups contain non-food, non-energy raw material commodities. They are available in the predefined product clusters of the Advanced Query tool of the World Integrated Trade Solutions database (WITS).

Figure 18. Exports, imports and trade balance by selected HS commodity group in 2017 ([51])



([50]) World Integrated Trade Solution (WITS), https://wits.worldbank.org/
([51]) World Integrated Trade Solution (WITS), https://wits.worldbank.org/

8.6 Exports, imports and trade balance by selected HS chapter

The selected HS chapter contain HS 6-digit non-food, non-energy raw material commodities.

Table 12. Exports, imports and trade balance by selected HS chapter in 2017 (million USD) ([52])

HS chapter	HS chapter name	Export	Import	Trade balance
25	Salt; sulphur; earths and stone; plastering materials, lime and cement	284.6	237.4	47.2
26	Ores, slag and ash	12.9	10.4	2.5
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	4695.6	5446.8	-751.3
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	283.2	422.7	-139.5
31	Fertilisers	69.2	323.5	-254.3
40	Rubber	290.1	723.8	-433.7
44	Wood and articles of wood	772.4	1884.6	-1112.2
45	Cork and articles of cork	1.0	8.1	-7.2
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal, and articles thereof	207.4	215.0	-7.7
72	Iron and steel	1319.0	1943.5	-624.6
74	Copper and articles thereof	220.2	359.2	-139.0
75	Nickel and articles thereof	1.4	18.7	-17.3
76	Aluminium and articles thereof	1033.9	1182.3	-148.4
78	Lead and articles thereof	6.9	4.5	2.4
79	Zinc and articles thereof	21.3	69.7	-48.4
80	Tin and articles thereof	5.8	7.3	-1.5
81	Other base metals; cermets; articles thereof	8.6	23.7	-15.1

([52]) World Integrated Trade Solution (WITS), https://wits.worldbank.org/

8.7 Top 20 non-food, non-energy raw material commodities

The Top 20 non-food, non-energy raw material commodities imported in 2017 and Top 20 non-food, non-energy raw material commodities exported in 2017 indicators present the country's top 20 HS 6-digit non-food, non-energy raw materials imported/exported in 2017, based on the database built in the of Raw Materials Information System's Economics & Trade module.([53])

Figure 19. Top 20 non-food, non-energy raw material commodities imported in 2017 ([54])

Rank	HS code	Product description	Value (million USD)
1	730890	Structures and parts of structures, iron or steel, ne	474.77
2	440130	Sawdust, wood waste or scrap	470.04
3	760612	Aluminium alloy rectangular plate/sheet/strip,t >0.2m	291.23
4	440710	Lumber, coniferous (softwood) thickness < 6 mm	290.60
5	720712	Semi-finished bars, iron or non-alloy steel <0.25%C, rectangular, nes	281.87
6	760110	Aluminium unwrought, not alloyed	132.53
7	760429	Bars, rods and other profiles, aluminium alloyed	110.04
8	721049	Flat rolled iron or non-alloy steel, coated with zinc, width >600mm, ne	106.95
9	310520	Nitrogen-phosphorus-potassium fertilizers, pack >10kg	105.75
10	720822	Hot rolled iron or non-alloy steel, coil,width >600mm, t 4.75-10mm, nes	98.74
11	720842	Hot rolled iron or non-alloy steel, flat,width >600mm, t >10mm, nes	98.37
12	730660	Hollow profiles/tubes,iron/steel,non-circular, welded	91.58
13	310240	Ammonium nitrate limestone etc mixes, pack >10 kg	91.02
14	730640	Pipes and tubing, stainless steel, welded	80.48
15	761090	Aluminium structures and parts nes, for construction	79.67
16	481091	Paper, multi-ply, clay coated, nes	79.45
17	721440	Bar/rod, iron or non-alloy steel, hot formed <0.25%C, nes	75.03
18	441119	Fibreboard >0.8 g/cm2 worked/surface covered	74.91
19	480560	Paper, weighing 150 g/m2 or less, uncoated, nes	71.61
20	730820	Towers and lattice masts, iron or steel	70.51

([53]) For further details, see Raw Materials Information System, Methodological Overview section - http://rmis.jrc.ec.europa.eu/?page=methodological-overview-f5f020

([54]) Raw Materials Information System, Economics & Trade module, Country section, Raw Materials Trade Flows, https://rmis.jrc.ec.europa.eu/?page=trade-flows#/

Figure 20. Top 20 non-food, non-energy raw material commodities exported in 2017 ([55])

Rank	HS code	Product description	Value (million USD)
1	730890	Structures and parts of structures, iron or steel, ne	515.54
2	730820	Towers and lattice masts, iron or steel	473.30
3	720449	Ferrous waste or scrap, nes	419.67
4	720842	Hot rolled iron or non-alloy steel, flat,width >600mm, t >10mm, nes	219.40
5	285100	Inorganic compounds,liquid/compressed air,amalgams ne	138.05
6	760200	Waste or scrap, aluminium	132.07
7	760421	Profiles, hollow, aluminium, alloyed	129.56
8	761090	Aluminium structures and parts nes, for construction	127.58
9	740400	Copper/copper alloy waste or scrap	121.58
10	760612	Aluminium alloy rectangular plate/sheet/strip,t >0.2m	110.81
11	720843	Hot rolled iron or non-alloy steel, flat,width >600mm, t 4.75-10mm, nes	101.12
12	252321	Portland cement, white or white artificially coloured	97.10
13	721440	Bar/rod, iron or non-alloy steel, hot formed <0.25%C, nes	72.01
14	760429	Bars, rods and other profiles, aluminium alloyed	70.05
15	481139	Paper, coated, impregnated, covered with plastics, ne	68.33
16	440130	Sawdust, wood waste or scrap	56.26
17	701090	Glass containers nes for packing or conveyance goods	54.65
18	720441	Waste from the mechanical working of iron or steel ne	42.81
19	441010	Particle board of wood	41.43
20	481190	Paper, coated/impregnated/covered/coloured/printed ne	39.88

8.8 Exports of mining equipment

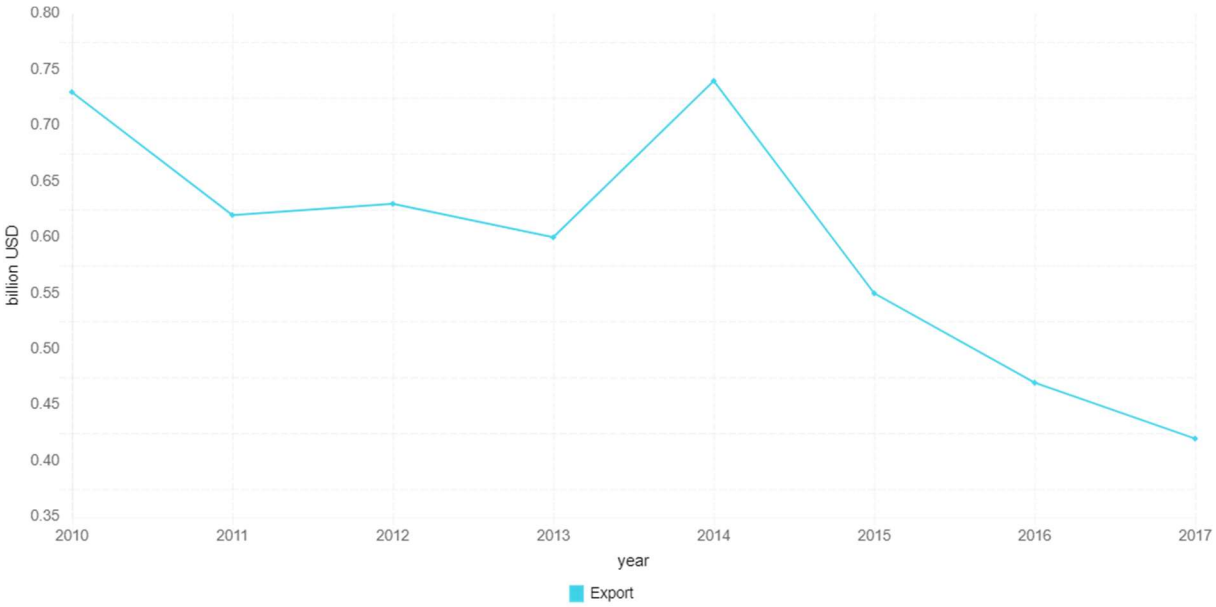
This indicator was developed by JRC, based on data from UN Comtrade, accessed via World Bank's World Integrated Trade Solution. The starting point for identifying the mining-equipment-related commodities were the products covered by the 4-digit NACE class 28.92, Manufacture of machinery for mining, quarrying and construction.

For more methodological details and the list of 21 six-digit HS codes covered by this indicator, see Raw materials scoreboard 2018, Methodological notes, Mining equipment exports.([56])

([55]) Raw Materials Information System, Economics & Trade module, Country section, Raw Materials Trade Flows, https://rmis.jrc.ec.europa.eu/?page=trade-flows#/

([56]) https://publications.europa.eu/en/publication-detail/-/publication/117c8d9b-e3d3-11e8-b690-01aa75ed71a1

Figure 21. Exports of mining equipment ([57])



([57]) World Integrated Trade Solution (WITS), https://wits.worldbank.org/

9 Environment

9.1 Land used by mining sites and other activities

Definition: Mineral extraction sites (category 1.3.1): Areas with open-pit extraction of industrial minerals (sandpits, quarries) or other minerals (opencast mines). Includes flooded gravel pits, except for river-bed extraction. Urban areas refer to the sum of *continuous urban fabric* (land use category 1.1.1) and *discontinuous urban fabric* (land use category 1.1.2), which cover, respectively, land where buildings, roads and artificially surfaced area cover almost all the ground, and land where buildings, roads and artificially surfaced areas associated with vegetated areas and bare soil, which occupy discontinuous but significant surfaces. Agricultural areas are the sum of categories 2.1.1-2.4.4, which include arable land, rice fields, permanent crops, pastures, and heterogeneous agricultural areas. Forests cover broad-leaved forest (category 3.1.1), coniferous forest (category 3.1.2) and mixed forest (category 3.1.3). The percentage of the total area related to the official country area as reported by the Eurostat ([58]). The net change refers to the area of each land use in 2012 minus the area in 2006, divided by area in 2006.

Table 13. Land used by mining sites and other activities ([59])

	Area (Km^2) 2012	Percentage of country area 2012	Net change 2006-2012
Mineral extraction sites	40	0.09%	-17.6%
Construction sites	1	0.002%	-96.4%
Urban	2069	4.8%	0.1%
Agricultural areas	32761	76.3%	0.43%
Forests	3807	8.9%	-2.26%

9.2 Greenhouse gas emissions and emissions intensity by raw materials sector

Definition: Greenhouse gas emissions refer to absolute emissions covering CO2, N2O and CH4, measured in CO2 equivalent). Emissions intensity presents intensity-ratios relating emissions to economic parameters, in this case gross value added, chain linked volumes (2010). Data are displayed for a selection of raw materials sectors (following the NACE Rev.2 classification). For absolute emissions, data are presented also for the sum of all economic activities. For emission intensity, average emission intensity for all NACE activities is also displayed. Concepts and principles are the same as in national accounts.

([58]) https://europa.eu/european-union/about-eu/countries/member-countries/

([59]) JRC calculation based on data from European Environment Agency, CORINE land cover 2012 and 2006, https://land.copernicus.eu/pan-european/corine-land-cover

Figure 22. Absolute greenhouse gas emissions ([60])

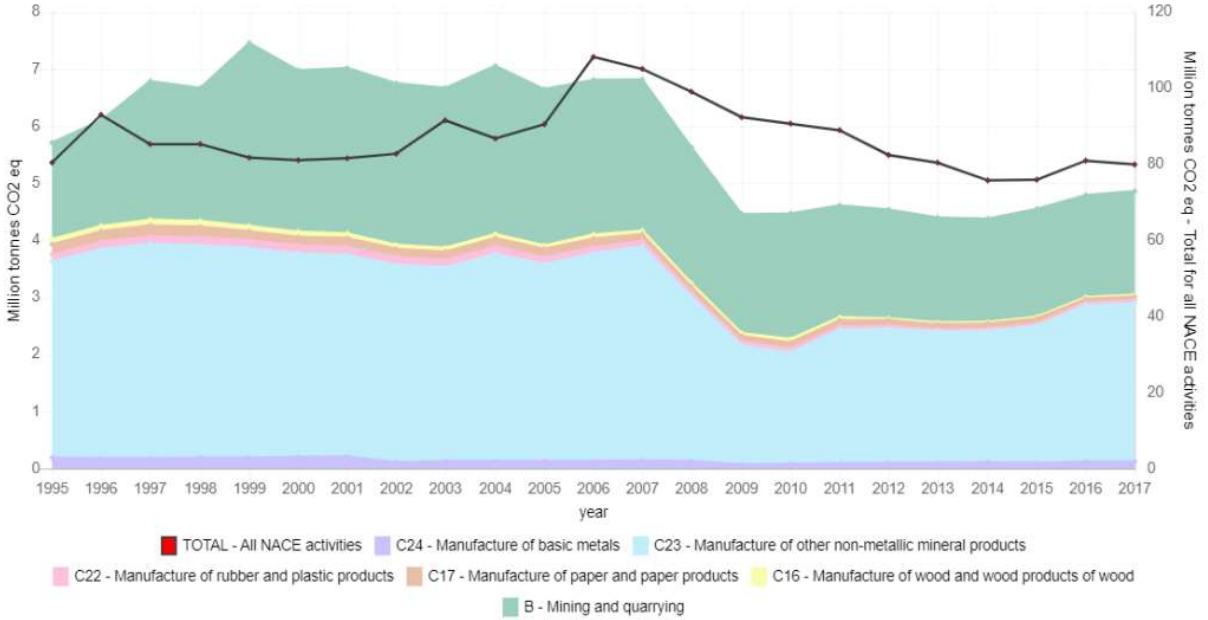
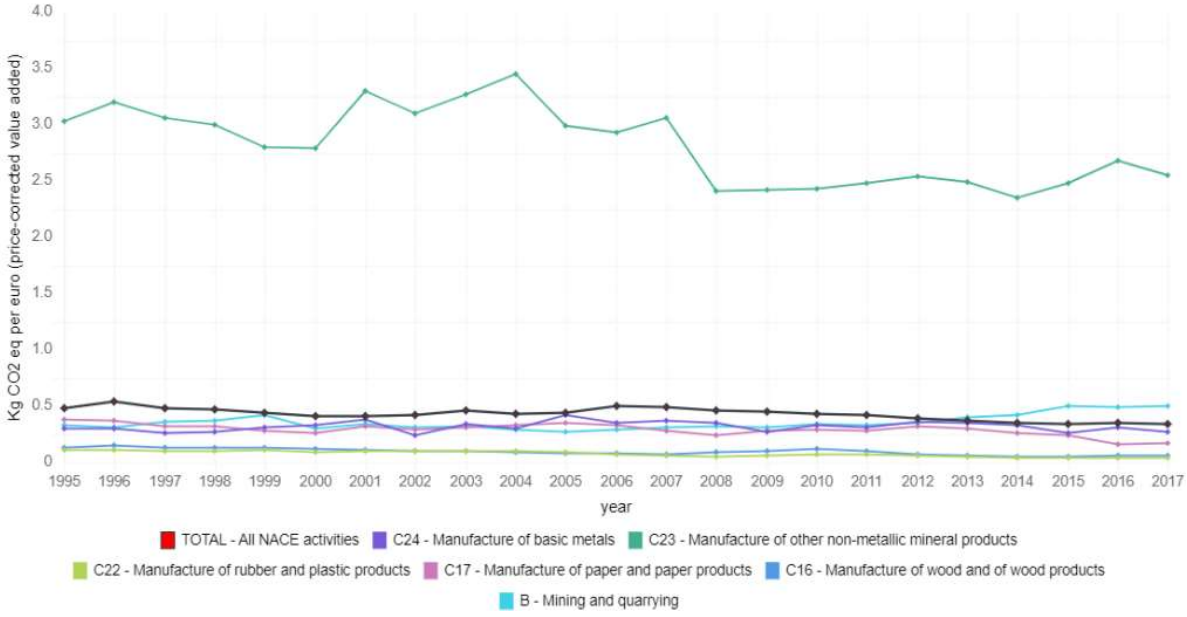


Figure 23. Greenhouse gas emissions intensity (emissions per gross value added) ([61])



([60]) Eurostat, Air emissions accounts by NACE Rev. 2 activity, code: *env_ac_ainah_r2*
([61]) Eurostat, Air emissions intensities by NACE Rev. 2 activity, code: *env_ac_aeint_r2*

9.3 $PM_{2.5}$ emissions and emissions intensity by raw materials sector

Definition: Particulate matter is a complex mixture of microscopic solid or liquid matter in the air, and a key pollutant affecting human health. $PM_{2.5}$ emissions refer to absolute emissions of $PM_{2.5}$, which refers to the fraction of particulate matter with a size up to 2.5µm, which are responsible for damages to human health given their higher potential to enter much deeper in the respiratory system. $PM_{2.5}$ emissions intensity presents intensity-ratios relating emissions to economic parameters, in this case gross value added, in chain linked volumes (2010). Data are displayed for a selection of raw materials sectors (following the NACE Rev.2 classification). For absolute emissions, data are presented also for the sum of all economic activities. For emission intensity, average emission intensity for all NACE activities is also displayed. Concepts and principles are the same as in national accounts.

Figure 24. Absolute $PM_{2.5}$ emissions ([62])

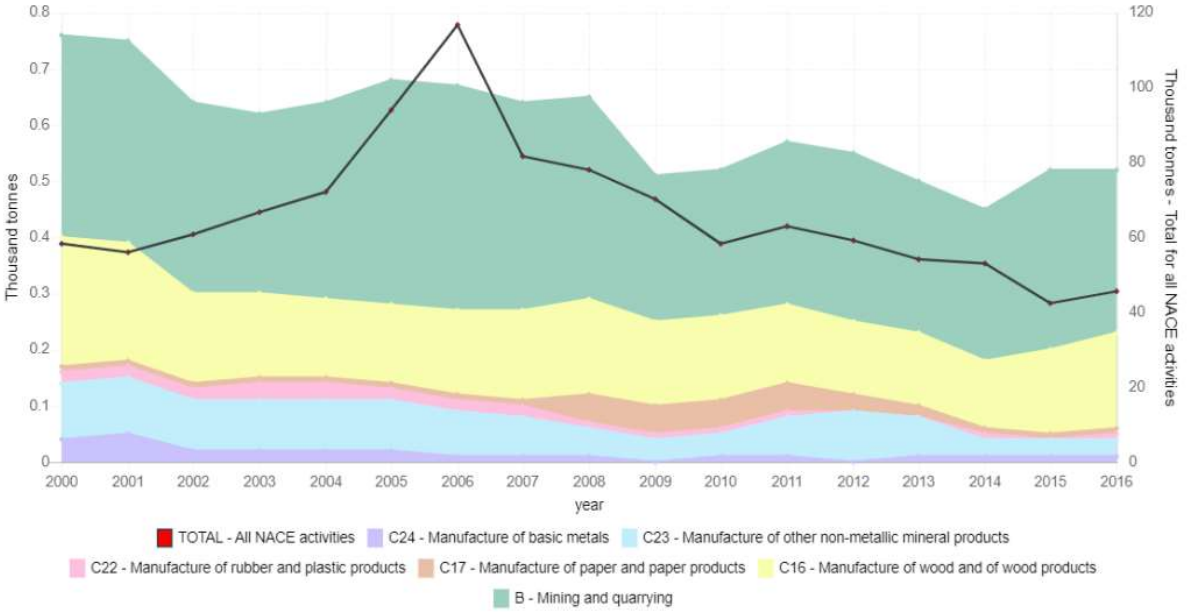
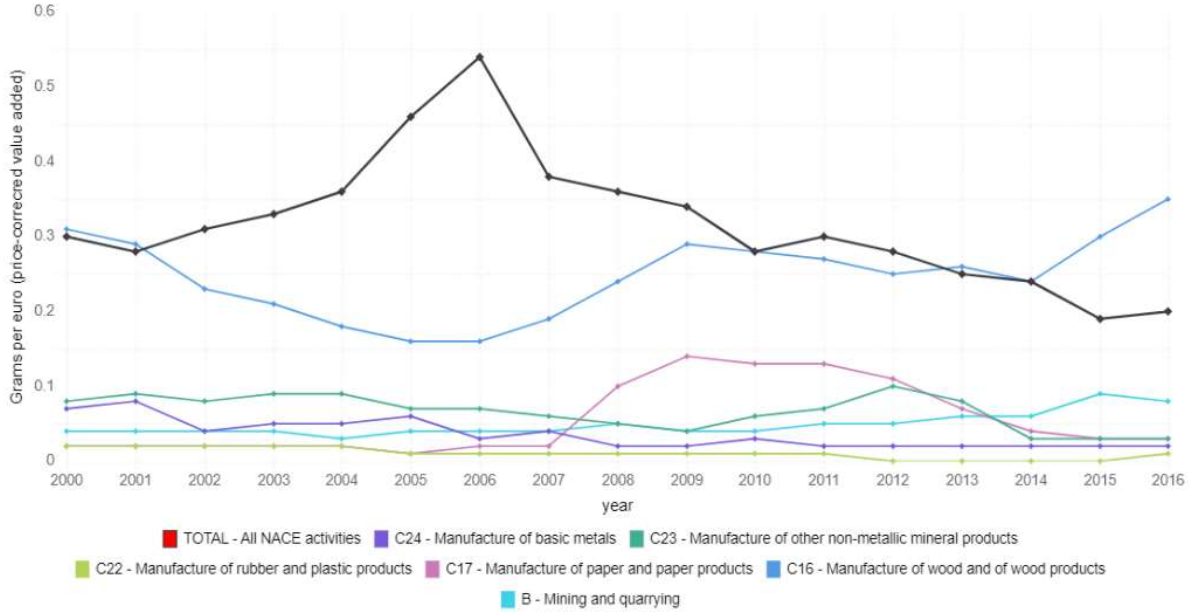


Figure 25. $PM_{2.5}$ emissions intensity (emissions per gross value added) ([63])



([62]) Eurostat, Air emissions accounts by NACE Rev. 2 activity, code: *env_ac_ainah_r2*
([63]) Eurostat, Air emissions intensities by NACE Rev. 2 activity, code: *env_ac_aeint_r2*

9.4 Generation of waste by raw materials sector

Definition: Generation of waste by economic sector following the NACE Rev.2 classification as reported by Member States. Waste is considered as any substance or object that the holder discards or intends or is required to discard. The sludges (including the dredging spoils) are measured in dry matter. These data include all typologies of hazardous and non-hazardous waste.

Figure 26. Non-hazardous waste ([64])

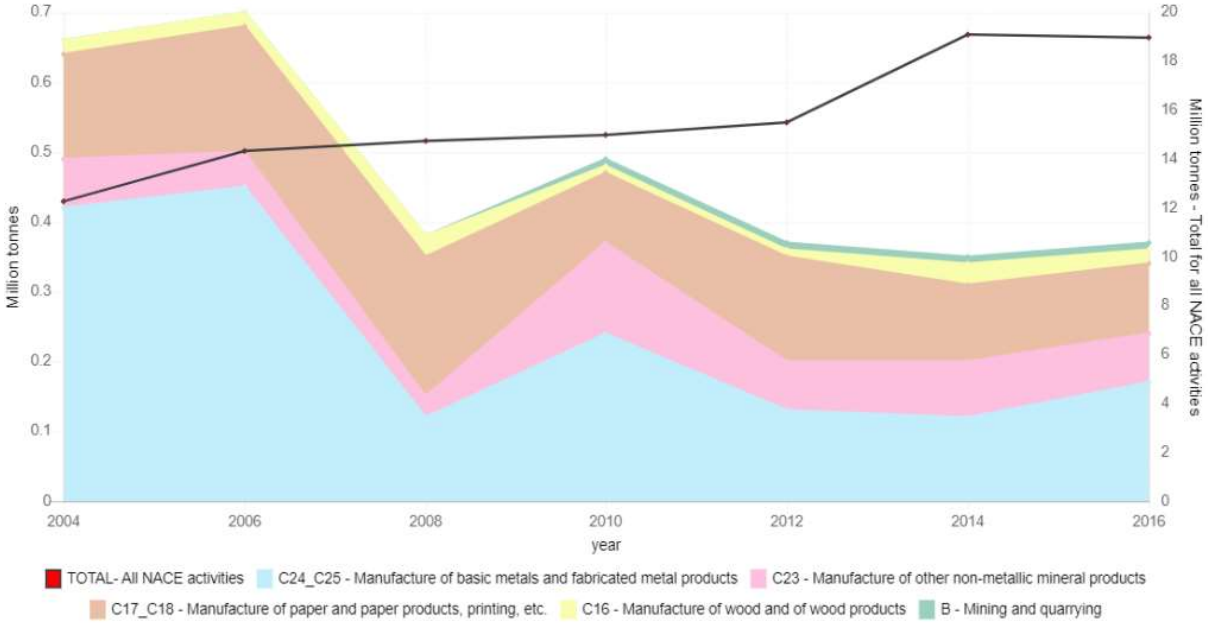
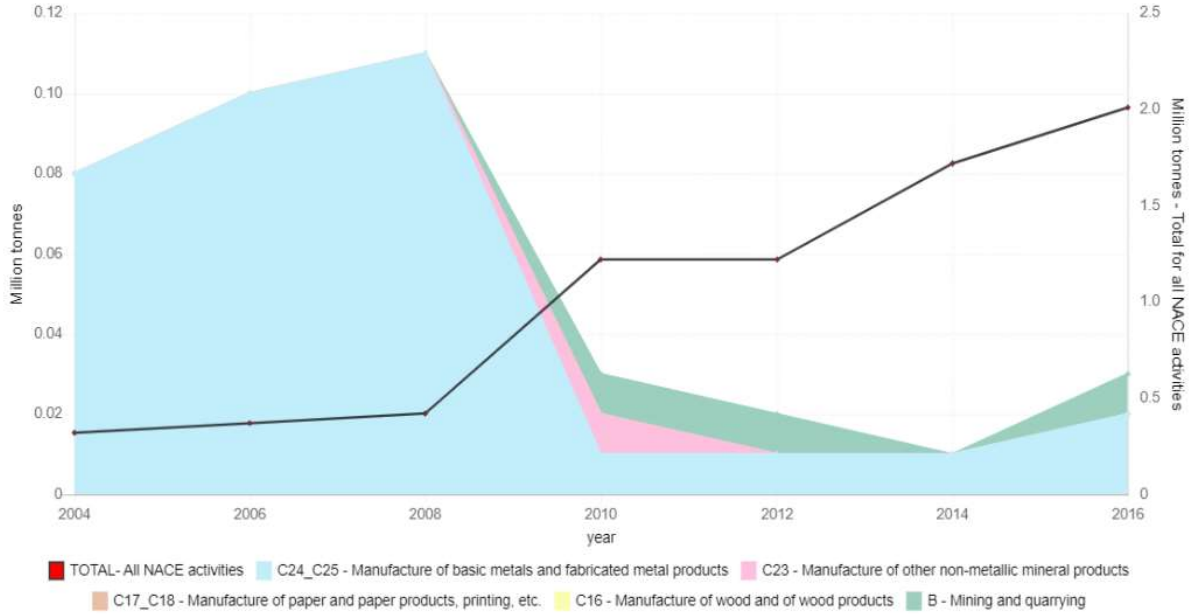


Figure 27. Hazardous waste ([65])

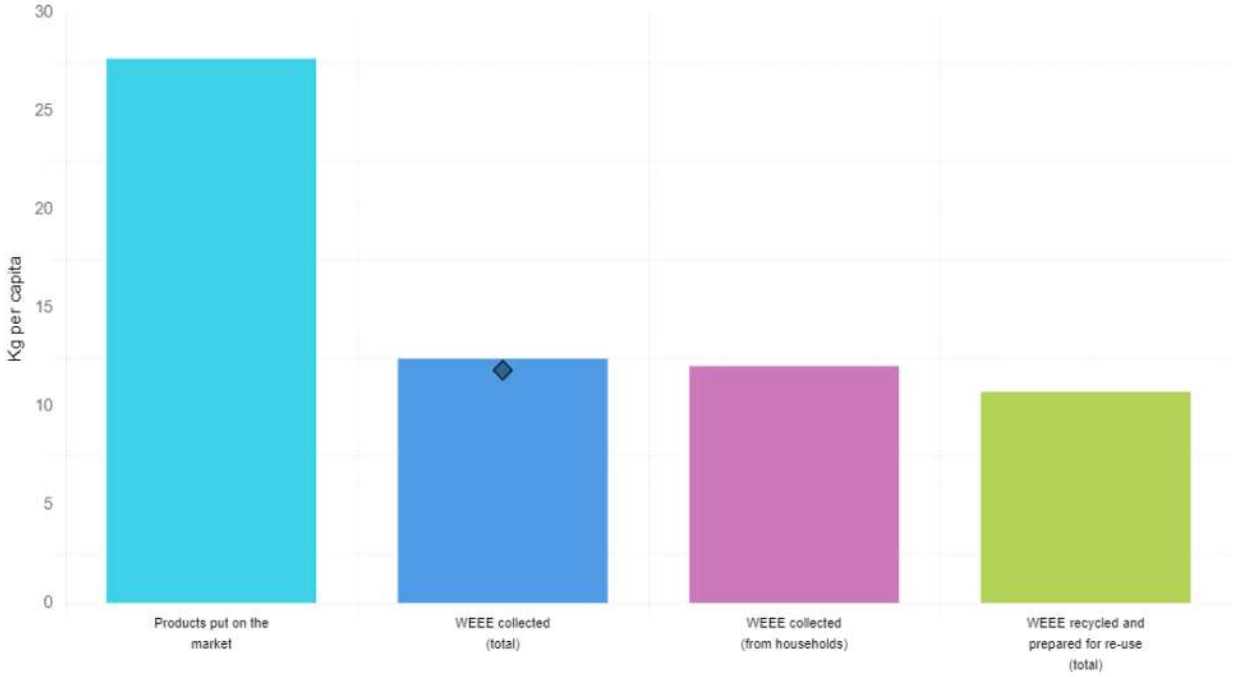


([64]) Eurostat, Generation of waste by waste category, hazardousness and NACE Rev. 2 activity, dataset code *env_wasgen*
([65]) Eurostat, Generation of waste by waste category, hazardousness and NACE Rev. 2 activity, dataset code *env_wasgen*

9.5 Waste of Electrical and Electronic Equipment (WEEE) management

Eurostat reports statistics of on WEEE collected (total and from households) based on data reported by Member States. Statistics also include the amounts of total WEEE 'recycled and prepared for re-use', and the detail of WEEE prepared for re-use. Target on WEEE collection from households: the Directive 2012/19/EU on WEEE established (article 7) that, from 2016, the minimum collection rate in a given year in a Member State shall be 45 % of the EEE placed on the market, expressed as a percentage of the average weight of EEE placed on the market in the three preceding years in that Member State.

Figure 28. Waste of Electrical and Electronic Equipment (WEEE) management ([66])



([66]) Eurostat, Waste electrical and electronic equipment (WEEE) by waste operations [*env_waselee*].

10 Social & Policy

10.1 Worldwide Governance Indicators

Definition: The *Worldwide Governance Indicators* cover over 200 countries and territories, measuring six dimensions of governance: Voice and Accountability, Political Stability and Absence of Violence/Terrorism, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. The aggregate indicators are based on several hundred individual underlying variables, taken from a wide variety of existing data sources. The data reflect the views on governance of survey respondents and public, private, and NGO sector experts worldwide. The WGI also explicitly report margins of error accompanying each country estimate. These reflect the inherent difficulties in measuring governance using any kind of data. Even after taking these margins of error into account, the WGI permit meaningful cross-country and over-time comparisons.([67])

Table 14. Worldwide Governance Indicators (2018) ([68])

Indicator	Score*	Percentile rank
Voice and accountability	1.61	98.03
Political Stability and Absence of Violence/Terrorism	0.96	82.38
Government Effectiveness	1.87	97.12
Regulatory Quality	1.68	94.23
Rule of Law	1.83	96.83
Control of Corruption	2.15	98.56

*Highest performance: +2.5; Lowest performance: -2.5

Percentile range: 0-10th 10-25th 25-50th 50-75th 75-90th 90-100th

10.2 Policy Perception Index

Definition: The Policy Perception Index assesses the public regulatory framework that affects investment, i.e. how government policy affects attitudes towards exploration investment in each mining jurisdiction, ranking jurisdictions based on the responses to the Annual Survey of Mining Companies done be the Fraser Institute.

It measures the overall policy attractiveness of 91 jurisdictions through annual survey of mining and exploration companies.

Denmark: n.a.([69])

10.3 Country risk: INFORM index

Definition: INFORM is a global, open-source risk assessment for humanitarian crises and disasters. It is developed by JRC and can support decisions about prevention, preparedness, and response. It builds up a picture of risk by bringing together around 50 different indicators that measure three dimensions of risk:

1. Hazard and exposure (events that could occur and the people or assets potentially affected by them);
2. Vulnerability (the susceptibility of communities to those hazards);
3. Lack of capacity (lack of resources available that can help absorb the shock).

([67]) Kaufmann, Daniel and Kraay, Aart and Mastruzzi, Massimo, The Worldwide Governance Indicators: Methodology and Analytical Issues (September 2010). World Bank Policy Research Working Paper No. 5430. Available at SSRN: https://ssrn.com/abstract=1682130
([68]) World Bank (2017): Worldwide Governance Indicators. Internet: http://info.worldbank.org/governance/wgi/#reports
([69]) https://www.fraserinstitute.org/sites/default/files/survey-of-mining-companies-2017.pdf

Table 15. Country risk: INFORM index (2019) ([70])

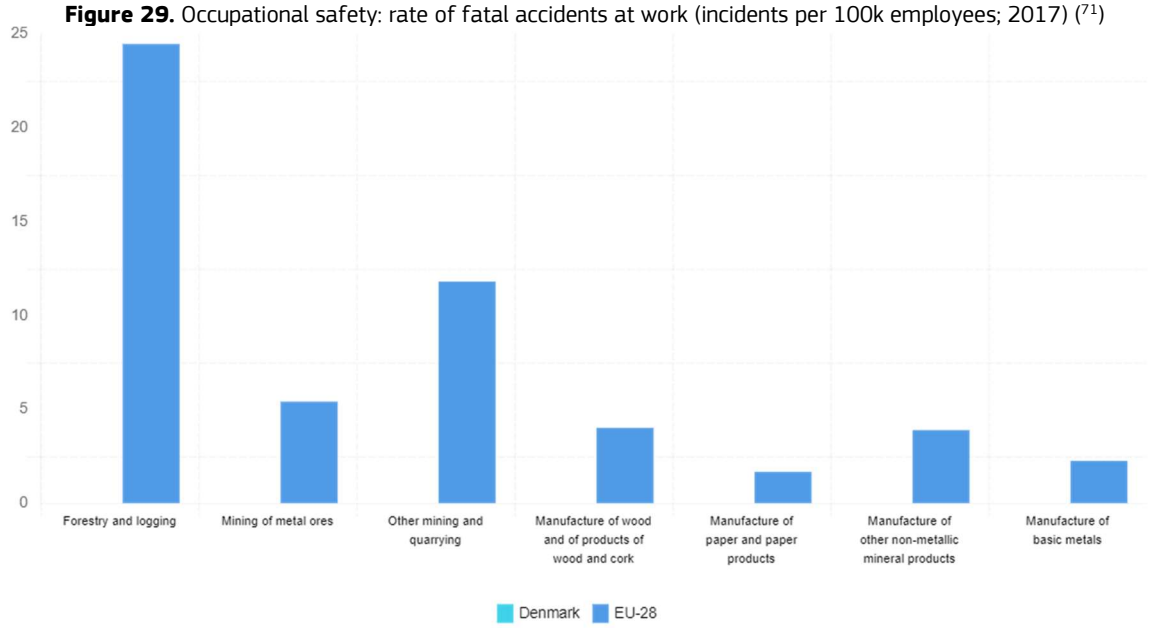
Components	Score*	Risk class
Hazard and exposure	0.5	Very Low
Vulnerability	1.8	
Lack of capacity	1.4	
INFORM index	1.1	

***** a lower value (closer to 0) represents a lower risk and a higher value (closer to 10) represents a higher risk.

10.4 Occupational safety: rate of fatal accidents at work

Definition: The incidence rates express the number of accidents at work in relation to the number of persons employed, in economic activities related to raw materials sectors.

Figure 29. Occupational safety: rate of fatal accidents at work (incidents per 100k employees; 2017) ([71])



([70]) https://ec.europa.eu/jrc/en/scientific-tool/index-risk-management-inform ; http://www.inform-index.org/ ;
([71]) Eurostat, Accidents at work (ESAW, 2008 onwards) (hsw_acc_work), [hsw_n2_02] https://ec.europa.eu/eurostat/cache/metadata/en/hsw_acc_work_esms.htm

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