SCRREEN

Solutions for CRitical Raw materials - a European Expert Network

OUTLOOK REPORT 2

DELIVERABLE 14.3

WP14. Foresight studies 1

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<u>EIT Raw Materials</u>

DELIVERABLE TYPE		
R	Document, report	X
DMP	Data Management Plan	
O	Other	
DISSEMINATION LEVEL		
PU	Public (fully open)	
SEN	Sensitive, limited under the conditions of the Grant Agreement	X

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V3			

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2 LIST OF ABBREVIATIONS AND ACRONYMS

CA – Consortium Agreement

D – Deliverable

DoA – Description of Action

EC – European Commission

GA – General Assembly

H2020 – Horizon 2020 The 8th EU Framework Programme for Research and Innovation.

HEU – Horizon Europe – the 9th framework Programme of the EC for research, technological development and innovation activities.

IPR – Intellectual Property Right

LCE – Lithium Carbonate Equivalent

PC – Project Coordinator

ROW – Rest of the World

SC – Steering Committee

SME – Small and Medium Enterprise

WP – Work package

Kt LCE – metric kilotons Lithium Carbonate Equivalent

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3 SCOPE – LIST OF HS CODES

Table 1: List of relevant HS codes with information on supply chain stage, material content (0-1) and description

Material	Stage	Content (0-1)	Description	HS Codes	Comment
Cu	Extraction	0.3	Copper ores and concentrates	26030000	based on Cu content in concentrates
Cu	Processing	0.75	Copper mattes; cement copper "precipitated copper"	74010000	
Cu	Processing	1	Copper, unrefined; copper anodes for electrolytic refining	74020000	
Cu	Processing	1	Copper, refined, in the form of cathodes and sections of cathodes	74031100	
Cu	Processing	1	Copper, refined, in the form of billets	74031300	
Li	Processing	0.17	Lithium oxide and hydroxide	28252000	
Li	Processing	0.19	Lithium carbonates	28369100	
Ni	Extraction	0.20	Nickel ores and concentrates	260400	
Ni	Processing	0.67	Nickel oxides and hydroxides	282540	
Ni	Processing	0.25	Chlorides; of nickel	282735	
Ni	Processing	0.05	Sulphates; of nickel	283324	
Ni	Processing	0.25	Ferro-alloys; ferro-nickel	720260	
Ni	Processing	0.45	Nickel; nickel mattes	750110	
Ni	Processing	1	Nickel; unwrought, not alloyed	750210	
Ni	Processing	0.5	Nickel; unwrought, alloys	750220	
Ni	Processing	1	Nickel; powders and flakes	750400	
Sb	Extraction	0.72	Antimony ores and concentrates	26171000	based on Sb content in concentrates
Sb	Processing	0.84	Antimony oxides	28258000	
Sb	Processing	0.99	Unwrought antimony; antimony powders	81101000	
Mg	Processing	1.00	Unwrought magnesium, containing >= 99,8% by weight of magnesium	81041100	
Mg	Processing	0.90	Unwrought magnesium, containing < 99,8% by weight of magnesium	81041900	
MgCO3	Extraction	1.00	Natural magnesium carbonate "magnesite"	25191000	
Pd	Processing	1.00	Palladium, unwrought or in powder form	71102100	
Pt	Processing	1.00	Metals; platinum, unwrought or in powder form	711011	
Rh	Processing	1.00	Rhodium, unwrought or in powder form	71103100	
Ru	Processing	0.82	Iridium, osmium and ruthenium, unwrought or in powder form	71104100	

4 DATA QUALITY AND CONFIDENCE

Different organisations collect data on raw materials use in different ways. This has been a challenge for all criticality assessments, and a pragmatic solution has been developed there: end-use categories/sectors are assigned to CPA/NACE codes based on expert opinion. NACE assignments are available through the Factsheets, and CPA (goods, end-uses) are available through the internal Excel files used for the last exercise. SCRREEN partners (e.g., EIT RawMaterials) do not have access to these by default.

Granular consumption data is rarely readily available. If there is an MFA/MSA study for the raw material (e.g., copper), this can be extracted; in other cases (e.g., magnesium, limited or no data are available. In some cases, the sources may remain ambiguous as to what it is, as definitions may be unclear or missing entirely. Indeed, varying methodologies, aggregations and gaps in the data pose an enormous challenge, especially for markets such as magnesium, where country-level and sector-specific data are not readily available.

As pointed out by JRC, some countries show significant negative values when calculating apparent consumption based on the formula C_A=Production+Imports-Exports.
Possible explanations:

- Wrongly reported or incompletely reported data.
- Inconsistencies in reporting codes definitions as basis for reported numbers
- Exports from stockpiled material.
- Trade hub inconsistencies, i.e., Rotterdam or Hamburg serving as trade hubs, and Belgium and Germany becoming the reporter or partner in the trade.

5 NICKEL

Table 2: Overview of nickel HS codes considered here. See also Table 2 for further details.

Nickel ores and concentrates	260400
Nickel oxides and hydroxides	282540
Chlorides; of nickel	282735
Sulphates; of nickel	283324
Ferro-alloys; ferro-nickel	720260
Nickel; nickel mattes	750110
Nickel; unwrought, not alloyed	750210
Nickel; unwrought, alloys	750220
Nickel; powders and flakes	750400

5.1 Nickel Consumption by Sector

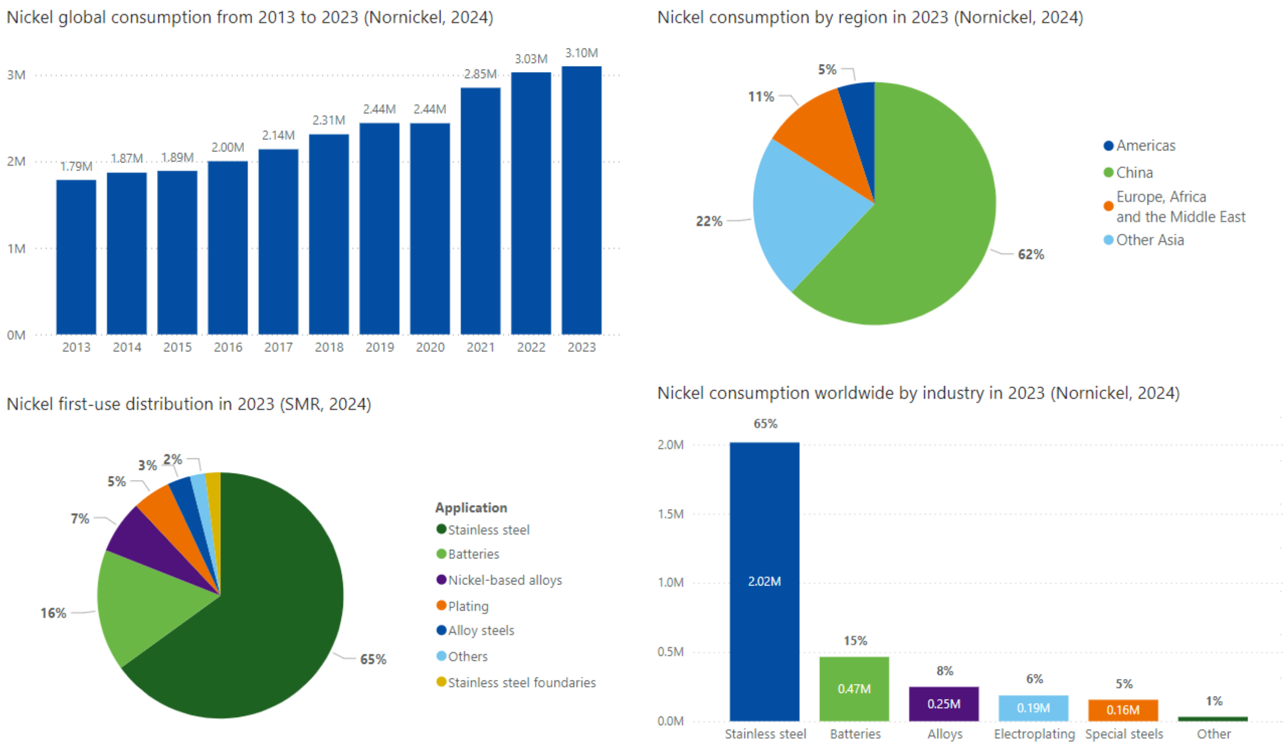

Figure 1: Nickel consumption globally and by region and industry in 2023 (Nornickel, 2024; SMR, 2024)

Primary nickel consumption in the EU and globally is primarily driven by the steel sector. However, forecasts see a steady increase in nickel consumption in the battery sector from currently 15% to over 40% by 2040 (see Figure 5).

Nickel usage, as reported by the International Nickel Study Group (INSG), has been steadily declining EU-wide between 2012 and 2023 (Figure 2). Germany is the biggest consumer of primary nickel among all EU27 countries, followed by Italy and Belgium, with around 21%, 20% and 13% of the EU27 share, respectively (based on 2023 data). While Germany and Italy have seen significant decreases in consumption (43% and 13%, respectively), Belgium's consumption increased, against the EU-wide negative trend, by over 11%, when comparing 2012 and 2023 figures (see EU27 Nickel Usage INSG tab in accompanying Excel file). Overall, nickel use decreased across the EU27 between 2012 and 2023, with an average de-growth rate of -23%, during this period (INSG, 2024).

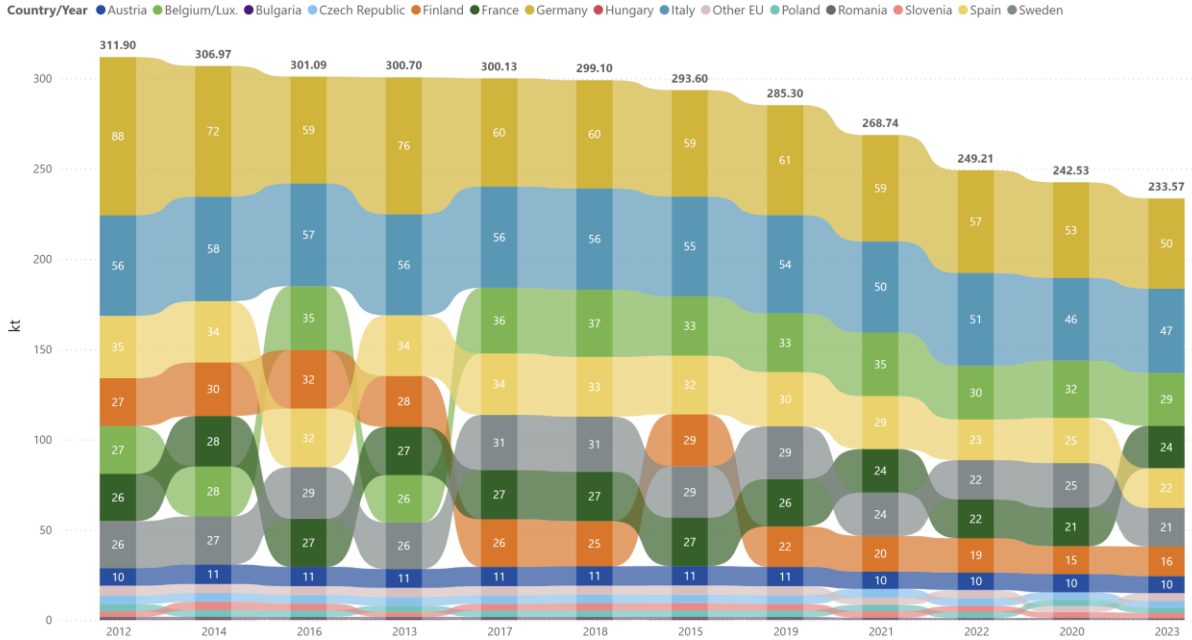

Figure 2: Primary Ni use across the EU27 between 2012 and 2023 in kt (INSG, 2024); raw data in accompanying data file.

End-use specific consumption data for the EU27 is available as part of the MISO2 material stocks data library, 1990-2016 (Dominik, et al., 2024). This indicates that nickel in civil engineering products has been the biggest growth sector. ‘Civil engineering except roads’ refers to railways, bridges, tunnels, subways, pipelines, electricity infrastructure, and other civil infrastructure. Machinery and equipment were the only end use to contract over the time period (see Figure 3).

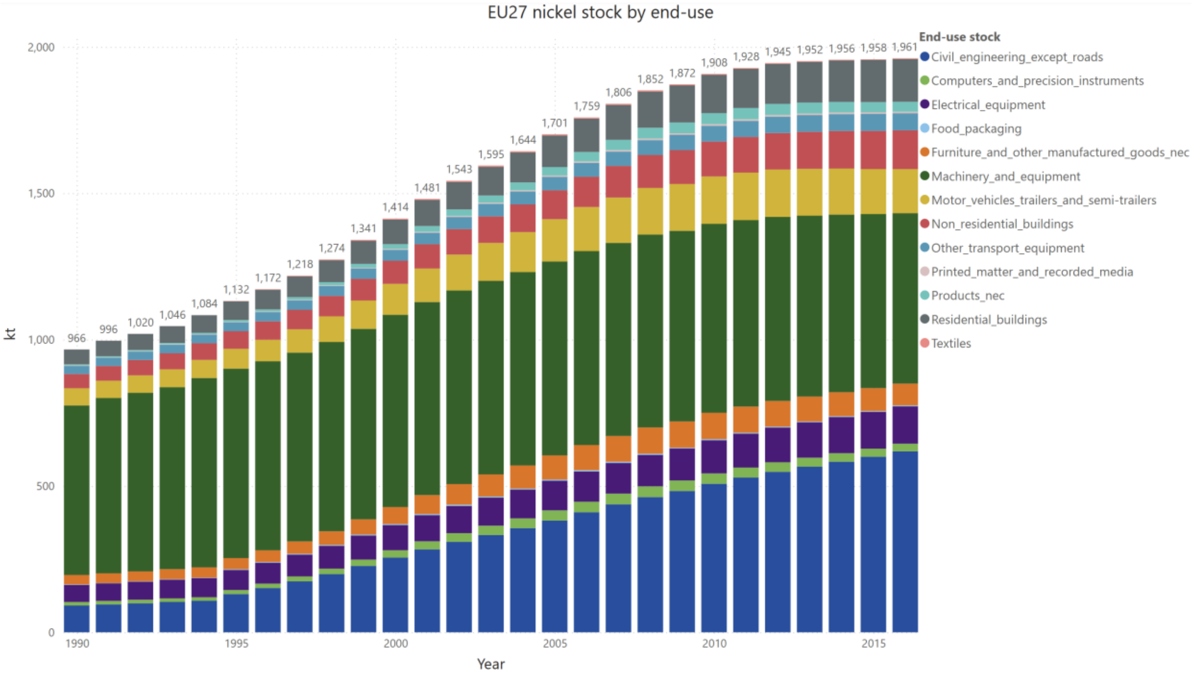

Figure 3. EU27 nickel stock by end use (1990-2016), MISO2 data library. Raw data in the accompanying data file.

5.2 Data Quality & Confidence

Historically, the battery precursor application for nickel was negligible; hence, predictions for the battery sector's nickel consumption based on pre-2020 data lack robustness.

Estimates of historical nickel end uses in Figure 3 from the MISO2 MAT_STOCKS database (MISO2) are generated using an economy-wide material cycles and stock dynamics model, which resolves many different data on production, trade, consumption, and end-of-life flows (Wiedenhofer, et al., 2024). It quantifies material end-use stocks and production, trade, and end-of-life flows at the country level for 20 materials and 13 end-use sectors. Data on primary material production, processing, waste generation, and trade come from a global country-level data set assembled by Plank (Plank, 2022). For nickel, production and trade data originally come from the British Geological Survey (BGS) and UN Comtrade. Materials are classified by their stage of processing – raw materials (e.g., nickel ore), raw products (e.g., primary copper), semi-finished products (e.g., copper plates and cables), and final products (e.g., electric appliances), using SITC1 codes from Comtrade. The allocation of material inflows to end-use sectors is modelled as described in Wiedenhofer et al. (2024). This allocation is indicative and subject to uncertainty. The data for nickel precede the large growth in nickel uses since 2016 for battery precursors.

5.3 Nickel trade in EU member countries

The MISO2 MAT_STOCKS database (MISO2) estimates imports and exports of materials grouped into raw products, semi-finished products, and materials in final products. This is done at the country level. However, the trading partner is not distinguished. Therefore, we cannot aggregate these trade flows to the EU27 level, as it would include both intra-EU and inter-EU trade and thus produce an overestimate of total trade flows. We present nickel imports and export estimates for Germany and Italy in Figure 4. There are no estimates of nickel traded in semi-finished or final products, so the flows shown for nickel are for raw products only.

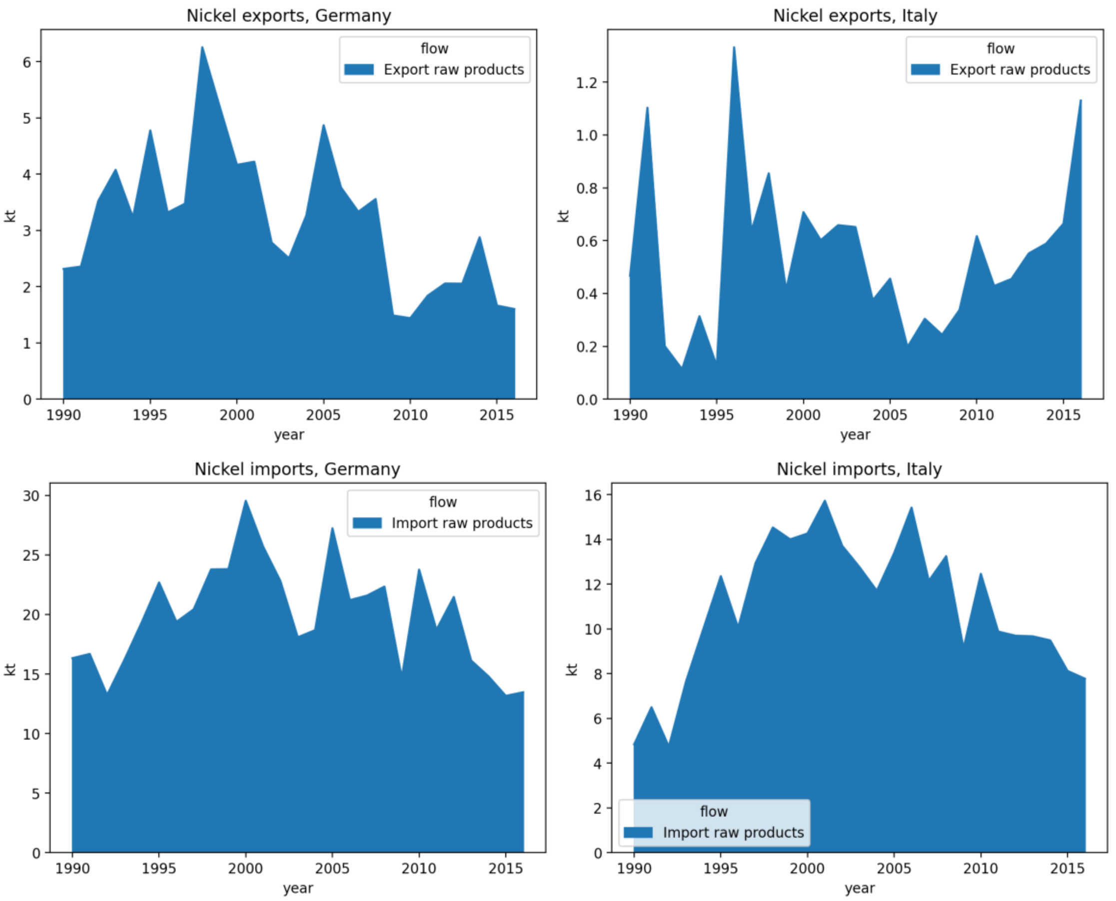

Figure 4 Nickel imports and exports for raw products for Germany and Italy (1990-2016), MISO2 data library.

5.4 Consumption Outlook

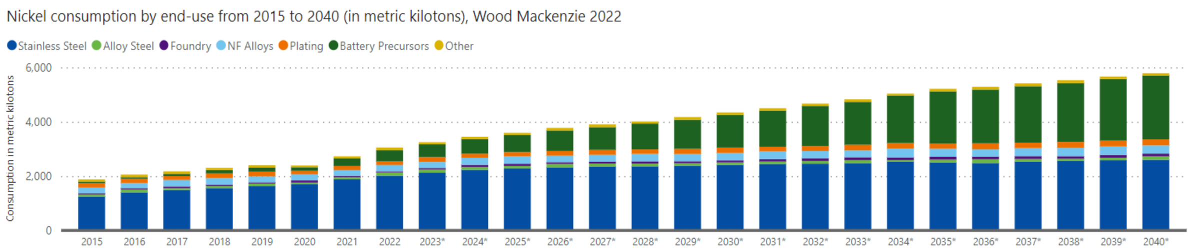

Figure 5: Nickel consumption by end-use 2015-2040 in metric kilotons (Wood Mackenzie, 2022)

As illustrated in Figure 5, nickel consumption by end-use is seeing a steady increase in battery precursor production towards 2040, while its current principal end-use, stainless-steel production, remains largely at the 2024 level at just over 2.2 to 2.5 million tonnes.

6 COPPER

6.1 Copper Consumption by Sector

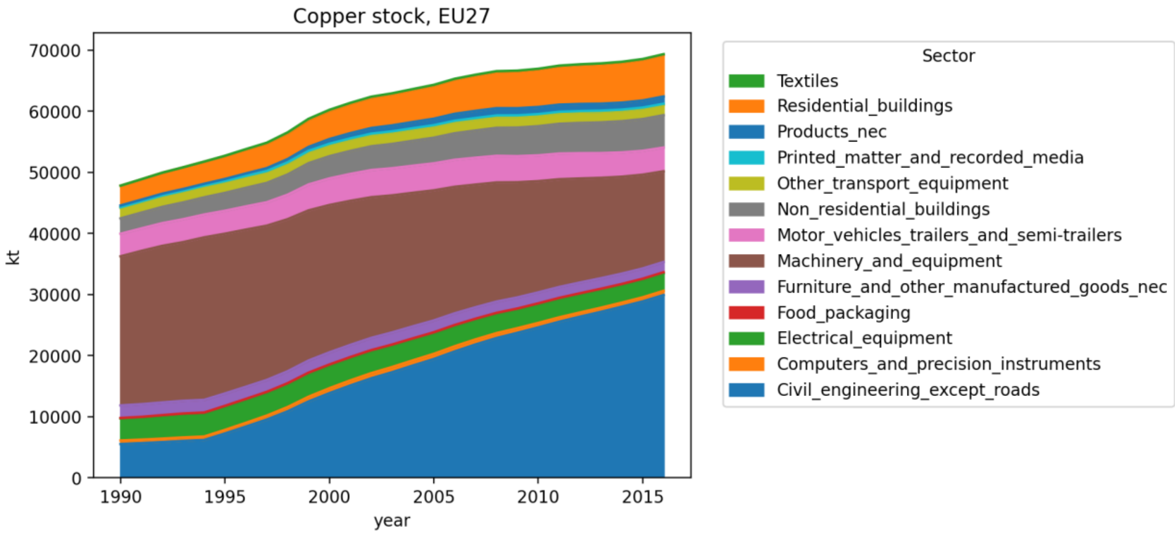

Figure 6 EU27 copper stock by end use (1990-2016), MISO2 data library

Estimates of historical copper end uses in Figure 6 are from the MISO2 MAT_STOCKS database (MISO2), described in section 1.2. The quantity and share of machinery and equipment have declined over time, and the stock in civil engineering has become the dominant share of nickel stocks. 'Civil engineering except roads' refers to railways, bridges, tunnels, subways, pipelines, electricity infrastructure, and other civil infrastructure. The latest version of Figure 7 is published at irregular intervals by the Copper Alliance (Copper Alliance).

Soulier et al. (2018) and updates made at Fraunhofer ISI together with Clausthal University of Technology provide an alternative view of EU stocks and flows. Figure 7 shows the overall picture for stocks and flows in the EU27 + UK as of 2016 and 2020. Trends in copper consumption in the EU27 + UK are shown in Figure 8 and detailed in the accompanying Excel data sheet.

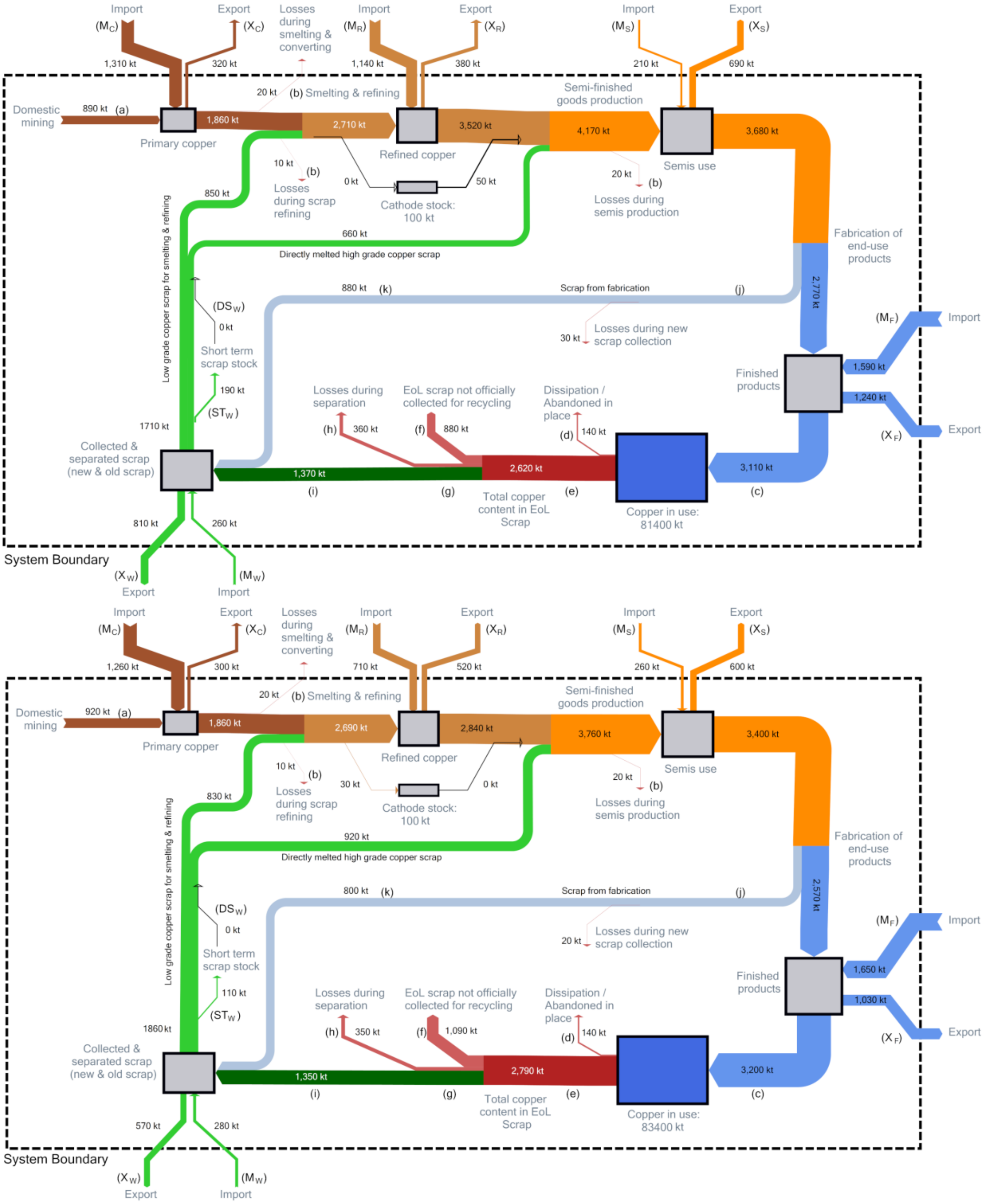

Figure 7. Aggregated stocks and flows of copper in the EU27+UK in 2016 (top) and 2020 (bottom). Source: Fraunhofer ISI based on Soulier et al. (2018)

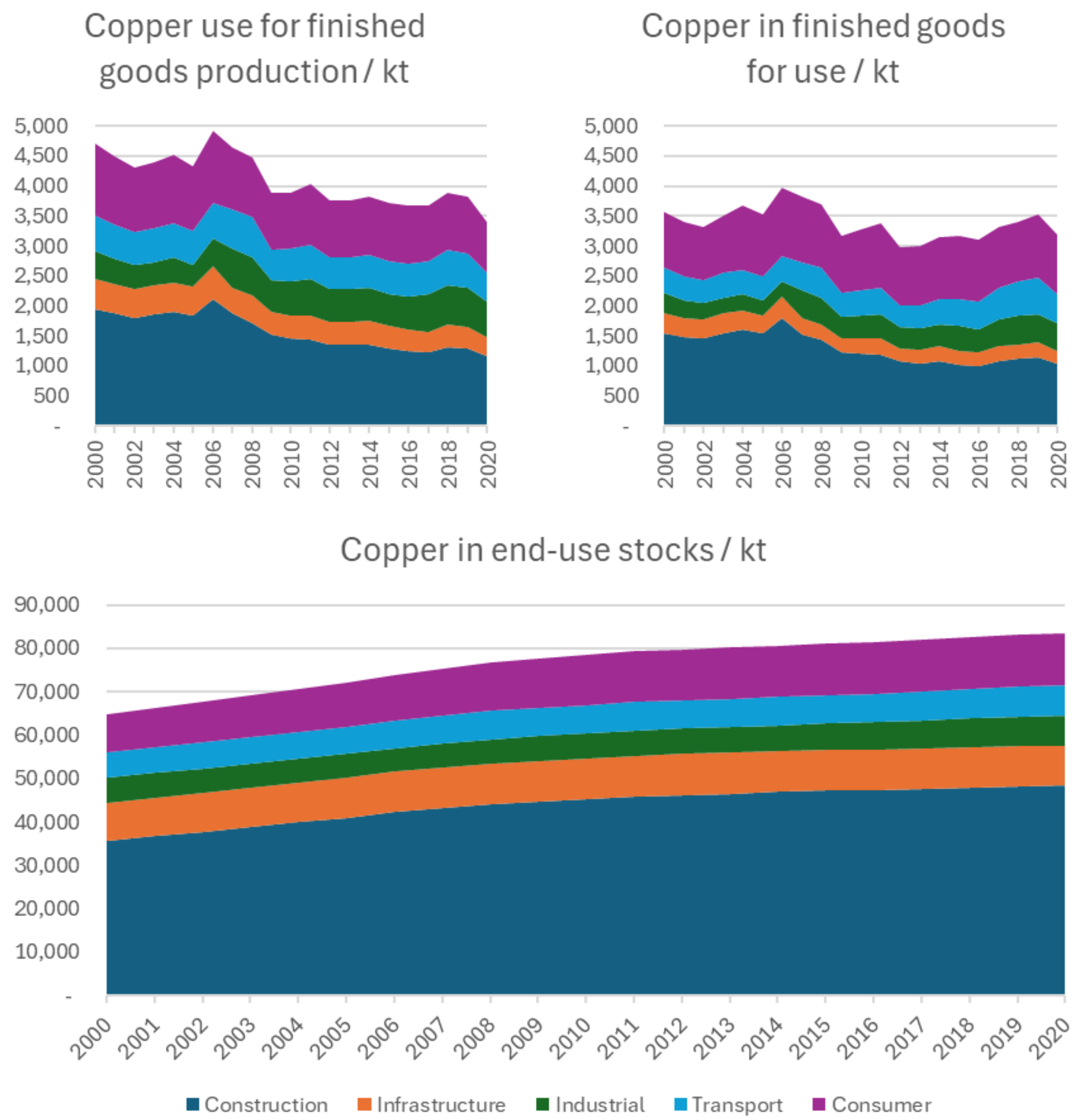

Figure 8. Selected stocks and flows for copper in the EU27+UK from 2000 to 2020. Source: Fraunhofer ISI based on Soulier et al. (2018)

6.2 Copper mining in EU member countries

Copper mining in the European Union is concentrated in a few member states, with Poland being the leading producer, followed by Spain, Bulgaria and Sweden Figure 9. The EU is not a major global copper producer, relying heavily on imports to meet demand. Despite domestic mining operations, the EU remains dependent on imported copper to sustain industries such as electronics, construction, and renewable energy. Recycling is crucial in supplementing supply, with 40% to 60% of the EU's metal production coming from recycled materials. (European Commission, 2025).

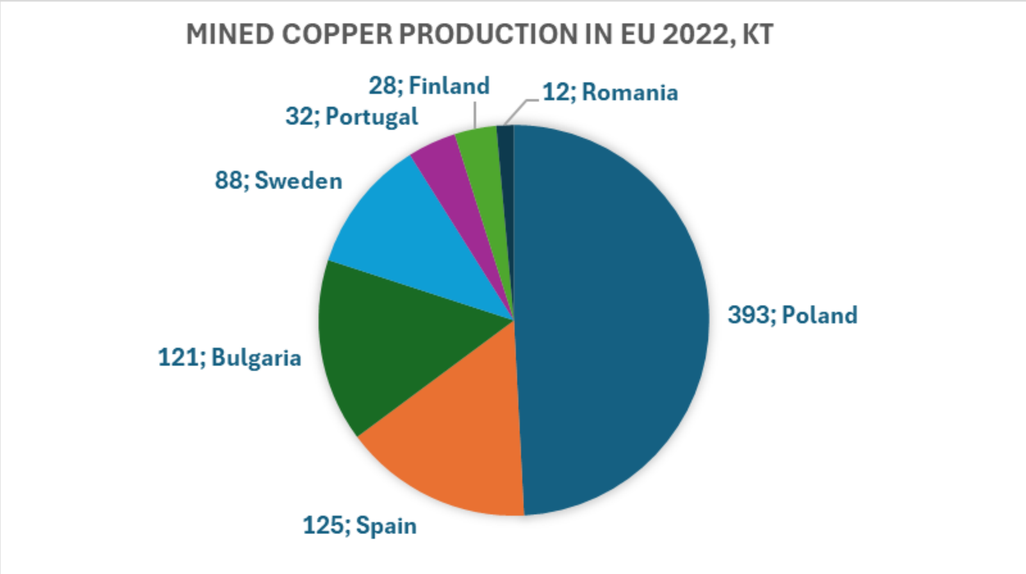

Figure 9. Copper mining production in EU member countries (in kt contained metal). (World Mining Data, 2025)

Poland is the largest mined copper producer in the European Union, with its mining industry dominated by KGHM Polska Miedź, which operates several mines in the Kupferschiefer formation (Krzak, 2021). This geological structure is a sedimentary-hosted copper deposit, rich in copper and silver. Spain has a significant copper mining industry, primarily concentrated in the Iberian Pyrite Belt, which extends across southern Spain and Portugal. Operating mines include Riotinto Copper Project operated by Atalaya Mining Plc and MATSA Mine Owned by Sandfire Resources Ltd (Sandfire, 2025). This region hosts some of Europe's largest volcanogenic massive sulfide (VMS) deposits, rich in copper, zinc, and lead (Barriga;Carvalho;& Ribeiro, 1997).

Copper mining in Bulgaria is concentrated in the Sredna Gora mountain range. Operating mines include, for example, Assarel Mine operated by Assarel-Medet JSC, and Chelopech Mine operated by Dundee Precious Metals. Bulgaria's copper deposits are mainly porphyry copper and VMS-type, formed through magmatic and hydrothermal processes (Popov, 2003). Sweden's copper production is primarily concentrated in the Aitik mine, one of Europe's largest open-pit copper mines, operated by Boliden, with annual production 60-80 kt. The Aitik deposit is a porphyry copper deposit, characterized by low-grade but large-tonnage ore bodies containing copper, gold, and silver.

6.3 Copper trade in EU member countries

The MISO2 MAT_STOCKS database (MISO2) estimates imports and exports of materials grouped into raw products, semi-finished products, and materials in final products. This is done at the country level. However, the trading partner is not distinguished. Therefore, we cannot aggregate these trade flows to the EU27 level, as it would include both intra-EU and inter-EU trade and thus produce an overestimate of total trade flows. We demonstrate imports and export estimates for Germany and Italy in Figure 10.

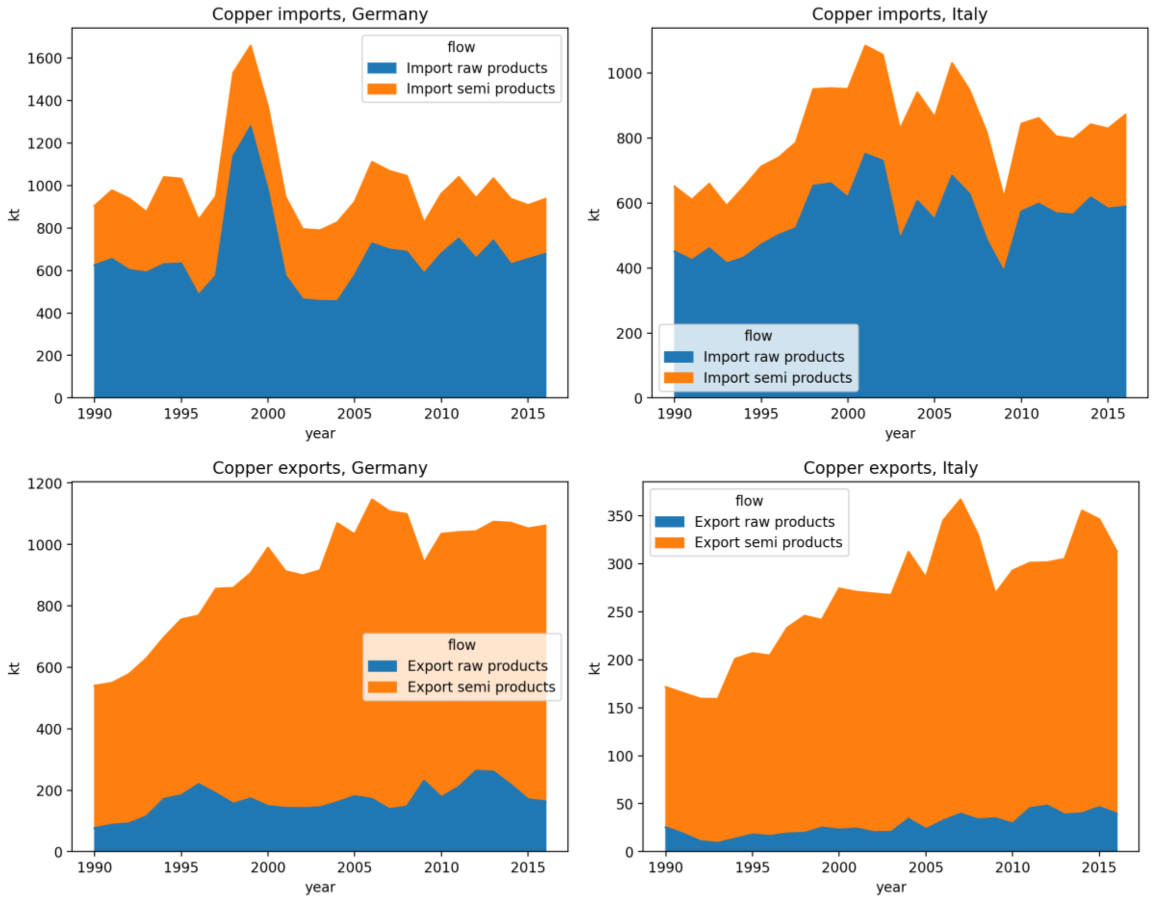

Figure 10. Copper imports and exports for raw and semi-finished products for Germany and Italy (1990-2016), MISO2 data library, included in the accompanying data file.

7 LITHIUM

7.1 Lithium Consumption by Sector

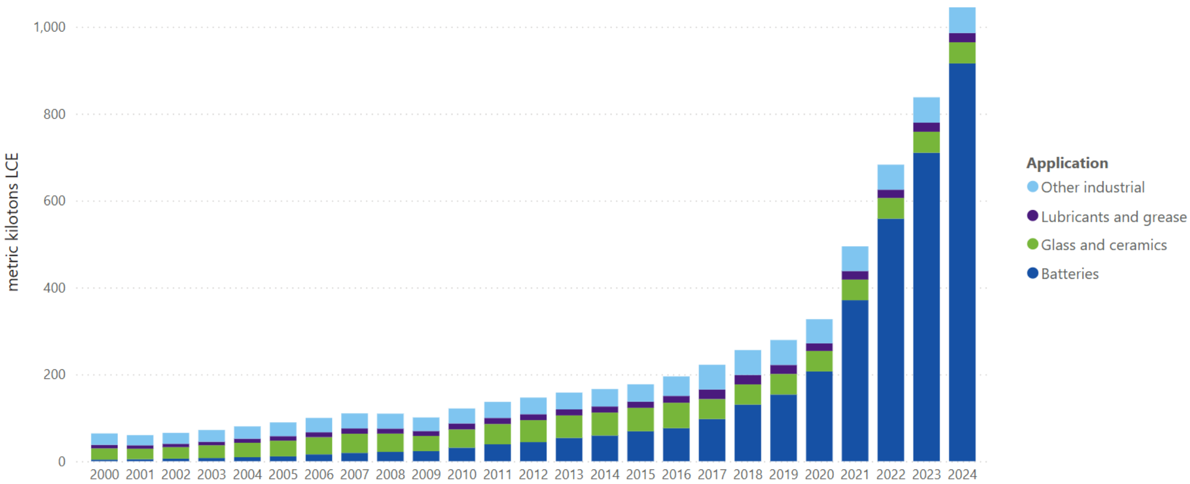

Figure 11: Global lithium demand by application (2000-2024) *(Roskill, 2016; US Geosurvey, 2017; US Geosurvey, 2018; S&P Global, 2025);*[1] raw data in the accompanying data file.

Between 2000 and 2024 (see Figure 11), global lithium consumption increased 16-fold, from just over 60 metric kilotons to over 1 million metric tons of lithium carbonate equivalent (LCE). This growth was primarily driven by the rise of rechargeable batteries, which became the dominant application, overtaking traditional sectors like ceramics, glass, lubricants and grease. Other industrial applications, including polymers, aluminium alloys and air treatment, also grew steadily, though on a smaller scale. By 2024, batteries accounted for 88% of the global lithium demand, followed by glass and ceramics (5%), lubricants and grease (2%) and other industrial applications (6%).

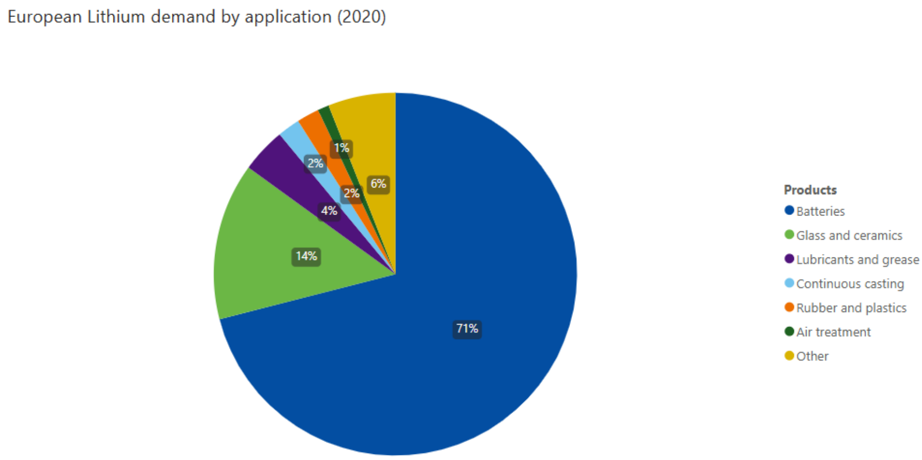

Figure 12: European lithium demand by application (2020) *(SCREEN, 2025)*

[1] In Roskill reports, "consumption" likely refers to actual demand rather than apparent consumption.

In line with global trends, batteries have also gained a prominent share of lithium demand in Europe, reaching over 70% in 2020, driven by the uptake of vehicle electrification and energy storage applications. Traditional applications such as glass and ceramics (14%) and greases and lubricants (4%) continued to play a role, though their relative importance has declined. Other industrial uses, such as continuous casting, rubber and air treatment, made up the remaining share (see Figure 12).

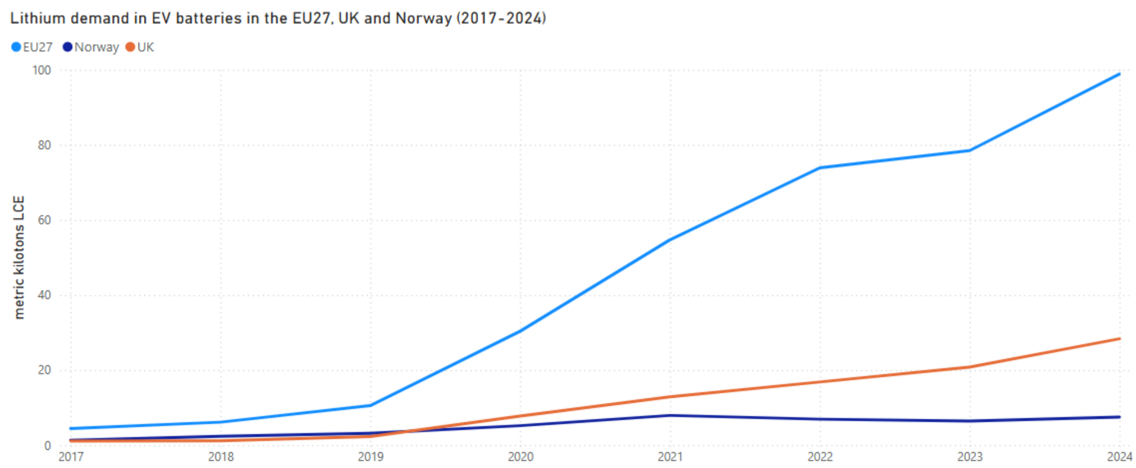

Figure 13. Lithium demand in EV batteries in the EU27, UK and Norway (2017-2024) (S&P Global, 2025)

From 2017 to 2024 (see Figure 13), lithium demand in European EVs rose sharply from around 7 kt to 135 kt LCE combined, driven by accelerating electrification across the EU27, the UK and Norway. Growth was fastest in the EU27, accounting for 100 kt LCE in 2024, as well as the UK, while Norway's more gradual increase reflects its already high EV market maturity (89% of new car sales in 2024 were electric*)* (Reuters, 2025). Figure 13 represents lithium embedded in vehicles sold in these markets, not where the material was sourced or processed.

7.2 Lithium Consumption Outlook

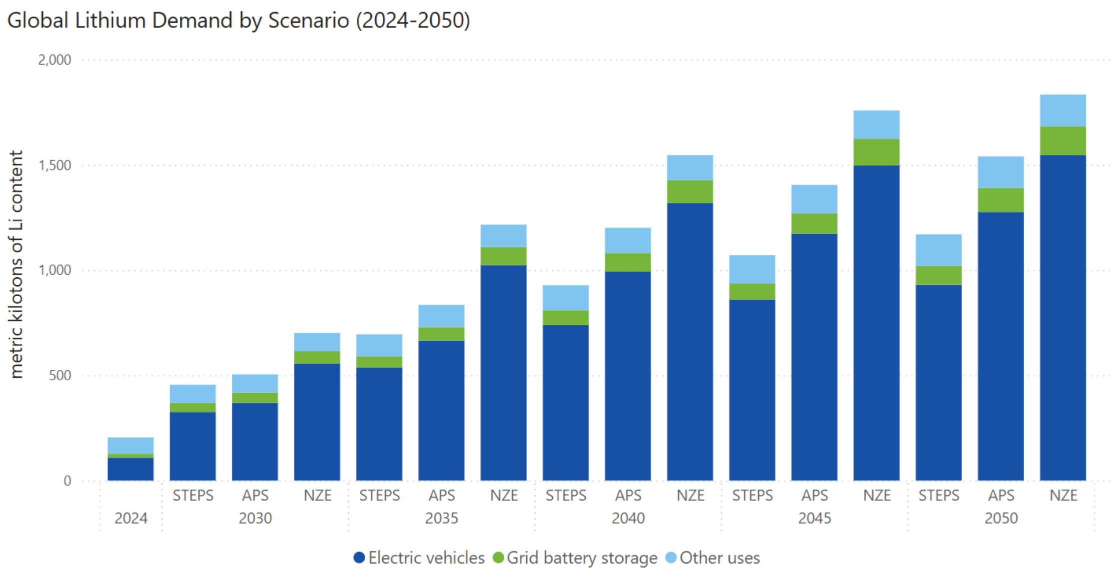

Figure 14: Lithium demand forecast by main application under three socio-economic scenarios (2024-2050, in metric kt lithium content). Scenarios: STEPS - Stated Policies Scenario, APS - Announced Pledges Scenario NZE – Net Zero Emissions) (IEA, 2025)

According to the IEA (see Figure 14), lithium global demand is projected to rise sharply across all scenarios, propelled by electric vehicles (EVs) and energy storage systems, with EVs being the dominant end use. In the Stated Policies Scenario (STEP), the combined lithium demand from EV and grid storage is expected to increase from 92 kt in 2023 to 1,041 kt in 2050 in lithium content (equivalent to approximately 490 kt LCE and 5,540 kt LCE, respectively). More ambitious pathways, such as the Announced Pledges (APS) and Net Zero Emissions (NZE) scenarios, foresee even greater demand, reaching 1,572 kt in lithium content (or 8,360 kt LCE) by 2050 under NZE.

Lithium use in other applications is also set to double, rising to 155 kt lithium content (825 kt LCE) by 2050.

However, circular economy strategies, such as lifetime extension and recycling, along with substitution with lithium-free battery technologies are expected to significantly mitigate long term primary lithium demand (Seppo Lähdesmäki, 2023; Patrycja Slotte, 2025; P. Granvik, 2025).

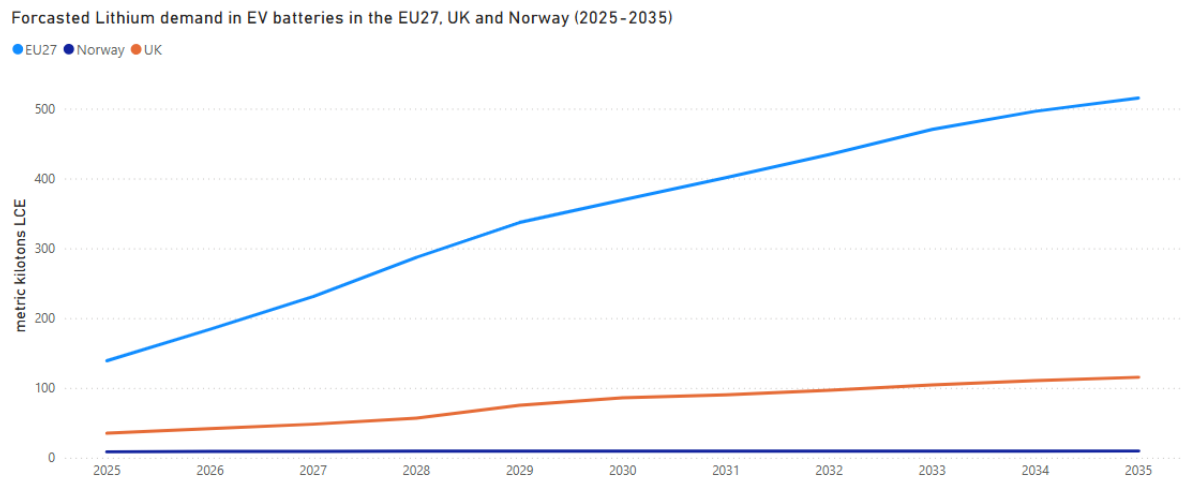

Figure 15: Lithium demand in EV batteries in the EU27, UK and Norway (2025-2035) *(S&P Global, 2025)*

Lithium use in EV batteries across Europe is expected to mirror global trends (see Figure 15). According to S&P Global, demand in the EU27, UK, and Norway is projected to rise sharply between 2025 and 2035. The EU27 is expected to see the most substantial growth, with demand more than tripling from 140 kt to over 510 kt LCE, reflecting sustained EV market expansion and regulatory momentum.

8 MAGNESIUM

8.1 Magnesium Consumption

The global magnesium market was valued at $4.34 billion in 2023 and is expected to reach $6.67 billion by 2032, growing at a CAGR of 4.9% (Weiler, 2025). In 2024, global primary magnesium production was 1,057 kt, with 949 kt from China and 109 kt from the Rest of World (ROW). Global magnesium consumption for the same period amounted to 1,022 kt, with 466 kt consumed in China and 556 kt in the ROW (personal communication with Martin Tauber, IMA).

8.1.1 EU Imports and exports of magnesium

Imports of magnesium remained stable in volume between 2019 and 2021 before increasing by 27% in 2022, but falling by 33% in 2023 (see Figure 16). Although export volumes are significantly lower than imports, they are mainly Mg scrap (CN 810420), which shows a similar trend, with a slight increase in 2022 and a drop in 2023. (Eurostat, 2024)

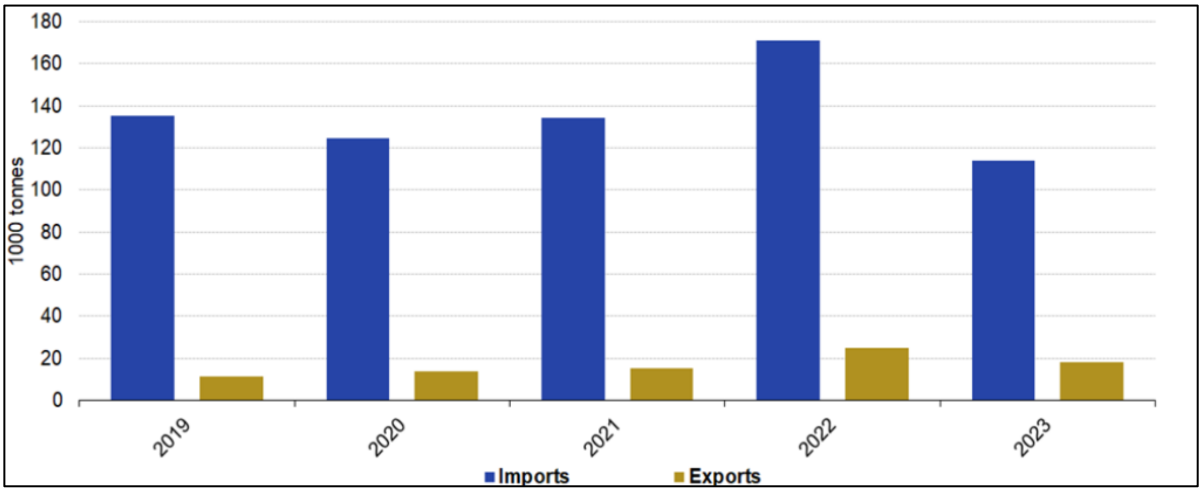

Figure 16. Imports and exports of magnesium (in 1000 tonnes). Source Eurostat; raw data in accompanying data file.

The EU supply of magnesium mainly relies on imports of pure magnesium (CN 810411), Mg alloy (CN 810419), and Mg powder (CN 810430). For its imports of magnesium, the EU was extremely dependent on Chinese imports which made up 99% of all magnesium imports into the EU. The largest partners of import for magnesium per CN code in 2023 is shown in Table 3 (Eurostat, 2024).Whereas the total imports of Magnesium in Europe per CN code from year 2020 to 2024 is shown in Figure 17.

Table 3. Largest partners for imports of magnesium by product code in 2023. Source Eurostat.

Product Code	Share of importing countries		Share in total imports of magnesium
Mg Pure (810411)	China (98 %)	Israel (2 %)	52 %
Mg Alloy (810419)	China (100 %)	United Kingdom (0 %)	48 %
Total	**China 99 %**	**Israel (1 %)**	**100 %**

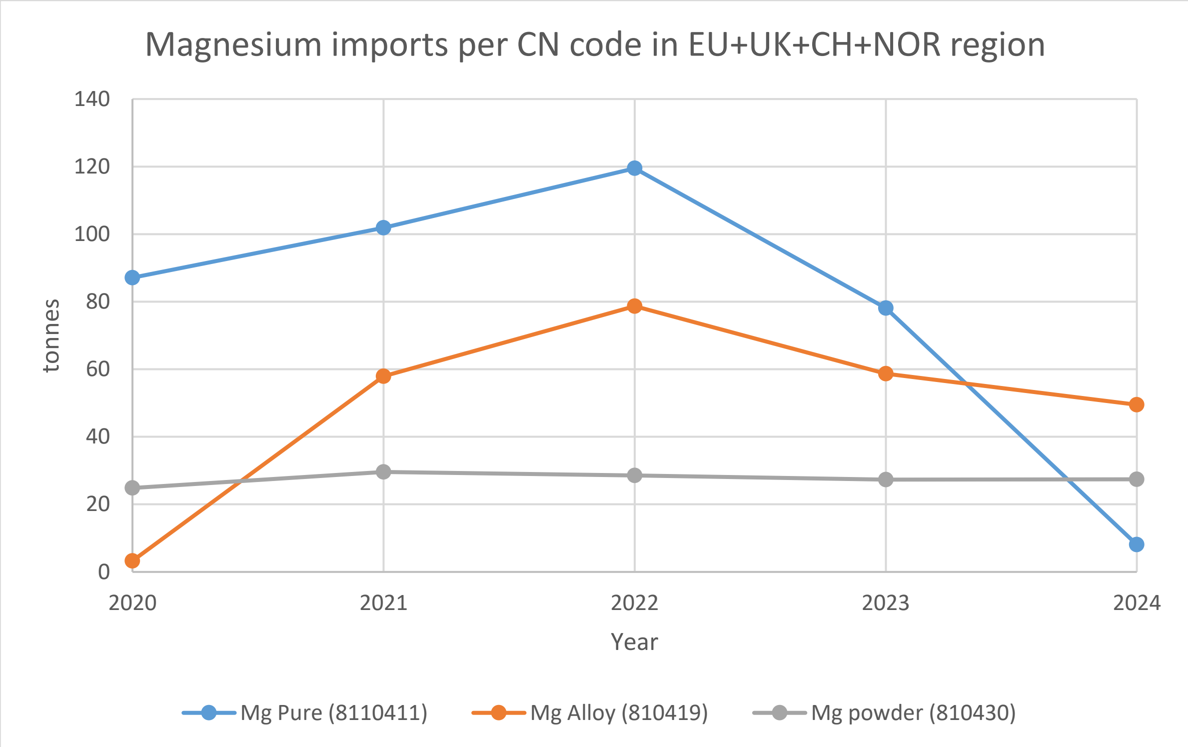

Figure 17. Magnesium imports per CN code from 2020 to 2024 in the EU+UK+CH+NOR region. Source: IMA

8.1.2 Magnesium European demand per application

Magnesium, the lightest structural metal, weighs one quarter as much as steel, two-thirds as much as aluminium, and offers comparable lightweight potential to carbon fibre. In the transportation sector, particularly in automotive applications, magnesium is prominently utilised. It also finds use in packaging, construction, and non-structural roles, such as a desulphurisation agent, when alloyed with aluminium. The European magnesium demand by application is shown in Figure 18.

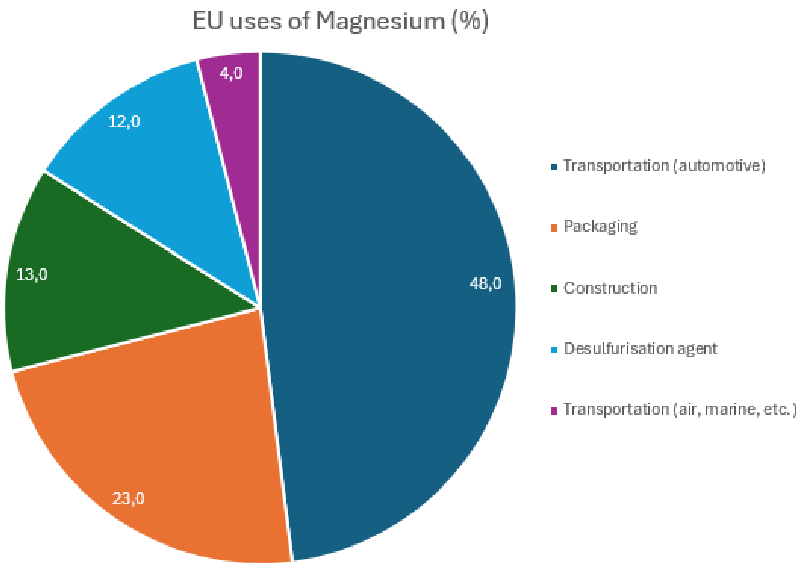

Figure 18.European magnesium demand by application. (SCRREEN, 2025)

8.1.3 Trade flow of Magnesium globally

Figure 19 highlights key trends in global magnesium trade of pure magnesium. Although China exports only about 50% of its production, it remains the leading global importer of pure magnesium. Most of the world's top five magnesium-importing regions rely heavily on Chinese exports, with the exception of the U.S. Instead, the U.S. sources nearly 75% of its magnesium imports from Israel and Turkey, as both countries export the majority of their trade to the U.S.

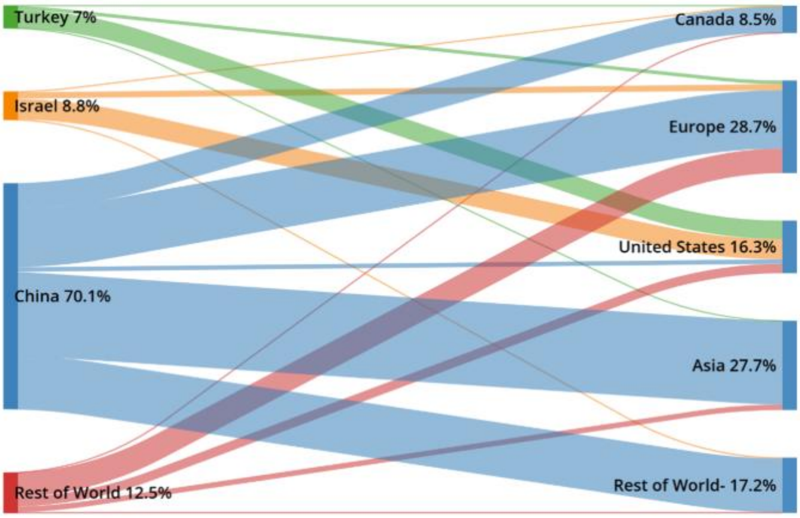

Figure 19.Global trade of pure magnesium (99.8% purity) as a percentage of the value of goods. (Trade flows less than 0.1% are not shown. Some data have been combined based on geographic considerations.)

Figure 20 illustrates the complexity of global magnesium trade when considering all forms of magnesium, including pure, alloy, and scrap. While China's trade distribution remains largely unchanged, other regions without primary magnesium production play a significant role in exports, maintaining multiple trade partnerships worldwide. The U.S. relies on a diverse range of suppliers, primarily importing from Israel, Europe, Asia, and North America. Unlike most importing regions, which typically depend on one or two key trade partners, the U.S. maintains trade relationships with five primary suppliers. Notably, the U.S. is the largest importer from five of the world's key magnesium-exporting regions. (Weiler, 2025).

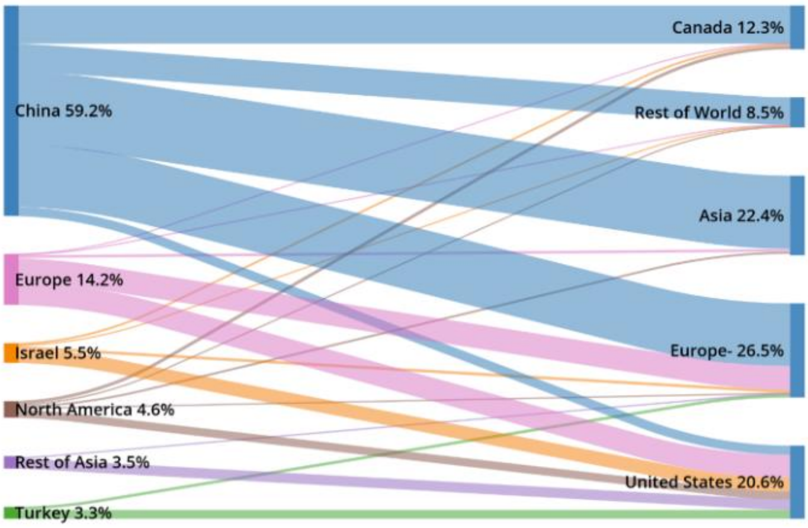

Figure 20.Global trade of all magnesium goods (pure, alloy, scrap, turnings, etc.) as a percentage of the value of goods. (Trade flows less than 0.1% are not shown. Some data have been combined based on geographic considerations.)

9 ANTIMONY

9.1 Antimony Consumption by Sector

In summary:

The study points out several specificities of the EU antimony market:

- The primary consumption sector in Europe is flame retardants, similar to the US and Asia historically (up to 2014), with some recent changes
- Legislation is an important driver for shifts in uses. They are not correlated to macroeconomic indicators
- Minor but highly strategic uses in the military sector, hardly quantified

In the last year, prices have skyrocketed by +350% due to China's supply restrictions, which will likely influence future uses. Experts expect prices to come down to reasonable levels only after a two—to three-year period, when new mining outputs could go online.

On long-term historical series, antimony (Sb) consumption shows different evolutions in terms of geographical regions, as illustrated in Figure 21, BRGM's document extract (BRGM, 2012).

	2004	2009	2014	% annuel (2009-2014)
Demande mondiale en retardateurs de flamme (en kt)				
Amérique du Nord	604	715	835	+ 3,2
Europe de l'Ouest	435	505	575	+ 2,7
Asie - Pacifique	578	810	1 140	+ 7,1
> dont Chine	202	335	540	+ 10,6
Afrique - Moyen Orient	37	52	70	+ 6,2
Amérique latine	36	50	67	+ 6,2
Europe de l'Est	37	54	73	+ 6,2
MONDE	**1 726**	**2 185**	**2 760**	**+ 4**
Demande mondiale en composés Sb pour les retardateurs de flamme				
Demande mondiale (kt)	106	152	213	+ 7
Part des composés Sb dans les retardateurs (%)	6,1	7,0	7,7	+ 10

	2005	2010	2015	% annuel (2010-2015)
Perspectives de consommation de Sb2O3 dans les retardateurs de flamme (en kt)				
Etats-Unis	25	29	33,6	+ 3,0
Europe de l'Ouest	20	22	24	+ 2,0
Japon	11,4	12,6	14	+ 2,0
Chine / Asie-Pacifique	50	77	113	+ 8,0
Autres	14	19	25	+ 6,0
MONDE	**120**	**160**	**210**	**+ 5,5**

Figure 21. Outlook for global demand of flame retardants and implications for Sb_2O_3 consumption.

9.1.1 EU Consumption

EU consumption of unwrought antimony metal was estimated just over 18,000 tonnes (on average) per annum during the 2010–2014 period. This represents around 15-20% of the average global annual consumption.

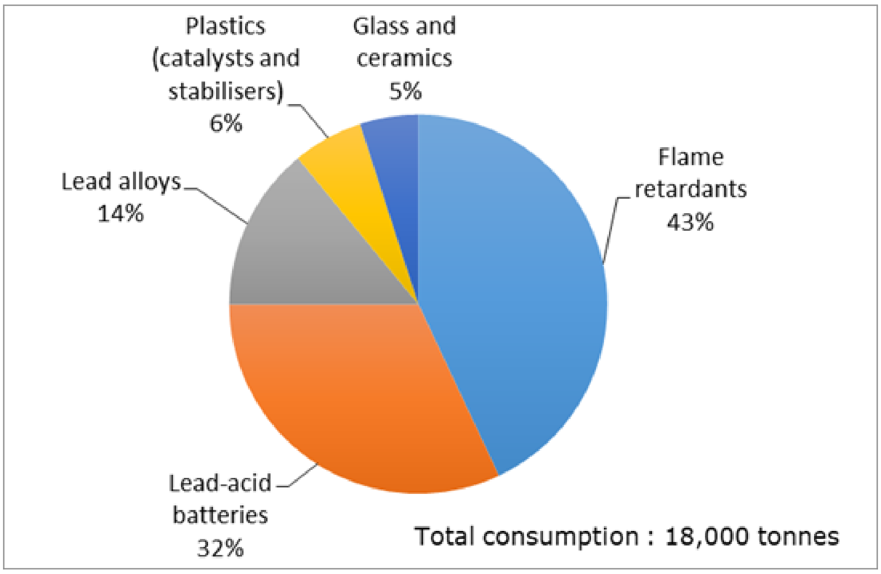

Figure 22. Antimony total EU consumption and division per sector.

Around 43% of antimony (in the form of antimony trioxide, or ATO) is used in flame retardancy. Hard-lead alloys are used in the manufacture of lead-acid batteries, accounting for about 32% of global antimony consumption. Around 6% of antimony, in the form of antimony trioxide (ATO), is used as a catalyst in the production of polyethylene terephthalate (PET). Antimony in the form of sodium hexahydroxyantimonate, is used in the manufacture of high-quality clear glass. This use accounts for about 5% of the global antimony consumption in Europe (see Figure 22).

Antimony trioxide is not a flame retardant in itself, but when combined with halogenated (i.e. brominated or chlorinated) flame retardant compounds, it becomes a highly effective flame retardant. Halogenated antimony compounds are effective dehydrating agents that inhibit ignition and pyrolysis in solids, liquids and gases. They also promote the formation of a char-rich layer on the substrate, which reduces oxygen availability and volatile-gas formation (Schwarz-Schampera, 2014). Antimony-based flame retardants are used in plastics, cable coatings, upholstered furniture, car seats, fabrics and household appliances (i2a, 2014).

Another important use of antimony, accounting for about 32 % of global antimony consumption, is in the production of antimonial, or hard-lead alloys used in the manufacture of lead-acid batteries. The incorporation of between 1–15% antimony in these alloys improves tensile strength and thus charging characteristics, it also reduces the production of unwanted hydrogen during charging. Antimony-lead alloys that contain 1-3% antimony are easy to cast and are used in the production of grid plates, straps and terminals in lead-acid acid batteries (CRM_InnoNet, 2015; Schwarz-Schampera, 2014).

The production of lead alloys accounts for about 14 % of global antimony use. For example, ternary Babbitt metals (i.e. tin-copper-antimony alloys) contain between 4–14% antimony and are used in the manufacture of low-load bearings used in the automotive sector. For applications that require heavy-load bearings (e.g., railway engines), quaternary Babbitt metals (i.e. tin-copper-lead-antimony alloys) are used instead. These alloys typically have higher antimony contents (between 8–15% antimony) and have greater fatigue resistance. The addition of antimony in Babbitt metals improves both corrosion resistance and anti-seizure properties. Britannia metal (i.e. tin-copper-antimony) and Pewter (i.e. tin-copper-antimony ± lead and bismuth) typically contain 7–20% antimony and are used in the manufacture of household and decorative items such as teapots, vases and lamp stands. Tin-lead-antimony solders are used extensively in the electronics industry (CRM_InnoNet, 2015; Schwarz-Schampera, 2014).

About 6 % of antimony, in the form of antimony trioxide (ATO), is used as a catalyst in the production of polyethylene terephthalate (PET), which is used in manufacturing plastic bottles. It is also used as a heat stabiliser in polyvinyl chloride (PVC) (Schwarz-Schampera, 2014).

According to Bloomberg (2024), in military uses, antimony is essentially used in bullet cores, explosives and shrapnel weapons (see Figure 23).

Figure 23. Antimony application in Military applications

Antimony, in the form of sodium hexahydroxyantimonate, is used in the manufacture of high-quality clear glass and accounts for about 5 % of global antimony consumption. In this particular application antimonates are primarily used as degassing agents, which act to remove trapped air bubbles from the cooling glass. They also act as a fining agent by removing impurities (e.g. iron) that may produce unwanted colouration (Schwarz-Schampera, 2014).

Primary antimony ores are not extracted in the EU. Unwrought antimony metal in not produced in the EU, meaning the EU is entirely reliant on unwrought antimony metal imports to meet demand. However, the EU does produce antimony trioxide, mainly in Belgium, France, Spain and Italy. The production of European ATO is heavily reliant on the availability of unwrought antimony metal and therefore on imports.

Secondary antimony recovered from lead-acid batteries also contributes to the European antimony supply chain. It is difficult to quantify the volume of ATO that is produced in Europe because data are unavailable via the Eurostat Prodcom database. However, it is assumed that flame retardants and the manufacture of PET plastics are the main end uses of ATO in Europe.

9.2 Outlook for the evolution of global consumption

In 2019, global consumption of antimony metal (primary and secondary) was approximately 182 kt, of which approximately ~ 20-25% was of secondary origin. Subsequently, demand was reduced due to several factors: substitution in the case of flame retardants and reduction in intensity of use in the case of lead batteries. In 2023, global demand can be estimated at around 100 kt.

Antimony demand in flame retardants continued to decline in 2023, although slower than in 2022. The expected demand recovery from increasing electrification and the recovery of China's construction sector has not materialised.

In the longer term, a return to market balance can be expected, notably driven by the photovoltaic sector, or even the evolution of global conflicts.

The effect of Chinese export restriction on prices of antimony have created a shock in 2024 and 2025 (see Figure 24), that may impact considerably future demand repartition, increasing substitution for some uses such as flame retardants, while boosting mining production, especially as gold by-product.

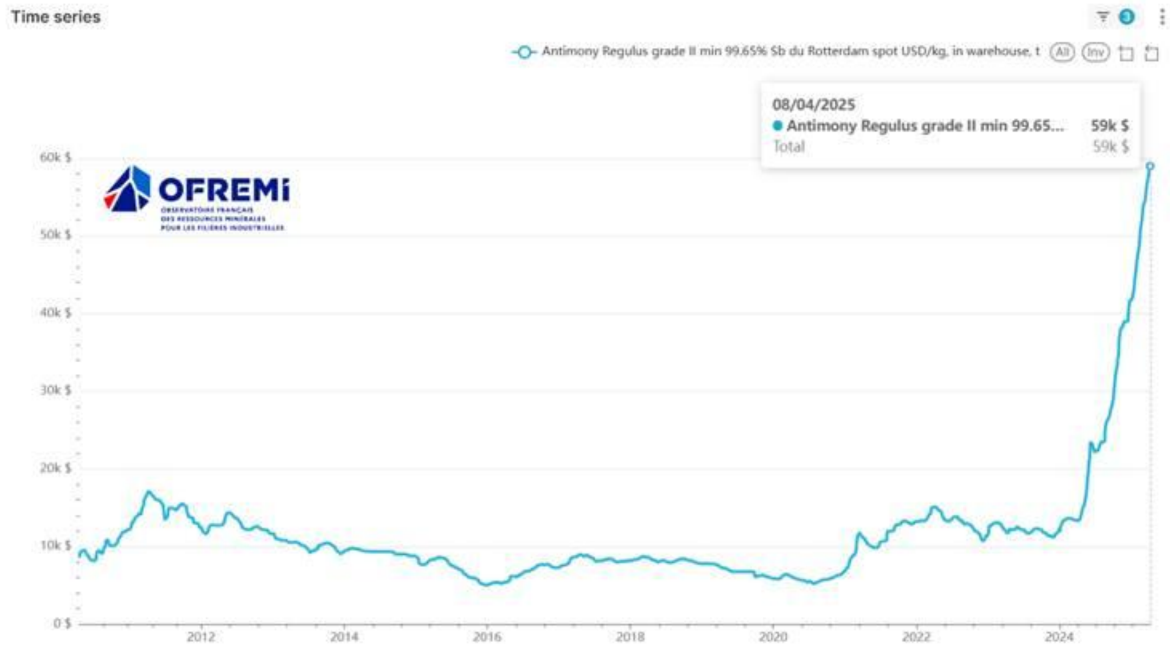

Figure 24. Market price evolution of Antimony from 2011 to 2025 (Source OFREMI).

10 CONCLUSIONS

All discussed commodities present strategically important raw materials for the EU market and the sovereignty of the EU27. **Antimony** is critical for flame retardants and military applications, for which consumption estimates are highly opaque. The **magnesium** sector is also rather intransparent; even personal communications with the leading association in the industry yielded no granular consumption data. **Nickel and copper** have a more robust database, and consumption data on the country and sector level are available at a higher granularity. For **lithium**, highly granular data is available for more recent years, and commercial providers such as S&P Global offer robust forecasts. Although Li-ion batteries were first commercialised in 1991, the Li-ion battery sector has grown rapidly along with the advent of consumer electronics (2000s) and electric vehicles (2010s). **Nickel**, another important battery metal, has historically been negligible for the battery precursor application; hence, predictions for the battery sector's Ni consumption based on pre-2020 data lack robustness. The car (Pt and Pd) and jewellery (Pt) industry are the primary consumers of **platinum and palladium** and have remained stable over the years, with the most recent dip in demand during COVID19 in 2020. The availability of data for chosen commodity is added in Table 4.

Table 4. Summary table outlining data availability for the chosen commodity

Commodity	Production data available	Production classification	Production geographical scope	Production Data Source	Production Year Range	Trade data (import/export) available	Trade data classification	Trade data geographical scope	Trade Data Source	Trade Year Range	Consumption Data	Consumption Standardised database/sources	Consumption geographical scope	Consumption Year Range	Consumption Product code classification	Content	Notes
Nickel	Yes	PRODCOM/HS/CN	Country	EUROSTAT/WMD	2000-2023	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes (End-Use Stock) + Apparent Consumption (AC)	MISO2	Country Yes (WBD)	1990-2016 | AC: 2000-2023	SITC1		
Copper	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes (End-Use Stock) + Apparent Consumption (AC)	MISO2	Country	1990-2016 | AC: 2000-2023	SITC1	Yes, for all 356 copper HS codes	
Lithium	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes + Apparent Consumption (AC) + Supply & Demand	BRGM, Roskill, S&P Global	Global	AC: 2000-2023			Supply and demand data (2000-2035) – sector-specific
Magnesium	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes (2016) + Apparent Consumption (AC)	IMA (personal communication)/DERA	Global	2016 | AC: 2000-2023			Limited to 2016 consumption data by country – no sector-specific data
Antimony	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes (estimates) + Apparent Consumption (AC)	BRGM		2010-2014 | AC: 2000-2023			
PGMs	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	Yes	PRODCOM/HS/CN	Country	EUROSTAT	2000-2023	No + Apparent Consumption (AC) + Supply & Demand	Johnson Matthey plc	Country	AC: 2000-2023			Supply and demand data (1975-2024) by region and application

11 REFERENCES

Barriga, F. J., Carvalho, D. d., & Ribeiro, A. (1997). Introduction to the Iberian Pyrite Belt. In D. C. F.J.A.S. Barriga, *Geology and VMS Deposits of the Iberian Pyrite Belt.*

BRGM. (2012). Panaroma mondial 2011 du marche de l antimoine. *Audioa A.A, avex la collaboration exterirure de la Compagnie Europeenne de'intelligence Strategique (CEIS)*, 22. doi:BRGM/RP-61342-FR

Copper Alliance. (n.d.). Retrieved from https://internationalcopper.org/sustainable-copper/about-copper/cu-demand-long-term-availability/stocks-flows/

CRM_InnoNet. (2015). Critical raw materials substitution profiles.

Dominik, W., Jan, S., Hanspeter, W., Benedikt, G., Andre, B., & Barabara, P. (2024). *The MAT_STOCKS database: economy-wide material flows and material stock dynamics around the world.* .: EU Open Research Repository. doi:10.5281/zenodo.12794252

European Commission. (2025, 5 13). *Internal Market, Industry, Entrepreneurship and SMEs*. Retrieved from Metallic Minerals: https://single-market-economy.ec.europa.eu/sectors/raw-materials/related-industries/minerals-and-non-energy-extractive-industries/metallic-minerals_en

Eurostat. (2024). International trade in critical raw materials. . Retrieved from https://ec.europa.eu/eurostat/statistics-explained/index.php?title=International_trade_in_critical_raw_materials#Magnesium

i2a. (2014). International Antimony Association, Antimony trioxide factsheet. Retrieved from https://www.antimony.com/

IEA. (2021). Total nickel demand by sector and scenario, 2020-2040. Retrieved from https://www.iea.org/data-and-statistics/charts/total-nickel-demand-by-sector-and-scenario-2020-2040

IEA. (2025). Critical Minerals Data Explorer. Retrieved from IEA: https://www.iea.org/data-and-statistics/data-tools/critical-minerals-data-explorer

INSG. (2024). World Nickel Statistics. Retrieved from www.insg.org

Krzak, M. (2021). *Is the EU's Resource Base of Copper Ore Deposits Large? A Fuzzy Set Theory Approach.* Resources 2021, 10(2).

MISO2. (n.d.). MISO2. Retrieved from https://doi.org/10.5281/ZENODO.12794252

Nickel Institute. (2022).

Nornickel. (2022).

Nornickel. (2024). *Annual Report 2023.*

P. Granvik, J. H.-S. (2025, May 15). Critical raw materials for green transition: Key parameters and feasibility index for sufficiency. *Resources, Conservation and Recycling*. doi:https://doi.org/10.1016/j.resconrec.2025.108197

Patrycja Slotte, E. P.-R. (2025, April). Effect of life extension strategies on demand and recycling of EV batteries – material flow analysis of Li and Ni in battery value chain for Finnish EV fleet by 2055. *Resources, Conservation and Recycling*. doi:https://doi.org/10.1016/j.resconrec.2024.108081

Plank. (2022). doi:10.1016/j.resconrec.2021.106122 ; 10.1016/j.mex.2022.101654
Popov, P. e. (2003). Main Features in Geology and Metallogeny. *University of Mining and Geology "St. Ivan Rilski" Annual, vol. 46, part I, Geology and Geophysics*.
Reuters. (2025, January 2). In Norway, nearly all new cars sold in 2024 were fully electric. Retrieved from https://www.reuters.com/business/autos-transportation/norway-nearly-all-new-cars-sold-2024-were-fully-electric-2025-01-02/
Roskill. (2016). *Lithium: Global Industry, Markets and Outlook to 2025, 13th Edition.* Roskill.
S&P Global. (2023). *S&P Global Capital IQ.*
S&P Global. (2025, April). Lithium and Cobalt global supply-demand balance. Retrieved from www.capitaliq.spglobal.com
Sandfire. (2025, 5 13). *MATSA Copper Operations*. Retrieved from https://www.sandfire.com.au/where-we-operate/matsa/
Schwarz-Schampera. (2014). Antimony, in Gunn, Gus, ed., Critical metals handbook: Hoboken, N.J., Wiley and Sons. 70-98. doi:http://dx.doi.org/10.1002/
SCRREEN. (2025). Factsheets. Retrieved from https://scrreen3.flexx.camp/factsheets
Seppo Lähdesmäki, D. J.-S. (2023, October 3). Insights into Circular Economy Potential of Lithium by System Dynamic Modelling of Material Streams. *Batteries & Supercaps*. doi:https://doi.org/10.1002/batt.202300231
SMR. (2024). Retrieved from https://www.smr.at/home.html
Soulier, M., Glöser-Chahoud, S., Goldmann, D., & Espinoza, L. A. (2018, February). Dynamic analysis of European copper flows. *Resources, Conservation and Recycling*, pp. 143-152. doi:https://doi.org/10.1016/j.resconrec.2017.10.013
US Geosurvey. (2017). *Mineral Commodity Summaries 2017.* Retrieved from https://d9-wret.s3-us-west-2.amazonaws.com/assets/palladium/production/mineral-pubs/lithium/mcs-2017-lithi.pdf
US Geosurvey. (2018). *Mineral Commodity Summaries 2018.* Retrieved from https://apps.usgs.gov/minerals-information-archives/mcs/mcs2018.pdf
Weiler, J. (2025). *Global Magnesium Market: Supply, Demand, and Future Outlook.* .: Light Metal Age. Retrieved from https://www.lightmetalage.com/news/industry-news/magnesium/global-magnesium-market-supply-demand-and-future-outlook/#:~:text=The%20global%20magnesium%20market%20was,steel%20desulphurization%20processes%20and%20in
Wiedenhofer, D., Streeck, J., Wieland, H., Grammer, B., Baumgart, A., & Plank, B. (2024, July 22). The MAT_STOCKS database: economy-wide material flows and material stock dynamics around the world. doi:https://doi.org/10.5281/ZENODO.12794252
Wiedenhofer, D., Streeck, J., Wieland, H., Grammer, B., Baumgart, A., Plank, B., . . . Krausmann, F. (2024). From extraction to end-uses and waste management: Modeling economy-wide material cycles and stock dynamics around the world. Retrieved from https://doi.org/10.1111/jiec.13575
WITS. (2022). *World Bank*. Retrieved from https://wits.worldbank.org/trade
WITS. (2023). Retrieved from World Bank: https://wits.worldbank.org/trade

Wood Mackenzie. (2022). *Nickel and copper: building blocks for a greener future*. Retrieved from https://www.woodmac.com/news/opinion/nickel-and-copper-building-blocks-for-a-greener-future/

World Mining Data. (2025, March 15). Retrieved from https://www.world-mining-data.info/