

# EXECUTIVE SUMMARY

## MED & Italian Energy Report 2025

Energy security in the Mediterranean transition:  
electrification, critical raw materials and technologies

7<sup>th</sup> Annual Report



The **7th Med & Italian Energy Report** focuses on the future of energy supply security within the framework of the Euro-Mediterranean transition, with particular emphasis on electrification, critical raw materials, emerging energy technologies, the role of nuclear power, and strategic maritime routes.

## KEY ELEMENTS

- **The EU remains heavily dependent on energy imports** which account for **56.9%** of total consumption. **China stands at 24%, while the United States is self-sufficient.** This factor is key to global competition.
- **Italy's energy dependency remains above the European average,** although it has slightly improved, **falling from 75% to 74%.** **France,** thanks to nuclear power, has a dependency below the European average (40.1%), while **Germany,** like Italy, is above the average and showing a rising trend, currently at 66.8%.
- **The European electricity mix is changing.** Since 2000, coal usage has fallen from 32% to 11%, while the share of natural gas has risen from 12% to 15%. Renewable energy has grown markedly, **from 15% to 47%,** and helped to reduce Europe's dependency. **All European countries have increased the share of renewables in the electricity generation mix, with Italy's figure standing at 49%,** above the European average.
- **The Euro-Mediterranean dialogue on renewables is therefore essential to accelerate the reduction of Europe's energy dependency.** Renewable energy production in North Africa and its import into Europe serve as a "green bridge" to achieve sustainability targets, strengthening energy competitiveness in the entire region.
- Although **the southern shore of the Mediterranean** has the highest solar and wind capacity, it **accounts for only 1.2% of the photovoltaic and wind power generation capacity** (9 GW out of 770 GW). There is therefore significant room for growth and investment.
- **Oil** remains an important, albeit declining, component of the European electricity mix, accounting for **23% of the total.**

- For this reason, it is important to pay close attention to international events. **Venezuela plays a significant role: it holds approximately 17% of the world's proven oil reserves**, ahead of Saudi Arabia in terms of reserve size, **yet it does not feature in the top 10 producers in 2024**; therefore, its potential return to the global oil market might have non-negligible repercussions.
- **Iran, by contrast, holds 9.1% of the world's proven oil reserves** and controls 5.2% of global oil production. It also has 17.1% of the world's gas reserves (second only to Russia, with 19.9%), but it ranks third in production, accounting for 6.4% of global gas extraction.
- **Hormuz, Malacca and Suez** are the global energy chokepoints through which approximately **50% of the world's maritime oil and gas traffic passes**.
- **The Suez Canal**, in particular, represents a strategic route. **Traffic is recovering, and today the Canal carries 7.6% of global refined petroleum product flows and 2.2% of LNG shipments**, up from 5.3% and 1.2% of maritime flows in 2024, respectively. A large share of these flows is bound for Europe, for which the Canal is even more significant.
- **The Strait of Gibraltar is also seeing growth**, particularly in **LNG** traffic, which has risen **from 6.4% to 10% of the total**. This increase is driven by re-routing via the Cape of Good Hope and by rising traffic from the United States.
- **The spread of renewable energy and green technologies has driven an unprecedented rise in demand for critical raw materials**. Minerals such as lithium, nickel, cobalt, graphite, copper and rare earths are essential for electric vehicles, batteries, grids and green technologies. The Report provides a detailed analysis of the production, refining and trade of the main strategic raw materials.
- **The Report shows that China is the main demand hub** for the majority of critical raw materials, including **bauxite, nickel, manganese, copper and cobalt**. It also has the largest refining capacity for several materials, notably cobalt, graphite and rare earths.
- The Report also examines the **uranium mining and processing market**, noting that **natural uranium reserves are highly concentrated (84% of the total is held by eight countries)**. **92% of global uranium production is**

**controlled by just seven countries through their respective mining companies, while Russia alone accounts for 40% of industrial capacity across the nuclear supply chain.**

- Among the six fission reactor technologies currently in operation, pressurised water reactors (PWRs) account for 78% of global installed capacity (294 GW out of 376 GW). **In the Mediterranean Basin, 65 reactors are operational (71 GW in total), 57 of which are in France (63 GW), seven in Spain (7 GW) and one in Slovenia (1 GW). In Turkey and Egypt, a 4.8 GW plant is currently under construction, with entry into service expected by 2030.**
- As with energy, strategic raw materials are **primarily transported by sea**. The Report **includes a detailed analysis of maritime flows of the main bulks** (the main raw materials shipped by sea), from which important data emerge, as specified below.
- **Between 2000 and 2025**, global maritime shipments of **nickel** (used in batteries and as a key component in automotive alloys) **rose from 5.7 million tonnes in 2000 to 58.5 million tonnes by the end of 2025**.
- The figure for **bauxite** (the primary source for aluminium production) rose **from 30.6 million tonnes in 2000 to 236.4 million tonnes in 2025**. There was also significant growth for **manganese** (used in batteries and as a key element in special steels), which increased **from 7.1 million tonnes in 2000 to 45.2 million tonnes in 2025**; and for **copper** (used in electronic components, batteries and vehicles), whose trade rose **from 10.2 million tonnes in 2000 to 40.4 million tonnes in 2025**.
- When considering **geographic area**, **over 90% of maritime bauxite** originates from **Guinea and Australia** and is **destined almost entirely for China**. The **Philippines** dominate nickel exports, accounting for **84% of the total**, while **South Africa** accounts for **55% of global manganese exports**.
- **Copper** flows predominantly on the **Chile–China and Peru–China routes**. For **cobalt**, the **Democratic Republic of Congo** accounts for **more than 80% of global exports**. Intermediate hubs such as **Belgium and Finland** play a **key role in refining and re-exporting**.

- **Dry bulk traffic (raw materials) is also strategic for Italy.** The total volume of Italian dry bulk traffic, which includes metalliferous components, approached **50 million tonnes in 2024 and 30 million tonnes in the first half of 2025.**
- **Italian shipping also plays a significant role in the movement of oil and gas.** Total liquid bulk traffic approached **170 million tonnes in 2024 and exceeded 80 million tonnes in the first half of 2025, accounting for 34%** of the country's freight traffic. Italy also has **the second-largest tanker fleet in Europe and the fourth-largest European fleet of bulk carriers,** which represent a strategic strength for the country.

## SUMMARY OF THE REPORT

**The energy transition towards decarbonization hinges on a delicate balance between energy security, environmental sustainability, and affordability.**

- The shift toward a carbon-free economy **requires a careful balancing** of energy security, environmental sustainability, and economic affordability—the three pillars of the so-called "Energy Trilemma. Security will become increasingly relevant due to the strategic dependency of Mediterranean countries on major suppliers of fossil fuels and the Critical Raw Materials (CRMs) essential for manufacturing green technologies.
- Three frontiers of energy security have emerged: the dependency on energy resources (fossil fuels, electricity and nuclear fuel); technological dependency on dominant suppliers of CRMs, semi-finished products and finished products; and the reliability and flexibility of domestic energy infrastructures.
- **In the EU27, the near-total absence of domestic resources has historically left Member States vulnerable to major producers. In 2023, Norway, the USA and Algeria alone accounted for 50% of the EU's natural gas imports, with the former two also being the second and first suppliers of crude oil, accounting for 28% of total imports.** Within the Mediterranean Basin, Libya contributed 7% of the EU's crude oil supply. This high concentration of resources, and the resulting lack of diversification, leaves supply chains exposed and subjects the market to volatile price swings.
- The transition towards decarbonisation requires an increased deployment of energy technologies based on the exploitation of Renewable Energy Sources (RES), mainly solar photovoltaic (PV) and wind. However, **the expected growth will inevitably entail a simultaneous global surge in the demand for the CRMs needed for their construction, estimated to be six times larger than in 2022. The almost total absence of Mediterranean domestic reserves and production/refining capacity for these materials risks creating new constraints of technological dependency on the respective main suppliers.**
- **At the EU level, the *Critical Raw Materials Act* in 2024 set out guidelines to mitigate the effects of Member States' dependency on imports of critical raw materials. The Act introduces non-binding benchmarks for the EU's demand: 10% from domestic extraction, 40% from processing, and 25% from recycling.** In addition, imports of a specific material from a single supplier must not exceed 65% of its total imports.

The plans for advancing the transition in Southern Mediterranean countries set extremely ambitious targets for installed capacity and investment. Since the late 1990s, initiatives for energy cooperation and development in the Mediterranean have been launched, but their effectiveness has historically been hampered by the absence of a common approach and a long-term strategic vision.

- The report outlines the demand for energy and non-energy resources in the Mediterranean Basin for 2030 and 2040, based on projections by Med-TSO, ENTSO-E and ENTSOG. The data incorporate Med-TSO's 2022 *Mediterranean Masterplan of Interconnections* alongside the 2024 *Ten Year Network Development Plan (TYNDP)* issued by ENTSO-E and ENTSOG.
- Both sources propose scenarios for the Mediterranean energy system with varying degrees of ambition. **According to these projections, total installed electricity capacity in the Mediterranean Basin is forecast to reach between 896 GW and 1,137 GW by 2030, up from 781 GW in 2024. Similarly, total electricity demand, which stood at 2,106 TWh in 2023, is expected to climb to between 2,387 TWh and 2,887 TWh by 2030.**
- **Since the late 1990s, various initiatives to foster energy cooperation and development in the Mediterranean Basin have been launched, most notably the *Mediterranean Organisation for Energy and Climate (OMEC, 1988)* and the *Barcelona Declaration (1995)*.** However, despite numerous attempts to promote regional integration, their effectiveness has historically been hampered by the absence of a common approach across the three Mediterranean shores. This is further compounded by a lack of long-term strategic vision, particularly in the Eastern and Southern shores, where persistent geopolitical instability **stifles** efforts directed towards sustainable development.
- **In October 2025, the European Commission published the *New Pact for the Mediterranean* with the aim of fostering cooperation across the Basin.** The Pact, which serves as a precursor to an Action Plan due in the first quarter of 2026, falls within the broader framework of *Projects of Common Interest (PCIs)*. These include several **strategic new interconnections, such as the ELMED power line between Italy and Tunisia (600 MW, 850 M€), GREGY between Egypt and Greece (3,000 MW, 3.6 G€), and the Great Sea Interconnector linking Greece, Cyprus and Israel, all designed for the mutual exchange of renewable electricity.**
- Transition plans for countries on the Southern Shore set ambitious targets for installed capacity and overall investment. However, their realisation remains questionable, especially when weighed against the projected development of fossil fuel infrastructure. In Algeria, for instance, \$48 bn of the \$60 bn in planned

investments for 2025–2029 is earmarked for the oil and gas sectors. Similarly, Libya intends to ramp up domestic production of oil and natural gas, with plans to boost exports of the latter to Europe via the Greenstream pipeline.

**The Mediterranean is a strategic hub for the energy transit and supply, with a high concentration of fossil resources on the Southern Shore and a marked energy dependence on the Northern Shore. Despite its high solar and wind power potential, the Southern Shore remains undersized in terms of installed capacity.**

- The Mediterranean is a strategic hub for the transit of energy commodities. Its maritime borders are defined by the Straits of Gibraltar and the Bosphorus, along with the Suez Canal, critical chokepoints through which 26.3% of global crude oil throughput and 20.9% of Liquefied Natural Gas (LNG) were shipped in 2024.
- **The Southern Shore holds a staggering 95% of the crude oil and 87% of the natural gas reserves in the Mediterranean Basin.** This uneven geographical distribution creates a stark contrast between net energy exporters—led by Algeria and Libya—and heavily import-dependent nations such as Italy (81%), Spain (75%), and Türkiye (71%). In 2023, Algeria established itself as a cornerstone of Mediterranean energy security: it was the Northern Shore's leading supplier of natural gas (accounting for 26% of total imports) and its ninth-largest source of crude oil (5%). Furthermore, it ranked as the third-largest gas supplier to Türkiye, covering 12% of imports. Libya, meanwhile, was the Northern Shore's third-largest supplier of crude oil, accounting for 11% of imports—narrowly trailing the USA and Iraq, which each supplied 12%).
- In 2023, oil and gas exports to the rest of the Mediterranean accounted for 75% of the total export value for Algeria, 41% for Libya, and 29% for Egypt. **This deep-rooted economic integration has fostered a symbiotic dependency across the region. While Northern and Eastern Shore nations rely on the South for critical energy supplies, Southern Shore exporters are equally dependent on their neighbours to secure a significant portion of their national income.**
- **Coupled with the projected surge in renewable energy capacity, fossil fuel demand in the Mediterranean Basin is set to gradually decline,** potentially reaching zero by 2040 in the most ambitious scenarios. Specifically, coal demand is forecast to plummet from 328 kt/y in 2023 to between 51 kt/y and 66 kt/y by 2030, before bottoming out at 16.2 kt/y in 2040. Similarly, oil demand is expected to drop to a maximum of 4 kt/y by 2030 and a mere 0.2 kt/y by 2040.
- **Natural gas consumption for power generation, however, is expected to see a more modest reduction across the Basin as a whole.** This masks a sharp

divergence between the shores: in the Eastern and Southern Mediterranean, demand is set to rise, driven by the shift away from coal and a general surge in electricity needs. While the most ambitious scenarios for 2030 predict a sharp contraction in the Northern Shore—dropping from 62bn m<sup>3</sup> in 2023 to a maximum of 34bn m<sup>3</sup>—consumption is projected to climb elsewhere. In the Southern Shore, demand is expected to rise from 68bn m<sup>3</sup> to at least 89bn m<sup>3</sup>, while the Eastern Shore will see an increase from 26bn m<sup>3</sup> to a minimum of 34bn m<sup>3</sup>.

- **Although the Southern Shore could harness the highest solar and wind potential in the Mediterranean Basin, it only accounts for 1.2% of the region's combined solar PV and wind capacity (9 GW out of a 770 GW total).** Installed capacity forecasts for 2030 for the Southern Shore stand at 20 GW-35 GW for PV and 16 GW-26 GW for wind, starting from the current 4 GW and 5 GW in 2024. On the Eastern Shore, the current 27 GW of PV capacity could increase to a maximum of 43 GW, while wind capacity is set to grow from 14 GW to between 20 GW and 28 GW.

**The nuclear sector—despite historically accounting for a significant share of electricity generation, particularly within the EU—faces major stumbling blocks in its fuel supply chain. Uranium ore production remains highly concentrated, dominated by a handful of countries and global operators. In this context, Small Modular Reactors (SMRs) are emerging as a promising solution, offering the potential to slash costs while fostering more flexible and decentralised generation.**

- **In 2024, nuclear power generation accounted for 9% of global electricity production and for 24% in the EU.** In relation to median yearly electricity generation, a Nuclear Power Plant (NPP) occupies an area 100 times smaller than a hydroelectric plant and 10 times smaller than a rooftop PV system.
- Among the six fission reactor technologies currently in operation, pressurised water reactors (PWRs) account for 78% of global installed capacity (294 GW out of 376 GW). **There are 65 reactors in operation in the Mediterranean Basin (71 GW in total), 57 of which are in France (63 GW), 7 in Spain (7 GW) and one in Slovenia (1 GW).** In both Türkiye and Egypt, a 4.8 GW NPP (featuring four 1.2 GW Russian VVER-1200 reactors) is currently under construction and is expected to start commercial activity by 2030.
- **The nuclear fuel supply chain presents several security-related issues. In fact, not only are natural uranium reserves extremely concentrated (84% is in eight countries), but 92% of the global uranium production is controlled by only seven countries, via their mining companies.** However, the main bottleneck in the

nuclear fuel cycle is the provision of uranium enrichment services, as Russian state-owned company TVEL alone holds 40% of the world's industrial capacity.

- **Small Modular Reactors (SMRs) are an emerging fission reactor technology consisting of units no larger than 300 MW**, which could be mounted in modular configurations and mass-produced, thus reducing the high upfront costs typically associated with traditional large-scale power plants. **They represent a potential solution for decentralised electricity generation – especially in geographically remote areas – and the repurposing of decommissioned coal-fired power plants.** Currently, **there are only five SMRs in operation** (two each in China and Russia, and a fifth in Japan), while about 100 other designs are under development and/or undergoing a licensing process.
- Two more NPP are scheduled for construction in **Türkiye** by 2035. **French nuclear capacity expansion plans** include the installation of 10 GW of nuclear reactors, with the possibility of adding a further 13 GW. In **Slovenia**, there are plans to build a second large-scale power plant, but the timeline of the project is more uncertain. **In 2030, the demand for nuclear fuel required to meet the requirements of NPPs in Mediterranean countries is estimated at 10 MtU, corresponding to 13%-15% of expected global demand.**

**The reserves and production supply chains of Critical Raw Materials are concentrated in a few extra-Mediterranean countries, increasing supply security risks for Med Countries. The heavy dependence on imports exposes the Mediterranean Basin to geopolitical vulnerabilities and a deterioration of the trade balance.**

- **The transition towards the electrification of the energy system will likely lead to a substantial increase in the demand for Critical Raw Materials (CRMs)**, needed to manufacture several of the technologies used for the generation, transport, conversion and final consumption of electricity. **Such growth will give rise to new security-related issues, as both their reserves and extraction/processing capacities are concentrated in a few countries, while almost non-existent in the Mediterranean Basin.**
- **The CRM market is dominated by China, which leads the production of several of them, often with near-monopolistic market shares. Such is the case, for example, with REEs (71%), tungsten (76%), graphite (67%), magnesium (64%) and vanadium (68%). The DRC controls 70% of global cobalt production and Brazil 93% of that of niobium.** In the Mediterranean, Türkiye is the world's leading producer of feldspars with a 40% share; meanwhile, although Morocco has the largest reserves of phosphates (68% of the world's total), the leading producer remains China with a 44% share.

- **The dependence of Mediterranean countries on CRM imports not only risks introducing new dependency ties but will also worsen their trade balance.** In 2023, the import and export of CRMs from and to extra-Mediterranean countries had already generated an economic deficit of more than \$28 bn, following a peak of \$37 bn in 2022. **The expected increase in CRM demand by 2030-2035** will inevitably exacerbate the situation, **making supply chains even more vulnerable and sensitive to perturbations and supply disruptions.**
- Global production of CRMs required for transition technologies in 2030 should be sufficient to meet the demand projected for the Mediterranean Basin. Nevertheless, Mediterranean countries will remain exposed to the severe risks inherent in supply disruptions and the consequent effects of price volatility. **In 2024, the European Commission published the *Critical Raw Materials Act*, which encourages Member States to satisfy the EU's demand for CRMs by ensuring at least 10%, 40% and 25% of annual consumption comes from domestic extraction, processing, and recycling, respectively.**

**Thanks to the use of quantitative indicators to assess the Energy Trilemma in the Mediterranean Basin, significant vulnerabilities emerge related to the import of Critical Raw Materials and energy fuels. *The New Pact for the Mediterranean*—together with all European policies aimed at strengthening energy security in the Med Area—seeks to enhance collaboration and cooperation among the three shores.**

- **The report presented a set of numerical indicators conceived to summarise the three attributes of the Energy Trilemma – environmental sustainability, energy security and affordability – with due attention to security.** The adoption of indicators to quantify the evolution of energy systems is fundamental in the context of policy decision-making, as it provides decision-makers with an intuitive and concise tool on which to base their strategic planning choices.
- The carbon intensity of the 2030 Mediterranean electricity generation mix could range between 142 gCO<sub>2</sub>/kWh and 181 gCO<sub>2</sub>/kWh, although with significant differences between the three shores. In the Northern Shore, it will vary between 40 gCO<sub>2</sub>/kWh and 70 gCO<sub>2</sub>/kWh, thanks to the wider employment of RES-based generation. In contrast, in the Southern Shore, the generation mix will still be heavily reliant on fossil fuels, as underscored by the carbon intensity of the two main oil and natural gas producers, Algeria (354 gCO<sub>2</sub>/kWh-375 gCO<sub>2</sub>/kWh) and Libya (351 gCO<sub>2</sub>/kWh-369 gCO<sub>2</sub>/kWh).
- **The security of supply of CRMs is quantified using two indicators: Supply Risk (SR) and Economic Importance (EI) – higher values imply greater difficulty in**

**compensating for supply disruptions and/or finding adequate substitute materials.** Most REEs, of which China is an almost monopolistic producer, have both high SR and EI values, as in the cases of dysprosium (SR: 5.6, EI: 7.8), neodymium (SR: 4.5, EI: 7.2), samarium (SR: 3.5, EI: 7.7) and terbium (SR: 4.9, EI: 6.4).

- **The EU is totally dependent on imports from extra-EU trading partners to meet its internal demand for most CRMs.** This is the case, for example, with antimony, boron, **lithium, magnesium, niobium, phosphates, titanium and REEs.** In the *Critical Raw Materials Act*, the Commission calls on Member States to ensure that no more than 65% of imports of a specific material come from a single supplier.
- **The security of crude oil and natural gas supplies depends on the composition of their import mix on the one hand, and on the intrinsic security of supply corridors on the other.** The diversification of import mixes in the Northern and Eastern shores has drastically increased: in the period 2003-2023, the Shannon Index for natural gas imports rose from 0.45 to 0.64 and from 0.39 to 0.62, respectively. The security of supply corridors is directly linked to the geopolitical stability of the countries through which they pass and, in the case of maritime routes, especially to the presence of chokepoints. This is particularly relevant for the Mediterranean Basin, which is accessed via the Strait of Gibraltar, the Bosphorus, and the Suez Canal.
- **Strategies and policy frameworks devoted to strengthening energy security in the Mediterranean Basin have increasingly proposed collaboration and cooperation between the shores, envisaging the wide adoption of RES, more sustainable economic models and a reduction in the environmental impact of energy systems.** This commitment was recently confirmed in the *New Pact for the Mediterranean*, issued by the European Commission in October 2025. Among its objectives, the Pact includes the creation of new jobs and ad-hoc training programmes, the construction of new energy and digital infrastructures, and the strengthening of internal security in the area.

**The energy transition is reshaping global demand for critical raw materials. High market concentration increases the vulnerability of supply chains.**

- The spread of renewable energy sources and green technologies has led in recent years to a significant increase in demand for raw materials. **Copper, cobalt, nickel, lithium, graphite, REEs are essential for electric vehicles, battery storage, renewables and grid networks.**

- The IEA and UNCTAD emphasize that **demand for energy transition minerals is expected to nearly triple by 2030 and more than quadruple by 2040**, with particularly steep growth anticipated between 2025 and 2035.
- **Lithium** demand (essential for electric vehicles) **rose by nearly 30% in 2024**, while demand for **nickel, cobalt, graphite and rare earths increased by 6-8%**.
- Between 2020 and 2024, approximately 90% of **supply growth in refined critical material production** came from a single top supplier: Indonesia for nickel and China for cobalt, graphite and rare earths.
- This concentration increases the risk of supply shocks, with potential effects on prices, industrial competitiveness and energy security.

**Seaborne trade serves as the backbone of mineral value chains. The flows of these sea-traded raw materials show a long-term structural growth.**

- Most of the flows of these critical materials (raw, semi-processed and refined) are traded by sea. **Seaborne trade thus serves as the backbone of mineral value chains, connecting resource-rich economies with global refining hubs and end users.**
- Critical minerals such as iron ore, copper and zinc are transported primarily **via bulk carriers** (the trade of these raw materials falls specifically within **the minor bulk category**), while **processed minerals, high-value cargo** and materials requiring enhanced security or traceability – such as lithium compounds – are increasingly **shipped in containers**.
- **World seaborne minor bulk trade grew by 29% between 2012 and 2025.** Minor bulks include four macro-categories: agri-bulks (i.e. sugar, rice, fertilisers), minerals (e.g. cement, coke, sand), manufacturers (e.g. steel and forest products), and **metals, which include critical materials such as bauxite, nickel, manganese and copper**. Among minor bulk goods, metals have grown the most in recent years. Between 2017 and 2025, their maritime trade saw a 46% increase.
- Critical minerals shipments experienced strong long-term growth between 2000 and 2025. **Maritime trade in nickel ore** (used in batteries and as a key component in alloys such as stainless steel for the automotive industry) **has increased tenfold**. The figure for **bauxite** (the primary source for aluminium production) is now approximately **eight times that of 2000**. There has also been significant growth for **manganese ore** (used in batteries and special steels, reaching **five times its 2000 value**) and **copper** (the cornerstone of all electricity-related technologies, **+294%**).

- Seaborne trade in **nickel ore** experienced the **most pronounced expansion**, particularly **after 2010**. **Bauxite** trade began **rising more sharply from 2015 onwards**, driven by the proliferation of green technologies.

### **Trade routes are highly concentrated and strategic. Copper and cobalt exhibit highly polarized value chains.**

- Among importing countries, **China takes the lion's share of imports for bauxite, nickel, manganese, copper and cobalt**
- Over 90% of sea-traded **bauxite** is **exported by** just two countries: **Guinea (74%) and Australia (18%)**, with **89% of the total volume shipped to China**. In addition, **84% of seaborne Nickel Ore is exported from the Philippines**, while **55% of seaborne Manganese Ore originates from South Africa**.
- For **copper**, flows from Chile and Peru to China dominate seaborne trade. **The top 5 exporters account for 55.3%** of the global seaborne copper trade across all value chain stages.
- For **cobalt**, the Democratic Republic of the Congo supplies over 80% of global exports, largely directed to China. **The top 5 exporters account for 88%** of global seaborne trade volume across all stages. **Midstream hubs** such as **Belgium and Finland** also **play a role, refining and re-exporting cobalt to major industrial consumers**.
- **Raw copper still flows primarily** from major producers such as Chile, Peru and Indonesia to China. Semi-processed and manufactured copper plays a minor role.
- The seaborne trade of **cobalt** witnessed a shift in composition **around 2015: the trade of semi-processed cobalt increased steadily**, driven by several reinforcing factors. These include policy support for in-country value-add in major producing nations and investment in local refining infrastructure, especially with Chinese support.

### **The trade in critical minerals has become a focal point of strategic geopolitics. Control over the various stages of processing is at the heart of industrial plans and new geopolitical designs.**

- **Importing countries** are implementing legislative initiatives, often accompanied by strategic partnerships and bilateral cooperation frameworks, **aimed at reducing excessive dependence on highly concentrated suppliers**.

- **Exporting developing countries are increasingly adopting measures to retain a greater share of the value generated by their strategic mineral resources.**
- Raw minerals still dominate maritime flows, but semi-processed materials are growing. **Control of refining capacity is the real competitive advantage.**
- **China possesses not only mining capacity but, crucially, refining and intermediate** processing capacity. The country stands out as the main refiner for cobalt, with 78% of the market.
- While many advanced economies aim to relocate chip or battery production, they remain dependent on inputs that come almost exclusively from China. **Whoever controls critical minerals controls the material basis of the technological transition.**

**While energy security requires new long-term strategies, maritime logistics can play its part in integrating the supply chains of critical raw materials.**

- **Traditional energy risks affecting the security of oil and gas supply are now accompanied by vulnerabilities in other areas, most visibly in supply chains for critical minerals,** which face high levels of market concentration.
- **Some pathways through which developed and developing economies should act to ensure future energy security include:**
  - **Supply diversification.** Partnerships and agreements between countries for the development of local mining projects and industrial capacity;
  - **Recycling to bridge the supply gap.** For example, the supply of recycled cobalt accounted for 12% of demand in 2024;
  - **Improving port infrastructure efficiency and logistics connectivity.** To enhance the capacity of developing countries to move beyond the export of raw materials by increasing domestic processing and promoting industrial upgrading.