Commissariat à l'énergie atomique et aux énergies alternatives
Atomic Energy and Alternative Energies Commission

Answer to the European Consultation

Project of legislation on critical raw materials

Date of issue: November 2022

Summary

The Covid pandemic and Russia's invasion of Ukraine have highlighted some of the EU's vulnerabilities associated with the supply of raw materials and the strategic value chains that depend on them. The CEA supports the Commission's desire to improve European anticipation capabilities on these issues, as well as the reduction of risks associated with the supply chain.

The issue of strategic dependencies includes but is not limited to raw materials. As such, strategic value chains should be considered in their entirety. Moreover, securing the supply of critical materials and technologies must not only take into account cyclical risks but also structural risks, leading to long-term constraints.

In order to reduce the risks concerning the supply of critical raw materials – exacerbated by the expected tensions on the supply side in the coming years for several strategic materials, the geopolitical context and the high concentration of extraction and refining capacities in a limited number of (non-European) countries – the European Union will have to address four areas in parallel:

- the development of metal extraction and refining capacities on European soil: Such capabilities would improve the European Union's strategic autonomy by ensuring supplies for essential uses, provided that the barriers on the public acceptance of mining are overcome,

- the development of secondary raw material production (collection, dismantling and recycling) in Europe: Ensuring the emergence of these secondary material valorisation channels in Europe even if the supply of primary materials may, in some cases, be more competitive ; avoid the leakage of secondary materials outside Europe... ;

- the diversification of technologies and metal dependencies to improve our resilience and response capabilities in the event of constraints on some metals affecting specific technologies;

- the moderation, sustainability and efficiency of use: Diversification of use such as modal shift in mobility, moderation of equipment (e.g. by reducing the weight of vehicles) and the extension of their lifespan by combating induced or programmed obsolescence. Thereby providing for the possibility of repairing, replacing or updating components and the possible re-use (second life) of equipment.

Since 2020, the Covid pandemic, the invasion of Ukraine and the geopolitical context in general have highlighted the risks associated with several of the European Union's strategic dependencies, be they energy resources (gas, oil, etc.), technologies (semiconductors, equipment for photovoltaic solar energy, batteries, electric motors, etc.) and raw materials (for industry, electrical and digital technologies, etc.)

The CEA welcomes the increasing attention given by the European institutions to the weaknesses induced by certain dependencies, particularly in regards to raw materials. We support the European Commission's desire to provide the Union with a legislative framework in this area. The CEA is providing recommendations to this end.

The need for a systemic and long-term vision

Anticipating supply disruptions or constraints, whether situational or systemic, requires studying the issue of supply-demand adequacy for raw materials over different time horizons up to the long term. Tensions in supply, whatever their origin, can occur at different timescales and have both situational origins (coups d'État, strikes, occasional geopolitical tensions, temporary shortage of upstream investments, etc.) and structural origins (political, economic, geological, environmental or social difficulties that place a lasting constraint on supply compared to demand). The study of risks relating to raw materials supplies must therefore integrate all of them, including structural risks, without presupposing that the market – via the price increase in the event of a supply/demand deficit and the incentive that this creates to find new sources of materials or alternatives to these materials – constitutes an absolute or even sufficient protection against systemic risks. The current example of European gas supply shows that even if quantities can be made available on the international market[1], Europe cannot buy gas "at any price" to meet all its demand, especially on a sustainable basis.

The study of the criticality of materials must take into account the relative importance of materials, not only from an economic and social point of view, but also considering the service they provide in strategic value chains, and their substitutability within these chains. A material that is currently inexpensive may occupy a key position in a strategic value chain, and thus pose a threat to the entire chain if supply is compromised.

Criticality issues go beyond the subject of materials alone. They need to be understood through the value chain as a whole. The risks are as much about the materials as they are about the technologies that rely on those materials. For example, it is not enough for the European Union to secure its supply of raw rare earth metals if it does not have the refining capacity, the production of permanent magnets with these metals, or the control of the industrial sectors using these permanent magnets (electric vehicles, offshore wind turbines, etc.). Thus the concerns of dependence and strategic autonomy must therefore encompass the entire value chain, from the raw material to the finished product (goods or services). In addition to magnets, semiconductors, batteries and solar photovoltaic technologies are other examples of strategic value chains that need to be considered as a whole and with a multi-purpose industrial vision (as is the case for copper).

Generally speaking, the European Union must use its policies to help all manufacturers – whatever their position in the value chain – **to secure supplies from their suppliers on competitive terms**, whether for raw materials upstream in the chain or for components or equipment downstream.

The consideration of integrated value chains and the search for their critical points is part of an industrial strategy, the importance of which should be recognised by the draft European legislation on critical raw materials. This emphasis on value chains should involve the European institutions, the

[1] Even so, these quantities are available because soaring prices are squeezing out other consumers, especially in Central America and South-East Asia.

governments of the Member States, research bodies and European industries. If industry is not sufficiently involved in these discussions, or if only certain stages (e.g. extraction of materials) are considered, the risks for the value chains will be poorly understood and the solutions inadequate. The European supply structure will then keep weaknesses that can be exploited by states hostile to the Union or that present a risk in the event of tension on certain markets.

Finally, the question of critical materials is only one part of the challenge linked to raw materials. It should not overshadow the attention required by utility materials whose use is structural, when the use of critical raw materials is functional. The same vigilance applied to the structural materials is essential to the deployment of the technologies affected.

Strengthening the security of supply of raw materials

The EU is heavily dependent on imported raw materials and components produced outside the EU. The extraction and refining of metals is more concentrated in a few countries than the extraction and refining of fossil fuels. This is particularly the case for metal refining, where China is largely dominant on a global scale (e.g. for copper, cobalt and rare earth metals).

In order to anticipate, prevent and prepare for future supply shocks, the EU needs to regain strategic autonomy by securing its supplies of materials and components produced from these materials.

Diversification of non-EU suppliers and strategic inventories

Diversification of non-EU suppliers will be part of securing the EU's materials supply, provided that this diversification is effective and takes place at all stages of the value chain. For example, diversifying the extractive source of some materials if the bulk of it is to be refined in a particular country, does little to secure supply. Similarly, diversifying supply from one unstable country to a few unstable countries (or countries linked by geopolitical agreements) provides limited security of supply.

In the case of non-EU supplies, and beyond the political and geopolitical risks, the nature of the supply contracts is particularly important. It is more favourable to ensure that these contracts guarantee a supply with long-term price and volume assurances. The European Union must also be particularly vigilant with regard to contracts specifically designed to preserve its dependence, such as the leasing of magnets by companies from certain non-EU countries, which requires their return to the supplier country at the end of the equipment's life.

The constitution of strategic inventories of critical materials on the territory is also a lever for reducing risks in the face of temporary and situational supply disruptions. However, these stocks are of no help in the face of a structural and long-term supply-demand imbalances.

Increase the extraction and refining of primary raw materials on the territory

In order to reduce European dependence on imported raw materials, projects for the extraction and refining of primary raw materials should be relaunched on the European soil. This would ensure a minimum supply regardless of future geopolitical developments.

Exploration and mapping of European mineral reserves must be undertaken rapidly in order for such projects to emerge. This mapping will allow the European Union and the Member States to understand precisely what reserves they have per mineral, as well as the economic and environmental conditions of extraction. These data are needed to make informed decisions on whether to initiate a mining project.

A regulatory framework that protects against non-European competition is needed. Long-term contracts and additional remuneration awarded through auctions would provide visibility to project promoters in order to reduce economic risks by ensuring a certain level of profitability in addition to selecting the most attractive projects. The introduction of Contracts for Difference (CfDs) would also have the advantage of protecting the European economy by containing the effects on supply costs of possible market price spikes.

Methods of governance involving citizens are needed to overcome the difficult question of the acceptability of mining projects to the public. Important communication of information and consultation work will have to be undertaken at all stages of the implementation of such a policy (from upstream exploration to the exploitation of deposits, including their opening and the determination of the conditions for their exploitation).

Promotion of mining projects within the EU allows for greater control over the social and environmental conditions of exploitation. Social and environmental standards for the opening and operation of extractive projects should ensure high standards without compromising the operation. A balanced approach is needed for Europe to regain its autonomy in developing the extraction of primary raw materials on its territory. This will respond to the concerns of the population while at the same time provide a framework that enables the mining industry to carry out key projects.

Domestic extraction of ores and metals on European soil must be addressed in conjunction with the refining of these ores/metals. Strategic autonomy begins in assuring extraction and refining are kept within the EU.

Developing secondary raw material sources

In order to reduce the need to extract and import primary raw materials, the EU will need to develop secondary raw material supplies, derived from the collection and recycling of metals in circulation. However, these sources will necessarily represent a minor part of the supply as long as metal demands continues to augment, which seems inevitable in the coming decades due to electrification efforts to replace fossil fuels. The development of secondary raw materials does not therefore preclude the parallel development of primary raw materials.

Materials from end-of-life equipment are a strategic resource for Europe. Regulations will be able to provide a framework that favours their processing on European soil as much as possible. Allowing these materials to leave the European Union, either for recycling or, after recycling, to be transformed into new components, thwarts the role they can play in increasing the Union's independence. It should be noted, however, that in the short and medium term, recycled materials will remain *a priori* more expensive than materials from extraction. Legislation and support for the development of the production and use of recycled materials will need to take this parameter into account so as to not affect the competitiveness of key European industries.

Introducing thresholds for the incorporation of metals of local origin in new equipment, components and products can boost the collection and recycling of metals. However, such thresholds need to be carefully chosen and frequently re-evaluated: If they are too low, they will fail to provide an incentive to increase recycling; if they are too high, they will be unattainable and equipment and components manufacturers will be left with the choice of producing less or producing without respecting the incorporation thresholds, thus undermining the scheme. The proposal to apply the threshold to the geographical origin of the metals rather than the secondary origin (i.e. metals from recycling) is intended to avoid the use of imported metals for which the control of secondary origin would likely be unenforceable in practice.

In addition, regulations could set thresholds on recycling rates for end-of-life products in strategic value chains. On these two points (rate of incorporation of locally sourced metals in products, and rate of recycling of end-of-life products), it is useful to draw inspiration from the new regulation on batteries, and to extend this approach to other strategic value chains (permanent magnets and electric motors, solar photovoltaics, etc.).

The European Union requires governance on the issue of secondary materials to organise their retention on European soil. The industry will not necessarily be able to keep these materials on their own without incentives, due to limited storage capacity and competition with primary raw materials.

Finally, the statutory transition from "hazardous waste" to "urban mine product" (i.e. secondary raw material) that benefits from a product code remains complex, if not impossible in practice. For example, at least one industrial process for the treatment of leaded glass cathode ray tubes exists, but its production has been made impossible by the practical impossibility of obtaining product codes for the recoverable products resulting from this process. Such an administrative barrier both discourages and prevents the recovery of waste into secondary materials, even if it would circumvent a demand for primary materials. Furthermore, it penalises treatment solutions that offer an outlet for hazardous waste and which would thereby reduce or even eliminate its hazardousness.

Diversifying technologies and reducing metal dependencies

In order to reduce Europe's exposure to dependence on certain critical metals, research to develop full or partial substitution of critical materials should be supported. The challenge is not so much to replace one technology with another as to develop several technologies in parallel (e.g. lithium and sodium batteries, or NMC and LFP batteries), in order to be able to adapt more easily in the event of supply constraints for a given metal or component.

Diversification of technologies will also allow different needs to be served with optimal efficiency. For example, NMC (nickel-manganese-cobalt) batteries, which provide greater autonomy than non-nickel batteries, are suitable for long-distance or intensive mobility, while non-nickel batteries – which are not exposed to nickel supply risks – are suitable for shorter term urban use. Similarly, sodium batteries – which have a lower power-to-weight ratio than lithium batteries – are more suitable for stationary storage than lithium batteries, which are more appropriate for mobility.

Beyond the existence of diversified technologies on the market, the European Union must ensure its presence on its territory and in diversified supplier countries of the complete value chains necessary for its supply. This approach must include the whole value chains. If one stage is concentrated in a small number of non-European countries – and even more so if these countries have different

geostrategic interests from the EU – the whole supply chain may be compromised and used as leverage against Europe's interests[2].

Moderation and efficiency of material uses

The European Union should promote (incentives, regulations, etc.) an approach of material efficiency (less use of materials with unchanged service) and moderation (evolution of the service to save materials) on a large scale, to reduce the dependence on imported materials and technologies, which will in all likelihood continue to account for the majority of the Union's supplies in the years to come.

The efficiency approach must ensure that material consumption is sufficient to provide a given level of service. For example, not all uses of glass require perfectly clear, colourless and bubble-free glass. The same level of service could be provided in some cases but with a lower grade glass, allowing increased use of recycled glass. Thus, without changing the service, material savings could be made by adapting the quality level to the need. Another example is that certain manufacturing processes (notably additive manufacturing) make new geometries accessible, enabling parts to be hollowed out by positioning the material only where it is needed. The double benefit of such an evolution is a lower consumption of material and a lighter component.

The moderation approach must ensure that material consumption is sufficient to meet the core requirements of a given service, while evolving to consume less material. For example, limiting the mass and optimising the aerodynamics of electric vehicles allows them to be equipped with smaller batteries, which makes it possible to produce more vehicles and equip a larger fraction of the population with a given quantity of material. Another example, incorporating a change in behaviour, i.e. car-sharing, makes it possible to share the immobilisation of materials for a vehicle between several users. These developments will both accelerate the decarbonisation of the European Union and make it more resilient to future shocks on fossil fuels and certain key metals for the transition: lithium, copper, nickel, etc.

Moderation of use also implies a consideration – which must involve citizens – on the diversification of uses. For example, the risk of constraints on the supply of many key metals for electric mobility (lithium[3], copper[4], nickel[5], etc.) makes it improbable to imagine the decarbonisation of transport solely in terms of the electrification of individual mobility, even if we lighten and improve the aerodynamics of vehicles. This implies thinking about the role and place of the car, alternative mobility and intermodality, etc. This thinking on mobility can be extended to other metal-consuming sectors (equipment in general, etc.).

The moderation approach also consists in making equipment last longer, ensuring the possibility of repairing it, supporting its second life by promoting the second-hand market, and the replacement

[2] Example of the rare earths embargo imposed by China against Japan during the Diaoyu Islands crisis in 2010-2011.
[3] Benchmark Mineral Intelligence, "More than 300 new mines required to meet battery demand by 2035", 6 September 2022
[4] N. Pickens, E. Joannides, B. Laul, "Red metal, green demand – Copper's critical role in achieving net zero", Wood Mackenzie, October 2022
[5] J. Casey, "Rystad Energy: Nickel demand to outstrip supply by 2024", *Global Mining Review*, 13 October 2021

and updating of its components[6]. This strategy could limit the obsolescence of equipment caused by software updates that degrade its core functions and is opposed to the notion of programmed obsolescence. Improving the ability to repair equipment may require concessions in energy efficiency. Thus, energy efficiency should not be approached as an end in itself but as a means to contribute to the EU's environmental and sovereignty challenges, the gains and costs of which should be set against those of developing a more circular approach.

[6] See the CEA's position on the evaluation of the European directive on electrical and electronic waste.