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Resource Productivity: Europe's Overlooked Route to Economic Security

In its urgent search for critical raw materials, Europe is overlooking a key strategy: demand reduction by keeping resources in use for as long as possible. Given that its economy is more exposed to trade than the US and in a weaker geopolitical position, Europe needs to build on its strengths. It could achieve greater autonomy through circularity and sufficiency, most notably through eco-design, improved recovery of materials for secondary use and innovation. The EU's agendas for economic security, strategic autonomy and competitiveness would all benefit from a stronger circularity strategy.

In its search for critical raw materials (CRMs), Europe has neglected an essential strategy for a buyer in a seller's market: demand reduction. Europe has every reason to develop a joined-up strategy for using resources much more efficiently, especially considering that its economy is heavily reliant on international trade.

Diversification of supply will only get Europe so far. The EU is trying to strike deals with extracting countries like South Africa. But many of the raw materials under such deals still have to go to China for processing, so they remain vulnerable to any future export controls. For example, China's new licensing requirements for rare earths and other materials could suddenly hit the European economy – along with multiple other obstacles from trade turbulence, to rules of origin, to tariffs.

The Commission's Economic Security Doctrine and RESourceEU initiative, launched on 3 December 2025, aim to reduce the EU's vulnerability to supply shocks and contain some measures to increase recycling of CRMs and better use of scrap. The supply side measures could be expensive – for example, significant costs are associated with stockpiling metals. Moreover, it will take a long time to develop more mining and processing capacity in Europe, not least because China controls much of the processing technology.

A cheaper and faster way to achieve greater autonomy is for the EU to launch a serious strategy to drive up resource

productivity. Demand is often assumed to be inelastic, and it can be in the short term. But economies can reduce toxic dependencies if incentives and regulation consistently push in that direction, as shown by the EU's success in progressively eliminating its reliance on Russian gas since 2022.

Demand reduction would not only make it harder for exporters to weaponise dependencies, but also build future resilience to supply shocks from climate impacts. The latest integrated climate assessments show that water will become much scarcer, higher temperatures will reduce labour productivity, and extreme weather will disrupt supply chains in multiple locations more often (IPCC, 2023). These trends will make extraction and processing of raw materials more expensive. Economies that are less exposed to such disruptions will gain in both security and competitiveness. Overall, a circular single market would protect the resource-poor European economy from price volatility that damages competitiveness, and from future increases in the cost of many raw materials.

The productivity issue that Draghi missed: Resources

Deep inside Mario Draghi's report on *The future of European competitiveness*, delivered to the European Commission in September 2024 and intended as a foundation for strategic planning in the next five years, lies an important admission of market failure. On CRMs, Draghi states that secondary raw materials are mostly more expensive than primary ones. He notes that this would change "if the negative environmental externalities associated with the resource-intensive (energy, carbon) production of primary raw materials would be internalised" (Draghi 2024, Part B, p. 54).

This is a fundamental argument in environmental economics: raw materials are artificially cheap because the environmental costs of their extraction and processing – such as destruction of nature, pollution and water shortages – are not included

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in the prices at which they are traded. Moreover, the costs of end-of-life disposal of the final products are often paid by taxpayers – far from the “polluter pays” principle.

The EU has addressed this market failure in relation to greenhouse gas emissions by putting a carbon price on the environmental damage they cause. But the other negative externalities of massive extraction and processing – including biodiversity loss and health damage – remain unpriced in advanced and developing countries alike. Thus, firms lack incentives to improve their efficiency in resource use, and waste is ever growing – causing a collective problem.

Draghi’s solution would be to extend the EU emissions trading scheme to incineration and landfilling in order to make recycled goods more attractive. To avoid crowding out of domestic secondary material production by imports of cheaper virgin material, he says the EU should combine carbon pricing with minimum recycled content requirements (Draghi, 2024).

Within the European economy, Draghi identifies many obstacles to circularity in CRMs that would enhance security of supply for the green and digital transitions. His report covers mainly the end-of-life of products, advocating incentivising investment in infrastructure for re-use and recycling; harmonising waste regulations across countries and removing the barriers to scale in recycling and recovering value from waste; strengthening the demand for secondary materials (e.g. through use of digital product passports to facilitate minimum content requirements); and preventing imports with lower recycled content obligations from undermining EU standards and causing loss of EU recycling capacity.

Surprisingly, while Draghi’s report covers many other aspects of improving European productivity growth, he leaves out the contribution that materials productivity – how long and how efficiently materials are used – can make. By contrast, another former Italian prime minister, Enrico Letta, made a more holistic case for the competitiveness benefits of circularity in his April 2024 report for the Council of the EU on the future of the Single Market. Letta highlighted the considerable opportunities for European firms to raise the potential return on investment by leveraging the full life-cycle value of resources and products, arguing that the linear economic model is “inherently unstable and inefficient” (Letta, 2024, p. 42). He advocated that the EU should champion standards for circular product design, applying them not only to goods produced in Europe but also to its imports.

These are sound recommendations for sustainable competitiveness that would benefit firms over the longer term and enhance economic security. However, they may be crowded out by short-termism, particularly demands for less regulation and for keeping prices down. To stay the course, the Commission

should listen to the positive views of companies. For example, German companies in most sectors see the circular economy as an opportunity rather than a risk.¹

Draghi rightly called attention to the major risks inherent in what he called the “commodity supply model” of depending on extraction of raw materials from resource-rich nations and processing in other countries (e.g. China). But in addition to these political and market risks, climate change will make raw materials more expensive in the future by reducing land and water availability. Regulation to increase circularity might raise production costs in the short term, but this is likely to be outweighed in the future by the benefits of giving European companies an incentive to invest in resource efficiency. They would then be better positioned to compete in harsher conditions.

How Europe can improve its economic security through circularity

There are three principal ways to achieve greater autonomy through circularity and sufficiency, most notably through eco-design, improved recovery of materials for secondary use and innovation.

Eco-design

The first way is to incentivise designing products and systems that use the least materials possible across the whole economy – not only for consumer goods but also business-to-business industrial circularity. Design of products for lower raw material use and resource efficiency through repair and longevity has great potential to contribute to economic security. Many household appliances are treated as obsolete far before their designed lifetime is over, partly driven by a culture of constant upgrading to the latest model (EEA, 2024).

However, much more could be done earlier in the life of products – up to 80% of environmental impacts could be eliminated in the design phase of products (EMF, 2024). The application of circular principles, e.g. using the fewest resources possible to make a product, extending its productive life for as long as possible, and designing it to be easy to recycle, in just seven sectors (including steel, construction, plastics and vehicles) could reduce annual EU industrial emissions by 34% by 2050 (Agora Industry, 2022).

The EU’s Single Market already has key elements such as eco-design requirements and extended producer responsibility, as well as the right to repair. Its regulatory lead could grow if it achieves the ambitious Circular Economy Act, due from the Commission next year.

¹ See survey by the German Chamber of Industry and Commerce.

Recovery of materials

A second route is to recover a lot more materials from those already in circulation. Apple calculates that from one metric ton of iPhone components, recyclers can recover the amount of gold and copper typically extracted from 2,000 metric tons of mined rock.² Less than 1% of rare earth elements is recycled globally at the moment, but even limited recycling of the rare earth magnets already in Europe would yield enough material to meet the requirements of EU magnet-makers, according to a European Commission expert group (ERECON, 2025). For less rare commodities, the EU has room to increase from its current rate of 39% of recycling of electrical and electronic equipment (EEA, 2024). For specific minerals, recycling rates are even lower: cobalt (22%), nickel (16%), neodymium (1%) and lithium (0%),³ all of which have been identified as transition materials for which there are likely to be significant supply gaps (ETC, 2023). The reasons for these low rates of recovery include poor product design for end of life and the lack of well-established infrastructure for recovery of such minerals, although there are variations per material (Charles et al., 2020). The EU's Critical Raw Materials Act aims for recycling to meet 25% of the Union's annual consumption of strategic raw materials by 2030, but the infrastructure to achieve these targets is still lacking (Regulation (EU) L 2024/1252).

The top priority in increasing circularity should be the CRMs necessary for decarbonisation, because the supply-demand gap for them is already widening and Europe's most toxic dependency is importing fossil fuels. Improved end of life recovery could be very powerful in contributing to diversified supply as energy infrastructure dependencies shift from import of commodities (fossil fuels) to import of CRMs (to create capital assets in renewable energy). Given the significant gaps forecast in critical inputs (see IEA, 2024), which are essential for a range of clean energy technologies, have risen up the policy agenda in recent years due to increasing demand, volatile price movements, supply chain bottlenecks and geopolitical concerns. The dynamic nature of the market necessitates greater transparency and reliable information to facilitate informed decision-making, as underscored by the request from Group of Seven (G7). Greater circularity in Europe could also mitigate shocks from high and volatile commodity prices. For example, one study found that secondary materials could meet up to 91% of demand for CRMs in low-carbon technologies by 2050 (Karali & Shah, 2022).

However, although end-of-life treatments are important, the high projected demand for CRMs means that recycling alone

cannot meet all the EU's needs for CRMs. One estimate suggests that globally, recycling may only start to play a substantial role in reducing virgin material extraction after 2040, once enough recyclable materials are in use in the economy (Pepelow, 2023). End-of-life treatment must be pursued in conjunction with greater resource efficiency in design and production to reduce the volume of CRMs needed.

Innovation

The third method of increasing circularity of critical materials is to invest in innovation to substitute the riskier inputs with ones that have more diverse sources of supply and less impact on nature, such as new battery technologies that require no lithium. Regulation may be unfashionable right now, amid the EU's "Omnibus" simplification drive. But it is needed to correct the market failure resulting from individual companies and even whole industries lacking incentives to invest in resource efficiency until the moment when prices go up – which is often too late to avoid coercion and disruption across the economy. For example, there are electric motors on the market that require no rare earths, but firms had little incentive to buy them in the absence of a collective security strategy. Even better is innovation that increases the use of secondary materials, given that secondary materials are more likely to come from diverse sources than primary ones.

Innovation is needed not only for individual products and services that are more efficient in their use of materials, but also system innovation for meeting human needs in a resource-efficient way. For example, to reduce the demand for lithium, innovation to produce smaller and more efficient car batteries should be combined with policies to expand public transport – thereby reducing individual car ownership.

The EU's progress so far

The EU has fostered circularity for more than a decade through actions and legislative instruments, but progress in implementation has been slow. The 2015 Circular Economy Package broadened the scope from the previous focus on waste to a wider vision for circularity in Europe, including the principles of eco-design, empowering consumers and facilitating the use of secondary raw materials. This resulted in 54 actions and four legislative proposals adopted or implemented by 2019, and encouraged 14 member states as well as regions and cities to put forward circular economy strategies (Ellen Macarthur Foundation, 2019). So far, three EU members have developed resource use targets.⁴

² Apple 2024 Environmental Progress Report.

³ See Eurostat, *Contribution of recycled materials to raw materials demand - end-of-life recycling input rates (EOL-RIR)*, dataset code: cei_srm010. Data is for 2022.

⁴ Finland, the Netherlands and Austria have set material consumption targets.

However, national implementation of circular principles has been modest. Although the Commission's actions since 2015 have by now led to 23 member states adopting their own circular economy strategies, most of them remain generic (EEA, 2024). The European Court of Auditors assessed in 2023 that Commission action from 2015 has led to little progress in influencing circular activities beyond these generic strategies; that waste management remained the focus for funding; and that reaching 2030 targets looked unlikely given current progress (European Court of Auditors, 2023). The stagnant circular material use rate⁵ is one such example, having remained essentially unchanged since 2010 despite EU targets to double it by 2030 (EEA, 2024).

One of the main reasons for modest progress is the EU's long-standing focus on waste management, rather than strategies earlier in the lifecycle of products, such as "refuse", "rethink" or "repair". Measures to address the whole lifecycle would reduce the EU's material footprint and reap huge environmental benefits. For example, 80% of production-related environmental impacts can be eliminated in the design phase of products (European Commission, 2022). The Commission's Circular Economy Act due in 2026 needs to devote more attention to material use reduction and the tools to achieve it beyond waste solutions, including measures to realise the innovation and productivity benefits of circularity.

Interestingly, China is making significant progress in developing its circular economy, including in innovation and recovery of battery materials. Europe should not wait for China to overtake it in this domain, as happened with solar and other clean tech. Now is the time for Europe to speed up the move to circularity to gain lasting independence.

Conclusions

Europe has to face the stark reality that it is a resource-poor continent in a world where geopolitics and climate change will drive up the cost of materials in future. Both the Draghi and Letta reports highlighted the potential for circularity to increase in the Single Market. However, Draghi primarily focused on labour productivity in his view of European competitiveness, with much less attention to the potential for resource productivity to improve both competitiveness and economic security. There are also important geopolitical implications if the EU were to improve resource productivity in the Single Market, as it would increase Europe's strategic autonomy by reducing import dependency for raw materials (including CRMs) and some intermediate goods.

This is not an argument for autarkic self-sufficiency just for Europe, but for keeping the value of materials in circulation for as long as possible across the global economy. The creation of lead markets in secondary materials would offer many economies greater resilience to supply shocks. Nature-based resilience to climate change would also be enhanced by less extraction and processing of raw materials, which causes most destruction of biodiversity and a large proportion of greenhouse gas emissions (UNEP, 2024). A resource efficiency agenda would therefore also help the EU to regain its leadership on climate action.

Economic security is a collective interest, and responsibility for it has to be shared by both the public and private sectors. The EU has both regulatory frameworks and leading companies in the circular economy that it could build on. Now it needs to bring its agendas for economic security, strategic autonomy and competitiveness together under a circularity strategy to achieve a step-change in resource efficiency.

References

- Agora Industry. (2022). *Mobilising the circular economy for energy-intensive materials: How Europe can accelerate its transition to fossil-free, energy-efficient and independent industrial production*.
- Charles, R. G., Douglas P., Dowling M., Liversage G., & Davies M. L. (2020). Towards Increased Recovery of Critical Raw Materials from WEEE – evaluation of CRMs at a component level and pre-processing methods for interface optimisation with recovery processes. *Resources, Conservation and Recycling*, 161, 104923.
- EEA. (2024). *Accelerating the Circular Economy in Europe: State and Outlook 2024*. European Environment Agency.
- Ellen Macarthur Foundation. (2019). *Completing the Picture: How the Circular Economy Tackles Climate Change*.
- ERECOM. (2025). *Strengthening the European Rare Earths Supply-Chain: Challenges and Policy Options*. European Rare Earths Competency Network.
- ETC. (2023). *Material and Resource Requirements for the Energy Transition*. Energy Transitions Commission.
- European Commission. (2022). Impact assessment accompanying the document Proposal for a Regulation of the European Parliament and of the Council establishing a framework for setting ecodesign requirements for sustainable products and repealing Directive 2009/125/EC, COM(2022) 142 final.
- European Court of Auditors. (2023). *Circular Economy: Slow transition by member states despite EU action* (Special Report 17).
- IEA. (2024). *Global Critical Minerals Outlook 2024*. International Energy Agency.
- IPCC. (2023). *Climate change 2023: Synthesis report AR6*. Intergovernmental Panel on Climate Change.
- Karali, N., & Shah N. (2022). Bolstering supplies of critical raw materials for low-carbon technologies through circular economy strategies. *Energy Research & Social Science*, 88, 102534.
- Letta, E. (2024). *Much more than a market: Empowering the Single Market to deliver a sustainable future and prosperity for all EU Citizens* (Report to the EU Council).
- Peplow, M. (2023). Lithium-ion battery recycling goes large. *Chemical & Engineering News*.
- Regulation (EU) 2024/1252. *Establishing a framework for ensuring a secure and sustainable supply of critical raw materials and amending Regulations (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1724 and (EU) 2019/1020*. European Union, European Parliament and Council of the European Union.
- UNEP. (2024). *Global Resources Outlook 2024*. United Nations Environment Programme.

⁵ The proportion of material resources that comes from recycled waste materials.