Geopolitical Dimensions of the Energy Transition

The Russian war of aggression in Ukraine has intensified efforts in Europe to become more independent of Russian fossil fuels. This has given political urgency to ambitions for the development of more renewable energy sources. Access to raw materials outside Europe will be key to this process of energy transition, and it could become a new dimension of geopolitical competition.

By Julian Kamasa

The necessary shift from fossil fuels such as natural gas, oil or coal towards renewable energy sources has increasingly intensified the pressure to act at the political, economic and societal levels across the world. The International Energy Agency and the Intergovernmental Panel on Climate Change estimate that net-zero emissions by 2050 should contain the temperature rise to 1.5 degrees Celsius. A net-zero scenario would mean that wind and solar energy would have to account for 70 percent of primary energy consumption. In 2020, the share of these energy sources was only nine percent, which strikingly illustrates the needed scale of the energy transition. Specific efforts towards developing cleaner energy or more sustainable forms of mobility have been on the rise for several years. In the meantime, they have also become profitable.

Wind turbines at the Saint-Nazaire offshore wind farm, off the coast of France, June 9, 2022.
Stephane Mahe / Reuters

Meanwhile, the so-called energy transition has gained new urgency, especially in Europe, partly as a result of the Russian war in Ukraine. Europe's heavy dependence on Russian gas and oil has become an element of not only climate policy, but also security policy. Specifically, the intent is to drastically reduce sources of revenue for the Russian state on the one hand and to minimize political blackmail on the other hand resulting from high energy dependencies. Consequently, in mid-May 2022, EU Commission President Ursula von der Leyen confirmed her intention to link the reduction of energy imports from Russia with an expansion of renewable energy sources. The role of nuclear power in the future energy mix is also being discussed at the EU level.

An energy transition as an integral part of the Zeitenwende in security policy will not be possible without access to the raw mate-

rials essential to many green technologies. Demand for raw materials such as cobalt, lithium, graphite, silicon, and rare earth elements (REEs) is expected to rise sharply. These are indispensable components of lithium-ion battery-based electric mobility and various traction and control systems for energy production from renewable energy sources. Most of such materials are mined outside Europe in a context of fragile global supply chains. The largest reserves are currently found in Africa, South America, and especially China. This poses a dilemma for European states, as it is hardly useful to replace large-scale imports of gas and oil from a belligerent autocracy with raw materials from China, which is increasingly openly harboring military expansion plans. Consequently, it is essentially a matter of reducing dependencies on aggressive autocracies through diversification and cooperation with strategic partners in order to meet the EU's ambitious goals of climate politics and geopolitics.

EU Approaches to Decarbonization

In December 2019, the EU Commission presented the so-called "European Green Deal", which is a comprehensive roadmap to stop emitting greenhouse gases by 2050. The declared goal is also to become the first climate-neutral continent. This ambition requires action in all sectors of the economy across the full range of policy areas. All EU member states have committed to reducing emissions by 55 percent until 2030 compared to 1990 levels and to meeting specific implementation measures for this interim target. These include reducing emissions from transport, creating new green jobs in the context of a third industrial revolution, increasing the share of renewable energy to 40 percent, and reducing energy dependence on third countries.

The European Green Deal is thus a very ambitious project that represents a far-reaching transformation of both the economy and society. These goals are to be achieved with public as well as private investment. As part of the COVID-19 "NextGenerationEU" reconstruction package, around EUR 600 billion will be allocated to support the European Green Deal. However, given the context of the Russian attack on Ukraine, the focus is on supply security in the short and probably also the medium term. The EU Commission has proposed joint gas procurement and binding minimum targets for gas storage facilities.

Against this background, the EU Commission presented the "RePowerEU" plan in mid-May 2022, which essentially links the reduction of Russian energy imports with three key areas: the expansion of renewable energy sources; energy-saving measures; and diversification of energy imports. To this end, a total of EUR 210 billion is to be invested by 2027 in order to eliminate energy imports from Russia, totaling an annual expenditure of EUR 100 billion. Energy-saving measures and diversification of energy imports, while important, do not support the EU's goal of net-zero emissions through decarbonization. Here, it is primarily a matter of procuring fossil fuels from another source and at the same time counteracting potential supply bottlenecks by using oil and gas more sparingly. It is interesting to note, however, that the targets of the European Green Deal have recently been raised.

Essentially, the share of renewable energies is to be increased from 40 percent to 45 percent by 2030. Among other things, this is to be achieved by doubling solar energy by 2025. The speed of the expansion of heat pumps is also to be doubled. By 2030, the EU should be able to produce 10 million tons of hydrogen itself from renewable energy sources and import the same amount to replace oil, gas and coal in industry and transport. For these ambitious projects, bureaucratic hurdles are to be removed and approval processes accelerated and simplified.

> Relations with countries that are rich in raw materials essential for the energy transition are likely to be important for the EU.

The European energy transition is unlikely to fail because of either its bureaucracy or the scale of its ambitions. The greatest challenge is likely to be outside the continent. This is because a large-scale expansion of renewable energy sources in combination with a switch from combustion engines to battery-powered mobility is a far-reaching transformation that requires an adjustment of foreign trade strategies. Relations with countries that are rich in raw materials essential for the energy transition are likely to be important.

Importance of Critical Raw Materials

Since 2011, the EU has published a list of raw materials that are classified as critical raw materials (CRMs) due to their economic importance and the extent of supply risks (see box). In 2020, there were 30 raw materials on this list, twice as many as in 2011.

CRMs such as cobalt, lithium, titanium, and niobium are needed for the most advanced lithium-ion battery systems. These are essential for increasing the range of electric vehicles and for storing electricity from solar energy. Graphite, copper, nickel, silicon, and manganese are also likely to gain in importance soon. Around three quarters of all battery raw materials come from China, Africa, and South America. The EU gets 68 percent of its cobalt imports from the DR Congo (DRC), 78 percent of its lithium deposits from Chile and 78 percent of its niobium imports from Brazil. Forty-five percent of titanium comes from China. Two-thirds of all lithium-ion batteries assembled come from China. The EU's market share in raw material mining and battery manufacturing is one percent each, making its dependence on China particularly pronounced.

The situation is similar for fuel cells. These are electrochemical devices that convert

The EU Evaluation Process of Critical Raw Materials

Since 2011, the EU Commission has published a list of critical raw materials, which is updated every three years. In 2020, a total of 66 metals were evaluated and classified into critical and non-critical according to two major criteria. First, the EU analyzes the economic importance of the respective raw material, especially in the context of added value and respective use. Second, supply risk plays an essential role in this evaluation process. This includes assessing the concentration of initial supply from commodity-extracting countries, considering governance performance and general trade aspects. The focus here is on the raw material extraction and processing stages, as the potential for bottlenecks is highest at these steps. Part of the evaluation includes substitution and recycling options, which are considered to mitigate risk. Since 2017, bauxite, lithium, titanium, and strontium have been added to the list, which now includes 30 commodities. All rare earth elements are already listed. Experts believe that the EU is likely to add more raw materials to the list in 2023.

hydrogen into electricity without combustion and are therefore important for emission-free mobility and renewable energy generation. CRMs such as cobalt, platinum, strontium or titanium are necessary to these cells. Similar to lithium-ion batteries, graphite is also very important. The importance of palladium, also used in many fuel cells, is expected to increase as Russia holds 44 percent of the total global supply of the element. From the EU's perspective, the dependence on critical raw materials for fuel cells is particularly strong on African countries, which holds roughly half the deposits of all CRMs, while China represents a lesser – but still important – provider with roughly 17 percent of all deposits. In terms of manufacturing, Japan and South Korea dominate with 51 percent and the US with 48 percent market share. The EU, with small market shares in manufacturing, is heavily dependent on imports, but from strategic partners with whom it has solid foreign and security policy relations.

A shortage of REEs could occur not only for geopolitical reasons, but also due to increased Chinese domestic demand.

Another consideration is that electric mobility and wind energy do not work without traction motors. The former requires an electric motor, the latter generators for wind turbines. Such traction systems use permanent magnets, whose magnetic forces are transformed into motion by repulsion and attraction. A key component of permanent magnets are REEs such as dysprosium, neodymium, and praseodymium. The EU imports 98 percent of these from China. Brussels also imports 98 percent of its boron, also important for permanent magnets, from Turkey. The EU is in a good position in terms of manufacturing wind turbines, with a 58 percent market share, but China has a monopoly on the production of the permanent magnets required by the manufacturing process.

Geopolitical Dimensions

Generally, the planning process from the detection of raw materials to the launch of mining operations takes around fifteen years. This means that European efforts towards increasing domestic capacity cannot be implemented in the short term. It is important to emphasize that REEs are not as rare as the name suggests. Rather, the term is derived from the classification in the periodic table of chemical elements. For example, experts suspect occurrences of REEs in Greenland, Norway, Sweden, Finland, Spain, Portugal, and France. The fact that there is no large-scale mining of CRMs in Europe has to do not only with long-term planning processes, but above all with environmental and labor standards. The extraction of these metals releases radioactive material and heavily contaminates groundwater. CRMs are therefore more likely to be imported from countries where resources exist in high concentrations and where environmental regulations and the safety of workers are less important. These include countries such as the DRC for cobalt, Chile for lithium, South Africa for platinum, Russia for palladium and China for REEs, tungsten, titanium, and graphite.

European countries are not alone in their interest in these raw materials, as the US, China, Canada, Australia, Japan, and South Korea also seek to procure these products in larger quantities. Even in China, with its questionable environmental policies, there are increased efforts to expand renewable energies. Competition between the US and China for technological supremacy also plays an important role, as green economies are an indicator of great innovation power in advanced technologies. A geopolitically motivated competition for access to CRMs is therefore likely to intensify if demand exceeds supply.

It is increasingly urgent for Switzerland to develop more renewable energy sources.

It is no coincidence that state-backed companies from China are trying to secure access to cobalt mines in the DRC. As much as 70 percent of global cobalt mining takes place in the DRC, and 40 percent of cobalt reserves are located on Congolese territory. In 2020, China directly and indirectly controlled fifteen of the nineteen mines in the DRC. It is important to note, however, that Congolese judicial authorities are increasingly targeting the business practices of Chinese companies. In 2022, a Congolese court overturned a Chinese company's control of the world's largest cobalt mine based on allegations of contractual violations by the company. This development is likely to be watched with interest in Washington, as well as in Brussels. Many Western governments fear that China could control a critical mass of the lithium-ion battery supply chain and exploit this monopoly position by raising prices or imposing export restrictions.

These fears have some basis. Following an incident between China and Japan near the territorially disputed Senkaku/Diaoyou Islands, China suspended all exports of REEs to Japan in 2010. In the same year, China imposed export restrictions on REEs, which raised prices up to 700 percent. The EU, the US, and Japan appealed against China at the WTO and were successful, forcing China to abandon restrictions in 2015. A shortage of REEs and other critical raw materials could, however, occur not only as geopolitical strategy, but also due to increased Chinese domestic demand for a transformation to a greener economy.

Therefore, the topic is at the top of the priority list for the EU, but also for the US, Japan, and South Korea. A trilateral alliance between Brussels, Washington and Tokyo aims to intensify strategic cooperation on supply chains in this area. Australia and Canada have also joined this group. The US and the EU held a second high-level meeting of the new EU-US Trade and Technology Council (TTC) in Paris in mid-May 2022. Explicit mention was made here of cooperation in reducing dependencies on strategically important resources from unreliable states, as well as the diversification of supply chains for REEs for permanent magnets and greater transparency and diversification of supply chains for solar energy. This highlights how wide-ranging cooperation between like-minded Western countries has become, encompassing geopolitical aspects of telecommunications, microchips, and strategic raw materials.

For its part, the EU drafted an Action Plan for CRMs in 2020 with four objectives: establishing more resilient supply chains; reducing dependencies through more circular use; increasing raw material extraction within the EU; and diversifying supplies from third countries. A diverse European Raw Materials Alliance (ERMA) consisting of industry, EU member states, regional representatives, trade unions, academia, non-governmental organizations, and investors has been established for this purpose. If successful, this Action Plan could

Further Reading

European Commission, *Critical Raw Materials for Strategic Technologies and Sectors in the EU: A Foresight Study*, 2020.

Jakob Kullik, "Zeitenwende heisst auch Rohstoffwende: Warum Rohstoffsicherheit ein Teil der neuen Nationalen Sicherheitsstrategie Deutschlands werden sollte" in: *Arbeitspapier Sicherheitspolitik Nr. 5* (2022).

Margarethe Hofmann / Alessandra Hool, "ESM Survey: Critical Materials in Switzerland", Entwicklungsfonds Seltene Metalle ESM, December 2015.

Viktoria Reisch, "The Race for Raw Materials" in: *SWP Journal Review No. 1* (2022).

have important ramifications for many European countries, where existing mining efforts could be transitioned towards the mining of lithium, graphite, nickel, or cobalt. Deposits in seafloors are also likely to become a target for European coastal states if raw materials in established mining regions become scarce. Important raw materials are also suspected in Greenland, an autonomous part of Denmark. The same applies to the Arctic, which has captured the interest of many near-Arctic countries (see CSS Analysis No. 270). While environmental motivations are likely to be central to the success of the Action Plan, it is important to recognize the increasing return on investment in this sector. Recycling CRMs has not been lucrative in the past, but more widespread capabilities could help promote the circular use of CRMs thanks to financial incentive schemes and the prospect of higher demand as the energy sector transitions.

Outlook for Switzerland

As a landlocked European country with few raw materials and reliance on imports, Switzerland is heavily dependent on external developments. For Swiss industry, the supply of CRMs does not seem to be of high priority, as it mainly imports semi-manufactured products. However, this is also true of industry located in the EU. In light of this, the Swiss Federal Council has determined only the stockpiles fall under the responsibility of the government, and that the private sector must oversee the security of CRM supply.

It is increasingly urgent for Switzerland to develop more renewable energy sources, not least since the Russian war of aggression in Ukraine. Consequently, the EU's policies and approaches are of the utmost importance to Switzerland as the continent works to eliminate potential supply bottlenecks and divest from Russian gas and oil.

The implications of greater cooperation between the EU and the US within the framework of the TTC are uncertain for Switzerland. A similar picture emerges regarding the EU Action Plan for critical raw materials. Increasingly, the EU Commission is differentiating between EU member states, EEA states and third countries. It could therefore be in Switzerland's interest to keep a close eye on these developments, to examine at these early stages possible access as a third country and, in parallel, to expand trade relations with countries rich in raw materials. One advantage Switzerland holds as a member of the European Free Trade Association (EFTA) is an independent trade policy that may be faster and more flexible than that of the EU.

For more on perspectives on Socio-technical resilience, see CSS core theme page.

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