

Green Transition-Critical Metal and Mineral Resources in the European Nordics

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The rapidly increasing demands for specific metals and minerals to fuel expanding green transition technologies are pushing a Europe that is overly dependent on imported raw materials towards necessary changes in their sourcing (cf. the European Critical Raw Materials Act of 2023). Notably, many of these metals and minerals are already classified as critical to the European industry. In this context, the Nordic countries, excepting Denmark and Iceland, represent one of the most fertile regions for exploration and mining of different metals and minerals in Europe. The geology of the Nordics is very diverse and comparable to abundantly mineralised shields globally, as it ranges from Archaean nuclei via Proterozoic mobile belts and accreted terrains, into the Phanerozoic, also featuring different young magmatic complexes and platform cover units. This extended geological evolution and the diverse processes involved provided favourable conditions for the formation of a wide variety of mineral deposits. We have recently synthesised available data from the relevant Nordic countries (Greenland, Norway, Sweden, and Finland) to assess the potential for critical raw materials (CRMs) specifically relevant for green technologies, i.e., cobalt, graphite, hafnium, lithium, niobium, platinum-group metals (PGMs), rare earth elements (REEs), silicon, tantalum, titanium, and vanadium, describing the most important deposits and their geological settings and resource characteristics. Of these, a number are very relevant in a European and, in several cases, also a global context. Among important resources for green technologies, REE-(±Nb-Hf) deposit projects in Greenland as well as Sweden and Norway stand out; Finland has significant cobalt and PGMs, while Norway has major graphite and titanium resources. Additionally, Sweden, Finland, and Greenland have very large vanadium resources, while several lithium-(tantalum) projects are underway in Finland and Sweden. Overall, we conclude that the exploration potential for most CRMs is significant in these Nordic countries.