Tapio Halkoaho (Geological Survey of Finland) 27 November 2022

Commodity	**Platinum-group metals (PGE = Pd, Pt, Rh, Ir, Ru, Os)**	**Data source**
Significance for the EU (2023)	*Critical and Strategic*	
Uses of the commodity	Main uses: *Vehicle exhaust catalysts, jewellery, investment. Electronics industry (half of the Ir and Ru demand). Crucibles for growing single crystals for lasers, scanners, LEDs, and for surface acoustic wave filters; OLED screens; thermostats and relays, hard disk drives.* Minor uses: *Catalysts in petroleum and chemical industry, medical uses, glass production.* Future uses: *Fuel cells, super conductors, data centres, hydrogen production, super alloys. Exhaust catalyst use (Pd, Pt, Rh) will grow in short term, but may significantly decrease if electric cars take a significant share in the vehicle production. On the other hand, if the fuel-cell and hydrogen-power technologies grow, the PGE demand will do so accordingly. Demand in electronics will grow substantially for all PGEs. For Pd, there may be significant growth in the chemical industry, in micro-electric capacitors and in seawater desalination.*	Lauri et al. (2018), Johnson Matthey (2020), IEA (2021), Marscheider-Weidemann (2021), USGS (2023)
Resources and potential in Nordic countries	*Known resource figures are minimum estimates, as PGE grades are not known or are only partially known for many shale, Ni and talc deposits which contain potential by-product PGEs. Especially for Ir, Rh, Ru and Os resources there is scant information.* Finland: *Known resources: 581 t Pd, 256 t Pt, 3.6 t Rh; 'undiscovered resources' at regional scale estimated to 12,000 t Pd and 5,600 t Pt.* Greenland: *Known resources: 533 t Pd, 42 t Pt (all in the Skaergaard intrusion); there are also PGM potential in other prospects, but no resource estimates are published.* Norway: *Known resources: 2.3 t Pd, 3.4 t Pt (Ni-Cu-PGE in metapyroxenites).* Sweden: *Known resources: 0.4 t Pd, 0.1 t Pt.*	Rasilainen et al. (2017), Boliden (2020), Eilu et al. (2021, 2022), Rosa et al. (2023)
Anthropogenic resources and potential in Nordic countries	*Vehicle exhaust catalysts, electronics, and scrap*	Kuusakoski (2022)
Main deposit types in Nordic countries	*Orthomagmatic Ni-Cu-Co-PGE deposits*	Eilu (2012), Rasilainen et al. (2017)

Main global deposit types	*Orthomagmatic Ni-Cu-Co-PGE deposits*	Mudd et al. (2018)
Global production	*Mine production: 210 t Pd (2022), 190 t Pt (2022), 23.8 t Rh (2021), 7.3 t Ir (2018), and 30.5 t Ru (2018)*	Johnson Matthey (2020, 2022), USGS (2023)
Nordic production (2021)	*Mine production: 960 kg Pd, 1,243 kg Pt (Finland only)*	Tukes (2023)
Main producing countries (2018, 2022)	Palladium (Pd) (2022): *Russia 41.9 %, South Africa 38.1 %, Canada 7.1 %, Zimbabwe 5.7 %, USA 5.2 %* Platinum (Pt) (2022): *South Africa 73.7 %, Russia 10.5 %, Zimbabwe 7.9 %, Canada 3.2 %* Rhodium (Rh) (2018): *South Africa 80 %, Russia 12 %, Zimbabwe 5 %* Iridium (Ir) (2018): *South Africa 92 %* Ruthenium (Ru) (2018): *South Africa 93 %*	Johnson Matthey (2020, 2022), USGS (2023)
Technological challenges in production	*Mature technology*	USGS (2023)
Recycling	Present: *About 104.6 t Pd, 51.6 t Pt, and 11.5 t Rh was recovered globally from new and old scrap in 2021.* Future: *Recycling rate and volume are estimated to increase due to increasing vehicle exhaust catalysts, electronics, and other scrap becoming available.*	Johnson Matthey (2022)

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