Tuomo Törmänen (Geological Survey of Finland) 25 November 2014
Update by Irmeli Huovinen (Geological Survey of Finland), 12 October 2022

Commodity	**Chromium (Cr)**	**Data source**
Significance for the EU (2023)	*Not Critical nor Strategic*	
Uses of the commodity	Main uses: *Mostly stainless steel, alloyed steel, and non-ferrous alloys* Minor uses: *As refractory mineral (chromite) and in foundry industry and as chemicals in leather tanning, chromium plating, catalysts, surface treatments, and refractories wood preservatives and pigments* Future uses: *Stainless steel remains the main use. New alloys.*	International Chromium Development Association (2022), USGS (2022)
Resources and potential in Nordic countries	Finland: *Known resources 48.76 Mt Cr. Assumed ('undiscovered') additional resources: 350 Mt Cr. Kemi mine is the only Cr mine in Europe: proven and probable mineral reserves are 32.2 Mt @ 24.3% Cr_2O_3, measured and indicated resources 123 Mt @ 29.5 % Cr_2O_3 (as of 1.1.2022).* Greenland: *Known resources 560,000 t Cr* Norway: *Mined deposits (in Feragen) contained 8,800 t of Cr, no resources known.* Sweden: *Known resources 167,000 t Cr*	Rasilainen et al. (2016), Eilu et al. (2021, 2022), T. Huhtelin, pers. comm (2022), Rosa et al. (2023)
Anthropogenic resources and potential in Nordic countries	*Stainless steel of nearly all kinds*	European Stainless Steel Development Association (2014), Bureau of International Recycling (2022)
Main deposit types in Nordic countries	*Overwhelmingly as reefs in 2.50–2.44 Ga layered intrusions. Also, an undefined Archaean intrusion and an undefined Palaeoproterozoic intrusion. Podiform type insignificant.*	Rasilainen et al. (2016), Eilu et al. (2022), Rosa et al. (2022)
Main global deposit types	*Reef type in layered intrusions, and podiform chromitite in ophiolite settings*	Mosier et al. (2012), Schulte et al. (2012)
Global production (2022)	*41 Mt "of marketable chromite ore"; 12.5 Mt ferrochrome*	Merape (2022), USGS (2023)
Nordic production (2022)	*Finland: 267,806 t Cr mined (2022), 430,000 t ferrochrome (2022); Sweden: ? t ferrochrome (2022)*	Tukes (2023)
Main producing countries (2022)	*Mining: South Africa 43.9 %, Turkey 16.8 %, Kazakhstan 15.9 %, India 10.2 % Finland 5.4 % (2023)*	Merape (2022), USGS (2023)

	Ferrochrome: China 46 %, South Africa 22 %, Kazakhstan 12 %, India 8 %, Finland 4 % (2022)	
Technological challenges in production	*Fairly mature production technology. Ferrochrome production is energy intensive, so restricted electrical power supply results in restricted ferrochromium production (a major issue in RSA). Also, stricter environmental standards could affect ferrochromium production in China, the leading ferrochromium producing country.*	USGS (2022)
Recycling	Present: *Stainless steel end products are generally easily recyclable, but their life cycle is long, from 10 years (household items) to >60 years (construction materials). Globally, the average recycled content of stainless steel was 44 % in 2015. In USA and Europe, the recycled content of stainless steels was 71 % and 70 %, respectively. The global figure is strongly impacted by China which has increased its stainless-steel production in the last two decades. In 2015, China produced 52 % of the world's stainless steels but contained on average only 23 % recycled content.* Future: *The low recycling rate in China may change, as most stainless steels currently in use there were produced after 2005 and have not yet reached their end of life, but will start to become available for reuse in the next years. China aims to reduce carbon emissions by cutting its steel output from 2021. In China's new steel masterplan, the country is targeting a scrap charge ratio increase to 30 % while supporting them in establishing large-scale scrap recycling, processing, and distribution centres.*	European Stainless Steel Development Association (2014), Bureau of International Recycling (2022), International Chromium Development Association (2022)

References

BGS 2022. World Mineral Production 2016-2020. 88 p. https://www2.bgs.ac.uk/mineralsuk/download/world_statistics/2010s/WMP_2016_2020.pdf

Bureau of International Recycling 2022. www.bir.org

Eilu, P., Bjerkgård, T., Franzson, H., Gautneb, H., Häkkinen, T., Jonsson, E., Keiding, J.K., Pokki, J., Raaness, A., Reginiussen, H., Róbertsdóttir, B.G., Rosa, D., Sadeghi, M., Sandstad, J.S., Stendal, H., Þórhallsson, E.R. & Törmänen T. 2021. The Nordic supply potential of critical metals and minerals for a Green Energy Transition. Nordic Innovation Report. 93 p. https://norden.diva-portal.org/smash/get/diva2:1593571/FULLTEXT02

Eilu, P., Hallberg, A., Bergman, T., Bjerkgård, T., Reginiussen, H., Sandstad, J.S. 2022. Nordic Ore Deposit Database. Annual update (end-2021 data). https://gtkdata.gtk.fi/fmd/

European Stainless Steel Development Association (2014)

Ghisler, M. 1970: Pre-metamorphic folded chromite deposits of stratiform type in the early Precambrian of West Greenland. Mineralium Deposita 5, 223–236. Ghisler, M. 1976: The geology, mineralogy and geochemistry of the pre-orogenic Archaean stratiform chromite deposits at Fiskenaesset, West Greenland. Monogr. Ser. miner. Deposits 14, 156

Huhtelin, T. Pers. comm.11 February 2022 Resource and reserve of Kemi Chrome Mine.

International Chromium Development Association. 2022. Online at: https://www.icdacr.com/

Merape 2022. Annual report 2021. www.meraferesources.co.za/reports/ir-2021/pdf/full-integrated.pdf

Mosier, D.L, Singer, D.A., Moring, B.C., and Galloway, J.P., 2012, Podiform chromite deposits—database and grade and tonnage models: U.S. Geological Survey Scientific Investigations Report 2012–5157, 45 p. and database. http://pubs.usgs.gov/sir/2012/5157/

Rasilainen, K., Eilu, P., Halkoaho, T., Karinen, T., Konnunaho, J., Kontinen, A. & Törmänen, T. 2016. Quantitative assessment of undiscovered resources in stratiform and podiform chromite deposits in Finland. Geological Survey of Finland, Report of Investigation 226. 186 p. http://tupa.gtk.fi/julkaisu/tutkimusraportti/tr_226.pdf

Rosa, D., Kalvig, P., Stendal, H. & Keiding, J.K. 2023. Review of critical raw material resource potential in Greenland. MiMa rapport 2023/1. 121 p. https://doi.org/10.22008/gpub/32049

Schulte, R.F., Taylor, R.D., Piatak, N.M., and Seal, R.R., II, 2012, Stratiform chromite deposit model, chap. E of Mineral deposit models for resource assessment: U.S. Geological Survey Scientific Investigations Report 2010–5070–E, 131 p.

Tukes 2023. Mineral commodity and metal production in Finland 2013–2022. https://tukes.fi/documents/5470659/6373016/Metallien+ja+mineraalien+tuotanto+Suomessa++2013-2022.pdf/962068ce-1955-7ff5-dee3-d53387e42fee/Metallien+ja+mineraalien+tuotanto+Suomessa++2013-2022.pdf?t=1679637813519

USGS 2022. Mineral Commodity Summaries 2022. 201 p. https://pubs.usgs.gov/periodicals/mcs2022/mcs2022.pdf

USGS 2023. Mineral commodity summaries 2023. U.S. Geological Survey. 210 p. pubs.usgs.gov/periodicals/mcs2023