Pasi Eilu (Geological Survey of Finland), 8 April 2019
Updated by Daniel Larsson (Geological Survey of Sweden), February 2023

Commodity	**Bismuth (Bi)**	**Data source**
Significance for the EU (2023)	*Critical and Strategic*	
Uses of the commodity	Main uses: *Chemicals, mainly pharmaceutical and cosmetics products (62 %), low-melting alloys (28 %), metallurgical additives (10 %)* Minor uses: *Coatings, pigments, and electronics* Future uses: *Demand in pharmaceuticals and solders increases. Semiconductors, thermoelectric materials and topological insulators.*	Latunussa et al. (2020); USGS (2023)
Resources and potential in Nordic countries	*As bismuth is not routinely assayed, there are Cu, Cu-Au and Au occurrences that contain potentially recoverable bismuth, at grades probably in several tens of ppm Bi, but Bi is not included into the mineral resources estimated.* Finland: *Bi is reported as a minor commodity in the Petrovaara Cu-Au occurrence, which has a resource of 0.15 Mt @ 1.31 % Cu, 0.1-4 ppm Au, up to 2.8 % Pb and up to 88 ppm Bi.* Greenland: *No assessment is made for Bi.* Norway: *Several sediment-hosted Zn-Cu deposits with up to 100 ppm Bi (e.g., in Røros, Bleikvassli, Mofjellet). Cu occurrences in Telemark.* Sweden: *589 t Bi* *Kankberg Au mine with 6.3 Mt @ 3.3 ppm Au, 7.3 ppm Ag, 159 ppm Te and 93 ppm Bi. A product consisting of a mixture of tellurium and bismuth oxides is sold. In addition, Bi is reported as a by-product at the historic Boliden Cu-Au mine.*	Grip & Wirstam (1970), Lauri et al. (2018), Eilu et al. (2021), Voigt & Bradley (2021), SGU (2022), Boliden (2023)
Anthropogenic resources and potential in Nordic countries	*Recycling of lead-acid batteries. Possibly fly ash from combustion of flame-retardant material.*	
Main deposit types in Nordic countries	*Copper and gold deposits (VMS, orogenic gold, porphyry copper)*	Jonsson et al. (2022), Lauri et al. (2018)
Main global deposit types	*Byproduct from lead sulphide and tungsten skarn deposits. Currently, the two main sources for the recovery of Bi are lead and tungsten extraction and processing. VMS deposits another potential source.*	Deady et al. (2022)
Global production (2022)	*20,000 t refinery production, mine production unknown.*	USGS (2023)
Nordic production (2022)	*No production*	

Main producing countries (2022)	*China 80 %, Laos 10 %, South Korea 4.8 %, Japan 2.4 % (refinery production)*	USGS (2023)
Technological challenges in production	*Apparently, no major issues*	
Recycling	Present: *Bismuth-containing alloy scrap. Given the type of applications, bismuth recycling is very limited.* Future: *EoL products*	USGS (2023)

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