



Making mining sustainable

Worldwide demand for metals is increasing. Consequently, the mining of metals has increased many times over in recent years in Finland as well. Therefore, more attention needs to be paid to both the environmental and social impacts of mining.

To reduce the environmental impact, water management connected with mining is a high priority in conditions that prevail in Finland. It would be important for mining companies to take this into account already in the planning stages of a mine. The licensing authorities should require sufficient information on good water management already in the early stages of processing an application for a mining permit.

Companies in the mining field should be active and open in communicating their activities already in the mineral prospecting and planning phases to ensure that local residents can affect the projects.

The goal is a society with a circular economy in which metals and minerals are recovered from products to be re-used. As little new ore as possible should be extracted.



KEY ENVIRONMENTAL ASPECTS OF THE DIFFERENT PHASES OF THE LIFE CYCLE OF A MINE

ORE PROSPECTING

- Prospecting is implemented using the method that is the least harmful to nature, such as a drone. This makes it possible to reduce test drilling.
- Prospectors must be provided with information on the location of sensitive nature areas.

FUNDING AND ENVIRONMENTAL REPORTS, AND PLANNING

- Planning of management of environmental risks begins ^{2,8}.

CONSTRUCTION, COMMISSIONING, AND PRODUCTION PHASE

- Concentration plant, piles of waste rock, roads, and other activities of the mine are situated in such a way that they cause as little damage as possible to the environment.
- Waste, such as waste rock and tailings, are to be handled in a way that minimises environmental impact. Waste is also utilised efficiently through recycling.
- Dam and pool structures are built with safety in mind.
- Water management and treatment is efficient. Recycling of water is maximised.
- Harmful effects on soil and bedrock, surface waters and ground waters, the air, and on biota are minimised.
- Energy efficiency is a goal in all activities.
- The impact of noise is alleviated.

CLOSURE AND AFTERCARE

- Closure of waste areas begins already in the production phases and is implemented in stages during the life cycle of the operation.
- The environmental risks of previously closed old mining areas are evaluated, and required actions are taken to avoid risks ¹⁰.

DEVELOPING METHODS FOR MANAGEMENT OF MINE WATERS

Methods have been developed at SYKE for calculating the water balance of mines and for modelling hydrological conditions in the SAM (Sustainable Acceptable Mining) project coordinated by VTT Technical Research Centre of Finland Ltd.

<http://virtual.vtt.fi/virtual/sam/english.htm>

Models for the evaluation of the tolerance of bodies of water receiving waters from mining and the reduction of negative impact have been developed in the KaiHali project run by SYKE. Models have been applied especially to the waters near the former Talvivaara mine, now Terrafame, located in Sotkamo.

www.syke.fi/hankkeet/kaihali

Methods have been developed for the management of risks for ground waters in the Watersmart and SAM projects. For example, a list has been made in the projects of reports that an operator is required to draft on minimising risks. For example, a list has been made in the projects of surveys that an operator is required to draw up on minimizing risks. projects.gtk.fi/watersmart/

Metals needed for carbon neutrality

Finnish bedrock contains rare metals, such as cobalt, lithium, and nickel, which are needed in the batteries of mobile phones and electric cars, for example. The technologies of renewable energy, which make a low-carbon society possible, require metals.

Demand for metals is constantly growing. In Finland, metallic ores, industrial minerals, and the extraction of stone for construction have quadrupled from the early 21st century. Companies in the mining field see Finland as a good operating environment ¹ and they are actively prospecting for ores in Finland.

Finland has set a carbon neutral circular society as its goal. In a circular economy metals and minerals are recovered from products and as little new ore as possible is extracted. The masses of tailings and waste rock in existing mines should be utilised more efficiently in earthworks and in the construction industry, for example.

Minimising environmental risks

In Finland the precipitation to evaporation ratio is high, and large amounts of water amass in mine areas. Climate change is set to amplify the exceptional weather conditions, such as heavy rain. Consequently, special attention should be paid to water management in a mine area.

Waste areas of mines generate emissions, especially into waters. The Best Available Techniques Reference Document for the Management of Waste from Extractive Industries was published in 2018 ². National guidelines are being drafted for them under the coordination of the Kainuu ELY Centre. The guidelines are scheduled for completion in the autumn of 2019.

Viable mineral deposits often exist in areas with a unique array of plant and animal species. Threatened plants and habitats are known to exist in nearly one out of four current ore prospecting areas.

According to a study by the Finnish Environment Institute (SYKE), mining has caused or will cause threats to more than 200 species and numerous habitats such as calcareous rocky slopes and alkaline fens. Most of these species are lichens and mosses. The most significant damage is caused by the extraction of limestone ^{3,4}.

Ore prospectors must be given access to all information about the sensitive nature sites in the search area. It is important for the Finnish Safety and Chemicals Agency (Tukes), which grants mining permits, and the ELY Centres, which deal with information on nature, to work in close cooperation in connection with the licensing process of a mine.

On the other hand, special types of environments which emerge as a result of mining activities can provide a beneficial living environment for threatened plants, as is the case with limestone quarries, for example. This should be utilised in the protection of species.

Important dialogue

A mine brings changes to the economic structure, residential environment, and landscape of an area. It is important for the mining company to operate in a transparent and responsible manner for the sake of these social impacts and the acceptability of mining activities. A company should not focus only on fulfilling the conditions of its environmental permit - it should aim at making continuous improvements^{5,6}.

Already in the planning stages of a mine a company should recognise all those who are affected by the mining activities and communicate actively and interact with them. In the EU-funded INFACCT project consideration has been given to the prevention of conflicts by improving interaction⁷.

Information in data systems on the environmental impact of mines, such as spatial information, should be made freely available to mining operators, officials and citizens through interface⁸.

Interaction by different parties should continue consistently throughout the mining permit, environmental permit, and environmental impact assessment (EIA) procedure. In the EIA an evaluation is made on how the various ways of implementing a mining project would affect the environment and how harmful effects can be reduced⁹. Local residents and other stakeholders are given a voice in the EIA process.

Help from spatial information

Mines can cause harm for other business activities, such as tourism, agriculture and forestry, and reindeer herding. The use of nature for recreation can also be endangered. However, it is possible through authentic interaction to find alternatives in which the harm is kept to a minimum. On the other hand, a mine brings more residents to a community, which benefits retail businesses, for example.

In Suurikuusikko in Kittilä conflicts have been successfully eased by utilising spatial information. In the TOKAT project run by SYKE the locations of winter grazing areas and winter lichen grazing areas were shown graphically on maps. The information helped mining companies take the needs of reindeer herding better into consideration in the planning of land use and developing cooperation in order to avoid conflicts.

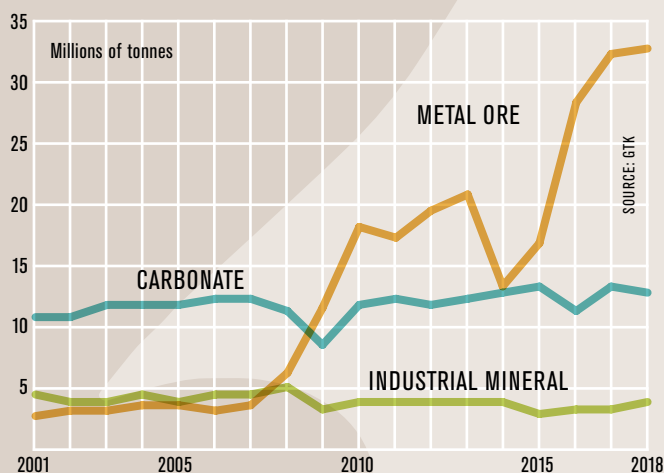
Amendments are being planned for the Land Use and Building Act. It could be possible in the amendment to strengthen the ability of local authorities to affect where mining activities would be located. Local authorities could, for example, be given the right to use the master plan in order to prohibit the establishment of mines in certain areas.

Improving collateral security arrangements

In Finland mining companies pay compensation to landowners on a per hectare basis, according to the calculated value of extracted and utilised mine material as well as by-products. In addition, the companies pay corporate taxes. Finland does not have an actual mining tax, but introducing one is currently under consideration. In amending the taxes and fees on mining activities the goal should be for the payments to serve as an incentive for the circular economy. Collateral security and liability arrangements for accidents and bankruptcy situations should be improved so that revenue received from them would fully cover the costs of a mine closure, accident, or bankruptcy situation.

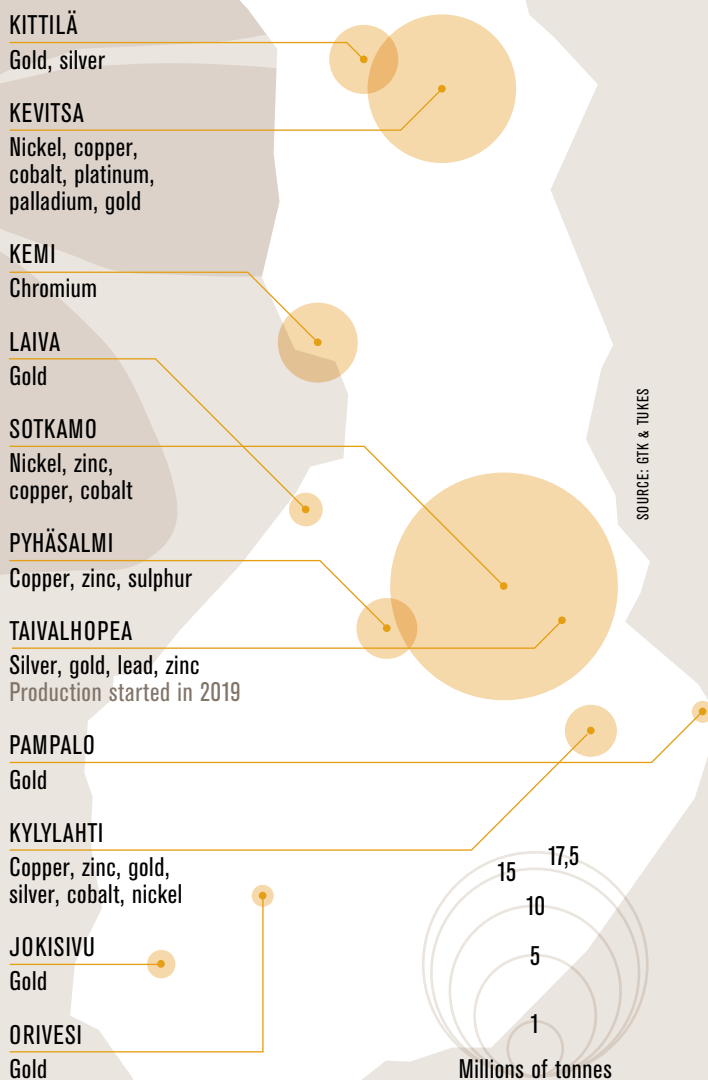
ORE MINING IS INCREASING

Ore mining in Finland in 2001–2018. Most of the mined carbonate is limestone.



VOLUME OF EXTRACTION FROM METAL ORE MINES 2018

More metal ores have been extracted in Finland in the past couple of years than ever before. Operations might be starting in a few new mines in the early 2020s and the re-opening of several closed mines is possible.



Finland has good preconditions for sustainable mining

After the environmental accident at the mine in Sotkamo in 2012 several development projects were launched in Finland to improve the sustainability of mining activities. In addition, improvements were made to procedures by operators and officials. For example, Finland's mining industry established the Finnish Network for Sustainable Mining. Thanks to the new information and the new operating culture that emerged from this, Finland now has very good preconditions for sustainable mining.

- Mining activities have posed or will pose a threat to more than 200 species in Finland. It is important for Tukes, which issues mining permits, and the ELY Centres, which manage nature information to work closely together during the licensing process. Special types of environments which emerge as a result of mining activities can actually provide a beneficial environment for threatened plants, as is the case with limestone quarries, for example.
- Collateral security and liability arrangements for accidents and bankruptcy situations should be improved so that revenue received from them would fully cover the costs of a mine closure, accident, or bankruptcy situation.

Several laws regulate mining

Environmental issues related to mines are addressed mainly in the Environmental Protection Act, the Water Act, and the Nature Conservation Act. In the Mining Act safety matters are handled primarily from the point of view of human safety.

Permits to explore a deposit and for the exploitation of minerals are granted by the Finnish Safety and Chemicals Agency (Tukes).

The environmental and water permit required for the activity is granted by the local Regional State Administrative Agency (AVI).

The licensing procedure for mining projects almost always requires an environmental impact assessment procedure. The liaison authority in this is the local Centre for Economic Development, Transport and the Environment (ELY Centre).

In addition, mining activities require numerous special permits linked with chemical safety, among other things.

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Further information: <https://www.kaivosvastuu.fi/in-english/> | www.infactproject.eu

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