Elinkeino-, liikenne- ja ympäristökeskus
Närings-, trafik- och miljöcentralen
Centre for Economic Development, Transport and the Environment

Managing the environmental impacts of mining - The role of environmental authorities, research institutions and mining companies

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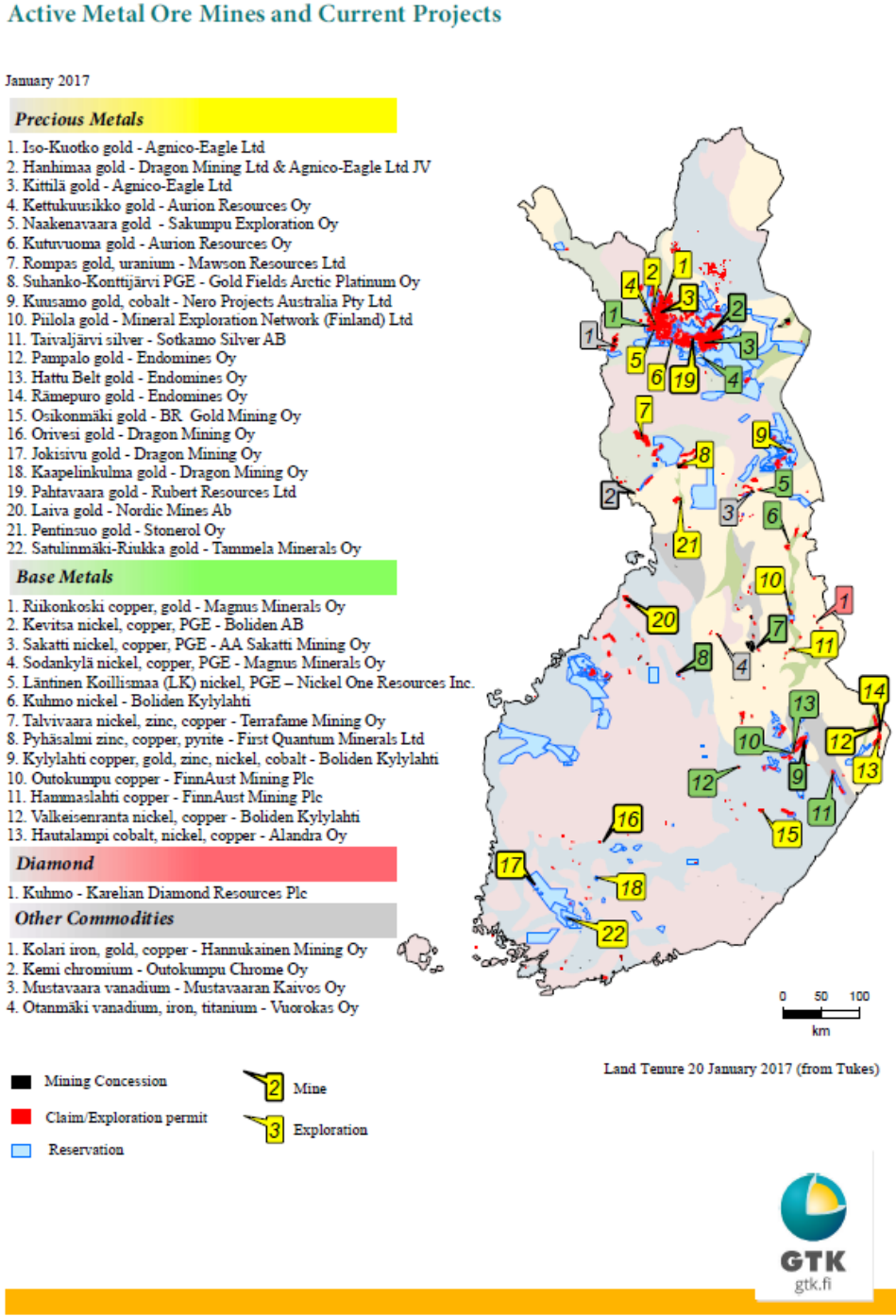
Introduction - Mining in Finland and Fennoscandia

- Mining has occurred in Finland since the 16th century
- Finland is one of Europe's largest producers of nickel, gold, chromite, copper and zinc
  - Currently there are 40 active metallic ore mines and projects in Finland
  - Over 100 closed and abandoned mines
  - 37 mine sites/53 waste areas with severe environmental effects
- GTK has published metallogenic map of Fennoscandia in December 2009 (updated May 2015)

http://en.gtk.fi/informationservices/databases/fodd/index.html
http://gtkdata.gtk.fi/fmd/

  - Altogether 1700 mines, deposits and significant metallogenic occurences
    - 61 % have not been exploited

    → might well be economic in the future
  - 71 active mines, 16 large closed mines, 54 large unexploited deposits and 56 potentially large deposits in the database based on the relative value of the in situ metal contents



Mine environmental management – Regulation in key role

- **Mining Act (621/2011)**
  - objective of this Act is to promote mining and organise the use of areas required for it, and exploration, in a socially, economically, and ecologically sustainable manner
- **Environmental Protection Act (527/2014)**
  - Implements the European Union directive on industrial emissions (integrated pollution prevention and control, IED), which obliges EU member states to integrate the control of emissions caused by industry. A general act on the prevention of pollution, which is applied to all activities that cause or may cause environmental damage. The act defines more explicitly the requirements of environmental permits and the prerequisites for granting a permit.
- Environmental Protection Decree (713/2014)
- Nature Conservation Act (1096/1996)
- Act on the Protection of Wilderness Reserves (62/1991)
- Land Use and Building Act (132/1999)
- **Water Act (587/2011)**
- Reindeer Husbandry Act (848/1990)
- Radiation Act (592/1991), Nuclear Energy Act (990/1987)
- Off-Road Traffic Act (1710/1995)
- **Dam Safety Act (494/2009),** Finnish Government Decree on Dam Safety (319/2010)
- Chemicals Act (599/2013), CLP regulation (1272/2008/EY), REACH regulation (1907/2006/EY)
- **Waste Act (646/2011)**
- **Waste directive (98/2008/EY) and Mine waste directive (2006/21/EY)**
- **Finnish Government Decree on waste from extractive industries (190/2013)**

Authorities – Role and duties according regulations (1/2)

- **Finnish Safety and Chemicals Agency (Tukes) acts as the mining authority**
  - Tukes is a national licensing and supervisory authority to endorse the safety and reliability of products, services and industrial activities in Finland
  - Exploration is subject to a permit granted by the mining authority (**exploration permit**)
  - The establishment of a mine and undertaking of mining activity are subject to a permit (**mining permit)**
  - The construction of a mine, and its productive operations are also subject to a permit by the mining authority (**mining safety permit**)

Authorities – Role and duties according regulations (2/2)

- **Regional State Administrative Agencies (AVIs)** are the state authorities charged with issuing environmental permits under **Finland's Water Act (587/2011)** and **Environmental Protection Act**
  - All the environmental effects of the activity will be assessed during the consideration of the permit
  - Environmental permits are needed in Finland for all activities that may lead to pollution of the air and water or contamination of the soil. Water permits are needed for other activities affecting constructions in waters or the water supply
- **Centres for Economic Development, Transport and the Environment (ELY Centres) supervise adherence to the environmental and water permits** granted by regional state administrative agencies and ensure that public interest is taken into account in environmental and water issues. **ELY Centres act as contact authorities in impact assessments** carried out in accordance with the Act on Environmental Impact Assessment Procedures and issue opinions in environmental impact assessments of plans and programmes.

Environmental impact assessment

- The environmental impact assessment (EIA) procedure aims at reducing or preventing the negative environmental impact of projects. Examples of projects include highways, landfill sites and power plants.

- In the EIA procedure, the impact of the project is assessed at the preparation stage, before any decisions are made and when the forthcoming solutions can still be influenced. The EIA procedure is a project planning tool, and its results should be taken into account when granting permits for projects.

- **Guide: Environmental Impact Assessment Procedure for mining projects in Finland** http://urn.fi/URN:ISBN:978-952-227-964-4

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Responsibilities of mine companies (1/2)

- Mine Act and Environmental legislation stipulates the responsibilities
- Operation according the permit regulations issued for the activity
- Ensure mine environmental safety, e.g.
  - Structural and technical safety of the mine
  - Prevent dangerous situations and limit detrimental consequences caused by them
  - Mining activities do not cause damage to people's health or danger to public safety, do not cause significant harm to public or private interests
- Ensure that potential future use and excavation work at the mine and deposit are not endangered

Responsibilities of mine companies (2/2)

- Duties based on general principles of the Environmental Protection Act:
  - the prevention or reduction of harmful impacts (principle of preventing and minimizing harmful impact)
  - The principle of caution and care
  - the use of the best available technique (BAT principle)
  - the use of best practices to prevent pollution (principle of environmentally best use)
  - It is the duty of parties engaged in activities that pose a risk of pollution to prevent impact and eliminate or minimize harmful environmental effects (principle of 'polluter pays').
- Operators must have sufficient knowledge of their activities' environmental impact and risks and of ways to reduce harmful effects (knowledge requirement)
- If the activities cause or may directly result in environmental pollution, the operator must take the appropriate action without delay in order to prevent pollution, or, if pollution has already resulted, to reduce it to a minimum (obligation to prevent pollution)

→ **Need for R&D studies**

Best available technigues and best practices to prevent pollution

- Research reports and articles
- Several guide books and wiki pages published recently
  - Best Environmental Practices in Metal Ore Mining
    http://hdl.handle.net/10138/40006
  - Mine Closure Wiki
    http://wiki.gtk.fi/web/mine-closedure
  - Guidelines for mine water management
    http://www.vtt.fi/inf/pdf/technology/2016/T266.pdf
  - Dam safety guide
    http://www.ymparisto.fi/en-US/Waters/Use_of_water_resources/Dams_and_dam_safety/Dam_Safety_Guide
- EU Commission Reference document on best available techniques (BAT)
  - Management of tailings and waste-rock in mining activities
    http://eippcb.jrc.ec.europa.eu/reference/BREF/mmr_adopted_0109.pdf

Reference document on best available techniques (BAT) - Management of waste from extractive industries

- Reference document on best available techniques (BAT) on the **management of tailings and waste-rock in mining activities** abbreviated as MTWR BREF was published by the European Commission in January 2009
  - Includes mineral processing, tailings and the waste-rock management of ores that have the potential for a strong environmental impact or that can be considered as examples of “good practice”.
- The European Commission launched the process of reviewing and adapting the current best available techniques reference document (BREF) on Management of Tailings and Waste-Rock in Mining Activities in order to make it consistent with the Directive 2006/21/EC on the **management of waste from extractive industries** in the end of the year 2013.
  - The technical working group (TWG) counts more than 150 experts representing member states (MS), industry, environmental non-governmental organizations and commission services.
  - The Finnish National working group consist of member from SYKE, VTT, GTK, ELY Centre and AVI, mining companies (FQM Pyhäsalmi Mine Oy, Yara Suomi Oy, Boliden Kevitsa Mining), FANC, YM, FINNMIN. TWG members of Finland are: Timo Jouttijärvi (SYKE), Soile Backnäs (Kainuu ELY Centre), Margareta Wahlström (VTT).
  - The work of the TWG was led and coordinated by the Institute for Prospective Technological Studies (IPTS) of the Joint Research Centre (JRC) in Seville (Spain).

→ **New best available techniques reference document will be published early 2018**

Role and focus of MWEI BREF

- The MWEI BREF should be seen as a reference document aiming at:
  - Providing industries, competent authorities and environmental NGOs with **up-to-date BAT information and data on the management of extractive waste**;
  - **Supporting decision makers** to take all the measures necessary to prevent or reduce as far as possible any adverse effects on the environment and human health brought about as a result of the management of extractive waste as stated in Article 4(2) of Directive 2006/21/EC.
  - The MWEI BREF **is not a legally binding document**; however, the MWEI BREF can act as a **reference document to enhance the consistent application of Directive 2006/21/EC by those involved.**
- Chapter 5 of the document, BAT conclusions, provides key information and data on BAT ensuring that extractive waste is, as far as possible, managed without endangering human health and without harming the environment
  - Description of BAT, applicability, the emission levels associated with BAT, associated monitoring, associated consumption levels and relevant site remediation measures

The BAT conclusions focus on

- Handling, treatment and storage of extractive waste on the operating site
- Directly associated activities with the waste management facility
  - Site selection, ground investigation and construction materials selection
  - Extractive waste facility construction and management based on long-term stability and safety
- Characterisation and monitoring of extractive waste characteristics
- Techniques to prevent and control emissions to air, soil and water
  - Prevention of extractive waste and extractive waste influenced water generation
- Techniques to minimize and reduce the consumption of energy, water and reagents
- Closure and site remediation measures

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Role of research institutes and universities

- **Applied research** is in central role to increase the knowledge on new methods and technologies and best practices in mine environmental impact assessment and management e.g.
  - Environmental monitoring
  - Hydrogeology and environmental geochemistry
  - Water treatment and waste management technologies
  - Mine closure and rehabilitation
- Annually tens of Master theses and Doctoral theses studies are finalized related to mine environmental impacts and management of impacts
- Significant amount of mining environmental R&D research is conducted in research institutes and universities
- **More cooperation is needed between the research organizations and universities and authorities and mine companies!**

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Mine specialization program - Aims to increase special know-how of mine environmental safety

- Close cooperation with research institutes and universities
  - Following latest R&D
- Expert service - review of plans and reports, statements of EIA and permit applications
- Participation into EU working groups (BREF document)
- Best available techniques (BAT) and Best environmental practices (BEP)

  → Share information on BAT technologies and good practices
- Video lectures, workshops and seminars
- Focus in:
  - Mine waste management and recycling
  - Geotechnical waste facilities and dam safety
  - Mine water management, treatment and recycling
  - Contaminant migration in mining environment
  - Environmental effects to recipient rivers, lakes and groundwater
  - Environmental monitoring
  - Crisis/failure situations
  - Mine closure and rehabilitation
  - Juridical questions (e.g. bankruptcy situations, use of collateral security, environmental offences)

→ Improve quality of EIA process, mine environmental supervision and permitting of mines

Thank you for your attention!

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