



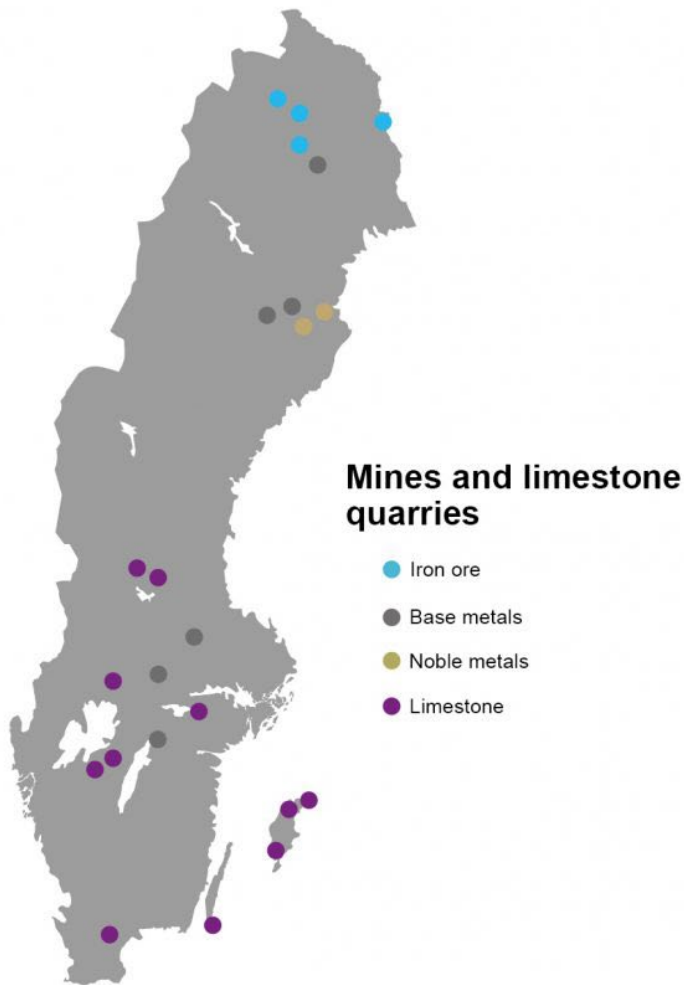
From Underground Ore Extraction to Steel Production

Innovation and IP in sustainability transformation of base industry, Margareta Ydreskog (margareta.ydreskog@epiroc.com)



Some "mined out" information

Sweden – Europe's mining nation



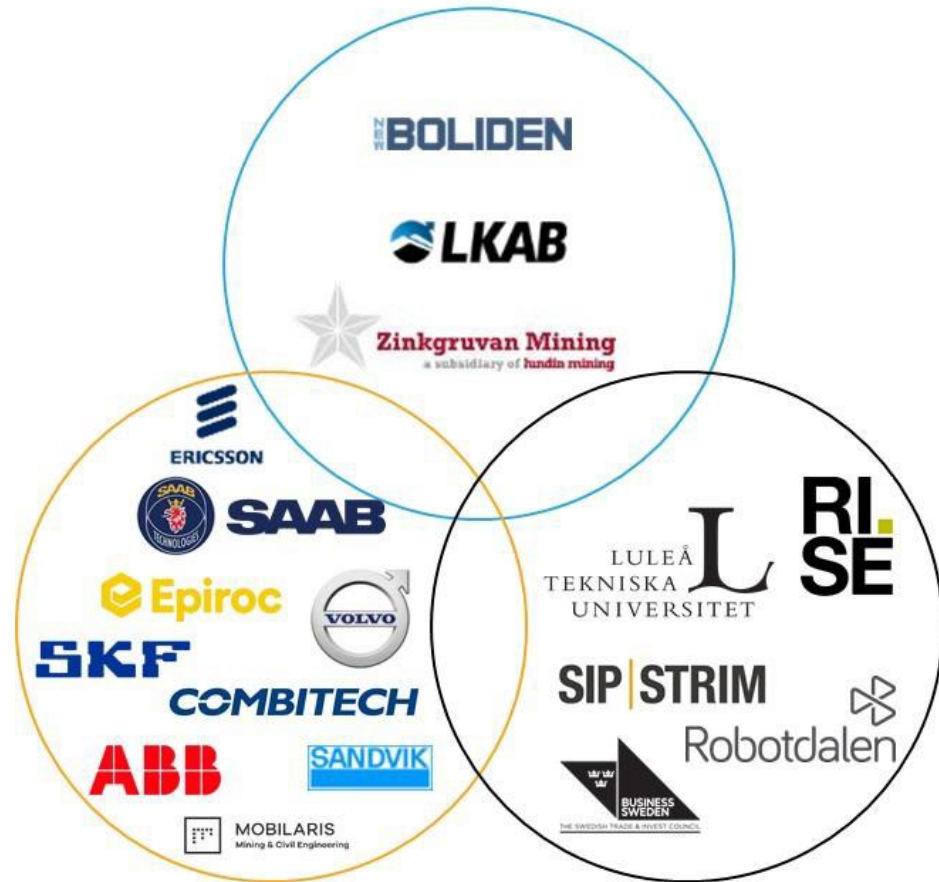
- 93% of all iron ore produced in Europe 2020.
- Global sales ~400 billion SEK (2019), >20% of total Swedish export of goods
 - Mined ore and minerals
 - Mining technologies (60% of global sales for underground mining equipment)
 - Refined ore and minerals, e.g., steel
- Significant carbon footprint 7-9% of total carbon dioxide emissions in Sweden, but "best in class" in global perspective
- Targets:
 - 2035: Fossil free mining
 - 2045: All processing steps are climate neutral and all energy use is fossil free

87,9 million tonnes
Production of **metal ores** in Sweden 2020

6,8 million tonnes
Production of **industrial minerals** in Sweden 2020

Innovation and IP in the sustainability transformation

Innovation through collaboration



Stimulation through funding



A new fossil-free Swedish model

From targets to reality – large scale innovation initiatives

- Sustainable Underground Mining - SUM
Developing carbon dioxide-free, digitalized, autonomous mining at great depth
- Hydrogen Breakthrough Ironmaking Technology - HYBRIT

Fossil free steel – transforming one of the world’s dirtiest industries responsible for more than 7 percent of global CO₂ emissions to sustainable steelmaking.



Source: <https://www.ssab.com/en/news/2021/08/the-worlds-first-fossilfree-steel-ready-for-delivery>

SUM – Project organisation

”New world ”standard” for sustainable mining at great depths”

Innovative technology and improved processes

Carbon-free, digital, and automated



HYBRIT - JV

”Value chain for fossil-free steel”

Fossil-free production of iron ore pellets

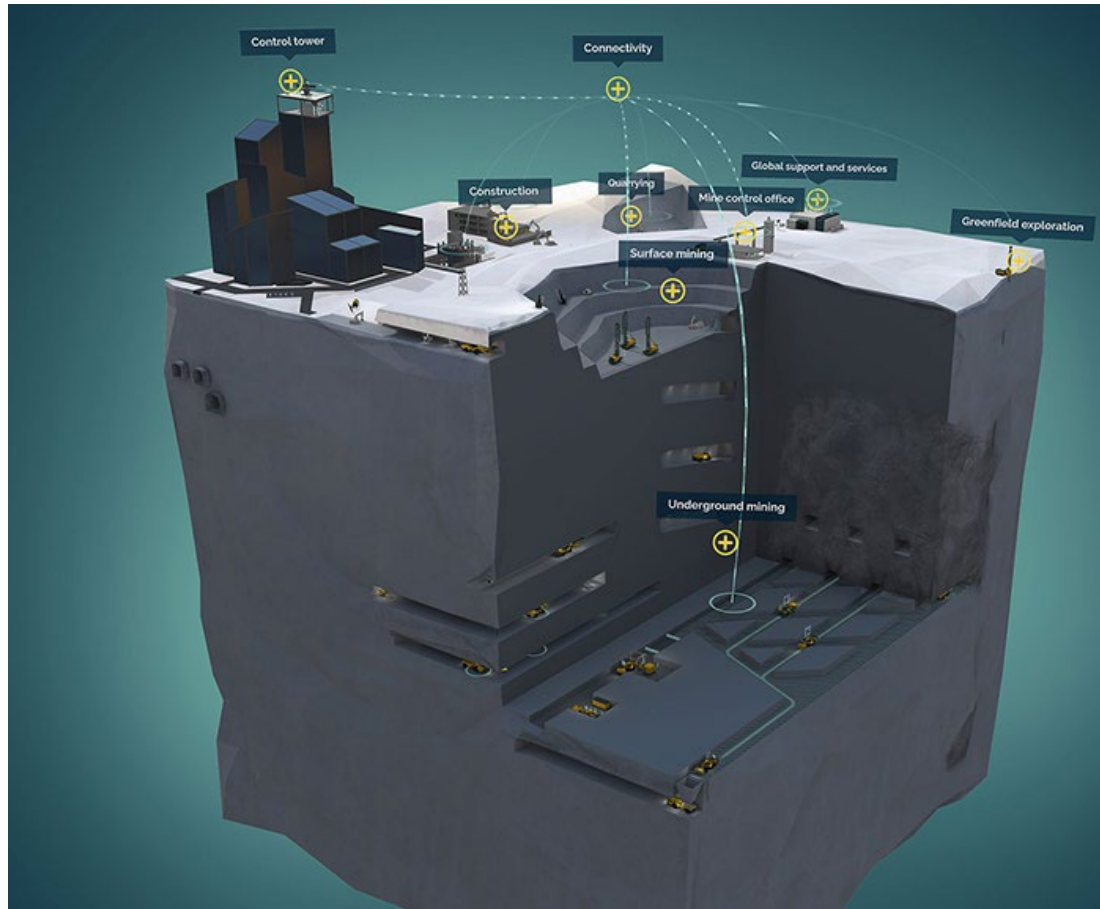
Underground hydrogen storage

Direct reduction plant



Collaborative innovation – From background to results

Ownership, right to use, and licensing



World of Epiroc

- Massive transformation on-going and collaborative efforts key, as well as public funding
- Significant IP and IPR creation within the on-going projects, but also within the industry as a whole and on a global basis
 - proprietary aspects, e.g., ownership and right to use, regulated through various agreements between partners
 - open aspects, e.g., standardization and licensing models, to accomplish "world standard" will likely be more challenging

Going forward

Sustainability solutions for the "world" of mining and steel manufacturing?

- Sustainable mining and steel manufacturing standards – how, when, and for whom?
 - Fair return on investments within industry segment(s) not yet used to extensive licensing and standards
- Freedom to use
 - Increased patent filings within all mining areas, not the least by new competitors/players from China
 - "World standard" – how far does our "world" reach when there is no standardization body in place and what needs to form part of a "standard"?
- Patent litigation increasing
 - In particular with regard to solutions addressing sustainability aspects
- Long way to fully commercially viable solutions - 2035/2045 horizon

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