



The Road to 2050

Bridging the Gap Between Challenges
& Solutions in the Mining Sector.

Mining

Bridging the Gap Between Challenges and Solutions in the Mining Sector

The Province of British Columbia, through their CleanBC program has set GHG emissions reduction targets of 40%, 60% and 80% for 2030, 2040, and 2050. They have also set a target for industry to reduce industrial emissions by 2.5 Mt. The challenge for the mining sector is not only to meet those targets, but to do so while meeting the growing demand for minerals and safeguarding the environment.

While targets and milestones give companies goals to achieve, the path to those goals is less clear. An industry roadmap is a tool that is used by an industry to trace the future technological paths that will be required to achieve the end goal, predict future market demands and opportunities, and coordinate the development of multiple technologies from an industry-wide viewpoint. It often opens up opportunities for collaboration.

This introductory document is meant to provide a snapshot of the roadmaps and approaches in use in the mining sector in BC in relation to meeting the targets for 2030-2050, and is part of a series of roadmap landscapes CORE Cluster and Foresight are producing in the six sectors of CORE's focus.

This summary of roadmaps and how they are being used can also help to identify 1) places where roadmaps either don't exist or are insufficient to achieve the government's targets and 2) areas where the industry would benefit from further support in order to achieve the targets.

What's At Stake

- Primary mineral and metal production is responsible for approximately 10% of global carbon emissions.¹
- The production of minerals, (e.g. copper, zinc), may need to increase by more than 200% by 2050 to meet the growing demand for clean energy technologies.²
- Energy used by the industry is estimated to be between 1.25% up to 11% of the world's total energy consumption, depending on source.³
- BC mining industry directly employs more than 10, 000 British Columbians.⁴





Roadmaps in the BC Mining Sector

Interviews with a cross-section of industry players suggests that the approach to roadmaps for the mining sector in BC is company-specific rather than cross-industry. While all companies recognize the need to move toward carbon neutrality, and see reducing energy usage and costs as significant milestones in that path, there is no standard roadmap in use across the board.

The usage of roadmaps varied. In some cases, in the defined sense of a roadmap as a tool to outline technological pathways towards a goal, companies were not using a roadmap to guide them toward achieving CleanBC targets. For the CMIC (Canadian Mining Innovation Council) roadmaps, the companies were aware of them, but were not using them as a roadmap or guideline. One company was particularly focused on achieving the UN SDG (sustainable development goals). One company is following the ICMM-ICSV roadmap, primarily as a guide toward vehicle electrification and reducing the carbon intensity of operations.

Rather than external, industry-focused roadmaps, the companies had their own business and technology plans in place. They were using internal roadmaps, and not following a roadmap that had been designed with CleanBC targets in mind. The ICMM-ICSV tool is new, limited in scope, and not well known, and there was no other industry roadmap the companies considered comprehensive enough for their needs.

The lack of a consistent technology roadmap to guide the mining sector towards achieving CleanBC targets does not imply a lack of effort or concern. Mining companies in BC are not solely operating in BC. While they are connected into BC and may have exploration units, headquarters, or mining operations here, they are global operations. Their guiding principles are grounded in what they refer to as “social license”, which while not clearly defined, refers in general to the environmental, economic and societal impact of their business, and includes concepts of sustainability. Every mine or mineral processing operation is subject to local environmental regulations and the agreement of their community.

	ICMM - ICSV	CMIC	UN SDG	INTERNAL
Company A	✓			✓
Company B		✓		
Company C		✓		✓
Company D			✓	

We're looking at how to design a mine for electrification.

Observations

Technology Strategy Snapshot

	ELECTRIFICATION	CLEAN ELECTRICITY	ENERGY EFFICIENCY	ORE SORTING
Company A	✓	✓		✓
Company B		✓	✓	
Company C	✓	✓	✓	✓
Company D	✓	✓		



Overview

The key technology areas that the companies were focused on were 1) ensuring a clean energy source and 2) electrification of their operations. These are areas of opportunity for innovation, both at the systemic/policy level and for pureplay cleantech SME's.

While hydroelectric power in BC provides some areas with access to a clean source of power, if a mine is in a remote location where there are no existing transmission lines, there are two options and potential areas of innovation for clean power: 1) build a transmission line, or 2) build power generation and storage facilities.

For electrification of operations, there are opportunities to advance and/or develop technologies to retrofit an existing mine to electric, for electrification of vehicle engines and equipment, and for other cleantech solutions that focus on optimizing energy efficiency at mining sites and facilities.

Barriers/Gaps

- It is costly to get electricity to remote areas and difficult economically to retrofit existing equipment.
- Return on investment and life of electric equipment/mine. The overall life of the mine impacts purchasing and investment decisions, and the business models of many mining companies operate based on these cycles. The life of a new mine is often shorter than the payback for renewable energy generation and storage, and the cost to move the equipment is prohibitive, leaving companies with diesel generators that are cheaper to purchase and easier to relocate, though more expensive to operate. A 3rd party will generally want a 20 yr. power purchase agreement (PPA) in order to finance renewable generation.
- Money is also an issue for access to clean energy and power generation/battery usage - there are high upfront infrastructure costs associated with these types of projects. This is also dependent on mine life and business models - while operating costs may be lower, in the long run, mining companies are hesitant about investing in long-term infrastructure.

Recommendations:

- Given that many mines end up lasting longer than initially planned, the government could de-risk renewable energy projects through funding partnerships with the mine or other community partners: depending on the location the energy could be used for other purposes after the mine no longer needs it. A source of reasonably-priced electricity can be a powerful draw for industry, and expands the capacity for innovation.
- With the concentration of mining company headquarters, engineers, suppliers and industry leaders in the province, BC is a hub of human capital and expertise in this sector. This could be leveraged to create an export market for electrification solutions in mining. If the technology to economically retrofit an existing mine from diesel to electric is developed in BC, it can be exported, making the province a major reference hub.
- BC is also developing an expertise in ore sorting technologies. Increased funding for research and technology development in this area could drive an export market and create jobs, economic growth and innovation opportunities.
- Energy and industrial efficiency is a driving force for change in multiple sectors. There is an opportunity to increase knowledge sharing between parallel industries (water management, transportation, forestry) to advance rapid uptake of technology and explore collaborative project opportunities (e.g. industrial challenges).
- Funding and support for research and development of non-fossil heavy duty trucks and equipment is required.
- Leverage the BC Mining Innovation Roadmap initiative to share learnings and engage the whole sector in activities that drive adoption and development of the technologies required for the mining industry to advance CleanBC targets.





About the Project

The CORE Cleantech Cluster is driving economic development goals of job growth, company growth, investment attraction and trade opportunities in British Columbia by activating, coordinating and developing collaboration opportunities and energizing an innovation ecosystem centred around cleantech and sustainability.

A more detailed analysis of the Mining Sector and its role in the cleantech innovation ecosystem is available in the report [Accelerating British Columbia's Clean Economy: A Cleantech Cluster Strategy for the Province of British Columbia](#).

Foresight

About Foresight Cleantech Accelerator Centre

This roadmap landscape report is funded through [Foresight Cleantech Accelerator Centre](#). Foresight is Western Canada's Cleantech Innovation Centre which supports the identification and validation of cleantech opportunities and the successful commercialization of solutions.

¹ Azadi, M., Northey, S.A., Ali, S.H. et al. [Transparency on greenhouse gas emissions from mining to enable climate change mitigation](#). Nat. Geosci. 13, 100–104 (2020).

² [Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition](#), International Bank for Reconstruction and Development/The World Bank, 2020

³ Rocky Mountain Institute. [Toward Sustainable Mining](#), Sunshine for Mines. July 2017

⁴ [Economic Impact: Mining](#), Mining Association of British Columbia, 2017