

**House of Commons' Standing Committee on Natural Resources
'Creating a Fair and Equitable Canadian Energy Transformation'**

Submitted by: Canadian Critical Minerals & Materials Alliance (C2M2A)
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Thank you again for the invitation and opportunity to appear before the Standing Committee on June 1st, 2022. I am pleased to elaborate upon my opening remarks and to respond to the specific questions posed by members during the Q&A session.

Despite Canada's vast resource wealth, our critical materials remain largely undeveloped and not strategically leveraged, primarily because of the lack of understanding of their significant climate, national security, broad economic and local community benefits.

Critical mineral resources and their mid & downstream processing feed major value-creating clean technologies and next generation jobs. These critical materials are fundamental to clean energy production and utilization, e-mobility, communications, medical and many other applications. The Industry Strategy Council, a forum assembled by ISED and reporting in December 2020 presents a blueprint for implementation – essentially the need for and roadmap for how Canada can enable critical material supply chains development. www.ised-isde.canada.ca/site/innovation-better-canada/en/industry-strategy-council/restart-recover-and-reimagine-prosperity-all-canadians#s-a.1

However, it is clear that realizing this potential is impossible unless Canada and its partners embrace the principles that facilitate a Just Transition. We all benefit by workers, communities, employers and government officials advocating for their own interests and fully participating in the planning process.

As an example, the EU has established dedicated funding streams, strong public sector attention, and partnering with non-governmental organizations and unions as instrumental to this transition. The EU's Just Transition Mechanism is a key tool to ensure that the transition towards a climate-neutral economy happens in a fair way, leaving no one behind. https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal/finance-and-green-deal/just-transition-mechanism_en

C2M2A has over the years proposed a suite of recommendations around critical mineral policy, investment, R&D, secondary sources, education, and trade. In this vein, the following four Just Transition-related initiatives were raised in my opening remarks:

1. Enable First Nations inclusion in value-added infrastructure investment. This participation should not necessarily be limited to resource development (i.e., mining) but consideration should be given to investment and active participation in downstream links in the supply chains. Mined ore products need to be connected to concentration, the refinement of valued elements, then on to the production of alloys, metals, compounds, and ultimately incorporated into specific components. For critical materials, which are unique in that they are not commodities, it is fundamentally important that suppliers directly understand and be connected to customers and their requirements, and that customers work with their suppliers to ensure their application specific needs are met. Individual links don't make a chain. In the critical materials arena, the individual links must be interlinked.

A program for indigenous groups to purchase equity in critical mineral & materials related projects, possibly through soft loans repaid from the indigenous group's share of the profit should be considered. Many indigenous groups understand the strategic nature of critical minerals, however, there needs to be a clear pathway for these groups to benefit by participating in, rather than opposing opportunities. We fully respect this may present delicate balances among different priorities.

2. Work with communities in developing projects that help address energy poverty and invest in new decarbonized energy. 'Cleaner energy for the cleaner mining of critical materials for a cleaner economy' is a growing mantra of end use customers, funders and shareholders. Any plans and actions should be built with the end-in-mind -- addressing what can or will a community do with the infrastructure at end of life? What can it be in its second life? Both communities and consumers of the end products would be beneficiaries.
3. Education – Canada needs to cultivate and prepare a workforce to fully participate in the low-carbon economy while minimizing the impacts of labour market transitions and identifying and supporting inclusive economic opportunities for workers in their communities. The much-needed education and training programs will require programs including hands-on practical experiences to be launched immediately, delivered through industry and schools. As many of today's critical material champions are maturing, they are still emerging players. Support from established majors can provide the on-the-job experiences with longer term employment transferred to the critical materials operations as they ramp up. Furthermore, coordination between the industry and training institutions is often promoted by competing jurisdictions that are successfully attracting automotive investments (e.g. Alabama, Tennessee)

Canada desperately needs a wide range of educated and trained professional and trade pools to meet our net-zero future.

4. Champion research and policies that increase and accelerate Canadian firms' and communities' abilities to develop supply chains built on secondary sources. These initiatives include processing materials currently stored in or destined to tailings ponds or slag heaps, and the processing of effluent streams currently coming off existing operations. Not only does this convert (essentially reclassify) 'waste products' into 'valued resources', but it will also accelerate Canadian development and access to next stage production and move closer to end customers. This will also demonstrate Canada's ability to capture market share and attract value-creating investment in Canada. This would not detract the benefits that will accrue from establishing new mines. Rather, it recognizes and contributes to net-zero goals considering the longer-term timelines required to bring new resources into production.

Canada's mineral wealth, mining and metallurgical reputation, and climate & justice aspirations are held in high esteem internationally. Canada can capture pan-Canadian across-society benefits from its natural resources. We must avoid the traditional trap of exporting domestic raw materials to be processed elsewhere only to be imported as value-added finished products.

Responses to the Members 'Questions

Members invited a written expansion on two specific dimensions of critical material supply chains and the opportunities for Canada (a) Are there pan Canadian solutions in the domestic and global critical materials marketplace? and (b) Is there real potential to establish mid and downstream processing opportunities in Canada? To both questions, the answer is an emphatic 'YES'!

While Natural Resources Canada has identified 31 elements as 'critical', I have focused the majority of the examples cited below on the automotive sectors battery materials (lithium, cobalt, graphite) and permanent magnets (rare earths) and light weighted materials (scandium) needs. The examples cited are not in any specific order.

Saskatchewan Research Council (SRC)

www.src.sk.ca/campaigns/rare-earth-processing-facility

Construction of the first stage of the SRC Rare Earth Processing Facility, which includes a Monazite Processing Unit (MPU), is well underway and is expected to be operational in early 2023. Its fully integrated facility, which includes a Solvent Extraction Unit and a

Metal Processing Unit, is expected to be operational by mid-2024. SRC is advancing the Facility's design and the procurement of highly specialized plant equipment. Five shipments of monazite feedstock are set to arrive at SRC from Brazil (as there is no current monazite production in Canada). Local-to-Saskatchewan, international shipping company TAM International is responsible for the logistical details of these shipments. The Government of Saskatchewan has invested \$31 million toward building Canada's first rare earth processing and separating facility.

Cheetah Resources www.cheetahresources.com

Commencing production in June 2021, Cheetah, owned by Australia's Vital Metals company, is Canada's first rare earths producer from its Nechalacho project in the Northwest Territories. Its initial product output is to be shipped to Norway for further processing. Cheetah has begun negotiations to build and operate a rare earth extraction plant in Saskatoon. Cheetah wants to build its proposed rare earth extraction plant alongside SRC's Facility as their technologies are complementary to each other.

Electra Battery Materials www.electrabmc.com

Electra, formerly First Cobalt is in the process of developing and expanding its refinery to be an integral part of the North American battery supply chain, providing low-carbon, sustainable and traceable raw materials for the region's fast growing electric vehicle industry. In partnership with the Government of Canada, the Government of Ontario, Glencore and Talon Metals, Electra is actively exploring the the establishment of Battery Materials Park. Electra is also collaborating on engineering, permitting, socio-economic and cost studies associated with the construction of a nickel sulfate plant as well as co-location by a global battery precursor cathode active materials manufacturer adjacent to Electra's cobalt refinery and recycling plant. Its refinery is positioned as a critical bridge between the North American electric vehicle supply chain and North American sources of raw minerals and recycled materials.

Neo Performance Materials www.neomaterials.com

Neo manufactures advanced materials that incorporate rare earths and rare earth elements. These products feed catalysts, precursor magnet powders and magnets, water purification systems and multi-layer ceramic capacitor, to name a few. Neo has operations across North America, Asia (including in China) and Europe (Estonia & Germany). Neo has also built a respected network of significant partnerships with automotive Tier 1 and OEM organizations, which has kept it on the leading edge of new product development cycles.

Rio Tinto www.riotinto.com/can

Rio Tinto has produced a first batch of high purity scandium oxide at its commercial scale demonstration plant in Sorel-Tracy, Quebec becoming the first North American

producer of this critical mineral. Scandium is notably used in solid oxide fuel cells and in aluminium alloys. Scandium, in the new generation of lightweight aluminum alloys, will replace conventional metals for the aerospace, automotive and defense industries. Rio is now focusing on production ramp up to bring the plant to its nameplate capacity of three tonnes of scandium oxide per year, representing approximately 20% of the global market. The plant uses the company's innovative process to extract high purity scandium oxide from the waste streams of titanium dioxide production, without the need for any additional mining. The company is also considering near-term expansion options to increase production capacity in line with market demand.

Avalon Advanced Materials www.avalonadvancedmaterials.com/

Avalon's Separation Rapids development in northwestern Ontario hosts one of the largest, undeveloped known resources of the rare lithium mineral petalite. Avalon is actively investigating the potential to serve the glass-ceramics market and producing a high purity lithium chemical for the rapidly expanding market in lithium-ion batteries. The global glass industry, valued at over \$100 billion annually, continues to grow through innovation of new glass products, many of which take advantage of the unique properties of lithium for strengthening glass. In addition to the burgeoning battery industry expansion, the glass industry still represents 25-30% of global demand for lithium. Partnering with Essar Global Fund, the company is working to develop a lithium battery materials process facility in Thunder Bay. This facility would be designed to accept lithium mineral concentrates from its own mineral deposits and potentially other emerging lithium mining operations.

As an aside, Avalon's Lilypad Project in Ontario is focused on cesium and tantalum, which with declining production from traditional sources, is needed in specialty drilling fluids, electric power devices, and photoelectric cells for medical devices and videography. Tantalum's ability to store electricity in small capacitors has allowed the miniaturization of aviation electronics, computers and handheld electronic devices. Avalon is also working toward re-starting production of tin at East Kemptville in Nova Scotia. The site, previously operated by one of the majors, was in production for just six years before closing in 1992 due to depressed tin prices. Growing demand for tin in the electronics sector presents an opportunity to re-develop the site as a North American producer of conflict-free tin.

Search Minerals www.searchminerals.ca

Search is focused on the development of the rare earth district in Southeastern Labrador. Search will leverage its scalable breakthrough patented Direct Extraction Metallurgical Process which provides a high purity rare earth oxide concentrate simply by crushing and treating the mineralized rock. The process effectively eliminates the grinding and wet flotation stages of a more conventional extraction processes, reducing the amount of capital equipment required and the amount of electricity and chemical reagents used in operations. Its pilot plant optimization program was successfully completed in March 2020.

GeoMega Resources www.geomega.ca

Geomega is building one of the world's first sustainable rare earths recycling facility to help meet surging global magnet demand as the transition to vehicle electrification and renewable energy sources accelerates. The market and company recognize that depending solely on the planet's natural resources poses both environmental and supply chain risks. Geomega's in-house developed innovative technology, under the banner INNORD, complimented by Quebec's renewable hydropower, could keep permanent magnets from the landfills by putting these critical rare earths back into a more self-sustaining supply chain. Quebec is the targeted location for the recycling facility.

E3 Lithium www.e3lithium.ca

E3 is a lithium resource and technology company aiming to power the growing electrical revolution. Within the Alberta Lithium permit area, E3 has outlined three resources hosted in the world-class Leduc Aquifer. This covers only a third of the Company's permit area in south-central Alberta. The aquifer is extremely well understood due to decades of historical oil and gas development in the area. E3's combined resources, including the Clearwater project to extract lithium from brine, are being developed on the backbone of the mature and sophisticated oil and gas industry that should the Company to accelerate its development.

Graphite – Zentek www.zentek.com & Nouveau Monde

Zentek, formerly known as Zen Graphene, is an IP development and commercialization company is actively developing a graphene-based fuel additive that can reduce GHG emissions from diesel and bio-diesel fuels by as much as 10% and it could have a similar impact on other refined petroleum products. Graphene nanoparticles in fuel improves heat transfer and combustion by increasing the burning rate leading to increased power. The graphene fuel additive can be introduced to the fuel from the refinery to the fuel tank and is anticipated to be cost-effective in the reduction in GHG emissions.

Nouveau Monde is also working towards developing a fully integrated source of carbon-neutral battery anode material in Québec for the growing lithium-ion and fuel cell markets.

Nanalysis Scientific

Nanalysis is a global manufacturer and seller of compact Magnetic Resonance Imaging and Spectroscopy products. The Nanalysis 60 MHz was the first portable, high-resolution 60 MHz benchtop NMR spectrometer released in the market in 2013. In 2019, Nanalysis introduced then 100 MHz spectrometer, representing the highest resolution instrument available on the market. Designed with flexibility in mind, the instruments can be configured as traditional NMR spectrometers or programmed as analyzers for specific industrial applications (oil and gas, chemical, pharma, biotech, food science, atomic agencies, cannabis, mining). The Company has recently launched an effort to enter the magnet materials making business in Canada.

Canada's Critical Material Process Engineering Support – Significant yet widely spread

There are a significant number of national & commercial laboratories and engineering firms, and universities (mostly at the graduate school level) who have been active in addressing critical material processing. Kingston Process Metallurgy www.kpm.ca provides process development and optimization, through contract research and development services to chemical, mining, and metallurgical knowledge to develop concepts and solve unique challenges for its clients. The core of the company's activities is client-driven experimental research for process development and optimization. We specialize in experimental design, bench-scale laboratory work, mini-pilot campaigns, flow sheet development, unit operation selection, and process modeling to provide clients with conceptual process designs.

SGS Canada, with offices across Canada and known across the world for excellence in exploration and mining have rapidly evolved into highly technical service provision process design, piloting, and demonstration work in critical materials.

Academic institutions (e.g., UofT, McGill, Waterloo, UBC, Memorial, Polytech, Laval) and technical and business-related organizations (e.g., BMAC, C2M2A, MAC, PDAC, METSOC, and the Chambers of Commerce) are also engaging but require national and provincial industrialization collaboration to focus priorities and encourage speed to market.

Accelerate ZEV www.acceleratezev.ca

Accelerate is a national alliance with a mandate to help organize and align Canada's ZEV supply chain to ensure its growth and success. Launched in September 2021 with some 36 Founding Members across the Zero Emission Vehicle sector, including

material and end user organizations (e.g., BMAC, C2M2A, Teck, New Flyer, UNIFOR). More recently, the First Nations Major Projects Coalition is allying with Accelerate and actively participate in Accelerate's material supply chain task force.

The automotive sector driven by electrification, and as such is undergoing the biggest change since the invention of the internal combustion engine. As the automotive industry undergoes transformational change, Canada needs to ensure that it is prepared to succeed in the global marketplace and retain its significant automotive manufacturing footprint. While there have been exciting announcements on EV manufacturing in Canada, compared to other leading jurisdictions, efforts to develop an integrated ZEV supply chain have been modest and disjointed.

Critical Mineral & Material Process and Just Transitioning are Interlinked

As the Standing Committee has heard during other forums, in addition to developing its domestic capacity to produce critical raw minerals and its associated supply chains, Canada, its communities and workers, could transform critical minerals into value-added products. Such an industrial transition would create economic and social wealth in Canada by giving rise to Canadian secondary (or intermediate) processing and advanced manufacturing, thus creating skilled, well-paid jobs and reducing the country's dependence on foreign supplies of these and cutting-edge technologies.

Between mining and technology manufacturing are intermediate processing stages through separation, refining, transforming refined minerals into chemicals and inputs such as cathodes, anodes and oxides, which are used in for batteries, or rare earths for permanent magnets and other applications in electric vehicles. Various links in value chains are well developed in Europe and Asia, and a number of countries have opened up a lead in the value-added critical minerals sector even without raw material feeds. China, which has the resources, including some in significant quantities, and also dominates the processing industry at every stage of the value chains.

This is a unique opportunity for Canadians, to build and Just Transition to a net-zero economy on a promising foundation. Canada must strive for our future health by integrating best practices in circular environmental and social responsibility, particularly with respect to the recycling and reusing materials, increasing transparency, and engaging all parties with collective and local interests. Fairness and solidarity must be defining principles in our critical mineral strategies & plans. Embracing Just Transition principles with the right actions and policies has the potential to create tens of thousands of jobs in Canada with communities and individual Canadians being the beneficiaries. respecting that it is not without its risks in light of global competition.

In conclusion, Canada is able and capable. Industry, governments, communities and workers at all levels need to embrace the need for Just Transition principles. As many have argued, 'It's all in the delivery' We may need to be bolder. So -- 'Let's'!

Respectfully submitted on behalf of C2M2A

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Canadian Critical Minerals and Materials Alliance (C2M2A)

www.c2m2a.org

The (C2M2A) is a non-profit, independent organization which endeavors to grow the Canadian economy through critical mineral supply chains. C2M2A's vision and mission will help Canada diversify its economy, foster job creation and provide an economically viable and healthy environment for future generations. C2M2A's will enable stakeholders around the country to collaborate on shared priorities while respecting each jurisdiction's needs and abilities – including the need to ensure the continued competitiveness and viability of businesses. C2M2A's mission is to foster and enhance Canada's role as a leader in the production of critical materials manufacturing in support of the global transition to a low-carbon, clean-growth economy. By focusing on rapidly advancing the establishment of economic critical materials production and manufacturing capacity — at commercial scale — Canada will secure and grow its economy, compete globally and protect our environment.