

MINING FOR CIRCULARITY

FIVE STRATEGIC INSIGHTS



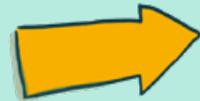


WE ACKNOWLEDGE THE FIRST AND CONTINUING CUSTODIANS OF THE COUNTRIES AND THE GROUNDS UPON WHICH WE ALL WORK, CREATE, LIVE AND DREAM.

We recognize the unique and enduring relationship that exists between Indigenous Peoples and their traditional territories the world over. We welcome their deep knowledge and participation in the regenerative economy.

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MINING FOR CIRCULARITY

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INTRODUCTION

On September 15th 2021, 150 people from 30 countries convened to engage in dialogue to advance our understanding of mining and metals in the circular economy.

The cohort represented public, private and civil society perspectives sharing the approaches, policies and practices both emerging or required for metals and minerals in an increasingly circular, materially intensive global economy.

This global dialogue was an accelerator session of the World Circular Economy Forum 2021 (WCEF2021) hosted by the Canadian Government and the Finnish Innovation Fund Sitra. The annual WCEF presents the world's leading circular economy solutions with participation from business leaders, policymakers and experts around the world.

This session was designed to interrogate the circular economy from different vantages along the mining and metals value chain with the intent to garner key insights and perspectives from all participants.



The session commenced with an overview of key circular economy opportunities and challenges from three diverse perspectives: a major mining company; a company focused on the battery chemicals market; and, a major automotive company seeking to move towards a fully integrated circular economy model of design and manufacturing.

A panel then zeroed in on ways in which collaboration and strategic coordination is happening throughout metal and mineral supply chains in Africa, Latin America, North America and Europe and the lessons we can take from this.

Lastly, the unique challenges faced by different commodities steel, copper, and critical minerals in the pursuit of circular economy values were explored.



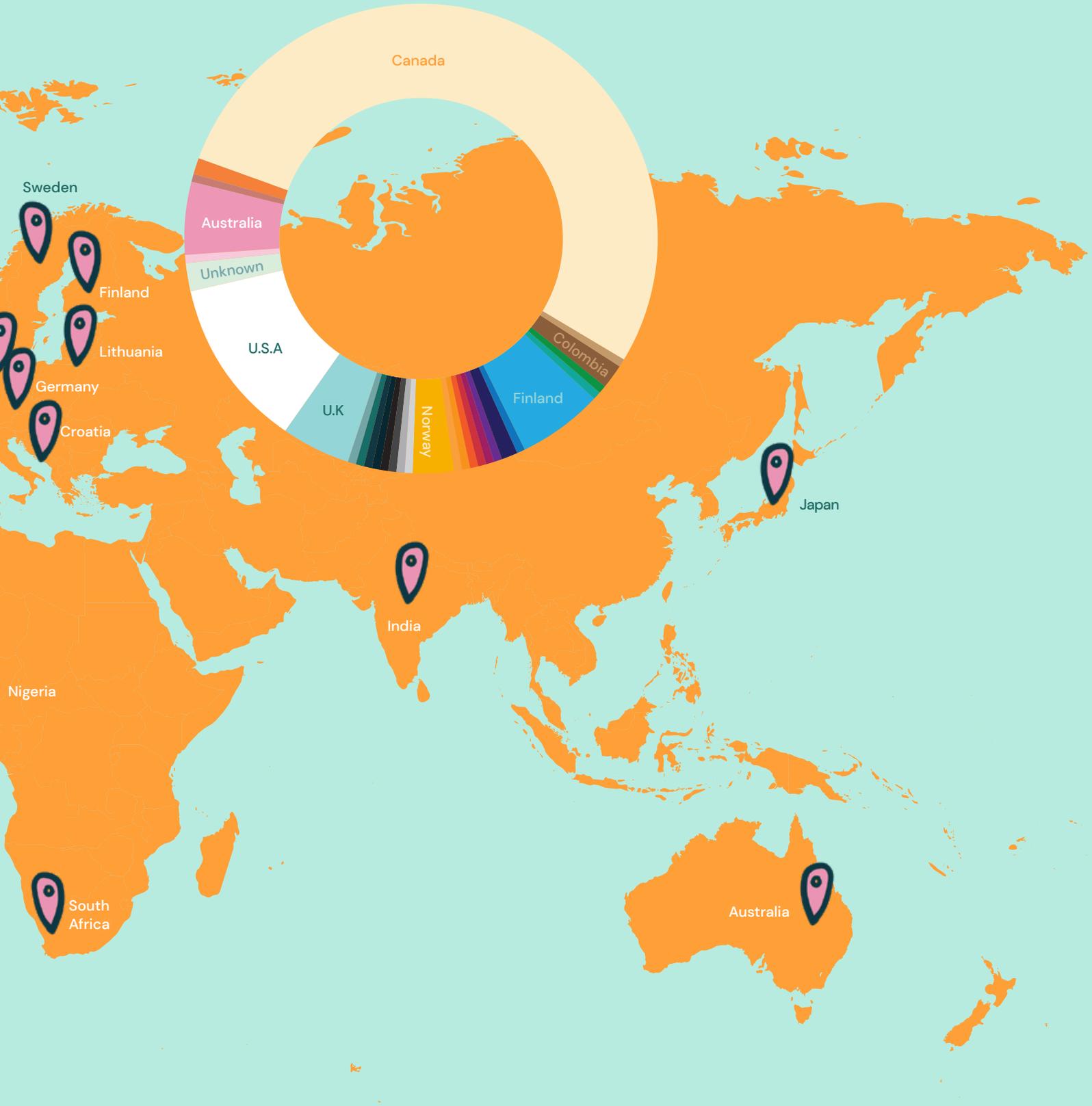
150 PEOPLE FROM 30 COUNTRIES

Convened to engage in dialogue to advance our understanding of mining and metals in the circular economy.



ATTENDEES

Countries of Origin



OBJECTIVES

The industry and practitioner-led discussions were built upon with a focus on three core objectives:

- Advancing a shared understanding of the roles and responsibilities of primary and secondary production of key metals and minerals in regional and international circular economies,
- Identifying examples of the circular economy best practices throughout metals and minerals supply chains,
- Identifying strategic priorities for governments, financiers, producers and buyers of primary and secondary metals and minerals to enable the circular economy strategies and practices.

This accelerator session was co-designed and presented by Circular Economy Leadership Canada, Smart Prosperity Institute, Materials Efficiency Research Group, and Coreo.

TEAM

ORGANIZERS AND FACILITATORS



Geoff McCarney

Professor, Environment & Development & Senior Director (Research) of Smart Prosperity Institute

geoff@smartprosperity.ca



Alan Young

Director, Materials Efficiency Research Group

alanyoung@merg.ca



Ashleigh Morris

CEO & Co-Founder of Coreo

ashleigh@coreo.com.au



STRATEGIC INSIGHT

1

Trust is the invisible wiring that allows systems change to occur

Carl Wetherell who joined the first panel session on collaboration aptly stated:



Without a blueprint to guide us, the new partnerships, collaborations, and conversations needed to power the circular economy will all have a common facilitator: trust.

Forging partnerships with suppliers and organizations across industry borders and historically competitive boundaries will be bridged only by trust. Trust is the invisible wiring that allows systems change to occur.

How will new opportunities be found without a safe space for trying and failing? How will supply loops be optimized without reliable and transparent data between players? How will investment buy-in occur without resilient systems and processes in place? How will employees opt in to change without confidence in the vision?

And how will the mining industry's social licence to operate be viable without trust from all relevant stakeholders?

Trust is what helps people to see that they are infinitely powerful to change the trajectory of our collective story.

Yet trust in and of itself does not imply trustworthiness. A trusting intention must go hand in hand with verification and validation. Intentional trust will enable organizations to be open to new partnerships, but trust will require intentionality when it comes to shared responsibility of risk between parties.

Trust is responsible for perpetuating bias; we trust what and who we know. But trust is also the key to unlock the unknowns, allowing our assumptions to be challenged.

Fostering trust is reliant on having a clear purpose, coupled with connecting that purpose to a collective mission and then verifying progress towards the mission.

While trust cannot solve all the challenges, no challenges will be solved without it.

STRATEGIC INSIGHT

2

Reality and practicality are force multipliers

While trust was recognized as a key building block to advancing innovation towards a more circular metals and minerals value chain, the need for pragmatism clearly emerged throughout the session.

The discourse recognized that while ambitious or aspirational goals for implementation of the circular economy are being set – including discussion of what objectives for ‘zero waste’ might mean in the mining sector – these objectives need to be grounded in realistic and practical steps forward.

There isn’t one pathway towards a circular economy, and discussion during the session clearly illustrated that we are not starting from scratch. There are a range of circular initiatives already being developed and implemented along metal and mineral value chains, including new traceability, process, and technology standards.

What these initiatives demonstrate is that the circular economy is not an ideology, but instead a practical approach to encourage governments and industry to adopt policies and processes that drive innovation in emissions and waste reductions along supply chains.

At the same time, while remaining realistic, there was also a clear trend towards communicating the imperative of transitioning to a circular economy among session participants. Speakers identified the need for well defined and measurable goals to help pace the transition towards greater circularity, while also setting direction and ensuring coordination among stakeholders along value chains. To this end, participants also pointed towards the need for a balance of approaches, including new regulations and policies, but also innovation as well as increased responsibility to advance practical steps towards increasing circularity in the mining and metals sector (see Figure 1).

In your opinion what is the primary driver for the mining and metals value chain to move towards a circular economy?

FIGURE 1



What do you believe is the primary barrier preventing greater collaboration or open innovation to move towards a circular economy in mining and metals?

FIGURE 2



A number of important challenges for taking practical steps towards circularity were also discussed by participants. Key among these were issues of standardisation, and how to ensure the sector avoids fragmentation and slowing down innovation outcomes that result. Engaging multi-stakeholder dialogues to develop standards for secondary materials and to help coordinate innovative ideas were identified as a core solution in this regard. Yet, participants also noted that industry collaboration around data sharing and financing the innovation required for a circular economy remained a requirement for any realistic acceleration of a circular transition. In this respect it was interesting to note that ‘competitive pressures’ emerged as a core challenge for advancing a circular economy among sector participants, outpacing ‘risk/financing’ and ‘awareness’ as a primary barrier to circular economy collaboration (see Figure 2).

STRATEGIC INSIGHT

3

We must embrace different scales of benefits and values



Participants keenly provided examples emphasizing that the circular economy can be implemented at all scales, with different value outcomes for different regions and segments of the value chain. Value delivery across scales needs to inform circular economy strategies, and different regions have taken different approaches to advancing circularity in metals and mining.

The importance of recognizing that the mining sector includes both a global industrial ecosystem of international supply chains as well as regional initiatives, small-scale producers and local impacts emerged through session discussions.

Participants pointed to the importance of global networks, large scale producers and extensive ecosystems to open up opportunities, encourage circularity along global OEM supply chains, and transfer technologies and ideas. At the same time, however, Canadian and Nordic participants highlighted the key role that regional circularity initiatives could play in developing integrated

innovation hubs and platforms and joint roadmaps towards a circular economy, to help scale leadership and ambition.

Bottom-up processes were also emphasized. In particular, participants from Chile highlighted that circularity initiatives there were initially adopted by SMEs and supply firms in the mining value chain. These circular business models were then adopted by mining companies in the region, before informing the development of a national circular economy roadmap (the first in Latin America).

Small scale mining was also identified as a priority for scaling circularity in the mining sector across Africa, where SMEs play a key role in driving innovation and technology adoption in the region. Improving SME support through incubators, and encouraging circular innovation and circular economy business models was emphasized to scale ambition in this context -- in addition to initiatives to increase linkages between large and small scale mining to build from incremental to more transformative change.

STRATEGIC INSIGHT

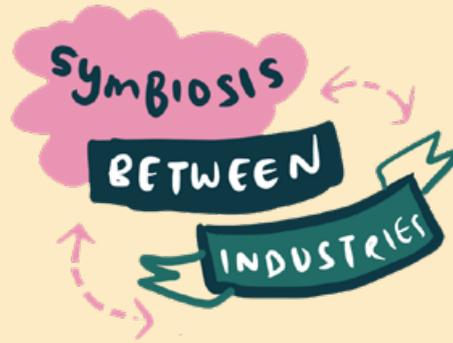
4

To compete or to collaborate? Partnership as the new leadership

There was a clear recognition among participants that circular economy strategies represent significant potential to gain competitive advantage for mining companies.

Advancing low carbon and low waste activities can increase preferential access to a variety of responsible sourcing markets, while driving integrated and systemic innovations that create new levels of operational efficiencies, and capture new value from what were previously seen as liability and cost-oriented waste streams. All this while being invaluable for increasing a beneficial public profile that strengthens the license to operate and, importantly, helps to attract and retain high quality personnel in a tight labor market.

Despite this potential for competitive advantage, the reality is that many important circular economy innovations require new partnerships and can only be effectively enabled by policies and systems that recognize the value of moving beyond the current take/make/waste machinery of the conventional linear industrial systems.



These kinds of circular economy innovations (and the associated benefits) regularly cut across a range of commodities and must run throughout supply chains. They undeniably require collaboration.

Whether it is coordinating on data systems for traceability and transparency from extraction through manufacturing, making meaningful progress on Scope 3 emissions with downstream users, pooling resources to accelerate system wide energy technology breakthroughs, or jointly advocating for enabling regulations for promoting waste to resources investments, collaboration is critical to making progress on circular economy in the mining and minerals sector.

Throughout the sector, organizations are increasingly realizing that other competing companies and other actors along their value chains are all facing similar challenges, whether these are technological, market or policy gaps and obstacles. In order to address and strategically focus investments a number of regions are working to develop circular economy road maps that are derived by bringing together diverse actors to identify common challenges and potential pathways to resolve them. Roadmaps are one important tool identified by several participants to achieve alignment and coordinate public and private sector actions on important circular economy opportunities.

STRATEGIC INSIGHT

5

Step back to inform an integrated systemic approach

If there is one characteristic of circular economy that differentiates it from many other sustainability and resource efficiency initiatives, it is the need to undertake a systemic, integrated approach to problem solving and value creation, throughout the mining and mineral life cycle.

Arguably, minerals are one of the greatest opportunities to demonstrate how we can use natural resources in a truly circular and sustainable manner.

While much of the initial circular economy focus has tended to be on the immense opportunities for recycling of metals and minerals, thanks to their unique properties of durability, this is only a small part of larger benefits of a circular economy transition strategy for metals and minerals supply chains. It is also about advancing increases in the life of all assets, innovative repurposing strategies for end of life products and waste streams, using a service (versus product) model for metal/mineral value use, and ultimately bringing in new partners to help optimize metals/minerals value chains.

With the significant increase in demands for a wide variety of minerals to build the infrastructure for generating, transmitting and storing renewable energy, there is an economic and environmental

imperative to ensure that future mineral extraction and use throughout a range of value chains is done in a way that demonstrates circular economy principles and objectives. This challenge can only be met in the limited time available if a more holistic and integrated approach is adopted.

There are a number of practical priorities that were identified for building these systemic approaches. A central and primary set of technical challenges resides in the need for better and more consistent data that will be necessary to, among other things, extract value from mine tailings, meet requirements for traceability and transparency throughout minerals supply chains, and achieve important Scope 3 emissions reductions. Realizing a more systemic analysis of problems and solutions also requires investment in both internal and external engagement for both companies and governments.

A fundamental structural problem faced by both private and public institutions is the silos that exist and are perpetuated by a range of production requirements and performance incentives that have been built to service the linear economy model. In order to begin to assess the potential benefits of a circular economy transition (along with the unaccounted costs of the existing model) there needs to be a commitment to stepping back from business as usual activities in order to consider what can be accrued by taking a genuinely systemic circular economy approach, and then to explore how this would require changes to existing practices at many levels from the macro strategy to the micro implementation mechanisms. In the absence of this commitment to think more deeply together among private sector, governments and civil society about what systemic circular economy change entails, there is little potential to go beyond inadequate incrementalism.

A PROPOSED PATH FORWARD REALIZING CIRCULAR ECONOMY VALUE FOR ALL PLAYERS

A PROPOSAL FOR PARTNERSHIP



The organizers of this forum are committed to working together with others to enable a collective opportunity and responsibility to advance circular economy strategies in the minerals sector.

The proposed Circular Minerals Consortium envisions five strategic initiatives that will accelerate, integrate and align efforts to be as strategically impactful as possible:

Real-time Insights: Developing a curated platform that would allow and promote sharing of latest research, relevant data and breakthrough circular economy news to keep Consortium members at the forefront of change.

Innovation and Resourcing Coordination: Coordinating investments to avoid duplication of efforts in research and innovation as well as offering opportunities for financing potential collaborations.

Policy and Practice Leadership

Round Tables: Working together to convene policy-makers, technical experts and the business community to advance areas of mutually recognized strategic priorities.

Strategic Roadmap Development Support: Convening diverse parties around recognized strategic priorities to build roadmaps that service and connect diverse regional and sector aspirations.

Circular Capabilities Upskilling Programs:

Investing in broader circular economy capacity building, drawing on our respective skills and institutional strengths.



WE INVITE YOU TO
JOIN US

If this approach to addressing the challenges and opportunities presented by circular economy for the minerals sector aligns with your interests and ambitions, please contact us to become part of catalyzing, convening and coordinating the efforts of the *Circular Minerals Consortium*.

APPENDIX

Speakers and panelists

Graphic Recording

Key Outputs
(Polls & WordClouds)

SPEAKERS & PANELISTS

We would like to thank and acknowledge the valuable contributions of all of the speakers and panelists.

“Unless someone like you cares a whole awful lot, nothing is going to get better. Its not” – Dr. Seuss

KEYNOTE SPEAKERS

Meaning & Drivers of Circular Economy along the Mining & Metals Value Chain

Paramita Das

General Manager, Global Marketing & Development, Rio Tinto

Alessandra Carreon

Responsible Sourcing Manager, Ford Motor Company

Janne Palosaari

Chief Commercial Officer, TerraFame

Moderator: **Ashleigh Morris**

PANEL I

Accelerating Collaboration towards a Circular Economy in the Mining & Metals Value Chain

Carl Weatherell

President & CEO, Canada Mining Innovation Council

Hanna Törmänen

Innovation Advisor, Nordic Innovation

Petar Ostojic

CEO, Neptuno Pumps & Founder, Center of Innovation and Circular Economy, Chile

Steve Kisakye

Director & Global Head, Dalberg Implement & Contributor to African Circular Economy Alliance

Moderator: **Geoff McCarney**

PANEL II

Circular Economy Opportunities & Challenges for Specific Metal & Mineral Supply Chains

Malcolm Shang

Global Mine Closure & Reclamation Specialist & Circular Economy Champion, ArcelorMittal

Jose Araneda

Sustainable Development Manager, Codelco

Daniele La Porta

Senior Mining Specialist & Lead, Climate-Smart Mining Initiative, The World Bank Group

Andrew Ghattas (Director, Critical Mineral Task Force, Policy & Economics Branch, Natural Resources Canada)

Moderator: **Alan Young**

Panel I Graphic Recording:

Accelerating Collaboration towards a Circular Economy in the Mining & Metals Value Chain





Drawn LIVE By CATFISH CREATIVE SEPT 2021

KEY OUTPUTS

This WCEF accelerator was designed to be interactive and foster a diversity of knowledge and perspectives ultimately, enabling us to capture key insights, highlights, and learnings.

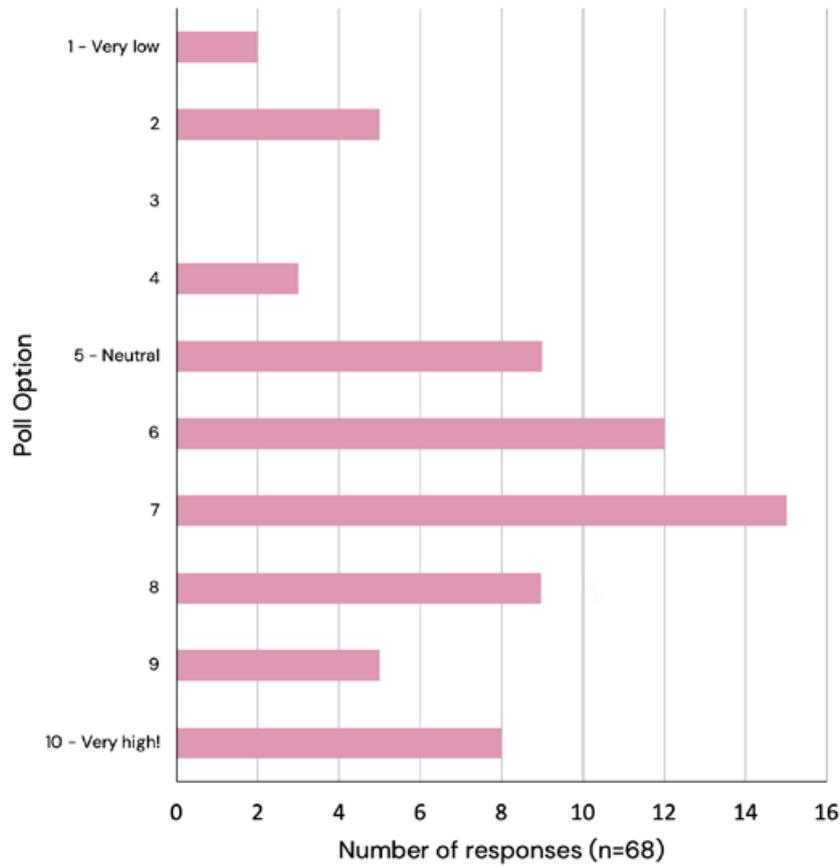
The outcomes of this truly interactive WCEF accelerator session are included below for your reference and use.

THE BASELINE

Poll Question – How would you rate your current level of circular economy understanding?

Poll Option	Count	Results
1 - Very low	2	3%
2	5	7%
3	0	0%
4	3	4%
5 - Neutral	9	13%
6	12	18%
7	15	22%
8	9	13%
9	5	7%
10 - Very high!	8	12%

How would you rate your current level of circular economy understanding?



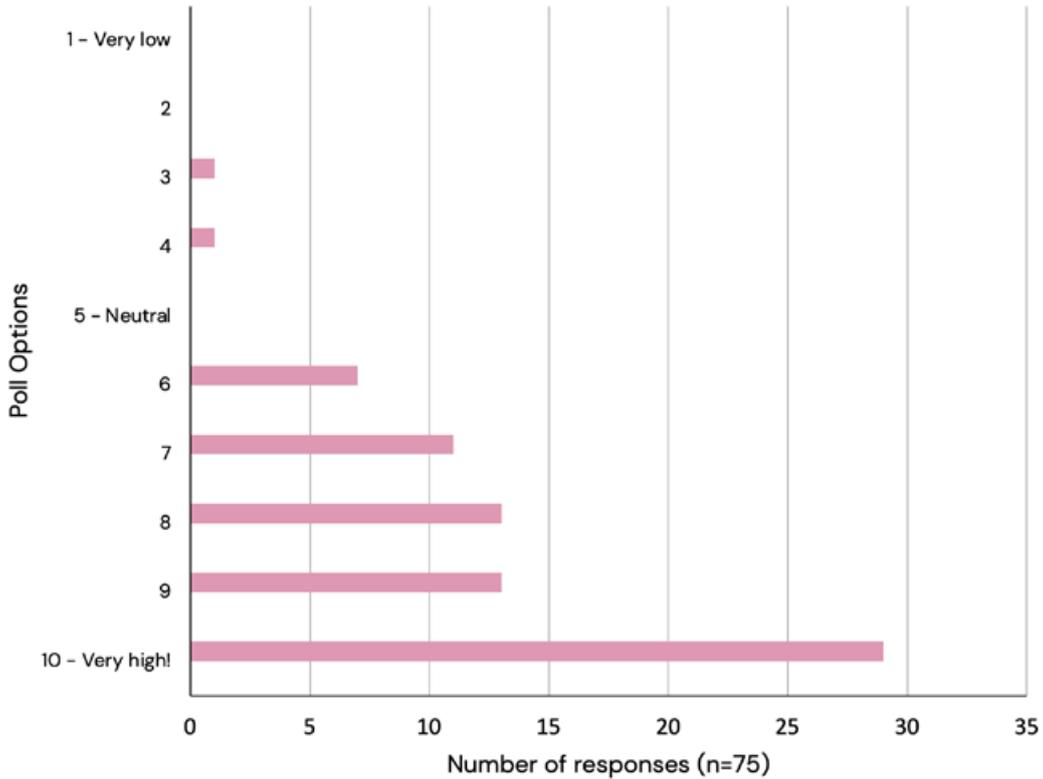
What is one word synonymous with the circular economy? (70 responses)



Poll Question – How would you rate the potential for circular economy strategies to add value to mining and metals supply chains?

Poll Option	Count	Results
1 - Very low	0	0%
2	0	0%
3	1	1%
4	1	1%
5 - Neutral	0	0%
6	7	9%
7	11	15%
8	13	17%
9	13	17%
10 - Very high!	29	39%

How would you rate the potential for circular economy strategies to add value to mining and metals supply chains?



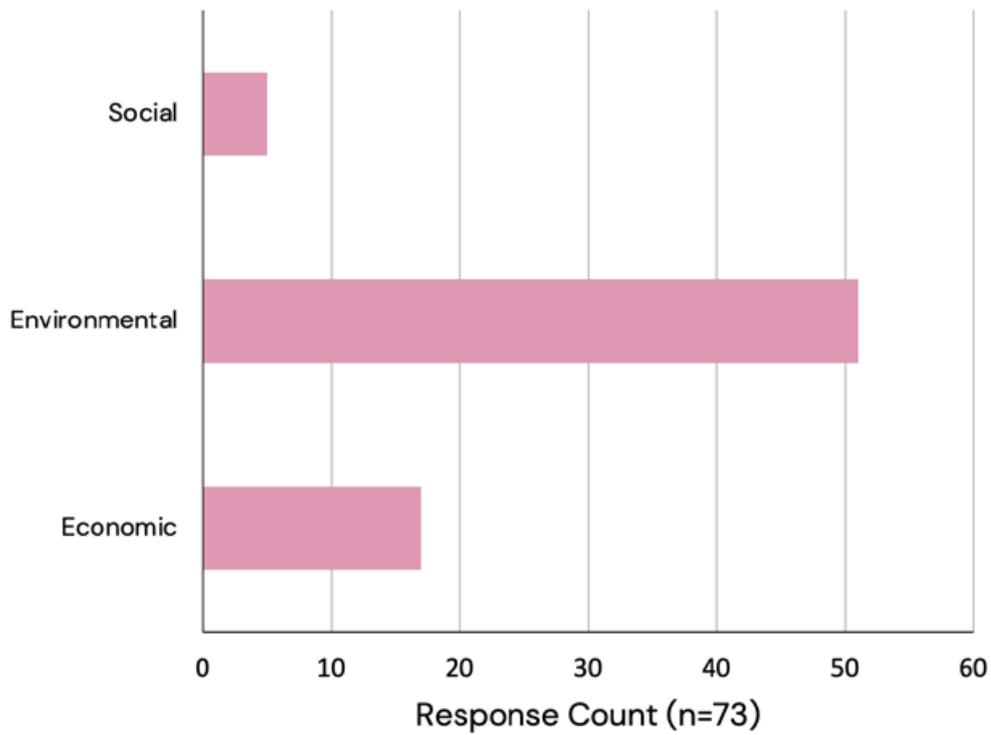
In your opinion, what is the primary driver for the mining and metals value chain to move towards the circular economy? (52 responses)



Poll Question – What type of value do you think the circular economy is most likely to deliver to the mining and metals value chain?

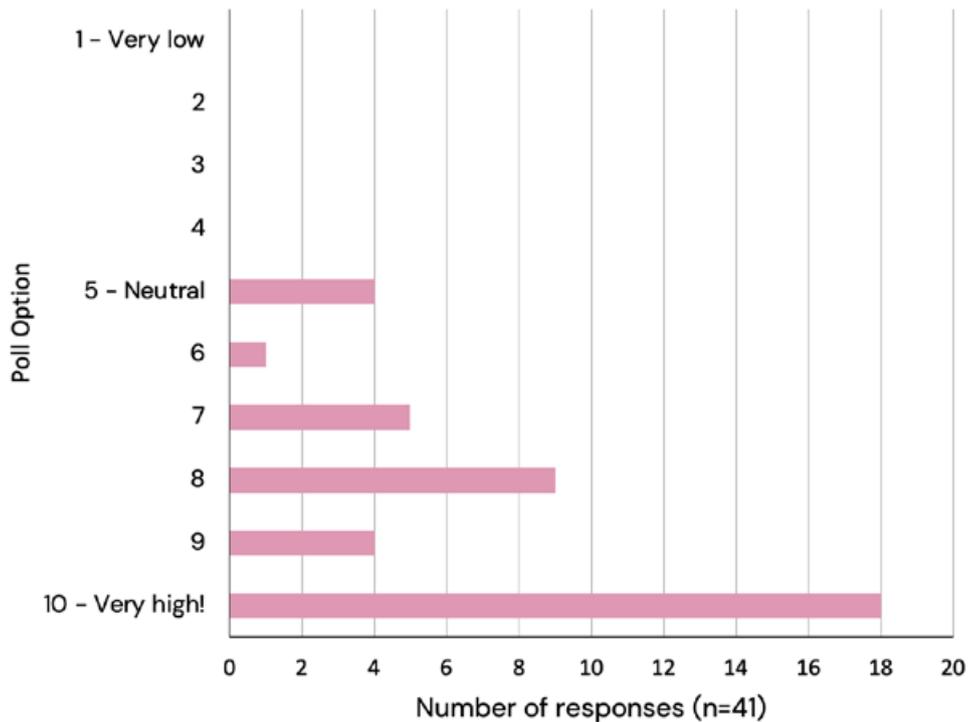
Poll Option	Count	Results
Social	5	7%
Environmental	51	70%
Economic	17	23%

What type of value do you think the circular economy is most likely to deliver to the mining and metals value chain?



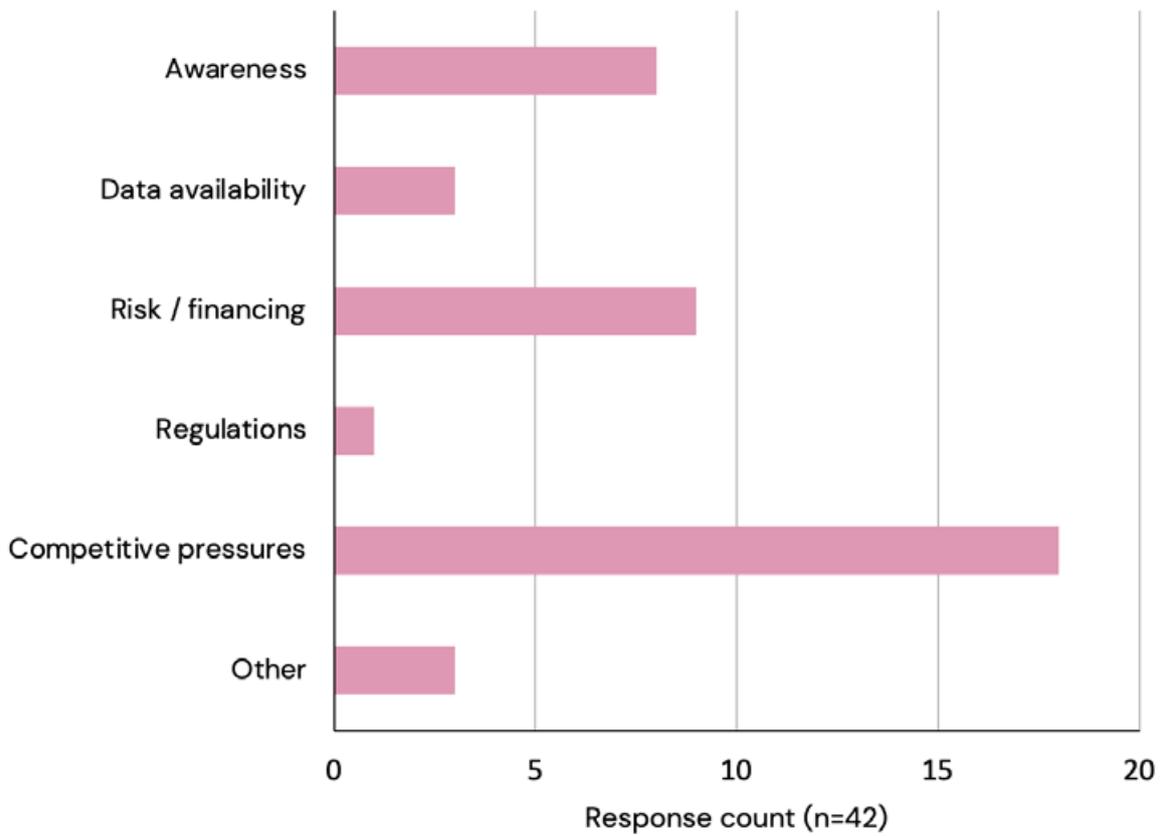
Poll Question – In your opinion, how effective or important are national or regional roadmaps or targets in enabling collaboration or strategic coordination to accelerate a circular economy?

Poll Option	Count	Results
1 - Very low	0	0%
2	0	0%
3	0	0%
4	0	0%
5 - Neutral	4	10%
6	1	2%
7	5	12%
8	9	22%
9	4	10%
10 - Very high!	18	44%



Poll Question – What do you believe is the primary barrier preventing greater collaboration or open innovation to move towards a circular economy in mining and metals?

Poll Option	Count	Results
Awareness	8	19%
Data availability	3	7%
Risk / financing	9	21%
Regulations	1	2%
Competitive pressures	18	43%
Other	3	7%





MINING FOR CIRCULARITY

FIVE STRATEGIC INSIGHTS

ABOUT US



Coreo is a trusted team catalysing the transition to a circular economy; one that serves people and nature, rather than one that people and nature serve. Our dedicated team of systems thinkers, strategists, and all-round doers guide high-profile clients to take circularity from theory to practice, globally. Coreo works across sectors such as mining, manufacturing, fashion, and the built environment, to implement the circular economy.



MERG works around the world in the mining and minerals sector to reduce the risks and impacts, improve benefits for communities, and support responsible business development. We help governments, companies, Indigenous organizations and civil society build sustainable solutions on a range of challenges from regulatory reforms, market standards and assurance systems and responsible supply chains.



Circular Economy Leadership Canada (CEL) is working to make Canada a world leader in building a sustainable, prosperous circular economy that benefits people and planet.



Smart Prosperity Institute is a national research network and policy think tank based at the University of Ottawa. We deliver world-class research and work with public and private partners — all to advance practical policies and market solutions for a stronger, cleaner economy.

MINING FOR CIRCULARITY



World Circular Economy Forum 2021

Accelerator Session: Circularity Across the Mining and Metals Value Chain