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Energy & Extractives

Climate-Smart Mining

IFC International Finance Corporation
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CLIMATE-SMART MINING

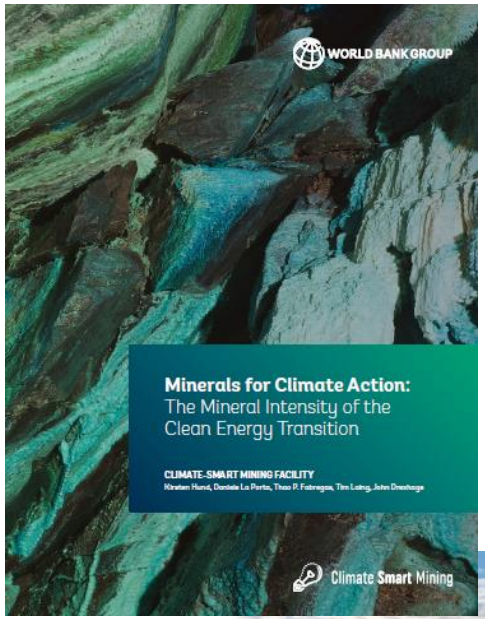
CHILE MINERÍA SOSTENIBLE: DE LA AMENAZA A LA OPORTUNIDAD

NOV 18, 2020

THIS YEAR, WE LAUNCHED A NEW REPORT:
THE MINERAL INTENSITY OF THE CLEAN ENERGY TRANSITION (2020)

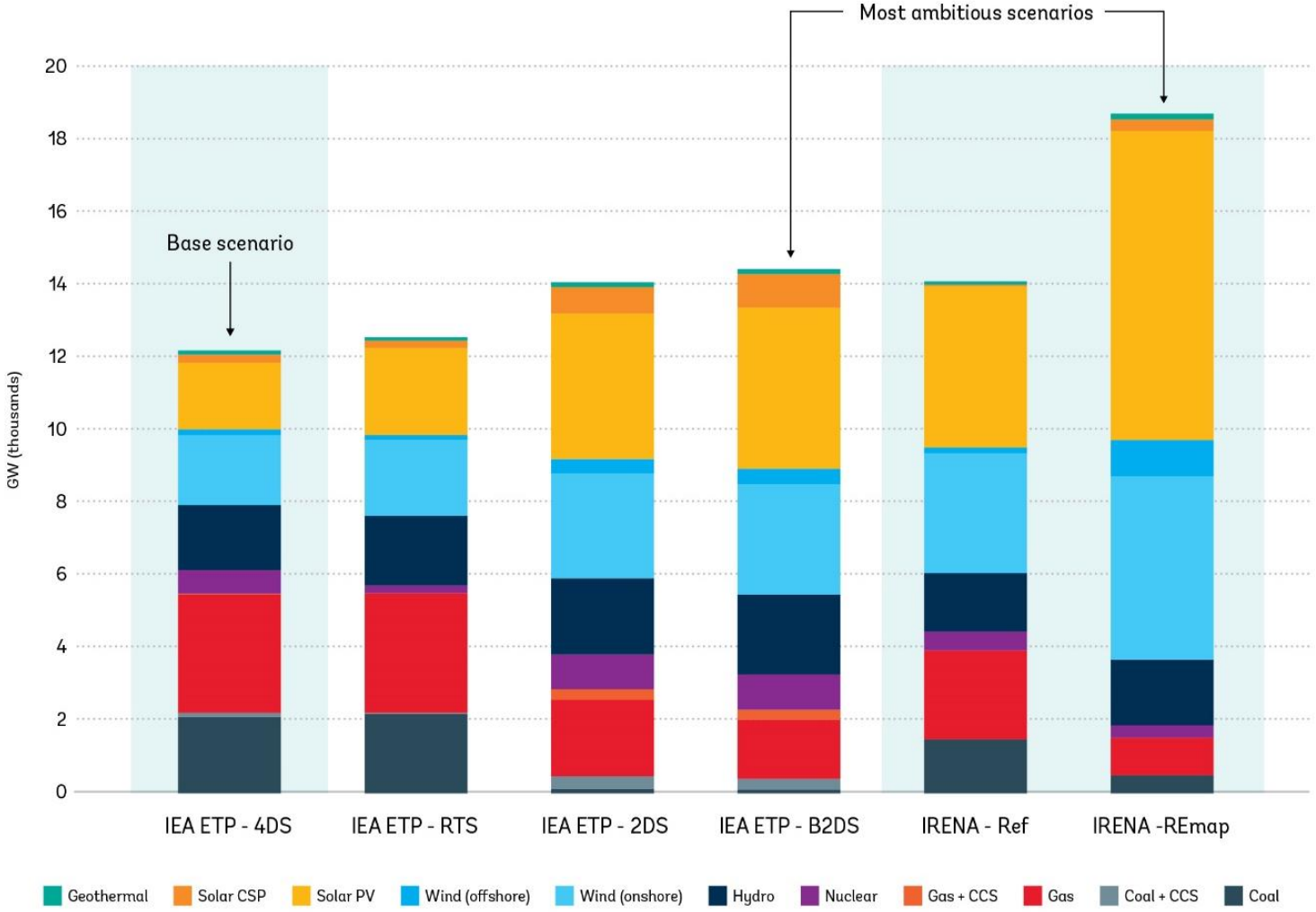
This new report looks at:

- How the demand risk for each mineral changes, depending on whether it is used in one technology, or across multiple technologies clean energy technologies
- Deep dive into different low-carbon technologies and how technological improvements and material efficiency could impact mineral demand
- Potential role of recycling and re-use in meeting demand under a 2-degree scenario
- Carbon footprint of the minerals needed for low-carbon technologies relative to conventional technologies



PROJECTED DEPLOYMENT OF ENERGY TECHNOLOGIES IN 2050

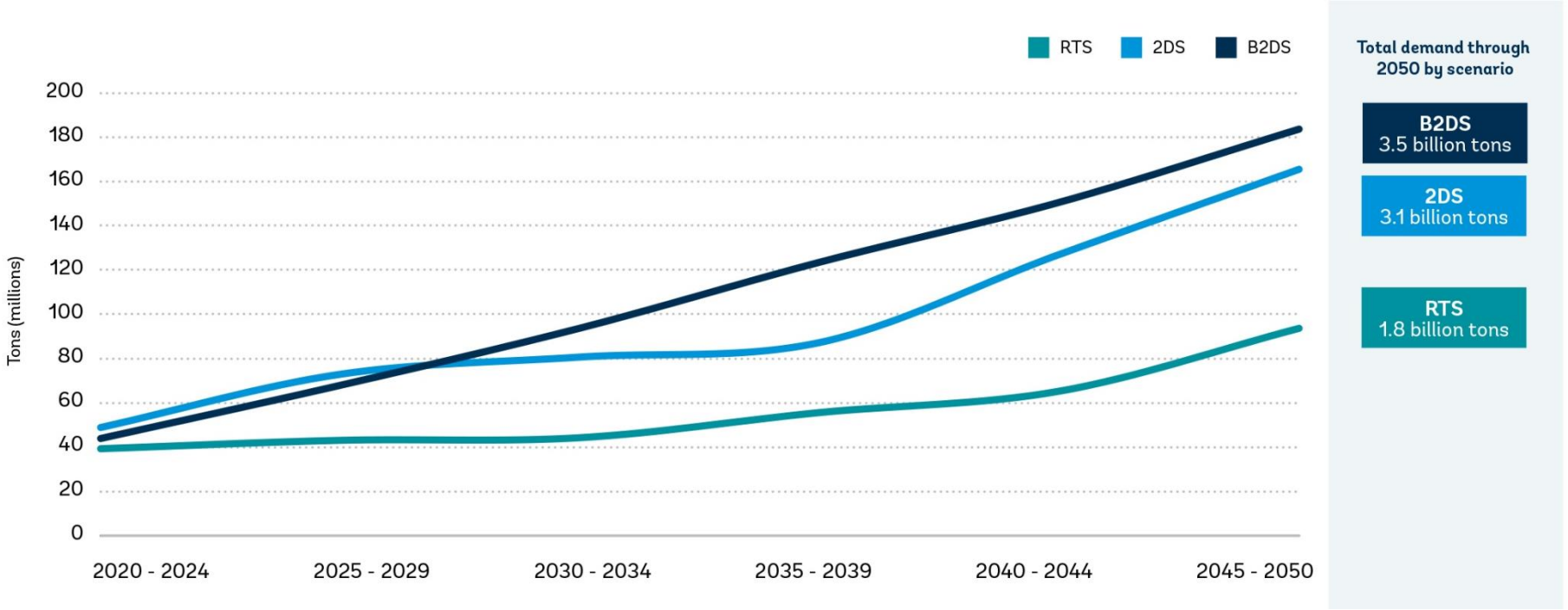
To derive mineral demand, we used **IEA** and **IRENA 2050** scenarios on deployment of electricity generation and energy storage technologies



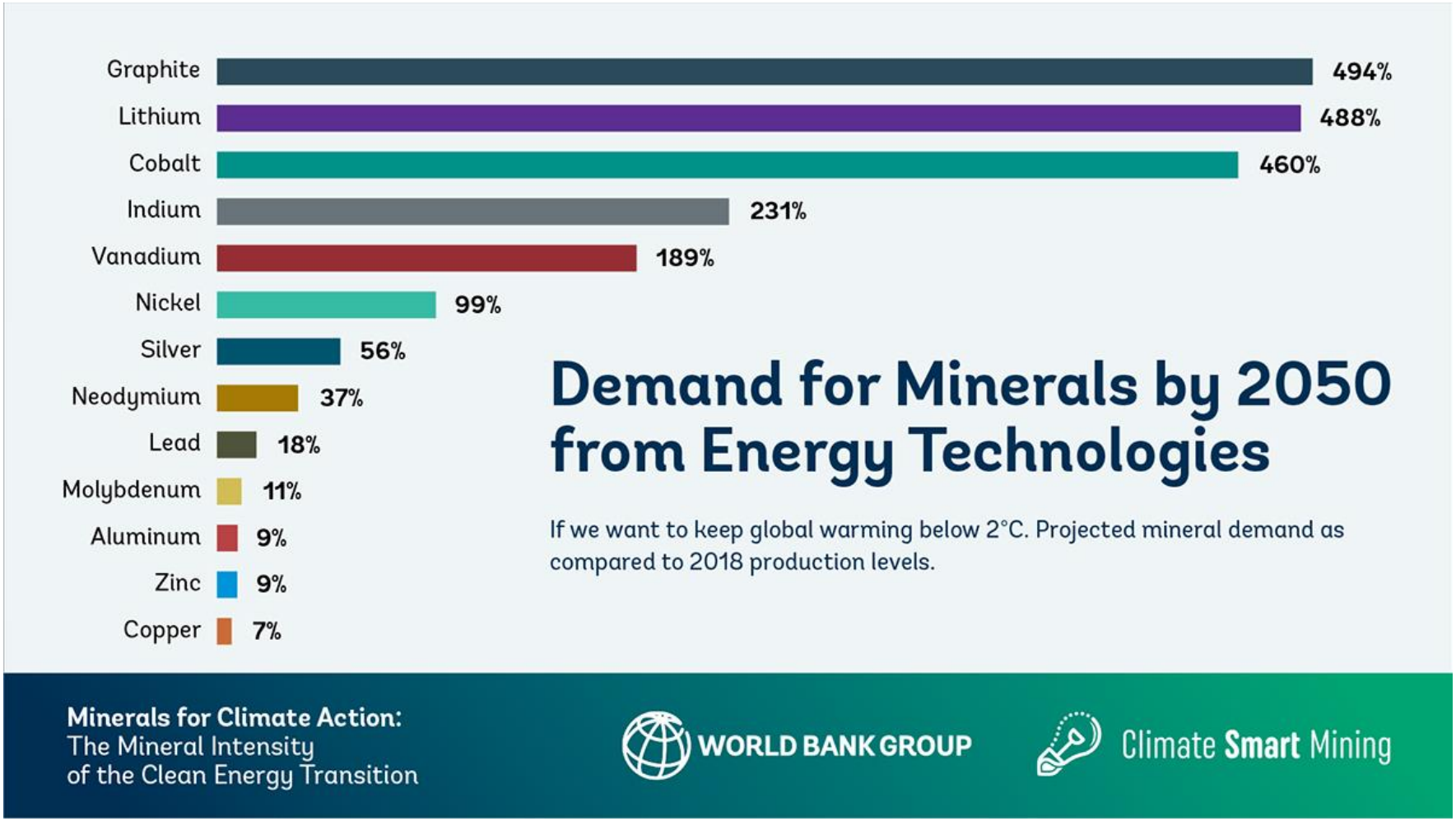
NEW REPORT FINDINGS:
THE MORE AMBITIOUS THE CLIMATE SCENARIO, THE MORE MINERALS NEEDED

More than **3 billion tons** of minerals and metals will be needed by 2050 to achieve a **<2°C scenario**, equivalent to more than a third of all plastic produced between 1950-2015.

Projected Annual Average Demand of Minerals up to 2050 Under the IEA Energy Technology Perspective Scenarios



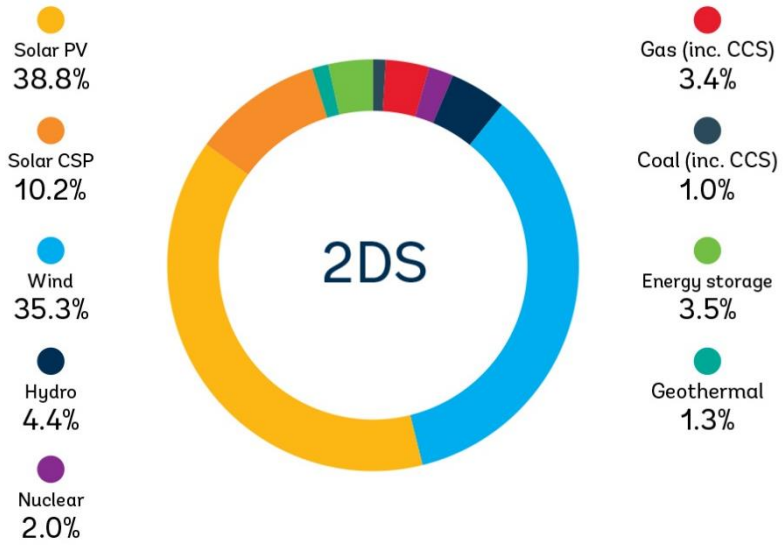
NEW FINDINGS:
DEMAND WILL INCREASE SIGNIFICANTLY FOR SOME MINERALS TO ACHIEVE 2DS



NEW FINDINGS:
CROSS-CUTTING VERSUS CONCENTRATED MINERALS

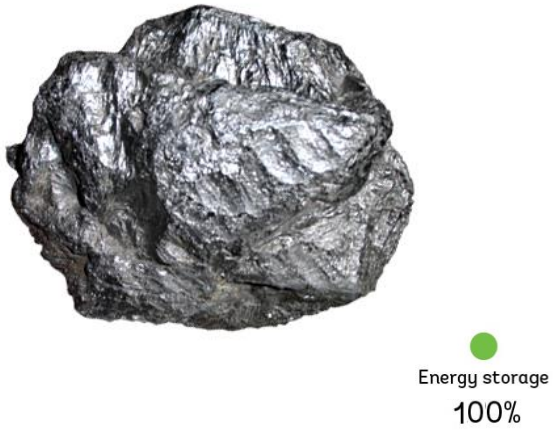
Cross-cutting minerals, like copper, are needed across all energy technologies, while **concentrated minerals**, like graphite, are only needed for one technology (energy storage).

Cumulative Copper Demand by Energy Technology Through 2050 Under 2DS



Note: 2DS = 2-degree scenario, CCS = carbon capture and storage, CSP = concentrated solar power, PV = photovoltaic.

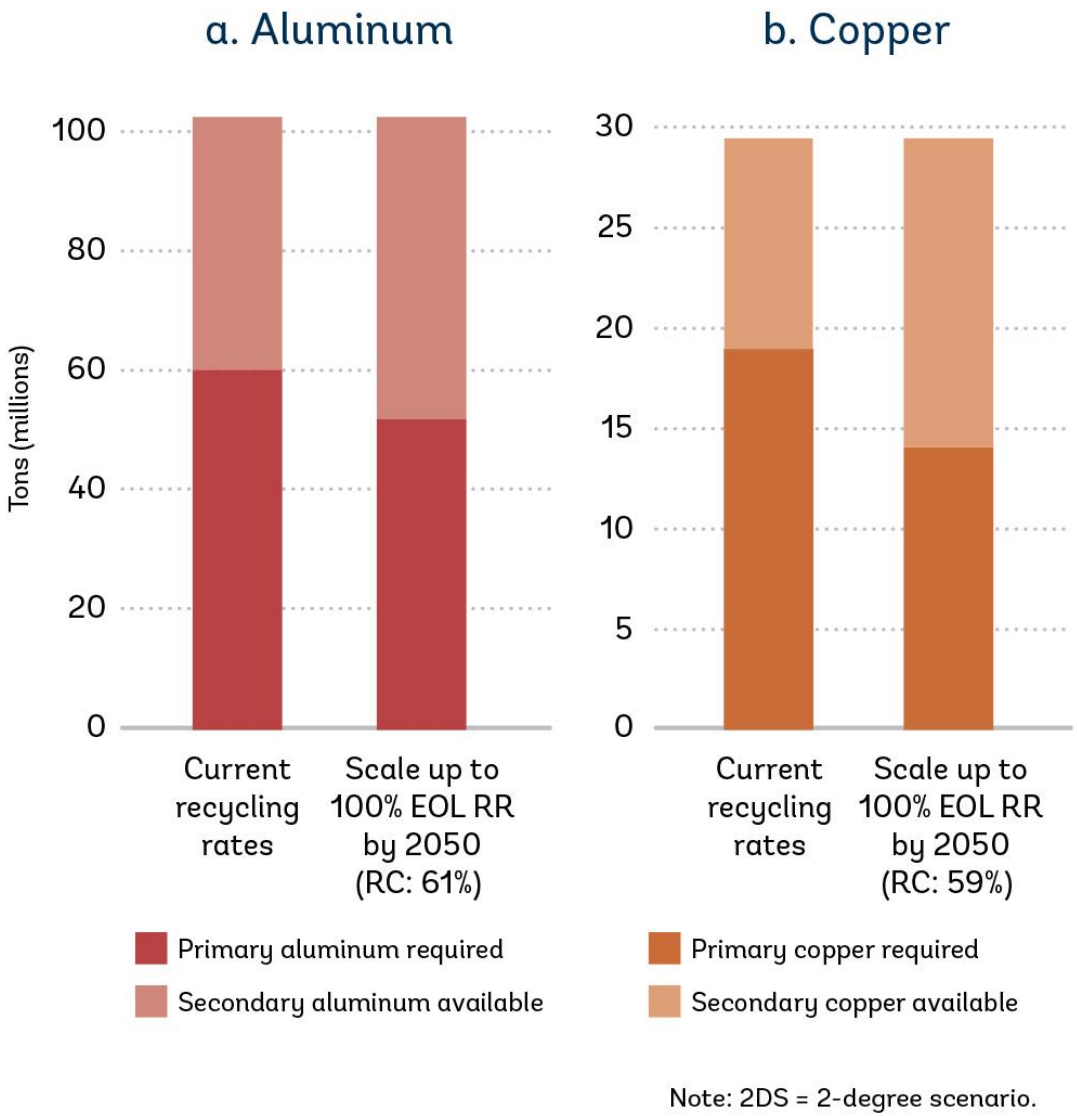
Cumulative Graphite Demand by Energy Technology Through 2050 Under 2DS



Note: 2DS = 2-degree scenario

NEW FINDINGS:
THE ROLE OF RECYCLING IN MEETING DEMAND UNDER 2DS

- **Current recycling rates** refer to how many minerals are recycled at the end of a product's life (**EOL RR**)
- **Recycled content** refers to secondary minerals, which is the amount of recycled mineral that is used in new products
- Even if aluminum and copper from current products are recycled at **EOL at 100%**, it still wouldn't be enough to meet mineral demand under a 2DS
- While recycling can play an important role in meeting demand, **primary production** will still be needed

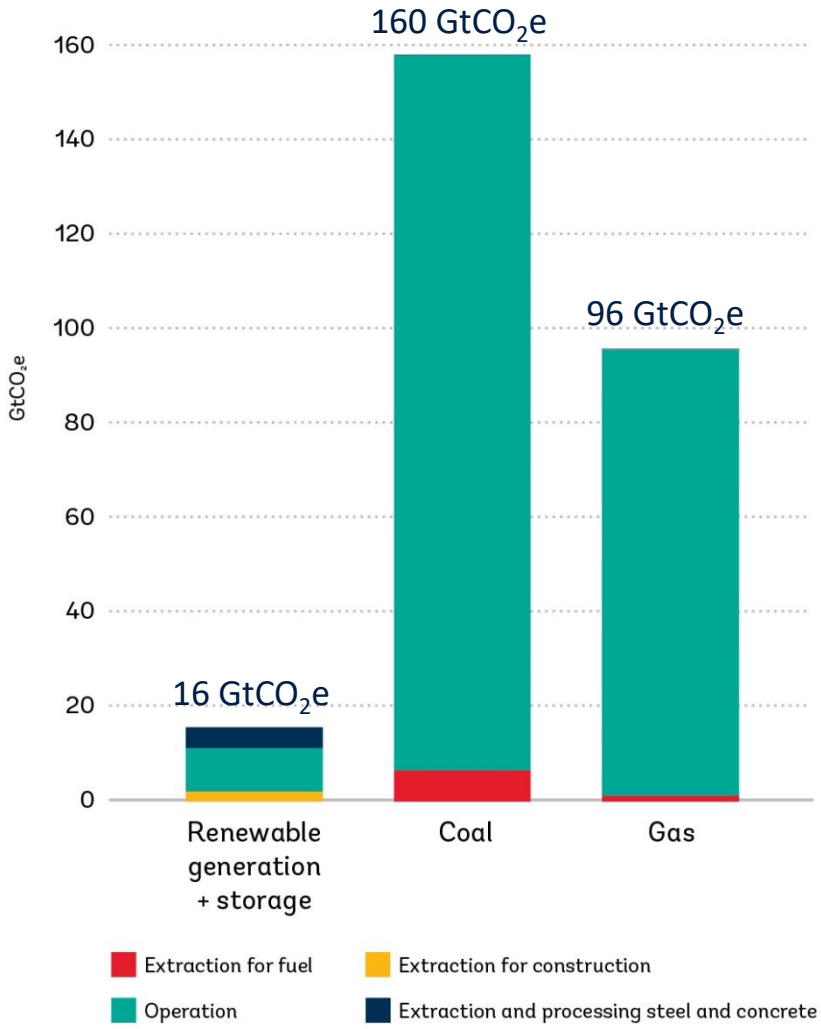


Note: 2DS = 2-degree scenario.

UNDER A 2DS RENEWABLE ENERGY TECHNOLOGIES ARE CLEANER THAN FOSSIL FUELS

- **Under a 2DS, renewable generation** and **energy storage** technologies only account for **6%** of emissions generated by **coal** and **gas** technologies
- **Emissions** from **RE technologies** are *not insignificant*. They account of **16 Gt CO_2e**, **equivalent** to the **2018 emissions of China** and **US** combined.
- The **GWP** does not include **emissions** from **assembling, shipping** and **disposing energy technologies**, due to limited available data

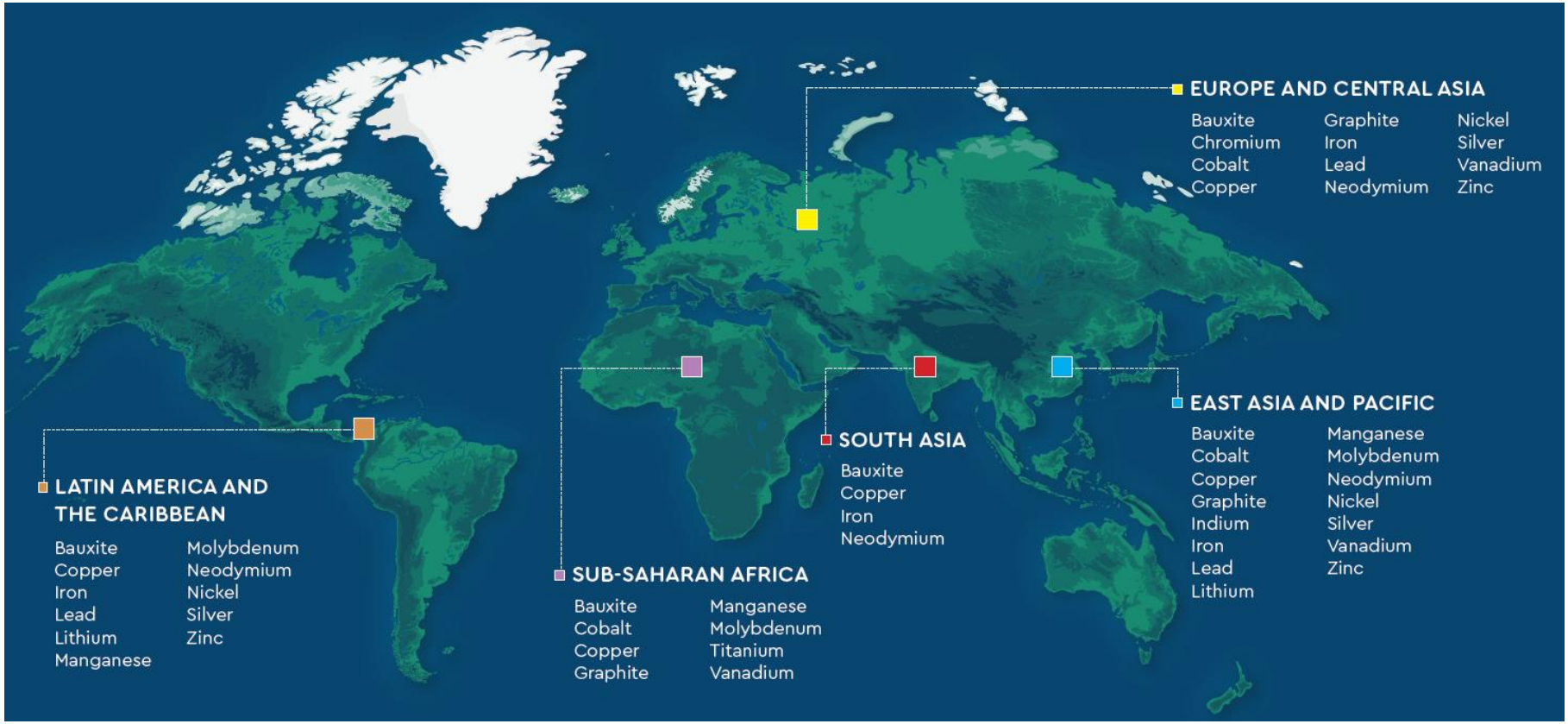
Emissions from selected energy technologies under 2DS



Source: World Bank's The Mineral Intensity of Clean Energy Transition 2020

SO, WHERE WILL ALL THESE MINERALS COME FROM?

Many of these minerals will come from resource-rich developing countries and emerging economies



New jobs can be created, infrastructure built, and government revenues boosted in client countries, thanks to higher mineral demand

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Climate Smart Mining

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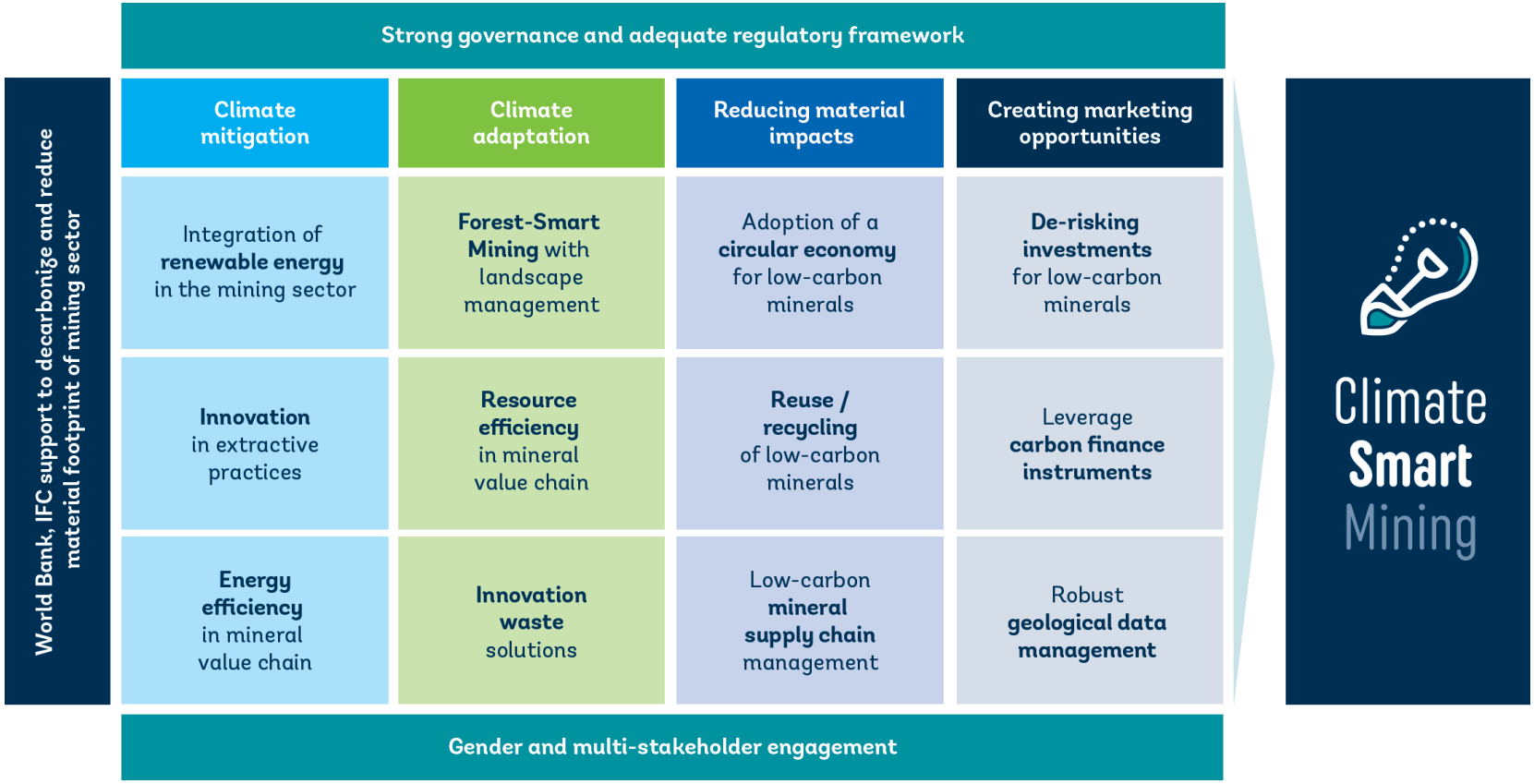
This map has been created based on USGS Mineral Commodity Summaries 2020 data, which is indicative but not meant to be definitive.

WHAT IS CLIMATE-SMART MINING?

Climate Smart Mining

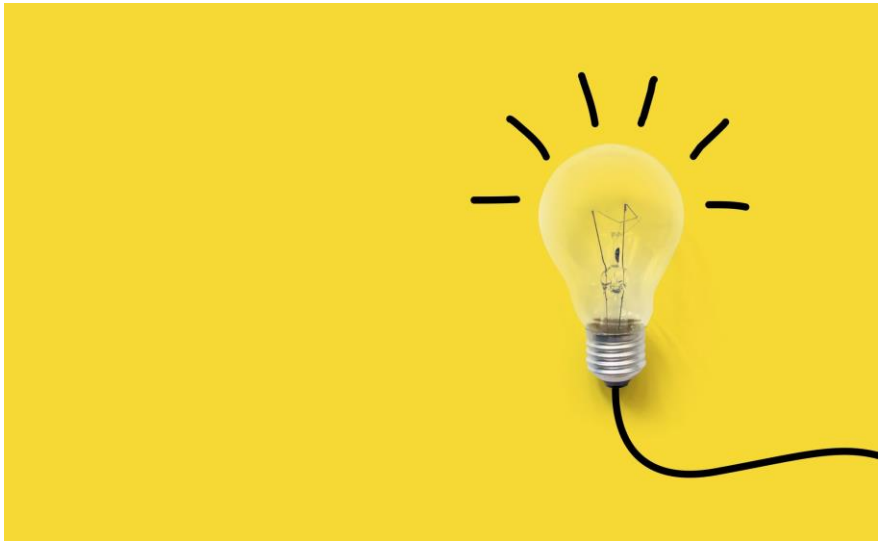
Climate-Smart Mining (CSM) supports the responsible extraction, processing and recycling of minerals needed for clean-energy technologies by minimizing their climate and material footprints throughout the value chain

Building Blocks of 'Climate Smart Mining'



WBG CLIMATE-SMART WORK PROGRAM: 2020 - 2021

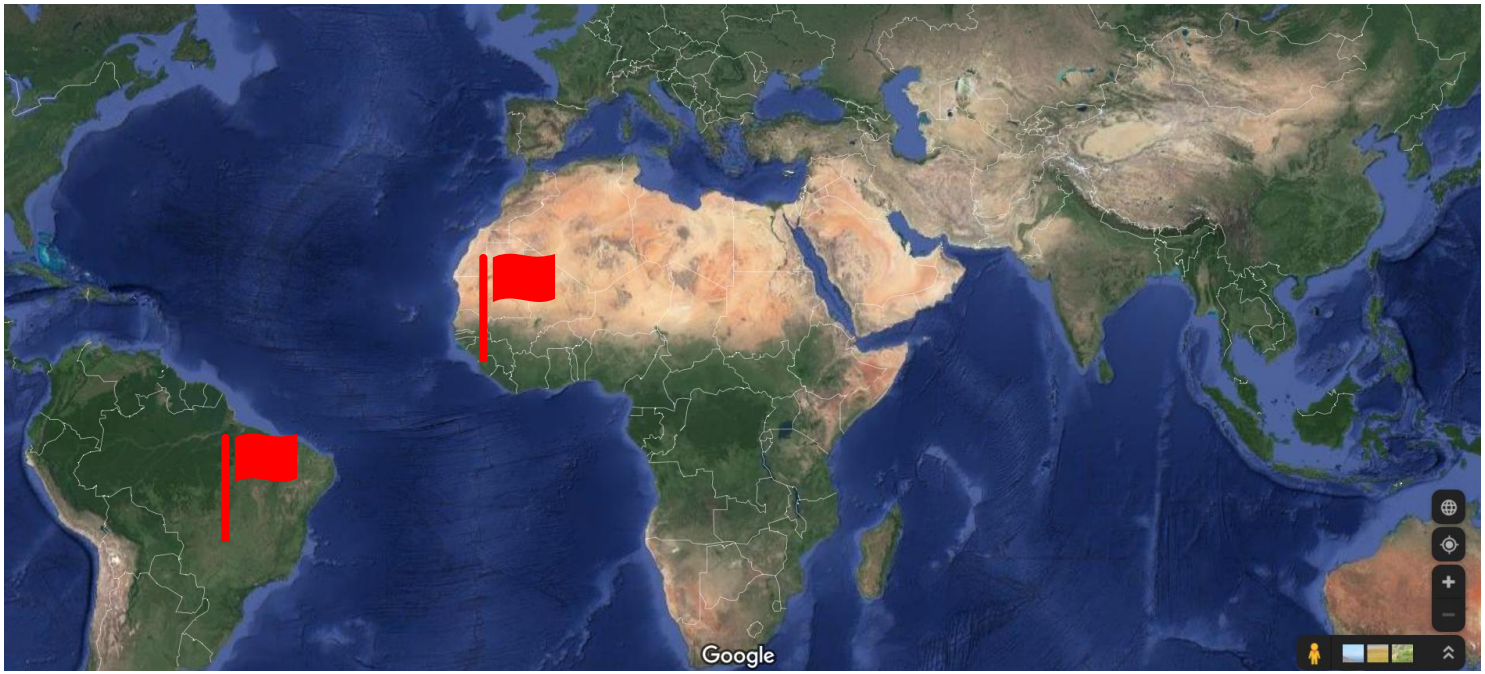
- Green Aluminum For Solar PV
- Lithium Carbon Footprint Dashboard
- Forest Smart Mining
- Battery Re Use and Recycling
- Road Maps: Chile and Indonesia



MAKING GREEN ALUMINUM FOR SOLAR PV

Context: What are the opportunities for developing countries to produce green aluminum to supply solar PV panels?

- **Two countries** have been selected for this research (**Brazil, Guinea**), which are *bauxite and/or alumina producers* with different energy profiles and geographical locations (Africa, Latin America)



MAKING GREEN ALUMINUM FOR SOLAR PV

This research intends to identify different approaches to decarbonizing aluminum production in Brazil and Guinea by:

- Analyzing the **environmental** and **economic challenges** and **opportunities** to maximize the value of developing countries' bauxite resources while reducing their carbon footprint as far as possible when supplying aluminum products to the solar PV sector
- Developing a **cost analysis instrument** of producing green aluminum from three selected countries from extraction to end-use of aluminum in solar PV - examining costs, value-added and emissions implications of different supply chains
- Assessing how, if applied, a regional and/or global **carbon price** could increase the competitiveness of local production (refining and smelting) and how it might impact on the economics of different supply chains
- Identifying opportunities to **implement CSM practices** into these countries' bauxite/alumina/aluminum sector to reduce CO2 emissions & integrate into their NDCs

Objective: Provide decision-makers involved in the aluminum and solar PV supply chain with data to understand the different options available for countries & companies to reduce their environmental impact while maximizing value-added opportunities of green aluminum production

LITHIUM CARBON FOOTPRINT DASHBOARD

Context: Is it possible to measure the carbon footprint of 'low-carbon' minerals from mine to end-use throughout the entire mineral supply chain of RE technologies?

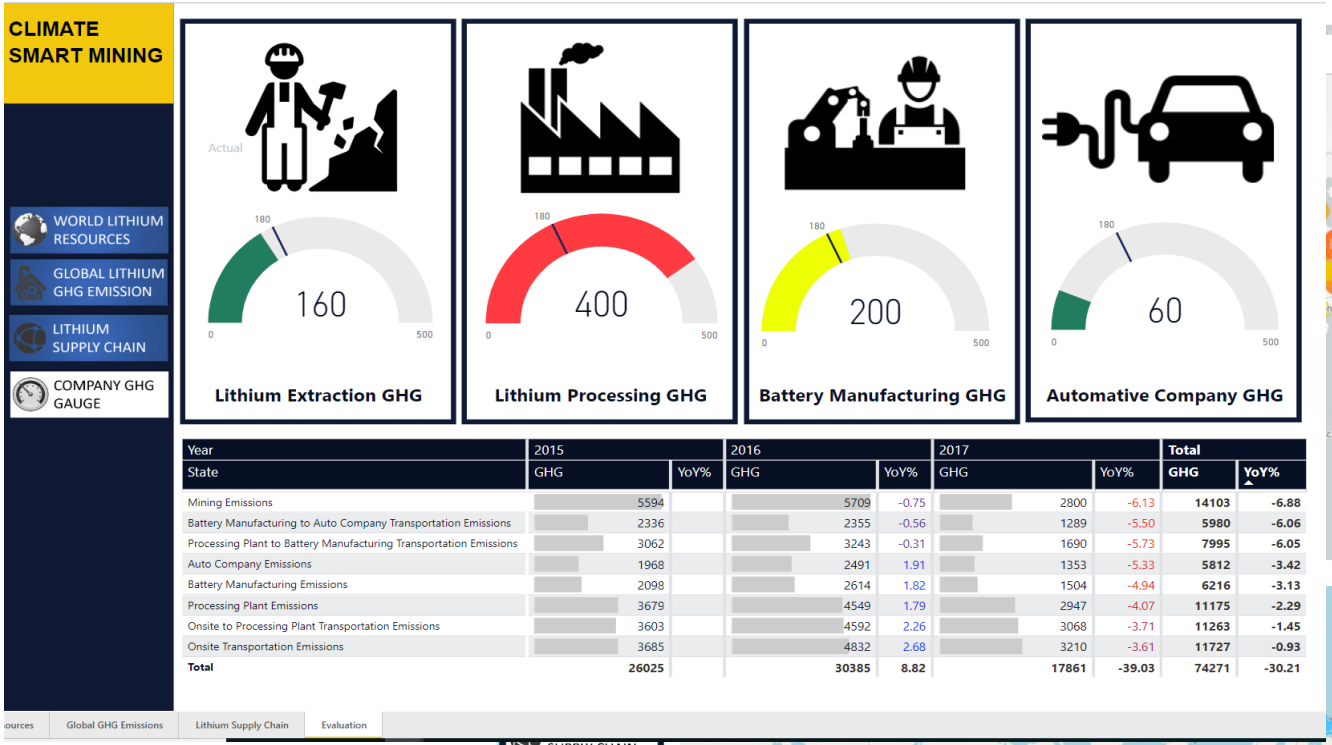
- **Lithium** has been selected given its primary use in li-ion batteries needed for electric vehicles (EVs)
- A **prototype** is being developed to trace GHG impact of lithium used in the production of li-ion batteries for EVs (extraction, processing, shipping, battery and EV manufacturing)
  - *Desktop research is underway to obtain GHG data from different parts of the supply chain (literature, company sustainability reports, etc.)*
  - *Stakeholder interviews will take place after desktop research is completed to compare publicly available data with company/country data from on the on-ground operations*
  - *A mock-up of a potential dashboard leveraging AI/IoT is under development to see how to best visualize this data in user-friendly format*
  - *Stakeholders across the lithium supply chain will be consulted once public and private data have been integrated and anonymized into the final dashboard for feedback*

Objective:

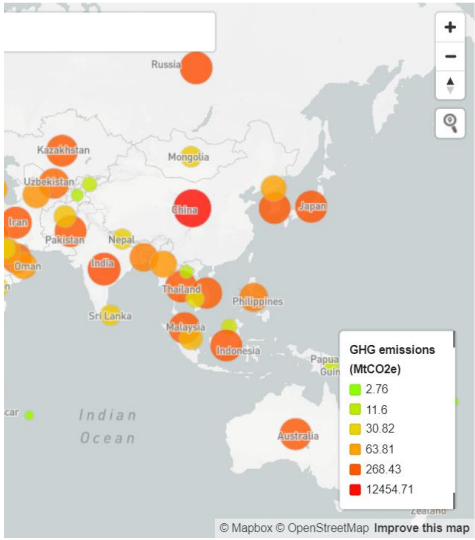
Develop a prototype to explore how emerging technologies (AI, IoT) can be leveraged to provide a real time view of GHG emissions from lithium across the entire mineral supply chain to enable climate-conscious stakeholders to identify areas for carbon emissions reduction opportunities via CSM practices (extractive-led economies, upstream and downstream companies, CSOs)

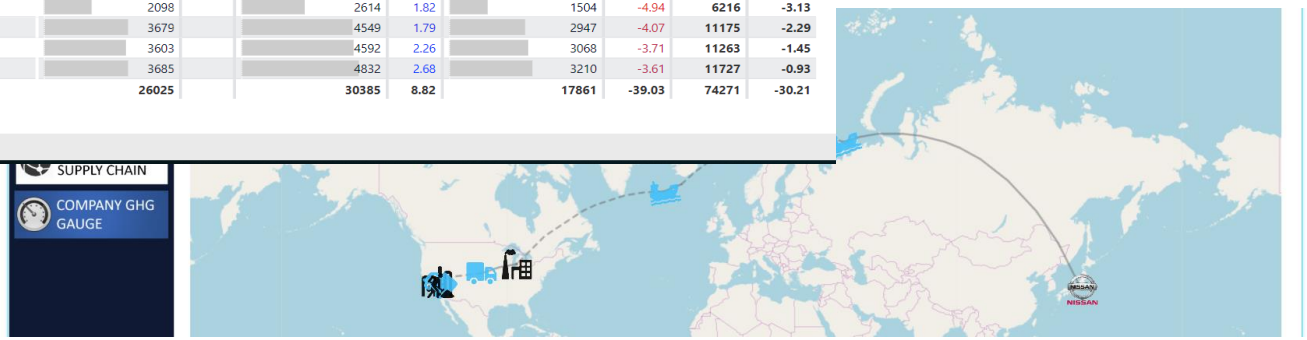
SNAPSHOTS OF *PRELIMINARY* LITHIUM CO2 DASHBOARD WITH DUMMY DATA

Dashboard sample snapshot: Company-level data would be anonymized, and the scope of visualizations refined based on available data



Year	2015		2016		2017		Total	
State	GHG	YoY%	GHG	YoY%	GHG	YoY%	GHG	YoY%
Mining Emissions	5594		5709	-0.75	2800	-6.13	14103	-6.88
Battery Manufacturing to Auto Company Transportation Emissions	2336		2355	-0.56	1289	-5.50	5980	-6.06
Processing Plant to Battery Manufacturing Transportation Emissions	3062		3243	-0.31	1690	-5.73	7995	-6.05
Auto Company Emissions	1968		2491	1.91	1353	-5.33	5812	-3.42
Battery Manufacturing Emissions	2098		2614	1.82	1504	-4.94	6216	-3.13
Processing Plant Emissions	3679		4549	1.79	2947	-4.07	11175	-2.29
Onsite to Processing Plant Transportation Emissions	3603		4592	2.26	3068	-3.71	11263	-1.45
Onsite Transportation Emissions	3685		4832	2.68	3210	-3.61	11727	-0.93
Total	**26025**		**30385**	**8.82**	**17861**	**-39.03**	**74271**	**-30.21**





BATTERY RE-USE & RECYCLING PHASE 2

THE CIRCULAR ECONOMY AND BATTERIES: A SOUTH – NORTH PERSPECTIVE

In partnership with the Energy Storage Partnership (ESP)

Development objective: how can developing countries best be provided with the tools and capacity to take advantage of a 2nd life global battery market for the new generation of batteries technologies?

Follow up to Report : RE USE AND RECYCLING : ENVIRONMENTAL SUSTAINABILITY OF LITHIUM-ION BATTERY ENERGY STORAGE

- Work ahead (in collaboration with GBA and others):
  - Systems for integration and effective management
    - EOL systems from cradle to grave
      - » Which countries have the mineral resources?
      - » What is the level of CSM in those countries to deliver those resources?
      - » Capacity for processing/beneficiation/recycling
  - Enhancing the economics: building the business case
  - Regime building – strengthening standards, regulations and liability provisions

Devising roadmap(s) for deployment of second life EV batteries and battery recycling capacity in developing countries:

- Capacity for collection and recycling of 'new generation' batteries
- Potential for re purposing to help developing countries transition to clean electricity services

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FOREST-SMART MINING

Follow up to Phase 1 of the project which provided the framework and evidence for mining interests becoming more proactive in forest conservation and restoration activities.

This project addresses ASM and LSM :

- ASM: integrating sustainable forest principles in ASM activities
- LSM: seeking innovative financial mechanisms (e.g., carbon offsets, carbon bonds, etc.) to support naturally based climate solutions (NBCS).

Methodology:

- General assessment and identification of candidate pilot studies
- In-depth analysis and lessons/guidelines from case studies

Deliverables:

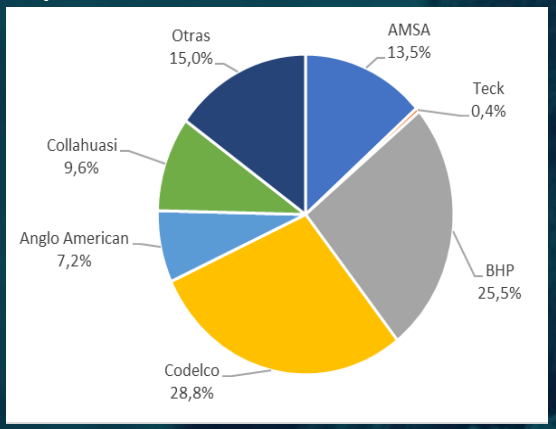
- "Standards" for Forest-smart ASM integrated in existing Standards
- Guidelines/tools for mining constituency - industry and governments

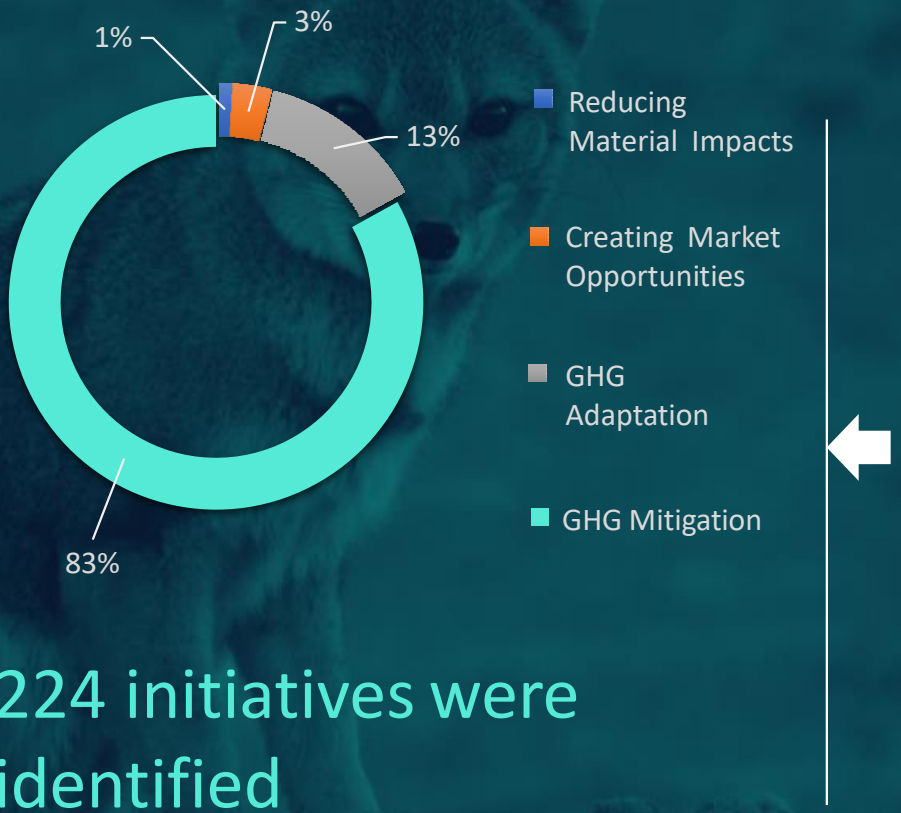
Chile CSM Road Map : Copper Mining Initiatives on Climate-Smart Mining (CSM)

Information sources:

- Surveys
- Interviews
- Corporative report (GRI)
- MOU- MINING and Energy Ministry

Represent 85% of copper national production





224 initiatives were identified

INDONESIA: PREPARING FOR A CSM COUNTRY ROADMAP, 2 DELIVERABLES

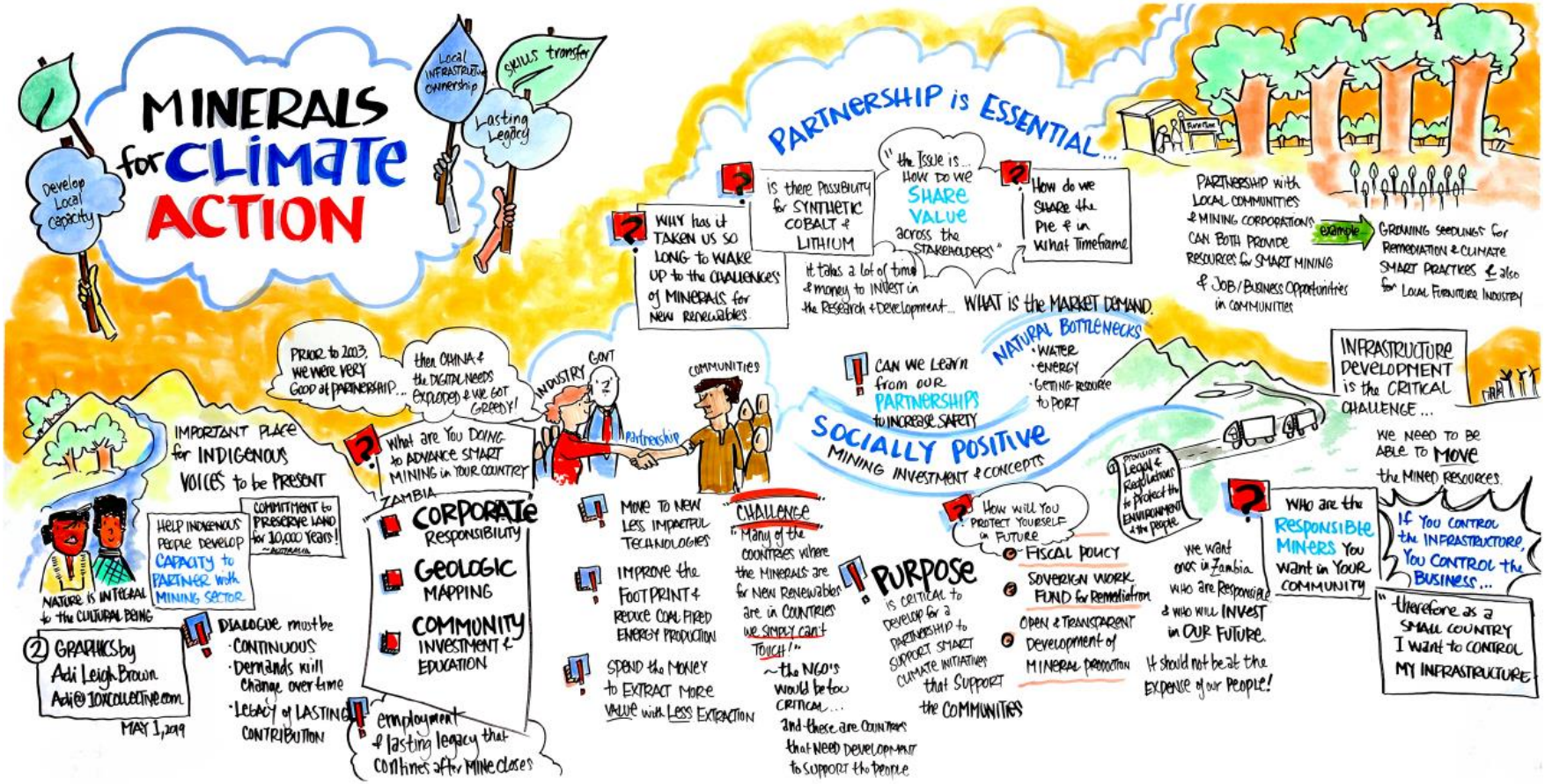
Objective 1:

Conduct a gap analysis on current GHG-emissions tracking and monitoring systems, energy efficiency measures, and green mining technologies in place along the critical minerals value chain (production, processing, refining); and provide recommendations for setting-up the policy framework to facilitate the contribution of the strategic minerals mining sector to the overall achievement of Indonesia's NDC

Objective 2:

Through a multi-stakeholder platform or establishment of an Indonesian CSM community of practice, support the Climate Smart Mining Initiative and disseminate relevant information to inform climate safe action policies and regulations for the preparation of a structural landscape conducive for the Indonesian CSM road map.

QUESTIONS?


MINERALS for CLIMATE ACTION
Develop Local Capacity
Local Infrastructure Ownership
Skills transfer
Lasting Legacy
PARTNERSHIP is ESSENTIAL...
WHY has it TAKEN US SO LONG to WAKE UP to the CHALLENGES of MINERALS for New Renewables
is there POSSIBILITY for SYNTHETIC COBALT & LITHIUM
it takes a lot of time & money to INVEST in the Research + Development...
" the Issue is... How do we SHARE VALUE across the STAKEHOLDERS "
How do we SHARE the Pie & in What Timeframe
WHAT is the MARKET DEMAND
PARTNERSHIP with LOCAL COMMUNITIES & MINING CORPORATIONS CAN BOTH PROVIDE RESOURCES for SMART MINING & JOB/BUSINESS Opportunities in COMMUNITIES
example
GROWING SEEDLINGS for REMEDIATION & CLIMATE SMART PRACTICES & also for LOCAL FURNITURE INDUSTRY
PRIOR to 2003, WE WERE VERY GOOD at PARTNERSHIP...
then CHINA & the DIGITAL NEEDS EXPLODED & WE GOT GREEDY!
INDUSTRY
GOVT
COMMUNITIES
Partnership
CAN WE Learn from our PARTNERSHIPS to INCREASE SAFETY
NATURAL BOTTLENECKS
· WATER
· ENERGY
· GETTING RESOURCE to PORT
SOCIALLY POSITIVE MINING INVESTMENT & CONCEPTS
INFRASTRUCTURE DEVELOPMENT is the CRITICAL CHALLENGE...
We NEED to BE ABLE to MOVE the MINED RESOURCES
IMPORTANT PLACE for INDIGENOUS VOICES to be PRESENT
What are You DOING to ADVANCE SMART MINING in YOUR COUNTRY
ZAMBIA
CORPORATE Responsibility
GEOLOGIC MAPPING
COMMUNITY INVESTMENT & EDUCATION
HELP INDIGENOUS PEOPLE develop CAPACITY to PARTNER with MINING SECTOR
COMMITMENT to PRESERVE LAND for 10,000 YEARS!
~AUSTRALIA
NATURE is INTEGRAL to the CULTURAL BEING
DIALOGUE must be
· CONTINUOUS
· Demands will Change over time
· LEGACY of LASTING CONTRIBUTION
employment & lasting legacy that continues after MINE closes
MORE to NEW LESS IMPACTFUL TECHNOLOGIES
IMPROVE the FOOTPRINT & REDUCE COAL FIRED ENERGY PRODUCTION
SPEND the MONEY to EXTRACT MORE VALUE with LESS EXTRACTION
CHALLENGE
" Many of the COUNTRIES where the MINERALS are for NEW RENEWABLES are in COUNTRIES we SIMPLY can't TOUCH!"
~the NGO's would be too CRITICAL...
and these are COUNTRIES that NEED DEVELOPMENT to SUPPORT the PEOPLE
PURPOSE is CRITICAL to DEVELOP for a PARTNERSHIP to SUPPORT SMART CLIMATE INITIATIVES that SUPPORT the COMMUNITIES
How will YOU PROTECT YOURSELF in FUTURE
FISCAL POLICY
SOVEREIGN WORK FUND for Remediation
OPEN & TRANSPARENT Development of MINERAL production
Provisions Legal & Regulations to Protect the ENVIRONMENT & the PEOPLE
we want ones in Zambia who are Responsible & who will INVEST in OUR FUTURE
It should not be at the EXPENSE of your PEOPLE!
Who are the RESPONSIBLE MINERS You want in YOUR COMMUNITY
If You CONTROL the INFRASTRUCTURE, You CONTROL the BUSINESS...
" therefore as a SMALL COUNTRY I want to CONTROL MY INFRASTRUCTURE
2 GRAPHICS by Adi Leigh Brown Adi@10XCOLLECTIVE.com
MAY 1, 2019