



Systemic innovation to decarbonize cobalt value chains

May 11th, 2023
Sam Whittlesey, LGI Sustainable Innovation

What is the scale of the challenge?

- The IPCC has warned that to avoid catastrophic tipping points in the Earth's climate system we must cut anthropogenic GhG emissions
 - by 45% from 2010 levels by 2030
 - Net zero by 2050
- Producing cobalt causes GhG emissions primarily from
 - Auxiliaries (solvents, separation agents, etc)
 - Energy (electricity and fuel)
- Achieving 1.5 C goals is forecast to drive a 403% increase in European cobalt demand between 2020-2050 (KU Leuven 2020)

Cobalt mines as renewable energy “prosumers”

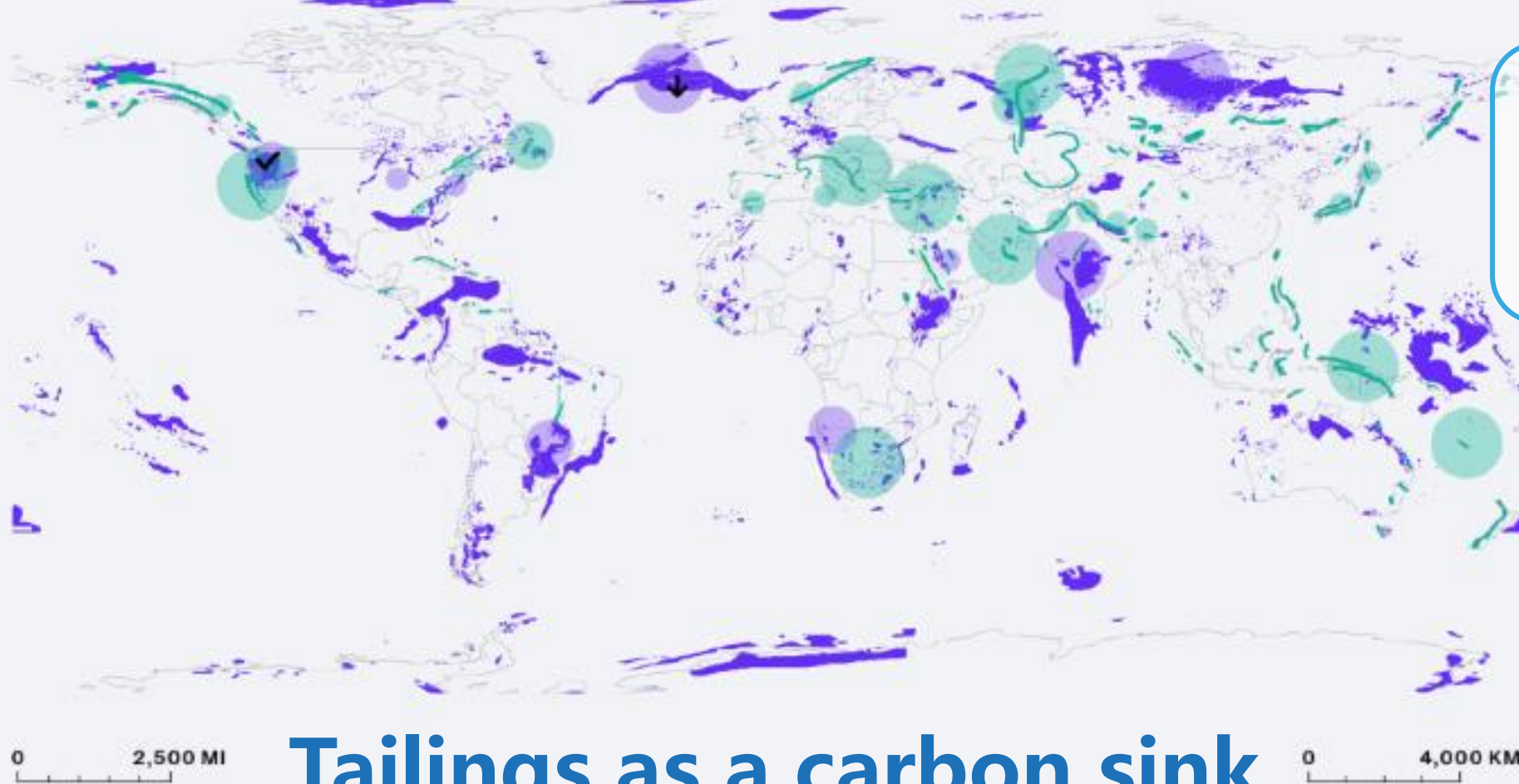
IMPACT

Renewables are by far the cheapest form of power today (IRENA)
68 million tonnes CO2 annually saved by electrifying mining trucks (ICMM)

3% of global energy used for comminution (CEEC)

19% of the DRC has access to electricity (World Bank)

300 Mt of CO₂ annually can be sequestered by global mine waste (Wilson 2014)



Tailings as a carbon sink

Sources of alkalinity

- Mafic rocks (basalts)
- Ultramafic rocks (peridotites & serpentinites)

On Land Capacity (GtCO₂)

BASALT	PERIDOTITE
10 ³ - 10 ⁴	10 ² - 5 × 10 ²
10 ⁴ - 10 ⁵	5 × 10 ² - 5 × 10 ³
10 ⁵ - 5 × 10 ⁵	5 × 10 ³ - 5 × 10 ⁴

CO₂ sequestration projects in basalts

- ↓ Operating
- ✓ Completed

Image from Sandalow, D., et al. *Carbon Mineralization Roadmap Draft October 2021*. No. LLNL-CONF-827384. Lawrence Livermore National Lab.(LLNL), Livermore, CA (United States), 2021. 4

Circular Hydrometallurgy

Next-generation circular hydrometallurgical flowsheet for battery-grade Co/Ni production

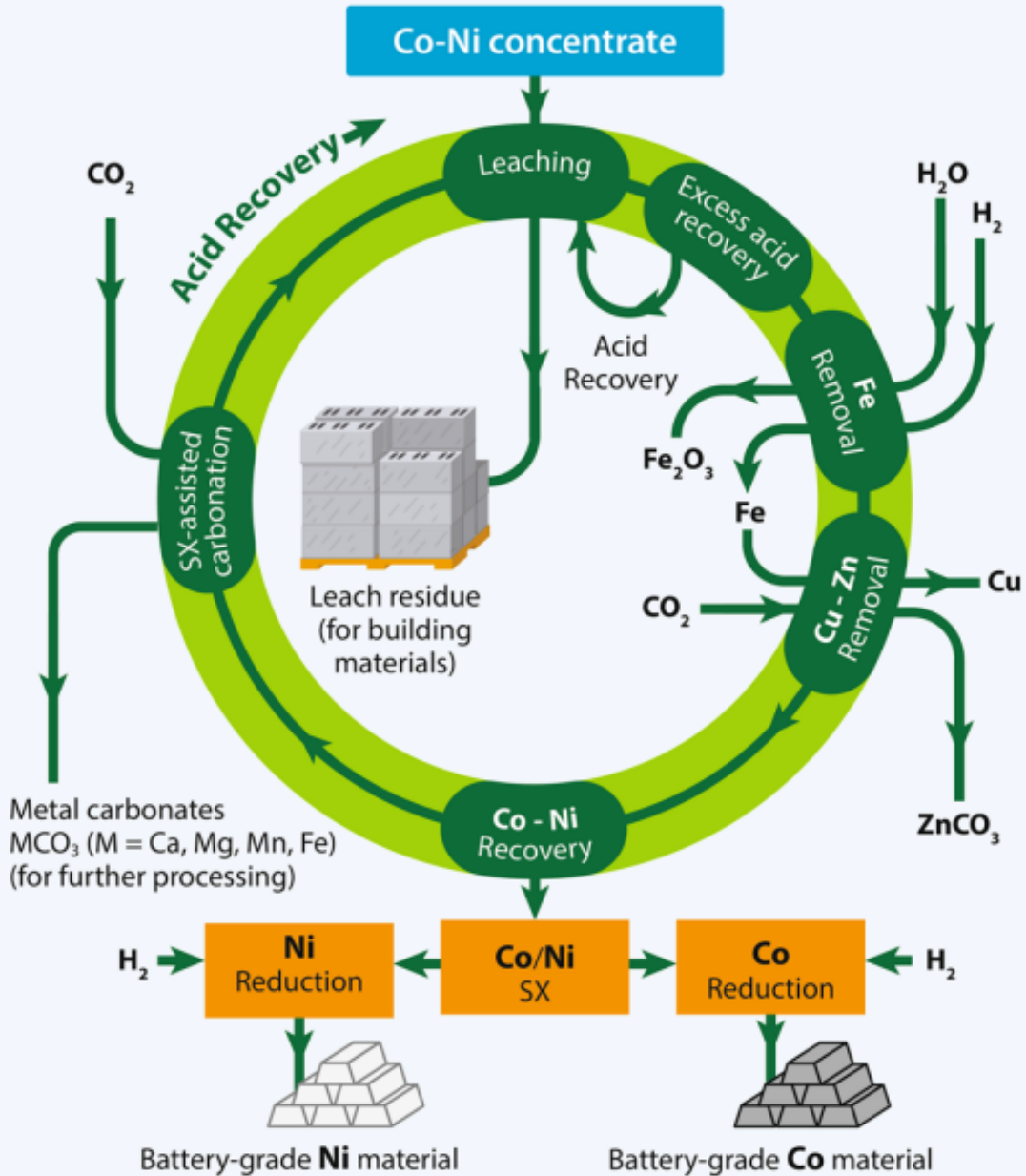


Image from: Binnemans, Koen, and Peter Tom Jones. "The twelve principles of circular hydrometallurgy." *Journal of Sustainable Metallurgy* 9.1 (2023): 1-25.

Responsible use of battery materials

← LESS EMISSIONS PER MILE

MORE EMISSIONS PER MILE →



Ford F-150 Lightning and other large electric vehicles

Electric vehicles

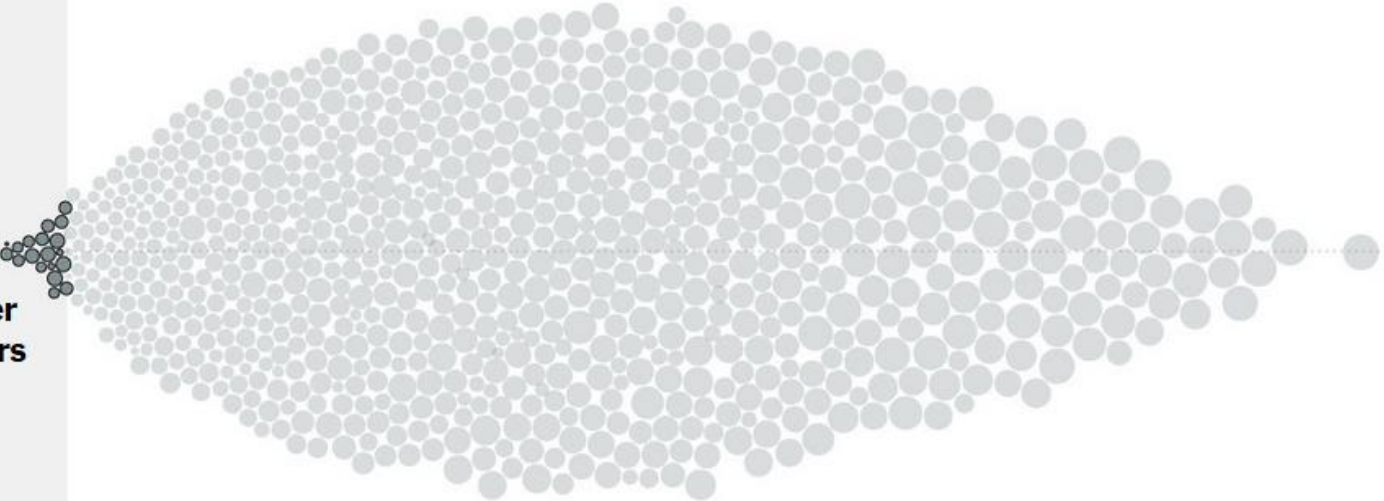


Similar emissions impact

VEHICLE SIZE, BY WEIGHT:
○ 3,500 lbs
○ 7,000 lbs

Gas vehicles

Smaller gas cars



Responsible use of battery materials

- Invest in sourcing low carbon cobalt
- Design long lasting products
- Reinvent e-mobility:
 - Shared mobility
 - Vehicle-to-grid
 - Battery as a service
- Remanufacture & repurpose batteries
- Reduce CO₂ emissions in recycling



Thank you for your attention!

Reach out for more information

Contact us:

 6 Cité de l'Ameublement, 75011, Paris

 +33 (0)1 84 16 30 73

 contact@lgi.earth

Follow us on:

 @LGI

 @LGI_earth

 @lgi_sustainableinnovation

