Alaska's Potential Role in Domestic (Mineral) Supply
August 22, 2022

- We have not made progress
- China
- Humans are the cause of impacts and consumption
- Responsible resource development takes time
- Metal cycles and project development
- Top risks
- Looking forward

We must take action on a plan

Lance Miller, NANA

Ten years ago:

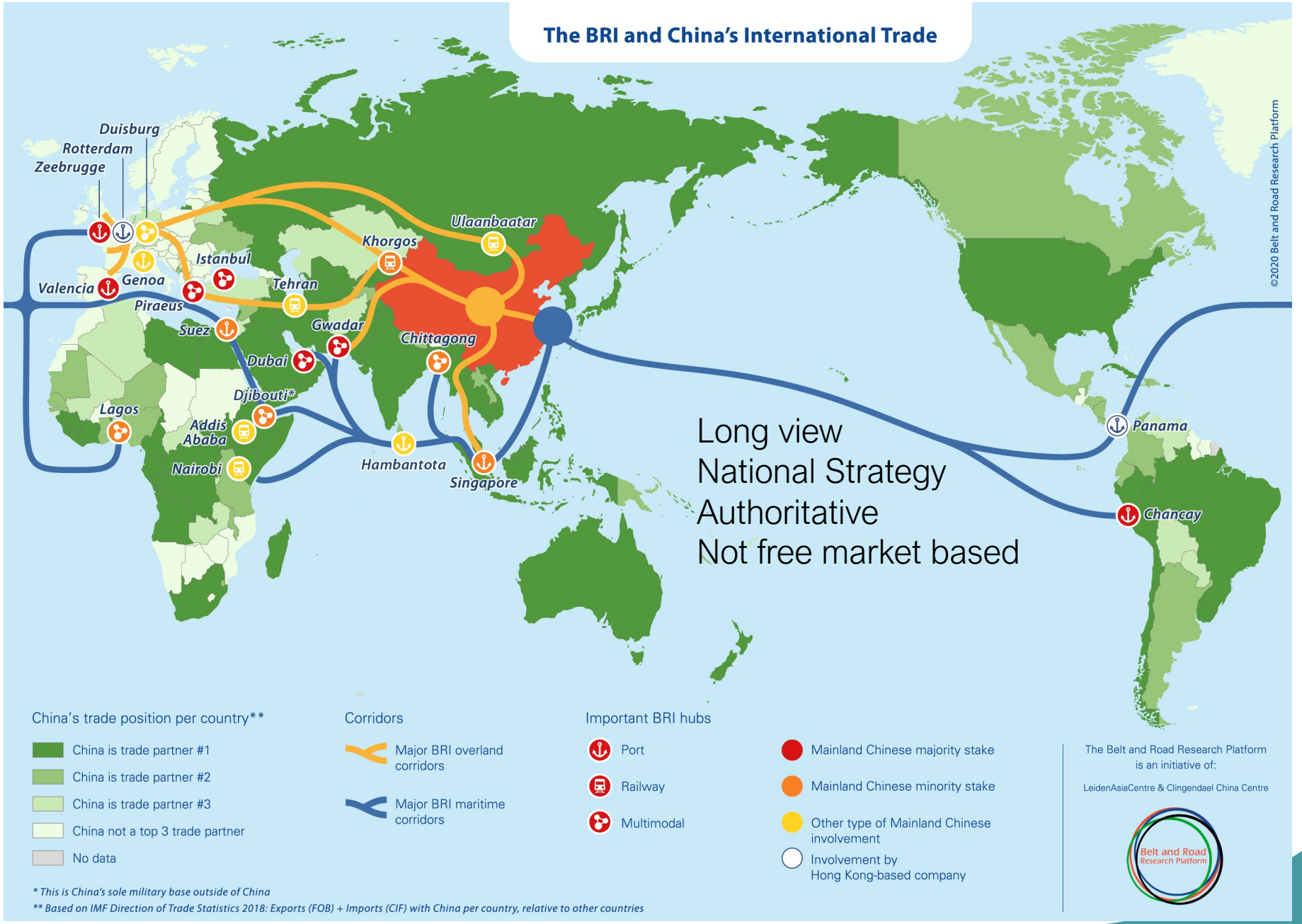
HR 4402 – passed 256-160 in July, 2012

Requires the Department of the Interior and the Department of Agriculture to more efficiently develop domestic sources of strategic and critical minerals and mineral materials; including rare earth elements.

Defines strategic and critical minerals as those that are necessary:

1. For national defense and national security requirements;
2. For the Nation's energy infrastructure including pipelines, refining capacity, electrical power generation and transmission, and renewable energy production;
3. To support domestic manufacturing, agriculture, housing, telecommunications, healthcare and transportation infrastructure; and
4. For the Nation's economic security and balance of trade.

In the last 10 years (really 9 years)!

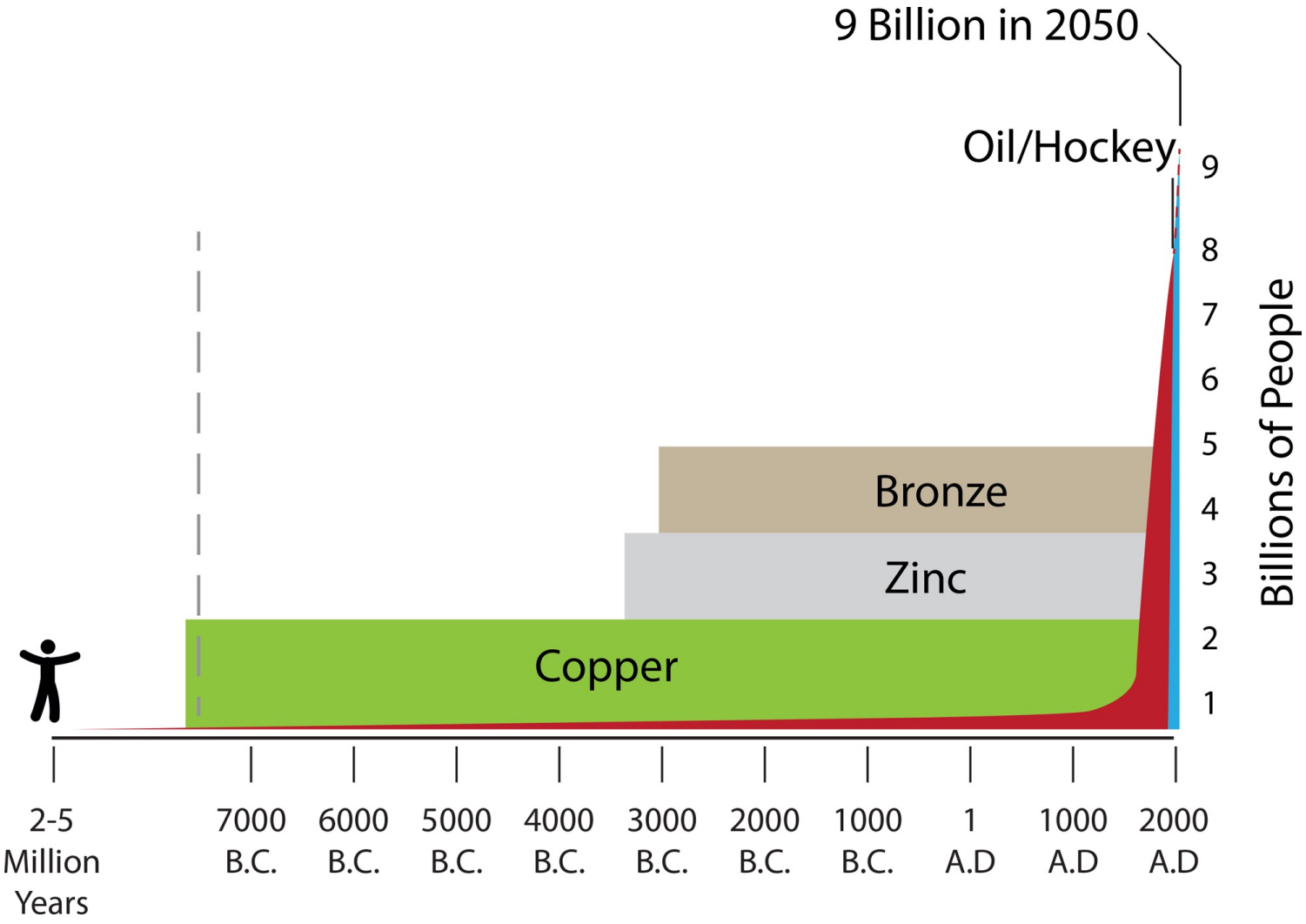


2021-22;Department of State Strategies and Executive Orders, *Where will Minerals Come From?*

- A US goal of Net-Zero Greenhouse Gas Emissions from Federal operations (procurement) by 2050 (Dept of State Strategy Paper, Nov, 2021)
- EO Securing supply chains including identifying risks to acquire critical minerals (February 24, 2022)
- President Biden, on March 31, 2022, invoked the Defense Production Act to secure reliable supply chains for minerals essential to a clean energy transition, including lithium, nickel, cobalt, graphite, and manganese.

Framing: - population will increase – this alone will drive demand. People are the consumers.

After over 7,000 yrs metals are still important!



Modern technologies have become more mineral intensive

H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cp		Fl		Lv		

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

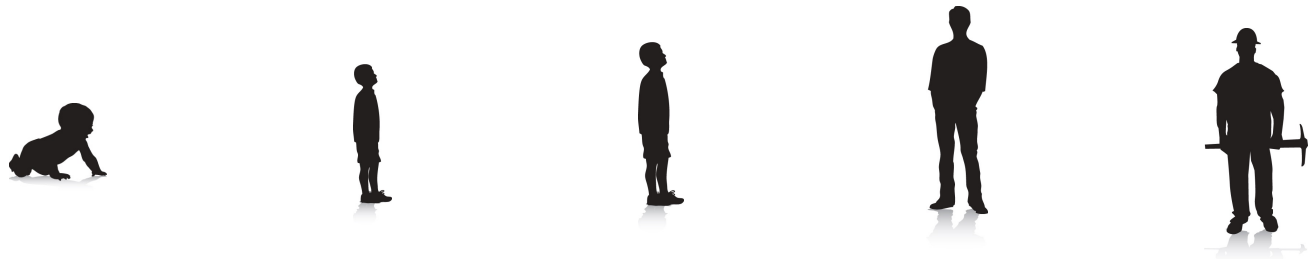
H																	He
Li	Be											B	C	N	O	F	Ne
Na	Mg											Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cp		Fl		Lv		

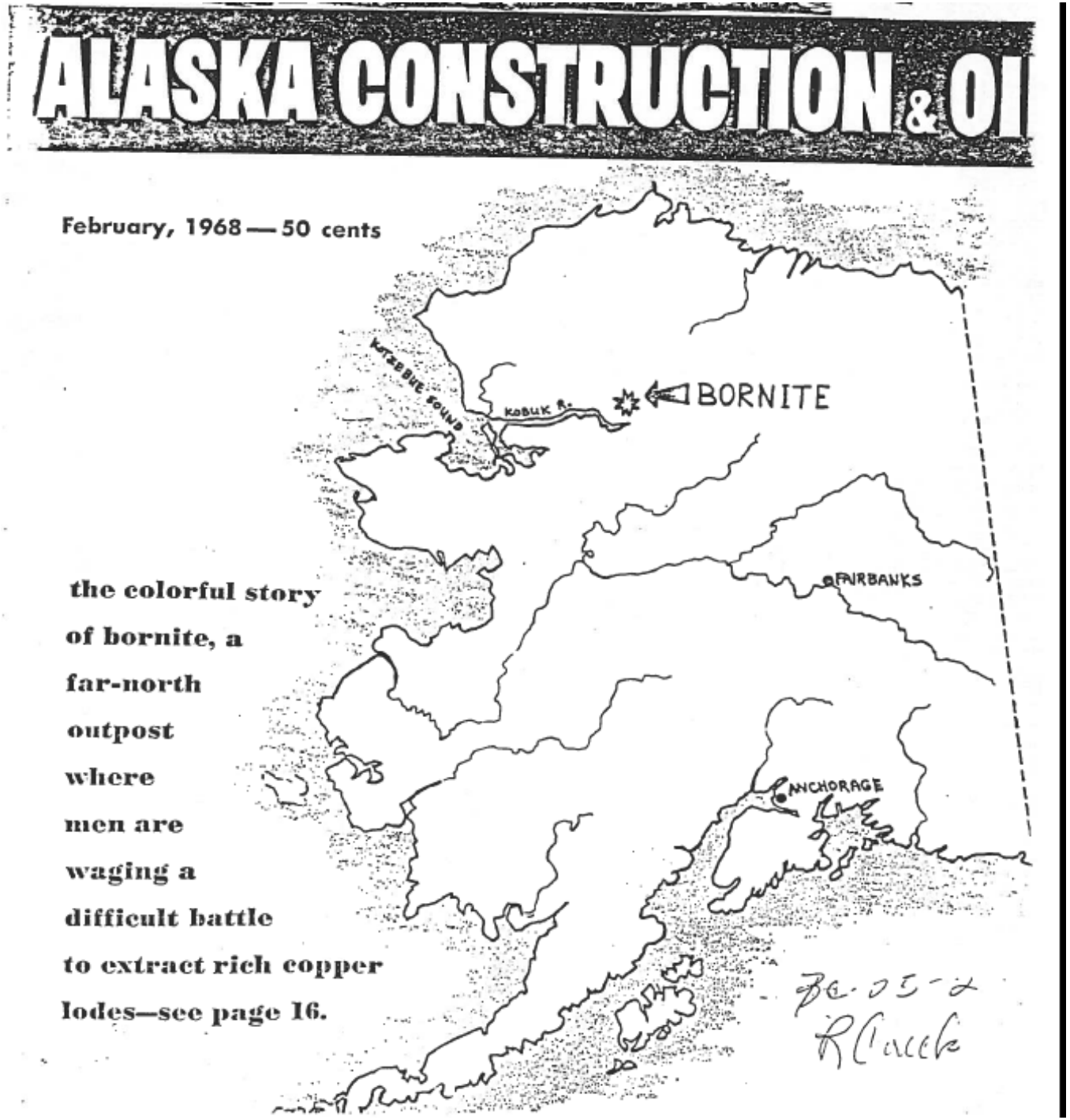
Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu	
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	

Responsible mineral development takes focus, technical and scientific work and time!!!!
Avg = 18-20 yrs to a decision/mine (and recent Alaska example exceed global averages)

<1% to 7% of drilled prospects become a mine

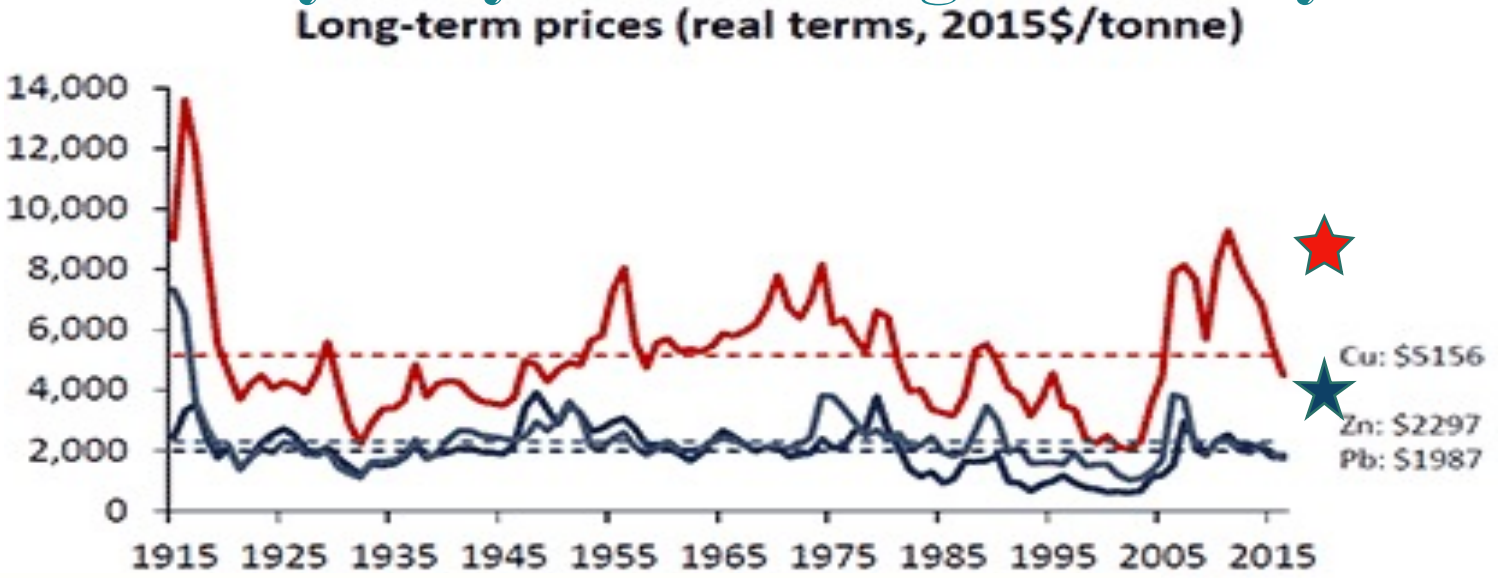
	Exploration	Positive Order of Magnitude Study	Prefeasibility	Positive Prefeasibility Study	Feasibility	Positive Feasibility Study	Permitting/ Design	Decision to Mine	Construction
Resource	Inferred		Indicated		Measured		Measured		
Reserves	Assumed		Probable		Proven/Prob.		Proven		
Mine	Sketch		Preliminary		Firm		Final		
Processing	Assumed		Options		Selected		Optimized		
Market	Assumed		Options		Letter of Intent		Agreement		
Environment Impact	Concept		Approximate		Near Complete		Completed		
EIS	Conceptual		Scoped		Approved				
Closure Plan	Concept		Preliminary		Advanced		Final		
Permits	Assumed		Identified		Applied for		Granted		
Community	Fatal Flaws		Issues		Negotiations		Agreement		
Project Schedule	Assumed		Approximate		Firm		Final		
Cost Estimate	±30%		15-25%		±15%		±5%		
Economics	Est. ±30%		Probable ±15%		Firm ±15%		Finalized		
Finance	Assumed		Options		Negotiations		In place		2-3 years
Time	A few years		1-2 years		A few years		???		$100's M
Cost of Stage	$5-10M		$10-30M		$30 – 100M		$5-10M		



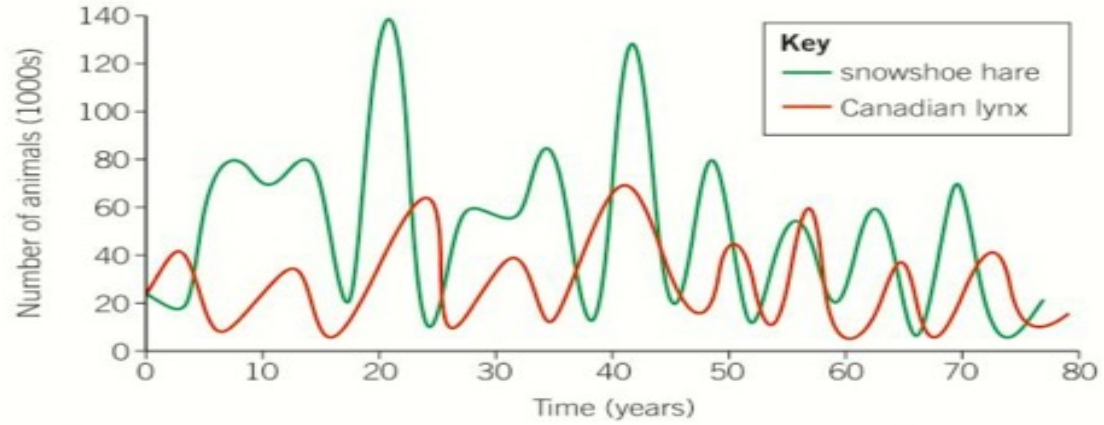


Bornite where first exploration was in the late 1940's!!!

Adding to the complications of development are metal cycles. Lynx cycles are as good as any Metal Price Predictor



2022
Cu = $9,500
Zn = $4,000



Averages

▲ Predator–prey graph showing the interdependence of the lynx and the hare.

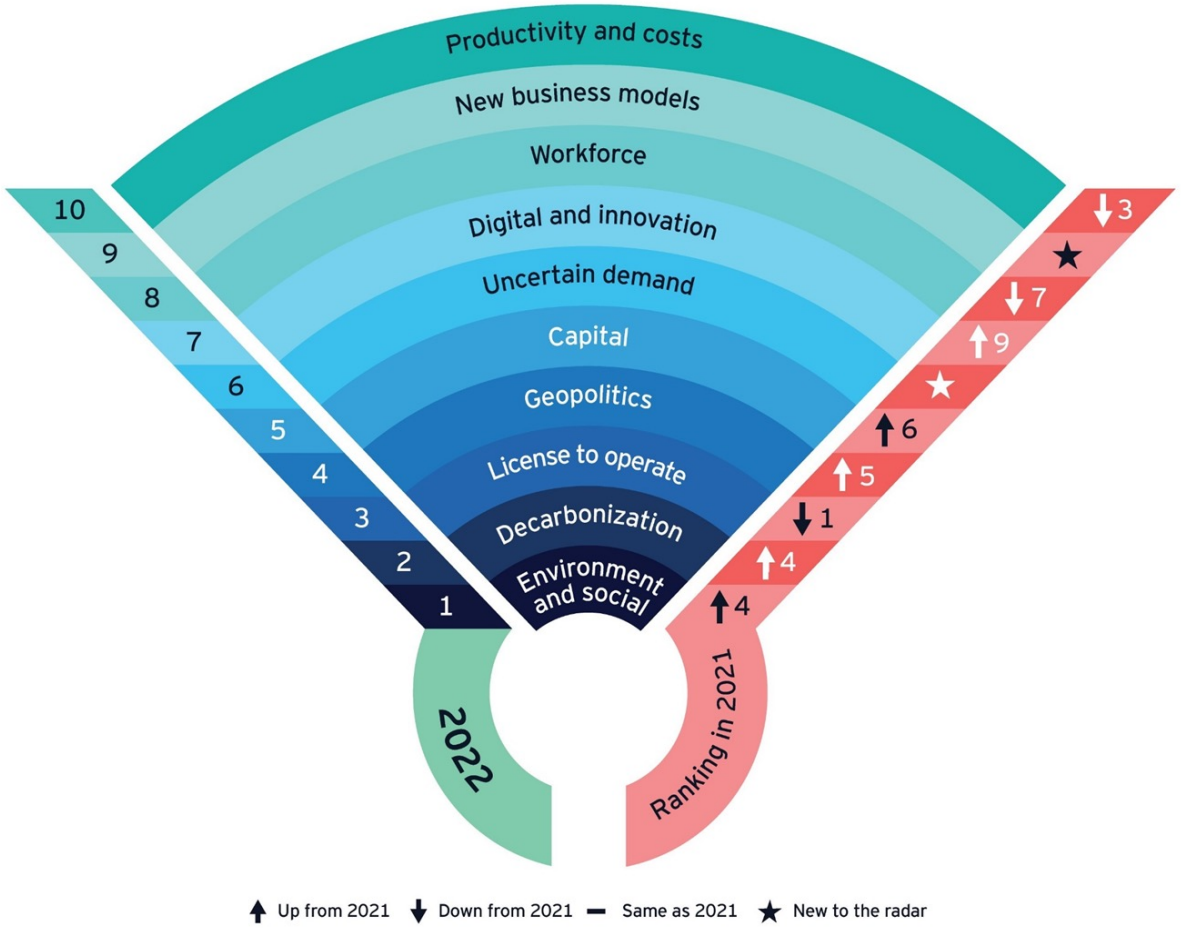
Metal cycles = 6-10 yrs (not super cycles)
Lynx/rabbit cycles = 8-11 years

Red Dog - America's Largest Critical Minerals Mine

(Zn and Ge)

"With zinc added to the list of minerals and metals critical to the U.S., world-class mine in Northwest Alaska is now top dog; North of 60 Mining News – March 4, 2022"

The Global Framework & Risks to Mining (Ernst & Young) and the Alaska Advantage (???)



Where are we in meeting the audacious National goals for carbon neutrality and minerals security?

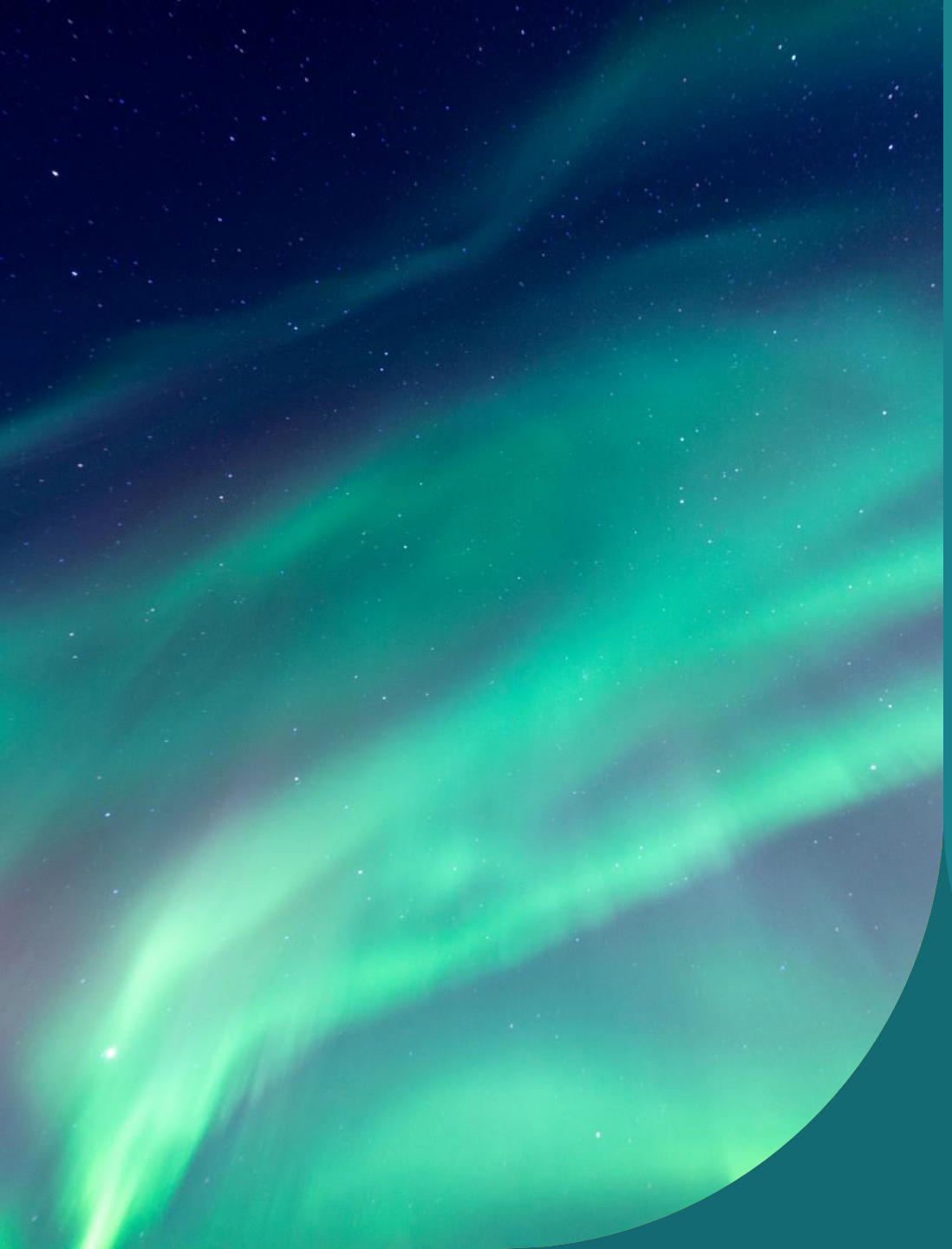
The US is behind on mine development & CM/REE processing….

Metal production is not ready to accommodate demand (project pipeline is small and lead time long due to metals cycles, permitting, logistics, financing, workforce, ESG)….

Non-open market driven metals that are not byproducts will need incentives and/or subsidies….

Alaska has the resource potential, yet that is only part of the solution. Alaska needs a plan and…..

New Federal Policies/structures are required to meet the audacious goals & population growth.



Taikuu

Quyanaqpak

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