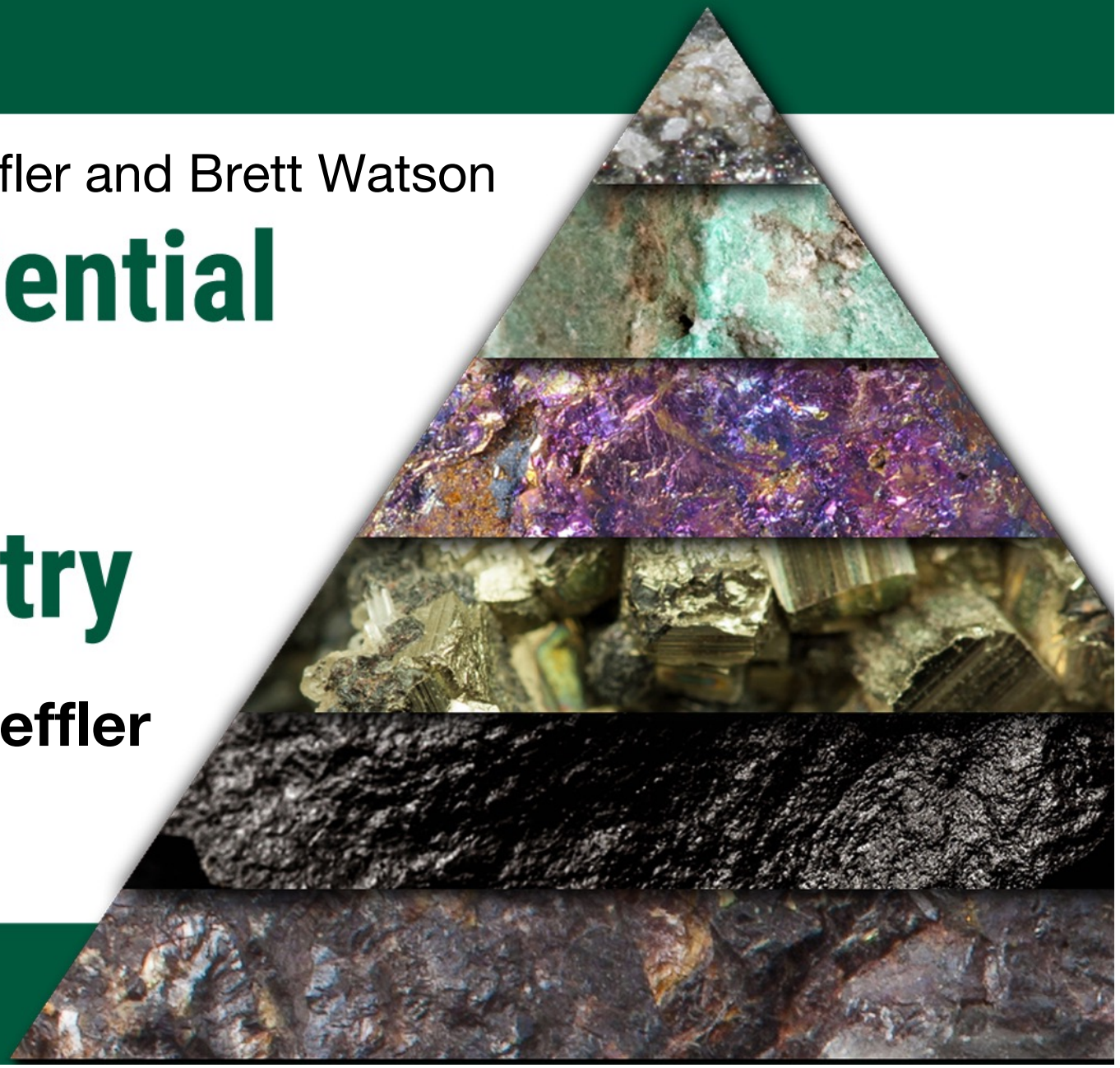
A UAA/ISER report by Bob Loeffler and Brett Watson

Economic Potential of Alaska's Mineral Industry

Presentation by Bob Loeffler

March 18, 2020



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Disclosure

- Bob and Brett would like to thank Power The Future for funding for the study. However, Power The Future had no editorial control over the results nor input into the methodology.

- The data assumption and conclusions are the responsibility of the authors and do not represent opinions of UAA, ISER, or the funder.
- Bob and Brett are not advocating for or against any particular mine, and their paper takes no position about whether any project can or should be developed.

Motivation

- Alaska economy on the verge of change
- Energy transition
- Thinking about the future is a way to inform policy today

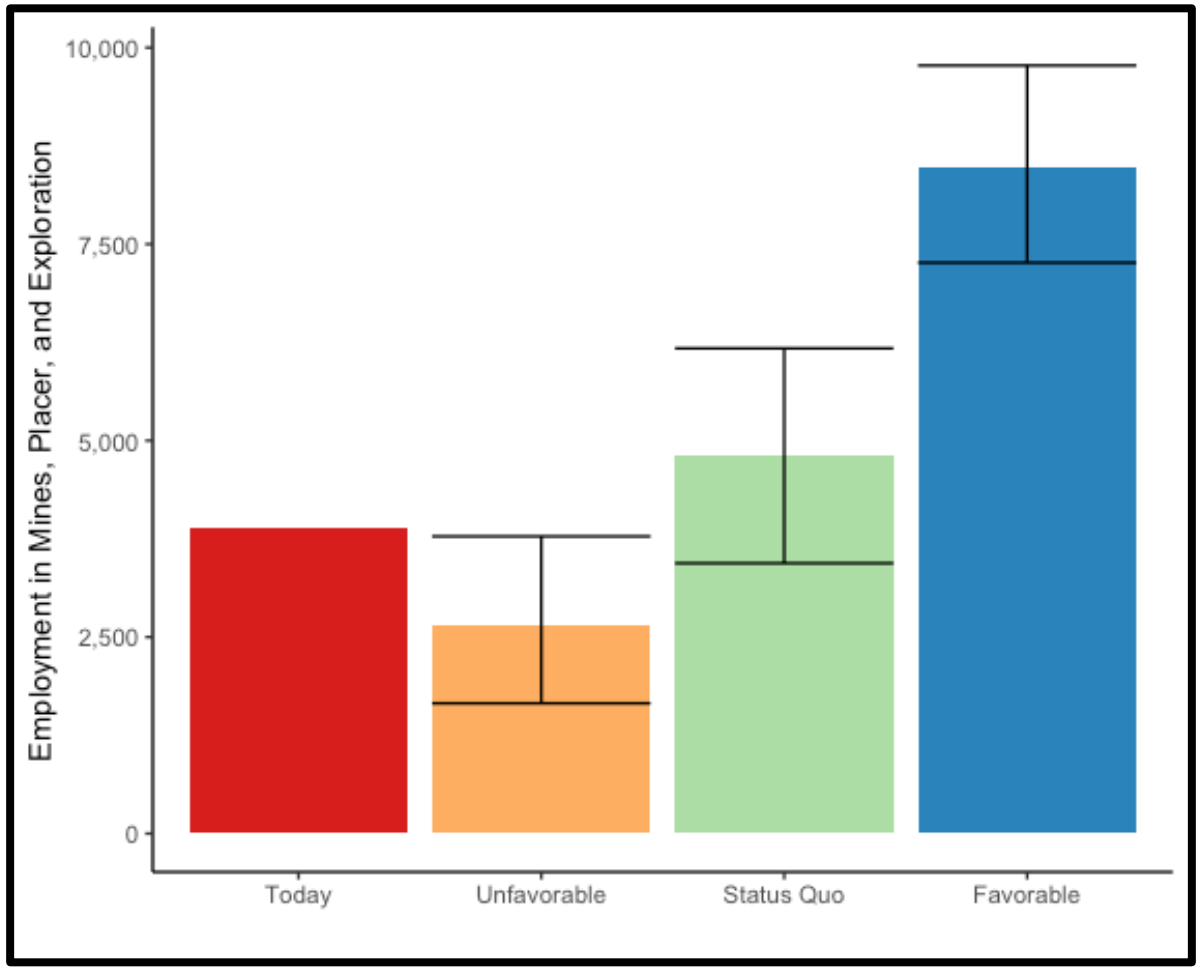
Key Questions

- How many jobs?
- Contributions to state’s exports?
- Supplying (energy) critical materials?
- How could mineral revenues contribute to Alaska’s budget?

Results Preview: Economic Impacts

- 'Industry favorable' scenario, mining's footprint might ~ double in 20 years

- 'Industry unfavorable' scenario, mining footprint might shrink by 1/3



Results Preview: Energy & Critical Minerals

	Today			'Favorable' Scenario			
	Production		% of 2019 US	Production		% 2019 US	% 2019 World
Cu				114	ktons	9%	1%
Pb	121	ktons	44%	215	ktons	79%	5%
Zn	603	ktons	80%	710	ktons	94%	6%
Au	17	tons	9%	80	tons	40%	2%
Ag	501	tons	51%	1,008	tons	103%	4%
Mo				138	tons	0%	0%
Co				518	tons	104%	0%
Barite				237	ktons	57%	3%
TREO				2,227	tons	8%	1%
Graphite				249	ktons	100%	23%

Remainder of Presentation

- Mining industry today
- 3 scenarios
- Methodology – the pyramid
- Results
  - employment & wages,
  - gross value,
  - supplies of energy and critical materials
  - Other
- Conclusions
- Q & A (or if you have question, just ask)

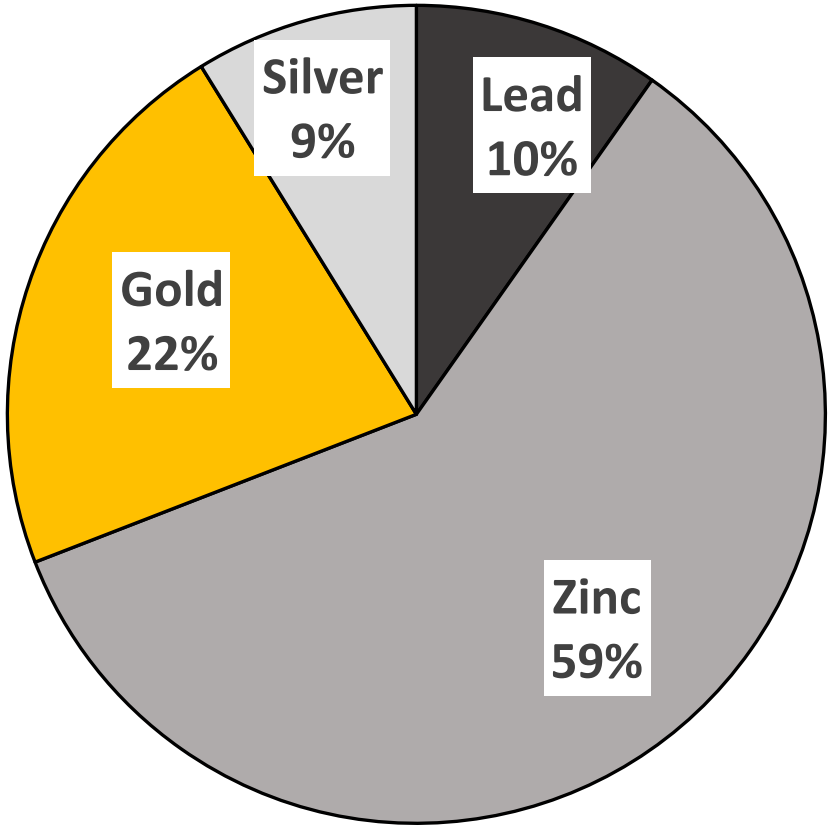
Alaska Mining Industry Today (2019)

Name	Commod. Symbol	Jobs	Total Gross Value ($m/y)
Hard Rock/Coal			
Pogo	Au	450	180
Kensington	Au	383	180
Fort Knox	Au	655	280
Greens Creek	Zn, Ag, Au, Pb	426	310
Red Dog	Zn, Ag, Pb	700	1,600
Usibelli	Coal	100	20
Other		62	<10
Placer	Au	159	67
Exploration		941	N/A
Total		**3,876**	**2,626**

Source: www.mcdowellgroup.net/wp-content/uploads/2021/02/ama-summary-brochure-web-version-2.15.2021.pdf

Alaska Mining Industry Today

- Economic impacts
  - Export base: ~ 10%
  - High wage jobs; $110,000/yr
- Alaska's primary products are zinc and gold



Percent of Gross Value Production, 2019

Possible Futures

Consider scenarios (not forecasts) of possible futures

From the perspective of the mining industry, 3 scenarios:

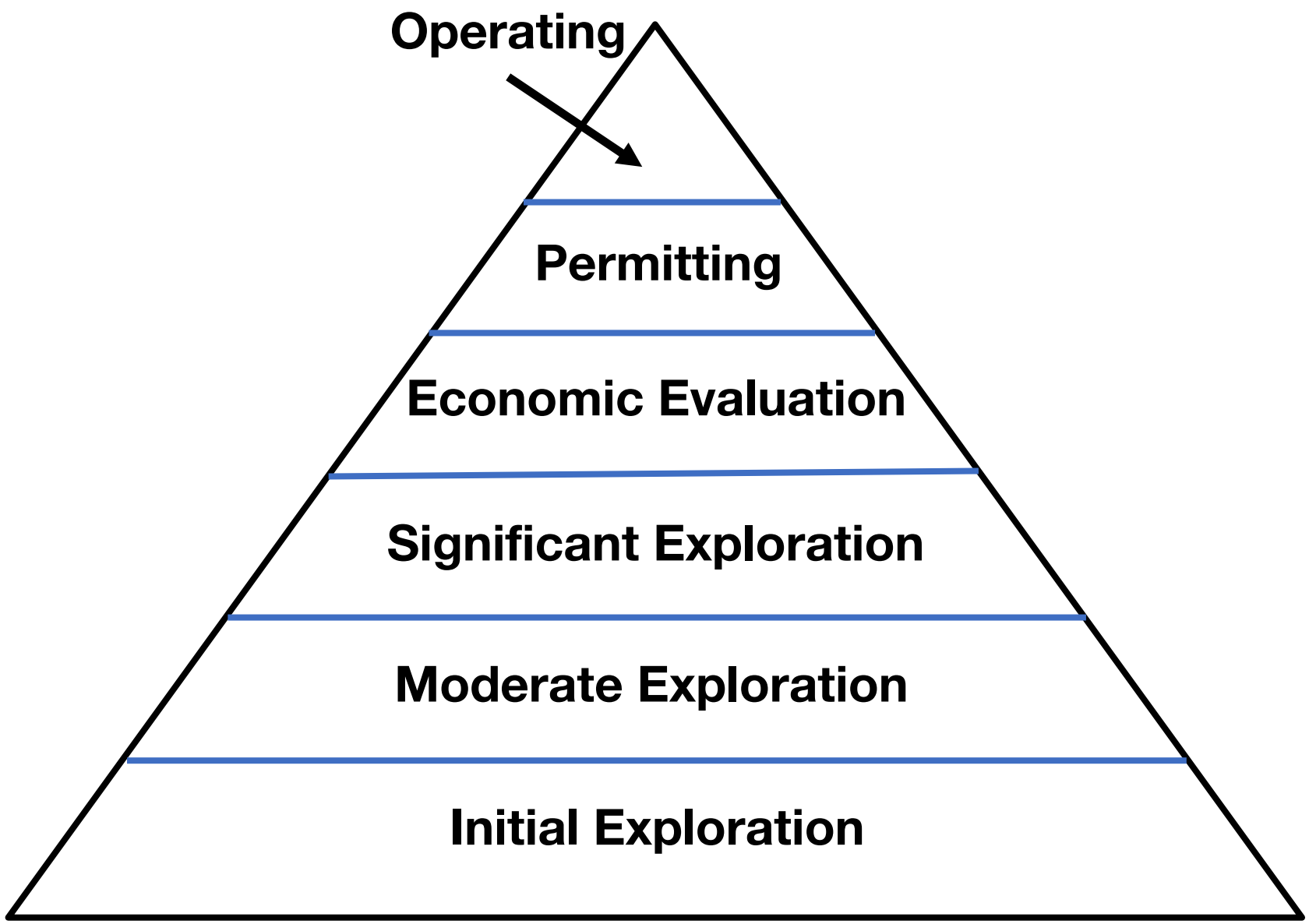
- Favorable: What if market and policy conditions are favorable?
- Status Quo: What if conditions mostly stay the same?
- Unfavorable: What if conditions degrade?

3 Scenarios for the Development Pyramid

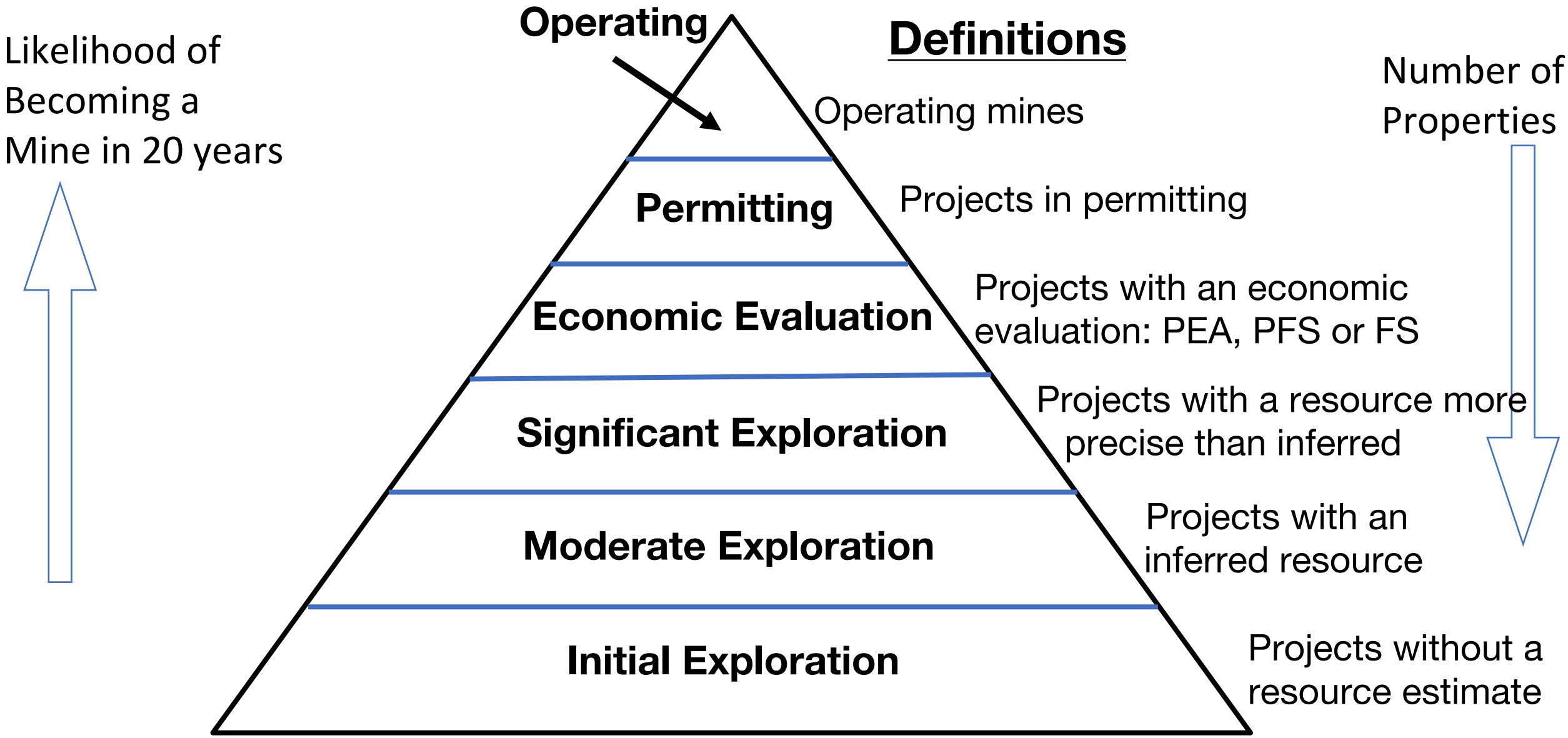
- 2020 Fraser Institute identifies main challenges for AK mining investment
- AK ranked 13th out of 77 jurisdictions in the Policy Perception Index

  lower than ID, WY, NV, UT, AZ, NM
- Of 15 factors, >25% of survey respondents cite five as mild or strong deterrent
  - 29%: Uncertainty Concerning the Administration, Interpretation and Enforcement of Existing Regulations
  - 35%: Uncertainty Concerning Environmental Regulations
  - 40%: Regulatory Duplication and Inconsistencies
  - 45%: Uncertainty Concerning Protected Areas
  - 59%: Quality of Infrastructure
- Look forward 20 years

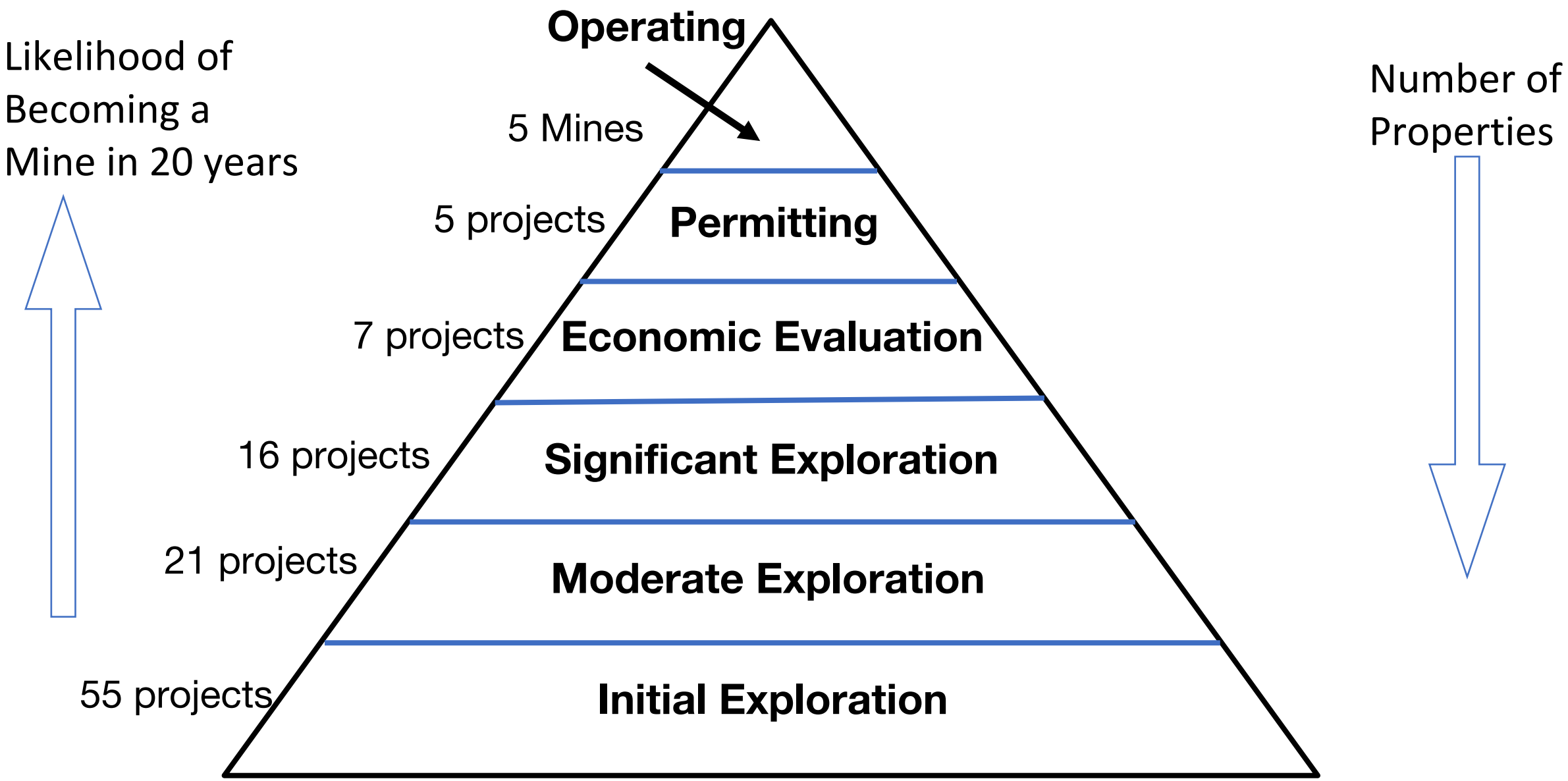
Method


Operating
Permitting
Economic Evaluation
Significant Exploration
Moderate Exploration
Initial Exploration

Method


Likelihood of Becoming a Mine in 20 years
Operating
Definitions
Operating mines
Permitting
Projects in permitting
Economic Evaluation
Projects with an economic evaluation: PEA, PFS or FS
Significant Exploration
Projects with a resource more precise than inferred
Moderate Exploration
Projects with an inferred resource
Initial Exploration
Projects without a resource estimate
Number of Properties

Method


Likelihood of Becoming a Mine in 20 years
Number of Properties
Operating
5 Mines
5 projects
Permitting
7 projects
Economic Evaluation
16 projects
Significant Exploration
21 projects
Moderate Exploration
55 projects
Initial Exploration

Method: Assigned Probabilities

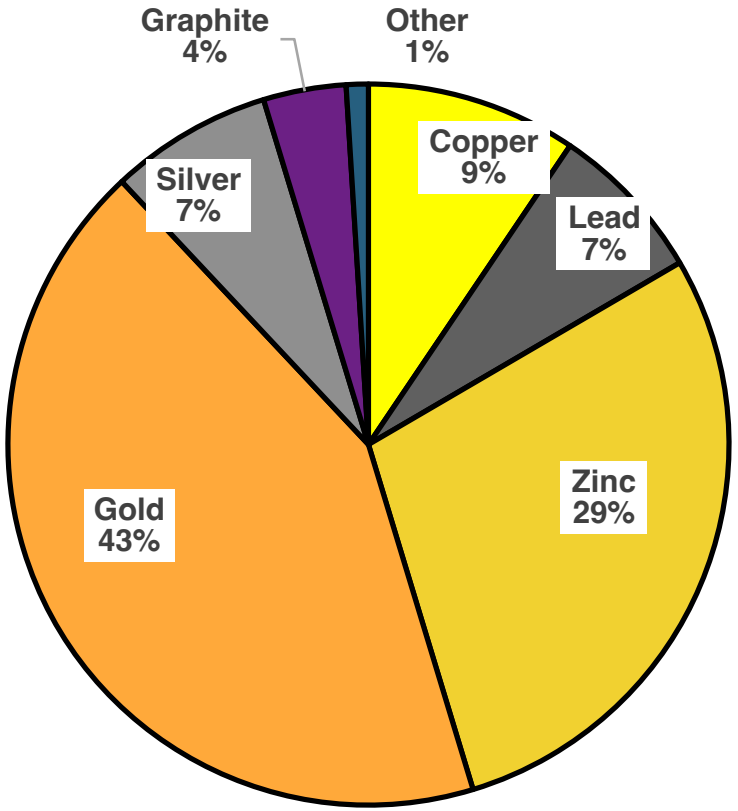
Hard Rock Minerals

Development Stage	Unfavorable Probability	Unfavorable (Range)	Status Quo Probability	Status Quo (Range)	Favorable Probability	Favorable (Range)
Operating	**50%**	(40%-60%)	**70%**	(60%-80%)	**100%**	(100%-100%)
Permitting	**37.5%**	(25%-50%)	**62.5%**	(50%-75%)	**87.5%**	(75%-100%)
Economic Evaluation	**12.5%**	(0%-25%)	**37.5%**	(25%-50%)	**62.5%**	(50%-75%)
Significant Exploration	**0%**	(0%-10%)	**12.5%**	(0%-25%)	**33%**	(25%-40%)
Moderate Exploration	**0%**	(0%-5%)	**5%**	(0-10%)	**10%**	(0%-20%)
Initial Exploration						
Small Mines	**0%**	(0-0)	**1**	(1-1)	**2.5**	(2-3)
Medium Mines	**0%**	(0-0)	**-**	(0-0)	**0.025**	(0-0.05)
Large Mines	**0%**	(0-0)	**-**	(0-0)	**0.025**	(0-0.05)

The report has a similar table for coal.

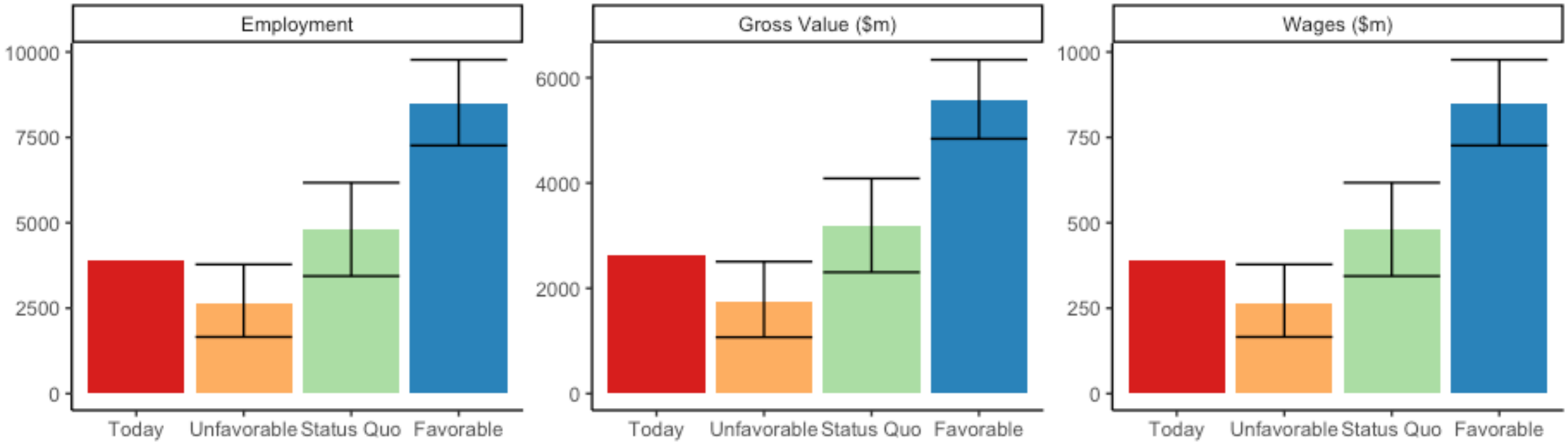
Results: Alaska Mining Industry in 20 years

- Size could double or decrease by 1/3
- In the favorable scenario:
  - Export base: grow to $5.6B or almost 1/3 of Alaska's 2019 exports
  - Export multiple new minerals
  - Alaska's primary products remain zinc and gold



Percent of Gross Value Production in 20 years
Favorable Scenario

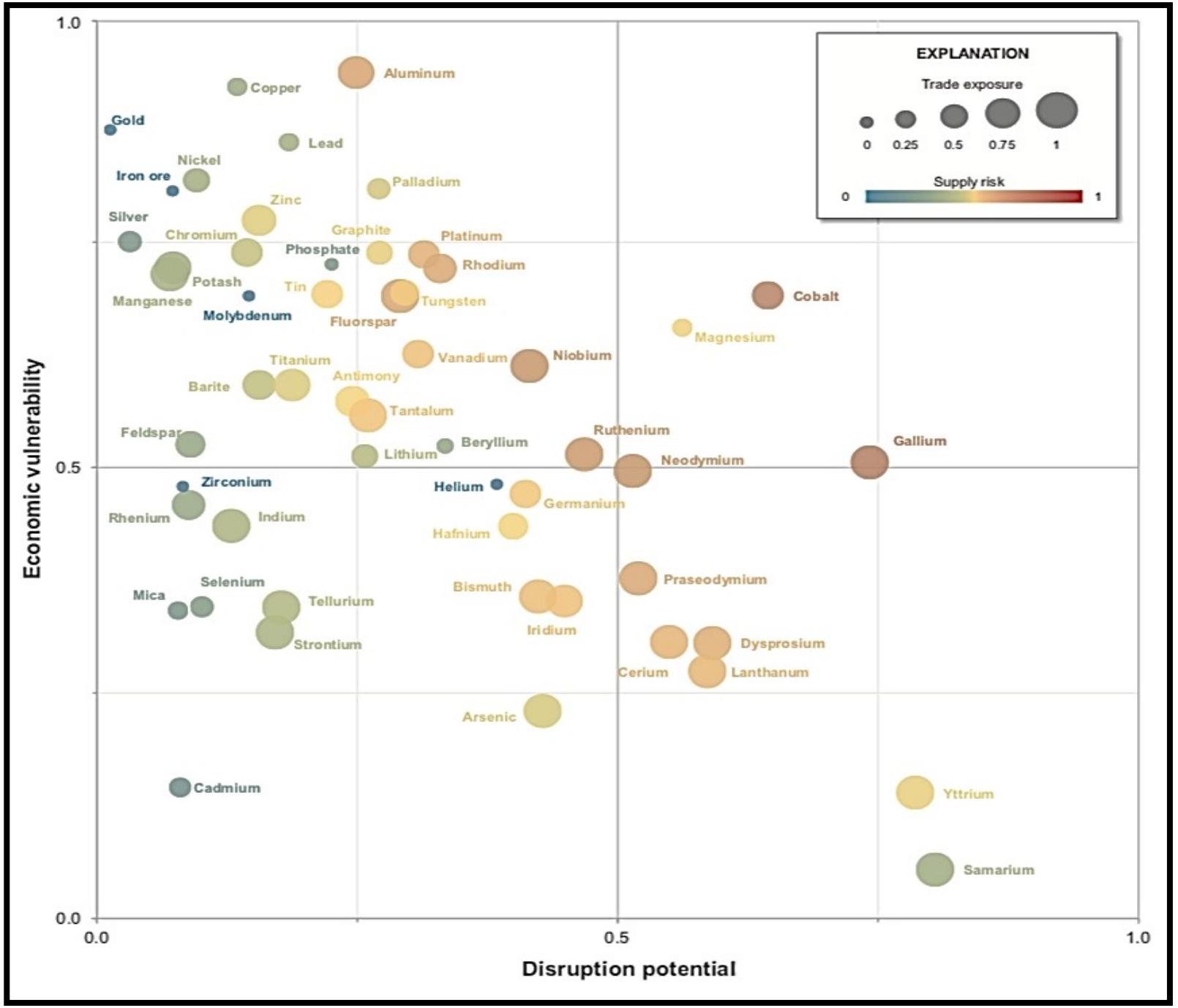
Results


Employment
10000
7500
5000
2500
0
Today
Unfavorable
Status Quo
Favorable
Gross Value ($m)
6000
4000
2000
0
Today
Unfavorable
Status Quo
Favorable
Wages ($m)
1000
750
500
250
0
Today
Unfavorable
Status Quo
Favorable

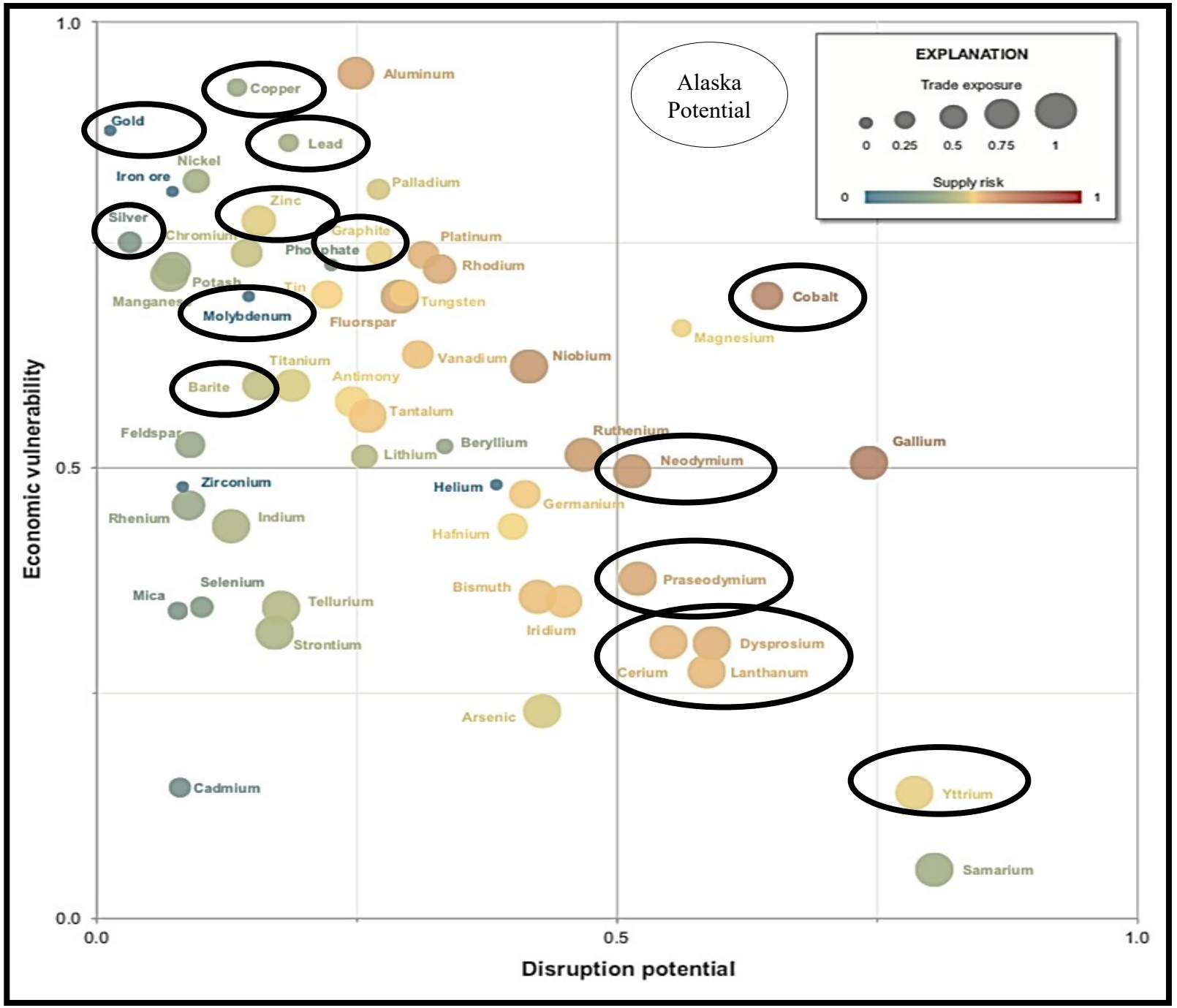
Mining Industry Employment in 20 years, by Scenario

	Today	Unfavorable		Status Quo		Favorable	
		Emp.	(Range)	Emp.	(Range)	Emp.	(Range)
Hard Rock & Coal	**2,776**	**1,833**	(1,141-2,630)	**3,319**	(2,372-4,267)	**5,823**	(5017-6,623)
Exploration	**941**	**733**	(456-1,052)	**1,328**	(949-1,7707)	**2,329**	(2,007-2,649)
Placer Mines	**159**	**80**	(60-100)	**160**	(120-200)	**320**	(240-500)
Total Direct	**3,876**	**2,646**	(1,657-3,782)	**4,807**	(3,440-6,174)	**8,472**	(7,263-9,772)
Total Direct & Multiplier		**5,292**	(3,300-7,600)	**9,614**	(6,900-12,300)	**16,944**	(14,500-19,500)

USGS: Economic Importance and Disruption Potential



USGS: Economic Importance and Disruption Potential



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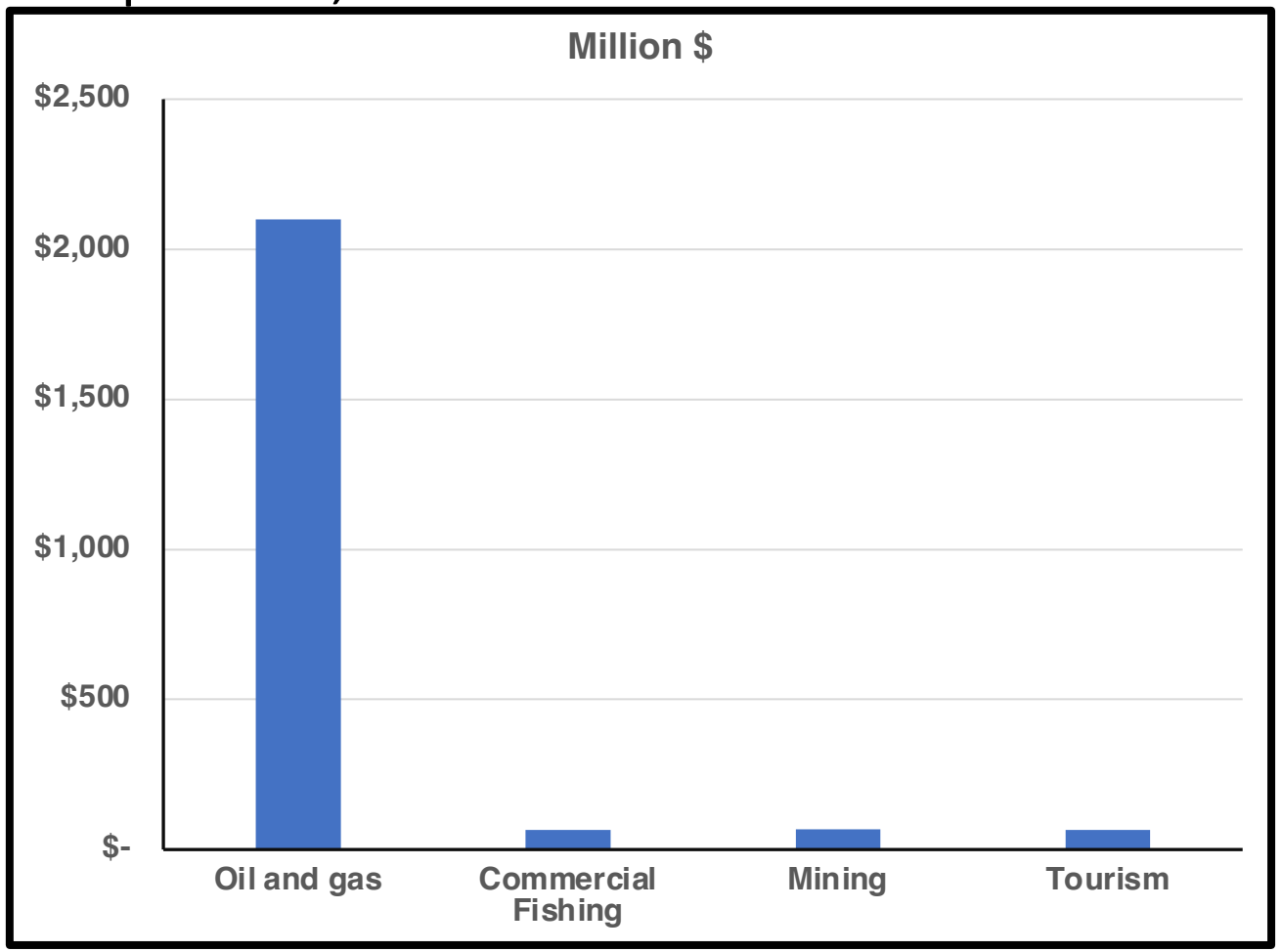
State Government Revenue

- Royalty, mine license, corporate income, rents, fees
- Avg 2016-2019
  - $66.6 m/year to state
  - $36.8 m/year to municipalities
- Compare to $4-5B state GF budget, petroleum revenue contributed $2.2B
- Favorable scenario doubles gross value
  - contradiction: prices fixed across scenarios (for comparability), but prices should be higher in favorable, lower in unfavorable
  - net profits royalties/taxes are more sensitive to prices than quantities
  - state revenue could more than double

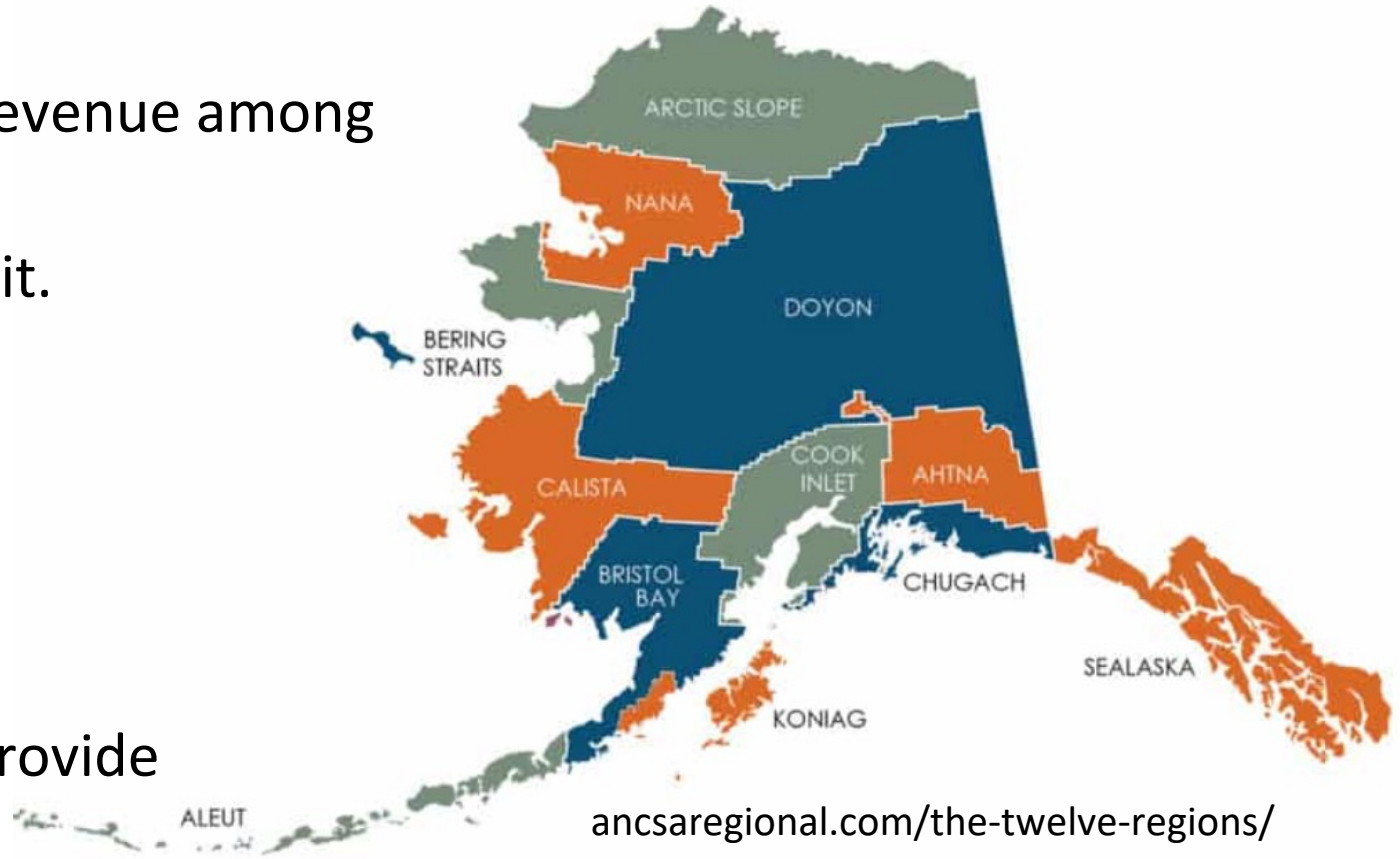
State Government Revenue (continued)

- Mining will not replace oil, but true net returns



Funding for Alaska Native Corporations

- Mines on ANCSA land provide revenue to Alaska Native Corps
- ANCSA 7(i), redistributes 70% of revenue among all Regional and Village Corps
- Most Village Corps dependent on it.
- Red Dog Mine
  - generated $2.4B for NANA
  - 69% of 7(i) from 2014-2020
  - May end in 2031
- Donlin is only project that could provide significant 7(i) revenue



ancsaregional.com/the-twelve-regions/

Regional Impacts

- Two Models:
- Rural, limited economic base (e.g. Red Dog)
  - Red Dog wages 2x higher than Borough avg.
  - 40% of all private sector employment, 30% of all wages
  - Tax base = local control
- Urban (e.g. Fairbanks & Juneau area mines)
  - Likely to be single largest tax payer, high wages, additional diversity
  - Pre-existing diversification -> non-transformative impact
  - Tax & jobs contributions just a fraction of total for areas

A note about Pebble

- The potential Pebble Mine not included in any scenario.
- Potential effect:
  - $85 million/yr in state revenue (more than double current revenue)
  - 850 direct jobs (an increase of 25%)
  - $1.7 million/yr in gross value (increase industry gross value by 65%)
- If you believe the project could be developed, its effects may be added to any scenario. This study makes no position for or against the project.

Take-aways

- Impacts
  - Potential to double industry size in next 20 decades
  - Mining won't replace oil on its own
- Supply domestic sources of critical & clean energy materials
- Unlikely to have a large impact on state revenues; but mining can be economic driver in rural locations
- Potentially Significant decrease in 7(i) revenues in 2031, which could be a significant problem for Village Corporations.

Observations for the favorable scenario

- Effect of Large Projects:
  - Donlin + Ambler district properties = 1,800 employees: 40% of the the favorable scenario increase

- Effect of infrastructure:
  - 70% of AK land area > 30 miles from a road but 66% of hard-rock projects (and most placer mines) < 30 miles or a road
  - Single largest impediment in the Fraser Institute Survey (59% said discouraged investment)

Thank you

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