Metal Mining and Alaska's Economy

by Chris Dunn, Bretwood Higman, Erin McKittrick, Andrew Mattox, David Coil

LAST MODIFIED: 30TH NOVEMBER 2023
CREATED: JAN. 19, 2018

Ground Truth Trekking

Table of Contents

Alaska’s entire mining industry produced $3.4 billion (http://www.akrdc.org/issues/mining/overview.html) in 2013, about 6.5% of the Gross State Product. Mining (of all types) was the 5th largest industry in the state economy (http://www.iser.uaa.alaska.edu/Publications/presentations/2012_02-Introduction_to_Economy_of_Alaska.pdf), after petroleum, government, fishing, and tourism/recreation.

Alaska’s Metal Mining Economy

5th largest driver*
Of the state economy

Gold & zinc
Most important metals

5 major metal mines
90% outside-owned

~300 small mines
Many locally owned

2,000 jobs
Direct metal mining jobs
+1,500 coal and quarrying

$3+ billion*
Annual production

METAL MINE ECONOMIC FACTS (/figures/alaska-metal-mining-numbers/) — Starred (*) items include coal & quarrying

Alaska’s present day metal mines bear little resemblance to those of the Klondike era. Early mining targeted extremely rich veins of metal on a small scale, using simple technology and without environmental controls. Today, major mines target enormous bodies of lower-grade ore, and are some of humanity’s largest physical creations.

Small-scale placer metal mining still provides a real income for small companies, but has become a minor player on the world metal stage. Many of Alaska’s “small” placer mines would dwarf Klondike-era operations in their earthmoving ability, thanks to powerful modern heavy machinery and techniques like hydromining and marine dredging.

Metal mining is the most robust sector of Alaska mining, with five major mines and hundreds of small mines scattered across the state. Metal mining directly employs (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) about 2,000 people in Alaska, out of 3,500 total state direct mining jobs. The industry attracts new workers and outside investment to the state, and leads to the expansion of infrastructure like roads and harbors.

Metal mining also produces long-term environmental problems and waste dumps which must be managed for the indefinite future (/Issues/OtherIssues/perpetual-waste-storage-perpetuity.html), and leads to the expansion of development into previously wild areas. Metal mines pay a small excise tax in-state and contribute only a small fraction of their taxes (/Issues/

MetalsMining/Mining-Taxes-Revenue-Alaska.html) to Permanent Fund. (http://en.wikipedia.org/wiki/Alaska_Permanent_Fund) Most (but not all) of Alaska's major mines are owned out-of-state.

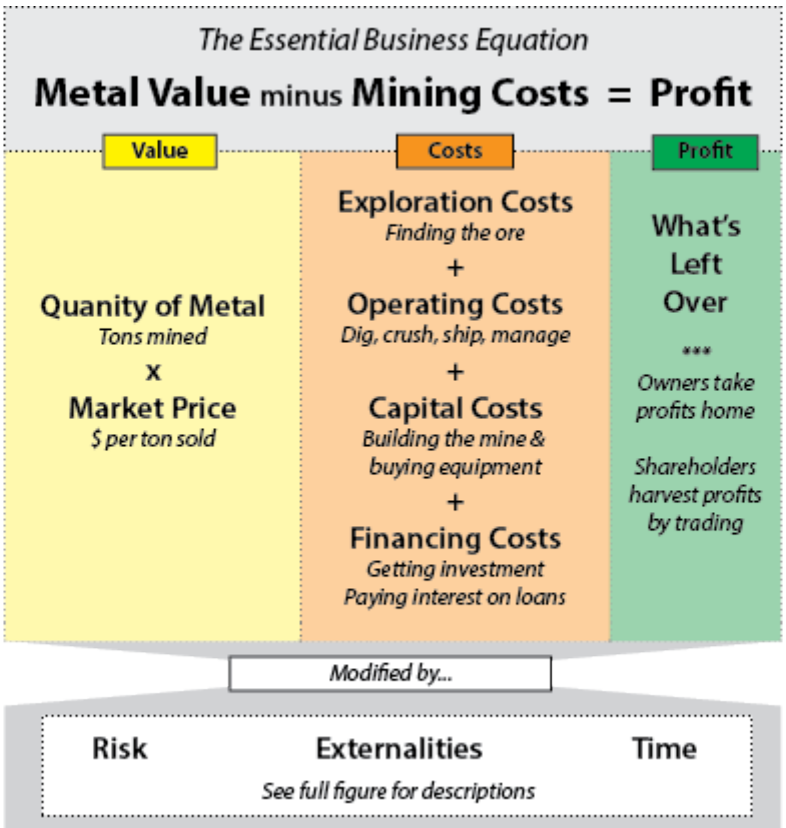
Driving Dynamic: Metal Value vs. Mining Costs

Mining in Alaska is ultimately driven (or inhibited) by two countervailing economic forces: the total value of the metal gotten out of the ground, and the cost per pound of doing so. The difference between these two numbers, in very simple terms, determines the mine profit.

Metal Prices

Total metal value is controled by the amount of metal mined, and selling price of that metal. While quantity of metal in a deposit is geologically fixed, the price of metal on the world market is constantly changing. Alaska's mined metals essentially feed into the world market (rather than into a smaller local market), and higher global metal prices make mining more attractive in the state. Metal prices on the world market are mostly a function of global supply and demand, and are beyond the influence of Alaska's mines, which contribute a tiny fraction to the global supply.

The exception to this is Red Dog mine, (/Issues/MetalsMining/RedDogMine.html) which supplies 5% - 10% of the world's zinc and thus probably influences global supply so much that it can alter world zinc prices by throttling its own production up and down.



METAL MINING BUSINESS EQUATION (/figures/metal-minings-business-equation/) — Determining whether a mine is profitable or not

Mining Costs

Mining costs depend on factors like the remoteness of a deposit, ore grade, tax rates, cost of environmental compliance, financing available, and the technology and logistics that can be brought to bear on the project.

Technological innovations have over time enabled humans to extract metal much more cost-effectively, letting us target lower and lower grade ores, as richer deposits have been exhausted. Mining becomes less attractive when costs rise or sales revenues fall, often due to factors like logistical issues, environmental remediation, higher local wages, or unexectedly poor ore.

Logistical factors are particularly important for Alaska mining. Long transport distances to commodity markets can drive up costs for Alaska mines, as can Alaska's difficult operating conditions and the high labor costs (which are themselves largely a function of logistics). Government investment in infrastructure also strongly influences logistical costs for mines.

For instance, the Alaska Railroad (/Issues/Infrastructure/alaska-railroad.html) is largely funded by state and federal grants, and is currently constructing a bulk export terminal at Port MacKenzie (/Issues/Infrastructure/Port-MacKenzie-Railroad-Extension.html) that would be a boon to metal, coal, and aggregate exporters along its route. The Delong Mountain Transportation System (http://www.aidea.org/Programs/InfrastructureDevelopment/DeLongMountainTransportationSystemDMTS.aspx) (Red Dog's road) was funded by the Alaska Industrial Development

Authority, (http://www.aidea.org/AIDEAHome.aspx) which has also proposed to build a road into the Ambler Mining District. (/Issues/MetalsMining/Ambler-Upper-Kobuk-Mineral-Project.html)

The Influence of Risk on Supply

While rising global metal prices have made Alaskan mining more attractive in recent years, risk has also acted as a brake on development. Risk acts like a “cost” on possible future mines. The greater the riskiness of a project, the greater the potential payoff must be to make it worthwhile. As a result, risk dampens mine development. Regulatory risk has become increasingly important in Alaskan’s mining climate, since large-scale opposition organized around the proposed Pebble Mine (/Issues/MetalsMining/pebble-mine-gold-copper-prospect-alaska.html) and the EPA moved to pre-emptively block development of the mine.

Establishing mines is risky, and this risk strongly affects whether new mines are built. Building a major mine often takes hundreds of millions or billions of dollars, across multiple years, and payback on this investment usually takes at least 5 years, if not a decade or more. Market prices of metal may fall and render operations unprofitable before the build-cost of the mine is recovered.

Minerals exploration, which must precede mine building, is also expensive and risky. For every worthwhile prospect, companies also spend a lot of money exploring prospects that turn out to be dead ends. In an extreme example, if Pebble Mine fails, more than $1 billion worth of exploration expenditures may be lost. Anglo-American is already known to have abandoned (http://www.adn.com/article/20130916/anglo-american-pulls-out-proposed-pebble-mine) a $540+ million dollar investment in the prospect.

Jobs, Revenue, and Taxes

Jobs

In 2010 (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf), the Alaska Department of Labor reported 2,000 direct metal mining jobs. The number of indirect jobs associated with metal mining is not clearly determined, but is likely in the range of 2,000. The average salary of all state direct mining jobs (including coal and gravel as well as metal) was reported at slightly over $100,000 per year. This figure is average (not median) salary, and therefore may be buoyed upward above the state average by very high salaries of the best-paid mine managers. However, anecdotal reports suggest Alaska mining jobs are generally well-paid.

For comparison, the oil and gas industry is responsible for 4,700 direct jobs, 8,400 jobs in support services, 37,000 jobs indirectly supported by oil and gas industry spending, and 60,000 jobs created by government spending of oil tax revenue.

Red Dog is a striking example (/Essays/RunningwithRedDog.html) of a mine to providing jobs and allow communities to economically sustain themselves in remote areas. The operation of Red Dog has employed local villagers, and provided a strong mechanism for young people to remain in rural villages while earning currency income.

The 10-year Pebble Prospect (/Issues/MetalsMining/pebble-mine-gold-copper-prospect-alaska.html) exploration created many jobs in the town of Iliamna, and which have recently dissapeared. (http://www.adn.com/article/20140727/year-after-pebble-iliamna-lake-communities-adjust-new-normal) In 2012, Pebble provided some work to 1,403 total people in the region (including very brief contracts), and 183 of those people were from the Bristol Bay region. Iliamna’s boom has recently switched to bust, as Pebble’s future has come into question. As of August 2014, the regional Pebble workforce had contracted to 184 total jobs, and has likely declined since. Although Pebble may not be built, the exploration provided temporary income for hundreds of residents. On the other hand, it is anecdotally reported that this income fell very unevenly across the local population, being concentrated heavily in certain villages (notably Iliamna) and among certain individuals/families and subgroups.

Revenues and Gross State Product

In 2010, the same year as the job statistics just described, Alaska produced minerals of all types worth a gross market value of $3.1 billion. (http://www.alaska.edu/files/bor/

120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf) Although the market value of mining production is often cited in Alaska mining statistics, it actually has little direct relevance to Alaska's economic gains from mining. Many mine-related expenditures occur, and most profits are realized, out-of-state. Instead, the most important cash flows for Alaska's economic health are probably in-state payroll, taxes, and vendor expenditures. Mining also provides in-state revenue in the form of political contributions, advertising, and lobbying.

MINE WORKERS — Workers and spurts of water at a drill rig, Pebble East. — Get Photo (/photos/mine-workers/)

Taxes

Mining activities paid roughly $54.9 million in state taxes and $14 million in local taxes in 2010. Oil & gas, in contrast, returned about 20%. In terms of absolute tax revenues (http://www.tax.alaska.gov/programs/documentviewer/viewer.aspx?859r) in the same year, oil & gas paid (http://www.aoga.org/sites/default/files/news/aoga_final_report_5_28_14_0.pdf) $3.8 billion, tobacco $72 million, fisheries $58 million, commercial passenger vehicles $44 million, and alcohol $39 million. (Note: fisheries is a sum of 7 different tax categories in the 2010 tax revenue report).

Based on 2002 analyses (/Issues/MetalsMining/Mining-Taxes-Revenue-Alaska.html), mining pays a very low tax in Alaska, returning roughly 1.6% of the resource value to the state. Economic forecasters predict a state government budget crunch (http://www.iser.uaa.alaska.edu/Publications/webnote/2013_01_03-WebNote14-FY2014MSYupdate.pdf) by 2023. Steeper taxes on metal mining could help fill the shortfall, which is expected to result from falling oil revenues and rising state government spending, although they might also discourage investment. Other options include a statewide sales or income tax, cutting government spending, and tapping the Permanent Fund.

Ownership, Investment, and Profits

Small-scale mines are often funded, built, and owned largely within Alaska. Although they represent a minority of total state metal production, they are numerous, with around 300 (http://

www.akrdc.org/issues/mining/overview.html) operations going. Many of these operations are locally owned, and their profits go to in-state owners before being spent.

In contrast, large Alaskan mines consistently have outside owners because such mines have massive startup expenses for exploration and construction. For instance, Fort Knox (/Issues/MetalsMining/FortKnoxMine.html) gold mine's initial construction cost was $373 million (http://www.kinross.com/pdf/operations/Technical-Report-Fort-Knox.pdf), Red Chris mine being constructed in British Columbia will cost roughly $500 million (https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCA
awards.com%2Fmultimedia%2Fkrwawards_assets%2Fassets%2Ffiles%2Faw
xH4qzoQS6-
oG4CA&usg=AFQjCNG2VhYFII98J9mvPYEu2bfKN9DpgQ&sig2=Oc1aydIbq
javdIsxatA&bvm=bv.78597519,d.cGU), and Pebble Mine is estimated to have a build-cost of $4.7 billion (http://www.northerndynastyminerals.com/i/pdf/ndm/Pebble_Project_Preliminary%20Assessment%20Technical%20Report_Februa
Exploration alone at the Pebble Prospect has cost more than $500 million (http://www.businessweek.com/articles/2013-09-27/why-anglo-american-walked-away-from-the-pebble-mine-gold-deposit). Alaska lacks local firms with sufficient funds and know-how to establish such large mines.

Initial capital investment and subsequent operating expenses at big mines can either go into the state economy (when they are spent on Alaskan workers and suppliers) or immediately leave the state (when they are spent on outside workers and vendors). Vendor purchases are likely to channel money outside the state, because mining equipment and most other goods are not produced in Alaska.

Of the five major mines in Alaska, only Red Dog mine (/Issues/MetalsMining/RedDogMine.html) has in-state ownership. Red Dog is half-owned by NANA (http://www.nana.com/) Native Corporation, which owns the land, and is therefore able to charge Teck mining corporation an economic rent (http://en.wikipedia.org/wiki/Economic_rent), in the form of a 50% ownership share. Regional Native Corporation profit sharing then distributes this money around the state, and Native Corporations' obligatory dividends distribute some of this money to all Native Corporation shareholders. This leads to an unusually wide distribution of Red Dog profits into the state population.

Infrastructure

Mining creates significant long-term features which outlive mine operation and can have ramifications well beyond the mine itself. Infrastructure like roads, ports, and pipelines that is built for mines can have other uses, or may remain serviceable long after a mine closes. By improving transport and energy access into remote areas, large mines can facilitate the local development of additional mines and related businesses, reinforcing an industrial development cycle. (See our related article (/Issues/AlaskaCoal/socioeconomic-impact-coal-alaska.html) on this phenomenon with respect to coal.)

Infrastructure can also impact local Alaskans in ways not related to mining. For instance, large mines can bring lower-cost electricity to small villages which are otherwise reliant on inefficient and aging diesel generators. Better transportation access can bring more outsiders to an area for hunting and fishing, leading to competition with local subsistence users. In an extreme example of infrastructure creation, the proposed Pebble Mine (/Issues/MetalsMining/pebble-mine-gold-copper-prospect-alaska.html) would involve the construction of a deepwater harbor, a long-distance road, several pipelines, and a natural gas powerplant (/Issues/MetalsMining/pebble-mine-gold-copper-prospect-alaska.html) which might increase Alaska's total generation capacity by around 20%. (/Issues/MetalsMining/powering-pebble-prospect-electricity-fuel.html)

Waste

The creation of massive, long-term economic liabilities (http://facstaff.uww.edu/bhattacj/mine_waste_overview.pdf) is an unusual property of mining. These liabilities usually come in the form of waste (http://www.miningfacts.org/Environment/How-are-waste-materials-managed-at-mine-sites/) dumps and water contamination. (http://www.safewater.org/PDFS/resourcesknowthefacts/Mining+and+Water+Pollution.pdf)

The full extent of damages caused by worldwide seepage of contaminated water from mine facilities is unknown, and may never be scientifically well-understood since it is very hard to measure. A large 2006 study (http://www.aktrekking.com/pebble/news/ComparisonsReportFinal.pdf) found that more than 60% of large U.S. mines failed to meet downstream water requirements. Contamination can become most acute after mine closure, when the mine is allowed to fill with water (for example, the Berkely Pit (http://www.mbmg.mtech.edu/env/env-berkeley.asp) in Butte, Montana).

Eventually, old mines become wards of the state, as the actual mining firms that own them go out of business or relinquish their long-term liability. Regardless of whether private firms or the state is responsible for management of old mines, their impacts become a cost to society - either in money and manpower to manage them, or in the damages to health and the environment they cause. Analysis suggest that Alaska’s reclamation bonds are systematically inadequate (http://www.csp2.org/files/reports/Alaska%20Reclamation%20Bonding%20-%20Sep05.pdf) to cover future waste management costs, as does independent industry commentary. (http://ithinkmining.com/2012/10/18/tailings-mine-waste-2012-the-challenge-of-tailings-risk-management-in-perpetuity/)

The Mount Polley Mine Tailings Breach, 2014

As the scale of mining has increased, so has the potential scale of waste accidents. This was displayed by the recent Mount Polley Mine tailings dam failure (http://www.cbc.ca/news/canada/british-columbia/mount-polley-mine-spill-78-larger-than-1st-estimates-1.2755974) in British Columbia, which catastrophically breached and released an estimated 25 million cubic meters of tailings and water - about 625 times the size of the Exxon Valdez oil spill (/Issues/AlaskaOilandGas/ExxonValdezSpill.html).

Although this comparison conveys the size of the breach, it should *not* be equated to that multiple of environmental harm or toxicity. Even the most hazardous mine tailings are in general far less toxic per unit volume than spilled petroleum, and Mount Polley's tailings were relatively inert (i.e. not acidic or chemically hazardous). Volume of discharge doesn't equate to damage. The environmental impact of the Mount Polley release isn't yet scientifically established, but ore chemistry suggests the total harm will be much less than a spill of sulfide ore tailings would have been.

Nonetheless, the breach did physically devastate the riparian environment immediately downstream, and poured a massive volume of tailings into two downstream lakes, which are conveniently situated to act as settling bains. The cleanup is forecast to cost as much as$500 million (https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCA metals-mount-polley-disaster-could-cost-500-million-bonds-only-fraction-amount&ei=X0ZRVJjEA5bfoATV44KABQ&usg=AFQjCNEliDGt8KntVS8pkkkS 78597519,d.cGU), and could bankrupt Imperial Metals (https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0CCA wCdYH0Tp3DV2g&sig2=reioCsY9EX6WCPE3pnka4w&bvm=bv.78597519,d.cGU), the mine owner. Imperial Metals has also suffered serious brand damage from to the incident, and Mount Polley may serve as a future case-study for the potential cost of a major mine accident in the North America. Imperial Metals stock lost 40% (https://www.google.com/webhp?sourceid=chrome-instant&rlz=1C1CHFX_enUS592US592&ion=1&espv=2&ie=UTF-8#q=impe of its value immediately after the breach, and has remained weak. If Imperial Metals defaults, Canadian taxpayers will likely assume financial responsibility.

Further Reading

> The Economic Contributions of Mining (http://www.nma.org/pdf/economic_contributions.pdf)

> Running with Red Dog (http://www.groundtruthtrekking.org/Essays/RunningwithRedDog.html)

> The Economic Impacts of Alaska's Mining Industry (http://www.alaska.edu/files/bor/120412Ref04_AK_Mining_Industry_Economic_Impacts.pdf)

> The Economic Impacts of Placer Mining in Alaska (https://www.dropbox.com/s/wly4yrnmlop59on/AMA%20Placer%20Final%20Report%2011.15.pdf?dl=0)

> Statewide Socioeconomic Impacts of Usibelli Coal Mine, Inc. (http://www.usibelli.com/McDowell-Report-Statewide-Socioeconomic-Impacts-of-UCM-2015l.pdf)

> by the Institute for Social and Economic Research. (http://www.iser.uaa.alaska.edu/Publications/presentations/2012_02-Introduction_to_Economy_of_Alaska.pdf)

> Reconsidering the "Value" of Gold (http://www.groundtruthtrekking.org/Essays/ValueofGold.html)

> Metals Recycling: A Necessary Start (http://www.groundtruthtrekking.org/Essays/MetalsRecycling.html)