



Observing Trends and Assessing Data for Arctic Mining

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Main Science Questions

The AON-SIP conceptual model explicitly identifies two pathways of interactions between development activities and social outcomes: economic effects and ecosystem services, with institutions as a mediating layer. Our emphasis on currently available, time series data has led us to an almost exclusive focus on economic and production data. In this project we did not collect indicator data on ecosystem services or the less tangible processes that affect fate control and cultural continuity.

Indicators and Limitations

- Employment: Limited and inconsistent data
- Mining related local spending: Proprietary data
- Physical quantities of minerals mined: Hard to compare impact of oz of gold to tonne of iron ore
- Value of minerals mined: Price variations do not reflect changes in local impact
- Real value at long run average price is the most consistent across time, geography and minerals

Mineral prices are volatile, but tend to hover around their long term average with occasional temporary price spikes.

Mining Value Index

- Long run average price multiplied by production
- Normalizes price fluctuations
- Preserves relative mineral values

Limitations:

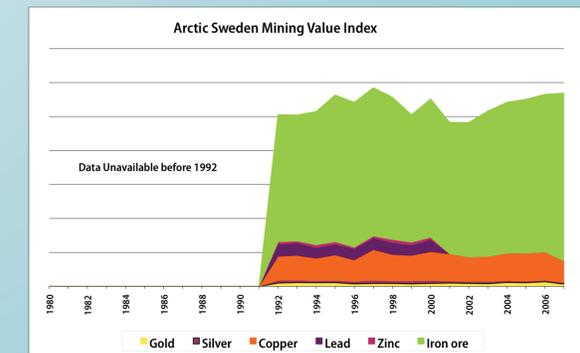
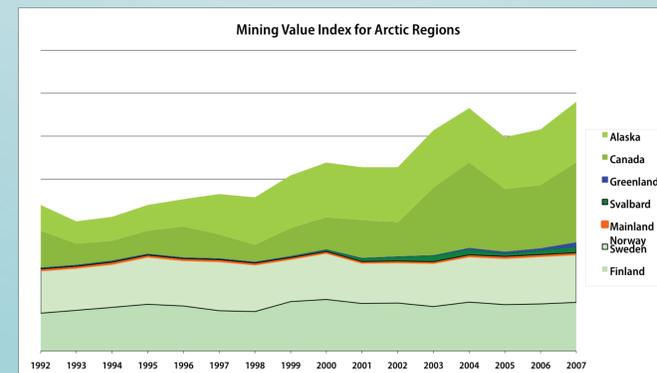
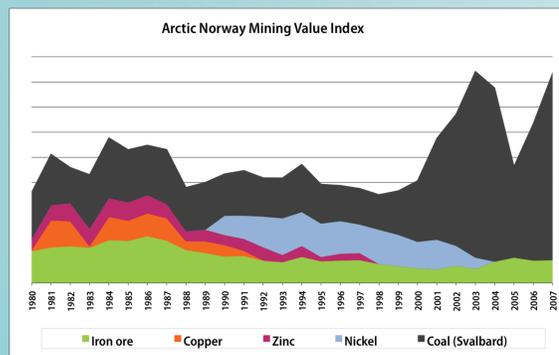
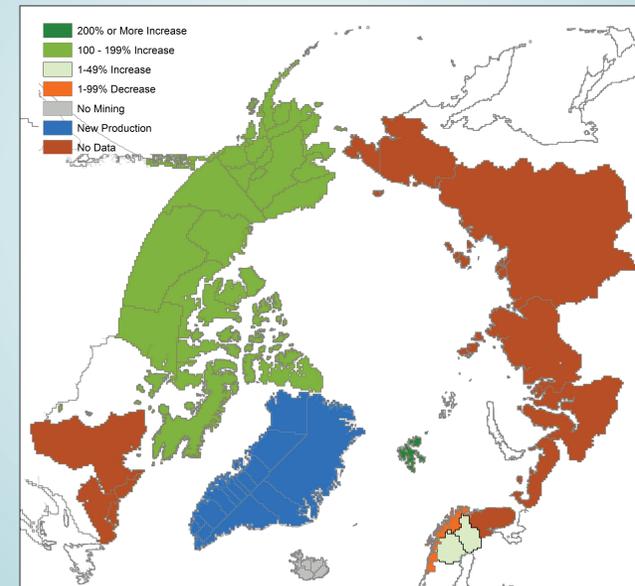
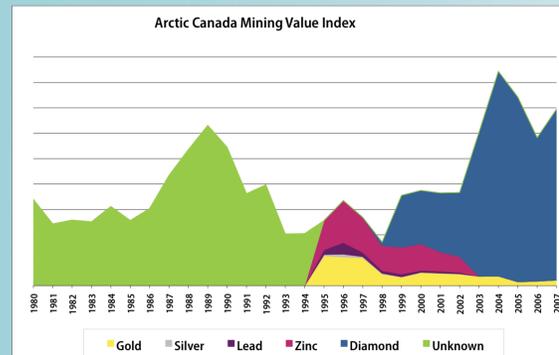
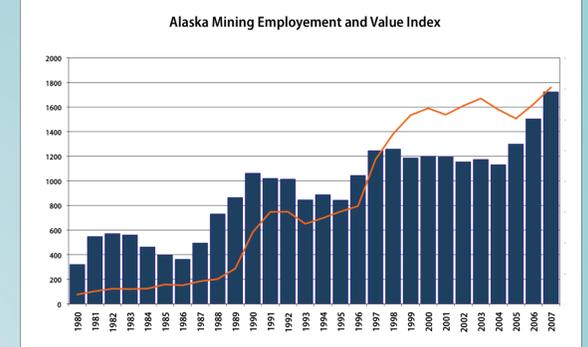
- Profit margins vary between mines
- Amount of "value-added" varies between mines—may include smelting, processing and transportation
- Employees do not always reside in the region
- "Noise" is inherent in the Index
- The Index does not reveal the type or magnitude of the social effects

Lifecycle Stages

- Social effects will differ at different stages of mining activities.
- Local effects are small in the exploration and predevelopment stage.
 - If development proceeds, employment is typically higher in the construction phase than in operations, and there may be social impacts associated with temporary workers. Operations also mark the start of different revenue streams that may enter the local economy, such as royalties, taxes, rents, local purchases, contributions, profits and dividends. There may be abrupt changes in ecosystem services, or long term cumulative effects, or increased risk of extraordinary events.
 - Expansion activities can expand the scale of impacts, or defer the impacts associated with closure.
 - Permanent shutdown involves loss of employment and revenue streams that may enter the local economy.



Changes in Mining Activity
1992 - 2007



Frontier regions show strong growth in mining activity while mature regions are stable or in decline.

Conclusion

The most universal measures we found address mineral production and value. We found these to be imperfect proxies for economic effects. Furthermore, we found that historical data on mineral production and value is unavailable in electronic format for much of the Arctic, specifically Scandinavia and Russia. Completing the historical record back to 1980 required work with paper archives or special requests to agencies. The most critically needed improvement in data collection and reporting is to develop comparable measures of employment.

The trends in mining activity that we found includes stasis or decline in mature regions of the Arctic, and strong growth in the frontier regions. Climate change has diverse and regionally-specific effects, and does not contribute to trends overall. The biggest driver in the Arctic frontier is the availability of large, undiscovered and untapped resources with favorable access and low political risk.