Economic Contribution Analysis

Construction and Operation of Highland Copper's Copperwood Mine

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PSC

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Executive Summary

Background

Highland Copper partnered with Public Sector Consultants (PSC) to analyze the economic contributions of the construction and operations of the Copperwood mining site to the state and Upper Peninsula (U.P.) economies. Relying on budget and expenditure projections provided by Highland Copper, PSC conducted this analysis using an input-output modelling tool, Impact Analysis for Planning (IMPLAN), that traces transactions among and between different sectors to quantify how activity in one part of the economy affects others.

PSC analyzed the impacts of the construction and operation of the Copperwood site on employment and economic output in the U.P. To do this, PSC conducted two analyses in IMPLAN using data from Highland Copper. The first modeled the direct, indirect, and induced economic contributions associated with the facility's construction. As construction impacts occur over a limited time frame, such estimated impacts exhibit a temporary shift in economic activities in the affected area. The second modeled the economic contributions of the annual operation of the mine once fully operational. The impacts of ongoing operations are expected to continue indefinitely in the analyses and are representative of typical annual economic contributions to the affected areas. This two-step approach allowed PSC to analyze the expected economic contributions of the planned Highland Copper investment in Copperwood to the U.P. and state economies.

Key Terms

PSC used IMPLAN to analyze the direct, indirect, and induced effects of Highland Copper's spending.[1] Direct, indirect, and induced effects were modeled in four main categories:

- **Employment:** Number of full- and part-time jobs in affected industries.
- **Labor income:** Total value of employee and proprietor compensation (excludes retained and distributed profits).
- **Value-added:** Regional income, also called gross regional product, incorporates labor income property-type income including retained and distributed profits and net government income (taxes minus transfers. This roughly translates to profits earned by in-region entities producing materials and equipment purchased for mine construction or operations.
- **Output:** The value of production by industry, which can also be described as annual revenues (value of sales transactions) plus net change in inventories.

Using IMPLAN also allowed PSC to estimate tax earnings at the local, county, state, and federal levels supported by the project.[2]

[1] See Appendix for more detail on direct, indirect, and induced effects.

[2] In the case of state taxes associated with operating the mine, PSC estimated the projected amount of Nonferrous Metallic Minerals Extraction Severance Tax owed by Highland Copper based on projected mineral output and material price.

Results and Findings

Highland Copper is projected to spend over **$425 million on construction** of the Copperwood site over the course of the project's three-year duration. This spending will **directly support 300 construction jobs** on-site, as well as **another 114 jobs** at Highland's vendor partners in the U.P. In addition to these direct jobs, the indirect and induced purchases made by households and businesses as part of this construction spending are expected to support **another 353 jobs statewide,** about half of which are expected to be in the U.P. The investment to bring the Copperwood site online is expected to generate an average of over **$4.5 million in local, county, and state tax revenue** on an annual basis during the three-year construction period.

Once the mine is operational, Highland Copper expects to employ **380 workers** at Copperwood. In addition to these employees, the mine's annual operations spending is projected to support **another 313 jobs across the state** on an annual basis. Operational spending at Copperwood is expected to increase spending to businesses in Michigan by **$130 million each year** and generate over **$12 million in local, county, and state tax revenue** on an annual basis.

Background

Highland Copper partnered with PSC to analyze the economic contributions of the construction and operation of the Copperwood mining site to the state and U.P. economies. Relying on budget and expenditure projections provided by Highland Copper, PSC conducted this analysis using IMPLAN,[3] an economic modeling tool that traces transactions among and between different sectors to quantify how activity in one part of the economy affects others.

Methodology

Introduction and Key Terms

PSC analyzed the direct, indirect, and induced effects of Highland Copper's spending with IMPLAN. Highland Copper's spending on construction and mining operations, on both labor and materials from vendors, across the U.P. and the state directly contributes to Michigan's economy; this is known as a **direct effect.** The industries paid by Highland Copper to provide materials and services use these revenues to purchase goods and services for their respective operations. A portion of these expenditures will go to other businesses in the U.P. and Michigan, creating jobs and economic activities in excess of the initial expenditures. These business-to-business transactions are known as **indirect effects.** In addition, payments to workers, proprietors, and government generate an additional source of transactions called **induced effects.** Like indirect transactions, many of these induced transactions are captured in the local economy. Direct, indirect, and induced effects are additive, generating total economic effects as the sum of the three effects. These effects can be measured in four different ways:

- **Employment:** Number of full- and part-time jobs in affected industries.
- **Labor income:** Total value of employee and proprietor compensation (excludes retained and distributed profits).
- **Value-added:** Regional income, also called gross regional product, incorporates labor income property-type income including retained and distributed profits and net government income (taxes minus transfers. This roughly translates to profits earned by in-region entities producing materials and equipment purchased for mine construction or operations.
- **Output:** The value of production by industry, which can also be described as annual revenues (value of sales transactions) plus net change in inventories.

For this analysis, PSC used Highland Copper construction and operation budget data, with adjustments based on Highland Copper's estimation of how many of these jobs and spending would occur within the study regions (U.P. and Michigan). Any spending projected to occur outside these regions was not included in the analysis. Using these adjusted data, PSC conducted two analyses for the Copperwood site. The first estimated the direct, indirect, and induced economic contributions of the construction of the facility in the U.P. and the state of Michigan. The second modeled the economic contributions of the annual operation of the mine once it is fully operational for the same regions.[4]

[3] For more background information on IMPLAN, see Appendix.

[4] For more detail on PSC's methodological approach, see Appendix.

The IMPLAN model estimates tax revenues along several public revenue sources, including indirect business taxes, personal and corporate income taxes, property taxes, and other tax revenue sources by taxing entity. IMPLAN also allows PSC to analyze the potential tax revenues supported by the project. In the case of state taxes associated with operating the mine, PSC estimated the projected amount of Nonferrous Metallic Minerals Extraction Severance Tax owed by Highland Copper based on projected mineral output and material price.

Model Inputs

Exhibit 1 shows the breakdown in construction spending used for this analysis.

EXHIBIT 1. Highland Copper Construction Spending

Year	Jobs	Labor	Materials and Equipment	Total
Copperwood				
2023	19	$1,738,367	$6,764,262	$8,502,629
2024	145	$27,813,872	$108,228,187	$136,042,059
2025	300	$57,366,110	$223,220,637	$280,586,747
Total		**$86,918,349**	**$338,213,086**	**$425,131,435**

Note: Totals may not added up due to rounding.
Source: Highland Copper

For the construction analysis, PSC applied an "analysis by parts" approach (Duval, Kerna, and Frisfold 2016) to assigning direct effects of construction spending on labor. Those results were then combined with a commodity output analysis of material and equipment spending. The latter used budget expenditure types to align with IMPLAN commodity codes to accurately reflect in-state and Upper Peninsula supply chains.

For the operational analysis, PSC used the following aggregated information provided by Highland Copper as inputs into the IMPLAN model.

EXHIBIT 2. Highland Copper Construction Spending

Year	Amount	Percent of Total
Copperwood		
Annual MI spend	$71,330,001	59.0%
Annual U.P. spend	$54,693,000	45.2%

Source: Highland Copper

Results and Findings

Construction Phase

Below are the results of PSC's analysis of the effects of spending to build the Copperwood mine. Results are presented as averages effects over the three-year construction phase.

EXHIBIT 3. Copperwood Construction Analysis (Annual for Three Years)

	Employment	Labor Income	Value-added	Output
U.P.				
• Direct (on-site construction)	300	$17,099,412	$19,608,442	$41,579,141
• Direct (stemming from effects)	114	$6,501,576	$7,455,565	$15,809,313
Direct (subtotal)	414	$23,600,988	$27,064,007	$57,388,455
Indirect and Induced (subtotal)	166	$7,262,385	$13,346,707	$27,702,929
U.P. Copperwood Total:	**580**	**$30,863,373**	**$40,410,714**	**$85,091,383**
Michigan (Includes U.P.)				
• Direct (on-site construction)	300	$21,982,181	$24,672,129	$47,370,554
• Direct (stemming from effects)	159	$11,619,292	$13,041,139	$25,039,022
Direct (subtotal)	459	$33,601,474	$37,713,268	$72,409,575
Indirect and Induced (subtotal)	353	$21,970,097	$36,342,752	$66,637,918
MI Copperwood Total:	**812**	**$55,571,571**	**$74,056,020**	**$139,047,493**

Source: PSC analysis

Exhibit 4 shows the estimated tax earnings at various government levels supported by construction spending at the Copperwood site. Results are presented as average effects over the three-year construction phase.

EXHIBIT 4. Copperwood Construction Tax Results

	All Local	All Counties	State	Federal	Total
U.P.					
Direct	$66,586	$24,208	$630,253	$4,962,982	$5,684,030
Indirect/Induced	$437,629	$158,767	$1,044,657	$1,356,854	$2,997,908
U.P. Copperwood Total:	$504,215	$182,976	$1,674,911	$6,319,836	$8,681,938
Michigan (Includes U.P.)					
Direct	$156,171	$26,397	$934,253	$6,708,460	$7,825,281
Indirect/Induced	$1,019,575	$228,458	$2,209,745	$4,273,289	$7,731,066
MI Copperwood Total:	$1,175,746	$254,855	$3,143,998	$10,981,749	$15,556,348

Source: PSC analysis

Key Takeaways

- Highland Copper projects to spend over $425 million on construction of the Copperwood site over the project's three-year duration.
- This investment will directly support 300 construction jobs on-site, as well as another 159 jobs across the state of Michigan at Highland's vendor partners. Most of these jobs will be in the U.P.
- In addition to these direct jobs, the indirect and induced purchases made by households and businesses as part of this construction spending are expected to support another 353 jobs statewide.
- From a broader economic perspective, the construction analysis estimates that the construction of the Copperwood site will add over $74 million to the state's gross state product each year during this phase, including $40 million in the U.P.
- The investment to bring the Copperwood site online is expected to generate an average of over $4.5 million in local, county, and state tax revenue annually during the three-year construction period.

Operations

Below are the results of PSC's analysis of the effects of Highland Copper's expected annual operational spending at the Copperwood mine. These effects are expected to occur on an annual and ongoing basis.

EXHIBIT 5. Copperwood Operational Expenditure Analysis

	Employment	Labor Income	Value-added	Output
U.P.				
Direct	380	$21,068,278	$45,647,848	$54,693,000
Indirect/Induced	111	$5,202,969	$9,766,108	$19,956,252
U.P. Copperwood Total:	491	$26,271,247	$55,413,957	$74,649,252
Michigan (Includes U.P.)				
Direct	380	$29,515,700	$57,536,589	$71,331,000
Indirect/Induced	313	$21,540,182	$34,122,236	$60,438,294
MI Copperwood Total:	693	$51,055,882	$91,658,825	$131,769,294

Source: PSC analysis

Exhibit 6 shows the IMPLAN estimated tax earnings at various levels of government supported by operational spending. These results are expected to occur on an annual basis while the mine is in operation. As with previous figures, Exhibit 6 includes tax results for both the U.P. and Michigan. The latter estimates the expected direct and secondary public revenues generated at each respective level of government from Copperwood's annual operational expenditures and property taxation generated or captured in the U.P. The latter section shows the same for all direct operational expenditures and property taxations captured across the state, including those captured in the U.P.

EXHIBIT 6. Copperwood Operations Tax Results

	All Local	All Counties	State	Federal	Total
U.P.					
Direct	$696,399	$252,668	$5,707,500[5]	$4,765,477	$11,422,044
Indirect/Induced	$411,964	$149,453	$941,574	$895,556	$2,398,547
U.P. Copperwood Total:	**$1,108,363**	**$402,121**	**$6,649,074**	**$5,661,032**	**$13,820,59**
Michigan (Includes U.P.)					
Direct	$1,687,979	$380,279	$5,707,500[6]	$6,334,957	$14,110,715
Indirect/Induced	$1,385,516	$311,402	$2,903,617	$4,953,114	$9,553,649
MI Copperwood Total:	**$3,073,496**	**$691,680**	**$8,611,117**	**$11,288,071**	**$23,664,364**

Source: PSC analysis

When this figure is added to the State total, PSC estimates that operational spending at the Copperwood site will result in $12.4 million in local, county, and state tax revenue on an annual basis.

Key Takeaways

- Once the mine is operational, Highland Copper expects to employ 380 workers at Copperwood.
- In addition to these employees, the mine's annual operations spending is projected to support another 313 jobs across the state on an annual basis.
- Operational spending at Copperwood is expected to increase spending to businesses in Michigan by $130 million each year.
- Highland Copper's operational spending is expected to generate over $12 million in local, county, and state tax revenue on an annual basis.

[5] The Nonferrous Metallic Minerals Extraction Severance Tax Act (MST) levies a specific tax of 2.75 percent of the "taxable mineral value" of copper and other minerals for mineral producing property in Michigan. The MST includes exemption from property and certain other taxes levied. Accordingly, instead of using IMPLAN, which relies on national tax data to estimate state tax contributions, PSC calculated an annual average MST using information from Highland Copper. Because the MST estimate is based on the company's revenue projections, as opposed to the operational spending used in the other IMPLAN estimates, the MST estimate is included in both the U.P. and State direct tax contribution tables.

[6] See footnote 5.

Conclusion

Highland Copper is projected to spend over $425 million on construction of the Copperwood site during the three-year duration of the project. This investment is expected to support hundreds of construction and other jobs across the U.P. and state of Michigan during the initial construction phase of the project. When the mine is operational, Highland Copper expects to employ 380 people in the U.P., adding millions of dollars to the regional and state economies each year. During both construction and operations phases, spending by Highland Copper, its vendors, and its workers is expected to generate millions in taxes at the local, county, state, and federal levels.

References

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Appendix

IMPLAN Modeling

To analyze the economic contributions of spending by Highland Copper on the Copperwood mining construction and operation project in the U.P. and Michigan, PSC used Impact Analysis for Planning (IMPLAN), an input-output model to estimate economic impacts and contributions. This model is a staple for regional economic analysts.

IMPLAN Terminology and Methodology

Input-output models trace transactions among and between different economic sectors (like households, businesses, and governments) over the course of a year. Tracing these transactions offers a clearer picture of how a change in economic activity in one part of the economy creates changes in other parts of the economy. When a business sells from inventory, it takes a portion of those earnings to pay for other goods and services (for example, to restock its inventory). Some of the wages companies pay to employees will go to local retailers and service providers, continuing the ripple effect throughout the economy. Because of all of these additional transactions, the overall economic effect is greater than the value of all the different direct revenue streams (employer to employee, consumer to business, business to business, etc.), resulting in what is called the multiplier effect. The existence of multiplier effects in regional and national economies is well documented in the economics literature (Coughlin and Mandelbaum 1991).

Direct Effects

The standard approach to modeling economic impacts with input-output models is to begin by establishing the value of transactions that represent direct expenditures giving rise to the economic effect. For the purposes of this study, these include construction expenditures during the initial construction phase of the project and operations and maintenance expenditures made in the normal operations of the mine. The direct effects of this spending are organized into various commodity categories, where each commodity represents a distinct supply chain within and outside of the modeled economy (Upper Peninsula and the State of Michigan, respectively). That is, each commodity type has a unique economic profile in the local economy. For example, purchases made from a vendor for steel create a different set of secondary transactions than purchases for restaurant meals.

Indirect and Induced Effects

Direct effects, measured in dollars transacted, are then used to estimate the secondary transactions that happen because of the direct effects. The first set of secondary transactions is the indirect effects, which are transactions between business sectors. Indirect effects are the intermediate purchases of goods from one business to another (such as restocking). A business's operational costs—like electricity, rent, and business services—are also indirect effects. Indirect effects ripple throughout the economy as businesses purchase goods and services from other businesses. These transactions cascade throughout the region, reduced only by the extent that inputs are purchased from suppliers from outside the region. The second set of secondary transactions are called induced effects. Induced effects measure the value of new transactions by households, governments, and other institutions in response to higher labor income, taxes, and profits. These household and institutional expenditures from earnings generate new rounds of business-to-business transactions and associated payments to institutions. These expenditures continue

throughout the regional economy, hampered only by the extent to which purchases are made for goods, services, and payments to institutions outside the local economy. The direct, indirect, and induced effects are summed together to calculate the total economic effects.

While the underlying model simulation tracks the value of transactions as they traverse the economy, the economic effect measured by the value of transactions provides only one measure of economic effect. More common measures of economic outcomes are the effect on employment or income. IMPLAN and similar input-output economic simulation models use fixed ratios of employment and income to sales transactions to estimate how changes in sales transactions convey effects on employment and income. Fixed ratios are created for each of the more than 500 industries underlying the IMPLAN model and once total economic effects measured in dollars is calculated for all 500-plus industries, the fixed ratios are used to convey that measure in employment and income terms.

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