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Economic Impact of a Potential Shrimp Harbor Facility in Southwest Minnesota

A REPORT OF THE ECONOMIC IMPACT ANALYSIS PROGRAM

Authored by Brigid Tuck and Neil Linscheid



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EXECUTIVE SUMMARY: ECONOMIC IMPACT OF A POTENTIAL SHRIMP HARBOR FACILITY IN SOUTHWEST MINNESOTA

Communities in Southwest Minnesota are interested in understanding the potential economic impact of large-scale shrimp aquaculture. This is prompted by a Minnesota company proposing the development of shrimp aquaculture in the region. Using a hub and spoke configuration, this company plans to build a series of facilities that include a hatchery and a connected set of harbors. Multiple hatchery and harbor facilities are then linked to a centralized processing and distribution center. This summary explores the economic impact of a single harbor facility. Under the proposed business model, several harbors could be operational. The region under consideration includes Cottonwood, Lyon, Murray, Nobles, and Redwood counties.

Economic Impact of Harbor Construction

Harbor construction will generate short-term impacts during the construction phase.

Direct Effect: The construction of a shrimp harbor is projected to cost \$45.9 million. An estimated \$37.7 million would be spent directly in the region. The construction companies would directly employ an estimated 250 people and pay \$11.3 million in wages, salaries, and benefits.

Total Effect: During the construction phase, a new shrimp harbor would generate an estimated total of \$48.3 million in economic activity in the five-county region. The \$48.3 million includes the \$37.7 million of direct spending and the ripple effects generated by businesses supplying the construction companies and workers. Construction would generate \$14.5 million in labor income and support an estimated 330 jobs across all industries.

Top Industries Impacted: Of the other industries affected, harbor construction would support an estimated \$2 million in wholesale trade activity and \$1 million in the housing industry.

Economic Impact of Harbor Operations

As long as the harbor is operational, its operations will generate long-term impacts.

Direct Effect: The shrimp harbor is projected to cost \$14.2 million to operate annually with an estimated \$12.3 million spent in the region. The facility plans to employ an estimated 74 full-time equivalent workers and pay \$2.8 million in labor income.

Total Effect: In total, the operation of a shrimp harbor in the five-county region would generate an estimated \$23.7 million in economic activity across all industries. This includes \$5.6 million in income to residents of the region and employment for 124 people.

Top Industries Impacted: One of the biggest direct beneficiaries of the new facility will be the feed industry with \$6.5 million in purchases. The industries expected to experience the largest secondary impacts from operations include housing, electric power, wholesale trade, and banking.

This research was prepared in partnership with The EDA Center at the University of Minnesota Crookston and the Southwest Initiative Foundation.



INTRODUCTION

Given Minnesota's 10,000 (and more) lakes, it is not surprising fish and fishing have a long history of being intertwined with the state's economy. Minnesotans have been involved in the field of aquaculture for more than 100 years, both through publicly-led efforts (e.g., stocking lakes) and through private efforts (e.g., production of tilapia).¹

As American preferences lean more toward fresh and sustainably-produced foods, there are renewed efforts to bring aquaculture production to Minnesota. One Minnesota company is proposing the development of shrimp aquaculture in Southwest Minnesota. Using a hub and spoke configuration, this company plans to build a series of facilities that include a hatchery and a connected set of harbors. Multiple hatchery and harbor facilities would then link to a centralized processing and distribution center. This report explores the economic impact of a single harbor facility. Under the proposed business model, it is possible several harbors could be operational in the region.

Communities in Southwest Minnesota are interested in understanding the potential economic impact of large-scale shrimp aquaculture. To address this need, University of Minnesota Extension—with funding from the EDA Center at the University of Minnesota Crookston and the Southwest Initiative Foundation—measured the potential economic impact of a shrimp harbor in the region.² The region under consideration includes Cottonwood, Lyon, Murray, Nobles, and Redwood counties.

An analysis of the potential economic impact of a shrimp harbor has two components that are best described as short-term and long-term impacts. First, there will be a short-term increase in economic activity during the construction of the harbor. The effects of the construction will dissipate over time, however, as the construction is completed. Second, there will be a long-term increase in economic activity as the harbor moves into operation. The on-going operational activity will continue as long as the harbor produces shrimp at projected levels.

TOTAL ECONOMIC IMPACT OF HARBOR CONSTRUCTION

Total economic impact is comprised of direct, indirect, and induced effects. It can be measured in output, employment, and labor income. The direct effect is the initial economic activity occurring because of the construction of a new facility, the opening of a new business, or the expansion of a new plant. When these things occur, additional activity is spurred along supply chains. Indirect and induced effects measure the activity along the supply chain. This section of the report explains how Extension calculated the direct, indirect, and induced effects of harbor construction.

Direct Effect

The direct effect of shrimp harbor construction in Southwest Minnesota is the expected construction budget. According to the estimates provided by the company, shrimp harbor construction would cost a total of \$45.9 million (Table 1). The largest component of the cost is for the construction of the building itself (\$27.6 million). Equipment costs are estimated at \$16.0 million.³

Of the \$45.9 million, it is estimated that \$37.7 million would contribute to **local** economic activity. Site acquisition costs are not included in the economic impact analysis, as the purchase of land is considered an exchange of assets—land for money—and does not create additional economic

¹ From Extension's Aquaculture team. www.extension.umn.edu/food/small-farms/livestock/fish.

² The EDA Center at University of Minnesota Crookston is part of the University Center network. University Centers have the mission of connecting University resources with the economic development community and are funded by the U.S. Economic Development Administration, which is a bureau of the U.S. Department of Commerce.

³ The company provided estimates of construction costs to Extension. Extension did not independently verify the feasibility or accuracy of the figures.

activity in the economy. Additionally, not all expenditures would occur in the five-county region under consideration. All building construction costs are local, as the construction is expected to occur in the region. Equipment, however, is often specialized and not all purchases will be sourced from local manufacturers or wholesalers.⁴

Table 1: Direct Effect, Construction of a Potential Shrimp Harbor in Cottonwood, Lyon, Murray, Nobles, and Redwood Counties (millions)

Construction Phase	Total Expected Expenditure	Local Expected Expenditure Included in Model
Site Acquisition	\$1.0	N/A
Site Preparation	\$1.3	\$1.3
Building	\$27.6	\$27.6
Equipment	\$16.0	\$8.8
Total	\$45.9	\$37.7

Indirect and Induced Effects

As described previously, indirect and induced effects are those generated by increases along the supply chain. Indirect effects are those related to the supply chain of the business or industry. In a construction project, the purchase of concrete, building supplies, and accounting services creates additional demand at those companies. Those companies then increase their purchases, setting off an additional round of activity. Induced effects are created due to an increase in spending by employees of the business or industry. As construction workers earn income, they make purchases for housing, health care, and goods and services. This triggers increased demand at those businesses, setting off additional activity.

The ripple effects, both indirect and induced, can be quantified using input-output models. Input-output models trace the flow of goods and services through an economy. Once the flow is established, the impact of a change in one part of the economy can be measured. The input-output software model, IMPLAN, version 3.0 with type SAM multipliers was used in this analysis.

The indirect and induced effects for the construction of a shrimp harbor are detailed below.

Total Effects

The direct, indirect, and induced effects are added to arrive at total economic impact. During the construction phase, a new shrimp harbor would generate an estimated \$48.3 million in economic activity in the five-county region (Table 2). This includes \$14.5 million in labor income.

The construction phase would employ an estimated 250 people at the site (direct effect). The spin-off effects of construction would support an additional 80 jobs. Thus, in total, construction would support employment for an estimated 330 people in Cottonwood, Lyon, Murray, Nobles, and Redwood counties.

⁴ Extension and the company examined each equipment purchase and determined its likelihood of being purchased locally.

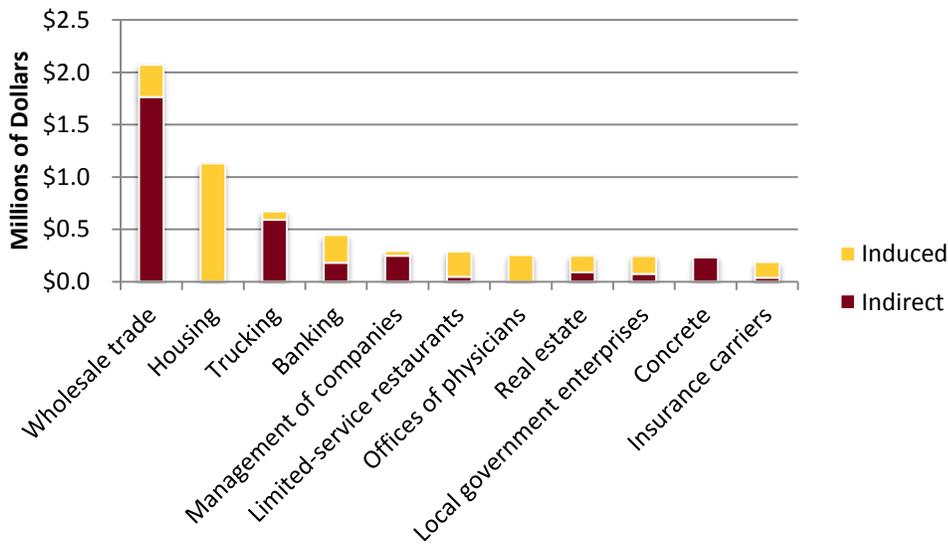
Table 2: Total Economic Impact, Construction of a Potential Shrimp Harbor in Cottonwood, Lyon, Murray, Nobles, and Redwood Counties

	Output (\$ millions)	Employment	Labor Income (\$ millions)
Direct	\$37.7	250	\$11.3
Indirect	\$4.9	30	\$1.6
Induced	\$5.7	50	\$1.6
Total	\$48.3	330	\$14.5

Top Industries Impacted

The construction phase will generate an estimated \$48.3 million in total activity. Of this, \$37.7 million is direct impact. The rest, \$10.6 million, will be at businesses other than those directly working on the construction project. Chart 1 shows the top 10 industries impacted during the construction phase. Construction would support an estimated \$2 million in wholesale trade activity⁵ and slightly more than \$1 million in the housing industry (primarily through mortgage payments made by workers). The trucking industry would also be impacted with just over \$500,000 of new activity.

Chart 1: Top Industries Impacted, Potential Shrimp Harbor Construction



⁵ “The Wholesale Trade sector comprises establishments engaged in wholesaling merchandise, generally without transformation, and rendering services incidental to the sale of merchandise. The merchandise described in this sector includes the outputs of agriculture, mining, manufacturing, and certain information industries, such as publishing.” Retrieved from naics.com.

TOTAL ECONOMIC IMPACT OF HARBOR OPERATIONS

Harbor operations will also generate economic activity. Unlike harbor construction impacts, which will dissipate over time, the impact from harbor operations will be ongoing as long as the harbor is operating at expected capacity. New shrimp harbors will increase production slowly between year one and year three. This analysis is focused on the expected expenditures once the facility is at full operation (anticipated in year three).

Direct Effect

A new shrimp harbor is projected to cost \$14.2 million annually to operate (Table 3).⁶ Since the harbor is designed to take post-larvae shrimp and feed them until they reach the appropriate size for sale, it is not surprising the biggest expenditure is for feed (\$6.5 million). It is anticipated a feed mill in the region will produce the specialized feed (consisting of items such as fish meal, soybeans, and hard red wheat). For purposes of this analysis, Extension assumed 70 percent of feed can be sourced locally.

The shrimp harbor will spend an estimated \$2.8 million on labor. The majority of labor will be in the harbor itself—harvest, for example. There will also be labor involved in back office operations and support for each harbor, which may be shared across harbors. Only the fraction of activity related to one harbor is included in this analysis.

The shrimp harbor will also purchase \$1.8 million of post-larvae shrimp from a hatchery. For this study, the shrimp hatchery is assumed to be within the region.

Table 3: Direct Effect, Operation of a Potential Shrimp Harbor in Cottonwood, Lyon, Murray, Nobles, and Redwood Counties (millions)

Item	Total Expected Expenditure	Local Expected Expenditure Included in Model
Shrimp (post-larvae)	\$1.8	\$1.8
Feed	\$6.5	\$4.6
Harbor operations	\$2.8	\$2.8
Office operations	\$0.3	\$0.3
Labor (harbor & office)	\$2.8	\$2.8
Total	\$14.2	\$12.3

A single shrimp harbor would employ an estimated 74 full-time equivalent workers (Table 4). The majority would be active in harbor operations, such as operating the reef, harvesting, sorting, and

⁶ The company provided expected operational expenditures to Extension. Extension has not vetted these figures nor measured the feasibility of the business model.

shipping. The remaining workers would be involved in office and administrative support positions, including harbor and production managers and water quality and feed technicians. While some positions can be filled by general workers, other jobs will require specialized skill sets.

Table 4: Employment, Operation of a Potential Shrimp Harbor in Cottonwood, Lyon, Murray, Nobles, and Redwood Counties

Item	Number of Employees (FTEs)
Harbor operations and support	74

Indirect and Induced Effects

The operation of a shrimp harbor also generates indirect and induced effects. Indirect effects stem from purchases of items such as post-larvae shrimp, feed, electricity, insurance, and office supplies. Induced effects stem from the spending of \$2.8 million in labor income by employees of the harbor.

Total Effects

In total, the operation of a shrimp harbor in the five-county region would generate an estimated \$23.7 million in economic activity annually (Table 5). This includes \$5.6 million in income for residents of the region.

Operation of the shrimp harbor would support employment for 124 people. Slightly more than half (74) would be employed at the harbor itself. The others (50) would be employed at businesses that support the harbor and its workers.

Table 5: Total Economic Impact, Operation of a Potential Shrimp Harbor in Cottonwood, Lyon, Murray, Nobles, and Redwood Counties

	Output (\$ millions)	Employment	Labor Income (\$ millions)
Direct	\$12.2	74	\$2.8
Indirect	\$10.2	40	\$2.4
Induced	\$1.3	10	\$0.4
Total	\$23.7	124	\$5.6

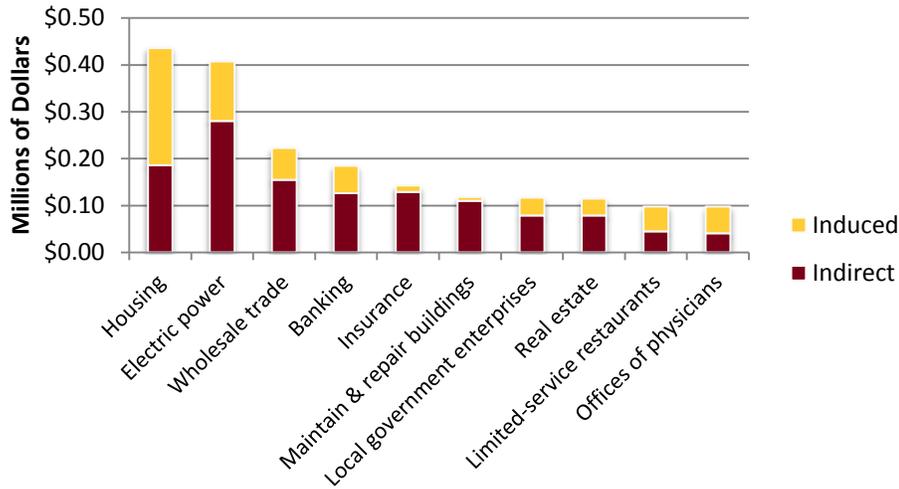
Estimates by University of Minnesota Extension

Top Industries Impacted

The shrimp harbor is projected to directly spend \$12.2 million in the region to operate. As a result, an additional \$11.5 million of economic activity will be generated at businesses beyond the shrimp

harbor. Chart 2 illustrates the industries expected to experience the largest impacts—housing, electric power, wholesale trade, and banking.

Chart 2: Top Industries Impacted, Potential Harbor Operations



Sensitivity Analysis

This analysis includes the assumption the shrimp hatchery will be located within the region. At this time, the company believes this to be a possibility. However, since the hatchery has not actually been located, it is possible it could be outside the region. Should the hatchery not be in the study region, the economic impact would decrease slightly. Total economic contribution without the hatchery is an estimated \$21.7 million.

PROFILE OF THE STUDY AREA ECONOMY

The study area for this analysis is Cottonwood, Lyon, Murray, Nobles, and Redwood counties. This study area was chosen, as a company is currently considering the development of a regional shrimp harbor in the region. For context, the region generated a total of \$11.0 billion of economic output across all sectors in 2014. There were 57,000 jobs in the region in 2014.⁷

Chart 3 shows output by industry in the five-county region. Manufacturing businesses generated 37 percent of all output in the region. Agriculture, forestry, and fishing accounted for 16 percent of output, or \$1.8 billion of output. The shrimp harbor operations would increase agriculture, forestry, and fishing output in the region.

⁷ Output and employment from the IMPLAN model. The 2014 data is the most current available at the time this report was written.

Chart 3: Output by Industry: Cottonwood, Lyon, Murray, Nobles, and Redwood Counties

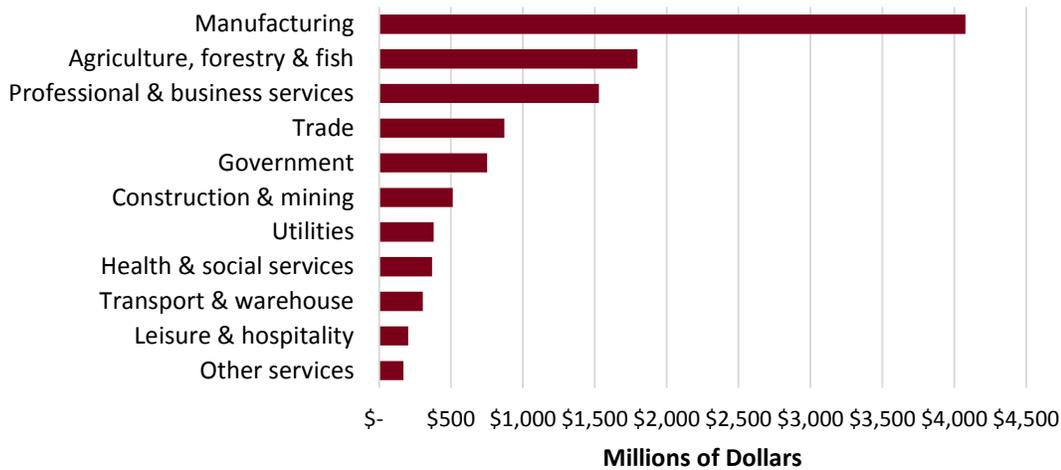
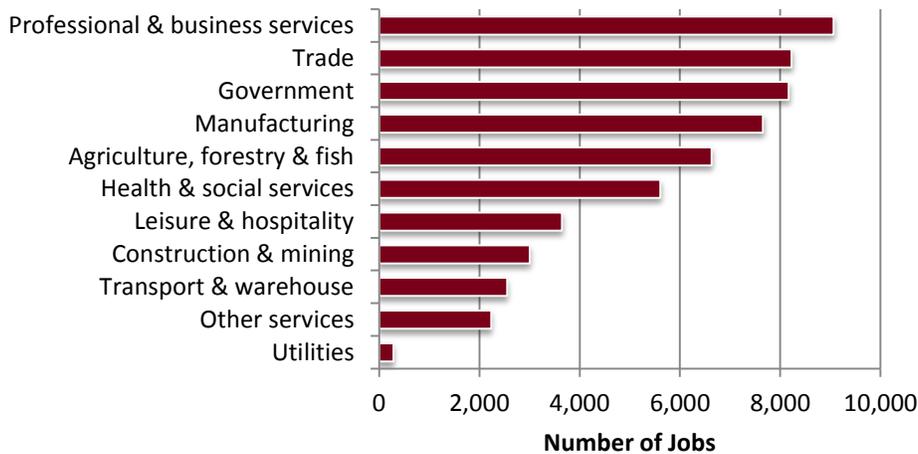


Chart 4 shows employment by industry in the region. In the IMPLAN model, one job is one job, regardless if it is full-time, part-time, or seasonal. This helps explain why manufacturing has a higher share of output than employment. First, other industries, such as the service industry, have a higher percentage of part-time employees, so they have more people for the employment count. Second, manufacturing employees can produce a higher value of production (output) per person than in other industries.

Chart 4: Employment by Industry, Cottonwood, Lyon, Murray, Nobles, and Redwood Counties



ECONOMIC IMPACT IN MINNESOTA

This report focuses on the economic impact of a potential shrimp harbor in Southwest Minnesota. A shrimp harbor could be located in any region of Minnesota, though. Therefore, it is valuable to look at the potential economic impact on the state. Given the larger economy, and therefore additional economic linkages, it is not surprising the total economic impact is greater in Minnesota than in the five-county region.

The construction of a shrimp harbor would potentially generate \$67.4 million dollars of economic activity in the state (Table 6). This includes \$24.0 million of labor income and support for 430 jobs.⁸

Table 6: Total Economic Impact, Construction of a Potential Shrimp Harbor in Minnesota

	Output (\$ millions)	Employment	Labor Income (\$ millions)
Direct	\$39.2	250	\$14.4
Indirect	\$11.3	60	\$4.0
Induced	\$16.9	120	\$5.6
Total	\$67.4	430	\$24.0

The operation of a shrimp harbor in Minnesota would potentially generate an estimated \$30.8 million in Minnesota (Table 7). This includes \$7.8 million in labor income and employment for 154 workers.⁹

Table 7: Total Economic Impact, Operation of a Potential Shrimp Harbor in Minnesota

	Output (\$ millions)	Employment	Labor Income (\$ millions)
Direct	\$13.5	74	\$2.8
Indirect	\$14.7	60	\$4.1
Induced	\$2.6	20	\$0.9
Total	\$30.8	154	\$7.8

Estimates by University of Minnesota Extension

⁸ This analysis assumes a higher percentage of equipment purchases, since it is possible equipment not available in the Southwest region are available in elsewhere in Minnesota.

⁹ In this analysis, the percent of feed sourced within the study area increased from 70 percent (Southwest region) to 90 percent (Minnesota).

APPENDIX 1: METHODS AND TERMS

Special models, called input-output models, exist to conduct economic impact analysis. There are several input-output models available. IMPLAN (Impact Analysis for PLANning, Minnesota IMPLAN Group)¹⁰ is one such model. Many economists use IMPLAN for economic impact analysis because it can measure output and employment impacts, is available on a county-by-county basis, and is flexible for the user. IMPLAN has some limitations and qualifications, but it is one of the best tools available to economists for input-output modeling. Understanding the IMPLAN tool, its capabilities, and its limitations will help ensure the best results from the model.

One of the most critical aspects of understanding economic impact analysis is the distinction between the “local” and “non-local” economy. The local economy is identified as part of the model-building process. Either the group requesting the study or the analyst defines the local area. Typically, the study area (the local economy) is a county or a group of counties that share economic linkages. In this analysis, the study area includes Cottonwood, Lyon, Murray, Nobles, and Redwood counties in Southwest Minnesota.

A few definitions are essential in order to properly read the results of an IMPLAN analysis. The terms and their definitions are provided below.

Output

Output is measured in dollars and is equivalent to total sales. The output measure can include significant “double counting.” Think of corn, for example. The value of the corn is counted when it is sold to the mill, again when it is sold to the dairy farmer, again as part of the price of fluid milk, and yet again when it is sold as cheese. The value of the corn is built into the price of each of these items and then the sales of each of these items are added up to get total sales (or output).

Employment

Employment includes full- and part-time workers and is measured in annual average jobs, not full-time equivalents (FTE’s). IMPLAN includes total wage and salaried employees, as well as the self-employed, in employment estimates. Because employment is measured in jobs and not in dollar values, it tends to be a very stable metric.

Labor Income

Labor income measures the value added to the product by the labor component. So, in the corn example, when the corn is sold to the mill, a certain percentage of the sale goes to the farmer for his/her labor. Then when the mill sells the corn as feed to dairy farmers, it includes some markup for its labor costs in the price. When dairy farmers sell the milk to the cheese manufacturer, they include a value for their labor. These individual value increments for labor can be measured, which amounts to labor income. Labor income does *not* include double counting.

Direct Impact

Direct impact is equivalent to the initial activity in the economy. In this study, it is spending by the shrimp harbor on operating expenses—post-larvae shrimp, feed, electricity, and salaries, wages, and benefits.

¹⁰ IMPLAN Version 3.0 was used in this analysis. The trade flows model with SAM multipliers was implemented.

Indirect Impact

The indirect impact is the summation of changes in the local economy that occur due to **spending for inputs** (goods and services) by the industry or industries directly impacted. For instance, if employment in a manufacturing plant increases by 100 jobs, this implies a corresponding increase in output by the plant. As the plant increases output, it must also purchase more inputs, such as electricity, steel, and equipment. As the plant increases purchases of these items, its suppliers must also increase production, and so forth. As these ripples move through the economy, they can be captured and measured. Ripples related to the purchase of goods and services are indirect impacts. In this study, indirect impacts are those associated with spending by the shrimp harbor for operating items.

Induced Impact

The induced impact is the summation of changes in the local economy that occur due to **spending by labor**. For instance, if employment in a manufacturing plant increases by 100 jobs, the new employees will have more money to spend to purchase housing, buy groceries, and go out to dinner. As they spend their new income, more activity occurs in the local economy. Induced impacts also include spending by labor generated by indirect impacts. So, if the shrimp harbor purchases services from a local tax preparer, spending of the tax preparer's wages would also create induced impacts. Primarily, in this study, the induced impacts are those economic changes related to spending by the shrimp harbor's employees.

Total Impact

The total impact is the summation of the direct, indirect, and induced impacts.

Input-Output, Supply and Demand, and Size of Market

Care must be taken when using regional input-output models to ensure they are being used in the appropriate type of analysis. If the models are used to examine the impact of an industry so large that its expansion or contraction results in major supply and demand shifts causing the price of inputs and labor to change, then input-output can overstate the impacts or impacts. While the shrimp harbor has the potential to contribute to Southwest Minnesota's economy, it is not likely that its existence has an impact on national prices for its inputs. Hence, the model should estimate the impacts reliably. However, the large purchases of feed do have the potential to affect feed prices within the local region. While hard to quantify the potential impact, it could range from \$0.05 to \$0.15 cents per bushel of soybeans. This should be remembered when considering this analysis.