

Estimating the Value of the Marine, Coastal and Ocean Resources of Newfoundland and Labrador Updated for the 2001-2004 Period



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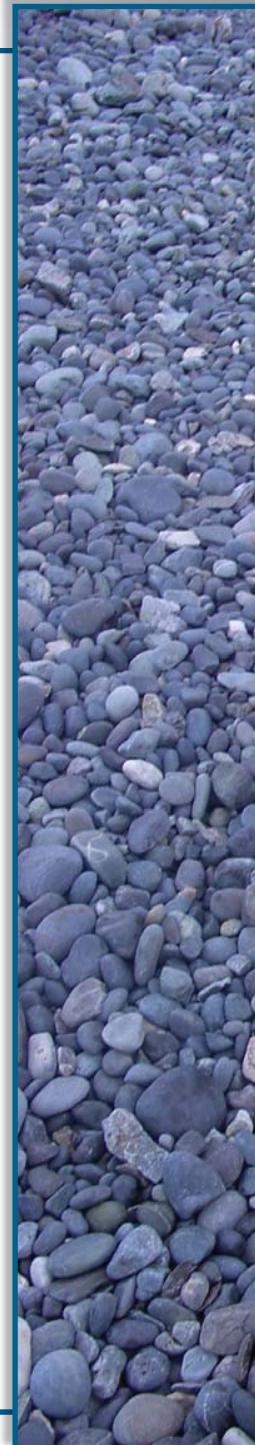
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TABLE OF CONTENTS

1.0 Introduction.....	1
1.1 Background.....	1
1.2 Defining the Oceans Sector	2
1.3 Methodology	5
2.0 Economic Impact of the Oceans Sector	9
2.1 GDP Impact	9
2.2 Labour Income Impact	10
2.3 Employment Impact	10
2.4 Comparison to Previous Study	11
3.0 Conclusions.....	13
Appendix 1 - Economic Impacts	15
Appendix 2 - Data Sources.....	19
Appendix 3 - Glossary of Terms.....	23



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1.0 INTRODUCTION

1.1 Background

In 2001, the provincial Department of Fisheries and Aquaculture and Fisheries and Oceans Canada contracted the Economic Research and Analysis Division, Department of Finance to estimate the economic value of oceans, marine and coastal activity (i.e., the oceans sector) in the province. The study covered the period 1997 to 1999 and was released in March 2002. Since that time, oceans related activity in the province has increased primarily as a result of increased offshore oil production and further oil project development. In 2005, Fisheries and Oceans Canada sought to update the earlier study. In this regard, the Economic Research and Analysis Division was contracted to update the data for the 2001-2004 period using the same methodology as the previous study.

Economic value can be derived from ocean resources and from use of the ocean as a means of movement, operation, business activity, and innovation. Estimating this value is important for policy development and management decisions at both the federal and provincial level, and in understanding the role and importance of industries and other stakeholders vis-à-vis their economic contributions in the oceans sector.

This study, as in the previous study, includes both private sector industries (i.e., oil, fishery, aquaculture, shipbuilding, boatbuilding, marine tourism, marine transportation, and oceans technologies) and federal and provincial public sector oceans-related departments and agencies.

The economic impacts of an activity or project encompass a wide array of indicators such as Gross Domestic Product (GDP) in current dollars, labour income (wages and salaries plus supplementary labour income such as employers' portion of mandatory employment programs and pension contributions) and employment. To calculate economic impacts due to spinoff activity, the Department of Finance used the Newfoundland and Labrador Econometric Model and multipliers from the provincial Input-Output Model.



1.2 Defining the Oceans Sector

For the purposes of this study, the area under consideration includes the coastline, inshore and nearshore waters, as well as activity in offshore areas to the edge of the continental shelf.

Marine resources in these areas can be classified as economic or ecological. This study focuses on the oceans sector as an economic resource and includes two broadly based industrial groupings in both the private and public sectors:

- Industries that use/extract ocean resources, including offshore oil production, the fishery, and (to some degree) tourism.
- Industries that use the ocean as a medium of movement, operation or innovation. This would include marine system design and construction, marine operations and shipping, and marine-related equipment and service industries.

Private sector industries considered in the study include:

- oil production and support services
- oil development
- fishery
- aquaculture
- shipbuilding and ship repair
- marine tourism and recreation
- marine transportation and infrastructure (including ports and harbours)
- oceans technologies (marine IT, communications, environmental, biotechnology).

Public sector departments, institutions and agencies include:

Federal¹

- Atlantic Canada Opportunities Agency
- Canadian Food Inspection Agency
- Canadian Transportation Agency
- Department of National Defence
- Environment Canada
- Fisheries and Oceans Canada
- Human Resources and Skills Development Canada
- Institute for Ocean Technology
- Marine Atlantic
- Natural Resources Canada
- Parks Canada
- Royal Canadian Mounted Police
- Transport Canada

Provincial

- Department of Environment and Conservation²
- Department of Fisheries and Aquaculture
- Department of Human Resources, Labour, and Employment³
- Department of Innovation, Trade and Rural Development⁴
- Department of Natural Resources⁵
- Department of Tourism, Culture and Recreation
- Department of Transportation and Works⁶
- Department of Education
- Marine Institute

¹ Other federal departments and agencies have oceans related responsibilities but have no direct operational or labour expenditures in Newfoundland and Labrador and are, therefore, not included in this study.

² Includes activities of the former Department of Environment.

³ Includes activities of the former Department of Human Resources and Employment.

⁴ Includes activities of the former Department of Industry, Trade and Rural Development.

⁵ Includes activities of the former Department of Mines and Energy.

⁶ Includes activities of the former Department of Works, Services and Transportation.



Federal-Provincial Partnerships

Canada-Newfoundland and Labrador Offshore Petroleum Board

Research and Development institutes⁷

- Aquanet
- Canadian Centre For Fisheries Innovation
- Canadian Centre For Marine Communications
- C-CORE
- Centre for Aquaculture and Seafood Development
- Centre for Earth Resources Research
- Centre for Sustainable Aquatic Resources
- GENESIS Group
- Ocean Engineering Research Centre
- Oceans Sciences Centre.

⁷ Each of these institutes is affiliated with Memorial University.

1.3 Methodology

The analytical phase of the study encompassed two key blocks: data collection and economic impact analysis. Private sector industries and government departments/agencies that encompass the oceans sector in Newfoundland and Labrador were taken to be those defined in the 2002 study. Every effort was made to include significant and quantifiable data from both the private and public sectors.

The reference period for the study was 2001 to 2004. The data for the four years were adjusted to remove double counting, and was averaged to help minimize the problems of annual fluctuations in oceans-related activity over the period. Key data collected for the private sector industries included Gross Domestic Product in current or nominal dollars, labour income and employment. This data came from various sources outlined in Appendix 3. Public sector data for labour income and employment (in full-year equivalents) was collected from relevant departments.

Fisheries and Oceans Canada led the collection of federal departmental and agency data. Twenty-eight federal departments and agencies which could potentially have oceans-related activities in this province were contacted via letter and asked to contribute to the project. Fourteen of these responded with information pertaining to total departmental/agency expenditures, income expenditures and number of full time equivalent positions pertaining to fiscal years 2000/2001 to 2003/04. The remaining departments/agencies indicated that they had no direct expenditures related to ocean activity in Newfoundland and Labrador or did not respond.

The Department of Finance coordinated and managed the collection of data from nine provincial departments and agencies.

The study also included cost-shared economic development agreements whose program delivery often includes several federal (e.g., Fisheries and Oceans Canada, Atlantic Canada Opportunities Agency) and provincial (e.g., Innovation, Trade and Rural Development; Fisheries and Aquaculture; Tourism, Culture and Recreation) departments. For simplicity, expenditures made through these agreements are, unless otherwise indicated, included with the Atlantic Canada Opportunities Agency and Innovation, Trade and Rural Development expenditures.

The provincial Department of Finance also managed the collection of private sector data. A number of sources were used to find, and in some cases, derive the data. A list of sources for private sector data is contained in Appendix 2. Although the goal of the study was to be as comprehensive as possible, not all the activities of government departments, industries or sub-industries are included due to lack of data. As such, the study's results should be considered conservative.



While recognizing that oceans technologies, research and development (R&D) institutes, and industry associations (e.g., Newfoundland Ocean Industries Association, Newfoundland Association of Technical Industries) are a component of the oceans sector, for the purposes of this study these entities were not included as a direct data source as these activities are, in most cases, captured in the indirect impacts.

The economic impacts of the public and private entities identified in this study are separated into three categories:

- Direct impacts are generated by workers and business owners working directly on a given activity or project;
- Indirect impacts are generated when other firms supply goods and services to the direct activity or project; and
- Induced impacts are generated when direct and indirect employees and business owners spend their incomes in other areas of the economy which leads to increased retail sales, housing starts and so on.

The primary data formed the direct economic impact of the oceans sector. Two economic analysis tools, the Newfoundland and Labrador Econometric and Input-Output Models, were then used to determine the indirect and induced impacts of the oceans sector.

The **Newfoundland and Labrador Econometric Model (NALEM)**, is a detailed model of the relationships between key economic variables in the provincial economy and is used by government for economic forecasting as well as to assess the macroeconomic impacts created by major development projects and government policy changes. NALEM contains over 370 mathematical equations and 600 data series which are designed to represent key aspects of the provincial economy, and to capture the relationship between certain socioeconomic variables or indicators. For example, changes in consumer spending can affect government revenues, employment levels, investment spending, and so on; NALEM tries to capture these relationships. The model is designed to capture the major economic relationships in the provincial economy, but not the minute details of every aspect of economic activity. It provides a representation of the current structure (i.e., basic economic relationships) of the provincial economy. As this structure changes (e.g., EI program changes, tax harmonization, collapse of the groundfishery, development of the oil and gas industry, etc.), the model is modified to capture the new or changed economic relationships. NALEM is organized into 10 different sectors. Consumer spending, residential construction, business investment, government spending, exports, and imports comprise the six expenditure sectors essential to the determination of GDP and other key economic indicators. The remaining four sectors cover income and output, demographic and labour market activity, prices and wages, and government revenue. The government revenue sector deals with the revenues of all levels of government. Forecasts can be produced for all main indicators of provincial economic activity including GDP, personal income, labour force, employment, and Consumer Price Index (CPI). Forecasts for detailed components and determinants of the main economic indicators are also available. Forecasts of economic indicators which are largely determined by factors outside of the provincial economy (e.g., interest rates, exchange rates, certain commodity prices, etc.) are generally obtained from external sources such as national forecasting agencies. NALEM has been in use since 1990.

The **Newfoundland and Labrador Input-Output Model (NALIOM)**, simulates the relationships between commodity outputs and commodity inputs at an industry level under the assumption of linearity (that is, that inputs used by an industry in the past to produce a commodity will be used in the same proportions in future for producing any incremental output). NALIOM can provide estimates of GDP and employment impacts of over 600 types of commodity purchases on over 200 industries (i.e., the direct impact). It can also provide the impacts of purchases locally sourced to specific industries (i.e., the indirect impact). The model's strength lies in its ability to capture backward linkages that arise from the production of one industry's inputs by other industries, and, in turn, the production of inputs for those industries by their suppliers.

Note on Individual Industry Impacts

In some cases direct oceans related industries are also indirect (e.g., transportation services used by the oil and gas industry). To avoid double counting, the indirect multipliers have been adjusted to remove any direct impacts quantified elsewhere. As such, readers are cautioned that individual industry impacts in this report are lower in some cases than if an impact was conducted for an industry on a stand alone basis.

Multipliers from NALIOM were used in this study to obtain the indirect industry impacts, which are the impacts of oceans-related activities on the industries that supply the direct industries with inputs. NALEM was used to capture the induced impacts on the provincial economy, which includes impacts related to the spending of workers who are directly or indirectly employed in oceans-related activity.





2.0 ECONOMIC IMPACT OF THE OCEANS SECTOR

The primary data collected for the oceans-related sectors formed the direct economic impacts of the oceans sector. To calculate indirect and induced economic impacts (specifically GDP, labour income and employment impacts), the Department of Finance used multipliers from both the Newfoundland and Labrador Econometric and Input-Output Models.

The industries used in the analysis are identified in Section 1.2. In reporting the findings of the analysis, the following industry groupings were used:

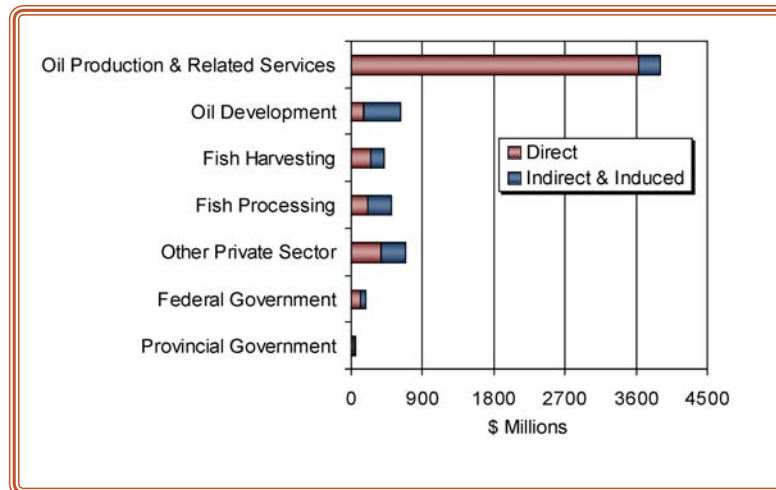
- oil production and support services
- oil development
- fish processing
- fish harvesting
- other private sector, this includes aquaculture, shipbuilding and ship repair, tourism, and marine transportation and related services
- federal government
- provincial government

2.1 GDP Impact

The direct nominal GDP impact of oceans-related activity averaged about \$4.77 billion annually from 2001 to 2004 or 31.0 percent of total GDP which averaged \$15.39 billion. Total GDP impact, including direct, indirect and induced effects, averaged about \$6.36 billion over this period, or 41.3 percent of total economic activity.

The most significant private sector industries, in terms of total GDP impact, were offshore oil (production and related services and development) at \$4.53 billion or 29.4 percent of GDP and the fishery (harvesting and processing) at \$0.92 billion or 5.9 percent. Higher levels of oil production and high oil prices in recent years have resulted in a sharp increase in oil production GDP.

GDP Impacts





Total public sector oceans-related activity contributed 1.5 percent of GDP. Fisheries and Oceans Canada accounted for about 58 percent of the public sector contribution, followed by the Marine Institute and the Department of National Defence.

2.2 Labour Income Impact

The direct labour income impact of oceans-related activity averaged about \$1.0 billion annually from 2001 to 2004 or 13.4 percent of total labour income which averaged \$7.44 billion. The total labour income impact, including direct, indirect and induced effects, averaged about \$2.02 billion over this period, or 27.2 percent of total labour income.

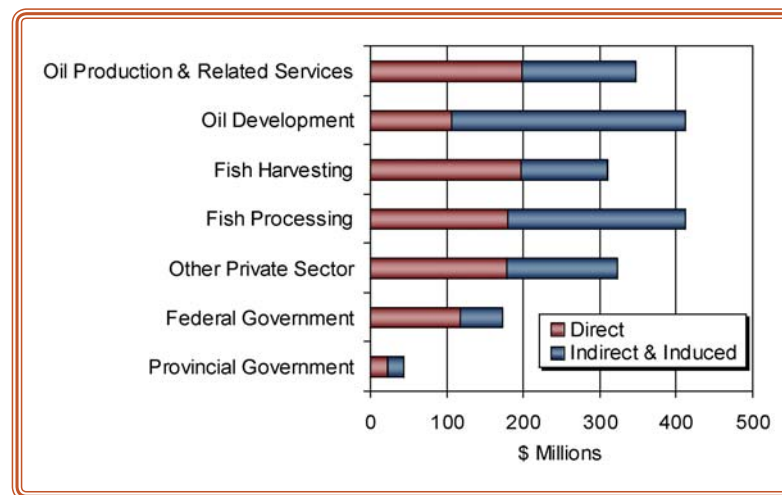
The most significant private sector industries, in terms of total labour income impact, were the offshore oil industry (production and development) at \$760 million and the fishery (harvesting and processing) at \$722 million. Due to its capital intensive nature, the oil and gas industry accounts for a lower percentage of total labour income (10.2%) than its does of total provincial GDP (29.4%). This difference can also be seen in its employment impacts (Section 2.3). Total public sector oceans-related activity contributed 2.9 percent of labour income.

2.3 Employment Impact

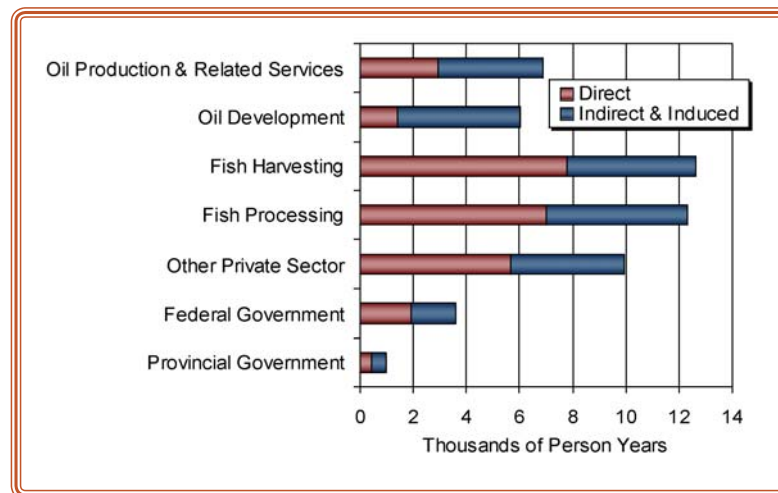
The direct employment (as measured in person years) impact of oceans-related activity averaged about 27,176 from 2001 to 2004 or 13.0 percent of total employment which averaged 209,800 over the same period. The total employment impact, including direct, indirect and induced effects, averaged about 52,363 over this period, or 25.0 percent of total employment.

The most significant private sector industries included in this study, in terms of total employment impact, were the fishery (harvesting and processing) at 11.9 percent and offshore oil

Labour Income Impacts



Employment Impacts



activity (production and development) at 6.2 percent. The employment contribution from the fishery (11.9 percent) was greater than its GDP contributions (5.9 percent). This reflects, in part, the labour intensive nature of this industry in the province. Total public sector oceans-related activity contributed 2.2 percent of employment. Fisheries and Oceans Canada accounted for about 60% of the total public sector contribution.

2.4 Comparison to Previous Study

As stated in the introduction, the oceans sector has grown since the reference period for the previous study. The most substantial change has been in the oil and gas sector. During 1997 to 1999, (the reference period for the previous study), Hibernia was the only oil-producing field and Terra Nova was being developed. From 1997 to 1999, about \$2.1 billion was spent on development, \$406 million was spent on exploration, and 61.5 million barrels of oil were produced (average of roughly 20 million barrels per year).

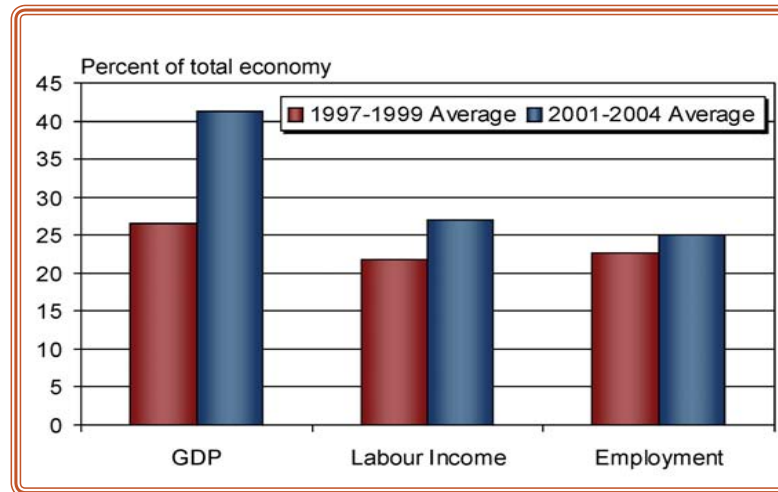
During 2001 to 2004 (the reference period for the current study), both Hibernia and Terra Nova were producing oil and the White Rose field was being developed. While development expenditures over the period were similar to the earlier reference period and exploration expenditures were actually lower, oil production was significantly higher. From 2001 to 2004, oil production totalled 396.4 million barrels (an average of approximately 99 million barrels per year). In addition oil prices have risen sharply in recent years greatly increasing the profits of oil companies and boosting oil production GDP.

The growth of the oil industry over the past decade has resulted in the oceans sector comprising a larger portion of economic activity than previously. The accompanying chart depicts the share of the economy that the oceans sector comprised in the earlier period and the current period.

In terms of GDP, the oceans sector comprised a much larger share of the total economy than during 1997-1999. This is due almost exclusively to the growth in oil production.

While larger than the previous study, the change in share for employment and labour income is not as significant as for GDP. Again, the gains were mostly due to increased activity in the oil production and support services industry.

**Total Economic Impacts of Oceans Sector
1997-1999 period vs. 2001-2004 period**





3.0 CONCLUSIONS

The economy, environment and social fabric of Newfoundland and Labrador are intrinsically linked to the Atlantic Ocean and its resources. During the 2001-04 period, ocean related activities contributed, on average, \$6.36 billion or 41.3 percent to the province's GDP. In addition, 27.0 percent of the province's labour income and 25.0 percent of its employment were linked to ocean-related activities.

Two industries, oil and the fishery, dominated Newfoundland and Labrador's oceans sector over the four year reference period. Combined, these two industries accounted for, on average, 35.4 percent of GDP (including indirect and spin-off impacts), 19.9 percent of labour income, and 18.0 percent of employment.

The contribution of oceans-related activity from other private sector industries, such as tourism, transportation, and ship building, were also important, contributing, on average, about 4.4 percent of GDP, 4.3 percent of labour income and 4.7 percent of employment.

The public service also plays an important role in the oceans sector in Newfoundland and Labrador. On a day-to-day basis, about 2,500 public servants from various departments and agencies work in oceans related activity. The public sector accounted for 1.5 percent of GDP, 2.9 percent of labour income, and 2.2 percent of employment over the study period.

With the continued development of the offshore oil and gas industry, the economic value of the oceans sector will continue to grow. It is important to quantify and appreciate the importance of oceans-related activity to the economy of Newfoundland and Labrador.





Appendix 1 - Economic Impacts



Table A2.1
The Oceans Sector in Newfoundland and Labrador
Direct Economic Impacts, Average of 2001-2004

	GDP		Employment		Labour Income	
	\$M	Percent of Total GDP	PYs	Percent of Total Employment	\$M	Percent of Total Labour Income
Private Sector						
Oil Production & Support Services	\$3,633.6	23.6%	2,930	1.4%	\$198.8	2.7%
Oil Development	\$160.3	1.0%	1,404	0.7%	\$105.7	1.4%
Fish Harvesting	\$249.4	1.6%	7,800	3.7%	\$196.5	2.6%
Fish Processing	\$203.5	1.3%	7,002	3.3%	\$179.6	2.4%
Other Private Sector	\$379.0	2.5%	5,679	2.7%	\$177.9	2.4%
Federal Public Sector						
Fisheries and Oceans Canada	\$87.5	0.6%	1,463	0.7%	\$87.5	1.2%
Other Federal Government	\$29.9	0.2%	466	0.2%	\$29.9	0.4%
Total Federal Government	\$117.4	0.8%	1,929	0.9%	\$117.4	1.6%
Provincial Public Sector						
Fisheries and Aquaculture	\$5.0	< 0.1%	94	< 0.1%	\$5.0	0.1%
Other Departments	\$2.4	< 0.1%	52	< 0.1%	\$2.4	< 0.1%
Marine Institute/MUN	\$15.7	0.1%	287	0.1%	\$15.7	0.2%
Total Provincial Government	\$23.1	0.2%	432	0.2%	\$23.1	0.3%
Total Oceans Sector	\$4,766	31.0%	27,176	13.0%	\$999	13.4%
Total Economy	\$15,389	100.0%	209,800	100.0%	\$7,435	100.0%

Table A2.2
The Oceans Sector in Newfoundland and Labrador
Total Economic Impacts, Average of 2001-2004⁸

	GDP		Employment		Labour Income	
	\$M	Percent of Total GDP	PYs	Percent of Total Employment	\$M	Percent of Total Labour Income
Private Sector						
Oil Production & Support Services	\$3,904.9	25.4%	6,880	3.3%	\$347.2	4.7%
Oil Development	\$625.2	4.1%	6,030	2.9%	\$412.3	5.5%
Fish Harvesting	\$412.0	2.7%	12,621	6.0%	\$309.5	4.2%
Fish Processing	\$503.3	3.3%	12,300	5.9%	\$412.4	5.5%
Other Private Sector	\$682.1	4.4%	9,929	4.7%	\$322.4	4.3%
Federal Public Sector						
Fisheries and Oceans Canada	\$132.9	0.9%	2,728	1.3%	\$129.1	1.7%
Other Federal Government	\$45.5	0.3%	888	0.4%	\$44.1	0.6%
Total Federal Government	\$178.4	1.2%	3,617	1.7%	\$173.3	2.3%
Provincial Public Sector						
Fisheries and Aquaculture	\$10.7	0.1%	213	0.1%	\$9.5	0.1%
Other Departments	\$5.2	< 0.1%	115	0.1%	\$4.6	0.1%
Marine Institute/MUN	\$33.6	0.2%	656	0.3%	\$30.0	0.4%
Total Provincial Government	\$49.4	0.3%	985	0.5%	\$44.2	0.6%
Total Oceans Sector	\$6,355	41.3%	52,363	25.0%	\$2,021	27.2%
Total Economy	\$15,389	100.0%	209,800	100.0%	\$7,435	100.0%

⁸ Total includes direct, indirect and induced economic impacts.

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Appendix 2 - Data Sources



A list of the industries included and the sources of data follows.

Oil Production and Related Services: GDP data for 2001 comes from Statistics Canada. GDP data for remaining years estimated based on value of oil production. Employment data for production was provided by the CNLOPB and related services data comes from Statistics Canada's Labour Force Survey.

Oil Development: GDP data for 2001 to 2004 was developed using expenditures from CNLOPB. Employment data was provided by the CNLOPB. Labour income was estimated by the Department of Finance using employment data and an estimate of average annual earnings.

Primary Fishing: GDP data for 2001 was taken from Statistics Canada for the industry "Fishing and Trapping Industries". (Trapping constitutes only a very small portion of GDP in this industry in Newfoundland and Labrador.) The 2002 to 2004 data was developed using the value of fish landings. Employment data comes from Statistics Canada's Labour Force Survey. Labour income was estimated using the value of fish landings and data from the Labour Income division of Statistics Canada.

Fish Processing: GDP data for 2001 was taken from Statistics Canada for the "Fish Products Industry". The 2002 to 2004 data was developed using the production value of fish products, as supplied by the Department of Fisheries and Aquaculture. Employment data comes from Statistics Canada's Labour Force Survey. Labour Income was estimated using data from the Labour Income division of Statistics Canada and data from Statistics Canada's Survey of Employment Payrolls and Hours.

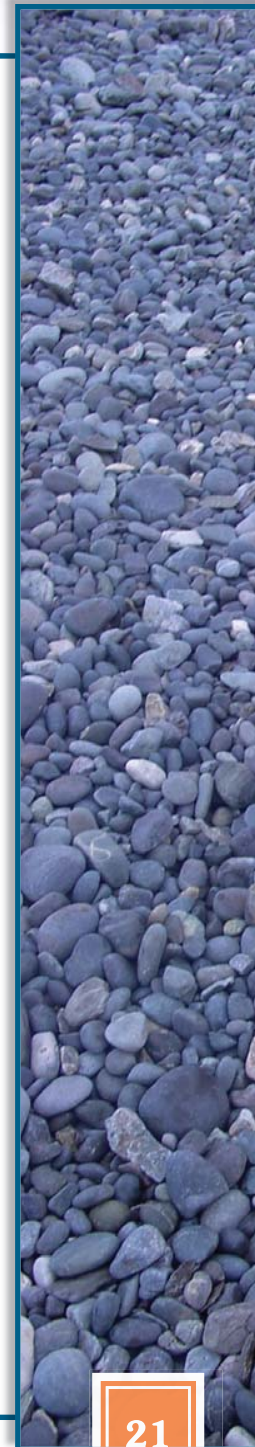
Aquaculture: 2001 to 2003 GDP, employment and labour income was obtained from Statistics Canada's Canadian Aquaculture Industry Survey. 2004 data estimated based on value of aquaculture production.

Ship and Boat Building: 2001 GDP estimates are Statistics Canada estimates for the "Ship and Boatbuilding" industry. All other years were estimated by the Department of Finance. Employment is Survey of Employment Payrolls and Hours data and labour income was estimated with employment and average weekly wage data.

Public Sector: All data collected directly from departments and agencies or from expenditure information available in the public accounts.

Water Transportation: Estimates of GDP were calculated in-house by the Department of Finance. Employment data comes from Statistics Canada's Labour Force Survey. Labour income was calculated based on the GDP estimates.

Tourism: Estimates of GDP, employment and labour income were estimated in-house by the Department of Finance using annual estimates of resident and non-resident tourism spending and information from the Department of Tourism, Culture



and Recreation's 1997 air and auto exit surveys for non-resident activity and the Canadian Travel Survey (Statistics Canada) for resident activity.⁹



⁹ The exit surveys include four activities which were identified as being oceans related: boat touring, whale watching, iceberg viewing and sea kayaking. Estimates indicate that about 47 percent of non-resident auto visitors and 36 percent of non-residents air visitors engage in oceans related activity.

Appendix 3 - Glossary of Terms



GLOSSARY OF TERMS

Econometrics. An area of economics that combines economic theory and statistical principles/methods in order to develop mathematical estimates of key economic relationships (e.g., an estimate of the relationship between consumer spending and income).

Goods Sector. Is a classification term for those industries that produce goods for local consumers or for export. It includes agriculture; logging and forestry; fishing and trapping; mining; crude petroleum; utilities (electric power, gas and water); construction; and manufacturing. These industries are often collectively referred to as the Good Producing Industries.

Gross Domestic Product (GDP). A measure of the value of all goods and services produced within the province in a given period. GDP measures the size of the economy and whether it is growing. Statistics Canada estimates GDP in two ways. First, GDP at market prices which values GDP by totalling the expenditures required to purchase the goods and services produced. This method is often referred to as GDP from the expenditure side. Second, GDP at factor cost which values GDP by summing the payments made to the owners of the factors used in production (i.e., land, labour and machinery/buildings) inclusive of profit, which is the factor payment to entrepreneurs. This method is sometimes referred to as GDP from the income side. GDP at factor cost equals GDP at market prices less indirect taxes and subsidies.

Multiplier. A number used to determine the impact of an event/project/industry on the economy. The ratio of total change in output or employment to the initial change (or direct change). For example, if an industry were to create 100 new jobs, it would require materials and services from its supplying industries. If this increase in demand created 30 new jobs in the supplying industries, the employment multiplier would be 1.3 [i.e., 100 (direct) + 30 (spinoff)].

Services Sector. Is a classification term for those industries that produce services for local consumers or for export. It includes transportation and storage; communication; wholesale/retail trade; finance, insurance, and real estate; community, business and personal services; and public administration. These industries are often collectively referred to as the Service Producing Industries.



